



SECTION 1

RESILIENCY & SUSTAINABILITY

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RESILIENCY & SUSTAINABILITY

INTRODUCTION

Resiliency is a community's ability to respond efficiently to disasters and bounce back quickly to a normal and functioning state. Located in South Louisiana, Gretna has experienced and responded to many disasters in the past, and resiliency planning has always been a central part of the City's planning efforts. Sustainability is a community's ability to maintain or improve its economic, social, and environmental status over time. Resiliency and sustainability are different, but they work hand in hand. Disasters and events that adversely impact communities can occur suddenly or gradually, over a long period of time. They can cause physical, economic, social, and environmental impacts that come in many forms. The most common events are severe rainstorms, hurricanes, and tornadoes. Other types of events are often not considered, such as economic downturns, departure of a major employer, widespread disease, major fires, sea-level rise, terrorism, and loss of significant historical, cultural, or social centers.

While the need for hazard mitigation has been vital since the area was first settled, the strategy on how to address such hazards, specifically flooding, has changed over recent decades and shifted from efforts to keep out the water with grey infrastructure (pipes and pumps) to the concept of creating spaces for water by implementing green infrastructure facilities. Green infrastructure is a system of facilities for stormwater management designed to receive, detain, and filter rainwater runoff while also facilitating runoff infiltration into the subsoil. Green infrastructure facilities have subsurface storage space for water in soil, aggregate, or tanks, for detention and infiltration. Green infrastructure can be planted with water-loving, native plants and include depressed surface area for additional storage, or can be constructed of flush pervious materials such as aggregate, pervious concrete, pervious pavers, etc.

This Element provides an overview of existing resiliency, sustainability, and hazard mitigation planning efforts and projects in the City of Gretna, as well as strategies for sustainable long-term risk reduction.

ENVIRONMENTAL RESILIENCY & SUSTAINABILITY

The City of Gretna is located within the coastal zone of Southern Louisiana. The most recent update of the Jefferson Parish Hazard Mitigation Plan (HMP) was approved by the State and FEMA in 2015. The document focuses on the five hazards with the highest potential for damaging physical assets, people, and operations within Jefferson Parish: floods, hurricanes and tropical storms, storm surge, sea level rise, and tornadoes. The City of Gretna has historically been affected by flooding from tropical storms and hurricanes. Additionally, tornadoes pose a threat to the entire Parish.

1. FLOODING

In Jefferson Parish, flooding typically occurs during and after major rainfall events, thunderstorms, hurricanes, and storm surges. Flood hazard threats are intensified by prolonged, heavy rain events with stormwater levels that overload the City's drainage system, potentially resulting in levee failure. Previous flooding in the City of Gretna was caused by localized flooding from rainfall events and levee overtopping, as well as hurricane storm surges. In the last six years, two significant flood events were recorded in the City of Gretna, one in July 2012 and one in May 2014. Both of them were flash floods (*Jefferson Parish Hazard Mitigation Plan Update 2015*).

2. WATERSHED

Surrounded by the Mississippi River, as well as Hero and Whitney Canals, the City of Gretna is considered its own watershed, meaning that Gretna has to manage all the water that falls in the City during any rain event. Conditions such as flat topography, the small size of the watershed, slow draining soils, and the extent of impermeable surfaces (paving and rooftops) result in localized flooding in low lying areas of the City (*Solutient, Inc., 2007*).

3. EXISTING INFRASTRUCTURE

As part of Jefferson Parish and the New Orleans Metropolitan region, Gretna benefits from structural mitigation infrastructure provided by the Mississippi River levees and the Greater New Orleans Storm Damage

Risk Reduction System, which reduce flood risk from the Harvey and Algiers Canals. Two levee systems protect the City from flooding: the U.S. Army Corps of Engineers (USACE) levee system along the Mississippi River and the levees along the Harvey and Algiers canals. The USACE levee system is rated to protect the area from the “standard project flood” that is usually equated to a 250- to a 500-year flood; whereas the levees along the Harvey and Algiers Canals are a local hurricane protection system. The City of Gretna Flood Hazard Plan from 2007 describes these floodwalls to be “lower than desired” and states that “the hurricane protection system would not be rated as having 100-year levees” (*City of Gretna Flood Hazard Plan 2007*). The City has previously experienced flooding due to levee failure and continues to face a severe flood risk from potential levee failure, including breach, collapse, or overtopping. In cases of levee failure, flood levels could reach remarkably higher levels than those shown in the AE Zone of the FEMA Floodplain map, [Figure 1.1: 2016 FEMA Flood Map](#), as the mapped levels are based on flooding caused by rain events (*City of Gretna Flood Hazard Plan 2007, Chapter, pp.5-10*).

