JEFFERSON PARISH

2015 MULTIJURISDICTIONAL HAZARD MITIGATION PLAN UPDATE

MARCH 2015

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Section 1
Executive Summary

On October 30, 2000, the President signed into law the Disaster Mitigation Act of 2000, also known as DMA2K. Among its other features, DMA2K established a requirement that in order to remain eligible for Federal disaster assistance and grant funds, local and State governments must develop and adopt Hazard Mitigation Plans (HMPs). On February 26, 2002, the Federal Emergency Management Agency published an Interim Final Rule (IFR) that set forth the guidance and regulations under which such plans are supposed to be developed. The IFR provides detailed descriptions of both the planning process that States and localities are required to observe, and the contents of the plan that emerges. The original version of the Parish HMP was approved by the State and the Federal Emergency Management Agency (FEMA) in 2005, and an update to the HMP was also approved by the State and FEMA in 2010. Both were subsequently adopted by the Jefferson Parish Council.

Hazard mitigation is defined as any sustained action taken to reduce or eliminate the long-term risk to life and property from hazard events. The 2015 HMP update is a comprehensive re-evaluation of all parts of the plan, including hazard profiles, risk assessment, mitigation goals, strategies, and mitigation priorities. This update was approved by the State and FEMA in 2015 and adopted by the Jefferson Parish Council and all jurisdictions.

Contact information for the Jefferson Parish official submitting this Hazard Mitigation Plan Update is:

Ms. Michelle Gonzales, CFM
Jefferson Parish Director of Floodplain Management & Hazard Mitigation
1221 Elmwood Park Boulevard, Suite 801
Jefferson, Louisiana 70123
Telephone: 504.736.6732
Email: mgonzales@jeffparish.net

1.1 Organization of the Plan

The Jefferson Parish Hazard Mitigation Plan Update is organized to parallel the structure provided in the Interim Final Rule [IFR]. The Plan has six sections and four Appendices (A-D).

Section 1 **Executive Summary**
Section 2 **Background**
Section 3 **Planning Process**
Section 4 **Hazard Identification, Ranking, and Risk Assessment**
Section 5 **Mitigation Strategy**
Section 6 **Plan Monitoring and Maintenance**

Appendix A **Public Notices and Meeting Minutes**
Appendix B **Summary of Changes**
Appendix C **Approval and Adoption Resolutions**
Appendix D **General Descriptions of Natural Hazards**

1.2 Background

The purpose of a mitigation plan is to rationalize the process of determining appropriate hazard mitigation actions. The document includes a detailed description of natural hazards in Jefferson Parish; a risk assessment that describes potential losses to physical assets, people and operations; a set of goals, objectives, strategies and actions that will guide the Parish's mitigation activities, and a detailed plan for implementing and monitoring the Plan. This Plan focuses on five hazards with the highest potential for damaging physical assets, people and operations in Jefferson Parish. These hazards are floods, hurricanes and tropical storms, storm surge, sea level rise, and tornadoes. Both the risk assessment section and goals sections reflect this emphasis, which was the result of careful consideration and a numerical ranking process carried out by the Mitigation Planning Team (MPT).

1.3 Hazards and Risks

1.3.1 Hazards

Section 4 of this Plan Update includes a detailed description of Jefferson Parish's risks from natural hazards, risk assessments for the Parish as a whole as well as individual jurisdictions, and more detailed assessments for Parish assets. Twelve hazards were identified and profiled by the MPT:

1. Floods
2. Hurricanes and Tropical Storms
3. Storm Surge
4. Tornadoes
5. Coastal Erosion
6. Subsidence
7. Hailstorms
8. Winter Storms
9. Lightning
10. Drought
11. Wildfires
12. Earthquakes

For each of these hazards, the profiles in Section 4 include:

- Description of the Hazard
- Location and Extent of the Hazard
- Severity of the Hazard
- Impact on Life and Property
- Occurrences of the Hazard

After these twelve hazards were profiled, the MPT used a ranking system with five criteria to reduce the range of hazards to those with the most potential to impact the Parish. The ranking and criteria are also discussed in detail in Section 4. The criteria included: (1) History, (2) Potential for Mitigation, (3) Presence of Susceptible Areas, (4) Data Availability, and (5) Federal Disaster Declarations and Local Emergency Declarations. The classification process provided a stratification of the hazards.

Table 1.3-1
Jefferson Parish MPT Hazard Ranking

Hazard	History	Mitigation	Vulnerability	Data	Disaster	Total
Floods	3	3	3	3	3	15
Hurricanes and Tropical Storms	3	3	3	3	3	15
Storm Surge	3	3	3	3	1	13
Tornadoes	2	2	2	2	1	9
Coastal Erosion	3	1	2	1	1	8
Subsidence	3	1	2	1	1	8
Hailstorms	2	1	2	2	1	8
Winter Storms	1	1	2	2	1	7
Lightning	1	1	2	1	1	6
Drought	1	1	1	1	1	5
Wildfires	1	1	1	1	1	5
Earthquakes	1	1	1	1	1	5

1.3.2 Risks

Risk is a numerical calculation of potential future damages. Although all of the events have some potential to affect the Parish, floods, hurricanes, and tropical storms are clearly the most significant hazards (based on the ranking criteria), followed by storm surge, and tornadoes. These four hazards were selected for more detailed assessments and estimations of future damages. Section 4 includes details about calculation methodologies and results of the risk assessment.

1.4 Summary of Goals, Objectives, Strategies and Actions

Section 5 of this Plan describes Jefferson Parish's priorities for mitigation actions. The section prioritizes the actions, describes the funding required, identifies potential sources of funding, designates responsible coordinating entity, gives anticipated year of completion, and analyzes benefits. The section also includes the Parish's hazard mitigation goals, objectives, and strategies.

1.4.1 Hazard Mitigation Goals

1. Identify and pursue preventive measures that will reduce future damages from hazards
2. Enhance public awareness and understanding of disaster preparedness
3. Reduce repetitive flood losses and substantial damage in the Parish and municipalities
4. Facilitate sound development in the Parish and municipalities so as to reduce or eliminate the potential impact of hazards

1.4.2 Hazard Mitigation Objectives

Objectives are well-defined intermediate points in the process of achieving goals. Jefferson Parish mitigation planning objectives include:

1. Reduce the exposure of residential areas to flooding and storm surge from the Mississippi River, Lake Pontchartrain, and the Gulf of Mexico.
2. Mitigate properties listed on the Jefferson Parish repetitive loss list and severe repetitive loss (SRL) list, and properties that meet substantial damage
3. Ensure that Parish critical facilities remain functional during natural hazard events.
4. Find and develop opportunities to work with other agencies to leverage mitigation funds, and to share information about the risks of natural hazards.
5. Improve the early warning and Public Alert System for hazards such as flash floods and tornadoes to save lives and reduce damages to property.
6. Promote partnerships among Federal, State, Parish, Interstate Commissions, and Local Governments to identify, prioritize and implement mitigation actions.
7. Improve the Parish's CRS rating through the NFIP to allow citizens to purchase flood insurance at a discounted price.
8. Maintain the viability of Jefferson Parish businesses by preventing damages from hazards.
9. Ensure that the Parish maximizes its opportunities for access to Federal and State grants and other kinds of assistance.
10. Reduce wind damages to residential and commercial buildings through hazard mitigation and effective implementation of building codes.
11. Provide effective implementation of existing floodplain regulations and building codes.
12. Ensure that the Parish continues to be represented in the determination of region-wide mitigation actions.
13. Stay involved with citizen and technical groups concerning measures related to hazard mitigation.

1.4.3 Hazard Mitigation Strategies

Strategies are specific courses of action to achieve the objectives. Jefferson Parish mitigation planning strategies include:

1. Maintain awareness of the potential effects of natural hazards on Jefferson Parish assets. Use new information from damaging events to increase local knowledge of risks.
2. Undertake vulnerability and risk studies to better understand the potential for future damages.
3. Ensure the Parish Emergency Operations Plan is maintained and updated and enhance Public Alert System.
4. Implement cost-effective projects and actions to reduce risk from natural hazards, both for Parish assets and operations, as well as for residents and businesses in the planning area.
5. Elevate and acquire qualifying residential structures from the Jefferson Parish repetitive loss list and severe repetitive loss list.
6. Install emergency backup generators at all critical facilities.
7. Distribute information to the public concerning the hazards associated with flooding. Include with the material opportunities about mitigation measures that can reduce flooding.
8. Monitor mitigation measures to ensure they are functioning efficiently.
9. Promote the purchase of flood insurance.

10. Continuously monitor this Plan Update to ensure that it remains current with regard to risks, strategies, priorities and mitigation actions.
11. Promote public understanding, support and demand for hazard mitigation.
12. Pursue drainage projects that will reduce local flooding in the Parish.
13. Seek Federal and State grants to fund mitigation activities.
14. Upgrade the local shelters to allow more people access during hazardous events.
15. Encourage and facilitate the development or updating of General Plans, Drainage Plans, Land and Zoning, Building Construction, Fire Protection and Floodplain Management Ordinances to limit development in hazard areas.
16. Implement elements of the Plan and monitor results.

1.4.4 Action Items

The 2015 Plan Update outlines the Parish's current priorities for specific activities to achieve the four goals listed above. Section 5 (Mitigation Strategy) gives details for the Parish's approach to addressing the Hazards profiled in Section 4 (Hazard Identification, Ranking, and Risk Assessment) and reducing their risk to Jefferson Parish.

1.5 The Planning Process

Section 3 provides details about the process that was used to develop this Plan. The process closely followed the guidance in the FEMA "G318" planning guidance, resulting in a five-stage process for the development of this mitigation plan update.

Step 1 Organize resources & create outreach strategy
Step 2 Identify community assets, analyze hazards, and assess risks
Step 3 Develop a mitigation plan
Step 4 Implement the plan and monitor progress
Step 5 Create a safe and resilient community

Step 1 includes identification of a Mitigation Planning Team (MPT) that was responsible for most aspects of Plan development; and a Stakeholder group, comprised of individuals from Jefferson Parish and its incorporated jurisdictions, which were informed of the planning decisions and provided interim versions of the Plan for review and comment. The Parish Council is the approving authority for the Plan.

Step 2 was completed by the MPT, and is included as Section 4 of the Plan.

Step 3 is described in Section 3 (Planning Process). The section includes details about who was involved, the processes that were used, and the products that were developed.

Step 4 is described in the Mitigation Strategy section (Section 5), which includes details about who is responsible for implementation of specific strategies and actions; and in Section 6, the Plan Monitoring and Maintenance section, which describes long-term implementation through periodic updates and reviews.

Step 5 will be an ongoing effort accomplished through the implementation of the mitigation strategies and actions discussed in Section 5 of this plan.

1.6 Approval and Adoption Processes

Appendix D discusses the Approval and Adoption of the Plan Update. The Parish Council is responsible for approving and adopting the 2015 Hazard Mitigation Plan Update. Each jurisdiction adopted 2015 Plan Update on the following dates:

- Jefferson Parish – April 29, 2015
- City of Gretna – May 13, 2015
- City of Harahan – May 21, 2015
- City of Kenner – May 21, 2015
- City of Westwego – May 11, 2015
- Town of Grand Isle – June 9, 2015
- Town Jean Lafitte – May 8, 2015

1.7 Implementation Process

The implementation process is described as part of the specific actions in the Mitigation Strategy section (Section 5).

1.8 Monitoring and Updating Processes

Section 6 (Plan Monitoring and Maintenance) describes the schedule and procedures for ensuring that the Plan Update stays current. The section identifies when the Plan must be updated, who is responsible for monitoring the Plan, and ensuring that the update procedures are implemented. The section also provides a combination of cyclical dates (oriented toward FEMA requirements) and triggering events that will initiate amendments and updates to the Plan. The Parish Department of Floodplain Management and Hazard Mitigation is responsible for monitoring the Plan and initiating the cyclical update process.

Section 2
Background

2.1 Introduction

In 2005 Jefferson Parish prepared its original Hazard Mitigation Plan (HMP) to be better equipped for disasters before they occur. It was also developed to objectively evaluate the hazards that occur in the Parish and prioritize the actions needed to provide a safe place to live. In February of 2003 the Parish was awarded a planning grant through the Hazard Mitigation Grant Program (HMGP). The HMGP grants are used by the Federal Emergency Management Agency (FEMA) to help States, Counties (Parishes) and Municipalities mitigate against future damages. The Plan was also developed to satisfy the Disaster Mitigation Act of 2000 (DMA 2000) which required local governments to develop a HMP that complied with specific regulations. If a Plan was not developed by the specified deadline, local governments would no longer be eligible for future HMGP funding. Over the next two years the Plan was developed and approved by the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) and FEMA in July of 2005.

What follows in Section 2 is a description of the "scope of the Plan" which addresses why the Plan was originally prepared and is now being updated, maps of the planning area, background about Jefferson Parish, and an overview of the Louisiana State Mitigation Plan.

2.1.1 Scope of the Plan

The original Jefferson Parish HMP was a concerted effort on the part of the Parish to develop an all hazards, Parish-wide approach to disaster damage reduction. In order to focus on a process needed to attain a sustainable future, Jefferson Parish utilized a FEMA approved process to identify and assess all potential hazards that may affect the community and develop an action plan to address those hazards. The original Plan was updated in 2010 and has been utilized to better articulate accurate needs for the community based on a process that involves all stakeholders including the general public, government, business and industry.

The Jefferson Parish HMP Update included re-evaluating the original hazards, the risk assessment, mitigation goals, strategies, and mitigation priorities. As part of the 2015 update process, all sections of the Plan were re-assessed to identify changes and updates that may have occurred since the 2010 version or as a result of any disaster declarations since that time.

In addition to the unincorporated areas of the Parish there are six incorporated municipalities, all of which are participating in the 2015 HMP Update, including; Gretna, Harahan, Kenner, Westwego, Grand Isle, and Jean Lafitte. The risk assessments, background, goals, and mitigation actions have been updated based on an analysis of hazard events, population changes, and other factors that impacted the risk within each municipality. The updates completed for each municipality can be found within each Hazard Profile in Section 4 of the Plan.

2.2 Organization, Objectives and Mission of Jefferson Parish

This section of the Plan describes the purpose, structure and operations of Jefferson Parish. The Parish is governed by a President who carries out the policies adopted by the Parish Council, the legislative body of the Parish. The Council is composed of five district Council Members and two at-large Council Members who are together responsible for levies, taxes, special assessments, service charges, and license fees.

The mission of the Parish as described on its web site is to "provide the services, leadership, and vision to improve the quality of life in Jefferson Parish." The Parish includes over 50 different departments that are overseen by the Parish President and a Chief Administrative Assistant. The Jefferson Parish Office of Emergency Management (OEM), the Planning Department, the Department of Capital Projects, the Emergency Operations Center (EOC), and the Department of Floodplain Management and Hazard Mitigation are the main Parish departments associated with emergency management activities and hazard mitigation. The five departments are summarized below;

- The Jefferson Parish Department of Emergency Management is responsible for developing a coordinated and effective response for the protection of lives and property of citizens in Jefferson Parish during natural or man-made disasters. This department oversees and coordinates the development of the Hazard Mitigation Plan. Additional functions include the development and implementation of an "All Hazard Emergency Operations Plan" and activate and man the EOC during emergencies. Jefferson Parish also shares emergency operations responsibilities with several organizations including the State, the jurisdictions, and national coordination with FEMA.

- The Planning Department is responsible for all planning activities in the unincorporated areas of Jefferson Parish. The department provides flood zone information including copies of FEMA's Flood Insurance Rate Maps (FIRM) which identify the special flood hazard area (SFHA).

- Emergency Operations Center provides disaster planning information including the development and maintenance of the Parish emergency operations plans. The department also provides information about flood preparedness including the importance of purchasing and maintaining flood insurance, the Parish flood warning system, and property protection.

- The Department of Capital Projects provides support to other Public Works departments. Additional responsibilities include coordinating the Southeast Louisiana Flood Control Program (SELA) for Jefferson Parish. The program began in 1996 to reduce flood damages by improving segments of the Parish primary drainage system.

- The Department of Floodplain Management and Hazard Mitigation provides flood zone determinations and guidance on various mitigation methods, including but not limited to: Oversight of Hazard Mitigation Assistance (HMA) Grants, Interpreting Flood Insurance Rate Maps (FIRMs), updating the Parish's Hazard Mitigation Plan, and working through the Community Rating System (CRS) program for Jefferson Parish.

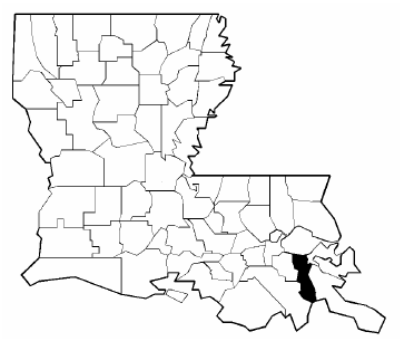
2.3 Background Information about Jefferson Parish

Prior to addressing the hazards that our community faces, this Plan presents a brief overview of Jefferson Parish, taking into account the geography, history, climate, transportation, community assets, and population and growth.

2.3.1 Geography

Jefferson Parish lies in southeastern Louisiana and is bordered by Lake Pontchartrain on the north, Orleans and Plaquemines Parishes to the east, the Gulf of Mexico to the south, and Lafourche and St. Charles Parishes to the west. Figure 2.3-a identifies the Parish's location within the State of Louisiana.

Figure 2.3-a
Jefferson Parish Location Map



Principal physiographic features of the area are the Mississippi River channel, natural levee ridges along its banks and along the banks of abandoned distributary channels, and low marshlands situated between and bordering the channels. Jefferson Parish is divided into an East and West Bank by the Mississippi River which meanders through the northern section of the Parish. The highest land in the Parish is approximately 10 feet above the National Geodetic Vertical Datum (NGVD) along the natural levee that borders the Mississippi River. The East Bank is nearly surrounded by water and bound by the Mississippi River to the south, Lake Pontchartrain to the north, the 17th Street Canal to the east, and St. Charles Parish to the west. The West Bank of Jefferson Parish, east of the Harvey canal, is bound by the Donner Canal to the east, the Mississippi River to the north, the Harvey Canal to the west, and the Intracoastal Waterway to the south.

As mentioned earlier in this section the Parish consists of six incorporated areas. In addition to the incorporated areas, Metairie is the Parish's largest community, an unincorporated area that comprises almost all of East Jefferson Parish. Smaller unincorporated areas include River Ridge and Jefferson. East Jefferson cities include Kenner and Harahan while cities such as Gretna and Westwego are in West Jefferson.

Jefferson Parish consists of a land area of 305 square miles or 195,793 acres and a water area of 336 miles or 215,358 acres. The Parish extends about 55 miles in a north-south direction from the southern shores of Lake Pontchartrain to the Gulf of Mexico. Figures 2.3-b and 2.3-c are maps of Northern and Southern Jefferson Parish.

Figure 2.3-b
Map of Northern Jefferson Parish

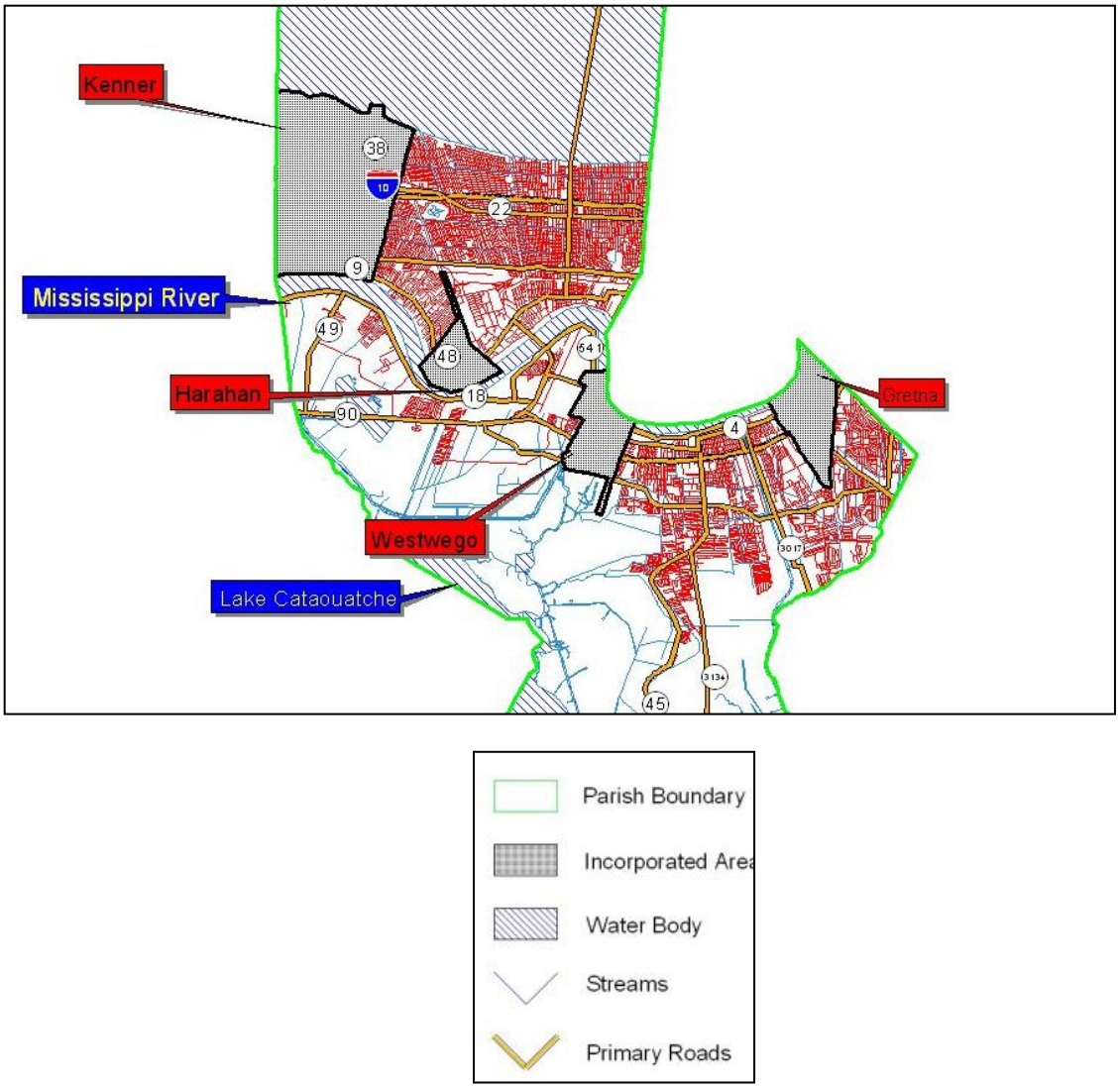
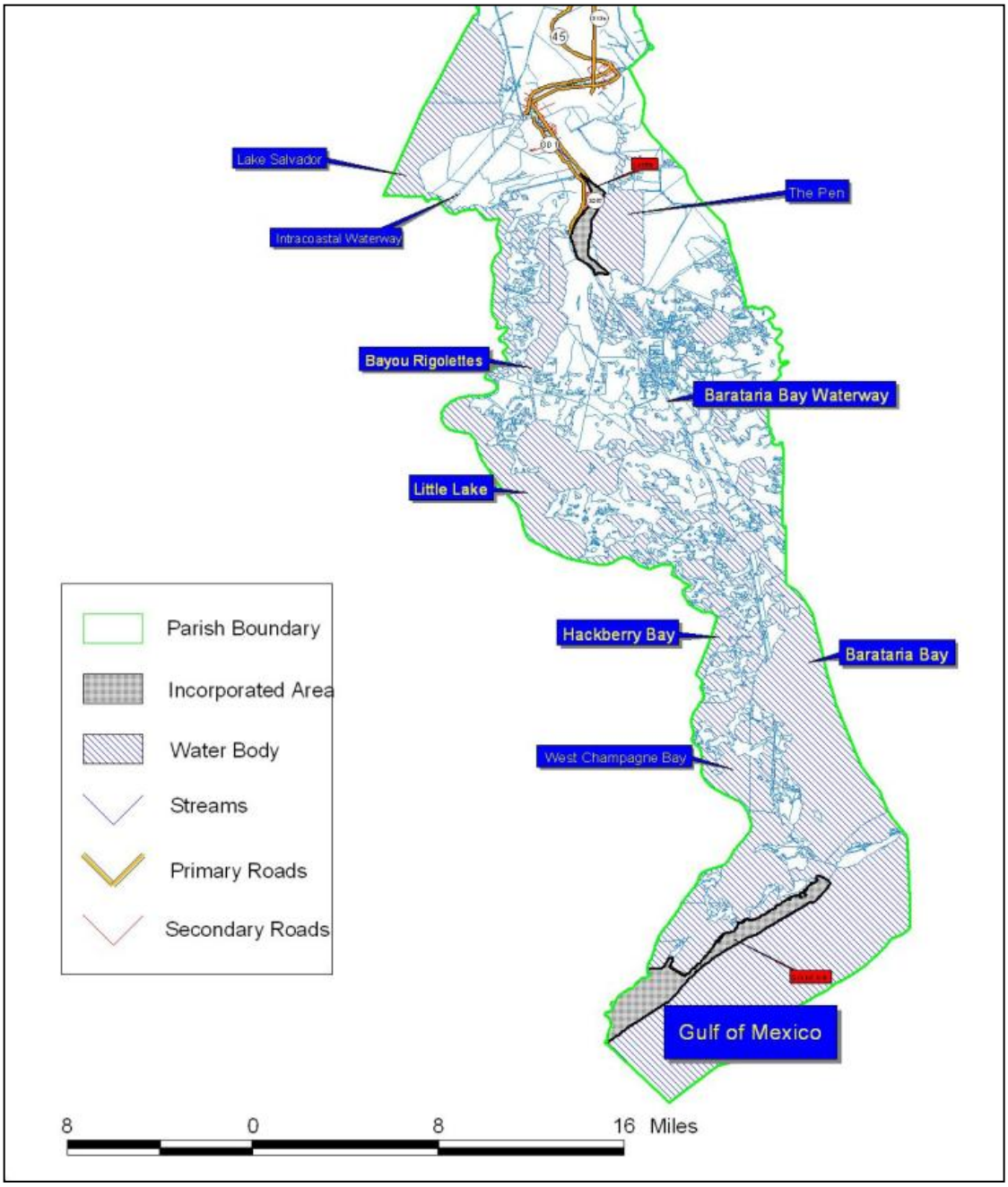


Figure 2.3-c
Map of Southern Jefferson Parish



The land use in Jefferson Parish has been developed for a variety of purposes including residential, industrial, transportation, and agricultural use. The northern portion of the Parish is considered heavily urbanized and is part of the New Orleans Metropolitan Area. This area predominately consists of residential, industrial, and infrastructure developed for transportation, utility, and communications. The southern part of the Parish is less populated and is characterized by estuarine systems that lead in from the Gulf of Mexico. The coastal marshes, wetlands, and estuaries

contain numerous bodies of shallow water. These bodies of water and wetlands make up over 85 percent of the Parish.

Flood protection in northern Jefferson Parish is achieved by a system of levees, floodwalls, canals and drainage pump stations. The Parish has 340 miles of canal waterways, drainage ditches, cross drains, culverts, and internal levee systems. There are also 70 pump stations (24 major stations) that include 167 pumps installed throughout the Parish drainage system for a total capacity of 47,569 cfs (Source; Jefferson Parish Drainage Department). With the exception of some areas inside the levee protected areas of northern Jefferson Parish, most of the land is located within FEMA's 100-year floodplain. The land area outside of the 100-year floodplain may still be subject to flooding if a levee failure were to occur.

2.3.2 Parish History

From the early 16th century European explorers recognized the strategic and economic potential of the lower reaches of the Mississippi River. Fertile soil and access to the Mississippi River were the area's most attractive features. French and Spanish land grants made during the colonial period set the pattern for development in what was to become the Greater New Orleans area. The French and Spanish heritage is the basis for the present division of the State of Louisiana into parish governmental units rather than the county which is used in other parts of the United States.

Jefferson Parish was established in 1825 and was named in honor of Thomas Jefferson, commemorating his role in purchasing the Louisiana Territory from France in 1803. The Parish originally extended from present day Felicity Street in New Orleans to the St. Charles Parish line. As Orleans Parish grew, it annexed from Jefferson Parish and established areas as the Garden District, Lafayette, Jefferson, and Carrollton. The present boundary was set in 1874 and the seat of the Parish government was transferred to Gretna, where it has remained.

Once, a largely rural area of farms and vast tracts of undeveloped land, Jefferson Parish is New Orleans' first suburb. It is a bedroom community west of the city that received the first migration of middle class families from the 1950s to the 1970s.

In 1935 the Huey P. Long Bridge was constructed across the Mississippi River connecting the East and West Bank of Jefferson Parish. At the time, the bridge was constructed too far upstream along the Mississippi River to benefit most residents of New Orleans. Constructed to be used by both automobile and rail traffic, it is the largest and highest steel railroad bridge in the United States. In 1958 the first span of the Crescent City Connection opened providing Jefferson Parish residents for the first time bridge access over the Mississippi River to New Orleans. Prior to this ferry boats provided the only link between the banks. The second span of the Crescent City Connection opened in 1988.

With the rapid economic development taking place throughout Jefferson, great growth was also seen in the Parish's population - from the 1970's to the year 2000 the census increased by almost 100,000. This growth trend might have continued had the Parish not been devastated by Hurricane Katrina in August of 2005. Katrina made landfall as a powerful Category 3 Hurricane with maximum sustained winds of 130 mph and a massive storm surge of up to 28 feet that completely destroyed parts of the gulf coast. Approximately 78,000 housing units in Jefferson Parish were damaged by high winds, localized flooding, and/or storm surge. As a result, large numbers of

residents were displaced from their homes, causing a population shift that was evident in the 2010 census that was 22,914 lower than the previous decade.

Despite the harsh impact of the costliest disaster in US History, the Parish continues to be a leading Louisiana Parish in terms of population and economic viability.

2.3.3 Climate

Jefferson Parish has a semitropical climate. Variations in daily temperature are determined by distance from the Gulf of Mexico and, to a lesser degree, by differences in elevation. The average annual temperature for the State as a whole is 67.4ºF. January is the coldest month averaging 59ºF, and July and August the warmest, averaging 83ºF for Jefferson Parish. Jefferson Parish enjoys a complete seasonal cycle with pleasant spring and fall seasons. Winter months are usually mild with cold spells of short duration. Snowfall is less than two inches per year. The summer months are quite warm, with an average daily maximum temperature in July and August of 83ºF degrees. Average annual precipitation for the area is 64.16 inches.

2.3.4 Transportation

The main transportation arteries through Jefferson Parish are Interstate 10, U.S. Highways 61 and 90, and numerous State routes. Interstate Highway 10 cuts through the northern portion of the Parish while U. S. Highway 61 runs south of I-10, parallel to the interstate. U.S. Highway 90 runs east and west, crossing the Mississippi River. The highways are well used and are maintained for commercial traffic. Some of these roadways are significant evacuation routes for Jefferson Parish, as well as surrounding Parishes during states of emergency.

Jefferson Parish is served by the Union Pacific, Southern Pacific, Southern Pacific Rail, New Orleans Lower Coast, New Orleans Public Belt, and Illinois Central Railroads. All of the tracks run east and west, parallel to the Mississippi River and the major highways. Rail rates in Louisiana for many commodities tend to be lower than those in the other States because of the competition from barge carriers. All lines handle a significant volume of containers, trailers on flat cars and carload traffic between New Orleans and other parts of America.

2.3.5 Community Assets

The statistics for the law enforcement, fire departments, medical services, and schools are current as of July 2007, but they are subject to change and will be updated appropriately. As part of the Plan update the Jefferson Parish Geographical Information Systems (GIS) Department provided their most recent data for the various Departments and Schools listed below.

Law Enforcement – The Jefferson Parish Sheriff's Office has six offices located on the east and west banks of the Mississippi River. The Parish also has the Greater New Orleans Expressway Police Department and the East Jefferson Levee District Police Department. The Sheriff's office handles all of the criminal, civil and tax division operations, as well as police protection throughout the Parish. The Sheriff's office also has a jail and a correctional center. The areas of Gretna, Harahan, Kenner, Westwego, Grand Isle, and Jean Lafitte have their own police departments.

Fire Departments – Jefferson Parish is served by 61 Fire Stations located throughout the Parish on the east and west banks.

Medical Services – Jefferson Parish has 20 hospitals to serve residents of the Parish. Residents have access to the large number of medical facilities located in the Parish as well as surrounding areas, including Charity Hospital in New Orleans, which is one of the largest teaching hospitals in the country, the clinics of both LSU and Tulane Schools of Medicine, and numerous other public and private medical facilities. The medical care in the New Orleans region is among the finest available in the world. The Parish also has 40 nursing homes.

Schools – There are 183 schools in Jefferson Parish including all public and private schools, two and four year colleges/universities, medical and law schools, technical colleges, and research bases.

Within an hour's drive of Jefferson Parish there are fifteen major colleges and universities. These universities are nationally recognized for sponsoring extensive research activities, for their schools of law, medicine, fine arts, and engineering curriculum.

- University of New Orleans – 10 miles
- Delgado Community College – New Orleans – 10 miles
- Tulane University – New Orleans – 10 miles
- Loyola University – New Orleans – 10 miles
- Southern University at New Orleans – 10 miles
- New Orleans Baptist Theological Seminary – 10 miles
- Xavier University – New Orleans – 10 miles
- Louisiana State University Medical Center – New Orleans – 10 miles
- Dillard University – New Orleans – 10 miles
- Our Lady of Holy Cross College – New Orleans – 10 miles
- Notre Dame Seminary School of Theology – New Orleans – 10 miles
- Nunez Community College – St. Bernard – 15 miles
- Southeastern Louisiana University – Hammond – 50 miles
- Louisiana State University – Baton Rouge - 60 miles
- Southern University – Baton Rouge – 60 miles

Parks and Recreation – There is an abundance of outdoor recreational activities available to local residents. There are many bayous, lakes, and rivers, which offer miles of navigable waters to boaters and wonderful fishing, camping and hunting grounds for residents and visitors. There are several swamp tours within the Parish, where visitors may see various types of wildlife including alligators, rare birds, nutria and more.

2.3.6 Population and Growth of the Planning Area

Population

Of the 64 Parishes within the State, Jefferson Parish is the second most populous accounting for almost 10 percent of the overall population of Louisiana. The Parish experienced significant growth during the 1970's, with an increase in population of 117,024 people from the 1970 U.S. Census to the 1980 U.S. The population leveled off in the 1980's and remained around 450,000 residents between 1980 and 2000. However, the Parish's population, according to the 2010 U.S. Census, experienced a slight decline of approximately 5 percent. See Table 2.3-1 for the population of the Parish and cities for years 1980, 1990, 2000, and 2010.[1]

Table 2.3-1
Jefferson Parish Population

Name	Total 2010 Population	Total 2000 Population	Total 1990 Population	Total 1980 Population
Jefferson Parish	432,552	455,466	448,306	454,592
Metairie, CDP	138,481	146,136	149,428	164,160
Kenner, City of	66,702	70,517	72,033	66,382
Marrero, CDP	33,141	36,165	36,671	36,548
Terrytown, CDP	23,319	25,430	23,787	N/A
Harvey, CDP	20,348	22,226	21,222	22,709
Gretna, City of	17,736	17,423	17,208	20,615
Estelle, CDP	16,377	15,880	14,091	N/A
River Ridge, CDP	13,494	14,588	14,800	N/A
Woodmere, CDP	12,080	13,058	N/A	N/A
Jefferson, CDP	11,193	11,843	14,521	N/A
Timberlane, CDP	10,243	11,405	12,614	N/A
Westwego, City of	8,534	10,763	11,218	N/A
Harahan, City of	9,277	9,885	9,927	N/A
Waggaman, CDP	10,015	9,435	9,405	N/A
Bridge City, CDP	7,706	8,323	8,327	N/A
Avondale, CDP	4,954	5,441	5,813	N/A
Elmwood, CDP	4,635	4,270	N/A	N/A
Jean Lafitte, Town of	1,903	2,137	1,469	N/A
Lafitte, CDP	972	1,576	N/A	N/A
Grand Isle, Town of	1,296	1,541	1,455	N/A
Barataria, CDP	1,109	1,333	1,160	N/A

As a result of Hurricanes Katrina, Rita, Gustav, and Ike, large numbers of residents were displaced from the State of Louisiana. Hurricane Katrina alone forced an immediate and massive relocation of hundreds of thousands of people, making it difficult to track the population shift. This displacement has caused a Parish wide decrease in population from the 2000 census to the 2010 data.

Growth

The 2010 population estimates from the U.S. Census Bureau indicate that growth has declined in the last ten years. Population growth is one indication of development trends - building permits are another. Development in the Parish has been steadily decreasing over the past nine years. Annual building permits for residential homes have decreased from 1,118 in 2004 to 711 in 2006 to 269 in 2010 and 243 in 2013.

The East Bank of the Parish is primarily built-out, with little vacant land available in the unincorporated areas. Although, there is considerable redevelopment activity located on the East Bank. The West Bank has experienced the majority of the Parish's growth. There were 2,271 total building permits issued on the West Bank and 2,030 on the East Bank in the year 2000. This indicates a trend towards redevelopment on the East Bank and more new developments on the West Bank. These building permit statistics for Jefferson Parish are prior to Hurricane Katrina.

Development trends, especially on the West Bank of the Parish are putting some pressure on the natural areas of the Parish. The Parish has purchased 610 acres of vacant property, primarily wetland areas to be used as a park with much of the wetlands area to remain as wetlands. There are vast areas of marshland and estuarine areas leading to the Gulf of Mexico that will remain undeveloped. In March of 1979, Jefferson Parish Council adopted an ordinance establishing a Growth Limit Line in the area south of Crown Point on the West Bank. The Growth Limit Line limits the types of structures and uses that can be established in critical wetland areas.

Jefferson Parish has seen growth primarily in the oil industry, tourism, retail centers, and business. In 2006 construction began on the Churchill Technology and Business Park located in Avondale near the center of the Parish. Other production includes manufacturing and industrial plants, shipyards, and port facilities. The fishing, hunting, and trapping industries are also important to the Parish.[2] See Table 2.3-2 for a list of the top 25 employers in Jefferson Parish reported by the Jefferson Parish Economic Development Commission as of October of 2013.[3]

Table 2.3-2
Jefferson Parish Top 25 Employers

Name	Product or Service	No. of Employees
Ochsner Health System	Medical	13,000
Jefferson Parish School Board	Education	6,631
Stewart Enterprises, Inc.	Funeral Services	5,000
Acme Truck Line, Inc.	Transportation	3,250
Jefferson Parish	Parish Government	2,882
East Jefferson General Hospital	Medical	2,310
Huntington Ingalls	Shipbuilding, Engineering, Repair, R&D	2,200
West Jefferson Medical Center	Health Care	1,850
Al Copeland Investments	Franchises	1,700
Jefferson Parish Sheriff's Office	Law Enforcement Government	1,500
Laitram Corporation	Shrimp Processing Equipment Manufacturing, Plastic Conveyor Belting & Alternating Tread Stair Manufacturer	1,000
People's Health	Health Services	1,000
Rouses Supermarket	Grocery Stores	812
Blessey Marine Services	Inland Water Passenger Transportation/Towing	800
Audubon Engineering Company	Engineering Firm	769
Imperial Trading Co. Inc.	Food Distributors and Food Services	750
Treasure Chest Casino	Casino	750
Intralox, LLC	Plastic Conveyor Belting and Accessories Manufacturer	704
City of Kenner	Municipal Government	699
LA Coca Cola Bottling, LLC	Soft Drink Bottling	650
MCC Electric, LLC	Electrical and Wiring Installation Contractors	642
Readsoft, LLC	Prepackaged Software Services	637
Boomtown Casino	Developer, Owner & Operator of Casinos & Related Hotel Entertainment Facilities	603
Cross Roads Centers	Warehouse and Transportation	600
Minerals Management Service	Federal Government Agency	600

Jefferson Parish has extensive zoning regulations that address use and height of buildings, density of population, open space limitation, and lot and occupancy requirements. The zoning ordinances are consistent with the Parish Comprehensive Plan. The Parish Council and Planning Advisory Board are responsible for proposed development changes. A written recommendation must be submitted to the Council and Planning Advisory Board before the Parish Council enacts or amends development regulations. The zoning ordinances address over 30 different types of districts in the Parish, ranging from suburban, medical, mixed-use to industrial. Districts are defined as any section of Jefferson Parish in which these zoning regulations are uniform.

2.4 The Louisiana State Hazard Mitigation Plan

The Louisiana Governor's Office of Homeland Security and Emergency Preparedness, together with the Louisiana State University Departments of Geography & Anthropology and Construction Management, completed the State of Louisiana Hazard Mitigation Plan (HMP) 3-year update in 2014. The updated HMP was reviewed, approved by FEMA, and adopted by the State in a letter dated March 31, 2014.

The State HMP profiled twenty (20) hazards affecting Louisiana, twelve (12) of which are profiled within this Jefferson Parish 2015 Plan Update. Descriptions and assessments of associated risk from these hazards can be found in Section 4 (Hazard Identification, Ranking, and Risk Assessment) of this Plan Update.

The goals outlined in the State HMP are listed below:

Goal 1 - The State of Louisiana will improve education and outreach efforts regarding potential impacts of hazards and the identification of specific measures that can be taken to reduce their impact.

Goal 2 - The State of Louisiana will improve data collection, use, and sharing to reduce the impacts of hazards.

Goal 3 - The State of Louisiana will improve capabilities and coordination at the Municipal, Parish, Regional, and State level to plan and implement hazard mitigation projects.

Goal 4 - The State of Louisiana will continue to pursue opportunities to reduce impacts to the State's manmade and natural environment through the mitigation of repetitive and severe repetitive loss properties and other appropriate construction projects and related activities.

Goal 5 - The State of Louisiana will improve on the protection of its Historic Structures/Buildings, Traditional Cultural Properties and Archaeological Sites from natural and human-constructed hazards.

The State HMP used the profiled hazards and risk assessments to develop a statewide mitigation strategy and action plan for future utilization in reducing risk across all jurisdictions within Louisiana.

Section 3
Planning Process

As part of the 2015 Plan Update, portions of the original Hazard Mitigation Plan (HMP) were preserved, including some of the terms and language. The process used to develop the 2005 version of the Plan was guided by a Steering Committee. The update process included a Mitigation Planning Team (MPT), which carried out most of the planning duties, and a Stakeholders group, which was responsible for reviewing the document at key points, and providing feedback.

The "Planning Process" (Section 5) of the original Plan was re-structured to highlight the 44 CFR 201 Interim Final Rule (IFR) requirements. As part of the Update, Section 3.2, Federal Mitigation Planning Requirements, has been added to highlight and review some of the other FEMA programs that are related to hazard mitigation planning. These FEMA programs include specific planning requirements as prerequisite for eligibility. Additional details about specific changes and updates from the original Plan can be found in *Appendix C, Summary of Changes and Updates to Jefferson Parish's Hazard Mitigation Plan.*

3.1 Interim Final Rule Requirements for the Planning Process

IFR §201.6(c)(1): [*The Plan shall document] the planning process used to develop the Plan, including how it was prepared, who was involved in the process, and how the public was involved.*

IFR §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

(1) An opportunity for the public to comment on the Plan during the drafting stage and prior to Plan approval;

(2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and

(3) Review and incorporation, if appropriate, of existing Plans, studies, reports, and technical information.

IFR §201.6(c)(4)(ii): [*The Plan shall include a] process by which local governments incorporate the requirements of the mitigation Plan into other planning mechanisms such as comprehensive or capital improvement Plans, when appropriate…*

3.2 Federal Mitigation Planning Requirements

As mentioned in Section 4.2, the Disaster Mitigation Act of 2000 requires State and local governments to develop and adopt natural hazard mitigation plans in order to be eligible for some types of federal assistance, including mitigation grants. The Act authorizes up to seven percent of HMGP funds available to a State after a disaster to be used for the development of State, tribal, and local mitigation Plans. Mitigation planning requirements are set forth in various FEMA policies and guidance documents, including the Interim Final Rule and the FEMA Local Mitigation Planning Handbook. The following series of bullets briefly describes the FEMA's three hazard mitigation programs, all of which require some form of mitigation plan in order for communities to be eligible for grants.

- **Flood Mitigation Assistance Program (FMA).** To qualify to receive grant funds to implement projects such as acquisition or elevation of flood-prone homes, local jurisdictions must prepare a mitigation Plan. The Plan must include specific elements and be prepared following the process outlined in the NFIP's Community Rating System.
- **Hazard Mitigation Grant Program (HMGP).** To qualify for post-disaster mitigation funds, local jurisdictions must have adopted a mitigation Plan that is approved by FEMA.
- **Pre-Disaster Mitigation Grant Program (PDM-C).** To qualify for pre-disaster mitigation funds, local jurisdictions must adopt a mitigation Plan that is approved by FEMA.

3.3 Description of the Planning Process

3.3.1 How the Plan was Prepared and Updated

The original Jefferson Parish Hazard Mitigation Plan was prepared in accordance with the process established in the FEMA How-To Guides, as well as the requirements of the 44 CFR 201 Interim Final Rule. The process established in the How-To guides has several steps.

Step 1 Organize resources

Step 2 Assess risks

Step 3 Develop a mitigation Plan

Step 4 Implement the Plan and monitor progress

Section 3 provides details about the process that was used to develop this Plan Update. The process closely followed the guidance in the FEMA Local Mitigation Planning Handbook, resulting in a five-stage process for the development of this mitigation plan update.

Step 1 Organize resources & create outreach strategy

Step 2 Identify community assets, analyze hazards, and assess risks

Step 3 Develop a mitigation plan

Step 4 Implement the plan and monitor progress

Step 5 Create a safe and resilient community

The How-To guides provided the structure for the process that was used to develop the original Plan. Other sections of this Plan include details about how the IFR requirements were met, and the process that was used to obtain and interpret data, and eventually make decisions in such areas as mitigation goals, as well as project and action priorities. These are discussed only generally in this section.

As part of the 2015 Plan Update, certain elements of the original Plan have been retained, while irrelevant or outdated information has been summarized or removed. In some cases the updated Plan includes cross references to particular information in the original version of the Plan. For the current version, there is a particular focus on incorporating new hazard information, updating the Parish risk assessment, and describing meetings and presentations held as part of the Update.

3.3.2 Step 1 - Organize Resources

Jefferson Parish used a standard organization to develop its Hazard Mitigation Plan and Update. The organization has four tiers;

- Mitigation Planning Team (MPT)
- Jurisdictional Sub-Team
- Stakeholders Group
- Jefferson Parish Council/Administration

As noted elsewhere, the Jefferson Parish Plan Update was funded through a grant from FEMA. In the Update process, Jefferson Parish procured the services of Hunt, Guillot & Associates, LLC, a professional planning consultant, to facilitate the process.

Composition of the Jefferson Parish Mitigation Planning Team

As part of the Update, government officials from several jurisdictions were members of the MPT and all jurisdictions were represented as part of the Stakeholders group. The MPT is comprised of the following individuals:

Table 3.3-1
Jefferson Parish Hazard Mitigation Plan, Mitigation Planning Team

Team Member	Job Title	Organization
Ms. Michelle Gonzales	Director of Floodplain Management and Hazard Mitigation	Jefferson Parish
Ms. Maggie Olivier	Floodplain/CRS Specialist	Jefferson Parish
Ms. Danika Gorrondona	Director of Inspections	City of Gretna
Mr. Michael Wesley	IT Manager	City of Gretna
Mr. Jeffrey Charlet	Director of the Regulatory Department	City of Harahan
Ms. Aimee Vallot	Director of Inspection and Code Enforcement	City of Kenner
Ms. Lisa Tapia	CRS Coordinator	City of Westwego
Ms. Nora Combel	Building Official	Town of Grand Isle
Ms. Yvette Crain	Clerk and Floodplain Manager	Town of Jean Lafitte

Mitigation Planning Team Meeting Schedule

The MPT and the consultant hired by the Parish were responsible for completing the Plan Update and project scoping including all of its component sections. The MPT met five times during the Plan Update – two of these meetings were open to the Public and are referenced below in Section 3.4. The meetings took place at the Yenni Building (4th floor), Mel Ott Center in Gretna, and the Jefferson Parish East Bank Regional Library. Appendix A of the Updated Plan includes minutes and attendees of all meetings.

Meeting 1 July 22, 2014

Meeting 2 August 19, 2014

Meeting 3 September 30, 2014

Meeting 4 October 21, 2014

Meeting 5 November 18, 2014

MPT members had an opportunity to provide input and feedback on the content and process of the Plan Update during these meetings. The Stakeholders group was periodically contacted by email to review and provide comments on meeting minutes, the updated Plan structure, as well as the draft and final Plan Updates.

Composition of the Jurisdictional Sub-Team

Government officials from several jurisdictions actively participated in the Update. These individuals provided data and insight to the various components of the plan. The Jurisdictional Sub-Team is comprised of the following individuals:

Table 3.3-2
Jefferson Parish Hazard Mitigation Plan, Jurisdictional Sub-Team

Team Member	Job Title	Organization
Mr. Kazem Alikhani	Director of Public Works	Jefferson Parish
Mr. Mitch Theriot	Director of Drainage	Jefferson Parish
Mr. Clinton Hotard	Engineer II Professional	Jefferson Parish
Ms. Tiffany Wilken	Director of Inspection and Code Enforcement	Jefferson Parish
Mr. John Piglia	Assistant Director of Inspection and Code Enforcement, CFM	Jefferson Parish
Mr. David Cobb	Assistant Regulatory Manager of Inspection and Code Enforcement, CFM	Jefferson Parish
Mr. Charles Hudson	Director of Emergency Management	Jefferson Parish
Mr. Timothy Gautreau	Assistant Director of Emergency Management	Jefferson Parish
Mr. Ridley Bourdreaux	Director of Management Information Systems	Jefferson Parish

Team Member	Job Title	Organization
Mr. Greg Brousse	GIS Manager	Jefferson Parish
Mr. Anthony Francis	Director of General Services	Jefferson Parish
Mr. Kriss Fortunato	Public Information Officer	Jefferson Parish
Ms. Danika Gorrondona	Director of Inspections	City of Gretna
Mr. Michael Wesley	IT Manager	City of Gretna
Mr. Jeffrey Charlet	Director of the Regulatory Department	City of Harahan
Ms. Aimee Vallot	Director of Inspection and Code Enforcement	City of Kenner
Ms. Lisa Tapia	CRS Coordinator	City of Westwego
Ms. Nora Combel	Building Official	Town of Grand Isle
Ms. Yvette Crain	Clerk and Floodplain Manager	Town of Jean Lafitte

Composition of the Stakeholders Group

Early in the update process the Parish determined that a group of knowledgeable participants, neighboring communities, businesses, academia and other organizations and individuals with an interest in the Jefferson Parish Plan Update and Project Scoping should be identified. This Stakeholders Group was provided regular updates on the planning process. Members of the Stakeholders group were also invited to attend and participate in all public meetings. This stakeholder group was identified by the MPT. Specifically, the neighboring communities' grant departments (Plaquemines Parish, Orleans Parish, and St. Charles Parish), nearby Offices of Emergency Preparedness (Plaquemines Parish and St. Charles Parish), and the floodplain office from Orleans Parish were invited to attend these meetings via e-mail by the Jefferson Parish Director of Floodplain Management & Hazard Mitigation. An image of one of those such e-mails is included on Page 16 of Appendix A.

As drafts of the Updated Plan were prepared, the Parish used email to distribute them to Stakeholders, and requested that they provide comments. Stakeholders were requested to provide feedback through email or by telephoning the Jefferson Parish POC or a member of the consultant team. The consultant was responsible for archiving the comments and including them in edited versions of the Plan.

Table 3.3-3
Jefferson Parish Hazard Mitigation Plan, Stakeholders Group

Group Member	Title	Organization
Ms. Belinda C. Constant	Mayor	City of Gretna
Mr. Provino "Vinny" Mosca	Mayor	Town of Harahan
Mr. Michael S. Yenni	Mayor	City of Kenner
Mr. John I. Shaddinger, Jr.	Mayor	City of Westwego
Mr. David Carmardelle	Mayor	Town of Grand Isle
Mr. Tim Kerner	Mayor	Town of Jean Lafitte

Mr. Jeffrey Giering	State Hazard Mitigation Officer	GOHSEP
Ms. Nicolette English	Planner	GOHSEP
Ms. Pamela Lightfoot	State NFIP and CRS Coordinator	LADOTD
Mr. Jerome Landry	Floodplain Manager	Orleans Parish
Mr. Brad Case	Hazard Mitigation Director	Orleans Parish
Group Member	**Title**	**Organization**
Mr. Mike Metcalf	Floodplain Manager	Plaquemines Parish
Ms. Hilda Lott	Grants Manager	Plaquemines Parish
Mr. Benny Puckett	Grants Administrator	Plaquemines Parish
Mr. Earl Matherne	Floodplain Manager	St. Charles Parish
Ms. Holly Fonseca	Grants Officer	St. Charles Parish
Ms. Monica Farris	Director	UNO-CHART

3.3.3 Step 2 - Assess Risks

In accordance with general mitigation planning practice, as well as the process FEMA established in its Planning "How-To" series of guides, the risk assessment forms the basis for the hazard mitigation Plan by quantifying and rationalizing information about how natural hazards affect the Parish. The processes used to complete the hazard identification and risk assessments, and the results of these activities, are described in detail in Sections 6 and 7 of this Plan. The assessment determined several aspects of the risks of natural hazards faced by the Parish and each jurisdiction:

- The natural hazards that are most likely to affect the Parish
- How often hazards are expected to impact the Parish
- The expected severity of the hazards
- What areas of Jefferson Parish are likely to be affected by hazards
- How Parish assets, operations, people and infrastructure may be impacted by hazards
- How private and commercial assets, operations, infrastructure may be impacted by hazards
- The expected future losses if the risk is not mitigated

Through a rating system (explained in detail in Section 6), the MPT reduced the initial hazard list to four. These are the predominant risks to the area: hurricanes and tropical storms, floods, storm surge, and tornadoes. For each of these hazards the planning team performed detailed risk assessments, i.e. calculations of future expected damages, expressed in dollars. These findings were presented to the MPT, discussed by the group, and approved by the Stakeholders Group as the basis for later phases of the planning process. The results of the risk assessment were also made available to the public during the public presentations noted elsewhere in this Plan. As noted above, a fuller description of this process and its results are presented in Section 7.

3.3.4 Step 3 - Identify and Scope Potential Hazard Mitigation Projects

As part of the planning initiative potential hazard mitigation projects were identified and scoped in accordance with the requirements of the program. The Parish and each of the six municipalities provided a list of potential mitigation projects that were reviewed and screened to identify those

most likely to qualify for funding under the HMGP and other FEMA mitigation grant programs. For those projects, the scoping phase includes conceptual design (feasibility analysis), environmental review, benefit-cost analysis, and a final feasibility analysis. As mentioned, the projects are included in Section 5, Mitigation Strategy, of the Plan Update.

3.3.5 Step 4 - Develop the Mitigation Plan

The process employed to develop this Plan was based on the FEMA Local Mitigation Planning Handbook which outlines hazard mitigation planning procedures in accordance with the Interim Final Rule section of the 44 CFR.

3.3.6 Step 5 - Implement the Plan and Monitor Progress

Once approved by FEMA and formally adopted by Jefferson Parish and the six participating Jurisdictions, this Plan must be updated every five years in order for the Parish to maintain its eligibility for various FEMA grant programs and funds. During this five year period, the Plan is periodically reviewed to ensure compliance with FEMA and the State of Louisiana requirements for Plan maintenance (See Section 6 – Plan Monitoring and Maintenance for more details). After the 2015 plan update is approved the Parish will implement specific actions to achieve the goals and objectives described in Section 5 - Mitigation Strategy. In addition to listing the mitigation strategies and actions the Parish is pursuing, the section describes the progress the Parish has made towards reaching the individual goals since the Plan was originally adopted.

The Jefferson Parish Council governs the Parish and has the final decision on what projects are worked on, and how and when they will be accomplished. The action items fall under their jurisdiction and they will delegate the tasks of the action items. Therefore the Council will coordinate with the Parish OEM Floodplain Manager and Lead Manager of each mitigation item to accomplish the goals and action items. The Lead Manager will follow any current procedures the Parish has while completing the action items. The Annual Progress Report and status reports (meeting minutes) will be submitted to the Parish Council, which will reflect progress on each item and on the Hazard Mitigation Plan.

3.4 How the Public and Jurisdictions were Involved

The Steering Committee met a total of five times during development of the original (2005) version of the HMP. The second, third and fourth meetings were open to the public. Public notices were distributed and posted throughout the Parish and municipalities. For these public meetings, press releases were prepared informing the public about the Hazard Mitigation Planning process and urged the public to be involved in this process. All the meetings were open discussions, where each person attending, whether a Steering Committee member or not, had the opportunity to volunteer information about the community and present ideas. Data was also collected from the respective jurisdiction representatives and used to assist with the Plan development. See Section 3 and Appendices K and L of the 2005 Plan for a more detailed discussion of meetings that were held, public involvement throughout the process, and the minutes and list of attendees at each meeting.

During the 2015 Plan Update, the public was involved by requesting their attendance and participation in two public presentations/meetings. In accordance with legal requirements, the Parish published public notice about the meeting on the Parish website and in the public library branches at least two weeks before each meeting. The jurisdictions also posted the public meeting notices in each of their respective locations. The flyers explained the purpose of the meeting, and provided the date, time, and location of the meeting place. The first public meeting was held on the West Bank of Jefferson Parish in August 2014. The second public meeting was held at the East Bank Regional Library in September of 2014. Public notices, sign-in sheets, and minutes of meetings can all be found in Appendix A of this plan.

- Public meeting 1 (West Bank) August 19, 2014
- Public meeting 2 (East Bank) September 30, 2014

Additionally, the Times Picayune printed an article about the August 19 meeting on August 20 by Ben Myers. Mr. Myers went on to recap the discussion had at the meeting as well as some interview questions he asked the Floodplain and Hazard Mitigation Director, Michelle Gonzales. Ms. Gonzales was also broadcasted on a public radio interview with Spud McConnell at WWL on August 21, 2014.

3.5 Other Local Planning Mechanisms

As required by FEMA Interim Final Rule that governs mitigation planning, actions and strategies from the Parish mitigation plan must be incorporated into other planning mechanisms, as applicable, during the routine re-evaluation and update of the Parish Plans. Jefferson Parish, as well as the cities of Gretna, Harahan, Kenner, and Westwego, and the towns of Grand Isle and Jean Lafitte are members of the NFIP and have Floodplain Management Ordinances. When the municipalities or Parish update their Floodplain Ordinances, the requirements from this HMP will be included in the revisions. This HMP will be made available to each committee leader responsible for revising their Floodplain Ordinance.

Both the Parish and the municipalities will use specific actions from the Strategies section of this plan as part of their capital budgeting processes, in particular when projects require local match for federal grants. Where possible the Parish will also use elements of this HMP to supplement CRS planning and mitigation activities. The Parish will also use the HMP as a resource in the process of identifying (and prioritizing) areas of focus in implementing the FEMA SRL and RFC mitigation programs. The Parish will also look for opportunities to use the updated HMP in conjunction with drainage plans.

The Parish and the municipalities follow the Southern Standard Building Code guidelines. The Southern Standard Building Codes were developed by the International Code Council and were adopted by the Cities and Parish. If the Parish or Cities decide to amend any of the Southern Standard Building Codes, within the process of amending them, they will take into account the requirements from this HMP.

The Parish Office of Emergency Management (OEM) has jurisdiction over the incorporated areas during disaster events; therefore, the incorporated areas follow the recommended guidelines in the Parish Emergency Operations Procedure.

3.6 Review and Incorporation of Plans, Studies, Reports and other Information

Other planning documents can be used as a valuable resource for integrating information related to hazard mitigation into the HMP. The 2010 version of the HMP included the review and incorporation of other Plans, studies, and reports that are applicable to the hazards discussed in the Plan. These documents were reviewed again as part of the 2015 Plan Update and any new information or changes have been incorporated into the HMP. A search was also conducted to identify additional Plans or studies that may have been completed since the release of the original Plan.

The following Plans and other documents were considered during the 2015 Jefferson Parish Plan Update: the Parish Comprehensive Plan, Coastal Wetland Conservation and Restoration Plan, the Debris Removal Plan, Comprehensive Drainage Master Plan, Jefferson Parish Emergency Operations Plan, and the Stormwater Management Plan. This HMP Plan Update has been made available to each committee leader responsible for updating these other Plans. In addition, any changes or updates to the States Coastal 2050 Plan, FIRMs, Southeast Louisiana Hurricane Preparedness Study 1994, and SLOSH Model are reflected in the Plan Update.

The specific Plans, Studies and Reports are listed below along with a discussion on how they were incorporated into the HMP Update.

- Louisiana State Hazard Mitigation Plan –The goals and strategies in the State plan were considered by the MPT as the planning team updated the Jefferson Parish plan, and to the extent possible the team patterned the update to reflect the spirit and details of the State document.
- Floodplain Ordinances – Jefferson Parish and the six sub-jurisdictions participate in the National Flood Insurance Program (NFIP) and therefore have adopted floodplain ordinances. These ordinances were reviewed and used to develop most of Section 5.2.4 of the original Plan – Floodplain Management and Building Codes. These ordinances were again reviewed to incorporate any new requirements, such as adoption of the FEMA Advisory Base Flood Elevations (ABFE) after Katrina, higher regulatory standards implemented in 2011, and the adoption of a Freeboard Ordinance in 2014.
- Jefferson Parish Emergency Operations Plan (EOP) –The EOP was reviewed to determine what action items were needed to improve emergency preparedness. The Parish updated the EOP in March of 2014.
- Parish Comprehensive Plan – The Parish is presently updating its Comprehensive Plan. The updated Plan will be entitled Envision Jefferson 2020. The current version of the plan was used to gather data on the Parish's growth strategies and planning initiatives. In the present plan update this information was used in Section 2.3.6, Population and Growth of the Planning Area.

- The Jefferson Parish Repetitive Loss and Severe Repetitive Loss Mitigation Plan – the Parish RL/SRL plan was updated as part of the present planning process, and is included as Appendix B.
- Parish Economic Plan – This is a 5-Year plan that was updated by the Parish to the Coast 2010 Plan. The existing Plan was reviewed to obtain demographic data and information on planned growth. This information was used in several sections of Sections 2.3, Background Information about Jefferson Parish.
- State of Louisiana Wetlands Conservation and Restoration Plan – This Plan was reviewed along with the State's Coastal 2050 Plan to determine the problems associates with Coastal conservation and restoration. Data from these Plans was used to assist with the development of the hazard profiles for coastal erosion and storm surge in Section 6, Hazard Identification, Profiling and Ranking. The Wetlands Conservation Plan also assisted with the identification of projects that have been completed towards reaching the goal of reducing future damages from hazards discussed in Section 5, Mitigation Strategy.
- Stormwater Management Plan – This Plan, along with the Jefferson Parish Flood Insurance Study, was reviewed to assess the complex drainage system in place in the Parish that controls stormwater during hurricanes, thunderstorms and other heavy rain events. By summarizing what is already in place, Plans can be made to determine what improvements are needed.
- Flood Insurance Rate Maps (FIRMs) – These maps were used to evaluate the risk associated with the Flood Zones AE, AO, X and VE. Data from these maps was also used to summarize the flood hazard in Section 4.3.
- Southeast Louisiana Hurricane Preparedness Study 1994, Technical Data Report by the Federal Emergency Management Agency, Region VI, U.S. Army Corps of Engineers, New Orleans District National Weather Serves – This document was used to evaluate the Parish's vulnerability to hurricanes and assist with the development of several Action Items listed in Section 8, Mitigation Strategies.
- Sea Lake and Overland Surges from Hurricanes (SLOSH) Model – This model was evaluated to determine the potential impact to the Parish and municipalities from storm surges. The SLOSH model output for Hurricane Katrina was included to show the estimated storm surge for the event. This information is contained in Section 6.3.3.
- Comprehensive Drainage Master Plan – Currently being developed to address the inefficiencies in the Parish's subsurface drainage system. Once complete, the Parish will be in a better position to determine, prioritize, and optimize drainage projects to reduce local flooding. Projects identified after the Plan is completed will be integrated into the updated HMP.

Section 4
Hazard Identification, Ranking, and Risk Assessment

As mentioned elsewhere, during the 2015 Plan Update some parts of the previous Plan were preserved. Where applicable, portions of the historical hazard data have been retained. One of the major updates for this section included updating all hazards that have occurred since the 2010 Plan.

As part of the Update, the list of hazards profiled in the previous Plan has been slightly modified. For this section, Sea Level Rise was added to the hazard identification, profiling, and ranking processes.

4.1 Hazard Identification

In accordance with IFR requirements, and as part of its efforts to support and encourage hazard mitigation initiatives, Jefferson Parish's Mitigation Planning Team (MPT) prepared this general assessment of the hazards that have potential to impact the Parish. The following subsections provide an overview of past hazard events in Jefferson Parish, descriptions of the 12 hazards identified as having the potential to impact the Parish, and risk assessments from a subset of the most significant hazards in Jefferson Parish.

The term "planning area" is used frequently in this section. This term refers to the geographic limits of the Parish. The risk assessments address the effects of hazards on Jefferson Parish and its citizens.

4.1.1 Overview of Jefferson Parish's Natural Hazards History

According to the National Oceanic Atmospheric Administration's (NOAA) National Climatic Data center (NCDC) database, between 1950 and 2014, Jefferson Parish has experienced 50 flood events, 25 storm surge events, 16 hurricanes, 24 tropical storms, 49 tornadoes, 132 thunderstorm and high wind events, 15 lighting events, 60 hail storms, and 9 winter storms. A number of these events caused property damage, injuries, and deaths. [4]

Numerous federal agencies maintain a variety of records regarding losses associated with natural hazards. Unfortunately, no single source is considered to offer a definitive accounting of all losses. The Federal Emergency Management Agency (FEMA) maintains records on federal expenditures associated with declared major disasters. The U.S. Army Corps of Engineers and the Natural Resources Conservation Service collect data on losses during the course of some of their ongoing projects and studies. Additionally, NOAA and the NCDC collect and maintain data about natural hazards in summary format. The data includes occurrences, dates, injuries, deaths, and costs.

In the absence of definitive data on some of the natural hazards that may occur in Jefferson Parish, illustrative examples are useful. In 1965, the federal government began to maintain records of events deemed significant enough to warrant declaration of a major disaster by the U.S. President. Since 1965 Jefferson Parish has received 24 Presidential Disaster Declarations which are summarized below in Table 4.1-1.[5] This list is not meant to capture every event that has affected the area, rather highlight significant events that have occurred here in the past. A number of these

events caused property damage and injuries. These figures and events are discussed in more detail in the hazard-specific subsections that follow.

Table 4.1-1
Natural Hazards and Declared Major Disasters in Jefferson Parish, Louisiana
(1965 to 2014)[6]

Disaster (DR) & Date	Nature of Event	Description
FEMA-DR-208 9/10/1965	HURRICANE BETSY	Category 3 Hurricane that hit west of New Orleans with 140 mile per hour (MPH) winds. The hurricane killed 70 people and caused significant property damage from high winds and flooding. The storm surge at Grand Isle was estimated at 15.5 feet and flooded the entire island.
FEMA-DR-272 8/14/1969	HURRICANE CAMILLE	Hurricane Camille affected the States of Louisiana, Alabama, Mississippi, Virginia, and West Virginia. Storm surge was estimated at 24 feet in the Pass Christian – Long Beach area.
FEMA-DR-374 4/27/1973	SEVERE STORM, FLOOD	Spring rains flooded major portions of Louisiana. Flooding occurs along the Mississippi River for more than 1500 miles.
FEMA-DR-448 9/23/1974	HURRICANE CARMEN	Category 4 Hurricane made landfall ten miles west of Grand Isle with winds up to 80 MPH winds and 6 foot storm surge in Southeastern Louisiana. Low lying areas of Jefferson Parish were evacuated. Almost 5,600 people were in Jefferson Parish shelters.
FEMA-DR-556 5/9/78	SEVERE STORM, FLOOD	The severe storms and flooding caused over $87 million in damage to Jefferson Parish. Heavy rains from the storm resulted in over 10 inches of rain in less than 24 hours.
FEMA-DR-616 4/9/1980	SEVERE STORM, FLOOD	The severe storms resulted in 10 inches of rain over several days. Drainage pumps throughout the Parish were overwhelmed and most shutdown during the event. Flooding in low-lying areas.
FEMA-DR-679 4/20/1983	SEVERE STORM, FLOOD	Drainage pumps throughout the Parish were overwhelmed during the event. There was moderate flooding in the low-lying areas.
FEMA-DR-752 11/1/85	HURRICANE JUAN	Storm stalled over Louisiana for several days and flooded more than 2,200 homes in Jefferson Parish. The storm caused $46.5 million in damages. Extensive flooding occurred when a breach occurred in the Harvey Canal levee.
FEMA-DR-849 11/19/1989	HURRICANE, RAIN, STORM, FLOOD	Homes and business were flooded due to heavy rain.
FEMA-DR-956 8/26/1992	HURRICANE ANDREW	Category 3 Hurricane with winds over 100 MPH at the time it made landfall for the second time in Louisiana. Grand Isle and coastal areas were completely evacuated.
FEMA-DR-1049 5/10/1995	SEVERE STORM, FLOOD	Heavy rains from the event resulted in 9-18 inches of rain within several hours. Tornadoes and flooding throughout the Parish caused significant damages to homes and businesses.

Disaster (DR) & Date	Nature of Event	Description
FEMA-DR-1246 9/13/1998	TROPICAL STORM FRANCES & HURRICANE GEORGE	Strong Category 3 Hurricane that made landfall to the east of New Orleans near Ocean-Springs-Biloxi, MS. In preparation for the event mandatory evacuation orders were given for Grand Isle and a voluntary evacuation for Jefferson Parish.
FEMA-DR-1380 6/11/2001	TROPICAL STORM ALLISON, FLOOD	Widespread flooding from the slow-moving Tropical Storm. In Gretna the National Weather Service recorded 21.30 inches of rain from the event. The worst flooding occurred on June 6-7 when an estimated 59 homes and two businesses were flooded in Jefferson Parish.
FEMA-DR-1435 9/27/2002	TROPICAL STORM ISIDORE	The Tropical Storm came ashore near Grand Isle with sustained winds of 35-45 MPH. Heavy rains from the storm resulted in 4-6 inches of rain in 6 hours. A total of 881 residential homes were reported flooded from the event. Drainage pumps throughout the Parish were overwhelmed.
FEMA-DR-1437 10/03/2002	HURRICANE LILI	Hurricane Lili made landfall as a Category 1 storm only 3 months after TS Isidore. The already saturated soils resulted in flooding mainly in the lower western section of Jefferson Parish.
FEMA-DR-1548 9/15/2004	HURRICANE IVAN	Impacted parish as a hurricane on September 16, 2004 and then moved through the eastern U.S. and then cycled back into the gulf and came ashore again as a Tropical Depression on September 26, 2004.
FEMA-DR-1601 7/5/05	TROPICAL STORM CINDY	The Tropical Storm came ashore just southwest of Grand Isle with wind gust as high as 70 MPH and a storms surge of approximately 4-6 feet. The storm knocked out power to an estimated 300,000 residents throughout southern Louisiana.
FEMA-DR-1603 8/29/05	HURRICANE KATRINA	Hurricane Katrina made landfall as a strong Category 3 storm that had a devastating impact on New Orleans and the entire gulf coast. Catastrophic flooding from storm surge and levee failures caused unprecedented flooding throughout New Orleans and the surrounding areas. Katrina caused an estimated $81 billion dollars in damage from flooding, high winds, and storm surge. An estimated 147,000 structures were flooded.
FEMA-DR-1603 9/24/05	HURRICANE RITA	Hurricane Rita made landfall as a strong Category 3 hurricane in extreme southwestern Louisiana just west of Johnson's Bayou. Rita made landfall less than a month after Hurricane Katrina while sections of the City of New Orleans were still being drained of floodwaters. An estimated 10,000 structures were flooded.
FEMA-DR-1685 2/13/07	SEVERE STORMS AND TORNADOES	Tornadoes and severe storms impacted Jefferson, Orleans, and St. Martins Parishes. An F2 Tornado moved through the City of Westwego and the Carrollton area of New Orleans. A total of 295 houses in New Orleans were damaged and 231 in Jefferson Parish. A total of 79 houses were destroyed. Individual assistance available for residents impacted by the disaster.

Disaster (DR) & Date	Nature of Event	Description
FEMA-DR-1786 9/2/08	HURRICANE GUSTAV	Hurricane Gustav made landfall as a Category 2 hurricane near Cocodrie, Louisiana. Storm surge around Lake Pontchartrain was 4 to 5 feet above normal and affected many low-lying coastal areas. Hurricane Gustav affected over 100 homes in the lower portion of Jefferson Parish with 4 homes being destroyed, 41 receiving major damage, and around 40 homes with minor damage. Substantial damage also occurred in lower Jefferson Parish.
FEMA-DR-1792 9/13/08	HURRICANE IKE	Hurricane Ike made landfall near Galveston, Texas as a Category 2 hurricane. The distant hurricane generated an unusually high storm surge of approximately 5 feet above normal in Lake Pontchartrain, which flooded approximately 2,500 structures in southern Jefferson Parish.
FEMA-DR-4041 10/28/11	TROPICAL STORM LEE	Tropical Storm Lee's slow forward speed caused both storm surge and rainfall as it circulated over the region for several days. Storm surge associated with Lee caused tide values to be 3 to 5 feet above normal causing low land flooding.
FEMA-DR-4080 8/29/12	HURRICANE ISAAC	Hurricane Isaac made landfall in Plaquemines Parish, Louisiana as a Category 1 hurricane and weakened to a tropical storm (and then a tropical depression) as it traveled further inland. Tropical Storm force winds lasted in excess of 48 hours, storm tides were 5 to 9 feet, and many areas of Southeast Louisiana received 8 to 12 inches of rain.

According to the NCDC database, Jefferson Parish has experienced 13 deaths and 79 injuries from natural hazards in the period from 1950 to 2014. [7]

4.2 Identifying Natural Hazards for Additional Analysis

Various national, regional and local sources were used to identify and classify different hazards for Jefferson Parish. In order to identify these hazards and broadly characterize the level of risk they pose to the Parish, a scoring classification of low (1), medium (2), and high (3) was given to each hazard, based on five criteria. The resulting numerical rankings were used to determine which hazards would be given priority in developing detailed risk assessments later in the process. The criteria used were:

1. **History.** High rating indicates that the hazard has affected the jurisdiction often in the past, and that the hazard has occurred often and/or with widespread or severe consequences.

2. **Potential for mitigation.** High rating indicates that there are ways to address the hazard, and that the methods are technically feasible and have the potential to be cost-effective [i.e. mitigation measures are available at a reasonable cost, and damages to property, lives and/or community functions would be reduced or eliminated.]

3. **Presence of susceptible areas.** High rating indicates that Jefferson Parish has numerous facilities, operations or populations that may be subjected to damage from the hazard.

4. **Data availability.** High rating indicates that sufficient quality data is available to permit an accurate and comprehensive risk assessment.

5. **Federal disaster declarations and local emergency declarations.** High rating indicates that Jefferson Parish has received numerous disaster declarations for the particular hazard.

Table 4.2-1 is the hazard ranking produced by applying the five criteria to the hazards profiled for Jefferson Parish. The MPT reviewed and approved the hazard ranking as part of the Plan Update.

Table 4.2-1
Jefferson Parish MPT Hazard Ranking

Hazard	History	Mitigation	Vulnerability	Data	Disaster	Total
Floods	3	3	3	3	3	15
Hurricanes and Tropical Storms	3	3	3	3	3	15
Storm Surge	3	3	3	3	1	13
Tornadoes	2	2	2	2	1	9
Coastal Erosion	3	1	2	1	1	8
Subsidence	3	1	2	1	1	8
Hailstorms	2	1	2	2	1	8
Winter Storms	1	1	2	2	1	7
Lightning	1	1	2	1	1	6
Drought	1	1	1	1	1	5
Wildfires	1	1	1	1	1	5
Earthquakes	1	1	1	1	1	5

The classification process provided a clear stratification of the hazards with Floods and Hurricanes and Tropical Storms at the top of the ranking. The MPT considered this hazard scoring and the mission of the Team and determined that in addition to Floods and Hurricanes and Tropical Storms, the hazards Storm Surge and Tornadoes would also be the focus of additional risk assessment and vulnerability studies, while the balance of the hazards would be profiled but not subjected to rigorous risk assessment.

Based on the outcome of this ranking, the Mitigation Planning Team conducted risk assessments from a subset of the most significant hazards in Jefferson Parish:

- Floods
- Hurricanes and Tropical Storms
- Storm Surge
- Tornadoes

4.3 Flood Hazard Profile & Risk Assessment

4.3.1 Description of the Flood Hazard

Flooding is defined as the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands. The floodplain is the land adjoining the channel of a river, stream, ocean, lake, or other watercourse or water body that is susceptible to flooding.

Hundreds of floods occur each year in the United States, including overbank flooding of rivers and streams and shoreline inundation along lakes and coasts. Flooding typically results from large-scale weather systems generating prolonged rainfall. Flooding in Jefferson Parish can be the result of the following weather events: hurricanes, thunderstorms (convectional and frontal), storm surge or winter storms. Flooding from hurricanes is covered in Section 4.4 and flooding from storm surge is covered in Section 4.5. See Appendix D, General Descriptions of Natural Hazards, for a more detailed description and definition of the flood hazard.

4.3.2 Location and Extent of the Flood Hazard

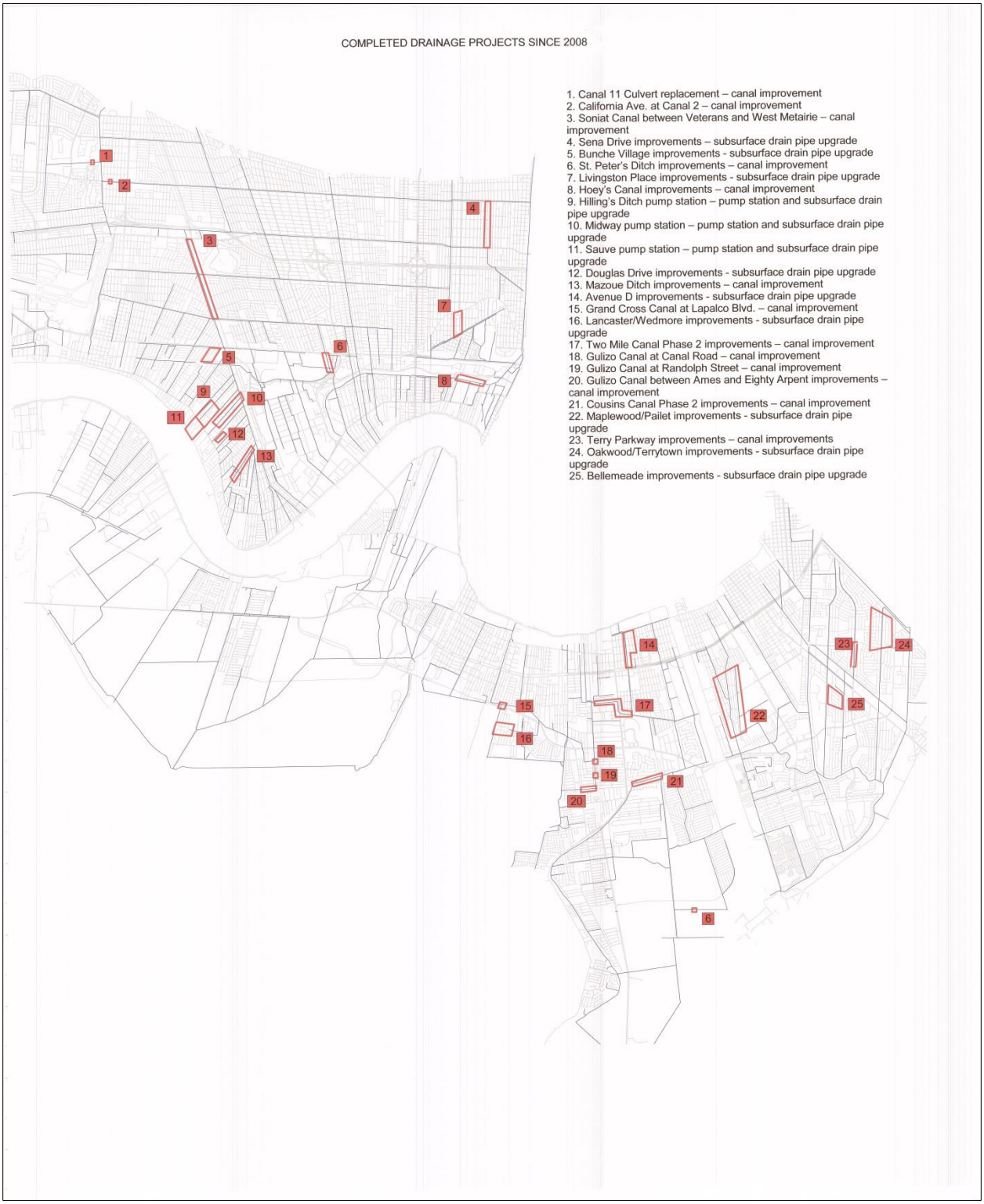
As described in Section 2.3.1, Geography, Jefferson Parish lies in southeastern Louisiana and is bordered by Lake Pontchartrain on the north, Orleans and Plaquemines Parishes to the east, the Gulf of Mexico to the south, and Lafourche and St. Charles Parishes to the west.

The Mississippi River divides the Parish into two distinctly different communities. Development on the East Bank of the Mississippi River consists mainly of residential and commercial improvements. Although some industrial development is located on the East Bank of the river, most of the heavy industrial concentration is found on the West Bank. In recent years, the West Bank area has also experienced rapid residential development. Development on the west bank ranges from small fishing villages at Lafitte and Barataria in the southernmost portion of the Parish to heavily urbanized areas along the Mississippi River.

Since most of Jefferson Parish's land mass is below sea level, a levee and pump system is employed for drainage. The levees protect the Parish from natural overbank flooding of these surrounding water bodies, including the Mississippi River, Lakes Pontchartrain and Cataouatche, and coastal marshes. Pumping is necessary to remove runoff from the drainage system over the levees into the outlying water bodies.

Drainage of floodwaters in Jefferson Parish is accomplished by a system of structures and canals, which outflow to pumping stations. Historically, these pumping stations have been inadequate in capacity to handle the volume of floodwaters reaching the stations and have operated at less than full capacity during floods. In addition, drainage structures through some man-made barriers, such as highway and railroad embankments, have proven inadequate during some rainfall events. Figure 4.3-a below depicts the location of drainage projects in Jefferson Parish that have been completed since the previous plan update in 2008 in an attempt to address these drainage deficiencies.

Figure 4.3-a
Jefferson Parish Drainage Projects
Completed Since 2008



There have been 49 floods recorded in Jefferson Parish in the period from 1996 to 2014. The principle sources of flooding are rainfall ponding, levee overtopping, and hurricane or tropical storm surges originating in the Gulf of Mexico from Lake Pontchartrain on the East Bank and Lakes Salvador and Cataouatche on the West Bank. The East Bank of Jefferson Parish has many flood problem areas. The flood-prone areas, such as Hoey's Basin in Old Metairie, are scattered throughout the Parish and are caused by land subsidence, and inadequate capacity of canals and culverts. Often they are in low areas, while other areas flood because of inadequacies in downstream parts of the system.

The area of Jefferson Parish outside the levee protection system, including Jean Lafitte and Grand Isle, in southern part of the Parish is most vulnerable to storm surge flooding. See Section 4.5, Storm Surge, where flooding from storm surge is covered in detail.

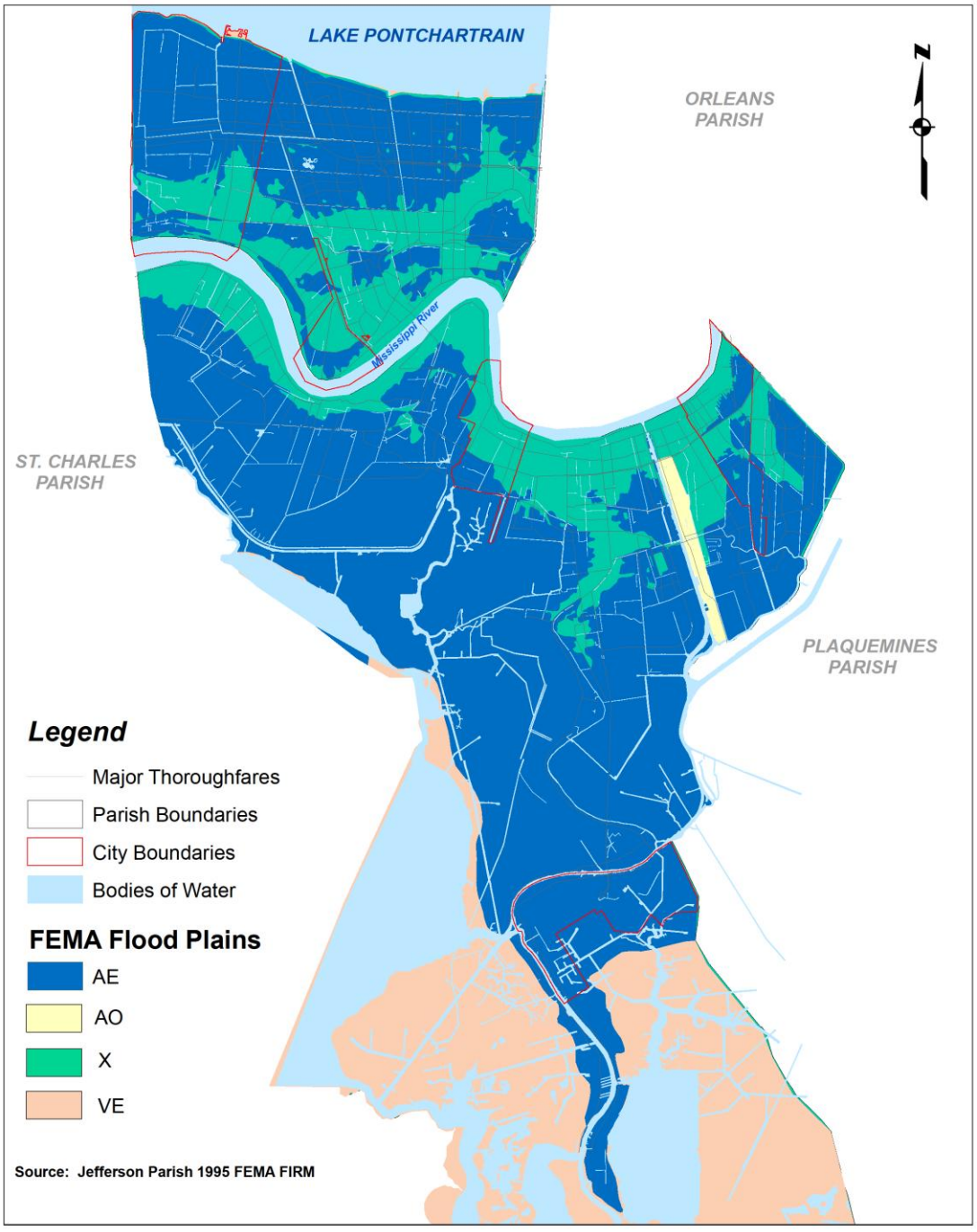
Based on past records, the planning area can expect future flood events throughout the Parish as deep as 18 inches.

In June of 1973 FEMA produced a Flood Insurance Study (FIS) for Jefferson Parish. A FIS details the flood hazard areas within a particular area or community and typically includes flood elevations, a history of flooding, and the engineering methods used to complete the analysis. The FIS includes the incorporated areas of the Parish. A Flood Insurance Rate Map (FIRM) is developed in conjunction with the FIS. The FIRM is the official map of a community on which FEMA has delineated both the special hazard areas and the risk premium zones.

Map 22051C is the FIRM map for Jefferson Parish. The map displays the different flood zones found within the unincorporated areas of Jefferson Parish (jurisdictional maps are highlighted under each jurisdictional description below). The flood zoned designations are defined as follows:

- **Zone AE:** Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. In most instances, base flood elevations derived from detailed analyses are shown at selected intervals within these zones. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- **Zone AO:** Areas subject to inundation by the 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- **Zone X:** Areas outside the 1% annual chance floodplain and 0.2 percent chance floodplain, areas of 1% annual chance sheet flow flooding where average depths are less than 1 foot, areas of 1% annual chance stream flooding where the contributing drainage area is less than 1 square mile, or areas protected from the 1% annual chance flood by levees. No Base Flood Elevations or depths are shown within this zone.
- **Zone VE:** Coastal areas subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base Flood Elevations (BFEs) derived from detailed hydraulic analyses are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.[8]

Figure 4.3-b
Jefferson Parish Floodplains



JEFFERSON PARISH, LOUISIANA
1995 FEMA FLOOD PLAIN

4.3.3 Severity of the Flood Hazard

Flood severity is measured in several ways, including frequency, depth, velocity, and duration, among others. For Jefferson Parish, generally speaking the severity relates to how frequent floods occur. Floods have been and continue to be the most frequent, destructive, and costly natural hazard facing Jefferson Parish. As demonstrated by Hurricanes Katrina and Ike, the northern part of the Parish including Metairie and Kenner are vulnerable to flooding from storm surge from Lake Pontchartrain. In the southern part of the Parish, the Town of Grand Isle is also susceptible to storm surge from the Gulf of Mexico. One of the lowest points in the northern part of Jefferson Parish is Hoey's Basin located in the area of Old Metairie.

The most densely populated areas of Jefferson Parish are protected from flooding by levees, drainage canals, and storm water pumps. The City of Gretna is served by the Hero and Planters pumping stations, which are located along Barataria. The major canal within Gretna is Verret Canal. The City of Kenner is served by a pumping station, which is located in the Parish Line Canal, approximately 3.9 miles below Lake Pontchartrain. The City of Westwego is served by the Westwego and Bayou Segnette pumping stations, which are located in the southwestern portion of the city along Bayou Segnette. The City of Westwego is partially protected from hurricane surges from Lake Salvador and Lake Cataouatche by Parish-built levees.

4.3.4 Flood Protection Measures

Jefferson Parish is protected by levees from flooding of the Mississippi and its tributaries due to high stages in the Mississippi River. On the East Bank of the Parish, the Lake Pontchartrain and vicinity hurricane protection levee prevent flooding by hurricane surge from Lake Pontchartrain. The West Bank area is partially protected from hurricane surge from the Gulf of Mexico by Parish-built levees. Levees that exist in the study area provide the Parish with some degree of protection against flooding. However, Hurricane Katrina proved that some of these levees may not protect the Parish from strong events such as a 100-year flood or storm surge from future hurricanes (Flood Insurance Study, Jefferson Parish, LA, Incorporated and Unincorporated Areas, November 9, 2012).

From 2008 – 2014 Jefferson Parish has completed 25 infrastructure/drainage improvement projects through multiple funding sources. Figure 4.3-a identifies the type and location of these projects.

In addition to engineered protection from flooding, Unincorporated Jefferson Parish and incorporated communities within Jefferson Parish also participate in the National Flood Insurance Program (NFIP). Participation requires that the community(ies) adopt a floodplain ordinance that meets or exceeds the minimum NFIP criteria and must also adopt any FIRM for the community. In doing so, Jefferson Parish provides flood protection to its residents, commercial building, and critical facilities by enforcing floodplain ordinance requirements for new construction, substantial improvements, and all over applicable permitting. Unincorporated Jefferson Parish and the incorporated communities within Jefferson Parish will continue to conform to all NFIP requirements through professional development and education/outreach events. Table 4.3-1 below gives greater detail regarding the Parish's participation with the NFIP.

Table 4.3-1
Jefferson Parish NFIP Participation

	Unincorporated Jefferson Parish	City of Gretna	City of Harahan	City of Kenner	City of Westwego	City of Grand Isle	City of Jean Lafitte
Insurance Summary							
How many NFIP polices are in the community? What is the total premium and coverage?	policies = 93,449 total premium = $77,154,726 total coverage = $22,924,754	policies = 3,454 total premium = $3,355,163 total coverage = $801,358	policies = 2,547 total premium = $1,605,211 total coverage = $703,992	policies = 15,675 total premium = $15,197,989 total coverage = $3,614,645	policies = 1,384 total premium = $1,001,701 total coverage = $334,377	policies = 1,016 total premium = $1,868,431 total coverage = $170,319	policies = 253 total premium = $309,588 total coverage = $53,263
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?	# of claims = 101,172 amount pd = $2,748,679,876 sub damage = 68	# of claims = 4,370 amount pd = $40,449,370 sub damage = 755	# of claims = 2,159 amount pd = $29,493,342 sub damage = 44	# of claims = 15,071 amount pd = $504,019,584 sub damage = 273	# of claims = 1,396 amount pd = $9,360,488 sub damage = 88	# of claims = 4,044 amount pd = $60,713,187 sub damage = 199	# of claims = 451 amount pd = $9,421,998 sub damage = 48
How many structures are exposed to flood risk with in the community?	All	All	All	All	All	All	All
Staff Resources							
Is the Community FPA or NFIP Coordinator certified?	Yes	Yes	Yes	Yes	No	No	No
Is flood plain management an auxiliary function?	No	Yes	Yes	Yes	Yes	No	Yes
Provide an explanation of NFIP administration services (e.g., permit review, GIS, education or outreach, inspections, engineering capability)	Yes to all	Yes to all	Yes to all but GIS	Yes	Yes	Yes to all	Yes
What are the barriers to running an effective NFIP program in the community, if any?	Board of Standards and Appeals - mapping process	Community's understanding of substantial damage; Community Knowledge of Compliance as a whole	Community Knowledge of NFIP	Public awareness of how critical the NFIP is; subsidence		15 feet in the air and can't have a shed; keeping up w/FEMA regs	
Compliance History							
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)?	No	No	No	No	No	No	No
When was the most recent Community Assistance Visit (CAV) or Community Assistance Contact(CAC)?	CAC was in July 2014	CAV-2012	CAV-2013	CAV-August 2013	CAV - August 2011	CAV - March 2013	CAV - 2014
Is a CAV or CAC scheduled or needed? If so when?	No	No	No	Yes, yearly	No	No	No
Regulation							
When did the community enter the NFIP?	10/1/1971	6/18/1971	6/15/1973	6/25/1971	12/28/1976	10/30/1970	10/1/1971
Are the FIRMs digital or paper?	Both	Both	Both	Both	Both	Both	Both
Do floodplain development regulations meet or exceed FEMA or State minimum requirements? If so, in what ways?	Yes, ABFE	Yes, 3 ft above street	Yes, require elevations above street in X zones	Yes	code regs & new construction/ substantial improvements have to meet the BFE requirements	Yes	No
Community Rating System (CRS)							
Does the community participate in CRS?	Yes	Yes	Yes	Yes	Yes	No	Yes
What is the community's CRS Class Ranking?	6	8	8	7	8	-	8
Does the plan include CRS planning requirements?	Yes	Yes	Yes	Yes	Yes	No	Yes

4.3.5 Impact on Life and Property

There have been 49 floods recorded in Jefferson Parish in the period from 1996 to 2014, with 16 of those events resulting in property damages slightly over $655 thousand dollars. This count includes coastal floods, floods, and flash floods. This total does not include flooding that has occurred as a direct result of hurricane events such as Katrina and Rita in August and September of 2005, Gustav and Ike in September of 2008, or Hurricane Isaac in 2012. Hurricane events and all the associated damages, such as flooding, are tracked as a separate hazard category in the National Climatic Data Center database. Jefferson Parish also has no reported deaths or injuries due to floods. Section 7 of this plan includes a much more detailed discussion of flood impacts on the Parish, in particular the history of National Flood Insurance Program claims, and the number of FEMA "repetitive loss" properties. With 49 flood events between 1996 and 2014, Jefferson Parish experiences a flood on average about three times per year. The 49 recorded flood events have occurred over a period of 18 years which calculates to a 100% annual probability of future flood occurrences.

4.3.6 Occurrences of the Flood Hazard

Table 4.3-1 below summarizes the 25 flood events occurring in Jefferson Parish in the last six years. These were all categorized as flash floods.[9]

Table 4.3-1
Flood Events, Jefferson Parish, 2008 – 2014

Location or County	Date	Time	Type	Dth	Inj
MARRERO	04/26/2008	15:00	Flash Flood	0	0
JEFFERSON	06/15/2008	08:30	Flash Flood	0	0
WESTWEGO	03/27/2009	04:15	Flash Flood	0	0
METAIRIE	12/12/2009	16:45	Flash Flood	0	0
SOUTHPORT	12/14/2009	23:20	Flash Flood	0	0
BRIDGEDALE	04/23/2010	13:51	Flash Flood	0	0
METAIRIE	08/12/2010	04:30	Flash Flood	0	0
METAIRIE	08/30/2010	14:00	Flash Flood	0	0
METAIRIE	03/09/2011	07:50	Flash Flood	0	0
METAIRIE	03/29/2011	17:50	Flash Flood	0	0

HARVEY	03/29/2011	18:45	Flash Flood	0	0
GOULDSBORO	03/29/2011	18:55	Flash Flood	0	0
GOULDSBORO	07/18/2011	05:30	Flash Flood	0	0
METAIRIE	07/27/2011	14:45	Flash Flood	0	0
MOISANT ARPT	07/28/2011	13:33	Flash Flood	0	0
HARAHAN	04/04/2012	02:54	Flash Flood	0	0
TERRYTOWN	06/07/2012	09:25	Flash Flood	0	0
GRETNA	07/20/2012	12:57	Flash Flood	0	0
RIVER RIDGE	07/20/2012	14:45	Flash Flood	0	0
KENNER	05/01/2013	11:50	Flash Flood	0	0
(MSY)MOISANT FLD NEW	05/01/2013	11:55	Flash Flood	0	0
GRETNA	05/09/2014	N/A	Flash Flood	0	0
METAIRIE	05/09/2014	N/A	Flash Flood	0	0
KENNER	05/29/2013	N/A	Flash Flood	0	0
KENNER	06/01/2014	N/A	Flash Flood	0	0

Significant events for unincorporated Jefferson Parish are summarized below:

- April 26, 2008 – Heavy rainfall amounts of up to 8 inches caused the flooding of numerous streets, several vehicles, and a few homes across sections of the West Bank including the Marrero, Harvey, and Terrytown areas.

- June 15, 2008 – Heavy rainfall of 4 to 6 inches from a thunderstorm resulted in widespread street flooding and the closing of some roadways. Numerous vehicles were flooded. At least 34 residences reported some damage from the flooding.

- December 12, 2009 – Heavy rainfall resulted in widespread and significant street flooding throughout northern Jefferson Parish and caused the flooding of some homes on the East

Bank. Residents reported water as high as 2 feet in parts of Kenner and 12 inches in Metairie at West Napoleon and Causeway.[10]

- December 14, 2009 – Heavy rain resulted in widespread street flooding. Sections of Veterans Boulevard were covered by 12 inches of water while areas of Airline Highway were covered by 18 inches of water.

- April 23, 2010 – Significant street flooding on Transcontinental, David Drive, West Metairie and Clearview Roads was reported higher than 3 inches.[11]

- August 12, 2010 – Water intruded into the first floor of an apartment complex in southeast Metairie near Ochsner Medical Center. There were also several flooded streets in Bridge City with a total rainfall of 4.64 inches. Damage costs were estimated at $10,000.

- August 30, 2010 – Localized flash flooding damaged two businesses near Jefferson Highway and Metairie Road and caused approximately $20,000 in property damage. The rain gauge at this intersection indicated 4.20 inches of rainfall.

- March 9, 2011 – Thunderstorms in advance of a strong cold front produced numerous reports of flooding and severe weather in addition to water overflowing the banks of the canal between West Napoleon and Severn. Parish President John Young reported flood depths of 4-5 inches at Transcontinental Drive and Kawanee Avenue.[12]

- March 29, 2011 – In Metairie, a trained spotter reported water approaching homes on Roosevelt Avenue south of the West Metairie Canal and the street was not passable. There were 4.08 inches of rainfall captured at the nearby rain gauge. Widespread street flooding was also reported in the Airline Park subdivision. In Harvey, numerous streets were flooded along Manhattan and Lapalco Boulevards. Two to three feet of water was reported on Gretna Blvd. Water was approaching, but not moving into, homes in this area. In Gouldsboro, Jefferson Parish Emergency Management reported water in 25 apartments in the 1600 block of Carol Sue in Terrytown, resulting in approximately $25,000 in property damage.

- July 18, 2011 – Jefferson Parish officials confirmed through local newspaper that 4 homes were flooded on Holmes Boulevard in Terrytown after early morning down pour. Widespread flooding of streets occurred in west bank areas of Jefferson Parish including Terry Parkway, Carrollton Parkway, and several other roadways as deep as 7 inches.[13]

- July 27, 2011 – Several reports of street flooding were received from the Metairie area, including parts of Airline Highway, Jefferson Highway, and some smaller residential streets. Jefferson Highway was nearly impassable at Clearview. Throughout the West Bank, Jefferson Parish Supervisory Control and Data Acquisition (SCADA) monitors recorded more than 7 inches of rain in several locations.[14]

- June 7, 2012 – Heavy rain produced standing water, making roads impassable. Some locations included were the 2000 block of Woodmere Street, Armagh Street, the 1700 block of Destrehan Avenue, and the 1600 block of Long Bridge. The rain gauge near Woodmere collected 1.57 inches of rainfall, 3.12 inches near Armagh Street, 0.44 inches near Destrehan Avenue, and 1.55 inches at Long Bridge.

- July 20, 2012 – Numerous streets were impassable due to flash flooding in River Ridge, Harahan and Metairie.

- May 9, 2014 – Heavy rainfall resulted in flooded streets at North Laurel from Airline Drive to Market Street, Ute Drive in Harvey, and Wall Blvd between Mount Laurel Drive and Harvey Blvd. Flood waters were recorded as high as 2.63 inches at David and York drives in Metairie to 2.51 inches at Terry Parkway and Stumpf Boulevard.[15]

The history of flooding in Jefferson Parish and each of the municipalities indicates that flooding may occur during any season of the year. In the cooler months, the area is subject to heavy rainfalls resulting from frontal passages. In the summer months, heavy rainfalls result from convective thunderstorms. In the late summer, hurricanes accompanied by rainfall and super-elevated water-surface elevations pose the largest threat of flooding to the area.

The most common source of such information is the National Flood Insurance Program (NFIP), the predominant flood insurer in the U.S. The Program maintains a very large database of claims information for millions of policies nationwide. Because of the prevalence of flooding in Jefferson Parish, these NFIP records offer an excellent source of information about past flood losses, and can be used as the basis of a risk assessment.

FEMA and the NFIP categorize policies in several ways, as part of their effort to focus mitigation program resources on properties with the highest risk. One such category is *repetitive loss* properties, which are defined as those that have been paid at least two claims of $1,000 or more over a rolling ten-year period. In recent years, FEMA has focused considerable attention on these insured, repetitive loss properties. By NFIP standards, these properties had to have received two or more claim payments of at least $1,000 each over a ten-year period. In Jefferson Parish, a total of 6,677 properties are currently identified as repetitive loss properties. In September of 2001, Jefferson Parish completed a Floodplain Management/Repetitive Loss Plan to address these repetitive loss properties. The Floodplain Management/Repetitive Loss Plan was updated as part of the 2008 Jefferson Parish Plan Update. Data related to RL properties in Jefferson Parish are shown in Table 4.3-2.

As of April 30, 2014, there were 94,119 structures located within the unincorporated areas of Jefferson Parish with flood insurance policies with the NFIP and annual premiums totaling approximately $76,950,478.00. The total coverage value of these policies is approximately $23 billion. Since 1978, NFIP policy holders within Jefferson Parish have filed 101,164 insurance claims for a total loss value of approximately $2.7 billion.

Table 4.3-2
Repetitive Loss Flood Insurance Statistics for Jefferson Parish
(Source: National Flood Insurance Program, May 31, 2014)

Jurisdiction	# RL Props	Total #Claims	Total $ Claims	Average $ Claim
GRETNA	277	1,202	$14,499,493.37	$ 12,062.81
KENNER	494	1,542	$43,974,669.30	$ 28,517.94
GRAND ISLE	391	1,222	$26,404,445.21	$ 21,607.57
WESTWEGO	93	364	$4,192,899.28	$11,518.95
LAFITTE	91	248	$9,030,199.07	$36,412.09
JEFFERSON	5,250	17,016	$385,717,304.53	$22,667.92
HARAHAN	81	277	$4,985,113.84	$17,996.80
Total	**6,677**	**21,871**	**$488,804,124.60**	**$22,349.42**

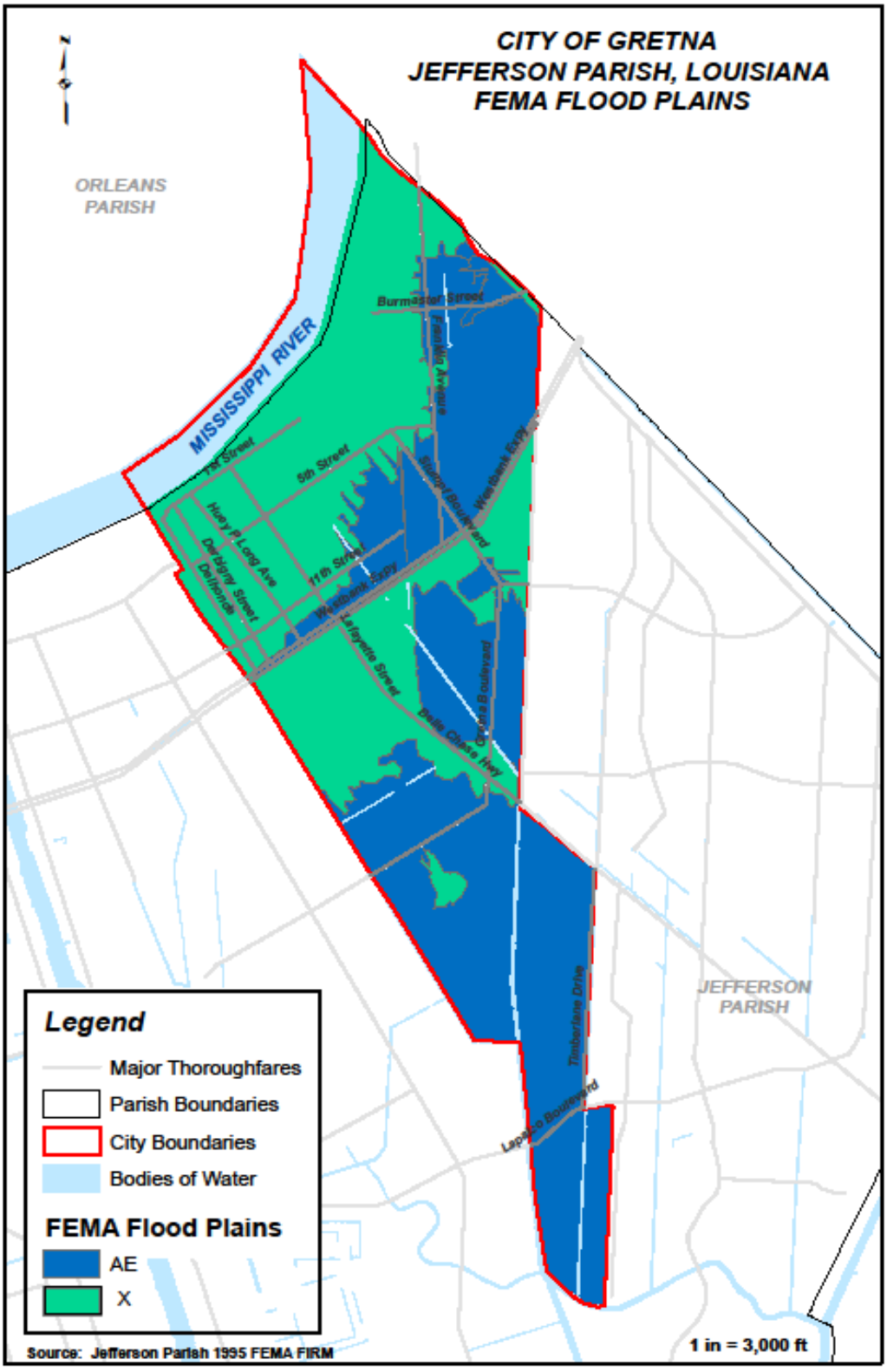
4.3.7 Municipality Flood Hazards

City of Gretna

Figure 4.3-c below identifies the FEMA flood zones for the City of Gretna. The flood zones identified on the map include Zones AE and X. The map indicates that the City is about equally divided between Zones AE and X. The areas of Gretna located in Zone AE include; the southern part of the City, the area just north of the Westbank Expressway, and a slim section along the Mississippi River.

The principle sources of previous flooding in the City of Gretna include rainfall ponding and levee overtopping and hurricane or tropical storm surges originating in the Gulf of Mexico that push water onshore, and into the interior areas of Jefferson Parish. Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the City of Gretna appear to be concentrated along Azalea Drive, Claire Avenue, Hero Drive and Rose Drive.

Figure 4.3-c
City of Gretna Flood Zones



In the last six years, two flood events were recorded in the City of Gretna.[16]

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
Gretna	07/20/2012	12:57	Flash Flood	N/A	0	0	0.00K	0.00K
Gretna	05/09/2014	N/A	Flash Flood	N/A	0	0	0.00K	0.00K
Totals:					0	0	0.00K	0.00K

- July 20, 2012 – Officials closed Stumpf Blvd at Gretna Blvd due to high water. Lafayette Street from the West Bank Expressway to the Mississippi River levee was also closed due to flooding. Flooding occurred in the McDonoghville area of Gretna as well.

- May 9, 2014 – Flooding resulted in the closure of Lafayette Street at the West Bank Expressway in Gretna. Rain gauges recorded 2.63 inches of rain at the Emergency Operations Center in Gretna.[17]

Four flood events have been recorded since 1998. These events occurred over a period of 18 years which translates to a 22% annual probability of future flood occurrences in the City of Gretna.

Flood Protection Measures

The most densely populated areas of Gretna are protected from flooding by levees, drainage canals, and storm water pumps. The City is protected from flooding by two levee systems. Along the Mississippi River the U.S. Army Corp. of Engineers (USACE) has constructed a levee system to protect the City from overbank flooding. The rest of the City is protected by levees that run along the Harvey and Algiers Canals (City of Gretna Flood Hazard Mitigation Plan). These levees are part of a hurricane protection system that partially protects the West Bank from storm surge from the Gulf of Mexico (Flood Insurance Study, Jefferson Parish, Louisiana, Incorporated and Unincorporated Areas, November 9, 2012).

Drainage of floodwaters in the City is accomplished by a system of structures and canals, which outflow to pumping stations. The City is served by the Hero and Planters pumping stations, which are located along Barataria. The major canal within Gretna is Verret Canal. Historically, these pumping stations have been inadequate in capacity to handle the volume of floodwaters reaching the stations and have operated at less than full capacity during floods. In addition, drainage structures through some man-made barriers, such as highway and railroad embankments, have proven inadequate during previous rainfall events.

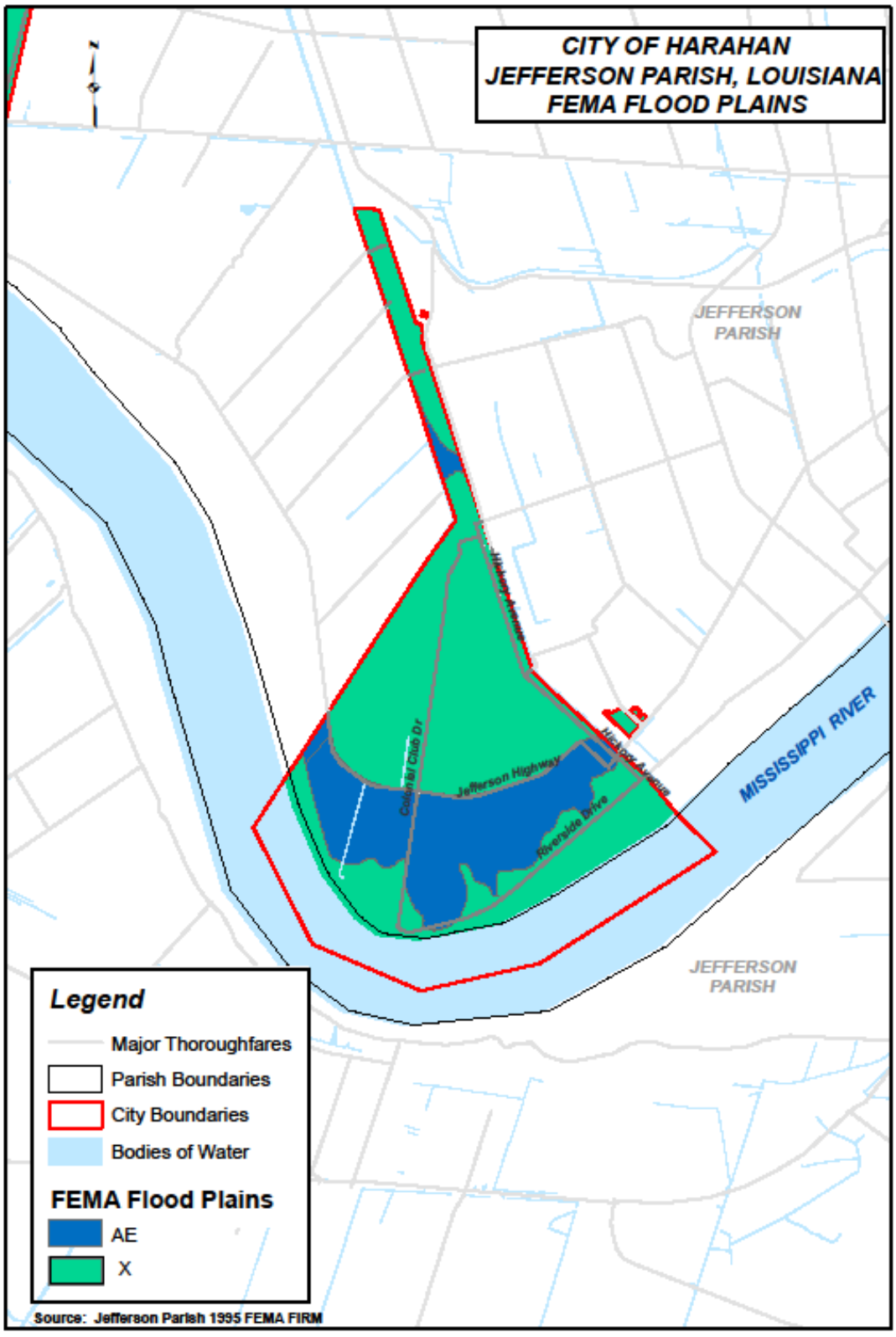
City of Harahan

Figure 4.3-d below identifies the FEMA flood zones for the City of Harahan. The flood zones identified on the map include Zones AE and X. The map indicates that the majority of the City south of Jefferson Highway is located within the shaded AE zone. The green areas are in the X zone. The X zone area between the Mississippi River and the AE flood zone is protected from flooding by the Mississippi River Levee.

The principle sources of flooding in the City of Harahan are sheet flow/ponding, levee overtopping, and hurricane or tropical storm surges originating in the Gulf of Mexico. Harahan is located on the East Bank of Jefferson Parish which has many flood problem areas. These problem areas are caused by land subsidence, inadequate capacity of canals and culverts, and inadequate capacity of pumping stations. Flooding from storm surge is covered in Section 6.3.3.

Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone residential areas in Harahan appear to be concentrated along Generes Drive and Hickory Street. Flooding on non-residential areas has occurred in the past along Clearview Parkway and a portion of Elmwood Park Boulevard.

Figure 4.3-d
City of Harahan Flood Zones



One flood event was reported in Harahan in the last six years.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
HARAHAN	04/04/2012	02:54	Flash Flood	N/A	0	0	5.00K	0.00K
Totals:					0	0	5.00K	0.00K

- April 4, 2012 - Public reports water entering at least one building near Mark Lane and Citrus Drive causing $5,000 in property damage. The nearby rain gauge indicated rainfall amounts of 3.35 inches.

One flood event has been recorded since 1998. This event occurred over a period of 18 years which translates to a 6% annual probability of future flood occurrences in the City of Harahan.

Flood Protection Measures

Since most of Harahan's land mass is located below sea level, a levee and pump system is employed for drainage. The levees protect the City of Harahan from natural overbank flooding of surrounding water bodies, including the Mississippi River and Lake Pontchartrain. The major canal in the City of Harahan is the Soniat Canal. The City of Harahan is served by Pump Station #3 located along Elmwood Canal. Pumping is necessary to remove runoff from the drainage system over the levees into the outlying water bodies.

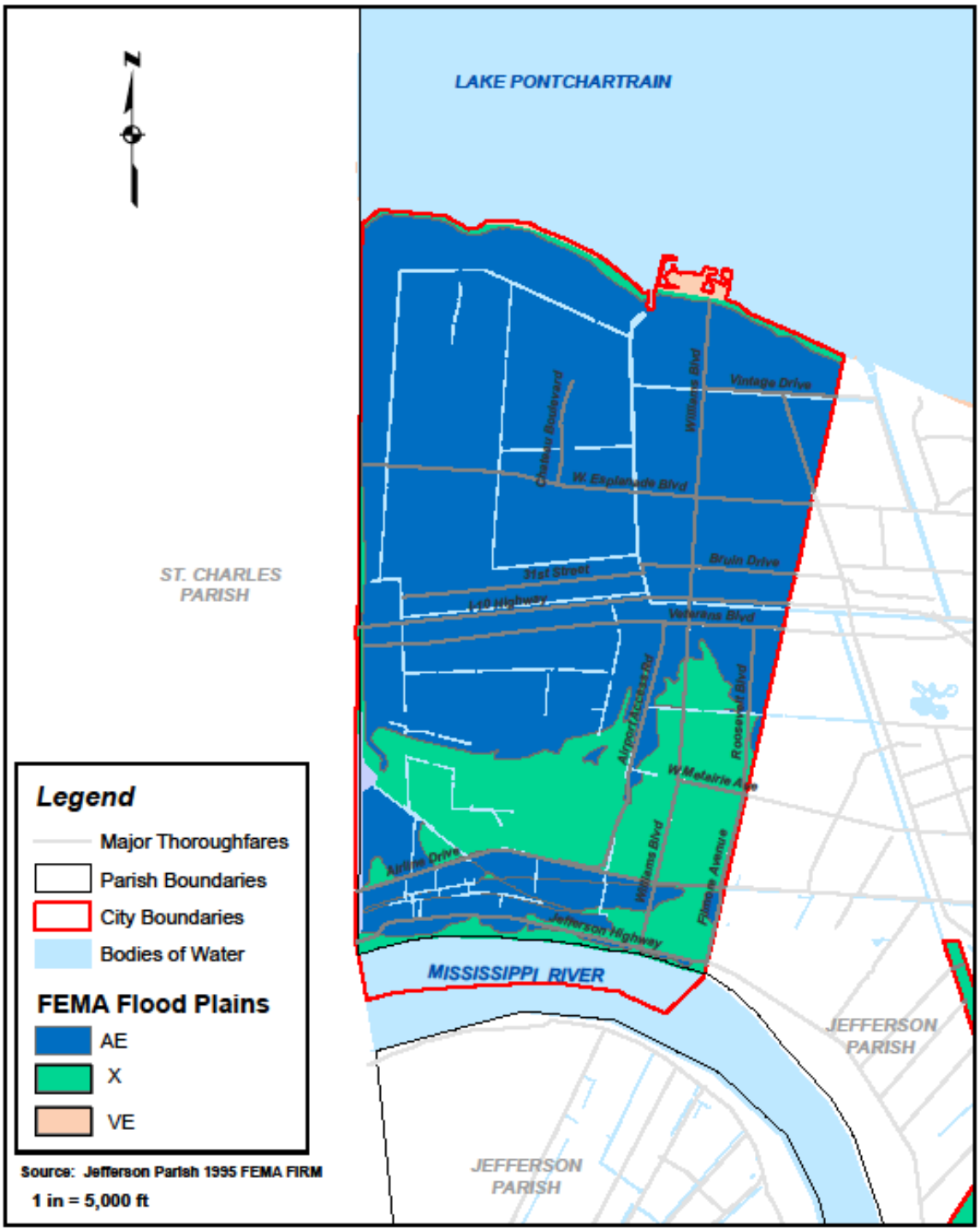
City of Kenner

Figure 4.3-e below identifies the FEMA flood zones for the City of Kenner. The flood zones identified on the map include zones AE and X. The map indicates that the majority of the city is located within Zone A. A portion of the southern part of the City between Veterans Memorial Boulevard and Jefferson Highway falls within Zone X.

The principle sources of flooding in the City of Kenner are rainfall ponding, levee overtopping and hurricane or tropical storm surges originating in the Gulf of Mexico from Lake Pontchartrain on the East Bank of the Mississippi River. As demonstrated by Hurricane Katrina, the northern and northwestern part of the City is particularly vulnerable to flooding from heavy rains that have the potential to overwhelm the City's drainage system.

Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the City of Kenner appear to be concentrated at the University Section, East and West Louisiana State Drive, and along Tulane Drive.

Figure 4.3-e
City of Kenner Flood Zones



CITY OF KENNER
JEFFERSON PARISH, LOUISIANA
FEMA FLOOD PLAINS

Of the three flood events occurring in the City of Kenner in the last six years, two resulted in property damage occurring between 2011 and 2013.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
MOISANT ARPT	07/28/2011	13:33	Flash Flood	N/A	0	0	0.00K	0.00K
KENNER	05/01/2013	11:50	Flash Flood	N/A	0	0	10.00K	0.00K
(MSY) MOISANT FLD NEW	05/01/2013	11:55	Flash Flood	N/A	0	0	10.00K	0.00K
Kenner	05/29/2013	N/A	Flash Flood	N/A	0	0	0.00K	0.00K
Kenner	06/01/2014	N/A	Flash Flood	N/A	0	0	0.00K	0.00K
Totals:					0	0	20.00K	0.00K

- July 28, 2011 – Police reported street flooding of Loyola Drive and West Esplanade from slow movement of the thunderstorms. Hooper Drive at Loyola Drive was also reported flooded. Radar estimates of two to three inches were shown in some areas.[18]

- May 1, 2013 – In Kenner, numerous streets were reported flooded, especially around Audubon Subdivision. Near Moisant Field, the intersection of West Esplanade and East Loyola was impassable due to flash flooding. One vehicle was stalled due to the water. A total of 2.52 inches of rainfall was recorded at the nearby rain gauge.

- May 29, 2013 - Kenner has seen roughly five inches of rainfall in a one and a half hour timeframe. Neighborhoods, particularly off of Vintage Drive in north Kenner, are seeing high water as a result of the afternoon storm. High water has been reported in the following areas: Chateau at Vintage, 33rd and Maine, two right lanes 4100 - 4300 block of Williams, 3800 - 39th and Lake Trail, Joe Yenni near Platt - drainage canal beginning to overtop.

- June 1, 2014 – After a weekend of heavy rain fall, street flooding was reported in the 4400 block of Lake Trail, 4200 block of Connecticut, 4200 block of Alabama, Gelpi from Driftwood Blvd to Coronado, Power Blvd NB and SB Vintage to I-10, and Chateau and Vintage. The rain gauge indicated more than 4 inches of rainfall.

Five flood events have been recorded since 1998. These events occurred over a period of 18 years which translates to a 28% annual probability of future flood occurrences in the City of Kenner.

Flood Protection Measures

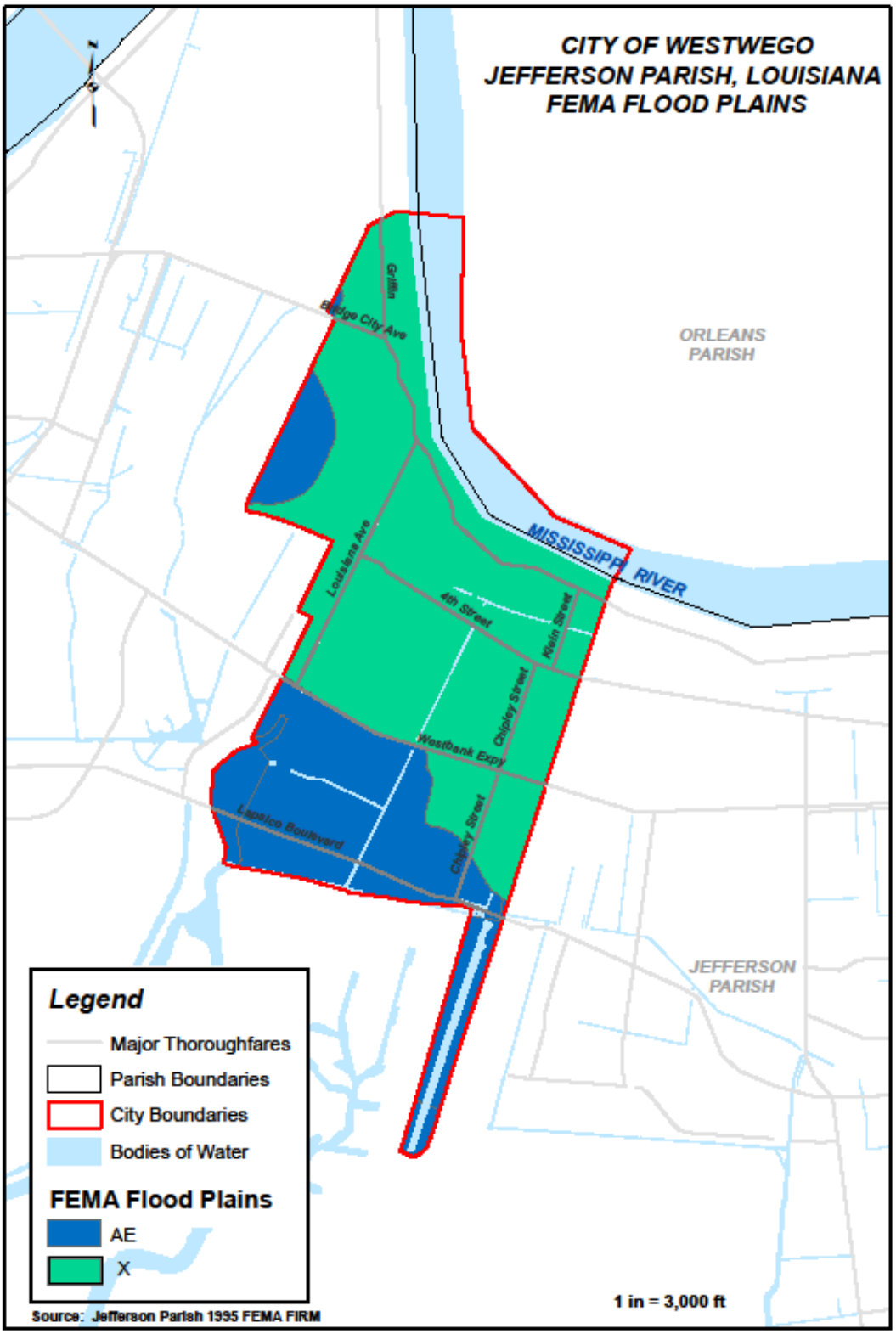
The most densely populated areas of the City of Kenner are protected from flooding by levees, drainage canals, and storm water pumps which outflow to pump stations. The major canals in the City of Kenner are Duncan Canal, Canal #1, Canal #2, and Canal #13. The City of Kenner is served by Pump Station #4, which is located in the City along Duncan Canal, Pump Station #3, and the Kenner Relief Pump Station, which is located along the Parish Line Canal approximately 3.9 miles south of Lake Pontchartrain. In Kenner, Lake Pontchartrain and the hurricane protection levee prevents flooding by hurricane storm surge from the Lake up to approximately 17 feet (Flood Insurance Study, Jefferson Parish, Louisiana, Incorporated and Unincorporated Areas, November 9, 2012).

City of Westwego

Figure 4.3-f below identifies the FEMA flood zones for Westwego. The flood zones identified on the map include Zones AE and X. The map indicates that the majority of the City is located within Zone X. A portion of the southern part of the City southwest of the Westbank Expressway is located within Zone AE as well as the area northeast of River Road.

The principle sources of flooding are rainfall ponding and levee overtopping and hurricane or tropical storm surges originating in the Gulf of Mexico from Lake Pontchartrain on the East Bank and Lakes Salvador and Cataouatche on the West Bank. Drainage of floodwaters in the City of Westwego is accomplished by a system of structures and canals, which outflow to pumping stations. Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the City of Westwego appear to be concentrated along Avenue A, Dumonde Drive, and along Walton Drive.

Figure 4.3-f
City of Westwego Flood Zones



One flood event was recorded in the City of Westwego in the last six years.

Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
WESTWEGO	03/27/2009	04:15	Flash Flood	N/A	0	0	0.00K	0.00K
Totals:					0	0	0.00K	0.00K

- March 27, 2009 – Heavy rainfall flooded numerous roadways and some homes and vehicles on the West Bank of Jefferson Parish. The rain gauge at the #2 Pump Station in Westwego recorded 4.38 inches of rainfall.

One flood event has been recorded since 1998. This event occurred over a period of 18 years which translates to a 6% annual probability of future flood occurrences in the City of Westwego.

The principle sources of flooding are rainfall ponding and levee overtopping and hurricane or tropical storm surges originating in the Gulf of Mexico from Lake Pontchartrain on the East Bank and Lakes Salvador and Cataouatche on the West Bank. Drainage of floodwaters in the City of Westwego is accomplished by a system of structures and canals, which outflow to pumping stations. Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the City of Westwego appear to be concentrated along Avenue A, Dumonde Drive, and along Walton Drive.

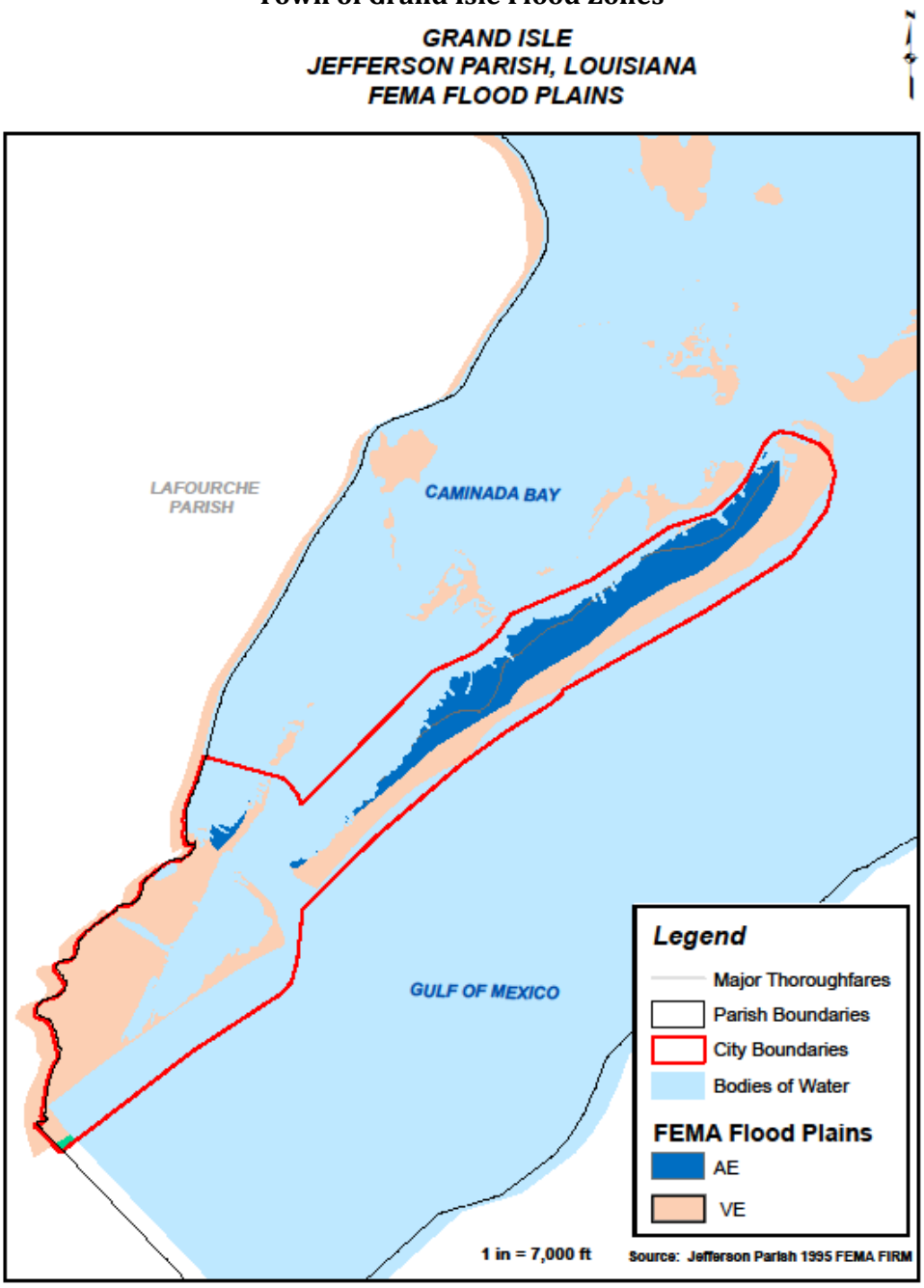
Flood Protection Measures

The most densely populated areas of the City of Westwego are protected from flooding by levees, drainage canals, and storm water pumps. The City of Westwego is served by the Westwego and Bayou Segnette Pumping Stations, which are located in the southwestern portion of the city along Bayou Segnette. The City of Westwego is partially protected from hurricane surges from Lake Salvador and Lake Cataouatche by Parish-built levees (Flood Insurance Study, Jefferson Parish, Louisiana, Incorporated and Unincorporated Areas, November 9, 2012).

Town of Grand Isle

The whole Town is susceptible to flooding due to its proximity to the Gulf of Mexico and low elevation. The Town is surrounded by levees, but still considered the most flood prone community in all of Jefferson Parish. Figure 4.3-g below identifies the FEMA flood zones for Grand Isle. The map shows the entire island is located within Zone AE, areas within the 100-year floodplain with no base flood elevations.

Figure 4.3-g
Town of Grand Isle Flood Zones



There were no non-hurricane-related flood events reported in the Town of Grand Isle since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future flash flood occurrences in the Town of Grand Isle.

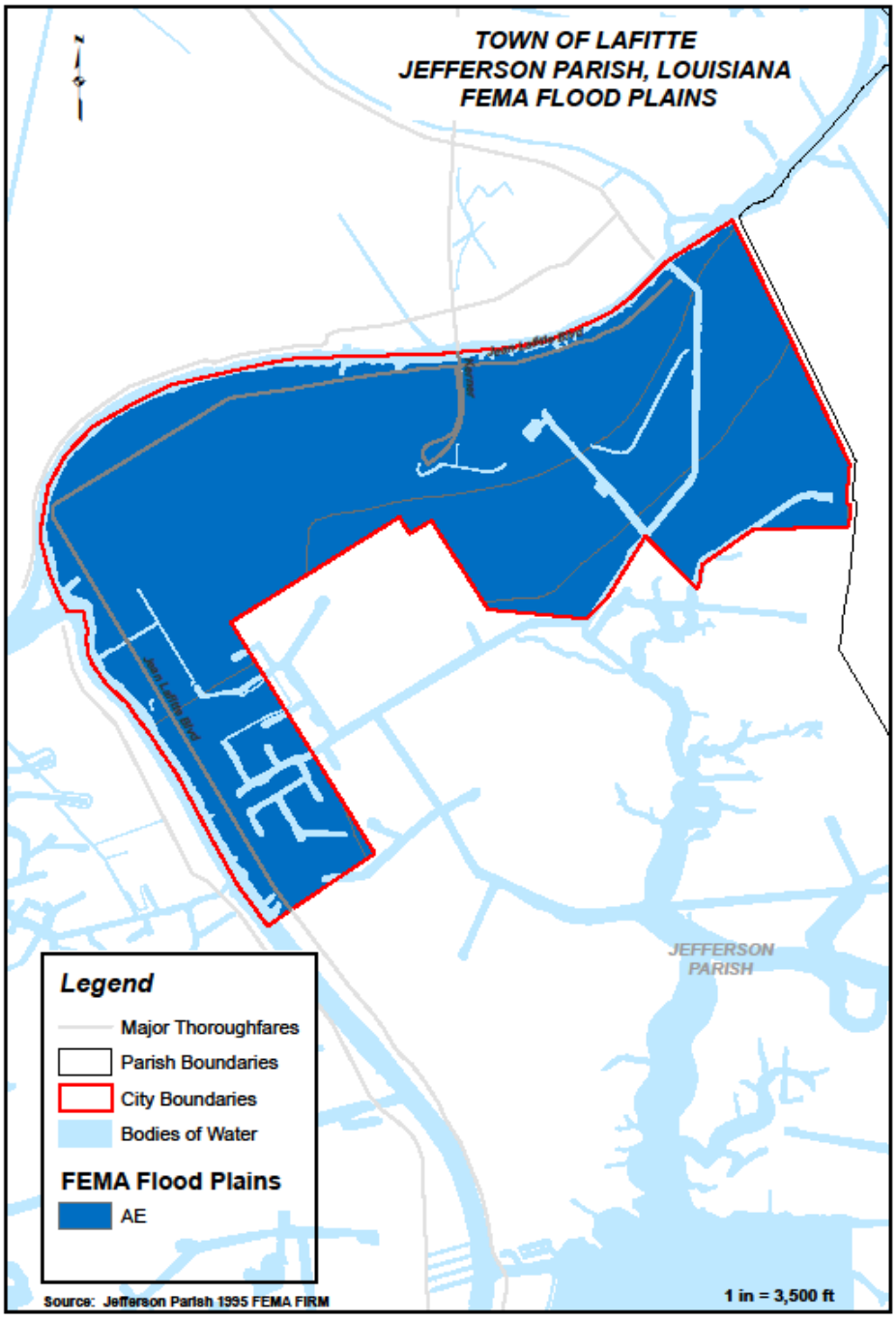
While floods are a significant threat to the Town of Grand Isle, almost all floods associated with this area are a result from strong hurricanes that produced large storms surges along the Louisiana coastline. The whole Town is susceptible to flooding due to its proximity to the Gulf of Mexico and low elevation. The Town is surrounded by levees, but still considered the most flood prone community in all of Jefferson Parish. The Town is located on the barrier island of Grand Isle at the southernmost point of Jefferson Parish along the Gulf of Mexico and is at the mouth of Barataria Bay and bordered by the Gulf of Mexico to the south and inland wetlands and estuaries to the north. The elevation of the Island is at or near sea level and the Town is surrounded by a system of levees to protect it from flooding from storm surge events.

As demonstrated by Hurricane Katrina, and other past hurricanes with strong storm surges, the entire island is vulnerable to flooding. See Section 4.5 (Storm Surge) for flooding in Grand Isle related to storm surge. Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the Town of Grand Isle appear to be located along Santiny Lane and Grand Isle Parkway.

Town of Jean Lafitte

The Town is protected by a system of levees, which helps reduce flood losses, but is still prone to flooding due to its location near the Gulf of Mexico and its low elevation. Figure 4.3-h below identifies the FEMA flood zones for Jean Lafitte. The map identifies that the entire Town is located within Zone AE, areas within the 100-year floodplain with no base flood elevations.

Figure 4.3-h
Town of Lafitte Flood Zones



There were no non-hurricane-related flood events reported in the Town of Jean Lafitte since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future flash flood occurrences in the Town of Jean Lafitte.

Ponding and flash floods are infrequent in the Town of Jean Lafitte, yet floods are a significant threat to the Town. Almost all floods associated with this area are a result from strong hurricanes that produced large storms surges along the Louisiana coastline. The Town is protected by a system of levees, which helps reduce flood losses, but is still prone to flooding due to its location near the Gulf of Mexico and its low elevation. Past flood events were almost all associated with strong hurricanes that produced large storm surges along the Louisiana coastline. Based on a review of FEMA NFIP repetitive loss and severe repetitive loss records, the most flood prone areas in the Town of Jean Lafitte appear to be located along Jean Lafitte Boulevard.

Flood Protection Measures

A portion of Jean Lafitte is currently protected from flooding by a system of levees. The levees are up to five feet in height and provide protection for only a portion of the Town. In July 2009, the Town of Jean Lafitte working in coordination with Jefferson Parish, the West Jefferson Levee District, and the US Army Corps of Engineers (USACE) completed phase one of the Fisher Basin tidal levee project. Phase one of the project included 4.7 miles of earthen levees along the southern edge of the town that abuts marshland.[19] The earthen levee is the first of three phases of the Fisher Basin tidal levee project and will provide Jean Lafitte residents an increased level of flood protection. When fully completed, there will be a ring of levees around the town to protect the area from inundation from nearby marshes and Bayou Barataria. As part of the project, the USACE plans to raise the Town's current levee protection from roughly five feet to seven feet, and construct seven foot floodwalls in those areas that do not have levees (Jefferson Parish website – Jean Lafitte Groundbreaking, December 4, 2006). In September 2014, workers broke ground on a ring levee that will run along the western boundary of the Town tying in with an already-built back levee that runs along the eastern side, encircling the Town.[20]

Based on statistics for the region, the Parish determined that this hazard should be included in the risk assessments.

4.3.8 Flood Risk Assessment

All communities have completed multiple flood protection measures from 2008 to 2014 as seen in each community's flood profile. However, flood risk remains the highest-ranked risk for all communities in Jefferson Parish.

Private Structure Vulnerability

The flood risk assessment for private structures in Jefferson Parish is based on an analysis of National Flood Insurance Program (NFIP) data on both repetitive loss (RL) properties and all NFIP flood claims in Jefferson Parish.

The NFIP defines repetitive loss properties as those that have received at least two NFIP insurance payments of more than $1,000 each in any rolling ten-year period. As of 2014, Jefferson Parish had 6,677 such unmitigated properties, based on a query of the FEMA BureauNet NFIP interface.[21]

Table 4.3-3
Summary of NFIP Repetitive Loss Statistics, Jefferson Parish;
Ordered by Number of Repetitive Loss Properties in each Community
(Source: FEMA NFIP BureauNet query 2014)

Jurisdiction	# RL Props	Total # Claims	Total $ Claims	Average $ Claim
Jefferson Parish	**5,250**	17,016	$ 385,717,304.53	$22,667.92
City of Kenner	**494**	1,542	$ 43,974,669.30	$28,517.94
Town of Grand Isle	**391**	1,222	$ 26,404,445.21	$21,607.57
City of Gretna	**277**	1,202	$ 14,499,493.37	$12,062.81
City of Westwego	**93**	364	$ 4,192,899.28	$11,518.95
Town of Jean Lafitte	**91**	248	$ 9,030,199.07	$36,412.09
City of Harahan	**81**	277	$ 4,985,113.84	$17,996.80
Grand Total	**6,677**	**21,871**	**$488,804,124.60**	**$22,349.42**

It should be noted that the number of claims or repetitive loss properties are not necessarily good indicators of risk, except on a community level. This is in part because communities with larger populations will normally have more insurance policies and more claims (holding constant the exposure to flood hazards). Table 4.3-4 shows the same data sorted by the dollar amount of the average NFIP claim. Particularly when a statistically significant number of claims are included in the data set, the dollar amount of the average claim is a better indication of relative flood risk.

Table 4.3-4
Summary of NFIP Repetitive Loss Statistics, Jefferson Parish;
Ordered by Average of NFIP Insurance Claims in each Community
(Source: FEMA NFIP BureauNet query 2014)

Jurisdiction	# RL Props	Total # Claims	Total $ Claims	Average $ Claim
Town of Jean Lafitte	91	248	$ 9,030,199.07	**$36,412.09**
City of Kenner	494	1,542	$ 43,974,669.30	**$28,517.94**
Jefferson Parish	5,250	17,016	$ 385,717,304.53	**$22,667.92**
Town of Grand Isle	391	1,222	$ 26,404,445.21	**$21,607.57**
City of Harahan	81	277	$ 4,985,113.84	**$17,996.80**
City of Gretna	277	1,202	$ 14,499,493.37	**$12,062.81**
City of Westwego	93	364	$ 4,192,899.28	**$11,518.95**
Grand Total	**6,677**	**21,871**	**$488,804,124.60**	**$22,349.42**

Outside of those properties that appear on the NFIP repetitive loss list, there have been an additional 53,711 flood claims paid in Jefferson Parish since 1978. The total of those losses for the Parish paint a very real picture of the impact to the Parish from flooding.

Table 4.3-5
NFIP Flood Losses in Jefferson Parish
(Source: FEMA NFIP BureauNet query 2014)

Jurisdiction	Total $ Claims 1978-2007	Total $ Claims 2008-2014	Total $ Claims
Jefferson Parish	$1,272,320,955.00	61,314,982.00	$ 1,333,635,937.00
City of Kenner	$ 500,720,873.00	$ 3,462,010.00	$ 504,182,883.00
City of Gretna	$ 39,294,737.00	$ 1,154,624.00	$ 40,449,361.00
Town of Grand Isle	$ 49,956,518.00	$10,782,275.00	$ 60,738,793.00
City of Harahan	$ 28,285,085.00	$ 1,208,252.00	$ 29,493,337.00
City of Westwego	$ 8,867,760.00	$ 492,726.00	$ 9,360,486.00
Town of Jean Lafitte	$ 2,741,544.00	$ 6,770,452.00	$ 9,511,996.00
Grand Total	**$1,902,187,472.00**	**$85,185,321.00**	**$ 1,987,372,793.00**

Utilizing the FEMA Benefit Cost Analysis (BCA) 5.0 software Damage-Frequency Assessment (DFA) Module, we are able to calculate the Annualized Losses for each community to better assess the potential dollar losses to residential structures across the Parish.

By inputting the total losses for each year from 2008 to 2014 (by community) and using the FEMA established recurrence interval for Hurricane Gustav/Ike of 20 years; a 2 year event, 10 year event and 20 year event damage value is reached.

The data that was used, as well as annualized damages that were reached, are summarized in **Table 4.3-6** and **Table 4.3-7** below.

Table 4.3-6
NFIP Flood Loss Statistics, Jefferson Parish;
By year from 2008-2014
(Source: FEMA NFIP BureauNet query 2014)

Jurisdiction	2008 Claims	2009 Claims	2010 Claims	2011 Claims	2012 Claims	2013 Claims	2014 Claims
Jefferson Parish	$33,903,798.00	$ 4,047,101.00	$ 191,398.00	$ 4,617,847.00	$ 18,176,694.00	$ 335,069.00	$ 43,075.00
City of Kenner	$ 360,867.00	$ 247,443.00	$ 3,958.00	$ 590,083.00	$ 2,120,086.00	$ 15,300.00	$ 124,273.00
City of Gretna	$ 111,248.00	$ 62,994.00	$ 0.00	$ 355,613.00	$ 585,833.00	$ 27,935.00	$ 11,001.00
Town of Grand Isle	$ 8,460,875.00	$ 16,225.00	$ 3,436.00	$ 125,109.00	$ 2,173,595.00	$ 0.00	$ 3,035.00
City of Harahan	$ 824,307.00	$ 203,299.00	$ 4,856.00	$ 24,507.00	$ 147,259.00	$ 4,024.00	$ 0.00
City of Westwego	$ 244,102.00	$ 119,244.00	$ 1,851.00	$ 17,771.00	$ 105,172.00	$ 4,586.00	$ 0.00
Town of Jean Lafitte	$ 4,312,850.00	$ 950.00	$ 0.00	$ 128,102.00	$ 2,328,550.00	$ 0.00	$ 0.00
Grant Total	**$48,218,047.00**	**$ 4,697,256.00**	**$ 205,499.00**	**$ 5,859,032.00**	**$ 25,637,189.00**	**$ 386,914.00**	**$ 181,384.00**

Table 4.3-7
BCA 5.0 Damage-Frequency Assessment Module
Risk of 2-Year Event, 10-Year Event and 20-Year Event, Jefferson Parish
(Source: FEMA BCA 5.0 DFA Module[22])

	Damages and Losses Incurred from a:		
Jurisdiction	**2 Year Flood Event**	**10 Year Flood Event**	**20 Year Flood Event**
Town of Jean Lafitte	$ 1,077.00	$ 2,448,814.00	$ 4,993,598.00
City of Kenner	$ 15,685.00	$ 2,229,586.00	$ 417,827.00
Jefferson Parish	$ 43,075.00	$ 19,115,474.00	$ 39,255,232.00
Town of Grand Isle	$ 3,035.00	$ 2,285,856.00	$ 9,796,354.00
City of Harahan	$ 4,125.00	$ 230,520.00	$ 824,307.00
City of Gretna	$ 11,001.00	$ 2,863,823.00	$ 128,808.00
City of Westwego	$ 19,324.00	$ 2,448,814.00	$ 4,993,598.00
Grand Total	**$97,322.00**	**$29,644,215.00**	**$55,698,757.00**

A second analysis of flood risk can be conducted by assessing the number of Pre and Post FIRM structure policies in Jefferson Parish and their respective flood claim totals. This data is summarized in **Tables 4.3-8 and 4.3-9** below.

Table 4.3-8
Pre-FIRM Structure Policies and Claims

Community	# of Policies	# of Paid Claims	$ of Claims
Jefferson Parish	52,570	52,653	$1,746,028,388.00
City of Gretna	2,559	2,725	$34,908,253.00
City of Harahan	1,637	1,213	$22,395,272.00
City of Kenner	6,431	6,445	$238,694,325.00
City of Westwego	995	849	$7,524,837.00
Town of Grand Isle	402	2,710	$50,139,347.00
Town of Jean Lafitte	72	220	$7,059,721.00
Totals	**64,666**	**66,815**	**$2,106,750,143.00**

Table 4.3-9
Post-FIRM Structure Policies and Claims

Community	# of Policies	# of Paid Claims	$ of Claims
Jefferson Parish	40,100	19,509	$936,059,256.00
City of Gretna	865	229	$2,885,530.00
City of Harahan	892	270	$6,277,984.00
City of Kenner	9,235	4,731	$253,945,879.00
City of Westwego	389	84	$1,346,258.00
Town of Grand Isle	579	583	$6,513,430.00
Town of Jean Lafitte	181	114	$1,401,328.00
Totals	**52,241**	**25,520**	**$1,208,429,665.00**

Pre-FIRM refers to houses that were built before the first Flood Insurance Rate Map (FIRM) was produced and issued. For Jefferson Parish, that means any home constructed prior to July 23, 1976 is considered a pre-FIRM home. These homes were built without any FEMA enforced regulations. Post-FIRM dwellings are those constructed after July 23, 1976. The tables above illustrate that with more houses built before floodplain regulations were enforced, the more houses are at risk for flooding. Both the City of Kenner and the Town of Jean Lafitte have more policies in force for post-FIRM houses. This could indicate that development increased in these two jurisdictions after 1976 or that once the FIRM went into effect, more of these properties were in the Special Flood Hazard Area, thereby requiring homeowners to purchase flood insurance policies. The Towns of Grand Isle and Jean Lafitte have substantially more pre-FIRM paid claims than they do policies which indicate a large number of repetitive loss properties in these jurisdictions. Post-FIRM dwellings have a

significantly lower number of paid claims in all the jurisdictions except for the Town of Grand Isle; however, they only have four more claims than they do policies. Ultimately, pre-FIRM houses are at such greater risk, as demonstrated, that the claims payments have costs an entire billion dollars more than the post-FIRM homes. Floodplain management regulations have made an astounding impact to Jefferson Parish in the last 38 years.

Table 4.3-10
Percentage of Pre-FIRM Structures by Community

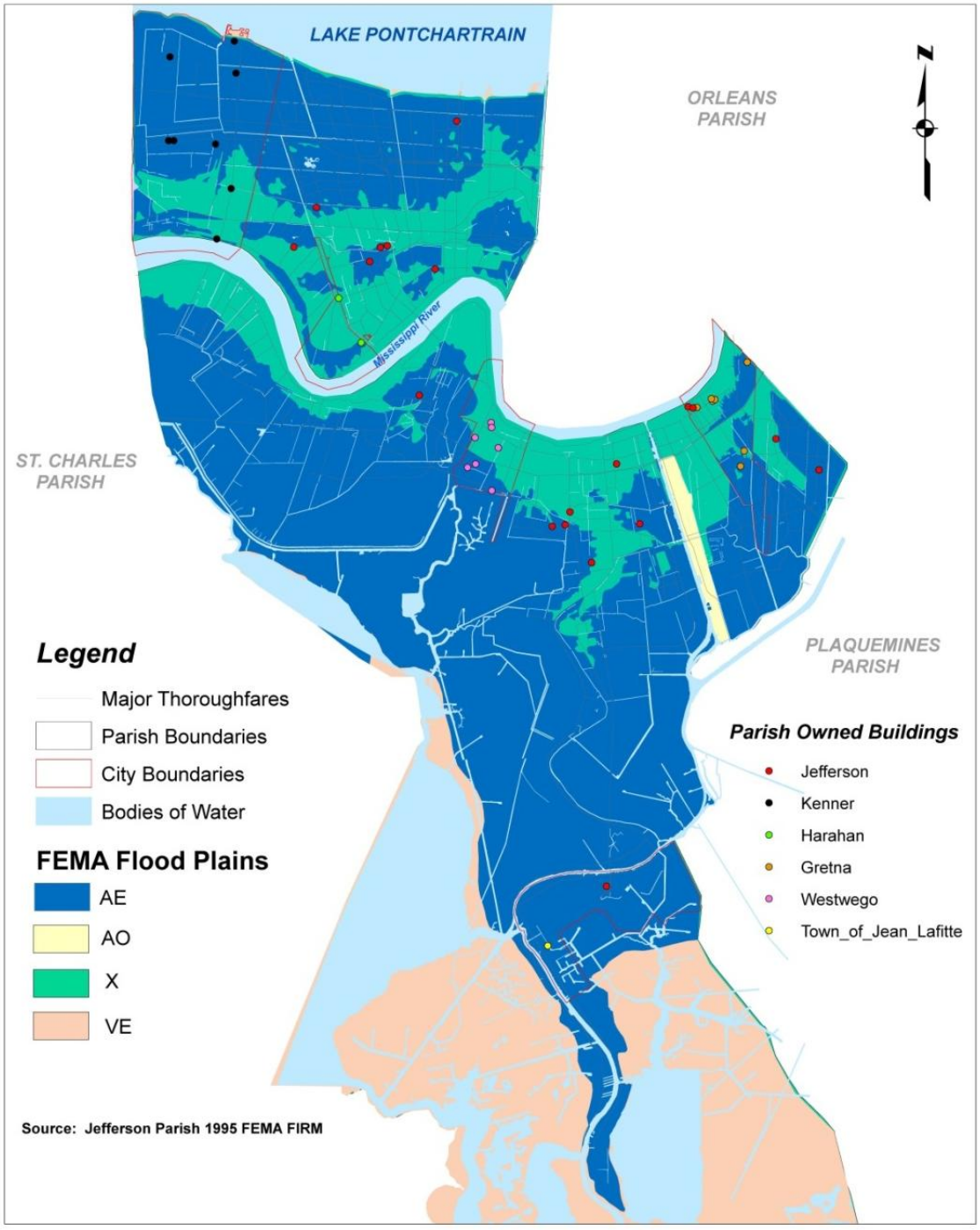
Community	Total # of Structures	Pre-FIRM Policies	% of Pre-FIRM
Jefferson Parish	109,921	52,570	48%
City of Gretna	6,013	2,559	43%
City of Harahan	3,754	1,637	44%
City of Kenner	19,877	6,431	32%
City of Westwego	2,800	995	36%
Town of Grand Isle	1,997	402	20%
Town of Jean Lafitte	1,522	72	5%

The results of this analysis substantiate the ranking position that is placed on the flood hazard, and also paint a monetarily cumbersome picture for Jefferson Parish from future flood events. Ways that the Parish plans to reduce this risk are discussed in detail in the Mitigation Strategy Section (Section 5).

Public Facilities Vulnerability

Public facility inventory data collected by the MPT was used to analyze the vulnerability of the structures to future flood events. Of the information gathered, the factors directly affecting the facility's susceptibility to damage and/or loss from flooding are the building's construction date and flood zone. Critical facilities constructed prior to 1976 were built before the first Flood Insurance Rate Map (pre-FIRM) and therefore were not designed with flood protection in mind. This leaves those structures more vulnerable to future flooding than those constructed post-FIRM which increases the risk of future damage. The designated flood zone in which each facility lies also greatly affects the likelihood that flooding will occur at that location. Figure 4.3-i below displays these Public Facilities on a map with their respective flood zone while Table 4.3-11 summarizes the flood event vulnerability of critical facilities in the municipalities of Jefferson Parish, in order of greatest risk.

Figure 4.3-i
Jefferson Parish Public Facilities;
Flood Zones



JEFFERSON PARISH, LOUISIANA
1995 FEMA FLOOD PLAIN

Table 4.3-11
Jefferson Parish Critical Facilities;
Flood Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	FLOOD RISK	
Jefferson Parish									
Waterworks	I	3600 Jefferson Highway	Jefferson	1964	AE-EL 0.0	2	3	5	High
Rosethorn WWTP	I	865 Jean Lafitte Blvd	Lafitte	1996	AE-EL 7	2	2	4	Moderate
Pard Playground	R	5185 Eighty Arpent Rd	Marrero	1988	AE-EL 3.5	2	2	4	Moderate
Causeway Head Start	E	3420 N. Causeway Blvd	Metairie	2006	AE-EL 3.5	2	2	4	Moderate
JP Drainage Bldg (off LA 18)	A	1561 River Park Road	Bridge City	2010	AE-EL 3.5	2	2	4	Moderate
JP Government Bldg (Yenni Bldg)	A	1221 Elmwood Park Blvd	Harahan	1986	AE-EL 2.5	2	2	4	Moderate
EB Wasterwater Treatment Plant	I	#2 Humane Way	Harahan	1988	AE-EL 2.5	2	2	4	Moderate
Kings Grant Playground	R	3805 15th St	Harvey	1991	AE-EL 1	2	2	4	Moderate
Lapalco Head Start	E	2001 Lincolnshire Dr	Marrero	2010	AE-EL 1	2	2	4	Moderate
Jutland Head Start	E	1821 Jutland	Harvey	2011	AE-EL 1	2	2	4	Moderate
Terrytown Gretna Head Start	E	2315 Park Place	Terrytown	2000	AE-EL -1.5	2	2	4	Moderate
Miley Playground	R	6716 W Metairie	Metairie	1976	AE-EL -3.5	2	2	4	Moderate
Waterworks	I	4500 Westbank Expressway	Marrero	1960	X	1	2	3	Moderate
Marrero Wastewater	I	6250 Lapalco Blvd	Marrero	1969	X	1	2	3	Moderate
JP Animal Shelter - West Bank	P	1869 Ames Blvd	Marrero	1973	X	1	2	3	Moderate
JP Animal Shelter - East Bank	P	1 Humane Way	Harahan	1987	X	1	1	2	Low
Little Farms Playground	R	10301 S Park St	River Ridge	1991	X	1	1	2	Low
Terrytown Playground	R	641 Heritage Ave	Terrytown	1994	X	1	1	2	Low
General Government Building	A	200 Derbigny St	Gretna	2004	X	1	1	2	Low
EOC	A	910 3rd St	Gretna	2010	X	1	1	2	Low
Jeff Par Fire Training Academy	E	200 East St	Bridge City	2013	X	1	1	2	Low

Table 4.3-11 (Continued)
Jefferson Parish Critical Facilities;
Flood Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	FLOOD RISK	
City of Gretna									
Police Substation	P	804 Gretna Blvd.	Gretna	Pre-Firm	AE-EL 15	2	2	4	Moderate
Gretna City Hall	A	740 Second St.	Gretna	1906	X	1	2	3	Moderate
Visitor's Center	A	337 Huey P. Long Ave.	Gretna	1906	X	1	2	3	Moderate
Water Plant Complex	I	100 Fifth St. (A)	Gretna	1934	X	1	2	3	Moderate
Police Department Complex	P	200 Fifth St.	Gretna	1949	X	1	2	3	Moderate
Wastewater Plant Main Bldg.	I	1101 Burmaster St. (B)	Gretna	1973	X	1	2	3	Moderate
Public Works Bldg.	A	224 Fourth St.	Gretna	1975	X	1	2	3	Moderate
Mel Ott Park Multi Purpose Center	R	2301 Belle Chasse Hwy	Gretna	2013	X	1	1	2	Low
City of Harahan									
City Hall, Jail, and Offices	A	6437 Jefferson Hwy	Harahan	1961	AE-EL 11.5	2	3	5	High
Maintenance Bldg	A	1075 Hickory	Harahan	1980	X	1	1	2	Low
City of Kenner									
Fire Station	P	400 Veterans Blvd	Kenner	1972	AE-EL -3.5	2	3	5	High
Police Training Center	P	1939 3rd Street	Kenner	1995	AE-EL 7.5	2	2	4	Moderate
Fire Station	P	401 Vintage Drive	Kenner	1979	AE-EL -3.5	2	2	4	Moderate
Pontchartrain Center	R	4545 Williams Blvd	Kenner	1990	AE-EL -3.5	2	2	4	Moderate
Police Headquarters	P	500 Veterans Blvd	Kenner	2000	AE-EL -3.5	2	2	4	Moderate
Fire Station	P	1919 40th Street	Kenner	2001	AE-EL -3.5	2	2	4	Moderate
Plant #3 Admin Trailer/Office	A	1 West 30th St	Kenner	2003	AE-EL -3.5	2	2	4	Moderate
City Hall	A	1610 3rd Street	Kenner	1952	X	1	2	3	Moderate
Fire Dept. Building	P	2000 Rev. Richard Wilson	Kenner	2007	X	1	1	2	Low

Table 4.3-11 (Continued)
Jefferson Parish Critical Facilities;
Flood Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	FLOOD RISK	
City of Westwego									
Fire Station	P	1168 Ave C	Westwego	1961	AE-EL 15	2	3	5	High
Sewerage Plant, Office, and Lab	I	8700 (r2) Lapalco Blvd	Westwego	1963	AE-EL 15	2	3	5	High
Fire Station	P	1500 Central Ave	Westwego	1974	AE-EL 15	2	3	5	High
Police Dept	P	419 Ave A	Westwego	1919	X	1	2	3	Moderate
City Hall	A	419 Ave A	Westwego	1919	X	1	2	3	Moderate
EMS	P	Ave H & 6th St	Westwego	1965	X	1	2	3	Moderate
Fire Station	P	300 Columbus St	Westwego	1966	X	1	2	3	Moderate
Fire Station	P	206 Louisiana St	Westwego	1975	X	1	2	3	Moderate
Fire Station	P	677 Ave H	Westwego	1976	X	1	1	2	Low
Town of Grand Isle									
Community Center	R	3811 Hwy 1	Grand Isle	1982	VE-EL 11	3	2	5	High
Mulit-Plex Center	R	3101 Hwy 1	Grand Isle	2012	VE-EL 12	3	2	5	High
Town Hall and Police Dept	A	170 Ludwig	Grand Isle	1918	AE-EL 10	2	3	5	High
Town of Jean Lafitte									
Town Hall	A	2654 Jean Lafitte Blvd	Lafitte	1979	AE-EL 7	2	2	4	Moderate
Multipurpose Ctr	R	4917 City Park Drive	Lafitte	2008	AE-EL 7	2	2	4	Moderate

A = Administration E = Education R = Recreation I = Infrastructure P = Public Safety

The following was used to assign a level of risk to the critical facilities listed in Table 4.3-11:

Zone Risk

- 1 = Structures located in an effective "X" zone
- 2 = Structures located in an effective "AE" zone
- 3 = Structures located in an effective "VE" zone

Pre/Post FIRM Risk

- 1 = Structures built after 1975 and located in an effective "X" zone
- 2 = Structures built after 1975 and located in an effective "AE" or "VE" zone; or Structures built prior to 1976 and located in an effective "X" zone
- 3 = Structures built prior to 1976 and located in an effective "AE" or "VE" zone

Those levels of risk were combined to assign an overall flood risk to each critical facility as described below:

FLOOD RISK

- Low – (1 – 2) These structures were built after the development of community Flood Insurance Rate Maps and were therefore designed with flood protection in mind. They are also located in an effected "X" zone which further reduces the likelihood of future damage/loss.

- Moderate - (3 – 4) These structures are at an increased level of risk due to their combined Zone and Pre/Post Firm Risk. Those built post-FIRM are located in an effective "AE" or "VE" zone which puts them at a higher risk, and those located in an effective "X" zone were built pre-FIRM and are at an equally elevated risk.

- High - (5 – 6) These structures are the most vulnerable of those inventoried and carry the greatest damage/loss risk from future flood events. They are all located within an effective "AE" or "VE" zone which in itself poses a larger flood threat. Structures given a "High" level of risk were either constructed pre-FIRM and are located in an effective "AE" zone, or were constructed post-FIRM and are located in an effective "VE" zone.

Of the 54 public facilities assessed, 44 are at a Moderate to High risk to a future 100-year Flood Event as assessed through comparison with the 1995 FIRM data and structure construction date.

Table 4.3-12
Flood Mitigation Actions

Jefferson Parish	City of Gretna	City of Harahan	City of Kenner	City of Westwego	Town of Grand Isle	Town of Jean Lafitte
Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas
Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins	Increase storm water protection management including retention and detention basins
Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ
Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas	Implement Drainage improvement projects in flood-prone areas
Adopt freeboard	Adopt freeboard	Adopt freeboard	Adopt freeboard	Adopt freeboard	Adopt freeboard	Adopt freeboard
Encourage the purchase of flood insurance	Encourage the purchase of flood insurance	Encourage the purchase of flood insurance	Encourage the purchase of flood insurance	Encourage the purchase of flood insurance	Encourage the purchase of flood insurance	Encourage the purchase of flood insurance

Table 4.3-12 (Continued)
Flood Mitigation Actions

Install increased permanent pumps to alleviate flooding	Install increased permanent pumps to alleviate flooding		Install increased permanent pumps to alleviate flooding	Install increased permanent pumps to alleviate flooding		Install increased permanent pumps to alleviate flooding
Educate public on not dumping and cleaning catch basins; enforce penalties for dumping	Educate public on not dumping and cleaning catch basins; penalties for grass cutters blowing grass cuttings into drainage systems	Educate public on not dumping and cleaning catch basins	Educate public on not dumping and cleaning catch basins	Educate public on not dumping and cleaning catch basins		
Issue fewer permits for building in vulnerable areas	Technology redundancy					
Implement failover systems as well as study and implement diversion projects for the Miss River						

4.3.9 Conclusion

If Jefferson Parish were to incur a flood, the total damages to all private structures in the Parish is estimated to be $97k for a 2 year event, $29.6M for a 10 year event, and $55.6M for a 20 year event. Public facilities parishwide are also vulnerable to a future flood event with 9 of those structures having a high risk of incurring damage in a 100 year event, and another 35 with a moderate risk of damage in that same event. Reduction of these risks will be addressed in greater detail in the Mitigation Strategy Section (Section 5).

4.4 Hurricanes and Tropical Storms

4.4.1 Description of the Hurricane and Tropical Storms Hazard

Hurricanes, tropical storms, and typhoons, collectively known as tropical cyclones, are among the most devastating naturally occurring hazards in the United States. They present flooding, storm surge, and high wind hazards to the communities that they impact.

A hurricane is defined as a low-pressure area of closed circulation winds that originates over tropical waters. A hurricane begins as a tropical depression with wind speeds below 39 mph. As it intensifies, it may develop into a tropical storm, with further development producing a hurricane. See Appendix D, General Descriptions of Natural Hazards, for a more detailed description and definition of the hurricane and tropical storm hazard.

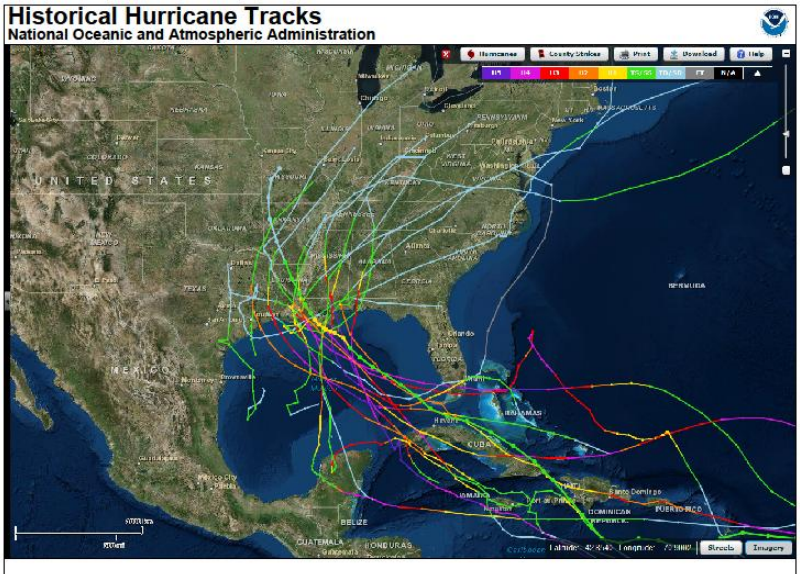
4.4.2 Location and Extent of the Hurricane and Tropical Storm Hazard

The hurricane risk in the United States extends along the entire east coast from Main to Florida, the Gulf Coast (including Florida, Alabama, Louisiana, and Texas), and Hawaii. The southeastern U.S. and Gulf Coast are at greatest risk based on historical storm tracks and the warmer waters of the Gulf of Mexico and Atlantic Ocean.

There have been 28 hurricanes and tropical storms in Jefferson Parish between 1965 and 2014. Of those 28 events, 13 are classified as hurricanes, four of which were a Category 1, three a Category 2, five a Category 3, one a Category 4, and one a Category 5. Although the entire planning area is subject to the effects of hurricanes and tropical storms, the southern part (particularly the Island of Grand Isle) is considered most vulnerable. Grand Isle is situated along the Gulf of Mexico at the southern point of the Parish, and directly exposed to hurricanes that make landfall along the Gulf. Based on past records, the entire planning area can expect hurricanes as strong as Category 5 in future events.

Figure 4.4-a shows all historical hurricanes that impacted southeastern Louisiana and Jefferson Parish from 1965 to 2014. The map was developed using NOAA's Historic Hurricane Tracks database.[23]

Figure 4.4-a
Historic Louisiana Hurricanes
(Source: NOAA Coastal Service Center – Historic Hurricane Tracks database[24])



4.4.3 Severity of the Hurricane and Tropical Storm Hazard

The severity of hurricanes and tropical storms is measured primarily by wind velocity, flooding, and storm surge. For the period 1886 – 1994, an average of five hurricanes per year has occurred in the North Atlantic basin. This region is particularly vulnerable because hurricanes occur frequently, the areas are prone to storm surge and coastal riverine flooding, and the population has climbed to an estimated 36 million people.

As shown in Table 4.4-1, the Saffir-Simpson Hurricane Scale is used to classify storms by numbered categories. Hurricanes are classified as Categories 1 through 5 based on central pressure, wind speed, storm surge height, and damage potential.

Table 4.4-1
Saffir-Simpson Hurricane Scale
(Source: NOAA[25])

Storm Category	Central Pressure	Sustained Winds	Storm Surge	Potential Damage
1	> 980 mbar	74 - 95 mph	4 – 5 ft	Minimal
2	965 – 979 mbar	96 - 110 mph	6 – 8 ft	Moderate
3	945 – 964 mbar	111 – 130 mph	9 – 12 ft	Extensive
4	920 – 944 mbar	131 – 155 mph	13 – 18 ft	Extreme
5	< 920 mbar	> 155 mph	> 18 ft	Catastrophic

4.4.4 Impact on Life and Property

Zero injuries and deaths are reported in the NCDC database for hurricanes and tropical storms for Jefferson Parish from 1996 to 2014. Property damage was estimated at $1.77 billion dollars. The dollar value associated with wind damage is seemingly small, but this is in part due to the difficulty in differentiating between damage caused by flood/surge and that actually caused by wind.

4.4.5 Occurrences of the Hurricane and Tropical Storm Hazard

While the NCDC database only lists hurricane and tropical storm events in Jefferson Parish between 1996 and 2014, FEMA's database of declared disasters indicates five additional hurricanes affected Jefferson Parish prior to 1996 for a total of 28 events since 1965. Jefferson Parish experiences hurricanes and tropical storms on average slightly less than once every two years. The 28 events have occurred over a period of 49 years which calculates to a 57% annual probability of future hurricane or tropical storm occurrences.

Table 4.4-2 below summarizes the hurricanes and tropical storms occurring in Unincorporated Jefferson Parish, City of Gretna, City of Harahan, City of Kenner, City of Westwego, Town of Grand Isle, and Town of Jean Lafitte in the last six years.

Table 4.4-2
Hurricane and Tropical Storm Events, Jefferson Parish Planning Area, 2008 – 2014
Lower Jefferson: Unincorporated Jefferson Parish, Town of Grand Isle, and Town of Jean Lafitte. Upper Jefferson: Unincorporated Jefferson Parish, City of Gretna, City of Harahan, City of Kenner, and City of Westwego
(Source: NOAA/NCDC[26])

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	LOWER JEFFERSON (ZONE)	08/03/2008	16:00	Tropical Storm	N/A	0	0	0.00K	0.00K
2.	LOWER JEFFERSON (ZONE)	09/01/2008	00:00	Hurricane (typhoon)	Cat 2	0	0	1.780M	0.00K
	UPPER JEFFERSON (ZONE)	09/01/2008	00:00	Hurricane (typhoon)	Cat 2	0	0	750.00K	0.00K
3.	UPPER JEFFERSON (ZONE)	09/11/2008	05:00	Hurricane (typhoon)	Cat 2	0	0	0.00K	0.00K
	LOWER JEFFERSON (ZONE)	09/11/2008	05:00	Hurricane (typhoon)	Cat 2	0	0	0.00K	0.00K
4.	LOWER JEFFERSON (ZONE)	11/09/2009	12:00	Tropical Storm	N/A	0	0	0.00K	0.00K
	UPPER JEFFERSON (ZONE)	11/09/2009	12:00	Tropical Storm	N/A	0	0	0.00K	0.00K
5.	UPPER JEFFERSON (ZONE)	09/02/2011	16:00	Tropical Storm	N/A	0	0	25.00K	0.00K
	LOWER JEFFERSON (ZONE)	09/02/2011	16:00	Tropical Storm	N/A	0	0	25.00K	0.00K
6.	UPPER JEFFERSON (ZONE)	08/28/2012	04:00	Hurricane (typhoon)	Cat 1	0	0	6.020M	0.00K
	LOWER JEFFERSON (ZONE)	08/28/2012	04:00	Hurricane (typhoon)	Cat 1	0	0	6.020M	0.00K

Significant events for Unincorporated Jefferson Parish, City of Gretna, City of Harahan, City of Kenner, City of Westwego, Town of Grand Isle, and Town of Jean Lafitte are summarized below:

- August 3, 2008 – Tropical Storm Edouard formed over the north central Gulf of Mexico on the afternoon of August 3rd. Edouard moved east northeast offshore the south Louisiana coastline before making landfall on the upper Texas Coast on Tuesday August 5th. The effects on the southeast Louisiana were minimal and confined to the coastal areas west of the Mississippi River. Tropical storm force winds, primarily in gusts, occurred along the coast. Tides were generally 1 to 3 feet above normal with a few low lying roadways having minor flooding.

- September 1, 2008 – Hurricane Gustav emerged into the southeast Gulf of Mexico as a major category 3 hurricane on August 31st 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. The highest wind gust recorded was 117 mph at a USGS site at the Houma Navigational Canal and at the Pilot Station Est C-MAN at near the Southwest Pass of the Mississippi River. Rainfall varied considerably across southeast Louisiana ranging from around 4 inches to just over 11 inches. Storm surge around Lake Pontchartrain was generally 4 to 5 feet above normal. Storm surge affected many low-lying coastal areas as well as areas around Lake Pontchartrain, but federal levees protected most of the high density population areas of greater New Orleans. However, some locally built levees were breached or overtopped. Hurricane Gustav affected over 100 homes in the lower portion of Jefferson Parish with 4 homes being destroyed, 41 receiving major damage, and around 40 minor damage. A number of businesses also received damage and several trees and utility poles were knocked down. Substantial damage from coastal flooding also occurred in lower Jefferson Parish, especially in Grand Isle where major beach erosion also occurred. In the upper portion of Jefferson Parish, Hurricane Gustav caused minor damage to several homes. Some businesses also received damage and several trees and utility poles were knocked down from the strong winds.

- September 11, 2008 – Hurricane Ike emerged into the southeast Gulf of Mexico as a category 1 hurricane on September 9th after earlier being a major hurricane as it moved across the Caribbean. Ike gradually intensified and developed an unusually large wind field as it tracked northwest across the Gulf over the next three days. Ike made landfall as a category 2 hurricane during the early morning hours on September 13th along the northern end of Galveston Island, Texas. The main effect of Ike on southeast Louisiana was the storm surge which inundated sections of the coast, especially Terrebonne and Lafourche Parish. The unusually high storm surge of approximately 5 feet above normal in Lake Pontchartrain generated by the distant hurricane affected many low-lying coastal areas as well as areas around Lake Pontchartrain, but federal levees protected most of the high density population areas of greater New Orleans. In southern Jefferson Parish from Lafitte and Crown Point to Grand Isle, approximately 2,500 structures were flooded. Considerable storm surge flooding was noted around Lakes Pontchartrain and Maurepas. The storm surge flooding took several weeks to fully drain from many low lying areas of southeast Louisiana. Rainfall across the area was mainly less than one and a half inches.

- November 9, 2009 – Ida developed from a tropical wave moving over the southwestern Caribbean Sea that spawned an area of low pressure on November 2nd. This low pressure

developed into a tropical depression on November 4th and then strengthened into a tropical storm a little later that same day. Ida then increased to hurricane strength on November 5th before shortly thereafter making landfall in Nicaragua. After weakening to a tropical depression while over land in Nicaragua and Honduas, Ida emerged back into the western Caribbean and strengthened into a hurricane once again late on November 7th as it tracked north toward the southern Gulf of Mexico. Ida continued north into the central Gulf of Mexico as a hurricane before weakening to a tropical storm early November 9th as moved into the northern Gulf. The storm briefly became a hurricane once again later that day south of the Mississippi River and then weakened to a tropical storm late on November 9th as it encountered increasing wind shear and cooler waters. Ida moved across the southeast Louisiana and Mississippi coastal waters as a tropical storm late on the 9th and early on the 10th of November. Ida became extratropical on the morning of November 10th and dissipated over the Florida panhandle on November 11th.

Tropical Storm Ida's effects on coastal areas of southeast Louisiana were relatively minor as the storm weakened as it moved across the coastal waters east of the Mississippi River and only brushed the region. Moderate beach erosion did occur in lower Jefferson Parish where storm surge eroded 100 to 200 feet of beach and cut a new pass through Elmer's Island adjacent to Grand Isle. In addition, on Grand Isle in lower Jefferson Parish two or three homes were threatened when a 1000 foot section of a local levee on the western side of the island collapsed as waters from Barataria Bay began to rise. The maximum sustained wind recorded in the vicinity of coastal southeast Louisiana was 52 knots at Pilots Station East near the mouth of the Mississippi River. The storm surge during the event generally ranged from around 2 to 6.5 feet along the southeast Louisiana coast. Rainfall totals were generally around 1 inch or less.

- September 2, 2011 - Tropical Storm Lee initially developed as Tropical Depression Thirteen in the middle Gulf of Mexico on Thursday evening September 1st. The depression moved slowly north and gradually strengthened, eventually reaching tropical storm strength just south of the Louisiana coast on Friday afternoon September 2nd. Tropical Storm Lee made only slow and haltingly northward progress over the next 24 hours eventually moving onshore the Louisiana coast Saturday night, September 3rd, with a maximum sustained wind estimated around 60 mph. 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 storm.

  No fatalities or injuries were associated with any Tropical Storm Lee hazards. The main impacts associated with Tropical Storm Lee were associated with storm surge and rainfall. Both of these impacts were related to its slow forward speed as it crossed the region which allowed the circulation to linger over the area for several days. Storm surge associated with Lee caused tide values to be 3 to 5 feet above normal causing low land flooding. The four-day storm total rainfall ranged between 7 and 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 storm strength winds recorded, resulting in tree limbs being blown down, and weak trees toppling causing power outages. All of the hazards associated with TS Lee resulted in an estimated $3.0 million in property

damage. The majority of the damage, approximately $2 million, was associated with storm surge flooding impacts. Flash flooding resulted in an estimated $75,000 in damages.

- August 28, 2012 - Isaac entered the Gulf of Mexico as a tropical storm on August 26, moving northwest after crossing Haiti, Cuba and the Florida Straits. Isaac strengthened into a hurricane on the morning of the 28th when it was 75 miles south-southeast of the mouth of the Mississippi River. Isaac made landfall in Plaquemines Parish as a Category 1 Hurricane near Southwest Pass of the Mississippi River on the evening of the 28th. A second landfall occurred near Port Fourchon the following morning. The storm weakened to a tropical storm on the afternoon of the 29th about 50 miles west southwest of New Orleans, and weakened further to a tropical depression on the afternoon of the 30th near Monroe, Louisiana.

  The highest wind gust recorded on land in Louisiana was 86 mph, measured by a portable weather station (Texas Tech University) near Buras on the evening at August 28. Due to Isaac's very large size, and slow forward speed, tropical storm force winds lasted in excess of 48 hours in many areas of coastal southeast Louisiana. Occasional hurricane gusts of 70 to 85 mph were recorded across southeast Louisiana during the night of the Aug 28th and early on the 29th, especially south of Lake Pontchartrain. Interior areas of southeast Louisiana such as around Baton Rouge and northward experienced tropical storm force winds. Widespread power outages occurred across the area. Local utility companies reported over 700,000 customers were without power at the peak of the storm in southeast Louisiana. Some of those outages lasted as long as seven days before being restored. Generally, most of the wind damage was limited to downed trees and power lines, and roof damage caused by wind and falling trees and tree limbs.

  Significant impact also occurred around Lakes Pontchartrain and Maurepas with a storm tide of 5 to 9 feet. Roadways and low lying property were flooded. Local levees around Lafitte and Myrtle Grove were overtopped and/or breached resulting flooding of numerous houses and property in this area. Many areas of southeast Louisiana received 8 to 12 inches of rain with a few locations having 15 inches of rain or more. Maximum storm total rainfall was 20.66 inches at the New Orleans Carrollton gauge on the Mississippi River. Overall impacts of Isaac resulted in at least $600 million in damages in southeast Louisiana, 3 direct fatalities, and 2 indirect fatalities. Storm surge flooding accounted for the bulk of damage, estimated around $500 million and the three direct storm surge fatalities in Louisiana. Winds accounted for a much lesser amount of slightly more than a $100 million. As stated earlier, these are early damage estimates and will likely be adjusted upward due to later damage assessments.

  Localized damage also impacted Jefferson Parish as a result of the high wind, flood water, and surge: Sewerage bypass pumps and lift stations were flooded, water lines were damaged by the uprooting of trees, and transportation routes were blocked by debris which slowed recovery efforts. In an attempt to off-set these issues, temporary pumps and sand bags were utilized outside of the levee system.

  During the recovery process there were two indirect fatalities. On Sept 1, a 67 year man was electrocuted when attempting to restore power to his house in Abita Springs, St Tammany Parish. On Sept 3, a 90 year old man died of heat related impacts in his house in Marrero, Jefferson Parish, where power had not been restored.

4.4.6 Municipality Hurricane & Tropical Storm Hazards

Unincorporated Jefferson Parish

Hurricanes are also a significant threat to Unincorporated Jefferson Parish. All of the parish wide events listed in Table 4.4-2 also impacted the unincorporated areas of Jefferson Parish. Jefferson Parish is only approximately 30-50 miles from the Gulf Coast. Of these miles, approximately 39 miles are marsh wetlands. These wetlands act as a buffer and can significantly reduce wind speeds as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The high winds associated with a major hurricane could have a devastating impact on the Planning Area. The entire Parish is subject to the effects of future hurricanes and tropical storms.

City of Gretna

Hurricanes are also a significant threat to the City of Gretna. All of the parish wide events listed in Table 4.4-2 also impacted the City of Gretna. Gretna is only approximately 45 miles from the Gulf Coast. Of these 45 miles, approximately 39 miles are marsh wetlands. These wetlands act as a buffer and can significantly reduce wind speeds as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The high winds associated with a major hurricane could have a devastating impact on the City. The entire City is subject to the effects of future hurricanes and tropical storms.

City of Harahan

Hurricanes are also a significant threat to the City of Harahan. All of the parish wide events listed in Table 4.4-2 also impacted the City of Harahan. Harahan is approximately 45 miles from the Gulf Coast. These 45 miles are separated by large areas of marsh wetlands that extend inland from Grand Isle. These wetlands act as a buffer and can significantly reduce wind speeds as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The high winds associated with a major hurricane could have a devastating impact on the City. The entire City is subject to the effects of future hurricanes and tropical storms.

City of Kenner

Hurricanes are a significant threat to the City of Kenner. All of the parish wide events listed in Table 4.4-2 also impacted the City of Kenner. The City is located approximately 50 miles from the Gulf Coast, separated by large areas of marsh wetlands that extend inland from Grand Isle. These wetlands act as a buffer and can significantly reduce wind speeds as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The high winds associated with a major hurricane could have a devastating impact on the City. The entire City is subject to the effects of future hurricanes and tropical storms.

City of Westwego

Hurricanes are a significant threat to the City of Westwego. All of the parish wide events listed in Table 4.4-2 also impacted the City of Westwego. The City of Westwego is located approximately 45 miles from the Gulf Coast, separated by large areas of marsh wetlands that extend inland from Grand Isle. These wetlands act as a buffer and can significantly mitigate storm surge as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The entire City is subject to the effects of future hurricanes and tropical storms.

Town of Grand Isle

High winds from hurricanes are also a significant threat to the Town of Grand Isle. All of the parish wide events listed in Table 4.4-2 also impacted the Town of Grand Isle. The Island is located along the Louisiana coastline adjacent to the Gulf of Mexico. When future hurricane events impact Grand Isle, the high winds associated with a hurricane most likely would be devastating to the Town. The entire Town is subject to the effects of future hurricanes and tropical storms.

Town of Jean Lafitte

Hurricanes are a significant threat to the Town of Jean Lafitte. All of the parish wide events listed in Table 4.4-2 also impacted the Town of Jean Lafitte. Jean Lafitte is located approximately 30 miles from the Gulf Coast separated by large areas of marsh wetlands that extend inland from Grand Isle. These wetlands act as a buffer and can significantly reduce wind speeds as a hurricane makes landfall. Even with this buffer, hurricane strength winds and gusts are often felt hundreds of miles inland. The high winds associated with a major hurricane could have a devastating impact on the Town. The entire Town is subject to the effects of future hurricanes and tropical storms.

4.4.7 Hurricane & Tropical Storm Risk Assessment

Protection against hurricane and tropical storm wind damage is difficult to provide to a Parish as a whole. Existing individual structures must be hardened and/or secured in order to produce a wind-sustainable community. For this reason, wind risk was assessed in two parts – estimated wind damage to residential structures, and estimated wind damage to Public Facilities.

Residential Structure Assessment

Hurricane and tropical storm wind risk to residential structures was calculated using the FEMA BCA 5.0 Hurricane Wind module.[27] The analysis assumes that that average square footage of residential structures in Jefferson Parish is 2,000 square feet, constructed of a wood frame with a hip roof and toe-nail connections, and has a replacement value of $125 per square foot. This data is summarized below in Table 4.4-3.

Table 4.4-3
Data Parameters for Hurricane/Tropical Storm Wind Analysis of Residential Structures

Data	Value
Residential Square Footage	2,000
Replacement Value	$125/sqft
Contents Value	50% of structure (FEMA default)
Residential Structure Type	Wood frame, Hip roof, Toe-nail connection
Residential Building Type	Single family, One story

Based on the parameters above, the Hurricane Wind Module was used to calculate expected wind losses for existing residential structures located within all municipalities of Jefferson Parish, as shown below in Table 4.4-4. This data is further used to populate estimated damages to each Jefferson Parish community for each event category based on their total private structures, as shown in Table 4.4-5.

Table 4.4-4
Estimated Wind Risk to
Jefferson Parish Residential Structures

Estimated Damages per Structure by Wind Speed	
70 MPH Event (Tropical Storm)	$95
95 MPH Event (Cat 1 Hurricane)	$2,451
110 MPH Event (Cat 2 Hurricane)	$5,714
120 MPH Event (Cat 3 Hurricane)	$10,811
140 MPH Event (Cat 4 Hurricane)	$64,950

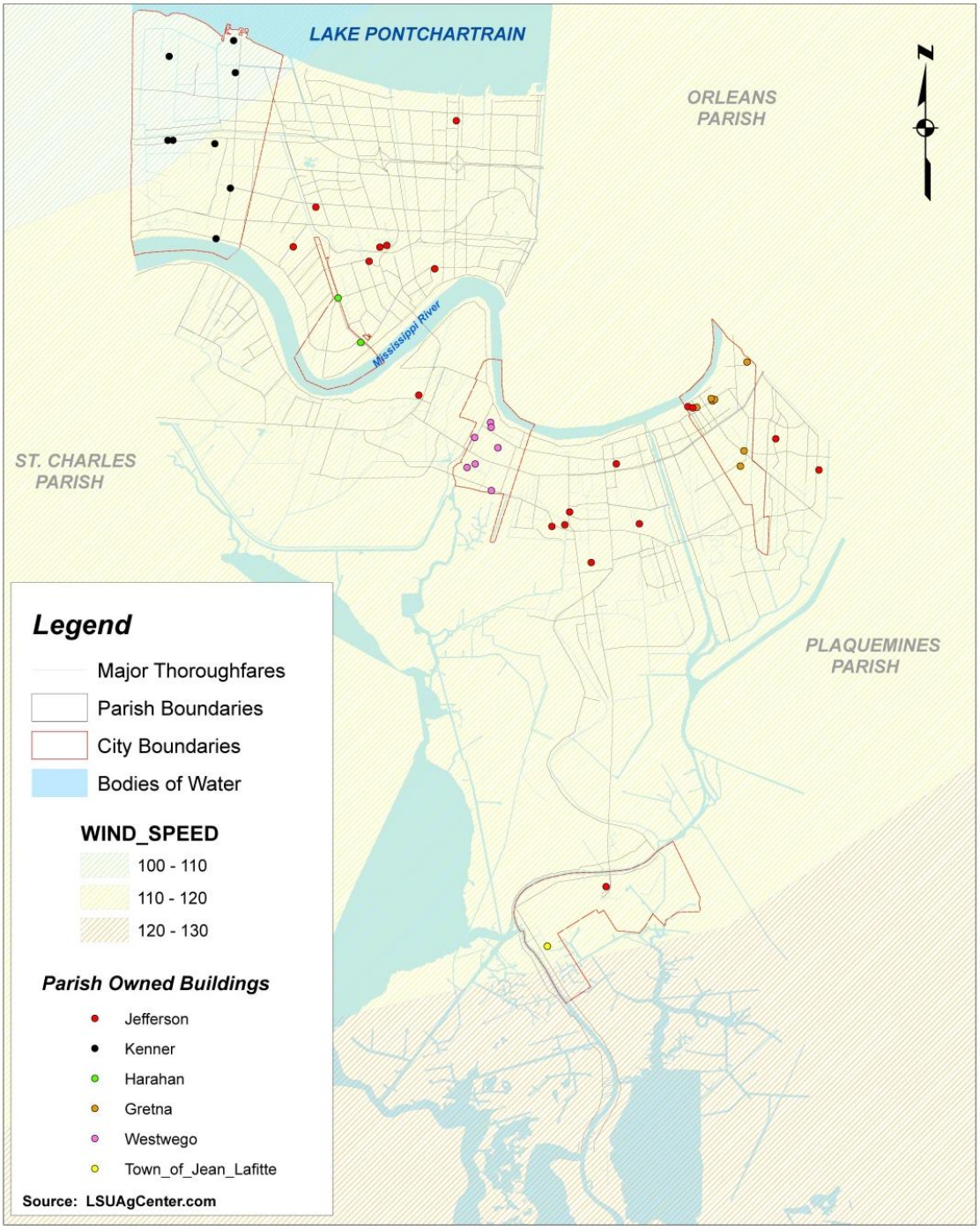
Table 4.4-5
Estimated Wind Risk to
Jefferson Parish Communities

		Estimated Damages Sustained by:				
	Residential Structures	70 MPH Event (Tropical Storm)	95 MPH Event (Cat 1 Hurricane)	110 MPH Event (Cat 2 Hurricane)	120 MPH Event (Cat 3 Hurricane)	140 MPH Event (Cat 4 Hurricane)
Jefferson Parish	109,921	$10,442,495.00	$269,416,371.00	$628,088,594.00	$1,188,355,931.00	$7,139,368,950.00
City of Gretna	6,013	$ 571,235.00	$ 14,737,863.00	$ 34,358,282.00	$ 65,006,543.00	$ 390,544,350.00
City of Harahan	3,754	$ 356,630.00	$ 9,201,054.00	$ 21,450,356.00	$ 40,584,494.00	$ 243,822,300.00
City of Kenner	19,877	$1,888,315.00	$ 48,718,527.00	$113,577,178.00	$ 214,890,247.00	$1,291,011,150.00
City of Westwego	2,800	$ 266,000.00	$ 6,862,800.00	$ 15,999,200.00	$ 30,270,800.00	$ 181,860,000.00
Town of Grand Isle	1,997	$ 189,715.00	$ 4,894,647.00	$ 11,410,858.00	$ 21,589,567.00	$ 129,705,150.00
Town of Jean Lafitte	1,522	$ 144,590.00	$ 3,730,422.00	$ 8,696,708.00	$ 16,454,342.00	$ 98,853,900.00
Grand Total	145,884	$13,858,980.00	$357,561,684.00	$833,581,176.00	$1,577,151,924.00	$9,475,165,800.00

Public Facilities Vulnerability

Public facility inventory data collected by the MPT was used to analyze the vulnerability of the structures to future Hurricane and Thunderstorm wind events. Building data pertaining to the structure's square footage, construction type, building replacement value, and property location were imported into the FEMA BCA 5.0 software and analyzed using the Hurricane Wind module. Figure 4.4-b below shows these Public Facilities on a map with wind speed, while Table 4.4-4 outlines the vulnerability of each critical facility to each storm category.

Figure 4.4-b
Jefferson Parish Public Facilities;
Wind Speed



JEFFERSON PARISH, LOUISIANA
WIND SPEED 2013

Table 4.4-6
Jefferson Parish Critical Facilities;
Wind Vulnerability Assessment

Name of Facility	Tropical Storm	Category 1 Hurricane	Category 2 Hurricane	Category 3 Hurricane	Category 4 Hurricane
Jefferson Parish					
Jeff Par Fire Training Academy	$ 54.00	$ 1,736.00	$ 23,538.00	$ 79,115.00	$ 269,197.00
General Government Building	$ 2,060.00	$ 47,219.00	$ 429,852.00	$ 1,424,173.00	$ 5,764,346.00
EOC	$ 1,043.00	$ 23,921.00	$ 217,766.00	$ 721,497.00	$ 2,920,264.00
JP Government Bldg (Yenni Bldg)	$ 25,999.00	$ 733,200.00	$ 1,879,227.00	$ 4,611,019.00	$ 10,334,966.00
JP Drainage Bldg (off LA 18)	$ 75.00	$ 2,424.00	$ 32,871.00	$ 110,485.00	$ 375,936.00
Lapalco Head Start	$ 163.00	$ 1,991.00	$ 71,520.00	$ 240,387.00	$ 908,479.00
Terrytown Gretna Head Start	$ 340.00	$ 4,154.00	$ 149,226.00	$ 501,568.00	$ 1,895,541.00
Causeway Head Start	$ 169.00	$ 3,788.00	$ 38,987.00	$ 247,043.00	$ 593,075.00
Jutland Head Start	$ 114.00	$ 1,394.00	$ 50,064.00	$ 168,271.00	$ 635,935.00
JP Animal Shelter - East Bank	$ 147.00	$ 4,748.00	$ 64,390.00	$ 367,514.00	$ 817,916.00
JP Animal Shelter - West Bank	$ 52.00	$ 630.00	$ 22,637.00	$ 76,086.00	$ 287,547.00
Kings Grant Playground	$ 19.00	$ 229.00	$ 8,242.00	$ 27,704.00	$ 104,699.00
Little Farms Playground	$ 127.00	$ 4,119.00	$ 55,865.00	$ 318,858.00	$ 709,632.00
Miley Playground	$ 8.00	$ 256.00	$ 3,474.00	$ 19,826.00	$ 44,123.00
Pard Playground	$ 7.00	$ 82.00	$ 2,944.00	$ 9,894.00	$ 37,392.00
Terrytown Playground	$ 223.00	$ 2,722.00	$ 97,767.00	$ 328,608.00	$ 1,241,887.00
EB Wasterwater Treatment Plant	$ 17.00	$ 381.00	$ 4,861.00	$ 29,619.00	$ 75,135.00
Marrero Wastewater	$ 7.00	$ 90.00	$ 3,366.00	$ 11,439.00	$ 43,541.00
Rosethorn WWTP	$ 7.00	$ 166.00	$ 2,257.00	$ 12,881.00	$ 28,667.00
Waterworks	$ 84.00	$ 1,026.00	$ 36,850.00	$ 123,859.00	$ 468,090.00
Waterworks	$ 39.00	$ 1,369.00	$ 19,073.00	$ 110,482.00	$ 246,732.00
City of Gretna					
Gretna City Hall	$ 530.00	$ 19,025.00	$ 146,737.00	$ 416,548.00	$ 1,429,180.00
Police Department Complex	$ 284.00	$ 9,183.00	$ 124,530.00	$ 418,562.00	$ 1,424,197.00
Wastewater Plant Main Bldg.	$ 342.00	$ 11,078.00	$ 150,238.00	$ 504,971.00	$ 1,718,212.00
Water Plant Complex	$ 277.00	$ 8,981.00	$ 121,796.00	$ 409,373.00	$ 1,392,931.00
Public Works Bldg.	$ 226.00	$ 7,320.00	$ 99,270.00	$ 333,660.00	$ 1,135,309.00
Visitor's Center	$ 57.00	$ 1,469.00	$ 3,425.00	$ 6,480.00	$ 38,929.00
Police Substation	$ 109.00	$ 2,817.00	$ 6,566.00	$ 12,423.00	$ 74,633.00
Mel Ott Park Multi Purpose Cente	$ 255.00	$ 3,113.00	$ 111,816.00	$ 375,829.00	$ 1,420,345.00

Table 4.4-6 (Continued)
Jefferson Parish Critical Facilities;
Wind Vulnerability Assessment

Name of Facility	Tropical Storm	Category 1 Hurricane	Category 2 Hurricane	Category 3 Hurricane	Category 4 Hurricane
City of Harahan					
City Hall, Jail, and Offices	$ 152.00	$ 4,918.00	$ 66,694.00	$ 380,665.00	$ 847,186.00
Maintenance Bldg	$ 76.00	$ 2,460.00	$ 33,362.00	$ 190,417.00	$ 423,780.00
City of Kenner					
Fire Dept. Building	$ 52.00	$ 1,682.00	$ 22,806.00	$ 130,170.00	$ 289,698.00
City Hall	$ 163.00	$ 5,285.00	$ 71,665.00	$ 409,034.00	$ 910,321.00
Police Training Center	$ 71.00	$ 2,295.00	$ 31,120.00	$ 177,619.00	$ 295,299.00
Fire Station	$ 155.00	$ 5,005.00	$ 67,868.00	$ 387,365.00	$ 862,096.00
Fire Station	$ 98.00	$ 3,161.00	$ 42,869.00	$ 244,678.00	$ 544,539.00
Police Headquarters	$ 288.00	$ 10,332.00	$ 79,690.00	$ 363,920.00	$ 901,694.00
Fire Station	$ 57.00	$ 1,835.00	$ 24,892.00	$ 142,072.00	$ 316,187.00
Plant #3 Admin Trailer/Office	$ -	$ 1,124.00	$ 12,377.00	$ 51,859.00	$ 114,236.00
Pontchartrain Center	$ 1,025.00	$ 36,820.00	$ 283,982.00	$ 1,296,858.00	$ 3,213,255.00
City of Westwego					
City Hall	$ 91.00	$ 2,949.00	$ 39,991.00	$ 134,414.00	$ 457,357.00
Police Dept	$ 85.00	$ 2,761.00	$ 37,441.00	$ 125,843.00	$ 428,193.00
Sewerage Plant, Office, and Lab	$ 224.00	$ 7,255.00	$ 98,388.00	$ 330,695.00	$ 1,125,222.00
EMS	$ 8.00	$ 244.00	$ 3,310.00	$ 11,126.00	$ 37,856.00
Fire Station	$ 26.00	$ 841.00	$ 11,401.00	$ 38,321.00	$ 130,392.00
Fire Station	$ 51.00	$ 1,654.00	$ 22,435.00	$ 75,407.00	$ 256,578.00
Fire Station	$ 32.00	$ 1,024.00	$ 13,888.00	$ 46,678.00	$ 158,826.00
Fire Station	$ 20.00	$ 874.00	$ 11,857.00	$ 39,854.00	$ 135,608.00
Fire Station	$ 53.00	$ 1,731.00	$ 23,479.00	$ 78,917.00	$ 268,524.00
Town of Grand Isle					
Town Hall and Police Dept	$ 149.00	$ 3,385.00		$ 262,039.00	$ 583,177.00
Community Center	$ 194.00	$ 4,635.00		$ 374,027.00	$ 835,287.00
Mulit-Plex Center	$ 412.00	$ 8,225.00		$ 289,686.00	$ 717,763.00
Town of Jean Lafitte					
Town Hall	$ 170.00	$ 3,854.00	$ 52,261.00	$ 298,288.00	$ 663,852.00
Multipurpose Ctr	$ 297.00	$ 7,105.00	$ 98,982.00	$ 573,354.00	$ 1,280,430.00

Table 4.4-7
Hurricane & Tropical Storm Mitigation Actions

Jefferson Parish	City of Gretna	City of Harahan	City of Kenner	City of Westwego	Town of Grand Isle	Town of Jean Lafitte
Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators
Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	Educate public on importance of evacuating, preparing for hurricane season, and generator safety
Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ
Issue fewer permits for building in vulnerable areas and/or adopt stronger bldg codes		Issue fewer permits for building in vulnerable areas	Adopt and Enforce Strict and uniform bldg codes	Issue fewer permits for building in vulnerable areas	Use debris (fallen trees) after a strong hurricane for coastal restoration (like Christmas tree project)	Barrier construction along bayous to prevent erosion

Table 4.4-7 (Continued)
Hurricane & Tropical Storm Mitigation Actions

Widen the bridges to expedite evacuation					Upgrade and lower water lines to 20 ft below the water surface	Elevate evacuation routes
						Emergency generators at sewer treatment plants and lift stations

4.4.8 Conclusion

Risk of damage and loss from future Hurricane and Tropical Storm wind events to Jefferson Parish is not only probable, but monetarily substantial. Jefferson Parish has been impacted by six storms over the past six years, and as seen in the tables above, both private structures and public facilities are vulnerable to damage losses across all municipalities of the Parish. More information on how this risk is being addressed can be found in Section 5 (Mitigation Strategy).

4.5 Storm Surge

4.5.1 Description of the Storm Surge Hazard

Storm surges occur when the water level of a tidally influenced body of water increases above the normal high tide. Storm surges occur with coastal storms caused by massive low-pressure systems with cyclonic flows that are typical of hurricanes.

Storm surges are particularly damaging when they occur at the time of a high tide, combining the effects of the surge and the tide. This increases the difficulty of predicting the magnitude of a storm surge since it requires weather forecasts to be accurate to within a few hours. See Appendix D, General Descriptions of Natural Hazards, for a more detailed description and definition of the storm surge hazard.

4.5.2 Location and Extent of the Storm Surge Hazard

The storm surge hazard associated with hurricanes and other severe storms are responsible for coastal flooding and erosion along the Louisiana Gulf Coast. In addition to flooding coastal areas, storm surge can also reach further inland impacting lakes and rivers. With more than 60% of Jefferson Parish residents living at or below sea level, residents are particularly vulnerable to flooding and storm surge.[28] Storm surge in Jefferson Parish is primarily the result of hurricanes that approach land from the Gulf of Mexico. Storm surge is most likely to occur in the southern part of the Parish, particularly along the island of Grand Isle. The northern part of the Parish, particularly the City of Kenner and the area around Metairie, are vulnerable from storm surge from Lake Pontchartrain. The effects of storm surge can be felt in the Parish from hurricanes that make landfall as far away as Texas, Mississippi, or Alabama.

There have been 25 instances of storm surge in Jefferson Parish between 1996 and 2014. Based on past records, the entire planning area can expect storm surge as high as 9 feet in future events.

4.5.3 Severity of the Storm Surge Hazard

Storm surges inundate coastal floodplains by tidal elevation rise in inland bays and ports, and backwater flooding through coastal river mouths. Severe winds associated with low-pressure systems cause increase in tide levels and water surface elevations. Storm systems also generate large waves that run up and flood coastal areas. The combined effects create storm surges that affect the beach, marsh, and low-lying floodplains. Shallow offshore depths can cause storm driven waves and tides to pile up against the shoreline and inside bays. See Table 4.5-1 for factors that can influence the severity of coastal storms.

Storm surges in Louisiana are deeper and travel further inland than in other Gulf Coast states, according to experts. Storm surge is considered the next most dangerous part of a hurricane after severe winds and causes nine out of every ten hurricane-related deaths, according to the National Weather Service.

The level of surge in a particular area is also determined by the slope of the continental shelf. A shallow slope off the coast, like what is found off the coast of Louisiana, will allow a greater surge to inundate coastal communities.

Table 4.5-1
Factors that Influence the Severity of Coastal Storms

Factor	Effect
Wind Velocity	The higher the wind velocity the greater the damage.
Storm Surge Height	The higher the storm surge the greater the damage.
Coastal Shape	Concave shoreline sections sustain more damage because the water is driven into a confined area by the advancing storm, thus increasing storm surge height and storm surge flooding.
Storm Center Velocity	Then slower the storm moves, the greater damage. The worst possible situation is a storm that stalls along a coast, through several high tides.
Nature of Coast	Damage is most severe on low-lying island barrier shorelines because they are easily over washed by wave action.
Previous Storm Damage	A coast weakened by even a minor previous storm will be subject to greater damage in a subsequent storm.
Human Activity	With increased development, property damage increases and more floating debris becomes available to knock down other structures.

4.5.4 Protection Measures

In February of 2014 FEMA declared the Hurricane Storm Damage Risk Reduction System (HSDRRS) as accredited, clearing the way for the improved storm surge protection to be incorporation into National Flood Insurance Program flood maps. The accreditation decision follows a formal certification process conducted by the Army Corps of Engineers, which had to prove to FEMA's satisfaction that the levee improvements will protect interior areas from the effects of surge caused by a hurricane with a one (1) percent chance of occurring in any year – a so-called 100-year storm.

The result is that the portions of new flood maps that include the levee system will show that areas behind the levees are protected, meaning they will be marked as a shaded Zone X. Zone X areas would see significantly lower flood insurance rates.

However, areas within the levee system that are still subject to flooding from other causes, such as poor drainage during rainfall events, would still be given an AE rating, with rates higher than those in a designated Zone X. Areas outside the levee system could still be rated at even higher risk levels, with corresponding insurance rates.

Figure 4.5-c below shows a portion of the HSDRRS at the Seabrook Floodgate Complex. The complex is designed to keep storm surges, such as that of Hurricane Katrina (a 100-year storm), out of the canal.

Figure 4.5-a
Army Corps of Engineers Harvey Canal Floodwall

4.5.5 Impact on Life and Property

In Jefferson Parish there have been no deaths or injuries due to storm surge. Approximately $377 million has been reported in property damages related to storm surge.[29]

4.5.6 Occurrences of the Storm Surge Hazard

There have been 5 storm surge events to impact Jefferson Parish between 2008 and 2014. Jefferson Parish experiences a storm surge event on average every other year. Table 4.5-2 summarizes the major storm surge events that have impacted Jefferson Parish since from 2008-2014.

Table 4.5-2
Storm Surge Events, Jefferson Parish, 2008 – 2014
(Source: NOAA/NCDC[30])

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	LOWER JEFFERSON (ZONE)	08/03/2008	16:00	Storm Surge/tide	N/A	0	0	0.00K	0.00K
2.	UPPER JEFFERSON (ZONE)	09/01/2008	00:00	Storm Surge/tide	N/A	0	0	0.00K	0.00K
	LOWER JEFFERSON (ZONE)	09/01/2008	00:00	Storm Surge/tide		0	0	5.000M	0.00K
3.	LOWER JEFFERSON (ZONE)	09/11/2008	12:00	Storm Surge/tide		0	0	87.500M	0.00K
4.	UPPER JEFFERSON (ZONE)	09/02/2011	16:00	Storm Surge/tide	N/A	0	0	5.00K	0.00K
	LOWER JEFFERSON (ZONE)	09/02/2011	16:00	Storm Surge/tide	N/A	0	0	620.00K	0.00K
5.	UPPER JEFFERSON (ZONE)	08/28/2012	06:00	Storm Surge/tide	N/A	0	0	42.300M	0.00K
	LOWER JEFFERSON (ZONE)	08/28/2012	06:00	Storm Surge/tide	N/A	0	0	22.800M	0.00K
	Totals:					**0**	**0**	**158.23M**	**0.00K**

- August 3, 2008 – Storm surge of 1 to 3 feet above normal was experienced along the southeast Louisiana coast as Tropical Storm Edouard moved across the northern Gulf of Mexico. Minimal impact was felt along the coast with only minor flooding of a few coastal roadways. Maximum storm tide was 3.2 feet recorded at the LUMCON-Cocodrie facility.

- September 1, 2008 – Hurricane Gustav continued to move northwest across south Louisiana and weakened to a Category 1 storm over south central Louisiana. Storm surge around Lake Pontchartrain was generally 4 to 5 feet above normal. Storm surge affected many low-lying coastal areas as well as areas around Lake Pontchartrain, but federal levees protected most of the high density population areas of greater New Orleans. However, some locally built levees were breached or overtopped. While numerous structures experienced flooding, especially in Grand Isle, only minor storm surge flooding occurred outside the levee system.

- September 11, 2008 - Storm surge flooding of 4 to 6 ft above normal from Hurricane Ike flooded low lying areas, roadways and property from Grand Isle through the Lafitte areas. Approximately 1500 structures were flooded in this area. The high water took several weeks to fully drain from some areas.

- September 2, 2011 – Tropical Storm Lee affected southeast Louisiana from late on September 2nd through September 4 with primarily onshore southeast and south wind flow. The slow forward speed and broad circulation caused above normal tides along the southeast Louisiana and south Mississippi coast and tidal Lakes of Pontchartrain and Maurepas. Tides were generally 2 to 5 feet above normal. Gauge readings included 6.25 ft NAVD at the Seabrook Bridge at Lake Pontchartain. Storm surge flooding was primarily confined to areas near the coast and tidal lakes, and outside of hurricane protection levees. Low lying roadways were flooded in many areas. Jefferson Parish was among the areas with the greatest impact to houses and other structures with approximately 105 homes experiencing minor flooding in the Lafitte and Crown Point areas. Low lying property on the bay side flooded in the Grand Isle.

- August 28, 2012 – Due to Hurricane Isaac's very large size, and slow forward speed, tropical storm force winds lasted in excess of 48 hours in many areas of coastal southeast Louisiana. Local utility companies reported over 700,000 customers were without power at the peak of the storm in southeast Louisiana. Generally, most of the wind damage was limited to downed trees and power lines, and roof damage caused by wind and falling trees and tree limbs. Significant impact also occurred around Lakes Pontchartrain and Maurepas with a storm tide of 5 to 9 feet. Storm surge flooding also affected areas south and southwest of New Orleans with a storm tide of 4 to 7 feet. Roadways and low lying property were flooded. Local levees around Lafitte and Myrtle Grove were overtopped and/or breached resulting flooding of numerous houses and property in this area. Overall impacts of Isaac resulted in at least $600 million in damages in southeast Louisiana, 3 direct fatalities, and 2 indirect fatalities. Storm surge flooding accounted for the bulk of damage, estimated around $500 million and the three direct storm surge fatalities in Louisiana. Winds accounted for a much lesser amount of slightly more than a $100 million. During the recovery process there was an indirect fatality in Jefferson Parish. On Sept 3, a 90 year old man died of heat-related impacts in his house in Marrero, Jefferson Parish, where power had not been restored.

The greatest recorded storm surge in the United States was generated by Hurricane Katrina, which produced a storm surge exceeding 27 feet along a 20 mile section of the Mississippi Gulf Coastline. The storm surge from Katrina caused an estimated $31.3 billion in damages to the Gulf Coast and $16.2 billion in damages to Louisiana[31] [32]. Hurricane Ike was a close second at $87.5 million for Jefferson Parish alone, mostly affecting the low-lying areas of Grand Isle and Lafitte with 4-6 feet of flooding.

Prior to Katrina, storm surge models (SLOSH) that were developed for the Louisiana coastline estimated storm surge flooding inland up to 18 feet above sea level. The damages caused by Hurricane Katrina demonstrate that storm surge-related flooding can reach depths of up to 30 feet above sea level, with ability to reach either the Northshore of Lake Pontchartrain, just north of New Orleans or the Southshore in Jefferson Parish. However, the highest recorded storm surge for Jefferson Parish in the NCDC database is 9 feet.

4.5.7 Municipality Storm Surge Hazards

City of Gretna

The City of Gretna is subject to storm surge from hurricanes or tropical storms in the Gulf of Mexico pushing water inland along the Mississippi River or Harvey Canal. The City has historically only experienced minimal impacts from storm surge. Zero storm surge events have been recorded since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future storm surge occurrences in the City of Gretna.

City of Harahan

The City of Harahan has no direct exposure to the Gulf, though clearly storm surge could impact Harahan via the Mississippi River. Zero storm surge events have been recorded since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future storm surge occurrences in the City of Harahan.

City of Kenner

Storm surge is most often a result of strong hurricane winds "pushing" water from either the Gulf of Mexico or another large body of water against the coastline causing flooding conditions. The City of Kenner is on the southern shore of Lake Pontchartrain and therefore, could potentially be impacted by storm surge from the Lake. The East Bank of Jefferson Parish, including the City of Kenner, is protected from storm surge by a levee that runs along the southern shoreline of Lake Pontchartrain. Although the levee provides protection from storm surge, historically the City has been impacted to some degree by storm surge from hurricanes affecting the area. Zero storm surge events have been recorded since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future storm surge occurrences in the City of Kenner.

City of Westwego

Storm surge is most often a result of strong hurricane winds "pushing" water onto land. The City of Westwego is subject to storm surge from the Mississippi River, Lake Salvador, and Lake Cataouatche. Bayou Segnette, located just south of the City, empties into Lake Salvador and may also threaten the City of Westwego as hurricane force winds push water from the Lake up into the Bayou. Although the Mississippi River Levee and the earthen levee along Lake Cataouatche provide some protection from storm surge, the City has historically been impacted to some degree by storm surge from hurricanes affecting the area. It is likely that during a major hurricane event Westwego would experience storm surge from Lake Cataouatche, Lake Salvador, or the Mississippi River. Zero storm surge events have been recorded since 1998. With zero events occurring in the last 18 years, there is <1% annual probability of future storm surge occurrences in the City of Westwego.

Town of Grand Isle

The storm surge hazard is perhaps the greatest threat to the Town of Grand Isle. Storm surge along the Island is a result of strong hurricane winds "pushing" water from the Gulf of Mexico against the coastline causing flooding conditions. As the island is surrounded by water, storm surge can be severe. The Town has historically been impacted by storm surge from hurricanes.

Four storm surge occurrences have been recorded in the Town of Grand Isle in the past six years. Summaries of these events follow:

- September 1, 2008 – Hurricane Gustav came ashore with 110 mph winds and storm surge as high as 10 feet in Grand Isle.[33] The surge resulted in extensive impacts to the barrier island and battered the island shore line along the Gulf of Mexico. Eighty-Five percent of the then new (completed just 9 days prior to H. Gustav) 8,000 square foot levee system on the east end of the island was breached or completely destroyed.[34]

- September 11, 2008 – Storm surge for Hurricane Ike was reported to reach 9-12 feet on the Island according to Grand Isle Mayor David Camardelle.[35].

- September 2, 2011 – Tropical Storm Lee's storm surge was recorded at 2.4 feet in the Town of Grand Isle.[36]

- August 28, 2012 – One Grand Isle resident reported two to five feet of water from Hurricane Isaac's storm surge covered the Town the day after Isaac hit shore.[37]

Six storm surge events have been recorded since 1998. With six events occurring in the last 18 years, there is a 33% annual probability of future flash flood occurrences in the Town of Grand Isle.

Town of Jean Lafitte

Storm surge along the coastal areas of southern Louisiana is most often a result of strong hurricane winds "pushing" water from the Gulf of Mexico against the coastline causing flooding conditions. The Town of Jean Lafitte can experience storm surge from the Gulf of Mexico, Barataria Bay Waterway, and from Bayou Rigolettes. Although the levee system provides some protection from storm surge, the Town has historically been impacted to some degree by storm surge from hurricanes affecting the area.

Three storm surge occurrences have been recorded in the Town of Jean Lafitte in the past six years. Summaries of these events follow:

- September 11, 2008 – Hurricane Ike's storm surge completely inundated residential areas just off Jean Lafitte Boulevard. Reports noted many of the houses and businesses that had been elevated after the 2005 hurricanes were flooded from Hurricane Ike (www.leanweb.org/our-work/community/hurricane-ike-damage-assessment). Another article stated many homes and businesses took several feet of water.[38]

- September 2, 2011 – Tropical Storm Lee's threat of flooding was so great that Mayor Tim Kerner called a mandatory evacuation for residents of Jean Lafitte, Crown Point, Barataria and areas outside the levee system because of rising surge and tides pushed into the area by southeast winds from the storm.. While the storm did not reach hurricane strength, its surge was powerful. Approximately fifty homes were flooded in the Town of Jean Lafitte, Crown Point, and nearby communities according to the Mayor.[39] [40]

- August 28, 2012 – Hurricane Isaac's storm surge reached as high as six feet in some spots according to Mayor Kerner. This number varied slightly by resident to resident. One

homeowner reported that the floodwaters exceeded the height of her roof, while another homeowner stated her home was inundated by 7 feet of water. Many homes in the area were severely flooded for Hurricane Isaac, even though some were elevated. Numerous homeowners loss all the contents of their homes and endured extensive structural damage as well. Widespread flooding prevented residents from returning home for days after the hurricane as roads were blocked until the water subsided.[41] [42] [43]

Three storm surge events have been recorded since 1998. With three events occurring in the last 18 years, there is a 17% annual probability of future flash flood occurrences in the Town of Jean Lafitte.

4.5.8 Storm Surge Risk Assessment

Private Structure Vulnerability

While the City of Gretna, City of Harahan, City of Kenner, City of Westwego, and some Unincorporated areas of Jefferson Parish are in proximity to the Mississippi River and/or Lake Pontchartrain, both of which are subject to storm surge, these areas are within the protection of Parish levee system and are not expected to be impacted by storm surge.

In order to assess the risk to Jefferson Parish privately owned structures from a future storm surge event, flood damages from 2008 storm surge flooding were populated into FEMA's BCA 5.0 Damage Frequency Assessment module to project estimated damages within each municipality that lies outside of Parish levee protection. The results of this analysis are presented in Table 4.5-3 below.

Table 4.5-3
BCA 5.0 Damage-Frequency Assessment Module
Annualized Risk from Future Storm Surge Events,
Areas of Jefferson Parish Outside of Levee Protection
(Source: FEMA BCA 5.0 DFA Module[44])

Jurisdiction	Storm Surge Event
Town of Jean Lafitte	$ 249,679.00
Town of Grand Isle	$ 489,817.00
Jefferson Parish	$ 1,523,665.00
Grand Total	**$2,263,161.00**

Public Facilities Vulnerability

Public facility inventory data collected by the MPT was used to analyze the vulnerability of the structures to future storm surge events. Of the information gathered, the factors directly affecting the facility's susceptibility to damage and/or loss from flooding are the building's construction date and location in relation to the levee system, also known as the Hurricane Storm Damage Risk Reduction System (HSDRRS). Critical facilities constructed prior to 1976 were built before the first Flood Insurance Rate Map (pre-FIRM) and therefore were not designed with flood protection in mind. This leaves those structures more vulnerable to future flooding than those constructed post-

FIRM which increases the risk of future damage. Critical facilities located within the protection of the HSDRRS have an added level of protection which reduces their vulnerability to a storm surge event. Table 4.5-4 summarizes the storm surge vulnerability of critical facilities in the municipalities of Jefferson Parish, in order of greatest risk.

Table 4.5-4
Jefferson Parish Critical Facilities;
Storm Surge Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	SURGE RISK	
Jefferson Parish									
Waterworks	I	3600 Jefferson Highway	Jefferson	1964	AE-EL 0.0	1	3	4	Moderate
Rosethorn WWTP	I	865 Jean Lafitte Blvd	Lafitte	1996	AE-EL 7	2	2	4	Moderate
Pard Playground	R	5185 Eighty Arpent Rd	Marrero	1988	AE-EL 3.5	1	2	3	Low
Causeway Head Start	E	3420 N. Causeway Blvd	Metairie	2006	AE-EL 3.5	1	2	3	Low
JP Drainage Bldg (off LA 18)	A	1561 River Park Road	Bridge City	2010	AE-EL 3.5	1	2	3	Low
JP Government Bldg (Yenni Bldg)	A	1221 Elmwood Park Blvd	Harahan	1986	AE-EL 2.5	1	2	3	Low
EB Wasterwater Treatment Plant	I	#2 Humane Way	Harahan	1988	AE-EL 2.5	1	2	3	Low
Kings Grant Playground	R	3805 15th St	Harvey	1991	AE-EL 1	1	2	3	Low
Lapalco Head Start	E	2001 Lincolnshire Dr	Marrero	2010	AE-EL 1	1	2	3	Low
Jutland Head Start	E	1821 Jutland	Harvey	2011	AE-EL 1	1	2	3	Low
Terrytown Gretna Head Start	E	2315 Park Place	Terrytown	2000	AE-EL -1.5	1	2	3	Low
Miley Playground	R	6716 W Metairie	Metairie	1976	AE-EL -3.5	1	2	3	Low
Waterworks	I	4500 Westbank Expressway	Marrero	1960	X	1	2	3	Low
Marrero Wastewater	I	6250 Lapalco Blvd	Marrero	1969	X	1	2	3	Low
JP Animal Shelter - West Bank	P	1869 Ames Blvd	Marrero	1973	X	1	2	3	Low
JP Animal Shelter - East Bank	P	1 Humane Way	Harahan	1987	X	1	1	2	Low
Little Farms Playground	R	10301 S Park St	River Ridge	1991	X	1	1	2	Low
Terrytown Playground	R	641 Heritage Ave	Terrytown	1994	X	1	1	2	Low
General Government Building	A	200 Derbigny St	Gretna	2004	X	1	1	2	Low
EOC	A	910 3rd St	Gretna	2010	X	1	1	2	Low
Jeff Par Fire Training Academy	E	200 East St	Bridge City	2013	X	1	1	2	Low

Table 4.5-4 (Continued)
Jefferson Parish Critical Facilities;
Storm Surge Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	SURGE RISK	
City of Gretna									
Police Substation	P	804 Gretna Blvd.	Gretna	Pre-Firm	AE-EL 15	1	2	3	Low
Gretna City Hall	A	740 Second St.	Gretna	1906	X	1	2	3	Low
Visitor's Center	A	337 Huey P. Long Ave.	Gretna	1906	X	1	2	3	Low
Water Plant Complex	I	100 Fifth St. (A)	Gretna	1934	X	1	2	3	Low
Police Department Complex	P	200 Fifth St.	Gretna	1949	X	1	2	3	Low
Wastewater Plant Main Bldg.	I	1101 Burmaster St. (B)	Gretna	1973	X	1	2	3	Low
Public Works Bldg.	A	224 Fourth St.	Gretna	1975	X	1	2	3	Low
Mel Ott Park Multi Purpose Center	R	2301 Belle Chasse Hwy	Gretna	2013	X	1	1	2	Low
City of Harahan									
City Hall, Jail, and Offices	A	6437 Jefferson Hwy	Harahan	1961	AE-EL 11.5	1	3	4	Moderate
Maintenance Bldg	A	1075 Hickory	Harahan	1980	X	1	1	2	Low
City of Kenner									
Fire Station	P	400 Veterans Blvd	Kenner	1972	AE-EL -3.5	1	3	4	Moderate
Police Training Center	P	1939 3rd Street	Kenner	1995	AE-EL 7.5	1	2	3	Low
Fire Station	P	401 Vintage Drive	Kenner	1979	AE-EL -3.5	1	2	3	Low
Pontchartrain Center	R	4545 Williams Blvd	Kenner	1990	AE-EL -3.5	1	2	3	Low
Police Headquarters	P	500 Veterans Blvd	Kenner	2000	AE-EL -3.5	1	2	3	Low
Fire Station	P	1919 40th Street	Kenner	2001	AE-EL -3.5	1	2	3	Low
Plant #3 Admin Trailer/Office	A	1 West 30th St	Kenner	2003	AE-EL -3.5	1	2	3	Low
City Hall	A	1610 3rd Street	Kenner	1952	X	1	2	3	Low
Fire Dept. Building	P	2000 Rev. Richard Wilson	Kenner	2007	X	1	1	2	Low

Table 4.5-4 (Continued)
Jefferson Parish Critical Facilities;
Storm Surge Vulnerability Assessment

Name of Facility	Purpose	Address	City	Year Built	Effective Zone	Zone Risk	Pre/Post Firm Risk	SURGE RISK	
City of Westwego									
Fire Station	P	1168 Ave C	Westwego	1961	AE-EL 15	1	3	4	Moderate
Sewerage Plant, Office, and Lab	I	8700 (r2) Lapalco Blvd	Westwego	1963	AE-EL 15	1	3	4	Moderate
Fire Station	P	1500 Central Ave	Westwego	1974	AE-EL 15	1	3	4	Moderate
Police Dept	P	419 Ave A	Westwego	1919	X	1	2	3	Low
City Hall	A	419 Ave A	Westwego	1919	X	1	2	3	Low
EMS	P	Ave H & 6th St	Westwego	1965	X	1	2	3	Low
Fire Station	P	300 Columbus St	Westwego	1966	X	1	2	3	Low
Fire Station	P	206 Louisiana St	Westwego	1975	X	1	2	3	Low
Fire Station	P	677 Ave H	Westwego	1976	X	1	1	2	Low
Town of Grand Isle									
Community Center	R	3811 Hwy 1	Grand Isle	1982	VE-EL 11	3	2	5	High
Mulit-Plex Center	R	3101 Hwy 1	Grand Isle	2012	VE-EL 12	3	2	5	High
Town Hall and Police Dept	A	170 Ludwig	Grand Isle	1918	AE-EL 10	2	3	5	High
Town of Jean Lafitte									
Town Hall	A	2654 Jean Lafitte Blvd	Lafitte	1979	AE-EL 7	2	2	4	Moderate
Multipurpose Ctr	R	4917 City Park Drive	Lafitte	2008	AE-EL 7	2	2	4	Moderate

A = Administration E = Education R = Recreation I = Infrastructure P = Public Safety

The following was used to assign a level of risk to the critical facilities listed in Table 4.5-4:

Zone Risk

- 1 = Structures located in an effective "X" or "AE" zone inside the HSDRRS
- 2 = Structures located in an effective "AE" zone outside the HSDRRS
- 3 = Structures located in an effective "VE" zone outside the HSDRRS

Pre/Post FIRM Risk

- 1 = Structures built after 1975 and located in an effective "X" zone
- 2 = Structures built after 1975 and located in an effective "AE" or "VE" zone; or Structures built prior to 1976 and located in an effective "X" zone
- 3 = Structures built prior to 1976 and located in an effective "AE" or "VE" zone

Those levels of risk were combined to assign an overall storm surge risk to each critical facility as described below:

SURGE RISK

- Low – (2 – 3) These structures were built after the development of community Flood Insurance Rate Maps and were therefore designed with flood protection in mind. They lie within the Hurricane and Storm Damage Risk Reduction System (HSDRRS) which provides additional protection from damage associated with a 100-year storm surge event.

- Moderate - (4) These structures are at an increased level of risk due to their location in relation to the HSDRRS combined with their Pre/Post Firm Structure Risk. Those built post-FIRM are located outside of the HSDRRS which puts them at a higher risk, and those located inside of the HSDRRS were built pre-FIRM and are at an equally elevated risk.

- High - (5 – 6) These structures are the most vulnerable of those inventoried and carry the greatest damage/loss risk from future storm surge events. They are all located within an effective "AE" or "VE" zone that also lies outside of the HSDRRS which in itself poses a larger storm surge threat.

Of the 54 public facilities assessed, 9 are at a Moderate to High risk to a future Storm Surge Event as assessed through comparison with the 1995 FIRM data and structure location in relation to the Hurricane and Storm Damage Risk Reduction System (HSDRRS).

Table 4.5-4
Storm Surge Mitigation Actions

Jefferson Parish	City of Gretna	City of Harahan	City of Kenner	City of Westwego	Town of Grand Isle	Town of Jean Lafitte
Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures	Educate public about risks, preparedness measures, and evacuation procedures
Maintain 100 Year levee protection to ensure continued protection	Maintain 100 Year levee protection to ensure continued protection	Maintain 100 Year levee protection to ensure continued protection	Maintain 100 Year levee protection to ensure continued protection	Maintain 100 Year levee protection to ensure continued protection	Increase coastal protection	Build back marsh
Elevate/ Reconstruct prone structures	Coastal erosion projects		Awareness of climate change and environmental impacts	Issue fewer permits for building in vulnerable areas	Elevate/ Reconstruct prone structures	Elevate/ Reconstruct prone structures
Increase coastal protection	Revitalize wetlands to protect City from surge				Natural Shoreline/ Dune Restoration	
Build back marsh						
Issue fewer permits for building in vulnerable areas						
Adopt Freeboard						
Fund more erosion mitigation projects (research alternative materials)						

4.5.9 Conclusion

The areas of Jefferson Parish that lie outside of levee protection are vulnerable to future damage from storm surge events. According to FEMA's Damage-Frequency Assessment Module, those areas have the potential risk of $2,263,161.00 in damages annually. Ways that the Parish plans to reduce this associated risk are addressed in Section 5, Mitigation Strategy.

4.6 Tornadoes

4.6.1 Description of the Tornado Hazard

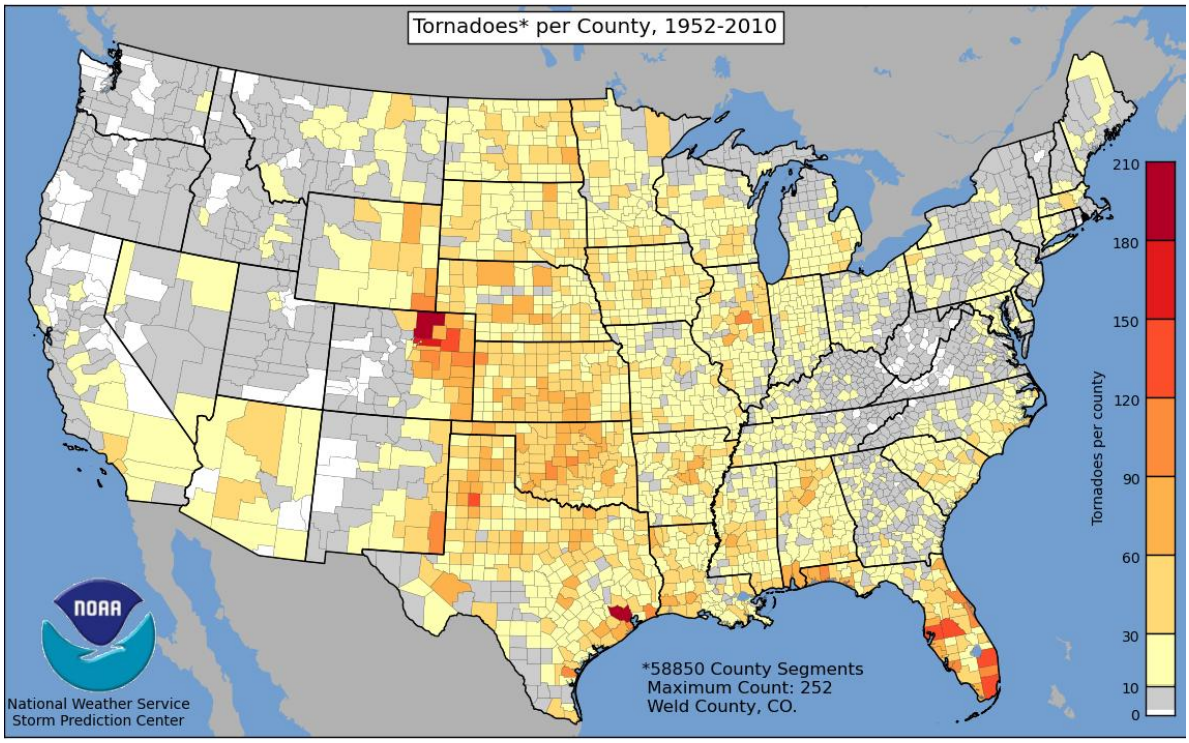
A tornado is a rapidly rotating vortex or funnel of air extending ground ward from a cumulonimbus cloud. Most of the time, vortices remain suspended in the atmosphere. When the lower tip of a vortex touches earth, the tornado becomes a force of destruction. Approximately 1,000 tornadoes are spawned by severe thunderstorms each year. See Appendix D, General Descriptions of Natural Hazards, for a more detailed description and definition of the tornado hazard.

4.6.2 Location and Extent of the Tornado Hazard

Tornadoes are random events and could occur in any of the jurisdictions. Therefore, all jurisdictions in Jefferson Parish have equal risk to the tornado hazard. The National Climatic Data Center reports that 54 tornadoes, including waterspouts, have occurred in Jefferson Parish between 1950 and 2014. Of those 54 tornadoes, 22 were an F0, 19 were an F1, and nine were an F2.

In Louisiana, peak tornado occurrence is in March through May, and in November. Figure 4.6-a shows tornado activity in the United States. The map indicates NOAA's recorded tornadoes per county from 1952-2010, including Jefferson Parish.

Figure 4.6-a
Tornado Activity in the United States[45]



An area covering portions of Texas, Oklahoma, Arkansas, Missouri, and Kansas is known as Tornado Alley, where the average annual number of tornadoes is the highest in the United States. Cold air from the north collides with warm air from the Gulf of Mexico, creating a temperature differential on the order of 20 – 30 degrees C. Most tornadoes in this area occur in the spring.

People living in manufactured or mobile homes are most exposed to damage from tornadoes. Even if anchored, mobile homes do not withstand high wind speeds as well as permanent, site-built structures.

4.6.3 Severity of Tornado Hazard

Tornado damage severity is measured by the Fujita Tornado Scale. The Fujita Scale assigns numerical values based on wind speeds and categorizes tornadoes from 0 to 5. The letter "F" often precedes the numerical value. Tornadoes are related to larger vortex formations, and therefore often form in convective cells such as thunderstorms or in the right forward quadrant of a hurricane, far from the hurricane eye. See Table 4.6-1 for the Fujita Tornado Measurement Scale.

Table 4.6-1
Fujita Tornado Measurement Scale

Category	Wind Speed	Examples of Possible Damage	Number in Louisiana	% of LA Tornadoes
F0	Gale (40-72 mph)	Light damage. Some damage to chimneys; break branches of trees; push over shallow rooted trees; damage to sign boards.	321	22%
F1	Moderate (73-112 mph)	Moderate damage. Peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off roads.	698	48%
F2	Significant (113-157 mph)	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.	292	20%
F3	Severe (158-206 mph)	Severe damage. Roofs and some walls torn off well constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.	132	9%
F4	Devastating (207-260 mph)	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.	18	1%
F5	Incredible (261-318 mph)	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile sized missiles fly through air in excess of 100 yards; trees debarked; incredible phenomena will occur.	2	0%

4.6.4 Impact on Life and Property

The tornadoes category is the one hazard recorded by the National Climatic Data Center since 1950. At that time, events were reported on a parish-wide basis. It was not until 1996 that recorded events included 48 different types of hazard events that were separated out by municipalities.

The National Climatic Data Center reports that 54 tornadoes, including waterspouts, have occurred in Jefferson Parish between 1950 and 2014. The tornadoes caused an estimated $63.7 million in property damage. For all 54 tornadoes, there were four deaths and 71 injuries. With a total of 54 tornadoes between 1950 and 2014, Jefferson Parish experiences a tornado event on average about once every 1.25 years. The 54 events have occurred over a period of 64 years which calculates to an 84% annual probability of future tornado occurrences.

Table 4.6-2
Tornado Events, Jefferson Parish, 2008-2014
(Source: NOAA/NCDC[46])

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	ESTELLE	03/19/2008	03:00	Tornado	EF1	0	0	200.00K	0.00K
2.	WESTWEGO	09/02/2008	16:40	Tornado	EF1	0	0	1.700M	0.00K
3.	METAIRIE	05/16/2009	20:20	Tornado	EF0	0	0	15.00K	0.00K
4.	WESTWEGO	12/15/2009	05:20	Tornado	EF0	0	0	3.00K	0.00K
5.	MOISANT ARPT	03/09/2011	06:08	Tornado	EF0	0	0	5.00K	0.00K
6.	GRAND ISLE	05/13/2011	11:46	Tornado	EF0	0	0	10.00K	0.00K
7.	GRAND ISLE	05/09/2012	13:40	Tornado	EF1	0	0	100.00K	0.00K
8.	TERRYTOWN	12/25/2012	18:20	Tornado	EF0	0	0	10.00K	0.00K
9.	KENNER	04/24/2013	10:52	Tornado	EF0	0	2	100.00K	0.00K
10.	MOISANT ARPT	04/24/2013	10:48	Tornado	EF1	0	0	150.00K	0.00K
11.	GRAND ISLE	06/19/2013	14:45	Tornado	EF0	0	0	10.00K	0.00K
	Totals:					0	2	2.303M	0.00K

4.6.5 Occurrences of the Tornado Hazard

Of the 54 tornadoes identified, 22 were an F0, 19 were an F1, and nine were an F2. Therefore, the most common size tornadoes that could impact the Parish are either an F0 or an F1. Significant events for unincorporated Jefferson Parish are summarized below:

- March 19, 2008 – An EF1 tornado damaged 13 homes and snapped several large hardwood trees in half along an intermittent path. Some of the trees fell on roofs of houses and one car was crushed by a falling tree. One person was injured when hit by a section of a falling rafter.

- May 16, 2009 – A National Weather Service storm damage survey indicated that a waterspout moved onshore from Lake Pontchartrain as an EF0 tornado before dissipating. Intermittent property damage occurred to a few houses and businesses from near the lakefront and Severn Avenue to a few blocks south of West Esplanade and Hessemmer Avenue. Damage occurred to trees, fences, and a few roofs.

- December 25, 2012 – An EF0 tornado touched down in Marrero near the intersection of Barataria and LaPalco Blvd. A gas station sign was blown over and minor damage was done to a fast food restaurant drive-through canopy.

4.6.6 Municipality Tornado Hazards

City of Gretna

No previous tornado occurrences have been recorded in the City of Gretna in the past six years.

City of Harahan

No previous tornado occurrences have been recorded in the City of Harahan in the past six years.

City of Kenner

Three tornadoes have been reported in the City Kenner in the past six years.

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	MOISANT ARPT	03/09/2011	06:08	Tornado	EF0	0	0	5.00K	0.00K
2.	KENNER	04/24/2013	10:52	Tornado	EF0	0	2	100.00K	0.00K
3.	MOISANT ARPT	04/24/2013	10:48	Tornado	EF1	0	0	150.00K	0.00K
		Totals:				0	3	255.00K	

- March 9, 2011 – An EF0 tornado blew down a couple of power poles. Minor fence damage was reported along Joe Yenni Boulevard. A few trees were uprooted and one tree fell onto the corner of a house on Platt Street. Traffic lights were twisted on Joe Yenni Boulevard. Maximum wind was estimated at 70 mph. The tornado moved into Lake Pontchartrain.

- April 24, 2013, two tornadoes were recorded—an EF0 tornado in Kenner near the Metairie line and an EF1 tornado near the airport. A weak tornado touched down near the intersection of Meadowdale Street and Kent Avenue in Metairie, where it downed a large, but rotting, tree onto a parked car. At the intersection of Transcontinental Drive and Veterans Boulevard, the tornado snapped several small trees and overturned a large truck, with the two occupants suffering minor injuries. The tornado continued to cause minor damage to trees and rooftops as it moved through the Pontchartrain Gardens subdivision. The tornado near the airport downed power lines, knocked over light poles, and ripped large limbs off of several large oak trees. A few of the limbs were upward of 18 inches in diameter. The tornado lifted shortly after crossing the intersection of West Loyola Drive and Vintage Drive. Sporadic straight line wind damage was also found in surrounding areas. Estimated peak wind speed was 90 mph.

City of Westwego

Two tornadoes have been recorded in the City of Westwego in the past six years.

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	WESTWEGO	09/02/2008	16:40	Tornado	EF1	0	0	1.700M	0.00K
2.	WESTWEGO	12/15/2009	05:20	Tornado	EF0	0	0	3.00K	0.00K
		Totals:				0	9	1.703M	

- September 2, 2008 – An EF1 tornado damaged 35 to 40 structures with 15 being classified as total losses or destroyed.

- December 15, 2009 – An EF0 tornado briefly touched down near the intersection of West Bank Expressway and Victory Drive resulting in minor damage. The tornado snapped large tree limbs, broke off two power poles, and knocked down power lines along West Bank Expressway.

Town of Grand Isle

Three previous occurrences have been recorded in the Town of Grand Isle in the last six years.

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	GRAND ISLE	05/13/2011	11:46	Tornado	EF0	0	0	10.00K	0.00K
2.	GRAND ISLE	05/09/2012	13:40	Tornado	EF1	0	0	100.00K	0.00K
3.	GRAND ISLE	06/19/2013	14:45	Tornado	EF0	0	0	10.00K	0.00K
		Totals:						120.00K	

- May 13, 2011 - A waterspout was observed crossing Grand Isle. The waterspout went ashore near the bridge, crossed the island and then moved north back over the water. Grand Isle police observed the waterspout for approximately 6 miles...mainly over the water. Power lines were downed near the bridge on Louisiana Highway 1. Part of a roof was taken off of a cabin at the Bridgeside Marina.

- May 9, 2012 – A waterspout over Barataria Bay, as described in an earlier entry, moved southward and onshore the west portion of Grand Isle. A National Weather Service storm survey determined EF-1 damage. There was a total loss of one manufactured home roof, and roof and siding damage to several other structures. A parked recreational travel trailer also suffered significant damage. Some roof debris was thrown 30 yards to the northeast. The path extended from just east of Raspberry Lane on the north side of the island to just west of Raspberry Street on the south side of the island.

- June 19, 2013 - A large waterspout over Barataria Bay moved south and onshore Grand Isle. A portion of a camp roof was blown off and several power lines snapped.

Town of Jean Lafitte

No previous tornado occurrences have been recorded in the Town of Jean Lafitte in the past six years.

Based on statistics for the region, the Parish determined that this hazard should be included in the risk assessments.

4.6.7 Tornado Risk Assessment

Although tornado risk is small in Jefferson Parish relative to other parts of the Nation, there remains enough exposure to the hazard to warrant a risk assessment to estimate potential future losses from this hazard.

The loss calculation is performed using FEMA's BCA 5.0 Tornado Safe Room Module which utilizes a series of default data by location, and population information to place a dollar value on the potential for injury and loss of life.

The risk from tornadoes in Jefferson Parish is the same across the entire planning area – for that reason, the estimated annual losses by jurisdiction only vary based on the number of residential structures. Table 4.6-3 below shows the FEMA BCA 5.0 expected annualized damages to Jefferson Parish by municipality. This analysis is based on the average residence size of 2,000 square feet, average household size of 2.5 persons, and number of residential households per jurisdiction. Since this tornado safe room module only calculates estimates based on injury and loss of life, the BCA 5.0 module was not utilized for Jefferson Parish public facilities.

Table 4.6-3
FEMA BCA 5.0 Tornado Risk Module[47]
Estimated Annual Damages without Mitigation

	Residential Structures	Annualized Losses
Jefferson Parish	109,921	$ 92,642.00
City of Gretna	6,013	$ 5,068.00
City of Harahan	3,754	$ 3,164.00
City of Kenner	19,877	$ 16,753.00
City of Westwego	2,800	$ 2,360.00
Town of Grand Isle	1,997	$ 1,683.00
Town of Jean Lafitte	1,522	$ 1,283.00
Grand Total	145,884	$ 122,953.00

In order to assess the estimated future damages to Jefferson Parish public facilities, building data pertaining to the structure's square footage, construction type, building replacement value, and property location were imported into the FEMA BCA 5.0 software and analyzed using the Hurricane Wind module. The default wind speeds were translated to those experienced in a tornado and estimated damages were derived and are outlined in Table 4.6-3.

Table 4.6-4
Jefferson Parish Critical Facilities;
Tornado Wind Vulnerability Assessment

Name of Facility	F0 Tornado	F1 Tornado	F2 Tornado
Jefferson Parish			
Jeff Par Fire Training Academy	$ 54.00	$ 12,637.00	$ 174,156.00
General Government Building	$ 2,060.00	$ 238,535.50	$ 3,594,259.50
EOC	$ 1,043.00	$ 120,843.50	$ 1,820,880.50
JP Government Bldg (Yenni Bldg)	$ 25,999.00	$ 1,306,213.50	$ 7,472,992.50
JP Drainage Bldg (off LA 18)	$ 75.00	$ 17,647.50	$ 243,210.50
Lapalco Head Start	$ 163.00	$ 36,755.50	$ 574,433.00
Terrytown Gretna Head Start	$ 340.00	$ 76,690.00	$ 1,198,554.50
Causeway Head Start	$ 169.00	$ 21,387.50	$ 420,059.00
Jutland Head Start	$ 114.00	$ 25,729.00	$ 402,103.00
JP Animal Shelter - East Bank	$ 147.00	$ 34,569.00	$ 592,715.00
JP Animal Shelter - West Bank	$ 52.00	$ 11,633.50	$ 181,816.50
Kings Grant Playground	$ 19.00	$ 4,235.50	$ 66,201.50
Little Farms Playground	$ 127.00	$ 29,992.00	$ 514,245.00
Miley Playground	$ 8.00	$ 1,865.00	$ 31,974.50
Pard Playground	$ 7.00	$ 1,513.00	$ 23,643.00
Terrytown Playground	$ 223.00	$ 50,244.50	$ 785,247.50
EB Wasterwater Treatment Plant	$ 17.00	$ 2,621.00	$ 52,377.00
Marrero Wastewater	$ 7.00	$ 1,728.00	$ 27,490.00
Rosethorn WWTP	$ 7.00	$ 1,211.50	$ 20,774.00
Waterworks	$ 84.00	$ 18,938.00	$ 295,974.50
Waterworks	$ 39.00	$ 10,221.00	$ 178,607.00
City of Gretna			
Gretna City Hall	$ 530.00	$ 82,881.00	$ 922,864.00
Police Department Complex	$ 284.00	$ 66,856.50	$ 921,379.50
Wastewater Plant Main Bldg.	$ 342.00	$ 80,658.00	$ 1,111,591.50
Water Plant Complex	$ 277.00	$ 65,388.50	$ 901,152.00
Public Works Bldg.	$ 226.00	$ 53,295.00	$ 734,484.50
Visitor's Center	$ 57.00	$ 2,447.00	$ 22,704.50
Police Substation	$ 109.00	$ 4,691.50	$ 43,528.00
Mel Ott Park Multi Purpose Cente	$ 255.00	$ 57,464.50	$ 898,087.00

Table 4.6-4 (Continued)
Jefferson Parish Critical Facilities;
Tornado Wind Vulnerability Assessment

Name of Facility	F0 Tornado	F1 Tornado	F2 Tornado
City of Harahan			
City Hall, Jail, and Offices	$ 152.00	$ 35,806.00	$ 613,925.50
Maintenance Bldg	$ 76.00	$ 17,911.00	$ 307,098.50
City of Kenner			
Fire Dept. Building	$ 52.00	$ 12,244.00	$ 209,934.00
City Hall	$ 163.00	$ 38,475.00	$ 659,677.50
Police Training Center	$ 71.00	$ 16,707.50	$ 236,459.00
Fire Station	$ 155.00	$ 36,436.50	$ 624,730.50
Fire Station	$ 98.00	$ 23,015.00	$ 394,608.50
Police Headquarters	$ 288.00	$ 45,011.00	$ 632,807.00
Fire Station	$ 57.00	$ 13,363.50	$ 229,129.50
Plant #3 Admin Trailer/Office	$ -	$ 6,750.50	$ 83,047.50
Pontchartrain Center	$ 1,025.00	$ 160,401.00	$ 2,255,056.50
City of Westwego			
City Hall	$ 91.00	$ 21,470.00	$ 295,885.50
Police Dept	$ 85.00	$ 20,101.00	$ 277,018.00
Sewerage Plant, Office, and Lab	$ 224.00	$ 52,821.50	$ 727,958.50
EMS	$ 8.00	$ 1,777.00	$ 24,491.00
Fire Station	$ 26.00	$ 6,121.00	$ 84,356.50
Fire Station	$ 51.00	$ 12,044.50	$ 165,992.50
Fire Station	$ 32.00	$ 7,456.00	$ 102,752.00
Fire Station	$ 20.00	$ 6,365.50	$ 87,731.00
Fire Station	$ 53.00	$ 12,605.00	$ 173,720.50
Town of Grand Isle			
Town Hall and Police Dept	$ 149.00	$ 3,385.00	$ 422,608.00
Community Center	$ 194.00	$ 4,635.00	$ 604,657.00
Mulit-Plex Center	$ 412.00	$ 8,225.00	$ 503,724.50
Town of Jean Lafitte			
Town Hall	$ 170.00	$ 28,057.50	$ 481,070.00
Multipurpose Ctr	$ 297.00	$ 53,043.50	$ 926,892.00

Default wind speeds in the FEMA BCA 5.0 Hurricane Wind Module do not provide data for higher than 145 mph. To date, Jefferson Parish has not had a recorded or reported tornado event with winds exceeding the maximum speed sustained in an F2 tornado, so the ability to assess potential damages from an F3, F4, or F5 event is not presently available.

Table 4.6-4
Tornado Mitigation Actions

Jefferson Parish	City of Gretna	City of Harahan	City of Kenner	City of Westwego	Town of Grand Isle	Town of Jean Lafitte
Construct Safe Rooms	Construct Safe Rooms	Construct Safe Rooms	Construct Safe Rooms	Construct Safe Rooms	Construct Safe Rooms	Construct Safe Rooms
Harden structures for wind	Harden structures for wind	Harden structures for wind	Harden structures for wind	Harden structures for wind	Harden structures for wind	Harden structures for wind
Fortify critical infrastructure	Strengthen foundation systems					

4.6.8 Conclusion

The total annualized risk to residential structures in Jefferson Parish from a tornado event is estimated to be $122,953.00. Any increase to the Parish's population would cause a rise in this assessment, as estimated loss for these structures utilizing the FEMA BCA 5.0 Tornado Safe Room Module is based solely on the loss of life and injury.

By also utilizing the FEMA BCA 5.0 Hurricane Wind Module with respective tornado wind speed calculations, it is estimated that damages to Jefferson Parish critical facilities could exceed $35 Million should the entire Parish experience an F2 scale tornado.

4.7 Coastal Erosion

4.7.1 Description of the Coastal Erosion Hazard

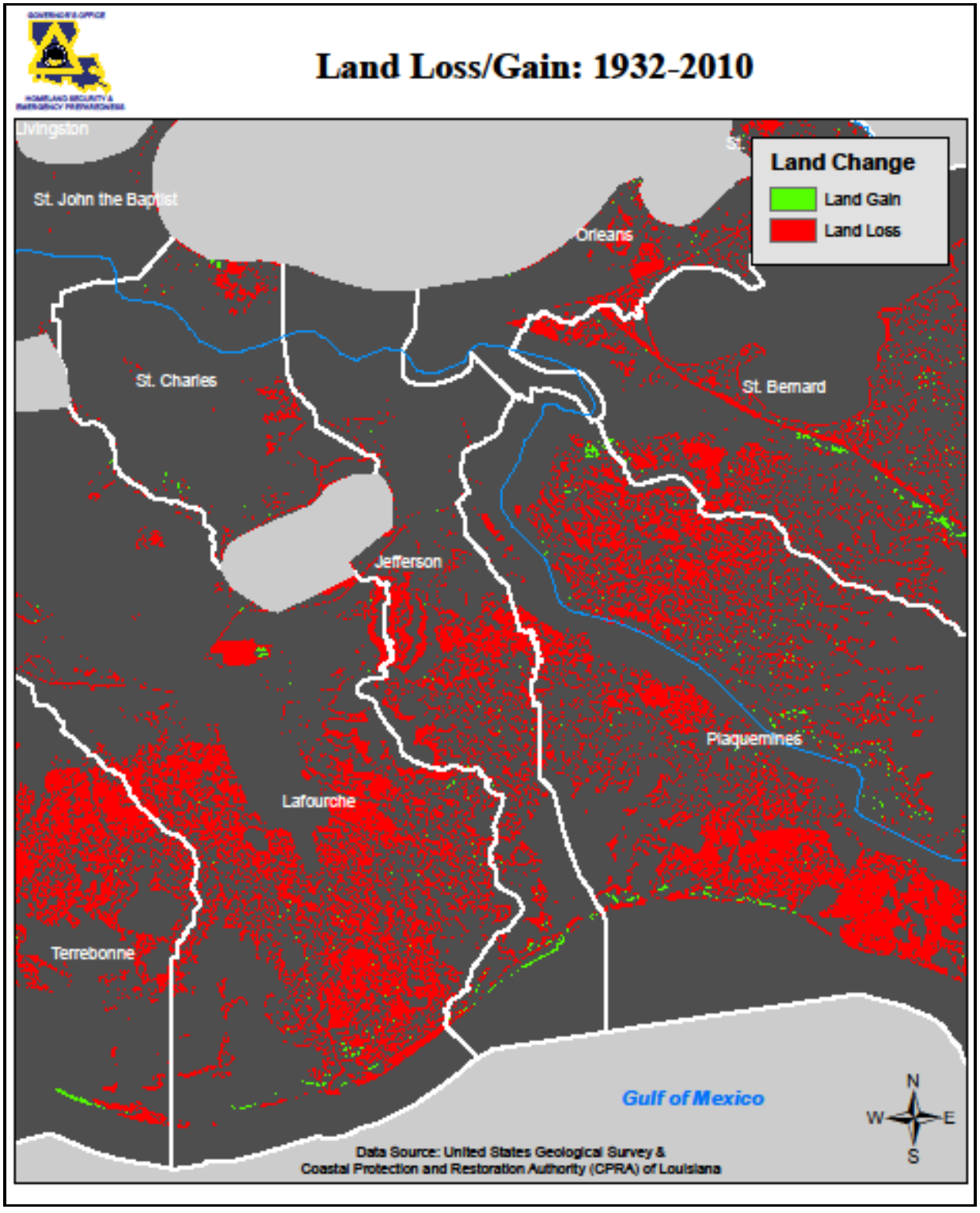
Coastal erosion is the wearing away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents, or drainage. The physical processes that cause barrier island erosion and wetland loss throughout the Louisiana delta plain are complex and varied (USGS – Coastal Erosion and Wetland Change in Louisiana). Coastal erosion along the Louisiana Gulf Coast is an ongoing process that continues to threaten the wetlands and barrier islands. The erosion process is only accelerated by strong storms and hurricanes which can erode large sections of coastline with a single event. See Appendix D for a more detailed description and definition of the coastal erosion hazard.

4.7.2 Location and Extent of Coastal Erosion

Coastal erosion is a significant problem along the entire Louisiana Gulf Coast. The barrier islands and marshes of Louisiana provide protection for inland development during hurricanes. These islands act as a buffer and help to reduce the intensity of hurricanes as they make landfall prior to reaching more densely populated areas such as Jefferson Parish. For example, Hurricane Lili went from a Category 4 to a Category 2 as it encountered Louisiana coastal waters. However, as more land is eroding, these barriers are far less effective.

Coastal erosion directly impacts the southern half of Jefferson Parish. One of the greatest areas of concern in the Parish is the Grand Isle barrier island. This is the only inhabited barrier island in the State of Louisiana. Coastal erosion threatens to shift or reduce the size of the island dramatically in coming years. Figure 4.7-a below identifies areas of coastal erosion that have occurred between 1932 and 2010 in southeastern Louisiana. For Jefferson Parish, the most land loss has occurred in the Towns of Jean Lafitte and Grand Isle.

Figure 4.7-a
Land Loss/Gains: 1932-2010
(Source: LA State HM Plan Map Packages)[48]



4.7.3 Severity of the Coastal Erosion hazard

Tides and strong storms moving onshore from the Gulf of Mexico are eroding Louisiana's marshy coastline at an alarming rate. Erosion of several of the barrier islands, which lie offshore of the estuaries and wetlands that buffer and protect these important ecosystems from the open marine environment, exceeds 20 meters/year. The average rate of shoreline erosion is over 10 meters/year. Within the past 100 years, Louisiana's barrier islands have decreased in area by more than 40 percent, and some islands have lost more than 75 percent of their land area. If these loss rates continue, several of the barriers are expected to erode completely within the next three decades. Their disappearance will contribute to further loss and deterioration of wetlands and back-barrier estuaries and increase the risk to infrastructure.

Coastal wetlands in southern Louisiana are also being lost due to erosion. Louisiana has the highest rate of wetlands loss in the country with the state accounting for 80 percent of the nation's total wetland loss. The USGS estimates wetland loss in the Mississippi River Delta Plain to be 70 square kilometers per year the equivalent of a football field every 20 minutes. In total, the USGS estimates that Louisiana has lost approximately 1,900 square miles of its coast since 1932. At the current rate, the USGS projects that another 500 square miles will be lost by the year 2050 (Wetlands Conservation and Restoration Plan).

Coastlines in southern Jefferson Parish are sinking or eroding away with incoming water eating at the marshes and wetlands that buffer and drain the higher drier land. There are efforts being made to reduce coastal erosion such as the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), Coast-2050, and the Louisiana Coastal Area (LCA) Plan of Restoration (USGS – Coastal Erosion and Wetland Change in Louisiana). Jefferson Parish is a member of the Parishes Against Coastal Erosion (PACE) formed in 1999 to encourage joint cooperation between the southern Louisiana parishes and communities to protect the coastline. The organization meets periodically to discuss issues and encourage policy that reduces coastal erosion.

4.7.4 Impact on Life and Property

There are no known deaths or injuries in Jefferson Parish due to coastal erosion. The slow movement and advancement of coastal erosion is not life threatening, but has the potential to cause substantial property damage and negative impacts to the Louisiana economy. If losses continue at the current rate it has the potential to have direct implications on the nation's energy supplies, seafood industry, economic security, and environmental integrity.[49]

4.7.5 Occurrences of Coastal Erosion

As mentioned above, the rate at which Louisiana is losing coastline and wetlands is fastest than any place in the United States or perhaps even the world. It is estimated that since 1932 the state of Louisiana has lost an estimated 1,900 square miles of coastal land, an area the size of Delaware.[50]

Although there are specific cases of coastal erosion that can be identified, this is an ongoing process that impacts the entire coastal region of Louisiana. The NCDC database does not track occurrences of coastal erosion, but specific cases in southern Louisiana and the coastal region of Jefferson Parish are summarized below:

- **Chandeleur Islands** – This chain of barrier islands are located in St. Bernard Parish, Louisiana

about 60 miles east of New Orleans and are part of the Breton National Wildlife Refuge. The USGS analyzed a section of the islands with aerial photographs taken two days after Hurricane Katrina. The photos were compared with those taken in 2001 prior to Hurricanes Lili and Ivan. Figure 4.7-b identifies the USGS study areas and sections photographed as part of the analysis. Figures 4.7-c and 4.7-d compare location 2 of the study area in 2001 and 2005. The photo taken in 2001 shows low vegetation and marshes behind narrow sand beaches. In 2005 this section of the barrier island is almost submerged from erosion and wave action from Hurricane Katrina and other hurricanes Source.[51]

Figure 4.7-b
Chandeleur Islands Study Area
(Source: USGS[52])

Figure 6.3-25
Location 2; Photo of barrier islands in 2001

Figure 6.3-26
Location 2; Photo of Barrier Islands in 2005

- **Grand Isle** – Grand Isle is a six square mile barrier island located in southern Jefferson Parish. The island lies between marshes on the inland side and the Gulf of Mexico. Saltwater intrusion has been a major source of coastal erosion around the area of Grand Isle. Construction of canals allows saltwater to infiltrate into the fresh and brackish marshes which weakens and kills many of the marsh grasses.

As the process of coastal erosion has been reported for decades, there is a 100% probability that it will continue to affect Jefferson Parish as well as the entire Gulf Coast.

The Parish considered the impact on life and property from coastal erosion and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.8 Subsidence

4.8.1 Description of the Subsidence Hazard

Subsidence is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence generally results from either desiccation and shrinkage, or oxidation of organic material, or both, following drainage. It is the motion of the Earth's surface as it shifts downward, relative to sea-level. Land subsidence, the loss of surface elevation due to the removal of subsurface support, ranges from broad, regional lowering of the land surface to localized collapse. Subsidence usually occurs gradually over a period of years or decades, but in some cases subsidence can happen much faster. It can be highly localized or spread over large regions. See Appendix D for a more detailed description and definition of the subsidence hazard.

Subsidence and sea level rise impact Louisiana in a similar manner – making it difficult to separate impacts. Rising sea levels coupled with subsidence – known as relative sea level rise – can accelerate coastal erosion and wetland loss, exacerbate flooding, and increase the extent and frequency of storm impacts.

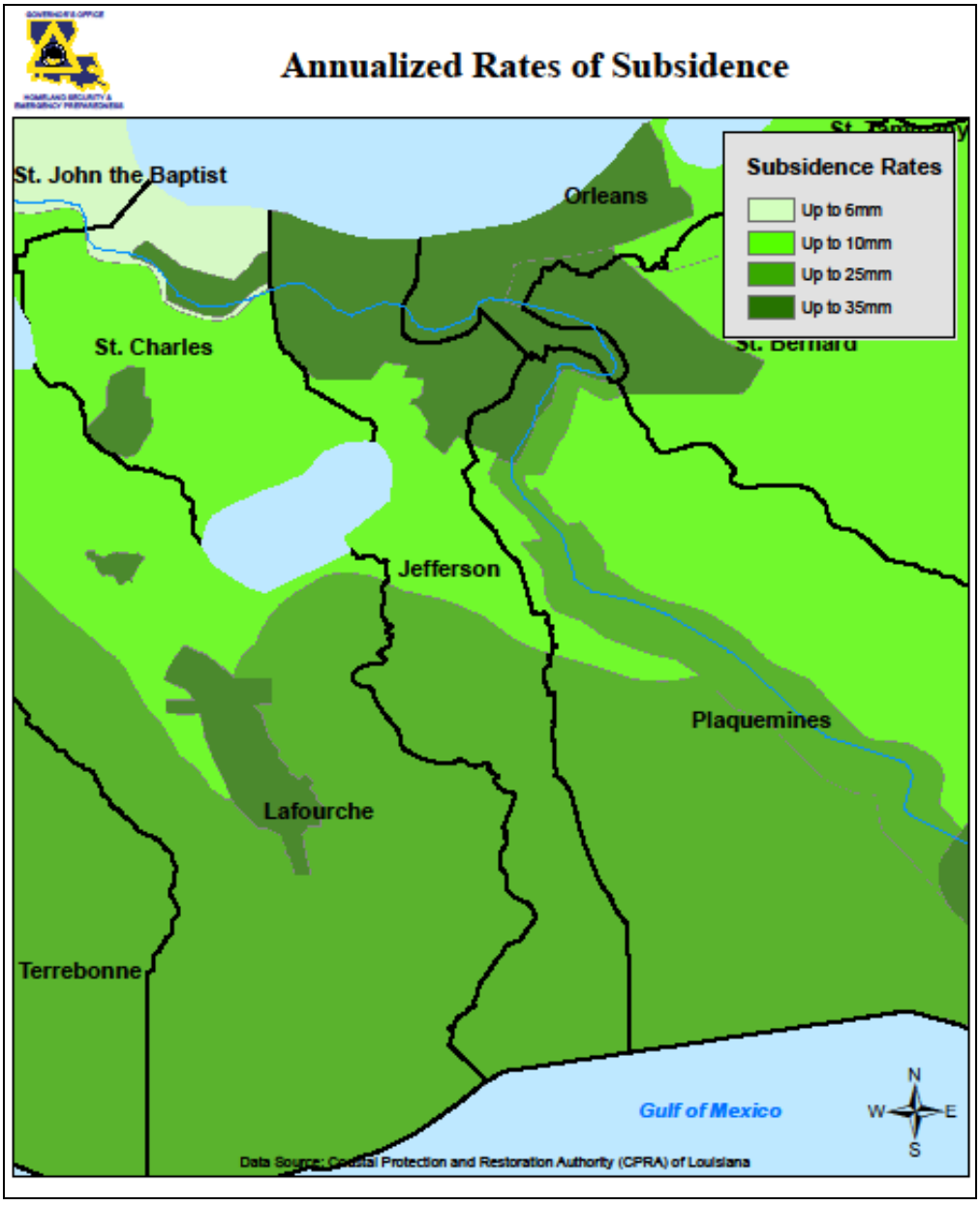
4.8.2 Location and Extent of the Subsidence Hazard

Subsidence is generally found in areas of very distinct geography, such as places where there is extensive gas or groundwater (that has been extracted), or in areas of karst topography or mines. All states with low-lying coasts are vulnerable to accelerated sea-level rise, but Louisiana's coast is much more so because of the subsidence of the Mississippi River delta. Until humans intervened, the surface elevation of the broad delta complex had kept pace with rising sea levels for several thousand years, largely because the river built delta lobes and nourished wetland vegetation. The rates of natural subsidence and sea-level rise along the Louisiana coast have been exacerbated by human modifications, primarily levees which have isolated the Mississippi River from a delta complex that depends on an annual flooding cycle. These modifications cut off the delta-building process of the river.

As of 2008, the Mississippi River delta plain as a whole is losing land at an average rate of more than 60 km2 (23 mi2) per year. Moreover, a recent news article on subsidence in Louisiana states that 1.32 inches of elevation have been lost in the Town of Grand Isle just in the last five years according to data from NOAA. That is approximately four times the subsidence rate than any other coastline. In addition, NOAA's data suggests that over the course of the next 100, sea levels could rise anywhere from 4 to 9 feet in Jefferson Parish, based on readings from the monitoring station at Grand Isle. This combination of relative sea level rise will certainly affect the future of Jefferson Parish.[53] [54] [55]

While the entire Parish is at risk from subsidence, different jurisdictions are losing land at different rates. According to Figure 4.8-a, the Upper part of Jefferson is losing at the fastest rate of up 35mm per year. This includes the City of Gretna, City of Harahan, City of Kenner, and parts of Metairie and the City of Westwego. The middle part of Jefferson Parish is experiencing rates of subsidence of up to 10mm annually. This includes a portion of the City of Westwego and the entire Town of Jean Lafitte. The lower half of Jefferson Parish that includes the Town of Grand Isle is losing land at a slightly faster rate than the Town of Jean Lafitte. This section of the Parish is subsiding at a rate of up to 25mm in a given year.

Figure 4.8-a
Subsidence Rates for Jefferson Parish
(Source: LA State HM Plan Map Packages)[56]



4.8.3 Severity of Subsidence

The severity of subsidence has no generally established measure, except that it can be described in terms of change in ground elevation relative to sea level. Subsidence is generally permanent, although it can be abated with proper management methods. Subsidence occurs slowly and continuously over time or on abrupt occasions, as in the case of sudden formation of sinkholes. Procedures for determining the probability or frequency of land subsidence have not been recommended.

Louisiana's coastal system, specifically Jefferson Parish, has also been heavily impacted by channels dug for navigation and mineral extraction, which have allowed high-salinity Gulf waters to migrate inland. Over a million acres of coastal land have been lost since the 1930s, and between 25 and 35 square miles continue to be lost each year. Louisiana's coastal ecosystems are threatened with systemic collapse.

4.8.4. Impact on Life and Property

In Jefferson Parish there are no known deaths or injuries due to subsidence. Also, specific data regarding the degree of property damage and costs associated with that damage is currently not available. As relative sea level rise (subsidence and sea level rise together) increases, impacts from floods and small hurricanes (Category 1) will increase dramatically; thus, causing property damage to grow cumulatively over the next few decades.

Exposure of people and property is a function of the type and duration of subsidence as well as the extent of the area affected.

- Collapse into Voids – Collapse of surficial materials into underground voids is most commonly associated with coal mining. Coal is found in 37 states and mined underground in 22 states.

- Sediment Compaction – Sediment compaction subsidence is caused by pumping groundwater and petroleum. More than 30 areas in seven states have experienced land subsidence of this type. Groundwater withdrawal in Houston, TX, caused some coastal areas to subside more than 6 feet.

- Drainage of Organic Soils – Approximately 3,600 miles^2 of land underlain by organic soil has subsided because of drainage of organic soils. An even larger area is susceptible to subsidence. Approximately 39,000 mi^2 of the conterminous United States are covered by peat and muck soils and more than 10,000 mi^2 of organic wetlands are in Standard Metropolitan Statistical Areas.

Subsidence can also cause the following impacts:

- Accelerate the effects of saltwater intrusion and other factors that contribute to land loss.

- In many cases, make structures more vulnerable to flooding.

- Call in to question the accuracy of surveying benchmarks which can contribute to additional flooding problems if construction occurs at lower elevations than anticipated or planned.

To estimate the effects of subsidence, page 2-236 of the 2014 Louisiana State Hazard Mitigation Plan includes an economic loss assessment with depth grids for current conditions and projected 2024 conditions across the entire planning area of Jefferson Parish. That data is presented in Table 4.5-2 below.[57]

Table 4.5-2
Exposure Data

	Population (2010)	Current Conditions $1,000	Future (2024) $1,000	% Change (2024 vs 2014)
Jefferson	325,919	$ 7,226,576.95	$ 7,986,823.95	11%
Gretna	17,828	$ 395,309.53	$ 436,896.70	11%
Harahan	11,124	$ 246,774.73	$ 272,735.81	11%
Kenner	58,955	$ 1,306,285.21	$ 1,443,708.42	11%
Westwego	8,295	$ 184,088.39	$ 203,454.77	11%
Grand Isle	5,920	$ 131,286.44	$ 145,097.98	11%
Jean Lafitte	4,511	$ 100,612.77	$ 111,197.39	11%

4.8.5 Occurrences of Subsidence

The average annual damage from all types of subsidence is estimated conservatively to be at least $125 million. Cities where cumulative damage from subsidence exceeds $100 million include Long Beach, CA, Houston, TX; New Orleans and Jefferson Parish.

- Collapse into Voids – The cumulative costs of damage from subsidence caused by underground mining are most significant in Pennsylvania and Washington, not as much in Louisiana.

- Sediment Compaction – Losses from natural compaction, particularly in the Mississippi River Delta, are difficult to estimate because of the uncertain value of coastal wetlands. Increased flooding potential is the principal impact because affected areas commonly are low lying and naturally subject to flooding. Annual revenue losses are possibly on the order of millions of dollars. Even areas with humid climates have incurred significant costs. For example, collapsible soils added more than $2.5 million in mitigation costs to interstate highway construction in Louisiana. The states with the highest damage caused from land subsidence are California and Louisiana.

- Drainage of Organic Soils – Costs associated with structural damage due to differential subsidence caused by drainage of organic soils appear to be high. Approximately $30 million was spent in New Orleans and Jefferson Parish to repair damage and maintain property. Increased flooding is the most serious problem associated with organic soil subsidence. The cumulative damage caused by drainage of organic soils exceeds $100 million in California, Louisiana, and Florida.

- Several benchmarks in Jefferson Parish have been found to be lower than what they are marked. Louisiana Highway 1 is a foot lower than what it is marked. Satellite imagery was used to confirm this.

Any of these types of land subsidence: collapse into voids, sediment compaction, and drainage of organic soils can potentially undermine the integrity of the levee system leading to levee failure. In Jefferson Parish, land subsidence has caused extensive damage to roads and drainage systems which can cause increased flooding. Due to continued heavy rains one would expect to see ongoing problems from subsidence in the future.

Because subsidence and sea level rise occurs as a gradual process, there are no single occurrences to report. As this process has been reported for decades, there is a 100% probability that subsidence will continue to affect Jefferson Parish, all of its jurisdictions, as well as the entire Gulf Coast.

The Parish considered the impact on life and property from past subsidence and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.9 Hailstorms

4.9.1 Description of the Hailstorm Hazard

Hail is a form of precipitation comprised of spherical lumps of ice. Known as hailstones, these ice balls typically range from 5 mm–50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. The size of hailstones is a direct function of the severity and size of the storm. See Appendix A for a more detailed description and definition of the hailstorm hazard.

4.9.2 Location and Extent of the Hail Hazard

The entire Parish has been affected by hail events at one time or another. Hailstorms affect Jefferson Parish and each of the jurisdictions equally and uniformly. The NCDC's database indicates that there have been 60 hailstorms in Jefferson Parish between 1955 and 2014. The largest size hail recorded is 3 inches, but the most common size hail the Parish has experienced is 1.00 inch. Based on past records, the entire planning area can expect hail sizes as large as 3 inches in future events.

Hailstorms occur more frequently during the late spring and early summer, when the jet stream migrates northward across the Great Plains. This period has extreme temperature changes from the ground surface upward into the jet stream, which produces the strong updraft winds needed for hail formation.

Peak periods for hailstorms, late spring and early summer coincided with the Midwest's peak agricultural seasons for crops such as wheat, corn, barley, oats, rye, tobacco, and fruit trees. Long-stemmed vegetation is particularly vulnerable to damage by hail impacts and winds. The land area affected by individual hail events is not much smaller than that of a parent thunderstorm, an average of 15 miles in diameter around the center of a storm.

4.9.3 Severity of the Hail Hazard

The severity of hailstorms is measured by duration, size of the hail itself, and geographic extent. All of these factors are directly related to the weather phenomena that create the hail, thunderstorms. There is wide potential variation in these severity components.

Figure 4.9-a
Large Hailstones

Data on the probability and frequency of occurrence of hailstorms is limited, with little recent research. What data that is available shows that only a localized area along the border of northern Colorado and southern Wyoming experiences hailstorms 8 or more days each year. Outside of the coastal regions, most of the United States experiences hailstorms at least 2 or more days each year.

4.9.4 Impact on Life and Property

Hail events have been recorded by the National Climatic Data Center since 1955. At that time, events were reported on a parish-wide basis. It was not until 1996 that recorded events were separated out by municipalities.

There are no known instances of injuries or death from hail events in Jefferson Parish. Although typically not life threatening, severe hailstorms have the potential to cause significant property damage particularly to automobiles and some building types. The development of hailstorms from thunderstorm events causes nearly $1.6 billion in property and crop damage each year.[58] One hail event occurred in January of 2000 that caused property damage totaling $65 million dollars in Jefferson Parish.

An intense thunderstorm produced a long swath of destructive hail extending from Metairie in northern Jefferson Parish southeast across much of New Orleans in Orleans Parish to Chalmette in St. Bernard Parish. The hail ranged in size from pennies (0.75") to golfballs (1.75") and covered the ground in many locations. The rare hailstorm caused widespread damage to roofs, windows, and vehicles resulting in nearly 25,000 auto and home insurance claims that were estimated to cost $65 million.[59]

4.9.5 Occurrences of the Hail Hazard

There have been 60 hailstorms recorded in Jefferson Parish between 1955 and 2014. Jefferson Parish experiences a significant hailstorm event on average approximately every year. The 60 events have occurred over a period of 59 years which calculates to a 100% annual probability of future hailstorm occurrences. Table 6.3-16 below summarizes the 20 hailstorm events that have been documented in the past six years in the Jefferson Parish planning area.

Table 4.9-1
Hailstorm Events, Jefferson Parish, 2008-2014[60] [61] [62]

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	METAIRIE	06/29/2008	15:52	Hail	0.88 in.	0	0	0.00K	0.00K
2.	METAIRIE	03/25/2009	22:50	Hail	1.00 in.	0	0	0.00K	0.00K
3.	METAIRIE	05/16/2009	20:55	Hail	1.25 in.	0	0	0.00K	0.00K
4.	SOUTHPORT	02/21/2010	18:05	Hail	0.75 in.	0	0	0.00K	0.00K
5.	(MSY)MOISANT FLD NEW	03/29/2011	17:35	Hail	1.00 in.	0	0	0.00K	0.00K
6.	HARVEY	03/29/2011	18:15	Hail	1.00 in.	0	0	0.00K	0.00K
7.	MARRERO	03/29/2011	18:15	Hail	1.25 in.	0	0	0.00K	0.00K
8.	TERRYTOWN	03/29/2011	18:20	Hail	1.00 in.	0	0	0.00K	0.00K
9.	LAFITTE	05/26/2011	19:10	Hail	1.00 in.	0	0	0.00K	0.00K
10.	KENNER	04/02/2012	15:51	Hail	1.00 in.	0	0	0.00K	0.00K
11.	KENNER	04/02/2012	16:00	Hail	1.00 in.	0	0	0.00K	0.00K

12.	METAIRIE	04/03/2012	21:23	Hail	1.00 in.	0	0	0.00K	0.00K
13.	MARRERO	02/24/2013	21:15	Hail	2.50 in.	0	0	0.00K	0.00K
14.	WESTWEGO ARPT	02/24/2013	21:15	Hail	1.75 in.	0	0	0.00K	0.00K
15.	TERRYTOWN	02/24/2013	21:15	Hail	1.50 in.	0	0	0.00K	0.00K
16.	Metairie*	04/29/2013	17:41	Hail	Not reported	0	0	0.00K	0.00K
17.	MARRERO	06/06/2013	16:10	Hail	1.00 in.	0	0	0.00K	0.00K
18.	Lafitte**	07/12/2013	Not reported	Hail	1.75 in.	0	0	0.00K	0.00K
19.	KENNER	04/08/2014	13:57	Hail	0.75 in.	0	0	0.00K	0.00K
20.	KENNER	04/08/2014	13:57	Hail	0.88 in.	0	0	0.00K	0.00K
	Totals:					**0**	**0**	**0.00K**	**0.00K**

The hail sizes for Jefferson Parish hail events between 1955 and 2014 are summarized in Table 6.3-17 below. The most common size hail the Parish has experienced is between .75 inches and 1.75 inches, with 1.00 inch being the most frequent size hail.

Table 4.9-2
Hail Size Summary for Jefferson Parish between 1953 and 2014

Size of Hail	Number of Events
0.75 inches	14
0.88 inches	4
0.90 inches	1
1.00 inches	19
1.25 inches	3
1.50 inches	2
1.75 inches	13
2.00 inches	2
2.50 inches	2
3.00 inches	1

Significant events from the last six years are summarized below:

- June 29, 2008 – Several reports of nickel size hail were received from the Metairie area on WWL News.[63]
- March 25, 2009 – One inch size hail was reported in Metairie.
- May 16, 2009 – Scattered strong to severe thunderstorms developed in a moist and very unstable airmass and hail measuring at 1.25 inches was reported in the Metairie area.
- February 21, 2010 – Pea to penny size hail was reported at Kenner and Metairie.

- March 29, 2011 – In Harvey, Jefferson Parish Emergency Manager reported quarter size hail at the intersection of Manhattan Blvd and the Westbank Expressway. A trained spotter reported half dollar size hail in Marrero and the Cooperative Observer in Terrytown reported quarter size hail covering his yard.

- April 3, 2012 – A storm spotter reported dime to quarter size hail occurring in Metairie between Causeway Boulevard and Bonnabel Boulevard.
- February 24, 2013 – A photo posted on social media indicated oblong shaped hailstone in a person's hand with a size of about 2.25 to 2.50 inches in Marrero and a NWS Cooperative Observer reported ping-pong ball size hail in Terrytown.

- April 29, 2013 – Hail was reported in Old Metairie and in the Edenborn and West Metairie Neighborhood. The size of hail was not indicated.

- June 6, 2013 – Quarter size hail was reported in Marrero.

No Presidentially-declared disasters from hail have occurred in Jefferson Parish

4.9.6 Municipality Hailstorm Hazards

City of Gretna

No previous hail occurrences have been recorded in the City of Gretna in the past five years.

City of Harahan

No previous hail occurrences have been recorded in the City of Harahan in the past five years.

City of Kenner

Five hail events have been reported in City of Kenner in the past six years.

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	(MSY)MOISANT FLD NEW	03/29/2011	17:35	Hail	1.00 in.	0	0	0.00K	0.00K
2.	KENNER	04/02/2012	15:51	Hail	1.00 in.	0	0	0.00K	0.00K
3.	KENNER	04/02/2012	16:00	Hail	1.00 in.	0	0	0.00K	0.00K
4.	KENNER	04/08/2014	13:57	Hail	0.75 in.	0	0	0.00K	0.00K
5.	KENNER	04/08/2014	13:57	Hail	0.88 in.	0	0	0.00K	0.00K
	Totals:					**0**	**0**	**0.00K**	**0.00K**

- March 29, 2011 – A trained spotter reported quarter size hail just east of New Orleans International Airport.

- April 2, 2012 – At 3:51 PM, quarter size hail was reported near Roosevelt Boulevard and West Metairie Avenue. Nine minutes later at 4:00 PM, quarter size hail was reported near Sam's Club in Kenner.

- April 8, 2014 – Kenner experienced 0.75 and 0.88 in hail when a cold upper level low pressure system passed through.

City of Westwego

There has been one hail event recorded in Westwego in the past five years.

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	WESTWEGO ARPT	02/24/2013	21:15	Hail	1.75 in.	0	0	0.00K	0.00K
	Totals:					**0**	**0**	**0.00K**	**0.00K**

- February 24, 2013 – Fire Station 86 near LaPalco Blvd and Westwood Drive reported golf ball size hail.

Town of Grand Isle

No previous hail occurrences have been recorded in the Town of Grand Isle in the past five years.

Town of Jean Lafitte

Two hail events have been recorded in the Town of Jean Lafitte in the past six years.[64]

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	LAFITTE	05/26/2011	19:10	Hail	1.00 in.	0	0	0.00K	0.00K
2.	LAFITTE*	07/12/2013	Not reported	Hail	1.75 in.	0	0	0.00K	0.00K
	Totals:					**0**	**0**	**0.00K**	**0.00K**

- May 26, 2011 – Hail the size of quarters was reported in the Marrero-Lafitte-Larose Highway area near Lafitte.

- July 12, 2013 – Near Lafitte, along Highway 45 between Jean Lafitte and Marrero, 1.75 inch hail was reported.[65]

The Parish considered the impact on life and property from past hailstorms and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.10 Winter Storms

4.10.1 Description of the Winter Storm Hazard

Winter storms typically form along a front generally following the meandering path of the jet stream. These storms, called mid-latitude cyclones or extra-tropical cyclones, differ from hurricanes, in that they move from west to east as opposed to east to west. These weather patterns carry cold air from Canada and the Rockies into the southern U.S. The origins of the weather patterns that cause winter storms in Louisiana are affected by differences in temperature and pressure, moisture availability, and wind direction as well as weather systems in the Atlantic Ocean and Gulf of Mexico. See Appendix D for a more detailed description and definition of the winter storm hazard.

4.10.2 Location and Extent of the Winter Storm Hazard

Nearly the entire United States is considered at risk for severe winter storms. When these storms occur in the South, unprotected pipes are especially vulnerable. Disruption in water service and decreases in water pressure cause a cascading problem for emergency responders. Heavily populated areas are particularly impacted when severe winter storms disrupt communication and power due to downed lines from high winds and icing. Debris associated with heavy icing may impact utility systems and transportation routes.

There have been a total of three winter weather events reported between 1996 and 2014 in Jefferson Parish. Winter weather/storms have affected the entire planning area. All people and assets are considered to have the same degree of exposure. All jurisdictions in the entire planning area could expect to see 2 day closures of government offices, schools/institutions, and elevated roadways and bridges. Temperatures below freezing combined with precipitation could bring ice accumulation of .10-.25 inches.

4.10.3 Severity of Winter Storms

Because severe winter storms are relatively rare in Louisiana, occurrences tend to be very disruptive to transportation and commerce. Trees, cars, roads, bridges, and other surfaces develop a coating or glaze of ice making even small accumulations of ice an extreme hazard to motorists and pedestrians. Roadways are often shut down during severe winter storms.

Many winter depressions give rise to exceptionally heavy rain and widespread flooding. Conditions worsen as the temperature drops, rain turns to ice, and accumulation of ice begins to occur. Winter storms are known to spawn other natural hazards, such as coastal flooding and erosion, severe thunderstorms, tornadoes, high winds, and severe ice.

4.10.4 Impact on Life and Property

The previous Hazard Mitigation Plan notes two injuries and 15 deaths from winter storms from 1950 through 2007 in Jefferson Parish. Property damage from two previous events totaled $11.8 million dollars. Zero injuries and deaths have been reported from winter storms in Jefferson Parish since 2007.

4.10.5 Occurrences of the Winter Storm Hazard

Table 4.10-1
Winter Storm Events, Jefferson Parish, 2008 – 2014
(Source: NOAA/NCDC[66])

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	UPPER JEFFERSON (ZONE)	01/24/2014	17:00	Winter Weather	N/A	0	0	0.00K	0.00K
2.	UPPER JEFFERSON (ZONE)	01/28/2014	12:00	Winter Weather	N/A	0	0	0.00K	0.00K
	Totals:					0	0	0.00K	0.00K

Since 1996 (the year NCDC starting tracking winter storms), three winter storms occurred in Jefferson Parish. One was on Christmas Day 2004. The significant events occurring within the last six years are summarized below:

- January 24, 2014 – Winter weather caused by a cold front moving through southern Mississippi and southeast Louisiana brought sub-freezing temperatures to the area. A combination of frozen precipitation including freezing rain, sleet and snow produced hazardous road conditions, forcing much of the area to shut down for 3 days. Bridges and overpasses were not safe and sections of interstate and the Lake Pontchartrain Causeway closed during this period, highly affecting travel. A local resident reported heavy sleet in Metairie with overpasses beginning to ice.

- January 28, 2014 – A bitterly cold air mass descended on southern Mississippi and southeast Louisiana during the night of the 26th and during the day on the 27th. A strong upper level jet disturbance moved across the area on the 28th, producing a large area of sleet and freezing rain. Temperatures remained at or below the freezing mark during much or all of the precipitation event on the 28th, even south of Lake Pontchartrain in the New Orleans metropolitan area. Travel was significantly impacted on bridges, overpasses and other elevated roadways. Portions of every Interstate in southeast Louisiana, plus the Lake Pontchartrain Causeway were closed at times on the 28th into the morning of the 29th.

With a total of three winter weather events reported between 1996 and 2014, Jefferson Parish experiences winter weather/storms on average once every 6 years. The three events have occurred over a period of 18 years which calculates to a 16% annual probability of future winter storm occurrences.

4.10.6 Municipality Winter Storm Hazards

City of Gretna
No previous occurrences of winter storms have been recorded in the City of Gretna in the past six years.

City of Harahan
No previous occurrences of winter storms have been recorded in the City of Harahan in the past six years.

City of Kenner
No previous occurrences of winter storms have been recorded in the City of Kenner in the past six years.

City of Westwego
No previous occurrences of winter storms have been recorded in the City of Westwego in the past six years.

Town of Grand Isle
No previous occurrences of winter storms have been recorded in the Town of Grand Isle in the past six years.

Town of Jean Lafitte
No previous occurrences of winter storms have been recorded in the Town of Jean Lafitte in the past six years.

The Parish considered the minimal impact on life and property from past winter storms and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.11 Lightning

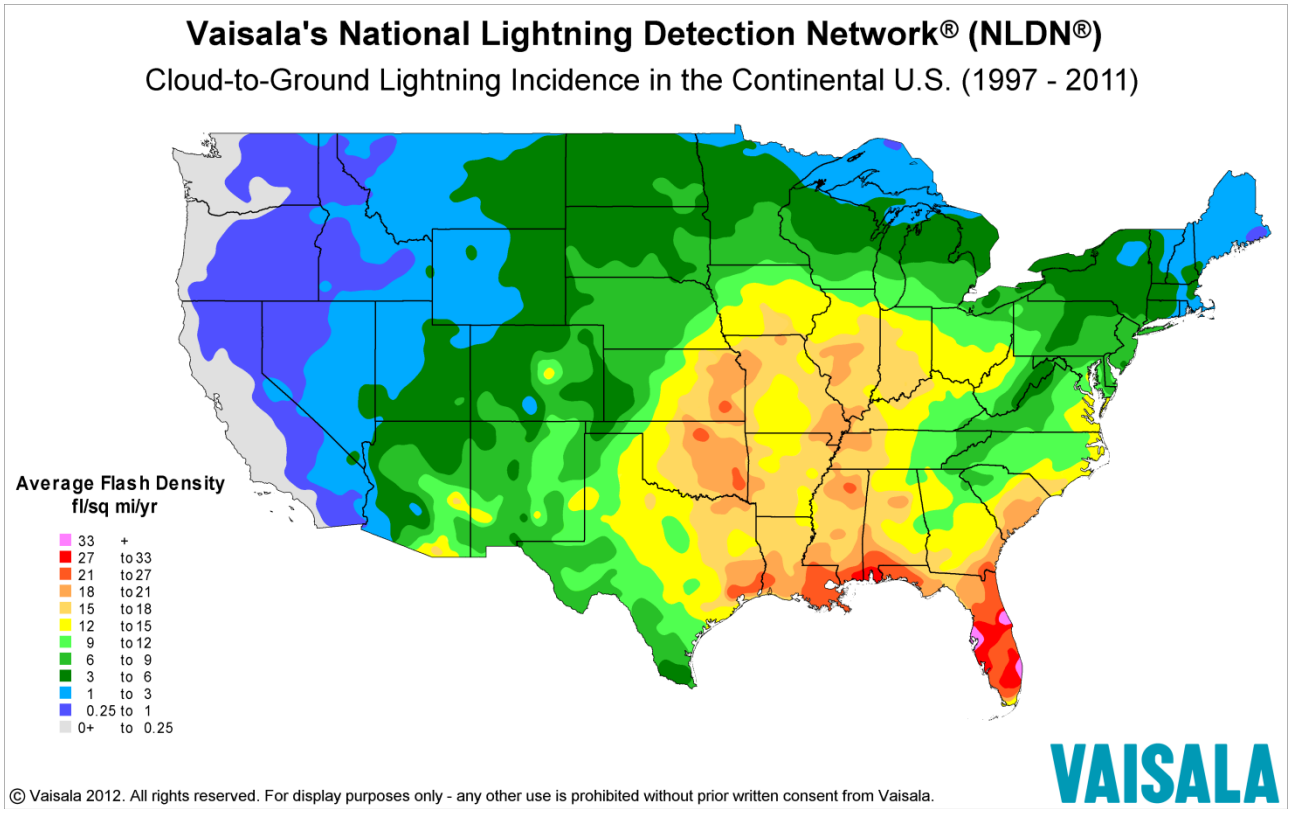
4.11.1 Description of the Lightning Hazard

Lightning events are generated by atmospheric imbalance and turbulence due to a combination of conditions. Lightning, which occurs during all thunderstorms, can strike anywhere. Generated by the buildup of charged ions in a thundercloud, the discharge of a lightning bolt interacts with the best conducting object or surface on the ground. The air in the channel of a lightning strike reaches temperatures higher than 50,000 degrees F. See Appendix D, General Descriptions of Natural Hazards, for a more detailed description and definition of the lightning hazard.

4.11.2 Location and Extent of the Lightning Hazard

Individual lightning strikes typically affect a relatively small geographical area. Lightning strikes are random events and could occur in any of the jurisdictions. Therefore, all jurisdictions in Jefferson Parish have equal risk to the lightning hazard, particularly during the warmer months of the year. Based on the lightning flash density map below, the entire planning area can expect 21 to 27 flashes per square mile/kilometer per year.

Figure 4.11-a
Lighting Flash Density Map[67]



4.11.3 Severity of the hazard

Severe lightning events can occur anywhere in the planning area. Even during common events, the lightning current can branch off to strike a person from a tree, fence, pole, or other tall object. In addition, electrical current may be conducted through the ground to a person after lightning strikes a nearby tree, antenna, or other tall object. The current also may travel through power lines, telephone lines, or plumbing pipes to a person who is in contact with an electric appliance, telephone, or plumbing fixture. Lightning may use similar processes to damage property or cause fires.

4.11.4 Impact on Life and Property

People and property in virtually the entire United States are exposed to damage, injury, and loss of life from lightning. According to NOAA, from 1963 to 1993, the average loss of life in the U.S. due to lightning was 89 per year, with an additional 300 persons injured each year. In the year 2000, lightning was responsible for 3 deaths (two while playing golf and one was from an unknown cause) in Louisiana. Most lightning-related deaths and injuries occurred when people were outdoors during summer afternoons and evenings.

Between 1996 and 2014 three deaths and one injury resulting from lightning strikes have been identified in Jefferson Parish. There have been no reported deaths or injuries since 2005. Total property damage reported in Jefferson Parish from lightning strikes since 1996 is estimated at $351,000 dollars.

4.11.5 Occurrences of the Lightning Hazard

Fourteen lightning events have been identified in Jefferson Parish between 1996 and 2014. Jefferson Parish experiences a significant lightning event on average approximately once every year. The 14 events have occurred over a period of 18 years which calculates to a 78% annual probability of future lightning occurrences. Table 6.11-1 below summarizes the lighting events for Jefferson Parish in the last five years.

Table 4.11-1
Lightning Events, Jefferson Parish, 2009-2014
(Source: NOAA/NCDC[68])

	Location or County	Date	Time	Type	Mag	Dth	Inj	PrD	CrD
1.	SOUTHPORT	04/04/2012	02:00	Lightning	N/A	0	0	20.00K	0.00K
	Totals:							20.00K	0.00K

This significant event is summarized below:

- April 4, 2012 - Lightning struck a house near Morris Place and Carol Drive in Old Jefferson, causing a fire.

Lightning strikes occur regularly in Jefferson Parish, but no damage has been documented beyond the April 4, 2012 event.

4.11.6 Municipality Lightning Hazards

City of Gretna
There have been no previous lightning occurrences recorded in the City of Gretna in the past five years.

City of Harahan

There have been no previous lightning occurrences recorded in the City of Harahan in the past five years.

City of Kenner

There have been no previous lightning occurrences recorded in the City of Kenner in the past five years.

City of Westwego

There have been no previous lightning occurrences recorded in the City of Westwego in the past five years.

Town of Grand Isle

There have been no previous lightning occurrences recorded in the City of Grand Isle in the past five years.

Town of Jean Lafitte

There have been no previous lightning occurrences recorded in the City of Jean Lafitte in the past five years.

While occurrences are frequent, the damage associated with these events is rare. Even when damages occur it is usually localized to individual properties and not reported to news or other weather information sources; therefore, no further assessment will be conducted for this hazard.

4.12 Drought

4.12.1 Description of the Drought Hazard

A drought is an extended dry climate condition when there is not enough water to support urban, agricultural, human, or environmental water needs. It usually refers to a period of below-normal rainfall, but can also be caused by drying bores or lakes, or anything that reduces the amount of liquid water available. Drought is a recurring feature of nearly all the world's climatic regions. See Appendix D for a more detailed description and definition of the drought hazard.

4.12.2 Location and Extent of the Drought Hazard

Droughts may occur anywhere in the United States. Effects seen in different regions vary depending on normal meteorological conditions such as precipitation and temperature, as well as geological conditions such as soil type and subsurface water levels.

There were nine recorded droughts in Jefferson Parish from 1996 to 2014, four of which occurred in 1998. Drought events affect Jefferson Parish and each of the jurisdictions equally and uniformly.

4.12.3 Severity of the Drought Hazard

A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity (FEMA, 1997). Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

Drought can cause extensive damage to commercial and residential structures' foundations, framing and walls, agricultural crops, roads, bridges, pipelines, utilities and railroads.

4.12.4 Impact on Life and Property

There are no known deaths or injuries from droughts in Jefferson Parish. Crop damage from three previous events totaled $385 million dollars.

4.12.5 Occurrences of the Drought Hazard

There were nine recorded droughts in Jefferson Parish from 1996 to 2014. Despite the fact that four of these events were in the same year, looking at the total number of droughts reported in that 18-year time span, Jefferson Parish on average experiences a drought event once every two years. The nine events have occurred over a period of 18 years which calculates to a 50% annual probability of future drought occurrences.

In the spring and summer of 1998, Jefferson Parish experienced severe drought conditions. In May, June, and July total precipitation was only 2.29 inches. Only the fall of 1924 (1.39 inches) and the summer of 1934 (2.09 inches) were drier. Area rivers and lakes fell to well below normal levels with water users urged to conserve. August was one of the hottest months in the history of the area.

- May 31, 1998 - Drought conditions were in full force by mid May across the Parish. Most places saw less half an inch of rain, dating back to the last half of April. The most significant impact in May was the drying up of shallow wells, with many farmers resorting to deeper wells for irrigation purposes. Some crops were beginning to see the affects of the drought, but any significant loses will be attributed to the month of June. The other major story during May's drought, though not directly attributed to it, was the smoke and haze from Mexican and Central American forest fires. Many places had visibilities of three miles or less for over a week (May 12-20th), and people with respiratory ailments, as well as the elderly and young, were confined to their homes during this period.

- June 30, 1998 - A mild to moderate drought continued across southeastern Louisiana through the month of June. This drought began in mid-May. There were only two opportunities for rain in June, on the 5th and the 26th.

- July 31, 1998 - A mild to severe drought continued for the third straight month across southeast Louisiana. The Parish saw only one to two inches of rain the entire month of July.

- August 31, 1998 - The drought of 1998 continued in the month of August across southeast Louisiana. Between four and five inches of rain fell in the entire month of August, which was actually the most in a month since April 1998. Crop damages were reported to be approximately $215.4 million across Southeast Louisiana.

- December 31, 2000 – The drought of 2000 was devastating to the agricultural communities. Lack of rain fall caused $169.6 million in crop damages across Southeast Louisiana.

There have been no previous drought occurrences recorded in Jefferson Parish in the last six years. Also, no Presidentially-declared disasters from drought have occurred in the Parish.

4.12.6 Municipality Drought Hazards

City of Gretna
There have been no previous drought occurrences recorded in the City of Gretna in the last six years.

City of Harahan
There have been no previous drought occurrences recorded in the City of Harahan in the last six years.

City of Kenner
There have been no previous drought occurrences recorded in the City of Kenner in the last six years.

City of Westwego
There have been no previous drought occurrences recorded in City of Westwego in the last six years.

Town of Grand Isle
There have been no previous drought occurrences recorded in Town of Grand Isle in the last six years.

Town of Jean Lafitte

There have been no previous drought occurrences recorded in Town of Jean Lafitte in the last six years.

The Parish considered the minimal impact on life and property from past droughts and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.13 Wildfires

4.13.1 Description of the Wildfire Hazard

Wildfires are uncontrolled fires often occurring in wildland areas, which can consume houses or agricultural resources if not contained. Wildfires/urban interface is defined as the area where structures and other human development blend with undeveloped wildland. See Appendix D for a more detailed description and definition of the wildfire hazard.

4.13.2 Location and Extent of the Wildfire Hazard

The potential for wildfires varies for all of the jurisdictions in Jefferson Parish. Upper Unincorporated Jefferson Parish, City of Gretna, City of Harahan, City of Kenner, City of Westwego, and Town of Grand Isle are dense urban areas without vegetation and do not have a chance of wildfire. The vegetative areas of Lower Unincorporated Jefferson Parish and Jean Lafitte are surrounded by water and vegetation that comprises of approximately 15.25 square miles of land area. While no wildfires have been reported in Jefferson Parish since 1996, one marsh fire has been reported within the last six years. Another marsh fire was reported in New Orleans, but its smoke directly affected Jefferson Parish. These marsh fires lasted for several days.

4.13.3 Severity of the Wildfire Hazard

The frequency and severity of wildfires is dependent on weather and on human activity. In a worst-case scenario event, all 15.25 square miles of the wildfire-prone areas in Lower Unincorporated Jefferson Parish and Jean Lafitte would burn. While wildfires have not been reported, two marsh fire events have, but the data is not readily available as to determine the damage incurred or acres burned.

4.13.4 Impact on Life and Property

There are no records of deaths or injuries and no recorded loss of property from wildfires/urban interface fires in the Parish. There is an impact on air quality, however, from the marsh fires as the DEQ advised the smoke from the marsh fire could cause respiratory irritation in children, adults, the elderly and people who suffer with respiratory sensitivity or diseases such as asthma.

If wildfire was to occur in the at-risk areas of Lower Unincorporated Jefferson Parish and Jean Lafitte, several vulnerable assets could be impacted. These assets include Jean Lafitte's Town Hall (Administration Building), its Multi-purpose Complex (Recreational Center), and the Rosethorn Waste Water Treatment Plant (Infrastructure Component).

4.13.5 Occurrences of Wildfires

There have not been any reported wildfires in Jefferson Parish since 1996. With zero events occurring in the last 18 years, there is <1% annual probability of future wildfire occurrences. Several marsh fires have occurred in the past in Jefferson Parish, but there are significant data limitations in determining exact numbers of fires. These incidents of fires in the marshes were from lightning strikes and/or arson.

Significant marsh fire events are summarized below:

- August 30, 2011 – A large marsh fire impacting Jefferson Parish is expected to burn for several more days in the Bayou Sauvage National Wildlife Refuge in eastern New Orleans near Interstate

10 and Interstate 510. The National Weather Service reports east to east southeast winds are expected to continue throughout the day in the Greater New Orleans area and other areas South and Southwest of Lake Pontchartrain. The marsh fire is not expected to spread toward any populated areas. However, because of its location, it is inaccessible to firefighting equipment. Recent reports from the Department of Environmental Quality indicate the smoke is resulting in "Unhealthy for Sensitive Groups Air Quality Index" levels in parts of the New Orleans metropolitan area, including Jefferson Parish.

- June 20, 2012 – Strong winds blew lots of smoke from a marsh fire on the West Bank Wednesday evening towards East Bank neighborhoods in Jefferson and Orleans Parishes. The Kenner Fire Department first reported that there was lots of smoke in the air near Armstrong International Airport just before 7:00 p.m. The Jefferson Parish Fire Department says the cause of the smoke is a marsh fire that was burning near Waggaman on the West Bank and that the fire is out now.

4.13.6 Municipality Wildfire Hazards

City of Gretna
No previous wildfire occurrences have been recorded in City of Gretna in the last six years.

City of Harahan
No previous wildfire occurrences have been recorded in City of Harahan in the last six years.

City of Kenner
No previous wildfire occurrences have been recorded in City of Kenner in the last six years.

City of Westwego
No previous wildfire occurrences have been recorded in City of Westwego in the last six years.

Town of Grand Isle
No previous wildfire occurrences have been recorded in Town of Grand Isle in the last six years.

Town of Jean Lafitte
No previous wildfire occurrences have been recorded in Town of Jean Lafitte in the last six years.

The Parish considered the minimal impact on life and property from past wildfires and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

4.14 Earthquakes

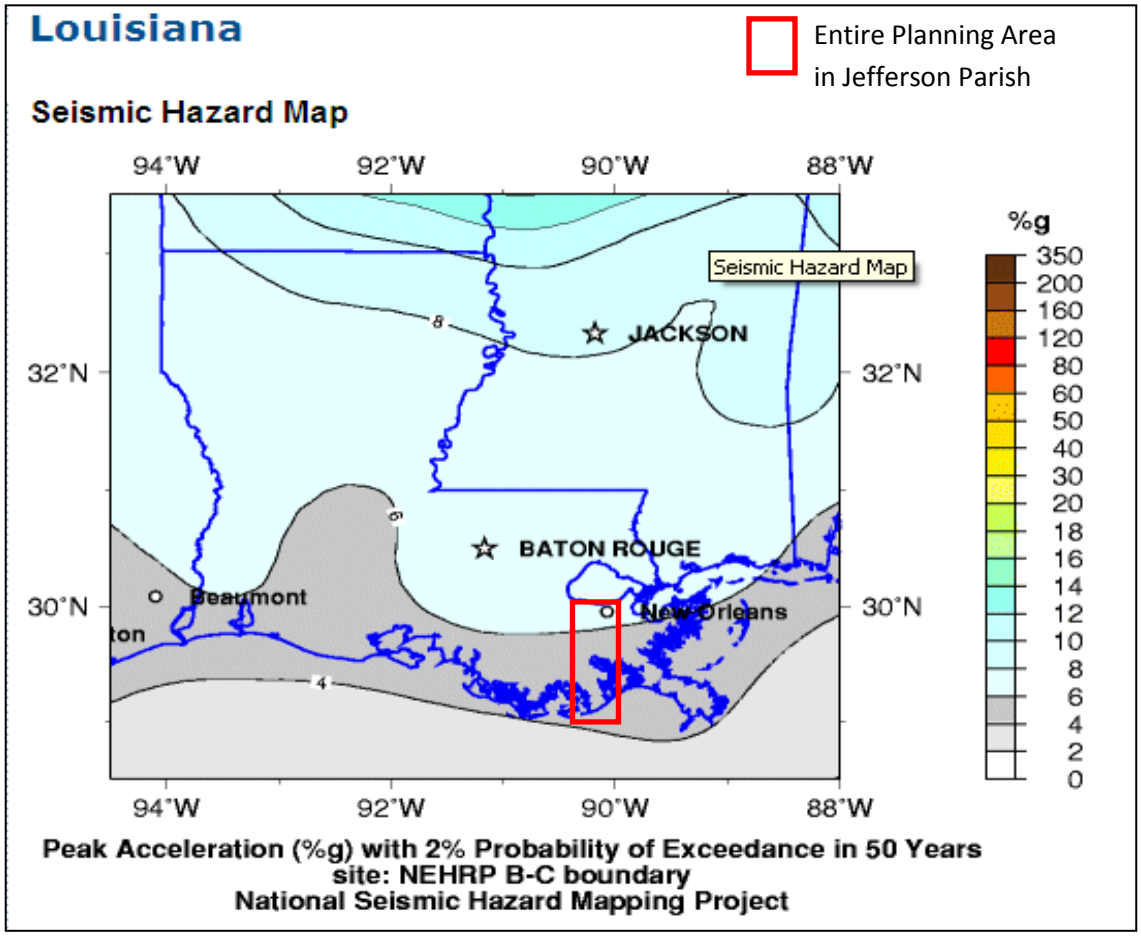
4.14.1 Description of the Earthquake Hazard

An earthquake is a sudden release of energy from the earth's crust that creates seismic waves. Tectonic plates become stuck, putting a strain on the ground. When the strain becomes so great that rocks give way, fault lines occur. At the Earth's surface, earthquakes may manifest themselves by a shaking or displacement of the ground, which may lead to loss of life and destruction of property. Size of an earthquake is expressed quantitatively as magnitude and local strength of shaking as intensity. The inherent size of an earthquake is commonly expressed using a magnitude. See Appendix D for a more detailed description and definition of the earthquake hazard.

4.14.2 Location and Extent of the Earthquake Hazard

The entire Parish and its jurisdictions are considered minimally susceptible to the effects of earthquakes with peak ground acceleration ranging from 2 to 8%g. As shown in figure 4.14-a.

Figure 4.14-a
Louisiana Seismic Hazard Map, showing Peak Ground Acceleration in Percent of *G*, with two percent exceedance in 50 years.
(Source: USGS[69])



4.14.3 Severity of Earthquake Hazard

As shown in the figure above, the probability of any severe earthquake in the area is minimal. The severity of earthquakes is influenced by several factors, including the depth of the quake, the geology in the area, and the soils.

4.14.4 Impact on Life and Property

There are no known deaths, injuries, or property damage from earthquakes in Jefferson Parish. The effects on life and property in the area would be minimal if a large earthquake were to occur, with very little damage to the built infrastructure. At most, a few small objects and/or hanging photos may fall off the wall.

4.14.5 Occurrences of Earthquakes

There have been no previous earthquake occurrences recorded in Jefferson Parish in the last six years.

Historical data reveals that areas near Jefferson Parish have experienced few and minor earthquakes of low magnitude and intensity over the past 75-plus years. In October of 1930 a small earthquake centered about 60 miles west of New Orleans was felt throughout southern Louisiana. In some areas small objects were overturned and trees were shaken, but no injuries or deaths were reported. On November 19, 1958, a local earthquake in the Baton Rouge area shook houses and rattled windows. Residents telephoned the Weather Bureau, Civil Defense, police and radio stations. The shock was also felt at Baker and Denham (USGS).

Based on historical records, there is <1% annual probability of future earthquake occurrences in Jefferson Parish.

4.14.6 Municipality Earthquake Hazards

City of Gretna
There have been no previous earthquake occurrences recorded in City of Gretna in the last six years.

City of Harahan
There have been no previous earthquake occurrences recorded in City of Harahan in the last six years.

City of Kenner
There have been no previous earthquake occurrences recorded in City of Kenner in the last six years.

City of Westwego
There have been no previous earthquake occurrences recorded in City of Westwego in the last six years.

Town of Grand Isle
There have been no previous earthquake occurrences recorded in Town of Grand Isle in the last six years.

Town of Jean Lafitte
There have been no previous earthquake occurrences recorded in Town of Jean Lafitte in the last six years.

The Parish considered the minimal impact on life and property from past earthquakes and determined that this hazard would not be addressed as part of the detailed risk assessments completed in this Section.

Section 5
Mitigation Strategy

Contents of this Section

As mentioned elsewhere, during the 2008 Plan Update portions of the original HMP were preserved, including some of the terms and language. This Section includes various elements from the original 2005 version of the Plan. In the earlier version of the Plan, the Mitigation Action Plan was a separate Microsoft Excel document. This section is now integrated into the present Mitigation Strategy as Subsection 5.5 (Prioritized Mitigation Actions and Projects). The same Subsection (5.5) also includes detailed descriptions and cost estimates for each project that have been scoped as part of this Plan Update. The update also includes discussion about progress on the goals, strategies and actions from the 2004/5 version of the HMP. This information is found in Section 5.2 (Mitigation Goals and Accomplishments). Additional details about specific changes and updates from the original Plan can be found in Appendix B, *Summary of Changes and Updates to Jefferson Parish's Hazard Mitigation Plan.*

The original Plan development process was guided by a Steering Committee. The process used in the present update divided this group into a Mitigation Planning Team (MPT) and a Stakeholders group.

5.1 IFR Requirements for Mitigation Strategy

IFR §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

IFR §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

IFR §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

IFR §201.6(c)(3) (iii): *[The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.*

5.2 Mitigation Goals and Accomplishments

Goals are general descriptions of desired long-term outcomes. State and federal guidance and regulations pertaining to mitigation planning require the development of mitigation goals to reduce or avoid long-term vulnerabilities to identified hazards. Mitigation goals have been established by FEMA, the State of Louisiana, and Jefferson Parish.

As part of the original (2004) Plan development process, the Hazard Mitigation Steering Committee met on numerous occasions to discuss possible mitigation measures to reduce or eliminate disaster-related damages in the Parish. Because hurricanes, floods, storm surge, thunderstorms and tornadoes were considered the predominate hazards in the Parish, they were the focus of the discussions. From these discussions, an Action Plan was prepared for the July 2005 version. It identified specific actions to achieve identified goals. A copy of the Action Plan developed as part of the original Plan is included in Appendix D.

The Steering Committee developed a list of mitigation goals at a meeting held on November 10, 2003. The goals were determined to be those that would have the greatest benefit in hazard reduction to Jefferson Parish and each jurisdiction. The committee established four goals with action items listed in each goal.

The goals identified by the Steering Committee for the original Plan include the following:

- Identify and pursue preventative measures that will reduce future damages from hazards.
- Enhance public awareness of disaster risks through education programs.
- Identify and pursue protective measures that will benefit natural systems from hazards
- Facilitate sound development in the Parish through local plans and regulations to reduce or eliminate the potential impact of hazards

As part of the 2007/08 HMP Update the MCT met on October 10, 2007 to discuss the update process. The meeting included discussion and review of the goals from the original Plan. Afterwards, the goals from the 2005 version were circulated to the MCT and Stakeholders groups for comment. The MCT determined the four goals were still valid and therefore remained unchanged in the Plan Update**.** The MCT also discussed the need to identify and describe progress towards achieving the goals since release of the July 2005 Plan.

The paragraphs below indicate progress toward various goals in the 2005 version of the Plan.

5.2.1 Goal 1: Identify and pursue preventive measures that will reduce future damages from hazards

<u>Fifi Island, Barataria Bay Waterway; Rock Dike and Marsh Creation</u>
Fifi is an uninhabited island that runs parallel to the north of Grand Isle and protects the bayside of the developed island from wave action during strong northerly winds. To protect the Town of Grand Isle, which is vulnerable to beach erosion from wave action (particularly during severe storms), a $3 million dollar rock dike was constructed on the northern and western edge of Fifi Island. The project was funded by grants from NOAA and the Department of Natural Resources (DNR). After the rock dike was completed, the USACE rebuilt approximately 400 acres of the Island using Dredge Slurry from Bayou Rigaud (New Orleans City Business, Dec. 2003; State of Louisiana Conservation and Restoration Plan). The armoring and rebuilding of Fifi Island has been critical to slowing the shoreline erosion rates at Grand Isle.

Construction of Safe Houses for Pump Station Operators

After Hurricane Katrina in August of 2005, the USACE provided funding to construct approximately 13 safe rooms as part of upgrading all major Pump Stations in Jefferson Parish. The safe rooms were constructed to allow workers to operate machinery from inside bunkers designed to withstand a Category 5 hurricane and flooding from storm surge, allowing them to remain on site during such events. The safe rooms also include automated and remote pump controls. The concrete block structures are elevated 30 feet above ground on three foot diameter pylons drilled 80 feet into the soil. As of the 2008-2009 HMP update, the Parish has completed all the pump station upgrades. Construction was not feasible at two other pump sites, but the pumping process will be automated so that the operation can be controlled remotely (MCT meeting October 10, 2007; *The Time-Picayune*, May 26, 2007). The safe rooms and automation switches will help prevent flooding in Jefferson Parish by allowing the Pump Stations to continue to operate uninterrupted during future hurricane events.

Safe rooms were completed at the following Pump Stations:

- Duncan (City of Kenner)
- Elmwood (City of Kenner)
- Suburban (Metairie)
- Bonnabel (Metairie)
- Old and New Bayou Segnette (Westwego)
- Ames (Marrero)
- Cousins #1 and #2 (Harvey)
- Whitney / Barataria (Harvey)

Detention Ponds at Wally Pontiff Jr. Playgrounds and near Earhart Expressway / Causeway Boulevard

The detention ponds constructed at Wally Pontiff Jr. Playgrounds and at a State-owned site near the intersection of Earhart Expressway and Causeway Boulevard in Old Metairie will impound approximately 140 acre feet of water. Once the pond is full floodwaters will be directed into the West Metairie Canal and eventually Lake Pontchartrain. A senior hydraulic engineer with the engineering firm hired to complete the project estimates that the Playground Pond alone will help keep one foot of water out of 60 city blocks. The detention ponds combined with re-directing the floodwaters should protect Old Metairie and Old Jefferson from a 10-year storm (*The Times-Picayune*, Sunday May 28, 2006).

Storm Surge Gates at 17th Street Canal, Harvey Canal, and Company Canal

As of December, 2007, an interim gated flood control structure is currently under construction at the mouth of the 17th Street Canal and Lake Pontchartrain. This steel structure will have a series of panel gates that will be open under normal conditions and closed during rising Lake Pontchartrain tide or impending tropical storm activity. The facility will include 18 temporary pumps and 14 portable pumps. The structure will be utilized as part of any potential future permanent facility (Source: USACE). In addition, temporary storm surge gates have been installed at both the Harvey and Company Canals. The temporary gates at the Harvey Canal will prevent storm surge flooding north of Lapalco Boulevard (Source: Southeast LA Flood Control). All three gates will reduce or prevent storm surge damage from either Lake Pontchartrain or the Gulf of Mexico during future hurricanes.

Figure 5.2-a
Gated Flood Control Structure located at the
Mouth of the 17th Street Canal and Lake Pontchartrain
Source: USACE[70]

Upgrades to the Levee Protection System

Jefferson Parish has completed the following upgrades to the Levee Protection System;

- In East Jefferson, the earthen levees of the hurricane protection system have been elevated, or are in the process of being elevated.
- The I-walls now have stronger sheet piling with concrete slope paving to protect against erosion, and enlarged earthen berms.
- Trees that could contribute to water intrusion, and hence possible levee failure, have been removed.
- Work is underway on Phase 1 of a multi-phase project that calls for the construction of a floodwall along the east side of the Harvey Canal between the Hero Pump Station and Lapalco Blvd.

Source: Southeast LA Flood Control (SELA)

Install Emergency Backup Generators at Parish Lift Stations and Pump Stations

The Parish has installed emergency backup generators at 10 lift stations and pump stations. In addition to the 10 generators already installed, the Southeast Louisiana Flood Control (SELA) is currently installing another generator at the Westminster Pumping Station. Another generator is scheduled to be installed at the Mount Kennedy Pump Station through a storm-proofing project funded by the USACE. The emergency generators will provide a source of electricity if the main source of power is lost during a storm event. The generators will reduce flood damages by allowing uninterrupted operation of these facilities if the main power supply is lost.

Preparation of Comprehensive Drainage Master Plan for East and West Bank

Jefferson Parish has engaged the services of an engineering consulting firm to prepare Comprehensive Drainage Master Plans to address the inefficiencies in the Parish's subsurface drainage system. Once complete, the Parish will be in a better position to determine, prioritize, and optimize drainage projects to reduce local flooding.

5.2.2 Goal 2: Enhance public awareness and understanding of disaster preparedness risks through education programs

Integrated Public Alert and Warning System

In June of 2006 FEMA began the development of an electronic emergency alert system titled Integrated Public Alert and Warning System (IPAWS). The IPAWS system provides a web portal enabling all levels of government to share information during any crisis. Emergency management officials can create emergency communication groups that can be used to transmit emergency information to first responders in the field. Jefferson Parish was the first in the State to implement the program and continues to do so (March 21, 2007 press release[71]).

The IPAWS system also includes an Emergency Alert System (EAS) that is used to inform citizens of emergency situations, as well as to communicate with evacuated residents to provide information about the condition of the Parish and when it is safe to return. The system uses cell phone text messaging and email, to communicate with residents (March 21, 2007 press release[72]). The EAS system was funded and developed in coordination with FEMA.

Program for Public Information (PPI)

The Program for Public Information (PPI) is a strategic outreach plan within the Community Rating System (CRS) that jurisdictions undertake to educate the community about flooding impacts and mitigation ideas. The PPI must involve the public and follow the seven-step process put forth by the CRS program. Jefferson Parish's CRS User Group, Jefferson United Mitigation Professionals (JUMP), is currently working through the steps of developing a PPI.

5.2.3 Goal 3: Identify and pursue protective measures that will benefit natural systems from hazards

Jefferson Parish has been the national leader in mitigating repetitive loss and severe repetitive loss properties. As of Fall 2008 the Parish has mitigated repetitive loss properties in the numbers indicated in Table 5.2-1, below. This number is constantly increasing as the Parish continues its efforts under the various FEMA grant programs.

Table 5.2-1
Number of Mitigated Jefferson Parish Repetitive Loss Properties
(9/30/2014 Repetitive Loss List)

Municipality	# Properties Mitigated
Jefferson Parish	1,487
Kenner	197
Gretna	218
Westwego	22
Jean Lafitte	40
Grand Isle	152
Harahan	37
GRAND TOTAL	2,147

As of February, 2009, the Parish has also mitigated 220 severe repetitive loss properties. In addition to this, the Parish developed a Severe Repetitive Loss Mitigation Plan as part of the implementation of FEMA's SRL mitigation program. This plan was approved by FEMA in Fall 2008.

5.2.4 Goal 4: Facilitate sound development in the Parish through local plans and regulations to reduce or eliminate the potential impact of hazards

Jefferson Parish Adoption of Freeboard

To minimize the flood impacts of future events after Katrina and Rita, FEMA provided advisory information concerning coastal flood elevations and interior levee ponding elevations that can be used to guide recovery efforts. The document titled, *FEMA Flood Recovery Guidance,* was published by FEMA on April 12, 2006 and included new floodplain guidance for substantially damaged structures and new construction inside and outside of the levee protected areas in Jefferson Parish.

For structures located inside the levee areas in the northern part of the Parish, FEMA recommends elevating to either the Base Flood Elevation (BFE) shown on the current effective Flood Insurance Rate Map (FIRM) or to the Advisory Base Flood Elevation (ABFE) until new FIRM maps have been updated and approved.

For areas of Jefferson Parish outside of the levee protected areas, FEMA encourages freeboard above the BFEs shown on the FIRM. Jefferson Parish revised its Flood Damage Prevention Ordinance in 2014 to include 2 foot of freeboard for all outside-levee areas in Jefferson Parish. That is, structures should be elevated at least 2 feet above the current BFE shown on the effective FIRM for the building site.

Digital Flood Insurance Rate Maps (FIRMs)

As a provision of the Flood Insurance Reform Act of 2004, all updated FIRMs are now available in digital format on FEMA's Map Service Center Website (Adoption of Flood Insurance Rate Maps by Participating Communities, FEMA 495/September 2012). Although Jefferson Parish is in the process of updating its FIRM, the preliminary maps panels are available digitally. This enhances the community official's ability to locate properties simply by typing in an address and can increase accuracy in determining a property's Flood Zone and Base Flood Elevation (BFE).

Building Code Effectiveness Grading Schedule (BCEGS)

The Building Code Effectiveness Grading Scale is a program run by the Insurance Services Office (ISO) to evaluate a community's effective building code and grade how that community enforces the codes. The rating ranges from 1-10 with 1 being the best. Jefferson Parish currently has a BCEGS rating of 4.

Planning Resources and Capabilities

Jefferson Parish has local authorities, policies and resources that reduce hazard impacts, or that could be used to implement hazard mitigation activities. These tools and their capabilities can vary by jurisdiction and are outlined in Table 5.2-2 below.

Table 5.2-2
Jefferson Parish Capability Assessment

	UJP	Gretna	Harahan	Kenner	Westwego	Grand Isle	Jean Lafitte
Plans	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Comprehensive / Master Plan	N	N	Y-2010	N	Y	N	Y
Capital Improvements Plan	Y	Y	N	Y	Y	N	Y
Economic Development Plan	Y	Y	Y	Y	Y	Y	Y
Local Emergency Operations Plan	Y	Y	Y	Y	Y	N	N
Continuity of Operations Plan	Y	N	N	N	N	N	N
Transportation Plan	Y	N	N	N	N	N	N
Stormwater Management Plan	Y	Y	Y	Y	Y	N	Y
Community Wildfire Protection Plan	N	N	N	N	N	N	N
Other plans (redevelopment, recovery, coastal zone management)							
Building Code, Permitting and Inspections	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Building Code	Y	Y	Y	Y	Y	Y	Y
Building Code Effectiveness Grading Schedule (BCEGS) Score	Y	N	N	Y	N	N	N
Fire Department ISO rating	Y	Y	Y	Y	Y	Y	Y
Site plan review requirements	Y	Y	Y	Y	Y	Y	

Table 5.2-2 (Continued)
Jefferson Parish Capability Assessment

	UJP	Gretna	Harahan	Kenner	Westwego	Grand Isle	Jean Lafitte
Land Use Planning and Ordinances	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Zoning Ordinance	Y	Y	Y	Y	Y	Y	Y
Subdivision Ordinance	Y	Y	Y	Y	Y	Y	Y
Floodplain Ordinance	Y	Y	Y	Y	Y	Y	Y
Natural Hazard Specific Ordinance (stormwater, steep slope, wildfire)	N	N	N	Y	N	N	N
Flood Insurance Rate Maps	Y	Y	Y	Y	Y	Y	Y
Acquisition of land for open space and public recreation uses	Y	Y	N	Y	Y	Y	Y
Other							
Administration	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Planning Commission	Y	Y	Y	Y	Y	Y	Y
Mitigation Planning Committee	Y	Y	Y	Y	Y	Y	Y
Maintenance programs to reduce risk (tree trimming, clearing drainage systems)	Y	Y	Y	Y	Y	Y	Y
Staff	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Chief Building Official	Y	Y	Y	Y	Y	Y	N
Floodplain Administrator	Y	Y	Y	Y	Y	Y	Y
Emergency Manager	Y	Y	Y	Y	Y	Y	Y
Community Planner	Y	Y	Y	Y	Y	N	N
Civil Engineer	Y	Y	Y	Y	N	Y	Y
GIS Coordinator	Y	Y	N	Y	N	N	N
Grant Writer	Y	Y	N	Y	N	N	N
Other		Y					
Technical	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Warning Systems / Service (Reverse 911, outdoor warning signals)	Y	Y	Y	Y	Y	Y	N
Hazard Data & Information	Y	Y	Y	Y	N	N	N
Grant Writing	Y	Y	N	Y	N	N	N
Hazus Analysis	N	N	N	N	N	N	N
Other							
Funding Resource	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Capital Improvements project funding	Y	Y	N	N	Y	Y	Y
Authority to levy taxes for specific purposes	Y	Y	Y	N	Y	Y	N
Fees for water, sewer, gas, or electric services	Y	Y	Y	N	Y	Y	N
Impact fees for new development	Y	Y	Y	N	N	N	N
Stormwater Utility Fee	N	N	N	N	N	N	N
Community Development Block Grant (CDBG)	Y	Y	Y	Y	Y	Y	Y
Other Funding Programs	HMGP	HMGP					

Table 5.2-2 (Continued)
Jefferson Parish Capability Assessment

	UJP	Gretna	Harahan	Kenner	Westwego	Grand Isle	Jean Lafitte
Program / Organization	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N	Y/N
Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Y	Y	Y	Y	Y	N	Y
Ongoing public education or information program (responsible water use, fire safety, household preparedness, environmental education)	Y	Y	Y	Y	Y	Y	Y
Natural Disaster or safety related school program	Y	Y	N	N	Y	Y	N
Storm Ready certification	Y	N	N	N	Y	N	N
Firewise Communities certification	N	N	N	N	N	N	N
Public/Private partnership initiatives addressing disaster-related issues	Y	N	N	Y	Y	N	N
Other							

Unincorporated Jefferson Parish

Unincorporated Jefferson Parish will continue to add to these plans, as well as work to create new plans that will address a long-term recovery and resiliency framework.

City of Gretna

The City of Gretna will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as City resources allow.

City of Harahan

The City of Harahan will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as City resources allow.

City of Kenner

The City of Kenner will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as City resources allow.

City of Westwego

The City of Westwego will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as City resources allow.

Town of Grand Isle

The Town of Grand Isle will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as Town resources allow.

Town of Jean Lafitte

The Town of Jean Lafitte will explore opportunities to create new plans that will address a long-term recovery and resiliency framework as Town resources allow.

5.3 Mitigation Objectives and Strategies

5.3.1 Objectives

Objectives are well-defined intermediate points in the process of achieving goals. Jefferson Parish mitigation planning objectives include:

1. Reduce the exposure of residential areas to flooding and storm surge from the Mississippi River, Lake Pontchartrain, and the Gulf of Mexico.
2. Mitigate properties at risk to flood and wind damage.
3. Ensure that Parish critical facilities remain functional during natural hazard events.
4. Find and develop opportunities to work with other agencies to leverage mitigation funds, and to share information about the risks of natural hazards.
5. Improve the early warning and Public Alert System for hazards such as flash floods and tornadoes to save lives and reduce damages to property.
6. Promote partnerships among federal, state, Parish, interstate commissions, and local governments to identify, prioritize and implement mitigation actions.
7. Improve the Parish's CRS rating through the NFIP to allow citizens to purchase flood insurance at a discounted price.
8. Maintain the viability of Jefferson Parish businesses by preventing damages from hazards.
9. Ensure that the Parish maximizes its opportunities for access to Federal and State grants and other kinds of assistance.
10. Reduce wind damages to residential and commercial buildings through hazard mitigation and effective implementation of building codes.
11. Provide effective implementation of existing floodplain regulations and building codes.
12. Ensure that the Parish continues to be represented in the determination of region-wide mitigation actions.
13. Stay involved with citizen and technical groups concerning measures related to hazard mitigation.

5.3.2 Strategies

Strategies are specific course of action to achieve the objectives. Jefferson Parish mitigation planning strategies include:

- Maintain awareness of the potential effects of natural hazards on Jefferson Parish assets. Use new information from damaging events to increase local knowledge of risks.
- Undertake vulnerability and risk studies to better understand the potential for future damages.
- Ensure the Parish Emergency Operations Plan is maintained and updated and enhance Public Alert System.
- Implement cost-effective projects and actions to reduce risk from natural hazards, both for Parish assets and operations, as well as for residents and businesses in the planning area.
- Elevate, acquire, or reconstruct qualifying properties that are flood and wind prone in Jefferson Parish.
- Install shutters and roof straps to structures that are susceptible to wind damage.
- Install emergency backup generators at all critical facilities.
- Distribute information to the public concerning the hazards associated with flooding. Include with the material opportunities about mitigation measures that can reduce flooding.
- Monitor mitigation measures to ensure they are functioning efficiently.
- Promote the purchase of flood insurance.

- Continuously monitor this Plan Update to ensure that it remains current with regard to risks, strategies, priorities and mitigation actions.
- Promote public understanding, support and demand for hazard mitigation.
- Pursue drainage projects that will reduce local flooding in the Parish.
- Seek Federal and State grants to fund mitigation activities.
- Upgrade the local shelters to allow more people access during hazardous events.
- Encourage and facilitate the development or updating of General Plans, Drainage Plans Land and Zoning, Building Construction, Fire Protection and Floodplain Management Ordinances to limit development in hazard areas.
- Implement elements of the Plan and monitor results.

5.4 Summary of Mitigation Measures from the Original Plan

The original Plan identified several hazard mitigation projects that would benefit Jefferson Parish. These were identified in the Steering Committee meetings, which included input from representatives from governmental organizations, local business, and private citizens. These are summarized below and in the Mitigation Measures Table in Appendix N of the original Plan. Many of the mitigation measure projects summarized below are applicable to multiple hazards.

- **Retrofitting of structures.** The retrofitting of structures prone to periodic flooding is an effective mitigation technique to reduce the flood loss of property. Retrofitting techniques include the elevation of both slab-on-grade and pier-on-beam structures, dry flood proofing, and wet flood proofing, and installation of generators and hurricane shutters.

    - Elevate qualifying structures from the repetitive flood loss and target lists.
    - Install an elevated and secured generator at the lift stations, East Jefferson Hospital and at West Jefferson Hospital.
    - Install new generators at all critical facilities.
    - Upgrade the shelters to serve more people, specifically at the East and West Jefferson Hospitals, Ochsner, Kenner Regional and Lakeside Hospitals, as well as adding more special needs shelters.

- **Drainage.** Jefferson Parish has a sophisticated drainage system allowing the floodwaters to be pumped over the levee systems that surround the parish. The Jefferson Parish Department of Drainage has a regular program of drainage system maintenance.

    - Increase the pumping capacity of the drainage pumps at Pump Station #1 Bonnabel and Mount Kennedy Pump Station.
    - Develop a comprehensive drainage plan and coordinate the preparation of this plan with the Drainage Advisory Board.
    - Investigate and implement a localized interior drainage project in the repetitive flood loss area of Rue Louis Phillippe and Sauvage Avenue.
    - Explore funding opportunities for extending the current levees to include Parish areas outside of the current levee system such as lower Lafitte and Barataria areas.
    - Elevate subsiding critical evacuation routes.

- **Public Awareness.** Although concerted local and statewide efforts to inform the public exist, lives and property continue to be threatened when segments of the population remain uninformed or chose to ignore the information available. Educating the public of these life and property saving techniques must remain a high priority item at the local, State, and Federal level.

    - Develop a Multi-Hazard Awareness Week.
    - Distribute information regarding flood hazards, SFHAs and mitigation measures.
    - Provide public education on the importance of maintaining the ditches.
    - Investigate ways to improve the Parish's CRS rating.

- **Floodplain Management and Building Codes.** Improved floodplain management, including land use planning, zoning, and enforcement at the local level can reduce flood related damages. The use of the National Flood Insurance Program (NFIP) is critical to the reduction of future flood damage costs to the taxpayer. The Louisiana Department of Transportation and Development (DOTD) is the primary agency responsible for the administration of the NFIP for the State of Louisiana. Jefferson Parish references the Southern Standard Building Codes for construction in the Parish.

    - Promote the purchase of flood insurance.
    - Adopt the International Building Codes.
    - Develop additional subdivision guidelines to help reduce flooding.

- **Early Warning;** With sufficient warning of a flood, a community and its residents can take protective measures such as moving personal property, cars, and people out of harms way. When a flood threat recognition system is combined with an emergency response plan that addresses the community's flood problems, considerable flood damage can be prevented. This system must be coupled to warning the general public, carrying out appropriate tasks, and coordinating the flood response plan with operators of critical facilities. A comprehensive education and outreach program is critical to the success of early warning systems so that the general public, operators of critical facilities, and emergency response personnel will know what actions to take when warning is disseminated.

5.5 Prioritized Mitigation Actions and Projects

As mentioned earlier in this section, a Mitigation Action Plan was prepared to develop specific actions to achieve the four goals discussed in Section 8.2, Mitigation Goals and Accomplishments. The Action Plan identified an appropriate lead person for each action, a schedule for completion and suggested funding sources. For the original Plan, the method that the Steering Committee chose to help them consider potential action items in a systematic way was the **S**ocial, **T**echnical, **A**dministrative, **P**olitical, **L**egal, **E**conomic, and **E**nvironmental (STAPLEE) Method. This method helped the Steering Committee to weigh the pros and cons of different alternative actions for each of the identified objectives and strategies. Table 5.5-1 provides an explanation of the criteria used for the STAPLEE methodology.

Table 5.5-1
STAPLEE Methodology

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

The Steering Committee members from the original Plan developed and prioritized the actions using the STAPLEE criteria. For the Plan Update, the Action Plan from the 2005 version was distributed to the MPT and members were requested to update and provide comments. The updates and comments received were integrated into the Action Plan for the 2007/08 Plan. The action items in Table 8.5-2 were prioritized by the MPT based on the STAPLEE criteria and their potential to reduce risk to the Parish, including its citizens, operations, and physical assets. The highest priority actions are those that are most effective in reducing risks to multiple assets simultaneously.

The Steering Committee defined High, Medium, and Low priorities in the Action Plan to be as follows:

- High: Meets five of the seven STAPLEE criteria
- Medium: Meets four of the seven STAPLEE criteria
- Low: Meets three of the seven STAPLEE criteria

These same priorities were applied to update the Action Plan. The items were sorted by high, medium, and low for each goal. As discussed in Section 4 (Hazard Identification, Ranking, and Risk Assessment), a key criterion in Jefferson Parish's prioritization of actions is the cost-effectiveness of actions and projects. High-priority actions and projects are subjected to feasibility assessments and benefit-cost analyses to determine if they are good candidates for mitigation actions. Cost effectiveness will continue to be central to the Parish's decision-making processes in identifying and funding mitigation actions.

The table below outlines mitigation actions that have been identified by the MPT. The actions are prioritized using the STAPLEE ranking method referenced above, and give implementation information, including: Person/Agency responsible, potential funding sources, benefit-cost and Technical Feasibility, estimated cost, and the anticipated year of completion. This information further identifies how Jefferson Parish could potentially implement these actions should funding become available.

Table 5.5-6
Summary of Mitigation Actions

Jefferson Parish							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Jefferson Parish							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G1	Install increased permanent pumps to alleviate flooding	4-Low	JP Drainage	F, H, M CAP	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$100 M	2020
F-8 G2, G4	Educate public on not dumping and cleaning catch basins; enforce penalties for dumping	6-Medium	JP FPHM JP Environ JP Drainage	n/a	An informed public is better able to respond to and protect themselves from flooding.		ongoing
F-9 G4	Issue fewer permits for building in vulnerable areas "study"	6-Medium	JP Planning	n/a	Reduce the localized flooding problems that would occur with new development and keep neighborhoods safe from disasters.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Jefferson Parish							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-10 G1	Implement failover systems as well as study and implement diversion projects for the Miss River	4-Low	JP Environ	F, H, CPRA CAPITAL		$200 M	2020
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G4	Issue fewer permits for building in vulnerable areas and/or adopt stronger bldg codes "study"	6-Medium	JP Planning	n/a	Reduce the localized flooding and roofing problems that would occur with new development and fortify structures to better withstand flood and wind.		ongoing
H&TS-5 G1	Widen the bridges to expedite evacuation	5-Medium	JP Streets Cap. Projects		Allows for more efficient traffic flow during evacuation.	$500 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Jefferson Parish							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1	Maintain 100 Year levee protection to ensure continued protection	6-Medium	SELFPA-E/W USACE	n/a	Reduce surge damage and cost to homeowner, government, and NFIP.		ongoing
SS-3 G1	Elevate/ Reconstruct surge-prone structures	4-Low	JP FPHM		By raising structures above the BFE, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020
SS-4 G1, G3	Increase coastal protection	6-Medium	JP Environ		Better coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.	$2 B	
SS-5 G1, G3	Build back marsh	6-Medium	JP Environ		Replenish the first lines of defense against hurricanes and surge. This will protect homes from catastrophic levels of damage.	$2 B	

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Jefferson Parish							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Storm Surge (Cont'd)							
SS-6 G4	Issue fewer permits for building in vulnerable areas "study"	6-Medium	JP Planning	n/a	Reduce the number of buildings susceptible to storm surge, thereby, keeping communities safe and damage cost low.		ongoing
SS-7 G4	Adopt Freeboard	7-High	JP FPHM		Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
SS-8 G3	Fund more erosion mitigation projects (research alternative materials)	6-Medium	JP Environ			$2 B	
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing
T-3 G1	Fortify critical infrastructure	4-Low	Gen. Services Dept. Heads		The stronger the critical infrastructure is, the better chance a community can continue to thrive after a tornado.	$50 M	

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Gretna							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Gretna							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G1	Install increased permanent pumps to alleviate flooding	4-Low	JP Drainage	F, H, M CAP	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$100 M	2020
F-8 G2	Educate public on not dumping and cleaning catch basins; enforce penalties for dumping	6-Medium	JP FPHM JP Environ JP Drainage	n/a	An informed public is better able to respond to and protect themselves from flooding.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Gretna							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-9 G1	Technology redundancy	7-High			Backing up technology at multiple locations can reduce disruption in productivity and operations.		
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1	Maintain 100 Year levee protection to ensure continued protection	6-Medium	SELFPA-E/W USACE	n/a	Reduce surge damage and cost to homeowner, government, and NFIP.		ongoing
SS-3 G1, G3	Coastal erosion projects	6-Medium			Increased coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.		

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
City of Gretna							
Storm Surge (Cont'd)							
SS-4 G1, G3	Revitalize wetlands to protect City from surge	6-Medium			Replenish the first lines of defense against hurricanes and surge. This will protect homes from catastrophic levels of damage.		
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing
City of Harahan							
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Harahan							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G2	Educate public on not dumping and cleaning catch basins	6-Medium	JP FPHM JP Environ JP Drainage	n/a	An informed public is better able to respond to and protect themselves from flooding.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Harahan							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G4	Issue fewer permits for building in vulnerable areas	6-Medium	JP Planning	n/a	Reduce the localized flooding and roofing problems that would occur with new development		ongoing
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1	Maintain 100 Year levee protection to ensure continued protection	6-Medium	SELFPA-E/W USACE	n/a	Reduce surge damage and cost to homeowner, government, and NFIP.		ongoing
Tornadoes							
T-1 G2	Encourage the construction of safe rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
City of Harahan							
Tornadoes (Cont'd)							
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing
City of Kenner							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Kenner							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G1	Install increased permanent pumps to alleviate flooding	4-Low	JP Drainage	F, H, M CAP	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$100 M	2020
F-8 G2	Educate public on not dumping and cleaning catch basins	6-Medium	JP FPHM JP Environ JP Drainage	n/a	An informed public is better able to respond to and protect themselves from flooding.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Kenner							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G4	Adopt and Enforce Strict and uniform bldg codes	6-Medium			Fortify structures to better withstand flood and wind.		
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1	Maintain 100 Year levee protection to ensure continued protection	6-Medium	SELFPA-E/W USACE	n/a	Reduce surge damage and cost to homeowner, government, and NFIP.		ongoing
SS-3 G2	Awareness of climate change and environmental impacts	6-Medium			An informed public is better able to respond to and protect themselves from climate change and disasters resulting from climage change.		

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
City of Kenner							
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing
City of Westwego							
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Westwego							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G1	Install increased permanent pumps to alleviate flooding	4-Low	JP Drainage	F, H, M CAP	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$100 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

City of Westwego							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-8 G2	Educate public on not dumping and cleaning catch basins	6-Medium	JP FPHM JP Environ JP Drainage	n/a	An informed public is better able to respond to and protect themselves from flooding.		ongoing
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G4	Issue fewer permits for building in vulnerable areas	6-Medium	JP Planning	n/a	Reduce the localized flooding and roofing problems that would occur with new development.		ongoing
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1	Maintain 100 Year levee protection to ensure continued protection	6-Medium	SELFPA-E/W USACE	n/a	Reduce surge damage and cost to homeowner, government, and NFIP.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
City of Westwego							
Storm Surge (Cont'd)							
SS-3 G4	Issue fewer permits for building in vulnerable areas	6-Medium			Reduce the number of buildings susceptible to storm surge, thereby, keeping communities safe and damage cost low.		ongoing
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing
Town of Grand Isle							
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Grand Isle							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood (Cont'd)							
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Grand Isle							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G3	Use debris (fallen trees) after a strong hurricane for coastal restoration (like Christmas tree project)	6-Medium			Better coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.		
H&TS-5 G1	Upgrade and lower water lines to 20 ft below the water surface	5-Medium			This would allow uninterrupted water service for residents living in the Town.		
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Grand Isle							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Storm Surge (Cont'd)							
SS-2 G1, G3	Increase coastal protection	6-Medium			Better coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.		
SS-3 G1	Elevate/ Reconstruct surge-prone structures	4-Low			By raising structures above the BFE, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.		
SS-4 G1, G3	Natural Shoreline/ Dune Restoration	4-Low			Better coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.		
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Jean Lafitte							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood							
F-1 G1	Elevate, Acquire, Reconstruct, Relocate or Flood proof private and public structures and infrastructure in flood-prone areas	7-High	JP FPHM	FEMA HUD CPRA DNR, DEQ	By removing structures from the floodplain, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$1 B	2020
F-2 G3	Increase storm water protection management including retention and detention basins	7-High	JP Drainage	FEMA HUD CAP OUTLAY USACE	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$20 M	2020
F-3 G2	Encourage and educate public regarding small-scale flood mitigation projects homeowners can employ	4-Low	JP FPHM JUMP	FEMA HUD PRIV. FUNDS CPRA	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.	$10 M	2017
F-4 G1	Implement drainage improvement projects in flood-prone areas	6-Medium	JP Drainage	FEMA HUD MILLAGE CAP OUTLAY	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$500 M	2020

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Jean Lafitte							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Flood							
F-5 G4	Adopt freeboard	7-High	JP FPHM	n/a	Provides a margin of safety against unknown flood depths while taking into account sea level rise and subsidence. Can ultimately reduce the amount of flooding a home would experience, lower flood insurance premiums, and provide the community with CRS points which in turn also lowers flood insurance premiums.		2014
F-6 G2	Encourage the purchase of flood insurance	7-High	JP FPHM JUMP	n/a	Enables homeowners to financially recover from the devastating effects of flooding as quickly as possible. Serves to educate area residents that any homeowner, regardless of location, can purchase flood insurance.		ongoing
F-7 G1	Install increased permanent pumps to alleviate flooding	4-Low	JP Drainage	F, H, M CAP	By improving drainage in flood prone areas, residents will suffer fewer flooded structures and therefore, less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.	$100 M	2020
Hurricanes and Tropical Storms							
H&TS-1 G1	Fortify critical infrastructure with storm shutters, upgraded roofs, and generators	6-Medium	JP Gen Services JP Risk Mngt JP FPHM	FEMA HUD	Provide extra protection to critical infrastructure from potential wind damage, thus allowing operations to continue during hurricanes and tropical storms.	$50 M	2017

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Jean Lafitte							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Hurricanes and Tropical Storms (Cont'd)							
H&TS-2 G2	Educate public on importance of evacuating, preparing for hurricane season, and generator safety	6-Medium	JP EM JP Fire	n/a	An informed public is better able to respond to and protect themselves from hurricanes.		ongoing
H&TS-3 G2	Encourage and educate public regarding small-scale wind mitigation projects homeowners can employ	5-Medium	JP FPHM JUMP	n/a	Homeowners will be empowered to protect themselves with low-cost, DIY projects and suffer less flood damage.		ongoing
H&TS-4 G1	Barrier construction along bayous to prevent erosion	4-Low			Better coastal protection could help to prolong the presence of the coastline and continue to provide protection against storms as well as economic gain from tourist destinations.		
H&TS-5 G1	Elevate evacuation routes	5-Medium			Alleviates the need to close evacuation routes due to road flooding and helps homeowners seek safety quicker.		
H&TS-6 G1	Emergency generators at sewer treatment plants and lift stations	5-Medium			Provide continuous source of power during power outages to keep homes protected from flood waters and sewer backup.		
Storm Surge							
SS-1 G2	Educate public about risks, preparedness measures, and evacuation procedures	6-Medium	JP EM JP FPHM JUMP	n/a	An informed public is better able to respond to and protect themselves from storm surge.		ongoing
SS-2 G1, G3	Build back marsh	6-Medium			Replenish the first lines of defense against hurricanes and surge. This will protect homes from catastrophic levels of damage.		

Table 5.5-6 (Continued)
Summary of Mitigation Actions

Town of Jean Lafitte							
Action ID and Goals	Description	Prioritization	Responsible Coordinating Entity	Potential Funding Agency	(B/C) Benefit-Costs (TF) Technical Feasibility	Cost	Anticipated Year of Completion
Storm Surge (Cont'd)							
SS-3 G1	Elevate/ Reconstruct surge-prone structures	4-Low			By raising structures above the BFE, homeowners suffer less mental and physical stress, displacement days, and flood damage. Also, the drain on the NFIP is reduced by a decrease in flood claims.		
Tornadoes							
T-1 G2	Construct Safe Rooms	5-Medium	JP FPHM JUMP	n/a	Provides security and peace of mind, protects residents from tornadoes, and has the potential to increase the value of one's home.		ongoing
T-2 G4	Harden structures for wind impact	6-Medium	JP Planning	n/a	Better protect homes from stong winds that could speed recovery after a tornado.		ongoing

Section 6
Plan Monitoring and Maintenance

Contents of this Section

6.1 IFR Requirements for Plan Monitoring and Maintenance

Requirement §201.6(c)(4)(i): *[The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle*

Requirement §201.6(c)(4)(ii): *[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Requirement §201.6(c)(4)(iii): *[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.*

6.2 Method for Monitoring the Plan

This Plan will be monitored by the Jefferson Parish Department of Floodplain Management and Hazard Mitigation for several related purposes:

1. Maintain the currency of hazard and risk information.
2. Ensure that mitigation projects and actions reflect the priorities of Jefferson Parish, the MPT and the Stakeholders group.
3. To comply with FEMA and State of Louisiana requirements for Plan maintenance, and maintain Jefferson Parish's eligibility for federal disaster assistance and mitigation grants.

The Parish Floodplain Manager is responsible for monitoring and maintaining this Plan, and will continuously monitor the Plan for the purposes noted above, and with respect to the update triggers noted in Section 9.4 below.

Each of the six incorporated municipalities that are included in this plan will have a representative on either the MPT or the Stakeholders group. Although the individuals filling the positions may change from year to year, the future MPT and Stakeholders group will continue to be comprised of the same job functions or titles. However, the decision of specific job duties will be left to the Parish OEM Floodplain Manager, to be assigned as deemed appropriate.

Progress on the mitigation action items will be monitored and evaluated by the Parish Floodplain Manager. The Department of Floodplain Management and Hazard Mitigation will complete an Annual Progress Report with coordination from the Responsible Coordinating Entity and submit them to the

Floodplain Manager for review. This Progress Report is designed to monitor the state of the projects and evaluate the success of each mitigation item. The report lists 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 actions items.

6.3 Method and Schedule for Updating the Plan

Jefferson Parish has a system to ensure that a regular review and update of the Hazard Mitigation Plan occurs. This will be the responsibility of the MPT and Stakeholders groups. The latter 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 either the MPT or Stakeholders group.

Comprehensive review and revisions to this Hazard Mitigation Plan will be undertaken on the required five-year cycle. This Plan Update will be re-adopted in 2015, and thus must undergo a formal FEMA-compliant update again by 2020. If a disaster occurs or as action items are completed, the plan will be reviewed, revised, and updated sooner than the required five years, using the process outlined in this section.

As mentioned above in Section 9.2, an Annual Progress Report will be completed to monitor and evaluate the mitigation action items. The Parish Floodplain Manager will consult with the Lead Manager for details involving each mitigation item. Copies of the Annual Progress Reports will also be sent to the Mayors of each jurisdiction. If during this process of reviewing the Annual Progress Report, the Parish Floodplain Manager determines that the MPT should be reconvened for discussion, he has the option of doing so. He will use the following criteria to determine if a meeting needs to be held:

- Are there any changes in mitigation plan requirements for funding programs?
- Are any changes or revision required to the Mitigation Action Items? (i.e. Have any action items been completed? Are there any new specific mitigation action items? Are there any changes to the mitigation plan requirements? Have any new specific mitigation action items been identified?)
- Does a review of the Progress Reports indicate any changes are necessary?
- Are there any changes within the MPT or Stakeholders group?

Although not required, FEMA recommends an annual meeting of the MPT. If the Parish OEM Floodplain Manager determines that this annual meeting needs to be conducted, he is responsible for contacting committee members, organizing the meeting and providing public noticing for the meeting to solicit public input.

The MPT will be reconvened approximately one year before the five-year deadline described above 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 may affect the 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 effect on hazard areas?

- 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 HMP will be updated accordingly.

The HMP review and update will be accomplished by reviewing each goal and action item to determine its 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 MPT will also review the risk assessment portion and determine if this information should be updated or modified. If no changes are necessary, the State Hazard Mitigation Officer will be given a justification for this determination.

The MPT will work together as a team, with each member sharing responsibility for completing the evaluation and updates. Each member of the MPT 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 Floodplain Manager is responsible for incorporating changes into the HMP. All necessary revisions will be completed at least three months prior to the end of the five year period to allow the MPT time to review the updated plan. During the revision process, Parish Floodplain Manager will send a status report (meeting minutes) to the Parish Council and Mayors of the incorporated municipalities after each MPT meeting. 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 is completed, the final Plan will be submitted to GOHSEP for review and comment. After any GOHSEP revisions are completed, the plan will be forwarded to FEMA for review and eventual approval.

6.4 Circumstances that will initiate Plan Review and Updates

This section identifies the circumstances or conditions under which Jefferson Parish will initiate Plan reviews and updates.

1. On the recommendation of the Parish Floodplain Manager or on its own initiative, the Jefferson Parish Council may initiate a Plan review at any time.
2. At approximately the one-year anniversary of the Plan's re-adoption, and every year thereafter.
3. After natural hazard events that appear to significantly change the apparent risk to Jefferson Parish assets, operations and/or citizens (including the five incorporated jurisdictions).
4. When activities of Jefferson Parish, its jurisdictions, or the State significantly alter the potential effects of natural hazards on Jefferson Parish assets, operations and/or citizen. Examples include completed mitigation projects that reduce risk, or actions or circumstances that increase risk.
5. When new mitigation opportunities or sources of funding are identified.

6.5 Continued Public Involvement

As noted above, this Plan will be evaluated and updated on approximately an annual basis, and when certain triggering events occur. Regardless of the reason for the evaluation and update, Jefferson Parish will observe its mandated public notification processes by publishing a notice in the local newspaper, *The Time-Picayune* at least two weeks in advance of all public meetings in which the Plan or elements of the Plan are to be discussed. Additionally, when Plan Updates or other revisions are being contemplated, Jefferson Parish will provide paper and electronic copies of these revisions for public review at least two weeks prior to any hearings or meetings at which the Plan or revisions will be discussed. All jurisdictions will be invited to participate in the process by notifying the Stakeholders group. A public notice will be displayed in prominent locations within the main governmental buildings in Jefferson Parish and in the City Halls and government buildings of all participating municipalities. Those who opt to participate in this process will have an opportunity to express their concerns, opinions, or ideas about the plan.

Copies of the Plan will be catalogued and kept on hand at all of the Parish public libraries. The existence and location of these copies will be publicized in *The Times-Picayune*. Electronic copies will be made available via PDF download from the Parish web site.

Jefferson Parish representatives will be available to discuss aspects of the Plan with the public or interested groups. Any public comments will be tracked by the Jefferson Parish OEM Floodplain Manager. All public comments will be reviewed and incorporated in the HMP at the five year update if appropriate. If an annual meeting of the MPT is held, than the public comments will be reviewed and incorporated at this time, if appropriate. The review, changes, and update that is made during the review, every five years, will also be publicized in *The Times-Picayune*.

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Appendix A
Multi-Jurisdictional Hazard Mitigation Plan Update
Team Meetings and Public Meetings

The Mitigation Planning Team met a total of four times during the plan update process. The following section describes the dates of the meetings, agendas, meeting minutes, and attendees as indicated by the sign-in sheets. These minutes were prepared by Maggie Olivier, Floodplain/CRS Specialist for Jefferson Parish. The proceedings will be described in chronological order.

Mitigation Planning Team (MPT) Meeting #1

The MPT met once before the public meetings and once after. The first meeting was held on July 22, 2014 on the 4th flood or the Joe Yenni Building in Elmwood beginning at 10:30 AM.

As part of the Update, government officials from several jurisdictions were members of the MPT and all jurisdictions were represented as part of the Stakeholders group. The MPT is comprised of the following individuals:

Jefferson Parish Hazard Mitigation Plan, Mitigation Planning Team

Team Member	Job Title	Organization
Ms. Michelle Gonzales	Director of Floodplain Management and Hazard Mitigation	Jefferson Parish
Ms. Maggie Olivier	Floodplain/CRS Specialist	Jefferson Parish
Ms. Danika Gorrondona	Director of Inspections	City of Gretna
Mr. Michael Wesley	IT Manager	City of Gretna
Mr. Jeffrey Charlet	Director of the Regulatory Department	City of Harahan
Ms. Aimee Vallot	Director of Inspection and Code Enforcement	City of Kenner
Ms. Lisa Tapia	CRS Coordinator	City of Westwego
Ms. Nora Combel	Building Official	Town of Grand Isle
Ms. Yvette Crain	Clerk and Floodplain Manager	Town of Jean Lafitte

Jurisdictional Sub-Team

Government officials from several jurisdictions actively participated in the Update. These individuals provided data and insight to the various components of the plan. The Jurisdictional Sub-Team is comprised of the following individuals:

Jefferson Parish Hazard Mitigation Plan, Jurisdictional Sub-Team

Team Member	Job Title	Organization
Mr. Mitch Theriot	Director of Drainage	Jefferson Parish
Mr. Greg Brousse	GIS Manager	Jefferson Parish
Mr. John Piglia	Assistant Director of Inspection and Code Enforcement, CFM	Jefferson Parish
Ms. Tiffany Wilken	Director of Inspection and Code Enforcement	Jefferson Parish
Mr. David Cobb	Assistant Regulatory Manager of Inspection and Code Enforcement, CFM	Jefferson Parish
Mr. Timothy Gautreau	Assistant Director of Emergency Management	Jefferson Parish
Mr. Charles Hudson	Director of Emergency Management	Jefferson Parish
Mr. Ridley Bourdreaux	Director of Management Information Systems	Jefferson Parish
Mr. Kriss Fortunato	Public Information Officer	Jefferson Parish
Mr. Kazem Alikhani	Director of Public Works	Jefferson Parish
Mr. Anthony Francis	Director of General Services	Jefferson Parish
Ms. Danika Gorrondona	Director of Inspections	City of Gretna
Mr. Michael Wesley	IT Manager	City of Gretna
Mr. Jeffrey Charlet	Director of the Regulatory Department	City of Harahan
Ms. Aimee Vallot	Director of Inspection and Code Enforcement	City of Kenner
Ms. Lisa Tapia	CRS Coordinator	City of Westwego
Ms. Nora Combel	Building Official	Town of Grand Isle
Ms. Yvette Crain	Clerk and Floodplain Manager	Town of Jean Lafitte

Stakeholders Group

Early in the update process the Parish determined that a group of interested groups, neighboring communities, businesses, academia and other organizations and individuals with an interest in the Jefferson Parish Plan Update and Project Scoping should be identified. This Stakeholders Group was provided regular updates on the planning process and given the opportunity to review the Plan at key points in its development. Members of the Stakeholders group were also invited to attend and participate in all public meetings. This stakeholder group was identified by the MPT.

Jefferson Parish Hazard Mitigation Plan, Stakeholders Group

Group Member	Title	Organization
Ms. Belinda C. Constant	Mayor	City of Gretna
Mr. Provino “Vinny” Mosca	Mayor	Town of Harahan
Mr. Michael S. Yenni	Mayor	City of Kenner
Mr. John I. Shaddinger, Jr.	Mayor	City of Westwego
Mr. David Carmardelle	Mayor	Town of Grand Isle
Mr. Tim Kerner	Mayor	Town of Jean Lafitte

MPT Meeting 1 Agenda

Jefferson Parish CRS User Group

Monthly Meeting – July 22, 2014
10:30 AM-12:30 PM
Joe Yenni Building

1) Welcome/Sign-In

2) Updates
   a. NFIP – HFIAA Webinar Overview; more viewings on July 24, 29, and 31
   b. Mitigation Grants (Review Status)
   c. Upcoming CRS Webinar-Natural Floodplain Functions (8/20, noon, 1 CEC)

3) Community Self-Assessment
   a. Any questions?

4) PPI Development
   a. Current Public Information Efforts
      i. Review inventory chart
      ii. Collect names for committee

5) Mitigation Plan Update
   a. Hand out current plan
   b. Review MOA and Schedule of Tasks
      i. Tracking time
   c. Fill out Questionnaire and Worksheets

6) Other Business
   a. AgCenter FloodMaps Portal Worksheet
   b. Outreach banner ideas
   c. Next meeting date/location: _____
   d. Meeting goals: _____

Notes:

_____

_____

_____

_____

_____

_____

MPT Meeting #1 Meeting Minutes
(Note: These minutes only describe agenda item 5-Mitigation Plan Update)

5. Mitigation Plan Update

a. Hand out current plan

Ms. Gonzales stated that each jurisdiction will be updating its own section. Ms. Olivier handed out hard copies of the current plan as well as a CD of the word version so that they can plug in new information rather than retype the whole section.

b. Review Memorandum of Agreement (MOA) Schedule of Tasks

The team reviewed the Memorandum of Agreement (MOA) for a Multi-Jurisdictional Hazard Mitigation Planning Team that Ms. Gonzales drafted. Each municipality will have to submit a resolution approved by their Council stating we are working on this update collectively. We briefly discussed the schedule of tasks. Ms. Olivier is s currently updating the hazard profile section. Our goal is to have the finished draft to GOHSEP by November so they can make suggestions. The updated plan will need to be approved by FEMA before the current one expires in March 2015.

c. Fill out Questionnaire and Worksheets

The team filled out the Hazard Mitigation Plan Review Questionnaire. Need responses to Part 3, #'s 7, 8, and 9 from everyone. The team also reviewed the worksheets GOSHEP distributed at the plan update training in early July. Every jurisdiction will to submit a list of parish/city owned buildings. These items are due to Ms. Olivier by August 5.

MPT Meeting #1 Sign-In Sheet

Sign In Sheet

Name	Title	Community/Organization	Email Address
Suzie Sumpter	Hazard Mitigation Specialist - Grant Manager	HGA Hunt Gilliot & Associates	ssumpter@hga-llc.com
Billy Pocke	Project Manager	HGA	bpocke@hga-llc.com
DANIEL GRANDADA	BUILDING OFFICIAL	CITY OF GRETNA	dgorrandon@gretnala.com
MICHAEL WESLEY	IT MANAGER	"	mwesley@gretnala.com
LISA TAPIA	CRS	City of Westwego	lisatapia@cityofwestwego.com
Michelle Gonzales	Director Floodplain Mngt.	JP	mgonzales@jeffparish.net
Maggie Olivier	Floodplain/CRS Specialist	JP	molivier@jeffparish.Net
Pam Lightfoot	Floodplain Mgmt Program Coor/ CRS Specialist for the State	LaDOTD	pam.lightfoot@la.gov
Monica Farris	Director	UNO-CHART	mateets@uno.edu
Jeffrey Charlet	DIRECTOR of Regulatory	City of Harahan	jeff.charlet@ci.harahan.la.us
Yvette Crain	Town Clerk	Town of Jean Lafitte	ycrain@townofjeanlafitte.com

July 22, 2014 JP Hazard Mitigation Plan Update Meeting Yenni Building

*Follow up was conducted with the Town of Grand Isle through phone calls after the meeting.

Public Meetings

These minutes document proceedings from the first and second public meetings related to the development of the 2015 Jefferson Parish Mitigation Plan Update. The public meetings were held at the following locations:

August 19, 2014	10:30 AM, Mel Ott Center, West Bank, 2301 Belle Chasse Highway, Gretna
September 30, 2014	10:30 AM, Jefferson Parish East Bank Regional Library, East Bank, 4747 West Napoleon Ave, Metairie

Copies of the flyers for these meetings are included below. Jefferson Parish and each of the jurisdictions created their own flyers to post. The flyers were posted on the Parish website and in the public library branches at least two weeks prior to each meeting. The jurisdictions also posted the public meeting notices in each of their respective locations. The flyers explained the purpose of the meeting and provided the date, time, and location of the meeting place. The agendas, brief summaries of the discussions from each meeting, and the sign-in sheets are also included.

AUGUST 19, 2014

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, August 19, 2014 at the Mel Ott Center in Gretna at 10:30 AM.

During the meeting, the public is invited to help identify community assets, describe natural hazard concerns, and assist in prioritizing proposed mitigation actions.

A completed plan will allow the Parish and participating municipalities to apply for federal relief aid to fund mitigation projects prioritized in the plan. The plan is designed to support GOHSEP's statewide Hazard Mitigation Plan and enhance coordination efforts between local, state, and federal agencies during times of disaster.

CONTACT

Jefferson Parish Department of Floodplain Management and Hazard Mitigation

Phone:
(504) 736-6540

E-mail:
JPfloodplain@jeffparish.net

In accordance with provisions of the American with Disabilities Act Amendments of 2008, as amended, Jefferson Parish shall not discriminate against individuals with disabilities on the basis of disability in its services, programs or activities. If auxiliary aids or devices, or other reasonable accommodation under the Amendments Act, please submit your request to the ADA Coordinator at least eight (48) hours in advance or as soon as practical. A seventy-two (72) hour notice is required to request Certified ASL interpreters.

ADA Coordinator/Office of Citizens with Disabilities

AUGUST 19, 2014

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

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CONTACT

Town of Grand Isle

Phone:
(985) 787-3196

E-mail:
nora_combel@yahoo.com


FEMA/Patsy Lynch

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

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CONTACT

City of Kenner
Inspection and Code Enforcement

Phone:
(504) 468-6606

E-mail:

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, August 19, 2014 at the Mel Ott Center in Gretna at 10:30 AM.

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CONTACT

City of Gretna
Department of Building and Regulatory Inspections

Phone:
(504) 363-1563

E-mail:
dgorrondona@gretnala.com

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, August 19, 2014 at the Mel Ott Center in Gretna at 10:30 AM.

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CONTACT

City of Harahan
Regulatory Department

Phone:
(504) 737-6765

E-mail:
jeff.charlet@ci.harahan.la.us

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, August 19, 2014 at the Mel Ott Center in Gretna at 10:30 AM.

During the meeting, the public is invited to help identify community assets, describe natural hazard concerns, and assist in prioritizing proposed mitigation actions.

A completed plan will allow the Parish and participating municipalities to apply for federal relief aid to fund mitigation projects prioritized in the plan. The plan is designed to support GOHSEP's statewide Hazard Mitigation Plan and enhance coordination efforts between local, state, and federal agencies during times of disaster.

CONTACT

Town of Jean Lafitte

Phone:
(504) 689-2208

E-mail:
ycrain@townofjeanlafitte.com

PUBLIC MEETING

Hazard Mitigation Plan Update

Date: 08/19/14

Time: 10:30 AM

Location:
Mel Ott Center
2301 Belle Chasse Highway
Gretna, LA 70053

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, August 19, 2014 at the Mel Ott Center in Gretna at 10:30 AM.

During the meeting, the public is invited to help identify community assets, describe natural hazard concerns, and assist in prioritizing proposed mitigation actions.

A completed plan will allow the Parish and participating municipalities to apply for federal relief aid to fund mitigation projects prioritized in the plan. The plan is designed to support GOHSEP's statewide Hazard Mitigation Plan and enhance coordination efforts between local, state, and federal agencies during times of disaster.

CONTACT

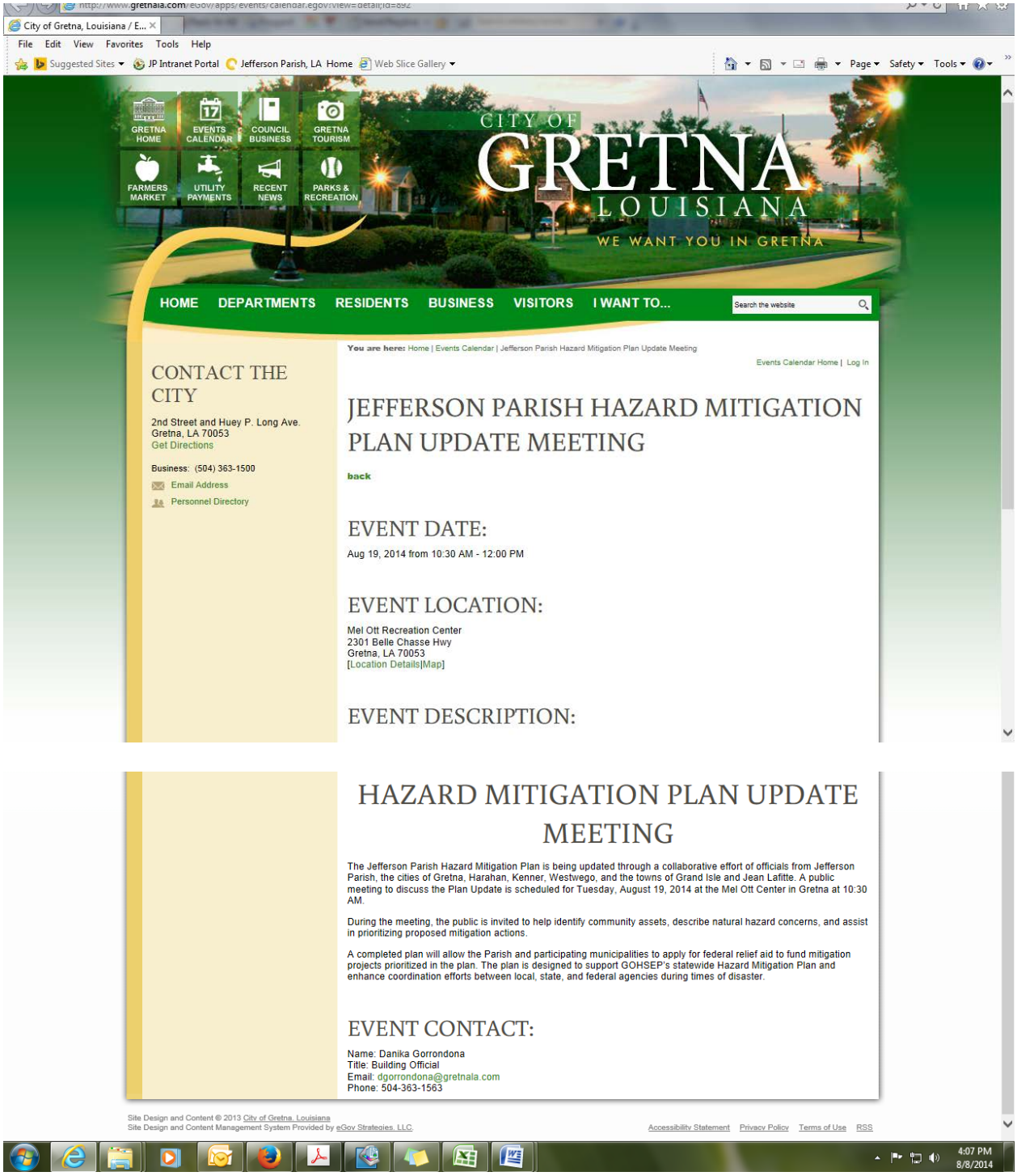
City of Westwego

Phone:
(504) 341-3424

E-mail:
LisaTapia@cityofwestwego.com


FEMA/Patsy Lynch

Example of Posting on City of Gretna's Website



Public Meeting #1 Agenda

Jefferson Parish Hazard Mitigation Plan Update
&
CRS User Group

Meeting – August 19, 2014
10:30 AM-12:30 PM
Mel Ott Center in Gretna

1) Welcome/Sign-In/Introductions

2) CRS - Program for Public Information (PPI) Development
   a. Add names to committee list
   b. Collect inventory chart on current public information efforts
   c. Vote on U-G name – Jefferson Unified Mitigation Professionals (JUMP)

3) Mitigation Plan Update
   a. Review purpose and Schedule of Tasks
   b. Update on MOA signatures and resolutions
   c. Review natural hazards
      i. Complete survey
      ii. Discuss small-scale hazard events
   d. Fill out required GOHSEP worksheets – Community Capabilities

4) Other Business
   a. Next meeting date/location: _____
   b. Meeting goals: _____

Notes/Comments:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Plan Update Purpose and Schedule of Tasks

Hazard Mitigation Plan Update

A Hazard Mitigation Plan is a comprehensive document created to develop and implement practical, manageable mitigation strategies that help to reduce a community's risk to natural hazards.

Jefferson Parish is updating its current plan through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. This update occurs every five years.

A completed plan will allow the Parish and participating municipalities to apply for federal relief aid to fund mitigation projects prioritized in the plan.

Schedule of Tasks

	August	September	October	November	December	January	February
Project Tasks							
Organize Resources and Convene Planning Team							
Conduct Risk Assessment							
Identify Mitigation Strategies							
Develop Action Plan for Implementation							
Identify Plan Maintenance Procedures							
Review Final Draft							
Submit Plan to State and FEMA							
Adopt Plan							
Meetings							
Planning Team							
Jurisdictional Sub-team							
Stakeholder/Public Outreach							

Public Meeting #1 Meeting Minutes

1. Welcome/Sign-In/Introductions

Ms. Gonzales introduced herself and representatives from Jefferson Parish and the separate municipalities who were in attendance. Staff and attendees were asked to sign the sign-in sheet that was circulated. The sign-in sheet is included below. Ms. Gonzales gave a ten-minute presentation about mitigation planning and explained that the Parish is presently completing an update to its 2010 plan as well as scoping mitigation projects as part of the planning process.

2. Community Rating System (CRS)-Program for Public Information (PPI) Development

The staff quickly reviewed some old business for the CRS User Group since the CRS coordinators were present.

3. Mitigation Plan Update

a. Review purpose and Schedule of Tasks

Ms. Gonzales explained the purpose of a hazard mitigation plan, the plan update process, who is involved, and the schedule of tasks. She then reintroduced the community officials who make up the Mitigation Planning Team (MPT), which has the responsibility for most of the procedural and technical decisions as the update is developed. The MPT is comprised of officials from the Parish and the six jurisdictions within it. Ms. Gonzales also reviewed the sections of the Parish Mitigation Plan, highlighting the list of goals, objectives and actions from the 2010 version of the plan. She noted how important this part of the plan is because it outlines the Parish's intentions in terms of projects that it will pursue in future grant applications. She explained that the goals, objectives and actions will be updated by the Parish with the input of the MCT and Parish officials.

b. Update on Memorandum of Agreement (MOA) signatures and resolutions

The Memorandum of Agreement (MOA) for a Multi-Jurisdictional Hazard Mitigation Planning Team was sent out to all of the jurisdictions' governing authorities to obtain signatures stating the jurisdictions would work collaboratively on the plan update. The MOA then needed to be passed as a resolution by each Council. Resolutions for the following are approved: Gretna, Kenner, Westwego, and Jean Lafitte. Jefferson Parish, Harahan, and Grand Isle are on their respective Council agendas.

c. Review natural hazards

In accordance with FEMA requirements, the plan only addresses natural hazards. Ms. Gonzales reviewed a list of the hazards that are proposed to be included in the plan – these hazards will be included in the hazard identification. A subset of these hazards will include risk assessments.

i. Complete survey

Using the list of natural hazards, attendees were given a survey (see survey below) and asked to rank them in order of what they considered to be top threats to Jefferson Parish. Top choices included storm surge, hurricanes, and coastal erosion. Timothy Gautreau from Emergency Management said he rated the hazards by which ones are likely to happen more frequently rather than which ones are more dangerous.

ii. Discuss small-scale hazard events

The group had an open discussion about hazards that have occurred in the Parish since 2008. In the last few years, Jefferson Parish has reduced its amount of Severe Repetitive Loss (SRL) properties from 1300 to 700. Ms. Gonzales noted that Jefferson Parish does a lot of mitigation and explained some of the current projects the Parish is undertaking. She asked the attendees to jot down innovative ideas for mitigation at the bottom of their survey that we may be able to incorporate into the mitigation strategies section of the plan. The discussion continued around the ideas volunteered by audience members.

d. Fill out required GOHSEP worksheets-Community Capabilities

The MPT worked through the following GOHSEP worksheets:

1. Critical Facilities Inventory
2. Vulnerable Populations
3. Community Assessments
4. National Flood Insurance Program (NFIP)

The meeting adjourned at 11:45 AM.

Participant Survey

Name: _____

Survey

Identified Hazards in Jefferson Parish

Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

_____ Coastal Erosion
_____ Drought
_____ Earthquakes
_____ Floods
_____ Hail Storms
_____ Hurricanes and Tropical Storms
_____ Land Subsidence
_____ Lightning
_____ Sea Level Rise
_____ Storm Surge
_____ Tornadoes
_____ Wildfires
_____ Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

_____

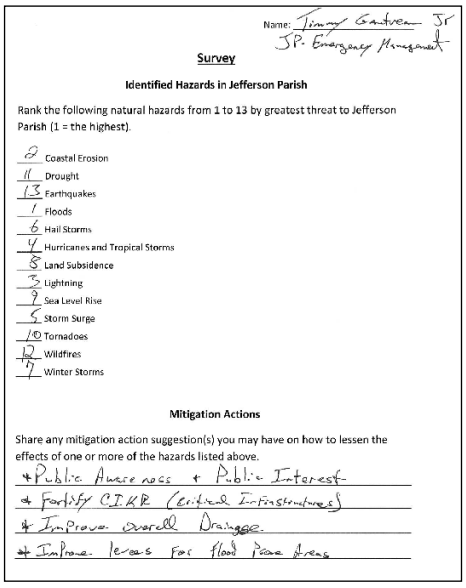
_____

_____

_____

_____

Sample of Audience Survey Responses



Name: Timmy Gautreau JR
JP. Emergency Management

Survey

Identified Hazards in Jefferson Parish

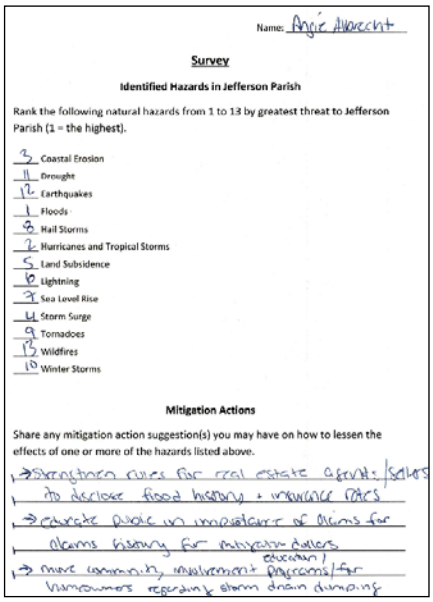
Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

2 Coastal Erosion
11 Drought
13 Earthquakes
1 Floods
6 Hail Storms
4 Hurricanes and Tropical Storms
8 Land Subsidence
3 Lightning
9 Sea Level Rise
5 Storm Surge
10 Tornadoes
12 Wildfires
7 Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

* Public Awareness + Public Interest
* Fortify CIKR (Critical Infrastructures)
* Improve overall Drainage
* Improve levees for flood prone areas



Name: Angie Aldrecht

Survey

Identified Hazards in Jefferson Parish

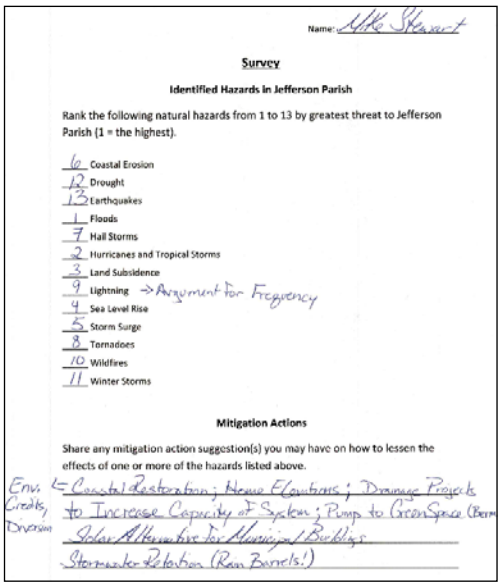
Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

3 Coastal Erosion
11 Drought
12 Earthquakes
1 Floods
8 Hail Storms
2 Hurricanes and Tropical Storms
5 Land Subsidence
10 Lightning
7 Sea Level Rise
4 Storm Surge
9 Tornadoes
13 Wildfires
10 Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

→ Strengthen rules for real estate agents: sellers to disclose flood history + insurance rates
→ educate public on importance of claims for claims history for mitigation dollars
→ more community involvement programs (education) for homeowners regarding storm drain dumping



Name: Mike Stewart

Survey

Identified Hazards in Jefferson Parish

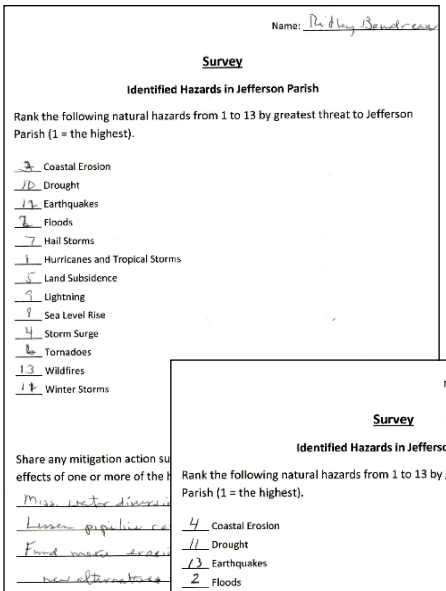
Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

6 Coastal Erosion
12 Drought
13 Earthquakes
1 Floods
7 Hail Storms
2 Hurricanes and Tropical Storms
3 Land Subsidence
9 Lightning → Argument for Frequency
4 Sea Level Rise
5 Storm Surge
8 Tornadoes
10 Wildfires
11 Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

Env. Circle, Diversion ← Coastal Restoration; Levee Enhancements; Drainage Projects to Increase Capacity of System; Pump to Green Space (Berm
Solar Alternative for Municipal Buildings
Stormwater Retention (Rain Barrels!)



Name: Ruby Bendreau

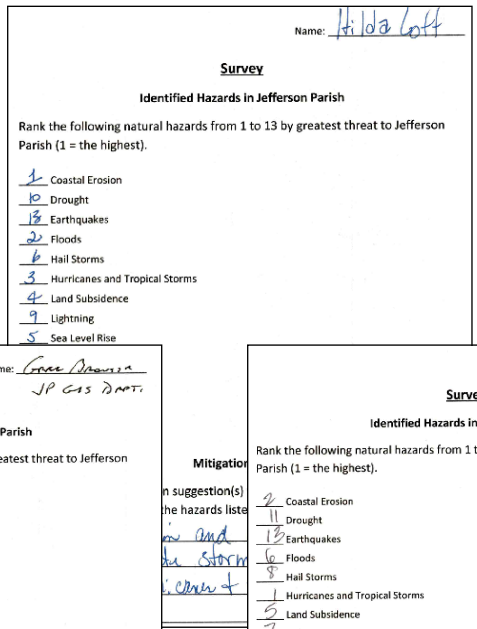
Survey

Identified Hazards in Jefferson Parish

Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

3 Coastal Erosion
10 Drought
13 Earthquakes
2 Floods
7 Hail Storms
1 Hurricanes and Tropical Storms
5 Land Subsidence
9 Lightning
8 Sea Level Rise
4 Storm Surge
6 Tornadoes
13 Wildfires
12 Winter Storms

Share any mitigation action su
effects of one or more of the h
Miss. water diversio
Loosen pipeline re
Fund more drain
new alternatives
Issue fewer permits
Strengthen + enforc



Name: Hilda Loft

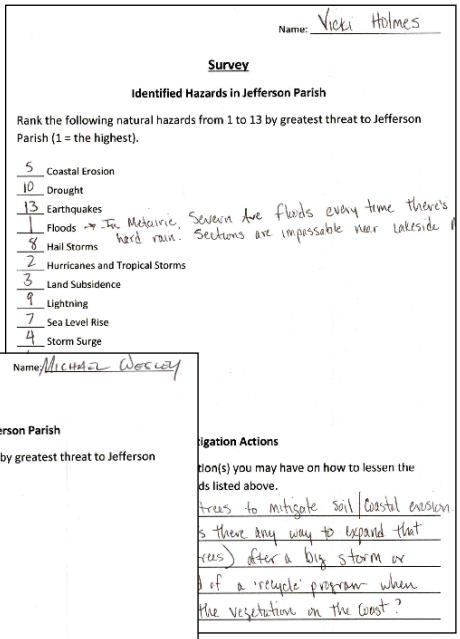
Survey

Identified Hazards in Jefferson Parish

Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

1 Coastal Erosion
10 Drought
13 Earthquakes
12 Floods
6 Hail Storms
3 Hurricanes and Tropical Storms
4 Land Subsidence
9 Lightning
5 Sea Level Rise

Mitigation
n suggestion(s)
he hazards liste
ve and
the storm
: cover of



Name: Vicki Holmes

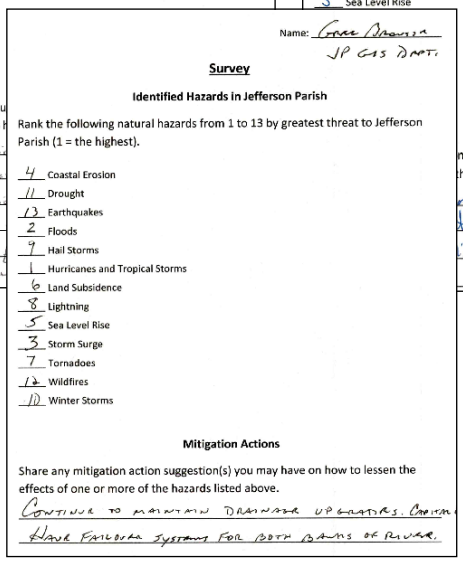
Survey

Identified Hazards in Jefferson Parish

Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

5 Coastal Erosion
10 Drought
13 Earthquakes
1 Floods → In Metairie, Severn Ave floods every time there's hard rain. Sections are impassable near Lakeside
8 Hail Storms
2 Hurricanes and Tropical Storms
3 Land Subsidence
9 Lightning
7 Sea Level Rise
4 Storm Surge

igation Actions
tion(s) you may have on how to lessen the
ds listed above.
trees to mitigate soil/coastal erosion
s there any way to expand that
reas) after a big storm or
) of a 'recycle' program when
the vegetation on the coast?



Name: Grace Bauzza
JP GIS DEPT.

Survey

Identified Hazards in Jefferson Parish

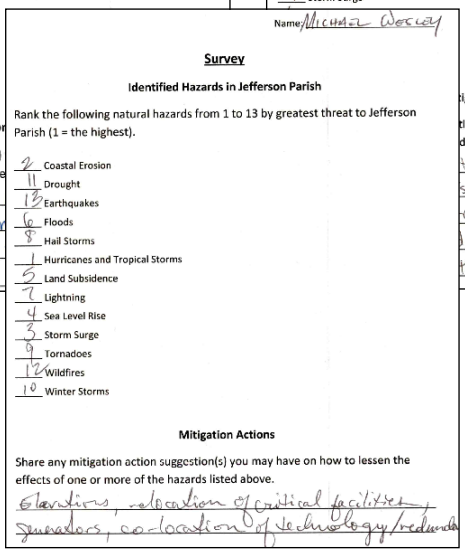
Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

4 Coastal Erosion
11 Drought
13 Earthquakes
2 Floods
9 Hail Storms
1 Hurricanes and Tropical Storms
6 Land Subsidence
8 Lightning
5 Sea Level Rise
3 Storm Surge
7 Tornadoes
12 Wildfires
10 Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

CONTINUE TO MAINTAIN DRAINAGE UPGRADES. CONSIDER
HAVE FAILURE SYSTEMS FOR BOTH BANKS OF RIVER.



Name: MICHAEL WORLEY

Survey

Identified Hazards in Jefferson Parish

Rank the following natural hazards from 1 to 13 by greatest threat to Jefferson Parish (1 = the highest).

2 Coastal Erosion
11 Drought
13 Earthquakes
6 Floods
8 Hail Storms
1 Hurricanes and Tropical Storms
5 Land Subsidence
7 Lightning
4 Sea Level Rise
3 Storm Surge
9 Tornadoes
12 Wildfires
10 Winter Storms

Mitigation Actions

Share any mitigation action suggestion(s) you may have on how to lessen the effects of one or more of the hazards listed above.

Elevations, relocation of critical facilities
Generators, co-location of technology/redunda

Public Meeting #1 Sign-In Sheet

Sign In Sheet

Name	Title	Community/Agency	Email Address	Initial
Michelle Gonzales	Director - Floodplain Mgmt	Jefferson Parish	mgonzales@jeffparish.net	MG
Maggie Olivier	Floodplain/CRS Specialist	Jefferson Parish	molivier@jeffparish.net	MLO
Danika Gorrondona	Building Official	City of Gretna	dgorrondona@gretnala.com	DGA
Michael Wesley	IT Manager	City of Gretna	mwesley@gretnala.com	MW
Jeff Charlet	Director - Regulatory Dept	City of Harahan	jeff.charlet@ci.harahan.la.us	JC
Aimee Vallot	Director - Inspection/Code	City of Kenner	avallot@kenner.la.us	
Dana Fink	Secretary - Inspection/Code	City of Kenner	dfink@kenner.la.us	
Theresa Armstrong	Planner/GIS Specialist	City of Kenner	tarmstrong@kenner.la.us	
Lisa Tapia	CRS Coordinator	City of Westwego	lisatapia@cityofwestwego.com	L.T.
Nora Combel	Building Official	Town of Grand Isle	nora_combel@yahoo.com	
Yvette Crain	Town Clerk	Town of Jean Lafitte	ycrain@townofjeanlafitte.com	YC
Monica Farris	Director	UNO-CHART	mateets@uno.edu	
Jonathan Smith	ISO/CRS Specialist	ISO	jonathan.smith@verisk.com	
Suzie Sumpter	Hazard Mitigation Specialist	HGA	ssumpter@hga-llc.com	
Billy Poche	Project Manager	HGA	bpoche@hga-llc.com	
Nicolette English	Hazard Mitigation Planner	GOHSEP	nicolette.english@la.gov	NE

August 19, 2014 JP Hazard Mitigation Plan Update Meeting Mel Ott Center in Gretna

Sign In Sheet

Name	Title	Community/Agency	Email Address
Vicki Holmes			vicki.holmes@cox.net
Kim Reeves			tkreeves@cox.net
Hilda Lott	Grant Admin.	Plaq. Parish	hlott@ppgov.net
Gabe Broussard	JP GIS Manager	Jefferson Parish	GABROUSSA@JEFFPARISH.NET
Mike Metcalf	Floodplain Mgr. Plaq. Parish		MMETCALF@PPGOV.NET
Timmy Gautreau Jr	Jeff Parish Emergency Manager		tgautreau@jeffparish.net
Mike Stewart	Proj. Manager	BHA/JP	mstewart@bha-engineers.com
Melonie Ellzey	HM Specialist	HGA	mellzey@hga-llc.com
Brenda Mathews	Hm Specialist	HGA	bmathews@hga-llc.com
Ridley Boudreaux	IT Director	Jefferson Parish	rboudreaux@jeffparish.net
Angie Albrecht	Manager	Trigon Associates	aalbrecht@trigonassociates.com

August 19, 2014 JP Hazard Mitigation Plan Update Meeting Mel Ott Center in Gretna

*Follow up was conducted with the Town of Grand Isle through phone calls after the meeting.

Public Meeting #2 Flyer

September 30, 2014

Public Meeting

Hazard Mitigation Plan Update

Date: 09/30/2014

Time: 10:30 AM

Location:
Jefferson Parish Library
4747 West Napoleon Avenue
Metairie, LA 70001

The Jefferson Parish Hazard Mitigation Plan is being updated through a collaborative effort of officials from Jefferson Parish, the cities of Gretna, Harahan, Kenner, Westwego, and the towns of Grand Isle and Jean Lafitte. A public meeting to discuss the Plan Update is scheduled for Tuesday, September 30, 2014, at the Jefferson Parish East Bank Regional Library at 10:30 AM.

The public is invited to listen to an overview of the Parish's current risk assessments of floods, hurricanes/tropical storms, storm surge, and tornadoes; current projects for these risks; and potential mitigation actions to reduce these risks as well as assist in identifying additional mitigation actions to consider.

A completed plan will allow the Parish and participating municipalities to apply for federal relief aid to fund mitigation projects prioritized in the plan. The plan is designed to support GOHSEP's statewide Hazard Mitigation Plan and enhance coordination efforts between local, state, and federal agencies during times of disaster.

Contact

City of Gretna
Department of Building and Regulatory Inspections

Phone:

Contact

Jefferson Parish
Department of Floodplain Management and Hazard Mitigation

Contact

Town of Jean Lafitte

Phone:

Contact

Town of Grand Isle

Phone:
(985) 787-3196

E-mail:
nora_combel@yahoo.com

Contact

City of Harahan
Regulatory Department

Phone:
(504) 737-6765

E-mail:
jeff.charlet@ci.harahan.la.us

Contact

City of Kenner
Inspection and Code Enforcement

Phone:
(504) 468-6606

E-mail:
avallot@kenner.la.us

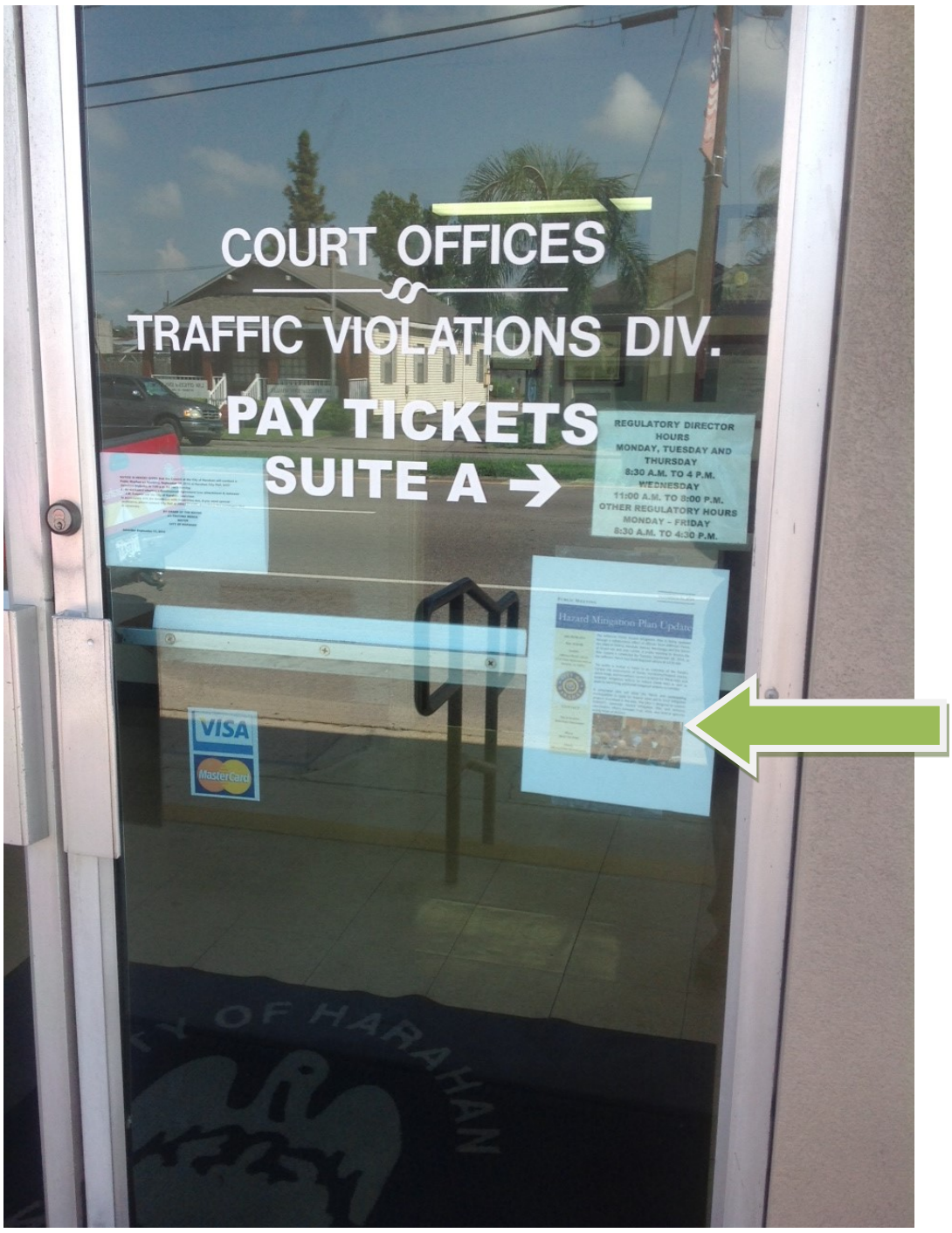
Contact

City of Westwego

Phone:
(504) 341-3424

E-mail:
LisaTapia@cityofwestwego.com

Example of Posting on City of Harahan's City Hall



Public Meeting #2 Agenda

Jefferson Parish Hazard Mitigation Plan Update

Meeting – September 30, 2014
10:30 AM-12:30 PM
Jefferson Parish EB Regional Library

1) Welcome/Sign-In/Introductions

2) Mitigation Plan Update
   a. Review Schedule of Tasks
   b. Discuss Resolutions and Plan Adoption
   c. Review Assessments
      i. View PowerPoint Presentation
      ii. Complete activity
      iii. Discuss hurricane events

3) Other Business
   a. Next meeting date/location: _____
   b. Meeting goals: _____

Notes/Comments:

_____

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Public Meeting #2 Meeting Minutes

1. Welcome/Sign-In/Introductions

Ms. Gonzales welcomed everyone to the meeting and introduced herself and representatives from Jefferson Parish and the separate municipalities who were in attendance. Staff and attendees were asked to sign the sign-in sheet. The sign-in sheet is included below. Ms. Gonzales gave a brief recap on the purpose and process of the Multi-Jurisdictional Hazard Mitigation Plan that Jefferson Parish is in the process of updating.

2. Mitigation Plan Update

a. Review Schedule of Tasks

Ms. Olivier informed the group that the team is finalizing the hazard profiles. She has been sending them one by one to GOHSEP for initial review. This process is going well as it is helpful getting feedback as we update each profile to ensure all the necessary components are included. The team will be shifting focus for the next 3-4 weeks to work on the risk assessments. The goal is to send a draft of the plan update to GOHSEP by early November 2014.

b. Discuss Resolutions and Plan Adoption

All of the resolutions have been approved. Regarding plan adoption, FEMA is asking for at least 10 weeks to review the plan. The team's goal is to have the document to Council as Approval Pending Adoption (APA) by February 2015.

c. Review Assessments

i. View PowerPoint Presentation

In accordance with FEMA requirements, the plan only addresses natural hazards. Ms. Gonzales gave an overview of the hazards to be included in the plan, some of which included flood, hurricanes, tropical storms, lightning, and tornadoes. She explained how some hazards result from other hazards. For instance, storm surge often results from the strong winds of hurricanes and tropical storms. This overlap can make it challenging to assessing the different risks.

ii. Complete activity

The audience was asked to complete an activity where they proposed mitigation actions for the top hazards identified at the first public meeting. With each hazard topic, Ms. Gonzales discussed a few of the mitigation actions completed in recent years in Jefferson Parish. The team reviewed the strategies listed in the 2010 mitigation plan. While the group will continue to work towards those projects not complete, the team would like to incorporate new ideas as we move forward.

iii. Discuss hurricane events

The Mitigation Planning Team led an open discussion with the audience on past hurricane events and what they experienced during those events to help better describe the profile narratives.

Some of the guiding questions included: What was your experience? How deep did the water get? How long were you out of work? Etc...

H. Gustav – Affected mostly Upper Jefferson. Gretna mostly suffered from wind damage.

H. Ike – Mostly affected Lower Jefferson.

T.S. Ida – Caused a lot of beach erosion in Grand Isle.

T.S. Lee – Mostly affected lower Jefferson. Only a few homes flooded in Lafitte as they were able to hold most of the water back.

H. Isaac – The Parish shut down for Isaac. There were extended power outages for over a week; parts of Metairie were out of power for up to seven days and Westwego for four days. Lafitte was issued a mandatory evacuation which was good because they were inundated. The current levee system does not protect Lafitte or Grand Isle from flooding.

The discussion shifted onto mitigation. One audience member pointed out that when you get rid of the water, you get subsidence from drying out the land. She suggested we include permeable landscaping, rain swells and rain gardens in our proposed projects.

The Director of Hazard Mitigation for Orleans Parish shared a success story of their drainage projects. Their drainage improvements have made great impacts on flooding in that they see a lot less flooding now. The City of Gretna also stated how better building codes, drainage projects, and elevation grants have all helped to alleviate the risk of flooding in Gretna. The City of Kenner shared that sentiment as they have a lot of Severe Repetitive Loss (SRL) properties and elevating these homes has significantly helped. They also have been adding in landscaping to slow down runoff in their comprehensive zoning plans.

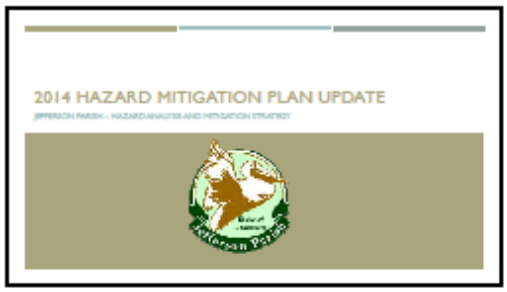
A representative from GOHSEP made the point the mitigation is to protect "life" AND "property". Lightning is a constant risk; one of the highest risk areas in the country. Approximately $50 million in damage has been reported from lightning vs $1 million in damages from wildfires. While elevating homes is an effective strategy for flooding, the mitigation strategy for lightning could be to educate the public to go inside when they see lightning.

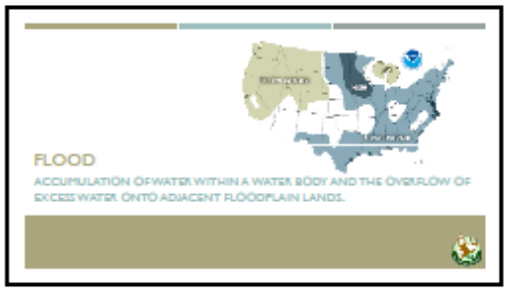
One final topic included tornadoes. Eleven recorded tornadoes have hit Jefferson Parish since 2008. In Westwego, tornadoes often hit one particular neighborhood that is fairly new. Knowing that this neighborhood is a hot spot for tornadoes can help developers look for

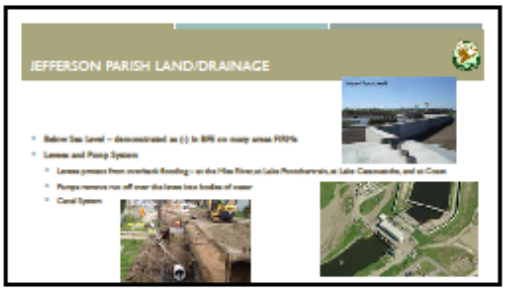
other “problem” areas when looking to expand development. Ms. Gonzales concluded the discussion with this statement: “While we need to try to prevent flooding, we also need to be looking at other hazards.”

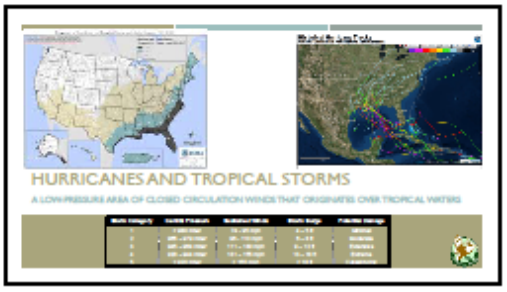
The meeting adjourned at 11:55 AM.

PowerPoint Presentation





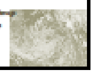




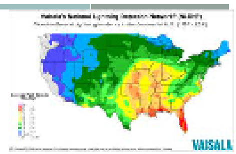
HURRICANES AND TROPICAL STORMS IN JEFFERSON PARISH

History since 2008

- Aug. 3, 2008 – TS Edouard
- Sept. 1, 2008 – Hurricane Gustav – Category 2
- Sept. 11, 2008 – Hurricane Ike – Category 2
  - Caused substantial damage in lower Jefferson in areas such as Lafitte and Grand Isle
    - Flooding from storm surge
    - Trees and Utility Poles knocked down
- Nov. 9, 2009 – TS Ida
  - Beach erosion, levees threatened, barrier island degradation
- Sept. 2, 2011 – TS Lee
  - Storm surge and rainfall
- Aug. 28, 2012 – Hurricane Isaac – Category 1
  - 48+ hours of TS force winds
    - Downed trees and power lines, roof damage
  - Storm Surge flooding in coastal areas



HURRIC…



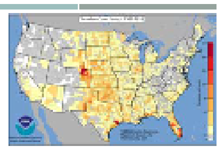
LIGHTNING

BUILDUP OF CHARGED IONS IN A THUNDERCLOUD; THE DISCHARGE OF A LIGHTNING BOLD INTERACTS WITH THE BEST CONDUCTING OBJECT OR SURFACE ON THE GROUND

LIGHTNING IN JEFFERSON PARISH

Occurrences since 2008

- April 4, 2012 – struck a home in old Jefferson causing a fire
- Strikes occur regularly but no other damage has been documented



TORNADOS

RAPIDLY ROTATING VORTEX OR FUNNEL OF AIR EXTENDING GROUND WARD FROM A CUMULONIMBUS CLOUD

TORNADOS IN JEFFERSON PARISH

Occurrences since 2008

Location	Date	Magnitude	Damage
Estelle	[illegible]	EF1	13 houses, 1 injury
Waggaman	[illegible]	EF1	[illegible] structures damaged, [illegible] destroyed
Harahan	[illegible]	EF0	Trees, fences, and [illegible]
Waggaman	[illegible]	EF0	Snapped tree limbs, power poles and lines
[illegible]	[illegible]	EF0	Power poles and fences; trees uprooted; 1 house damaged by fallen tree
Grand Isle	[illegible]	EF0	Downed power lines and 1 roof damaged
Grand Isle	[illegible]	EF1	Roof and siding damage
Terrytown	[illegible]	EF0	Gas station sign and restaurant canopy
Kenner	[illegible]	EF0	Snapped trees, overturned a car
[illegible]	[illegible]	EF1	Downed power lines, light poles, limbs off of trees
Grand Isle	[illegible]	EF0	Power lines snapped, roof damage

MITIGATION ACTIONS

Current Actions

- Extend current levees
- Add backup power to fire stations, pump stations, and [illegible] medical centers
- Promote Flood Insurance
- Increase public awareness
- Sponsor a multi-hazard week
- Pursue elevation and flood proofing of RL and SRL
- Feasible drainage projects
- Adopt International Building Codes
- Develop subdivisions guidelines help to reduce flooding

Future Actions

- Continued mitigation of SRL and RL properties
  - Elevation
  - Reconstruction
  - Higher building codes
- Continued retrofit of government buildings
  - Windows
  - Roofs
  - Generators
- Retrofit of utility infrastructure
- Increased flood and storm surge protection

CONTACT INFO

Thanks for attending and participating

Audience Activity

Name: _____ HMP Update Public Meeting 2

Activity

Top 5 Identified Hazards in JP	Proposed Mitigation Actions
Floods	
Hurricanes/Tropical Storms	
Storm Surge	
Sea Level Rise	
Coastal Erosion	

Sample of Audience Responses

Name: Vicki Holmes

HMP Update Public Meeting 2

Activity

Top 5 Identified Hazards in JP	Proposed Mitigation Actions
Floods	Elevation Floodproofing Retention/Detention ponds - use existing parks?
Hurricanes/Tropical Storms	Harden critical facilities Underground power lines
Storm Surge	Offshore barriers
Sea Level Rise	
Coastal Erosion	1) Beach restoration 2) offshore reefs / barriers / breakers

Proposed Mitigation Actions
- Water retention ponds - eco Friendly Bio Swalls - planting plants/trees/vegitation that soak up & filter water

Name: Dorothea Dell (Miss)

HMP Update Public Meeting 2

Activity

Top 5 Identified Hazards in JP	Proposed Mitigation Actions
Floods	Plant trees, create rain gardens & bioswales to clean water of pollutants & slow it before it enters the lake. Retention ponds aerated by solar power. Roofs & paving & interstates & roads are enemies! Require permeable surfaces. NO slabs - perhaps a cap on amount of paved surfaces.
Hurricanes/Tropical Storms	Evacuate and take your chances.
Storm Surge	
	Reduce carbon emissions! millions of gas-operated edgers, mowers, blowers (all unregulated & unlicensed - anything goes). Inefficient gas-guzzling SUV's! CONSERVE IN ALL THINGS. Climate Change is Real!
	Insurance to cover damage cost.

Name: Mike Stewart

HMP Update Public Meeting 2

Activity

Top 5 Identified Hazards in JP	Proposed Mitigation Actions
Floods	W. Metairie Drainage Canal Upgrade Reconstruct Streets & Utilities lower essentially reducing crown of street Rain Barrels! Permeable Driveways
Hurricanes/Tropical Storms	Wind Retrofit Education Outreach
Storm Surge	River Diversions Environmental Credits -> Alligator Bend Example
Sea Level Rise	Barrier Construction along Bayous to Prevent Erosion => Jean LaFitte Blvd right before Goose Bayou for example
Land Subsidence	SAME as Storm Surge & Sea Level Rise

Name: Reee Hodges

HMP Update Public Meeting 2

Activity

Top 5 Identified Hazards in JP	Proposed Mitigation Actions
Floods	- Do community outreach to educate the public about on-site raingarden & retention ponds - Retrofit pumping stations → what's their current state - How does runoff impact soil & water quality?
Hurricanes/Tropical Storms	- There wasn't much in the presentation on hurricane wind damage. Are there mobile home parks in the area that may be vulnerable? I've seen tie downs/clamps effectively used to mitigate wind damage
Storm Surge	- Wetland redevelopment
Sea Level Rise	- Long term sustainability outreach for the public regarding the impact of personal actions & climate change (Maybe a long shot, but interesting!)
Hail Storms	- Building codes related to roofing - Mobile Home focused actions

Public Meeting #2 Sign-In Sheet

Sign In Sheet

Name	Title	Community/Agency	Email Address	Initial
Michelle Gonzales	Director - Floodplain Mgmt	Jefferson Parish	mgonzales@jeffparish.net	MG
Maggie Olivier	Floodplain/CRS Specialist	Jefferson Parish	molivier@jeffparish.net	MLO
Danika Gorrondona	Building Official/Director	City of Gretna	dgorrondona@gretnala.com	DG
Michael Wesley	IT Manager	City of Gretna	mwesley@gretnala.com	
Jeff Charlet	Director - Regulatory Dept	City of Harahan	jeff.charlet@ci.harahan.la.us	JC
Aimee Vallot	Director - Inspection/Code	City of Kenner	avallot@kenner.la.us	
Dana Fink	Secretary - Inspection/Code	City of Kenner	dfink@kenner.la.us	
Theresa Armstrong	Planner/GIS Specialist	City of Kenner	tarmstrong@kenner.la.us	
Lisa Tapia	CRS Coordinator	City of Westwego	lisatapia@cityofwestwego.com	
Nora Combel	Building Official	Town of Grand Isle	nora_combel@yahoo.com	
Yvette Crain	Town Clerk	Town of Jean Lafitte	ycrain@townofjeanlafitte.com	YC.
Nicolette English	Hazard Mitigation Planner	GOHSEP	nicolette.english@la.gov	NE
Jonathan Smith	ISO/CRS Specialist	ISO	jonathan.smith@verisk.com	
Suzie Sumpter	Hazard Mitigation Specialist	HGA	ssumpter@hga-llc.com	
Billy Poche	Project Manager	HGA	bpoche@hga-llc.com	
Melonie Ellzey	Hazard Mitigation Specialist	HGA	mellzey@hga-llc.com	ME

September 30, 2014 JP Hazard Mitigation Plan Update Meeting 2 Jefferson Parish EB Regional Library - Metairie

Sign In Sheet

Name	Title	Community/Agency	Email address
Vicki Holmes			vicki.holmes@cox.net
Wife Andrews		SDMI, LSU	jandrews1@lsu.edu
Grace Bonura	GIS	JP GIS	GBONURA@JEFFPARISH.NET
Ridley Boudreaux	EMS DIRECTOR	J.P.	RBOUDREAUX@JEFFPARISH.NET
Aimee C. Vallot	Code Enf. Dir.	City of Kenner	avallot@kenner.la.us
Lisa Tapia	CRS	Westwego	lisatapia@cityofwestwego.com
Brad Case	Director of Mitigation City of New Orleans		bwcase@nola.gov
Kelle Hodges	Student	Tulane	rhodges3@tulane.edu
Mike Stewart	Proj. Coordinator	ZHA	mstewart@bh-engineers.com
Dorothea Dell	interested citizen		dorotheadell@msn.com

September 30, 2014 JP Hazard Mitigation Plan Update Meeting 2 Jefferson Parish EB Regional Library - Metairie

*Follow up was conducted with the Town of Grand Isle through phone calls after the meeting.

Public Meeting #2 Photo of the Mitigation Planning Team

Mitigation Planning Team (MPT) Meeting #2

The second MPT meeting was held on October 21, 2014 at the Mel Ott Center located at 2301 Belle Chasse Highway in Gretna. The meeting began at 10:30 AM.

MPT Meeting #2 Agenda

Jefferson United Mitigation Professionals (JUMP)

Monthly Meeting – October 21, 2014
10:30 AM-12:30 PM
Mel Ott Center

1) Welcome/Sign-In
2) Mitigation Plan Update
    a. Finalize Worksheets (just a few blanks left)
    b. Discuss Status of Plan Components
3) Outreach Banner
    a. Review Layout Idea
    b. Vote on Slogan
4) PPI Development
    a. Review Public Information Inventory
    b. Collect Additional Names for Committee
    c. Identify Target Audiences
5) Other Business
    a. Upcoming Webinars and Conferences (see handout)
    b. FLOAT Updates?
    c. Next Meeting Date/Location: _____
    d. Meeting Goals: _____

Notes:

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MPT Meeting #2 Meeting Minutes

(Note: These minutes only describe agenda item 2-Mitigation Plan Update)

2. Mitigation Plan Update

a. Finalize Worksheets

Ms. Olivier led the discussion on what was needed to finalize the worksheets that GOHSEP required. Harahan needs to confirm whether or not they have a Capital Improvements Plan, Stormwater Management Plan, Capital Improvements project funding, and the authority to levy taxes for specific purposes. Kenner needs to confirm whether or not they have the capability to do HAZUS Analysis and if they have a natural disaster or safety related school program.

b. Discuss Status of Plan Components

Twelve hazard profiles have been submitted to the state (GOHSEP) for initial review. GOHSEP and FEMA have approved tornadoes, lightning, and hailstorms. Storm surge-a little more data has been added to Hurricane Isaac narrative. Floods-we are awaiting SCADA data to note the rainfall amounts for the highlighted events. Also, with the help of the Jefferson Parish GIS Department, we will be adding FIRM representations separated out by jurisdiction in this section.

Subsidence and coastal erosion will need more extent for the jurisdictions. GOHSEP suggested we use the data in the map packages they created for the state plan but are having challenges with accessing them at this time.

MPT Meeting #2 Sign-In Sheet

Sign In Sheet

Name	Title	Community/Agency	Email Address	Initial
Michelle Gonzales	Director - Floodplain Mgmt	Jefferson Parish	mgonzales@jeffparish.net	
Maggie Olivier	Floodplain/CRS Specialist	Jefferson Parish	molivier@jeffparish.net	MLO
Danika Gorrondona	Building Official/Director	City of Gretna	dgorrondona@gretnala.com	
Michael Wesley	IT Manager	City of Gretna	mwesley@gretnala.com	
Jeff Charlet	Director - Regulatory Dept	City of Harahan	jeff.charlet@ci.harahan.la.us	
Aimee Vallot	Director - Inspection/Code	City of Kenner	avallot@kenner.la.us	
Dana Fink	Secretary - Inspection/Code	City of Kenner	dfink@kenner.la.us	
Theresa Armstrong	Planner/GIS Specialist	City of Kenner	tarmstrong@kenner.la.us	
Lisa Tapia	CRS Coordinator	City of Westwego	lisatapia@cityofwestwego.com	
Yvette Crain	Town Clerk	Town of Jean Lafitte	ycrain@townofjeanlafitte.com	
Jonathan Smith	ISO/CRS Specialist	ISO	jonathan.smith@verisk.com	
Pam Lightfoot	Floodplain Mgmt Program Coord/CRS Specialist for the State	LaDOTD	pam.lightfoot@la.gov	
Monica Farris	Director	UNO-CHART	mateets@uno.edu	MTF
Suzie Sumpter	Hazard Mitigation Specialist	HGA	ssumpter@hga-llc.com	
Melonie Ellzey	Hazard Mitigation Specialist	HGA	mellzey@hga-llc.com	

October 21, 2014 JUMP CRS Meeting Mel Ott Center in Gretna

*Follow up was conducted with the Town of Grand Isle through phone calls after the meeting.

Appendix B
Summary of Changes

As part of the Jefferson Parish 2015 Hazard Mitigation Plan (HMP) Update Process, the updated plan was formatted to comply with the guidelines given in FEMA's Local Mitigation Planning Handbook. In addition to the requirements/suggestions given in this Handbook, the Interim Final Rule (IFR) was utilized and the plan was updated to comply with those rules as well.

The general design of the plan was modified to provide a more "streamlined" approach to the HMP so that it is better used in carrying out the identified strategies. The most notable of these changes is the combining of the Hazard profiles, rankings, and risk assessments into one section. The municipality vulnerability to each hazard is also located within the same section, allowing persons using the HMP to locate all hazard information in one location of the Plan.

Plans Reviewed:

- City of Gretna Flood Hazard Mitigation Plan
- Coastal Wetland Conservation and Restoration Plan
- Comprehensive Drainage Master Plan
- Debris Removal Plan
- FIRMs
- Flood Insurance Study, Jefferson Parish, LA, Incorporated and Unincorporated Areas, November 9, 2012
- Jefferson Parish Comprehensive Plan
- Jefferson Parish Emergency Operations Plan
- Louisiana State Hazard Mitigation Plan 2014
- Southeast Louisiana Hurricane Preparedness Study 1994
- State Coastal 2050 Plan
- State of Louisiana Wetlands Conservation and Restoration Plan
- Stormwater Management Plan
- Wetlands Conservation and Restoration Plan

Appendix C

Memorandum of Agreement for a Multi-Jurisdictional Hazard Mitigation Planning Team Resolutions

and

Adoption Resolutions

Memorandum of Agreement for a Multi-Jurisdictional Hazard Mitigation Planning Team Resolutions

Jefferson Parish

On joint motion of all Councilmembers present, the following resolution was offered:

RESOLUTION NO. 123441

A resolution ratifying a Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015. (Parishwide)

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015; and

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects; and

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update; and

WHEREAS, Jefferson Parish seeks to complete a Multi-Jurisdictional Hazard Mitigation Plan to include all municipalities within Jefferson Parish; and

WHEREAS, it is in the best interest of all parties and the citizens of Jefferson Parish to provide commitment and cooperation in the development this Multi-Jurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED, by the Jefferson Parish Council, the governing authority of said Parish:

SECTION 1. That the Council Chairman does hereby ratify the terms of the Memorandum of Agreement between the Parish of Jefferson City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

SECTION 2. That there shall be no cost for Jefferson Parish pursuant to this agreement.

SECTION 3. That the Chairman of the Jefferson Parish Council, on in his absence the Vice-Chairman, be and is authorized to execute any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 6 **NAYS: None** **ABSENT: (1) Roberts**

The resolution was declared to be adopted on this the **27th day of August, 2014.**

THE FOREGOING IS CERTIFIED
TO BE A TRUE & CORRECT COPY

Eula A. Lopez

EULA A. LOPEZ
PARISH CLERK
JEFFERSON PARISH COUNCIL

City of Gretna

On motion by **Councilman Rau** and seconded by **Councilman Crosby,** the following resolution was offered:

RESOLUTION NO. 2014-046

A resolution authorizing Mayor Belinda C. Constant to enter into a Memorandum of Agreement (MOA) for a Multi-Jurisdictional Hazard Mitigation Planning Team on behalf of the City of Gretna, Louisiana.

WHEREAS, "Participating jurisdictions" in this MOA are Parish of Jefferson; Town of Grand Isle; City of Gretna; City of Harahan; Town of Jean Lafitte, City of Kenner and City of Westwego; and

WHEREAS, the purpose of this MOA is to establish commitment from and a cooperative working relationship between all Participating Jurisdictions in the development and implementation of the Jefferson Parish Hazard Mitigation Plan Update 2015; and

WHEREAS, the intent of this MOA is to ensure that the multi-jurisdictional hazard mitigation plan is developed in accordance with Title 44 of the Federal Code of Regulations (CFR) Part 201.6; and

WHEREAS, that the planning process will be conducted in an open manner involving community stakeholders; that will be consistent with each participating jurisdiction's policies, programs and authorities; and will be an accurate reflection of community's values; and

WHEREAS, this MOA sets out the responsibilities of all parties and identifies the work to be performed by each participating jurisdiction.

NOW, THEREFORE, BE IT RESOLVED, by the City Council, acting as legislative authority for the City of Gretna, Louisiana that:

Mayor Belinda C. Constant is hereby authorized to enter into a Memorandum of Agreement (MOA) for a Multi-Jurisdictional Hazard Mitigation Planning Team on behalf of the City of Gretna, Louisiana.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

Yeas: **Council Members Rau, Crosby, Miller, Marino and Berthelot**

Nays: None

Absent: None

ADOPTED: AUGUST 13, 2013

/S/ NORMA-JEAN CRUZ
CITY CLERK
CITY OF GRETNA
STATE OF LOUISIANA

/S/ BELINDA C. CONSTANT
MAYOR
CITY OF GRETNA
STATE OF LOUISIANA

A TRUE COPY:

CITY CLERK
CITY OF GRETNA

City of Harahan

The following resolution was offered unanimously by the Council:

RESOLUTION NO. 2014 - 515

A resolution ratifying a Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015. (Parishwide)

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015;

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects;

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update;

WHEREAS, Jefferson Parish seeks to complete a Multi-Jurisdictional Hazard Mitigation Plan to include all municipalities within Jefferson Parish; and

WHEREAS, it is in the best interest of all parties and the citizens of Jefferson Parish to provide commitment and cooperation in the development of this Multi-Jurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED, by the Harahan City Council, acting as governing authority of said city that:

SECTION 1. The Harahan City Council does hereby commit to the efforts that will result in a Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

SECTION 2. There shall be no cost for the City of Harahan pursuant to this agreement.

SECTION 3. The Mayor of the City of Harahan, and in his absence, the Mayor Pro Tempore, be and is authorized to execute any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: Baudier, Chatelain, Huete, Landry, Murray
NAYS: None
ABSENT: None
ABSTENTION: None

And this resolution was declared adopted on the 21st day of August, 2014.

Provino Mosca
Mayor
City of Harahan

Nicole Lee

Nicole Lee
City Clerk
City of Harahan

City of Kenner

On motion of Councilmember DeFrancesch, seconded by Councilmember Conley, the following resolution was offered:

RESOLUTION NO. B-16525

A RESOLUTION APPROVING A MEMORANDUM OF AGREEMENT BETWEEN CITY OF KENNER, PARISH OF JEFFERSON, CITY OF GRETNA, TOWN OF GRAND ISLE, CITY OF HARAHAN, TOWN OF JEAN LAFITTE, AND CITY OF WESTWEGO RELATIVE TO ESTABLISHING A COMMITMENT IN THE DEVELOPMENT OF THE JEFFERSON PARISH MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN UPDATE 2015

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015; and,

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects; and,

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update; and,

WHEREAS, the City of Kenner desires to coordinate with Jefferson Parish to complete a Multi-Jurisdictional Hazard Mitigation Plan that will include all municipalities within Jefferson Parish; and,

WHEREAS, it is in the best interest of all parties and the citizens of Kenner to provide commitment and cooperation in the development of this Multi-Jurisdictional Hazard Mitigation Plan Update.

THE COUNCIL FOR THE CITY OF KENNER HEREBY RESOLVES:

SECTION ONE: That a Memorandum of Agreement between City of Kenner, Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015 is hereby approved.

SECTION TWO: That pursuant to Section 3.09 of the Charter for the City of Kenner of 1974, amended, the Mayor of the City of Kenner is authorized to execute all contracts, agreements, instruments of debt and the like for which the City is obligated.

This resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 7
NAYS: 0
ABSENT: 0
ABSTAINED: 0

This resolution was declared adopted on this, the 7th day of August, 2014.

Natalie Hall
CLERK OF THE COUNCIL

Mona C. DeFrancesch
PRESIDENT OF THE COUNCIL

Michael S. Yenni
MAYOR

City of Westwego

On motion by Councilman Nobles, and seconded by Councilman Toups, the following resolution was introduced:

RESOLUTION 2014-08(B)

A resolution authorizing Mayor John I. Shaddinger, on behalf of the City of Westwego, to execute any and all documents necessary to enter into the Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015; and

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects; and

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update; and

WHEREAS, Jefferson Parish seeks to complete a Multi-Jurisdictional Hazard Mitigation Plan to include all municipalities within Jefferson Parish; and

WHEREAS, it is in the best interest of all parties and the citizens of Jefferson Parish to provide commitment and cooperation in the development this Multi-Jurisdictional Hazard Mitigation Plan Update.

NOW THEREFORE, IT IS HEREBY RESOLVED, by the Mayor and City Council of the City of Westwego, Louisiana, acting as full governing authority of said City that:

Mayor John I. Shaddinger, Jr. is hereby authorized, on behalf of the City of Westwego, to execute any and all documents necessary to enter into the Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

The foregoing resolution having been read in full, the roll was called on the adoption thereof, and the resolution was adopted by the following votes:

Yeas: Green, Nobles, Fonseca, Toups, Warino
Nays: None
Abstained: None
Absent: None

Adopted: Monday, August 11, 2014

John I Shaddinger, Jr., Mayor

Michelle A. Norris, City Clerk

Town of Grand Isle

RESOLUTION NO. 2674

A resolution ratifying a Memorandum of Agreement between the Parish of Jefferson, City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015. (Parish wide)

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015; and

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects; and

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update; and

WHEREAS, Jefferson Parish seeks to complete a Multi-Jurisdictional Hazard Mitigation Plan to include all municipalities within Jefferson Parish; and

WHEREAS, it is in the best interest of all parties and the citizens of Jefferson Parish to provide commitment and cooperation in the development this Multi-Jurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED, by the Jefferson Parish Council, the governing authority of said Parish:

SECTION 1. That the Council Chairman does hereby ratify the terms of the Memorandum of Agreement between the Parish of Jefferson City of Gretna, Town of Grand Isle, City of Harahan, Town of Jean Lafitte, City of Kenner, and City of Westwego relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

SECTION 2. That there shall be no cost for Jefferson Parish pursuant to this agreement.

SECTION 3. That the Chairman of the Jefferson Parish Council, on in his absence the Vice-Chairman, be and is authorized to execute any and all documents necessary to give full force and effect to this resolution.

This resolution was offered by Council Member Clifford Santiny, Jr. and seconded by Council Member Lafont.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: Ray Santiny, Lafont, Clifford Santiny, Jr., Bladsacker

NAYS: Resweber

ABSENT: 0

This resolution was declared adopted this 23rd day of September, 2014

David J. Camardelle, Mayor
Town of Grand Isle

ATTESTED:

Ray A. Santiny, Town Clerk
Town of Grand Isle

Town of Jean Lafitte

RESOLUTION #1855

On motion by Councilman Smith and seconded by Councilman Creppel the following resolution was adopted:

> A resolution ratifying a Memorandum of Agreement between the Parish of Jefferson and the Town of Jean Lafitte relative to establishing a commitment in the development of the Jefferson Parish Multi-Jurisdictional Hazard Mitigation Plan Update 2015.

WHEREAS, in March of 2014, the Federal Emergency Management Agency (FEMA) notified Jefferson Parish that the current Jefferson Parish Hazard Mitigation Plan will expire in March of 2015; and

WHEREAS, a current Hazard Mitigation Plan is needed to receive funding from FEMA for Hazard Mitigation projects; and

WHEREAS, in July of 2014, the Governor's Office of Homeland Security and Emergency Preparedness (GOHSEP) provided Jefferson Parish with funding to assist in the development of the Jefferson Parish Hazard Mitigation Plan Update; and

WHEREAS, Jefferson Parish seeks to complete a Multi-Jurisdictional Hazard Mitigation Plan to include all municipalities within Jefferson Parish; and

WHEREAS, it is in the best interest of all parties and the citizens of the Town of Jean Lafitte to provide commitment and cooperation in the development this Multi-Jurisdictional Hazard Mitigation Plan Update.

WHEREAS, the Mayor is authorized to execute any and all documents necessary to give full force and effect to this resolution.

NOW, THEREFORE, BE IT RESOLVED, by the Mayor and Councilmen of the Town of Jean Lafitte a municipal corporation domiciled in the Parish of Jefferson acting as governing authority of said town:

This resolution was submitted to a vote and the vote was thereon as follows:

YEAS: 4
Councilman Bartholomew
Councilman Creppel
Councilman Guillie
Councilman Smith

NAYS: 0

ABSENT: 1
Councilman LeBeau

This resolution was hereby adopted
On this 13th day of August 2014.

Mayor

Town Clerk

Adoption Resolutions

Jefferson Parish

On motion of **Mr. Lagasse**, and seconded by **Mr. Roberts,** present, the following resolution was offered:

RESOLUTION NO. 124846

A resolution authorizing the Jefferson Parish Council to adopt the revised 2015 Multijurisdictional Hazard Mitigation Plan Update prepared and completed by Jefferson Parish Floodplain Management and Hazard Mitigation Department, Jefferson Parish Incorporated Municipalities, and Hunt, Guillot & Associates, LLC (HGA), under contract RP-0311, utilizing funding provided from HMGP Grant #4080-0005-051(3-P). (Parishwide)

WHEREAS, Jefferson Parish previously received approval from the Federal Emergency Management Agency (FEMA) the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010 and said plan is required to be revised every five (5) years; and

WHEREAS, Jefferson Parish recognizes the threat that natural hazards pose to people within Jefferson Parish; and

WHEREAS, Jefferson Parish Floodplain Management and Hazard Mitigation with Jefferson Parish Incorporated Municipalities and HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, The 2015 Multijurisdictional Hazard Mitigation Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Jefferson Parish from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, Adoption by the Jefferson Parish Council demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED by the Jefferson Parish Council of Jefferson Parish, Louisiana, acting as governing authority of said Parish:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, is hereby granted.

SECTION 2. The Chairman of the Jefferson Parish Council or in his absence, the Vice Chairman, is hereby authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 7 **NAYS: None** **ABSENT: None**

The resolution was declared to be adopted on this the **29th day of April, 2015.**

THE FOREGOING IS CERTIFIED
TO BE A TRUE & CORRECT COPY

Eula A. Lopez

EULA A. LOPEZ
PARISH CLERK
JEFFERSON PARISH COUNCIL

City of Gretna

On motion of **Councilman Rau** and seconded by **Councilman Crosby,** the following resolution was offered:

RESOLUTION NO. 2015-029

A resolution authorizing the City of Gretna Council to adopt the revised 2015 Multi-Jurisdictional Hazard Mitigation Plan Update prepared and completed by City of Gretna, Jefferson Parish Floodplain Management and Hazard Mitigation Department and Hunt, Guillot & Associates, LLC (HGA), utilizing funding provided from HMGP Grant #4080-0005-051(3-P). (Parishwide)

WHEREAS, City of Gretna previously received approval from the Federal Emergency Management Agency (FEMA) the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010 and said plan is required to be revised every five (5) years; and

WHEREAS, City of Gretna recognizes the threat that natural hazards pose to people within Jefferson Parish; and

WHEREAS, City of Gretna, Jefferson Parish Floodplain Management and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multi-Jurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, The 2015 Multi-Jurisdictional Hazard Mitigation Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Gretna from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multi-Jurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, adoption by the Gretna City Council demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multi-Jurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED, by the City Council of the City of Gretna, acting as legislative authority of said City, that:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, is hereby granted.

SECTION 2. Mayor Belinda C. Constant is hereby authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

Yeas: **Councilmen Rau, Crosby, Marino, Miller and Berthelot**

Nays: None

Absent: None

ADOPTED: MAY 13, 2015

/S/ NORMA J. CRUZ
CITY CLERK
CITY OF GRETNA
STATE OF LOUISIANA

/S/ BELINDA C. CONSTANT
MAYOR
CITY OF GRETNA
STATE OF LOUISIANA

A TRUE AND CORRECT COPY:

Norma J. Cruz

CITY CLERK
CITY OF GRETNA

City of Harahan

The following Resolution was offered unanimously by the Council of the City of Harahan.

RESOLUTION NO. 2015 - 531

A resolution authorizing the City of Harahan Council to adopt the revised Multijurisdictional Hazard Mitigation Plan Update prepared and completed by the City of Harahan, Jefferson Parish Floodplain Management and Hazard Mitigation Department and Hunt, Guillot & Associates, LLC, utilizing funding provided from HMGP Grant #4080-0005-051(3-P).

WHEREAS, the City of Harahan previously received approval from the Federal Emergency Management Agency (FEMA) the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010, and said plan is required to be revised every five (5) years; and

WHEREAS, the City of Harahan recognizes the threat that natural hazards pose to people within the Parish of Jefferson; and

WHEREAS, the City of Harahan, Jefferson Parish Floodplain Management and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the 2015 Multijurisdictional Hazard Mitigation Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Harahan from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, Adoption by the City of Harahan Council demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED by the Harahan City Council acting as the governing authority of said city that:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, be granted.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: Baudier, Benton, Huete, Johnston, Wheeler
NAYS: None
ABSENT: None
ABSTENTION: None

And this resolution was declared adopted on this 21st day of May, 2015.

Nicole Lee

Nicole Lee
City Clerk

City of Kenner

On motion of Councilmember Conley, seconded by Councilmember DeFrancesch, the following resolution was offered:

RESOLUTION NO. B-16607

A RESOLUTION ADOPTING THE REVISED 2015 MULTIJURISDICTIONAL HAZARD MITIGATION PLAN UPDATE PREPARED AND COMPLETED BY THE CITY OF KENNER, JEFFERSON PARISH FLOODPLAIN MANAGEMENT AND HAZARD MITIGATION DEPARTMENT, AND HUNT, GUILLOT & ASSOCIATES, LLC, UTILIZING FUNDING PROVIDED BY HMGP GRANT #4080-0005-051(3-P)

WHEREAS, the City of Kenner previously received approval from the Federal Emergency Management Agency (FEMA) of the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010 and said plan is required to be revised every five (5) years; and,

WHEREAS, the City of Kenner recognizes the threat that natural hazards pose to people within Jefferson Parish; and,

WHEREAS, the City of Kenner, Jefferson Parish Floodplain Management and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and,

WHEREAS, the 2015 Multijurisdictional Hazard Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in the City of Kenner from the impacts of future hazards and disaster; and,

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and,

WHEREAS, adoption by the City of Kenner demonstrates commitment to hazard mitigation and achieving the goals outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

THE COUNCIL FOR THE CITY OF KENNER HEREBY RESOLVES:

SECTION ONE: That the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by the Federal Emergency Management Agency, is hereby adopted.

SECTION TWO: That the Mayor of the City of Kenner, in his executive capacity, is authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

This resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 7
NAYS: 0
ABSENT: 0
ABSTAINED: 0

This resolution was declared adopted on this, the 21st day of May, 2015.

Natalie Hall
CLERK OF THE COUNCIL

Keith McRaymond
PRESIDENT OF THE COUNCIL

Michael S. Yenni
MAYOR

City of Westwego

On motion by, and seconded by, All Councilmen, the following resolution was offered:

RESOLUTION 2015-05(B)

A resolution authorizing the City of Westwego to adopt the revised 2015 Multijurisdictional Hazard Mitigation Plan Update prepared and completed by Westwego, Jefferson Parish Floodplain Management and Hazard Mitigation Department and Hunt, Guillot & Associates, LLC, utilizing funding provided from HMGP Grant #4080-0005-051(3-P). (Parish wide)

WHEREAS, the City of Westwego previously received approval from the Federal Emergency Management Agency (FEMA) for the initial Hazard Mitigation Plan (HMP) on September 16, 2005 and the HMP update on March 11, 2010, and said plan is required to be revised every five (5) years; and

WHEREAS, the City of Westwego recognizes the threat that natural hazards pose to people within Jefferson Parish; and

WHEREAS, the City of Westwego, Jefferson Parish Floodplain Management, and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, the 2015 Multijurisdictional Hazard Mitigation Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in City of Westwego from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, adoption by the City of Westwego Council demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Westwego, Louisiana, acting as governing authority of said city, that:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, is hereby granted.

SECTION 2. The Mayor of the City of Westwego or in his absence, the Mayor Pro Tempore, is hereby authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

Yeas: Green, Nobles, Fonseca, Toups, Warino
Nays: None
Absent: None
Abstained: None

Adopted: Monday, May 11, 2015

John I. Shaddinger Jr., Mayor

Maurice T. Bourgeois, Jr., Interim City Clerk

Town of Grand Isle

RESOLUTION NO. 2685

A resolution authorizing the Town of Grand Isle Town Council to adopt the revised 2015 Multijurisdictional Hazard Mitigation Plan update prepared and completed by The Town of Grand Isle, Jefferson Parish Floodplain Management and hazard Mitigation Department and Hunt, Guillot & Associates, LLC. utilizing funding provided from HMGP #4080-0005-051(3-P). (Parishwide).

WHEREAS, The Town of Grand Isle previously received approval form the Federal Emergency Management Agency (FEMA) the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010 and said plan is required to be revised every five (5) years; and

WHEREAS, The Town of Grand Isle recognizes the threat that natural hazards pose to people within Jefferson Parish; and

WHEREAS, The Town of Grand Isle, Jefferson Parish Floodplain Management and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, The 2015 Multijurisdictional Hazard Mitigation Plan Updated identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Grand isle from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, Adoption by The Town of Grand isle Council demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOVED BY the Town Council of the Town of Grand Isle, Jefferson Parish, Louisiana that:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, be granted.

SECTION 2. the Mayor of the Town of Grand isle or in his absence, the Mayor Pro-Tempore, is hereby authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

This resolution was offered by Council Member Lafont and seconded by Council Member Ray Santiny.

Vote thereon as follows:

YEAS: Ray Santiny, Jay Lafont, Clifford Santiny, Jr.
NAYS: Stephen Resweber, Leoda Bladsacker
ABSENT: 0

This resolution was declared adopted this 9th day of June, 2015.

David J. Camardelle, Mayor
Town of Grand Isle

ATTESTED:

Ray A. Santiny, Town Clerk

Town of Jean Lafitte

RESOLUTION # 1894

On motion of Councilman Guillie and seconded by Councilman Bartholomew the following resolution was adopted:

A resolution authorizing the Town of Jean Lafitte to adopt the revised 2015 Multijurisdictional Hazard Mitigation Plan Update prepared and completed by Town of Jean Lafitte, Jefferson Parish Floodplain Management and Hazard Mitigation Department and Hunt, Guillot & Associates, LLC, utilizing funding provided from HMGP Grant #4080-0005-051(3-P). (Parish wide)

WHEREAS, Town of Jean Lafitte previously received approval from the Federal Emergency Management Agency (FEMA) the initial Hazard Mitigation Plan (HMP) on September 16, 2005, the HMP update on March 11, 2010 and said plan is required to be revised every five (5) years; and

WHEREAS, Town of Jean Lafitte recognizes the threat that natural hazards pose to people within Jefferson Parish; and

WHEREAS, Town of Jean Lafitte, Jefferson Parish Floodplain Management and Hazard Mitigation with HGA has prepared a multi-hazard mitigation plan, hereby known as 2015 Multijurisdictional Hazard Mitigation Plan Update in accordance with the Disaster Mitigation Act of 2000; and

WHEREAS, The 2015 Multijurisdictional Hazard Mitigation Plan Update identifies mitigation goals and actions to reduce or eliminate long-term risk to people and property in Town of Jean Lafitte from the impacts of future hazards and disaster; and

WHEREAS, FEMA has reviewed and approved the 2015 Multijurisdictional Hazard Mitigation Plan Update as of April 15, 2015; and

WHEREAS, Adoption by the Town of Jean Lafitte demonstrates commitment to hazard mitigation and achieving the goals as outlined in the 2015 Multijurisdictional Hazard Mitigation Plan Update.

NOW, THEREFORE, BE IT RESOLVED by the Councilman of the Town of Jean Lafitte acting as governing authority of said town:

SECTION 1. The adoption of the updated Jefferson Parish Hazard Mitigation Plan 2015, as approved by FEMA, be granted.

SECTION 2. The Mayor of the Town of Jean Lafitte, is hereby authorized to sign and approve any and all documents necessary to give full force and effect to this resolution.

The foregoing resolution having been submitted to a vote, the vote thereon was as follows:

YEAS: 5 **NAYS: 0** **ABSENT: 0**

Councilman Bartholomew
Councilman Creppel
Councilman Guillie
Councilman LeBeau
Councilman Smith

The resolution was declared to be adopted on this 8th day of May, 2015.

Mayor

Town Clerk

Appendix D

The following is a general description for each of the hazards listed below. The complete profile for each hazard can be found in Section 6.3 of the 2008 Hazard Mitigation Plan (HMP) Update.

General descriptions completed for the following natural hazards;

1. Floods
2. Hurricanes and Tropical Storms
3. Storm Surge
4. Tornadoes
5. Coastal Erosion
6. Subsidence
7. Hailstorms
8. Winter Storms
9. Lightning
10. Drought
11. Wildfires
12. Earthquakes

1. Floods

Definition of Flood Hazard

Flooding is the accumulation of water within a water body (e.g., stream, river, lake, or reservoir) and the overflow of excess water onto adjacent floodplains. As illustrated in Figure A-1, floodplains are usually lowlands adjacent to water bodies that are subject to recurring floods. Floods are natural events that are considered hazards only when people and property are affected. Nationwide, hundreds of floods occur each year, making them one of the most common hazards in the U.S. (FEMA, 1997). There are a number of categories of floods in the U.S., including the following:

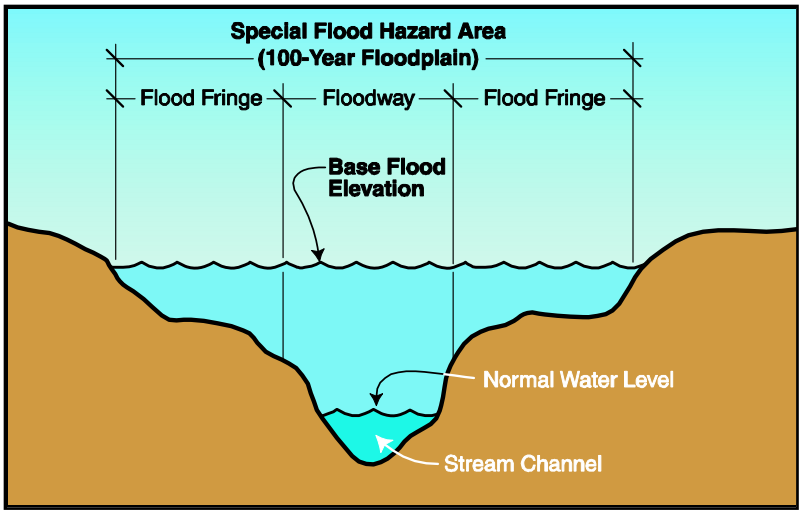
- Riverine flooding, (river channel, flash floods, alluvial fan floods, ice-jam floods, dam breaks)
- Local drainage or high groundwater levels
- Fluctuating lake levels
- Coastal flooding, including storm surges
- Debris flows
- Subsidence

Characteristics of Floods

While there is no sharp distinction between riverine floods, flash floods, alluvial fan floods, ice jam floods, and dam-break floods, these types of floods are widely recognized and may be helpful in considering the range of flood risk and appropriate responses.

The most common kind of flooding event is riverine flooding, also known as overbank flooding. Riverine floodplains range from narrow, confined channels in the steep valleys of mountainous and hilly regions, to wide, flat areas in plains and coastal regions. The amount of water in the floodplain is a function of the size and topography of the contributing watershed, the regional and local climate, and land use characteristics. In steep valleys, flooding is usually rapid and deep, but of short duration, while flooding in flat areas is typically slow, relatively shallow, and may last for long periods of time.

Figure A-1
Floodplain Definition
Source: FEMA, August 2001



Flash floods involve a rapid rise in water level, high velocity, and large amounts of debris, which can lead to significant damage that includes the tearing out of trees, undermining of buildings and bridges, and scouring new channels. The intensity of flash flooding is a function of the intensity and duration of rainfall, steepness of the watershed, stream gradients, watershed vegetation, natural and artificial flood storage areas, and configuration of the streambed and floodplain. Dam failure and ice jams may also lead to flash flooding.

Alluvial fan floods occur in the deposits of rock and soil that have eroded from mountainsides and accumulated on valley floors in the pattern of a fan. Alluvial fan floods often cause greater damage than overbank flooding due to the high velocity of the flow, amount of debris, and broad area affected. Human activities may exacerbate flooding and erosion on alluvial fans via increased velocity along roadways acting as temporary drainage channels or changes to natural drainage channels from fill, grading, and structures.

Ice jam flood occur when an upstream part of a river thaws first (possibly because it flows away from the equator), and the ice gets carried downstream into the still-frozen part. Masses of ice can become lodged under bridges and other wiers, causing an ice dam, flooding areas upstream of the jam. After the ice dam breaks apart, the sudden surge of water that breaks through the dam can then flood areas downstream of the jam. While this usually occurs in spring, it can happen as winter sets in when the downstream part becomes frozen first. Dam-break floods may occur due to structural failures (e.g., progressive erosion), overtopping or breach from flooding, or earthquakes.

Local drainage floods may occur outside of recognized drainage channels or delineated floodplains for a variety of reasons, including concentrated local precipitation, a lack of infiltration, inadequate facilities for drainage and stormwater conveyance, and/or increased surface runoff. Such events often occur in flat areas, particularly during winter and spring where the ground is frozen. Drainage floods are found also in urbanized areas with large impermeable surfaces. High groundwater flooding is a seasonal occurrence in some areas, but may occur in other areas after prolonged periods of above-average precipitation.

2. Hurricanes and Tropical Storms

Definition of Hurricanes and Tropical Storms

Hurricanes, tropical storms, and typhoons, collectively known as tropical cyclones, are among the most devastating naturally occurring hazards in the United States. They present flooding, storm surge, and high wind hazards to the communities that they impact.

A hurricane is defined as a low-pressure area of closed circulation winds that originates over tropical waters. A hurricane begins as a tropical depression with wind speeds below 39 mph. As it intensifies, it may develop into a tropical storm, with further development producing a hurricane. Table A-1 below identifies the criteria for each stage of development.

Table A-1
Classification of Hurricanes

Stage of Development	Criteria
Tropical Depression (development)	Maximum sustained surface wind speed is < 39 mph
Tropical Storm	Maximum sustained wind speed ranges 39 - <74 mph
Hurricane	Maximum sustained surface wind speed 74 mph+
Tropical Depression (dissipation)	Decaying stages of a cyclone in which maximum sustained surface wind speed has dropped below 39 mph

Hurricane winds blow in a large spiral around a relative calm center known as the "eye." The "eye", the storms core, is an area of low barometric pressure and is generally 20 to 30 miles wide. The storm may extend outward 100 - 400 miles in diameter. As a hurricane approaches, the skies will begin to darken and winds will grow in strength. As a hurricane nears land, it can bring torrential rains, high winds, storm surges, and severe flooding.

As shown in Table A-2, the Saffir / Simpson Hurricane Scale is used to classify storms by numbered categories. Hurricanes are classified as Categories 1 through 5 based on central pressure, wind speed, storm surge height, and damage potential.

Table A-2
Saffir/Simpson Hurricane Scale

Storm Category	Central Pressure	Sustained Winds	Storm Surge	Potential Damage
1	> 980 mbar	74 - 95 mph	4 – 5 ft	Minimal
2	965 – 979 mbar	96 - 110 mph	6 – 8 ft	Moderate
3	945 – 964 mbar	111 – 130 mph	9 – 12 ft	Extensive
4	920 – 944 mbar	131 – 155 mph	13 – 18 ft	Extreme
5	< 920 mbar	> 155 mph	> 18 ft	Catastrophic

A single hurricane can last for more than two weeks over open waters and can run a path across the entire length of the eastern seaboard. August and September are peak months during the hurricane season that lasts from June 1 through November 30.

Characteristics of Hurricanes and Tropical Storms

Hurricanes and Tropical Storms are categorized based on their wind speed. Both bring strong winds and are characterized by torrential rain that often results in widespread damage. Hurricanes can produce both extreme high winds and heavy rains. Tropical storms are most often associated with heavy rains that have the potential to produce severe flooding.

High winds from Hurricanes and Tropical Storms are capable of imposing large lateral (horizontal) and uplift (vertical) forces on buildings. Residential buildings can suffer extensive wind damage when they are improperly designed and constructed and when wind speeds exceed design levels. The effects of high winds on a building will depend on several factors:

- Wind speed (sustained and gusts) and duration of high winds
- Height of building above the ground
- Exposure or shielding of the building (by topography, vegetation, or other buildings) relative to wind direction
- Strength of the structural frame, connections, and envelope (walls and roof)
- Shape of building and building components
- Number, size, location, and strength of openings (windows, doors, vents)
- Presence and strength of shutters or opening protection
- Type, quantity, velocity of windborne debris

Proper design and construction of residential structures, particularly those close to water or near the coast, demand that every factor mentioned above be addressed. Failure to do so may result in building damage or destruction by wind. See Appendix M for recommended Stability System Design Tables for wind loads.

3. Storm Surge

Definition of Storm Surge Hazard

Storm surges occur when the water level of a tidally influenced body of water increases above the normal high tide. Storm surges occur with coastal storms caused by massive low-pressure systems with cyclonic flows that are typical of hurricanes.

Changes in the earth's surface also contribute to the effects of surges. Rising seas and erosion have led to the deterioration of the state's barrier islands and marsh, important shields against storm surge. Furthermore, erosion has caused the entire delta to sink, meaning homes, businesses and highways are becoming more susceptible to surges. New Orleans actually has pumps to keep rising seawaters from inundating the entire city, but they would hold little power in the face of a powerful hurricane.

Characteristics of Storm Surge

Storm surges are characterized by several factors that allow the displacement of water from oceans, bays or rivers to travel so far inland. A combination of relatively flat terrain and an extensive system of bayous and tidal lakes allow the surge to flow easily northward. Shallow water off the coast also adds to the problem, contributing to a higher storm surge than would occur in a location that has deeper coastal water.

Because of our coastal marshes and barrier islands, Louisiana's commercial and recreational fisheries are among the most abundant in America, providing 25 to 35 percent of the nation's total catch. Louisiana is first in the annual harvest of oysters, crabs and menhaden, and is a top producer of shrimp. Some of the best recreational saltwater fishing in North America exists off Louisiana's coast. The reason for this abundance is that our coastal marshes provide the nursery for young fish and shellfish.

Wetlands create friction and reduce high winds when hurricanes hit. They also absorb hurricane storm surges. Scientists estimate that every 2.7 miles of wetlands absorbs one foot of storm surge. The 3.5 million acres of wetlands that line Louisiana's coast today have storm protection values of $728 million to $3.1 billion.

4. Tornadoes

Definition of Tornado Hazard

A tornado is a rapidly rotating funnel (or vortex) of air that extends toward the ground from a cumulonimbus cloud. Most tornadoes do not touch the ground, but when the lower tip of a tornado touches the earth, it can cause extensive damage. Tornadoes often form in convective cells such as thunderstorms or at the front of hurricanes. Tornadoes may also result from earthquake induced fires, wildfires, or atomic bombs (FEMA, 1997). The formation of tornadoes from thunderstorms is explained in Figure A-3.

Characteristics of Tornadoes

Tornadoes in the dissipating stage can appear like narrow tubes, or ropes, twisting into all manner of curls, twists, and s-shapes. These tornadoes, such as the one pictured above, are *roping out*, or becoming a *rope tornado*. Multiple-vortex tornadoes can appear as a family of swirls circling a common center, or may be completely obscured by condensation, dust, and debris, appearing to be a single funnel. In addition to these appearances, tornadoes may be obscured completely by rain or dust. These tornadoes are especially dangerous, as even experienced meteorologists might not spot them.

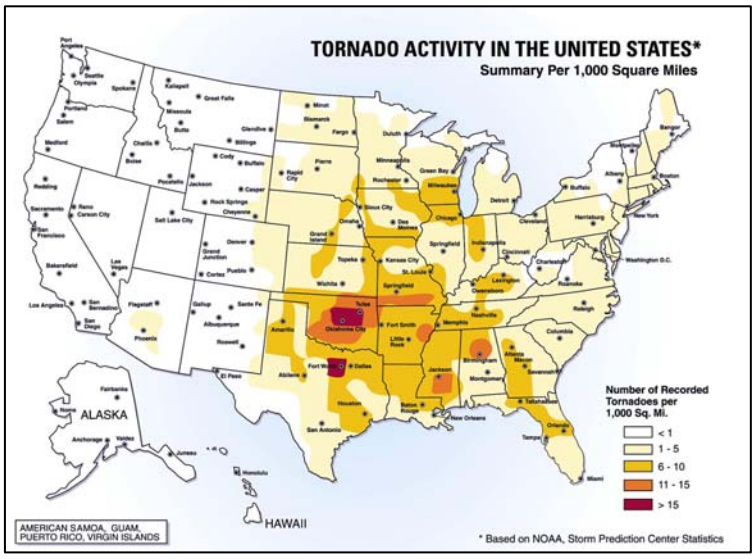
As shown in the following table, tornadoes are measured by the Fujita Scale, an empirical system that determines the severity by observed damages (last column).

Table A-3
The Fujita Tornado Scale
(Source: FEMA 1997)

Category	Wind Speed	Description of Damage
F0	40-72 mph	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
F1	73-112 mph	Moderate damage. The lower limit is the beginning of hurricane speed. Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206 mph	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	207-260 mph	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	261-318 mph	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked.

Figure A-4 illustrates the frequency of tornado strikes in the U.S. per 1,000 square miles. While tornadoes can occur in any month and at all hours of the day or night, they occur with greatest frequency during the late spring and early summer months during late afternoon and early evening hours.

Figure A-4
Historic Tornado Activity in the United States,
Summary per 1,000 Square Miles



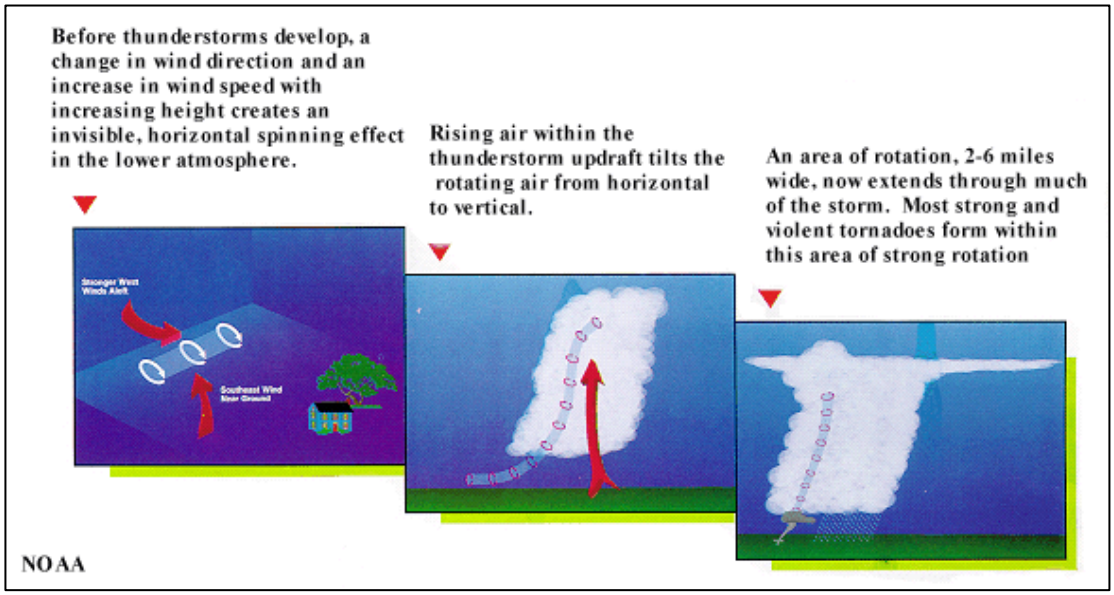
The severity and duration of tornadoes is a function of several factors, including weather conditions, topography and the F class of the event. As noted earlier, tornado severity is measured with the Fujita scale, an empirical system that classifies events after they occur. In some cases there are anomalous patterns for various reasons (including the reliability and completeness of reporting), but generally speaking smaller events are more probable, larger (more severe) ones are less likely.

Tornado duration is usually relatively short, varying from a matter of seconds to several minutes on the ground, although in rare cases they can last significantly longer. The path width of a single tornado generally is less than 0.6 miles. The path length of a single tornado can range from a few hundred yards to miles. A tornado typically moves at speeds between 30 and 125 mph and can generate internal winds exceeding 300 mph.

Figure A-5
Strong Wind Effects
Source: FEMA

Most tornadoes take on the traditional appearance of a narrow funnel, a few hundred yards across, with a small cloud of debris near the ground. Tornadoes can appear, however, in all manner of shapes and sizes.

Figure A-6
Formation of Tornadoes



Small, relatively weak landspouts might only be visible as a small swirl of dust on the ground. While the condensation funnel may not extend all the way to the ground, if associated surface winds are greater than 40 mph (64 km/h), it is considered a tornado. Large single-vortex twisters, often violent, can look like a large wedge stuck into the ground, and are known as *wedge tornadoes* or *wedges*. Wedges can be so wide that they appear to be a block of dark clouds. Even experienced storm observers may not be able to tell the difference between a low-hanging cloud and a wedge tornado from a distance.

5. Coastal Erosion

Definition of Coastal Erosion

Coastal erosion is the wearing away of land or the removal of beach or dune sediments by wave action, tidal currents, wave currents, wind, or drainage.

Characteristics of Coastal Erosion

Coastal erosion is a dynamic process that is constantly occurring at varying rates along the coasts and shorelines of the U.S. Numerous factors can influence the severity and rate of coastal erosion including human activities, tides, the possibility of rising sea levels, and the frequency and intensity of hurricanes. Strong storms and hurricanes can erode large sections of coastline with a single event. The process of coastal erosion results in permanent changes to the shape and structure of the coastline. Human activities such as poor land use practices and boating activities can also accelerate the process of coastal erosion.

Billions of dollars of economic development are potentially threatened by the impacts of coastal erosion. In a report to Congress in the year 2000 FEMA estimated that erosion may cost property owners along the coast $500 million a year in structural damages and loss of land. The report also stated as many as 87,000 residential homes may be at risk of eroding into the oceans or Great Lakes over the next 60 years.

Coastal erosion is a significant problem along the entire Louisiana Gulf Coast. The barrier islands and marshes of Louisiana provide protection for inland development during hurricanes. These islands act as a buffer and help to reduce the intensity of hurricanes as they make landfall prior to reaching more densely populated areas such as New Orleans. Tides and strong storms moving onshore from the Gulf of Mexico are eroding Louisiana's marshy coastline at an alarming rate. Erosion of several of the barrier islands, which lie offshore of the estuaries and wetlands that buffer and protect these important ecosystems from the open marine environment, exceeds 20 meters/year.

On the west coast powerful winter storms during El Nino years can cause considerable erosion along sections of the Pacific coastline. El Nino winters can include more frequent storms, large waves, and extreme high tides. Along the pacific coastline, erosion can lead to flooding, collapsed bluffs, destroyed houses and closed roads.

Figure A-8
Coastal Erosion in Pacifica, California
During El Nino Year in 1998
Source; USGS

6. Subsidence

Definition of Subsidence Hazard

Land subsidence is the loss of surface elevation due to the removal of subsurface support, ranges from broad, regional lowering of the land surface to localized collapse. In geology, engineering, and surveying, subsidence is the motion of a surface (usually, the Earth's surface) as it shifts downward relative to a datum such as sea-level. The opposite of subsidence is uplift, which results in an increase in elevation. The inhabitation of lowlands, such as coastal or delta plains, requires drainage. The resulting aeration of the soil leads to the oxidation of its organic components, such as peat, and this decomposition process may cause significant land subsidence. This applies especially when ground water levels are periodically adapted to subsidence, in order to maintain desired unsaturated zone depths, exposing more and more peat to oxygen. In addition to this, drained soils compact as result of pore-tension reduction. In this way, land subsidence has the potential of becoming self-perpetuating, collapsing at rates up to 5 cm/yr. Water management used to be tuned primarily to factors such as crop optimization but, to varying extent, avoiding subsidence has come to be taken into account as well.

If natural gas is extracted from a natural gas field the initial pressure (up to 600 bar) in the field will drop over the years. The gas pressure also supports the soil layers above the field. If the pressure drops, then the soil pressure increases and this leads to subsidence at the ground level. This type of subsidence can similarly be caused by extraction of other resources, e.g., ground water, petroleum, or rock salt.

Characteristics of Subsidence

The term subsidence commonly involves a gradual sinking, but it also refers to an instantaneous or catastrophic collapse. Subsidence is caused by a diverse set of human activities and natural processes. Different types of subsidence are address below:

- Collapse into Voids – Collapse of surficial materials into underground voids is the most dramatic form of subsidence. Most of the subsidence-related voids in the United States were created by coal mining.

- Sediment Compaction – Sediment compaction typically causes broad regional subsidence. Rates of subsidence usually are low, ranging from a few millimeters to centimeters per year, but total subsidence may reach several meters over decades. Sediment compaction results from underground fluid withdrawal, natural compaction, and hydrocompaction. Underground fluid withdrawal is one of the major causes of sediment compaction in the U.S. When fluids are withdrawn, fluid pressures decline and support of the overburden is transferred to the solid skeleton. If the reservoir soil is compressible, sediment compaction and subsidence occurs.

- Another type of sediment compaction occurs naturally as older sediment is buried by younger sediment. Natural subsidence is occurring most rapidly in the Mississippi River Delta area of southern Louisiana where approximately 1,500 mi^2 of land are subsiding.

Estimating average rates of subsidence range from 0.3 to 0.4 inches per century. Maximum rates measured by geodetic surveys are approximately 0.5 inches per year.

- Drainage of Organic Soils – Drainage of organic soils, particularly peat and muck, induces a series of processes that reduces the volume of soil. These processes include biological oxidation, compaction, and desiccation. Biological oxidation usually dominates in warm climates. The principal areas of organic soil subsidence in the United States are in the greater New Orleans and Jefferson Parish area.

- Tides and heavy storms in the Gulf are eroding Louisiana's marshy coastline at an alarming rate. Coastlines in southern Jefferson Parish are sinking or eroding away with incoming water eating at the marshes and wetlands that buffer and drain the higher drier land. Parts of Jefferson Parish's coastal evacuation routes are indeed vulnerable to storm flooding due to land subsidence. One such place is along Louisiana Highway 1.

A "triggering mechanism" can cause a change in the local environment that affects the soil mass causing subsidence. Water is the main factor affecting the local environment that causes subsidence. The main triggering mechanisms for subsidence follow.

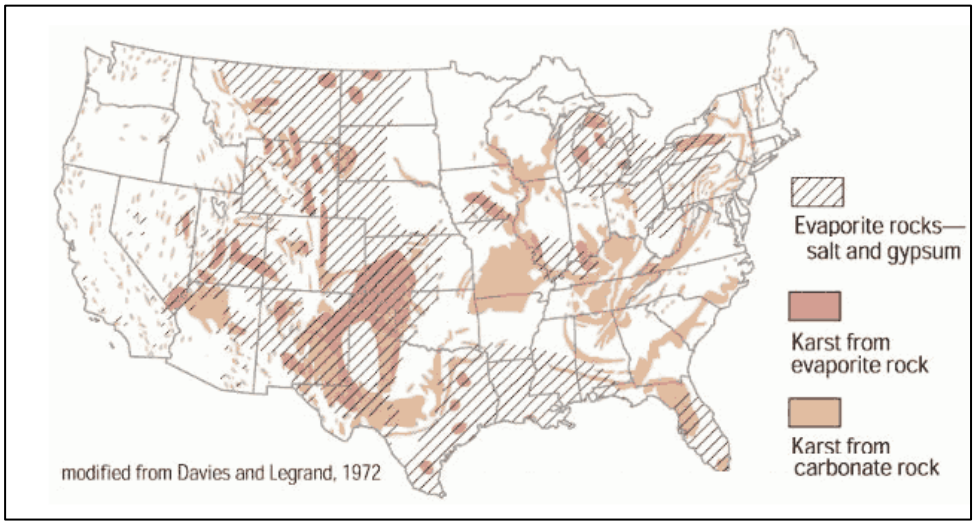
- Water level decline
- Changes in groundwater flow
- Increased loading
- Deterioration (abandoned coalmines)

Water level decline can happen naturally or be human induced. Main factors in water decline are:

- Pumping of water from wells
- Localized drainage from construction
- Dewatering
- Drought

Changes in the groundwater flow include an increase in the velocity of groundwater movement, increase in the frequency of water table fluctuations, and increased or reduced recharge.

Figure A-7
Rock Types Susceptible to Dissolution in Water
Source: USGS



7. Hailstorms

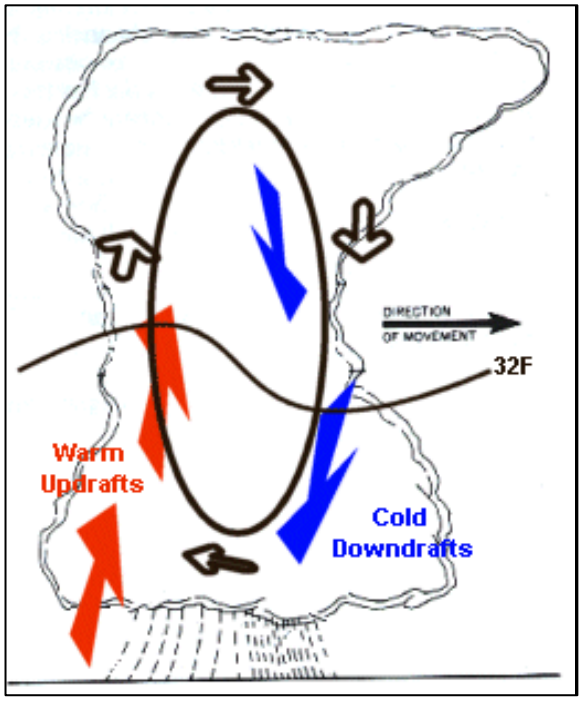
Definition of Hailstorm Hazard

Hail is defined as balls or pieces of ice falling as precipitation from a thunderstorm. Known as hailstones, these ice balls typically range from 5 mm–50 mm in diameter on average, with much larger hailstones forming in severe thunderstorms. The size of hailstones is a direct function of the severity and size of the storm.

Characteristics of Hail

Hail is an outgrowth of severe thunderstorms and develops within a low-pressure front as warm air rises rapidly in to the upper atmosphere and is subsequently cooled, as shown in Figure 6-13, leading to the formation of ice crystals. These are bounced about by high-velocity updraft winds and accumulate into frozen droplets, falling as precipitation after developing enough weight (FEMA, 1997). The National Weather Service (NWS) defines severe thunderstorms as those with downdraft winds in excess of 58 miles an hour and/or hail at least 3/4 inches in diameter. While only about 10 percent of thunderstorms are classified as severe, all thunderstorms are dangerous because they produce numerous dangerous conditions, including one or more of the following: hail, strong winds, lightning, tornadoes, and flash flooding.

Figure A-9
How Hail Is Formed



Hailstorms occur most frequently during the late spring and early summer. During this period, extreme temperature changes occur from the surface up to the jet stream, resulting in the strong updrafts required for hail formation.

The size of hailstones varies and is related to the severity and size of the thunderstorm that produced it. The higher the temperatures at the Earth's surface, the greater the strength of the updrafts, and the greater the amount of time the hailstones are suspended, giving the hailstones more time to increase in size. Hailstones vary widely in size, as shown in Table A-2. Note that penny size (3/4 inches in diameter) or larger hail is considered severe.

Table A-4
Estimating Hail Size

Size	Inches in Diameter
Pea	1/4 inch
Marble/mothball	1/2 inch
Dime/Penny	3/4 inch
Nickel	7/8 inch
Quarter	1 inch
Ping-Pong Ball	1 1/2 inch
Golf Ball	1 3/4 inches
Tennis Ball	2 1/2 inches
Baseball	2 3/4 inches
Tea Cup	3 inches
Grapefruit	4 inches
Softball	4 1/2 inches

Figure A-10
Large Hailstone
Source: NOAA

8. Winter Storms

Definition of Winter Storm Hazards

A winter storm is a type of precipitation in which the dominant varieties of precipitation are forms that only occur at cold temperatures, such as snow or sleet, or a rainstorm where ground temperatures are cold enough to allow ice to form (i.e. freezing rain). In temperate continental climates, these storms are not restricted to the winter season, and may occur in the late autumn and early spring. Also, there are very rare occasions when they form in summer, although it would have to be an abnormally cold summer, such as the summer of 1816 in the Northeast U.S. In many locations in the Northern Hemisphere, the most powerful winter storms usually occur in March and, in regions where temperatures are cold enough, April.

Figure A-11
Split Tree Caused by Ice Storm
Source: FEMA

Characteristics of Winter Storms

Winter storms typically form along a front generally following the meandering path of the jet stream. These storms, called mid-latitude cyclones or extra-tropical cyclones, differ from hurricanes, in that they move from west to east as opposed to east to west. These weather patterns carry cold air from Canada and the Rockies into the southern U.S. The origins of the weather patterns that cause winter storms in Louisiana are affected by differences in temperature and pressure, moisture availability, and wind direction as well as weather systems in the Atlantic Ocean and Gulf of Mexico.

Winter storms vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and

death. Severe winter and ice storms can cause unusually heavy rain or snowfall, high winds, extreme cold, and ice storms throughout the continental United States.

NOAA describes the jet streams that carry storm systems across the United States as narrow bands of strong wind in the upper atmosphere that follow the boundaries between hot and cold air masses. These boundaries are most pronounced during the winter months, when the jet streams travel to their southernmost position over the United States and surrounding water.

In the last 11 winters, no region in the United States has escaped flooding during the winter months. The Southeastern and Gulf Coast states (regularly hit by autumn hurricanes) experience damaging floods in the winter months, too. No region is immune. Global warming threatens to disrupt weather patterns around the world and may increase the frequency of winter flooding.

Another weather phenomenon, El Niño, can have a significant effect on precipitation in the United States. Named by Peruvian fishermen who noticed the periodic appearance of warming surface temperatures in the Pacific Ocean around Christmas, El Niño is now understood to be the warm phase of a temperature oscillation in the Pacific Basin's water and atmosphere. The cool phase of the oscillation is nicknamed La Niña. During the warm phase, heat and moisture are released into the upper atmosphere, creating precipitation. El Niño alters the course of the jet stream - pushing it farther south than usual.

According to NOAA, El Niño winters tend to be wetter than normal in the Southeastern United States, as well, and contribute to flooding along the Gulf Coast. Storms that spin up in the Gulf of Mexico typically track northeast on the southern jet stream, bringing rain as well as ice and even snow to the Gulf states.

Winter storm occurrences tend to be very disruptive to transportation and commerce. Trees, cars, roads, and other surfaces develop a coating or glaze of ice, making even small accumulations of ice extremely hazardous to motorists and pedestrians. The most prevalent impacts of heavy accumulations of ice are slippery roads and walkways that lead to vehicle and pedestrian accidents; collapsed roofs from fallen trees and limbs and heavy ice and snow loads; and felled trees, telephone poles and lines, electrical wires, and communication towers. As a result of severe ice storms, telecommunications and power can be disrupted for days. Such storms can also cause exceptionally high rainfall that persists for days, resulting in heavy flooding.

9. Lightning

Definition of Lightning

Lightning is a powerful natural electrostatic discharge produced during a thunderstorm. This abrupt electric discharge is accompanied by the emission of visible light and other forms of electromagnetic radiation. The electric current passing through the discharge channels rapidly heats and expands the air into plasma producing acoustic shock waves (thunder) in the atmosphere.

Lightning, which occurs during all thunderstorms, can strike anywhere. Generated by the buildup of charged ions in a thundercloud, the discharge of a lightning bolt interacts with the best conducting object or surface on the ground. The air in the channel of a lightning strike reaches temperatures higher than 50,000 degrees F. The rapid heating and cooling of the air near the channel causes a shock wave, which produces thunder.

Characteristics of Lightning

Lightning typically occurs as a by-product of a thunderstorm. The action of rising and descending air in a thunderstorm separates positive and negative charges, with lightning the result of the buildup and discharge of energy between positive and negative charge areas. Water and ice particles may also affect the distribution of the electrical charge. In only a few millionths of a second, the air near a lightning strike is heated to 50,000°F, a temperature hotter than the surface of the sun. Thunder is the result of the very rapid heating and cooling of air near the lightning that causes a shock wave.

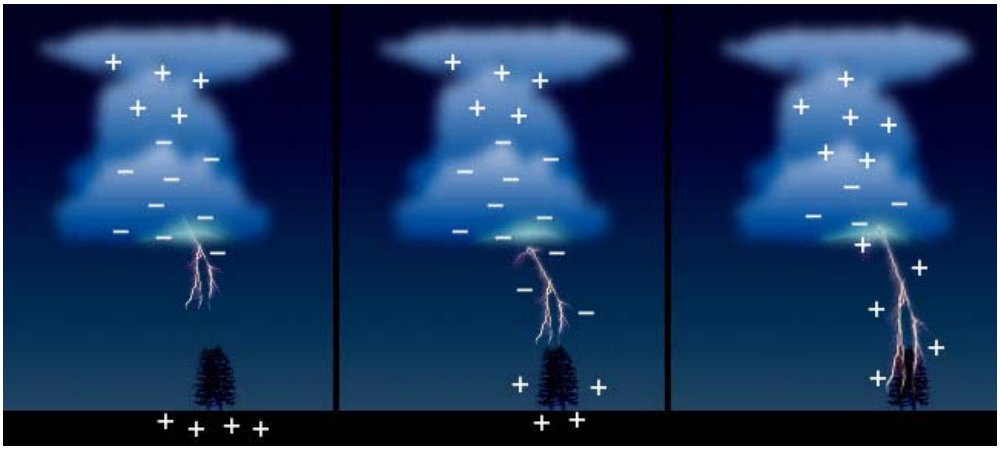


Figure A-2

Formation of Lightning
Source: University Corporation for Atmospheric Research (UCAR)

The hazard posed by lightning is significantly underrated. High winds, rainfall, and a darkening cloud cover are the warning signs for possible cloud-to-ground lightning strikes. While many lightning casualties happen at the beginning of an approaching storm, more than half of lightning deaths occur after a thunderstorm has passed. The lightning threat diminishes after the last sound of thunder, but may persist for more than 30 minutes. When thunderstorms are in the area, but not

overhead, the lightning threat continues to exist. Lightning has been known to strike more than 10 miles from the storm in an area with clear sky above.

Lightning is the most dangerous and frequently encountered weather hazard that most people in the United States experience annually. Lightning is the second most frequent killer in the U.S., behind floods and flash floods, with nearly 100 deaths and 500 injuries annually. These numbers are likely to underestimate the actual number of casualties because of the under reporting of suspected lightning deaths and injuries. Cloud-to-ground lightning can kill or injure people by either direct or indirect means.

According to the National Oceanic and Atmospheric Administration (NOAA), an average of 20 million cloud-to-ground flashes has been detected every year in the continental United States. About half of all flashes have more than one ground strike point, so at least 30 million points on the ground are struck on average each year. In addition, there are roughly 5 to 10 times as many cloud-to-cloud flashes as there are to cloud-to-ground flashes (NOAA, July 7, 2003).

Figure A-3
Lightning Bolt in Night Sky
Source: FEMA

Cloud-to-ground lightning is nearly always associated with thunderstorms and related weather phenomena. Thunderstorms occur in most warm and hot months, and occasionally at other times as well. The entire planning area is subject to the lightning hazard. While the duration of individual lightning strikes is only milliseconds, the duration of thunderstorms that create the lightning ranges from very short periods (15 minutes or less) to long periods when the storms are relatively stationary.

Damages from lightning hazards are generally limited to those related to power surges and contact with electrical equipment. In some cases ungrounded structures are hit by lightning and experience damage, either as a direct result of the lightning or via fires secondary to the hazard. There are also reports of brushfires being started by lightning, although these are usually relatively small and quickly contained. No reliable database or information exists to determine the cost of recovery from lightning.

10. Drought

Definition of Drought Hazard

A drought is an extended dry climate condition when there is not enough water to support urban, agricultural, human, or environmental water needs. It usually refers to a period of below-normal rainfall, but can also be caused by drying bores or lakes, or anything that reduces the amount of liquid water available. Drought is a recurring feature of nearly all the world's climatic regions.

Drought is the result of a decline in the expected precipitation over an extended period of time, typically one or more seasons in length. Meteorological drought is defined solely on the degree of dryness, expressed as a departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales. Hydrological drought is related to the effects of precipitation shortfalls on streamflows and reservoir, lake, and groundwater levels. Agricultural drought is defined principally in terms of soil moisture deficiencies relative to water demands of plant life, usually crops. Socioeconomic drought associates the supply and demand of economic goods or services with elements of meteorological, hydrologic, and agricultural drought. Socioeconomic drought occurs when the demand for water exceeds the supply as a result of weather-related supply shortfall. This may also be called a water management drought.

Figure A-12
Boy Wheeling Water during Drought
Source: FEMA

Characteristics of Drought

Drought produces a complex web of impacts that spans many sectors of the economy and reaches well beyond the area experiencing physical drought. This complexity exists because water is integral to our ability to produce goods and provide services. Impacts are commonly referred to as direct or indirect. Reduced crop, rangeland, and forest productivity; increased fire hazard; reduced water levels; increased livestock and wildlife mortality rates; and damage to wildlife and fish habitat are a few examples of direct impacts. The consequences of these impacts illustrate indirect

impacts. For example, a reduction in crop, rangeland, and forest productivity may result in reduced income for farmers and agribusiness, increased prices for food and timber, unemployment, reduced tax revenues because of reduced expenditures, increased crime, foreclosures on bank loans to farmers and businesses, migration, and disaster relief programs.

Drought is a normal part of virtually every climate on the planet, including areas of both high and low normal rainfall. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds and low relative humidity (FEMA, 1997). A drought's severity depends on numerous factors, including duration, intensity, and geographic extent as well as regional water supply demands by humans and vegetation. Due to its multi-dimensional nature, drought is difficult to define in exact terms and also poses difficulties in terms of comprehensive risk assessments.

Drought differs from other natural hazards in three ways. First, the onset and end of a drought are difficult to determine due to the slow accumulation and lingering effects of an event. Second, the lack of an exact and universally accepted definition adds to the confusion of its existence and severity. Third, in contrast with other natural hazards, the impact of drought is less obvious and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments.

Droughts may cause a shortage of water for human and industrial consumption and cause a decrease in hydroelectric power. Water quality may also decline while the number and severity of wildfires may increase. Severe droughts may result in the loss of agricultural crops and forest products, undernourished wildlife and livestock, lower land values, and higher unemployment.

11. Wildfires

Definition of Wildfire Hazard

A wildfire, also known as a forest fire, vegetation fire, grass fire, brush fire, or hill fire, is an uncontrolled fire often occurring in wildland areas, which can also consume houses or agricultural resources. Common causes include lightning, human carelessness, and arson.

Wildfires are fueled by naturally occurring or non-native species of trees, brush, and grasses. Topography, fuel, and weather are the three principal factors that impact wildfire hazards and behavior.

Figure A-13
Warehouse Fire
Source: FEMA

Characteristics of Wildfires Interface

Wildfires often begin unnoticed, spread quickly, and are usually signaled by dense smoke that may fill the area for miles around. As mentioned, wildfires can be human-caused through acts such as arson or campfires, or can be caused by natural events such as lightning. Wildfires can be categorized into three types:

1. Wildland fires occur in very rural areas and are fueled primarily by natural vegetation.

2. Interface fires occur in areas where homes or other structures are endangered by the wildfires. The fires are fueled by both natural vegetation and man-made structures. These are often referred to as Wildland Urban Interface fires.

3. Firestorms occur during extreme weather (e.g., high temperatures, low humidity, and high winds) with such intensity that fire suppression is virtually impossible. These events typically burn until the conditions change or the fuel is exhausted.

The following three factors contribute significantly to wildfire behavior:

Fuel: The type of fuel and the fuel loading (measured in tons of vegetative matter per acre) have a direct impact on fire behavior. Fuel types vary from light fuels (grass) to moderate fuels (Southern Rough) to heavy fuels (slash). The type of fuel and the fuel load determines the potential intensity of the wildfire and how much effort must be expended to contain and control it.

Weather: The most variable factor affecting wildfire behavior is weather. Important weather variables are precipitation, humidity, and wind. Weather events ranging in scale from localized thunderstorms to large cold fronts can have major effects on wildfire occurrence and behavior. Extreme weather, such as extended drought and low humidity can lead to extreme wildfire activity.

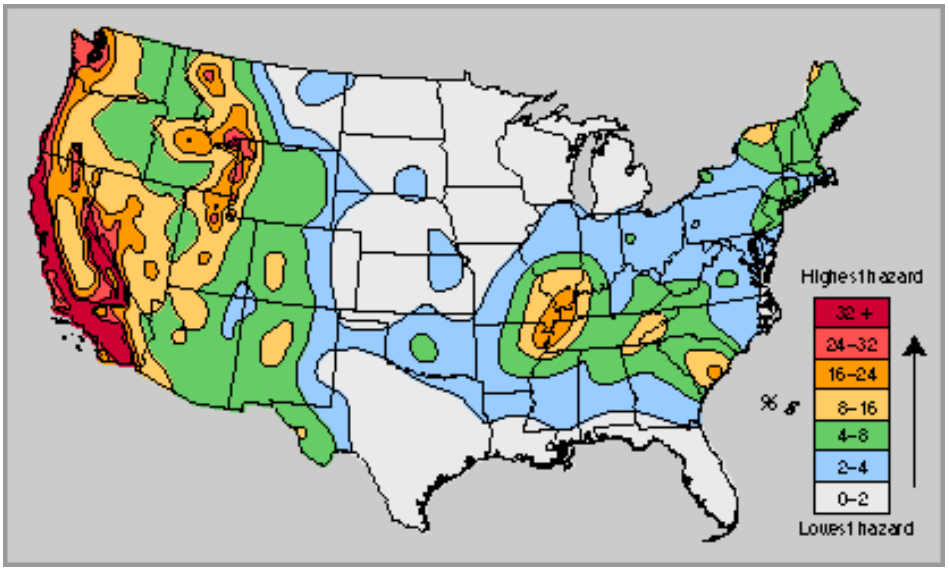
Topography; Topography can have a powerful influence on wildfire behavior. The movement of air over the terrain tends to direct a fire's course.

12. Earthquakes

Definition of Earthquake Hazard

An earthquake is "…a sudden motion or trembling caused by an abrupt release of accumulated strain in the tectonic plates that comprise the earth's crust." These rigid plates, known as tectonic plates, are some 50 to 60 miles in thickness and move slowly and continuously over the earth's interior. The plates meet along their edges, where they move away from or pass under each other at rates varying from less than a fraction of an inch up to five inches per year. While this sounds small, at a rate of two inches per year, a distance of 30 miles would be covered in approximately one million years (FEMA, 1997). Figure A-7 shows a USGS seismic probability map for the continental U.S.

Figure A-14
United States Earthquake Zones



Characteristics of Earthquakes

The vibration or shaking of the ground during an earthquake is described by ground motion. Severity of ground motion generally increases with the amount of energy released and decreases with distance from the fault or epicenter of the earthquake. Ground motion causes waves in the earth's interior, also known as seismic waves, and along the earth's surface, known as surface waves. The following are the two kinds of seismic waves:

- P (primary) waves are longitudinal or compressional waves similar in character to sound waves that cause back-and-forth oscillation along the direction of travel (vertical motion), with particle motion in the same direction as wave travel. They move through the earth at approximately 15,000 mph.

- S (secondary) waves, also known as shear waves, are slower than P waves and cause structures to vibrate from side-to-side (horizontal motion) due to particle motion at right-angles to the direction of wave travel. Unreinforced buildings are more easily damaged by S waves.
- Earthquakes are often relatively short duration, but there may be aftershocks and other effects (such as liquefaction) that prolong and exacerbate their effects. The potential for either of these effects depends on local conditions and other technical factors that are not discussed in this Plan.

There is some potential for seismic activity virtually anywhere on the earth. Locations that are close to tectonic faults, however, are much more likely to be impacted by earthquakes than other places. The United States Geologic Survey and other organizations develop maps to indicate the relatively probability of earthquakes in particular areas.

Figure A-15
Earthquake Damage
Source: FEMA