Due to its flat topography, low elevation, and high percentage of impermeable surfaces, Gretna depends on pumps to drain stormwater. Jefferson Parish’s drainage infrastructure includes a system of structures and canals that flow to pumping stations that pump the stormwater runoff out. Two of the Parish’s pumping stations, the Hero and Planters pumping stations, are located within Gretna’s city limits. The Verret Canal is one of the major canals in the City that creates a border between the Bellevue and Timberlane neighborhoods. See [Element 6: Infrastructure](#) for more details. The Gretna drainage system was designed to carry the 10-year storm (9 inches of stormwater within a 24-hour period) under ideal conditions. However, broken or clogged storm drains and pipes reduce the system capacity, and during heavy storm events, the drainage facilities have shown to be inadequate to handle the volume of stormwater runoff.

4. GREEN INFRASTRUCTURE

Gretna currently relies almost entirely on grey infrastructure to drain precipitation. This single-purpose approach to handling stormwater is connected with high cost of capital improvements and maintenance of the infrastructure. Furthermore, the extensive drainage of stormwater through conventional drainage systems is a major cause of subsidence and diminishing water quality of the water bodies to which the system



Bioretention Cell at Dillard University in New Orleans, LA



Stormwater Lot in the Gentilly Neighborhood of New Orleans



Bioretention Cells at the Maumus Center in Arabi, LA



Bioswale at the New Orleans City Hall Parking Garage

drains. While the conventional approach of draining stormwater is to pump it out, green infrastructure is designed to manage water close to where it falls. Green infrastructure can create functional green spaces that store and infiltrate stormwater locally while improving water quality. Conventional drainage works as an entirely interdependent system, while green infrastructure can be implemented incrementally, as each green infrastructure facility functions independently and reduces the burden on the pumping system by detaining and utilizing runoff. In this way, green infrastructure efficiently mitigates localized flooding and improves water quality. While grey infrastructure is entirely in public hands, the community can contribute to green infrastructure by implementing facilities on private properties, including pervious pavement for parking lots, rain gardens, green roofs, and bioswales.

The City of Gretna has, in recent years, begun an effort to shift from an exclusively grey infrastructure approach to including green infrastructure as an integral part of the City's comprehensive drainage system. Currently, a small number of green infrastructure projects on public land have been implemented or are in the implementation phase. However, the current zoning and building regulations do not require stormwater management, as opposed to drainage, for land development projects. In order to reduce localized flooding in the long run and strengthen Gretna's resiliency, the implementation of green infrastructure on public property, including streetscapes, parks, plazas, and other public spaces should be increased. The City should mandate that all private developments manage stormwater on their property, reducing localized flooding issues. Further, the City should establish open space requirements for all new development and redevelopment of properties over a certain size to ensure the preservation of green space and impervious surfaces throughout the City. Parking lot design standards should require tree plantings to increase the urban tree canopy, as well as regulations for both parking lots and buffers that define landscape requirements supporting urban ecology principles. Since most of Gretna is built out, such requirements will be necessary for redevelopment projects.

5. NATIONAL FLOOD INSURANCE PROGRAM (NFIP)

The City of Gretna has been taking part in the National Flood Insurance Program (NFIP) since 1979 and adopted required floodplain regulations that same year (*City of Gretna Code of Ordinances, Chapter 28 - Floods*). As shown on [Figure 1.1: FEMA Flood Plain Map](#), Gretna is almost equally divided between two flood zones: AE and

X. The AE zone is defined as a Special Flood Hazard Area (SFHA), which has a one percent chance of flooding in any given year. It is also referred to as base flood zone or 100-year flood zone. The X-Zone has, according to FEMA, a moderate flood risk estimated between the limits of the base flood and the 0.2 percent annual chance (500-year flood zone). While about half of the City's area is located within the FEMA 100-year flood plain, realistically all properties within Gretna City limits are prone to flooding. According to NFIP data in 2014 in Jefferson Parish, a total of 6,677 properties are identified as repetitive loss properties (properties that have been paid at least two NFIP claims of \$1,000 or more over a ten-year period), of which 277 are located in Gretna as displayed in [Figure 1.2: Repetitive Flood Loss](#). Floodplain regulations require a permit for all development located within the AE Zone. While building in the AE zone is generally permitted, all new or substantially rehabilitated structures must comply with floodplain development standards, which ensure protection from potential damage by the base flood. Gretna has been leading efforts to mitigate repetitive loss structures with the goal to eventually eliminate this risk. For properties located within the Z Zone, the purchase of flood insurance is not mandatory. As the flood risk in those areas during heavy storm events is still high, the City, through outreach efforts, encourages property owners within this zone to purchase insurance voluntarily. The City is also offering information and support in elevating and flood-proofing structures to additionally minimize future flood damage.

Gretna has been taking part in the NFIP Community Rating System (CRS) since 2000, which offers discounted flood insurance rates in exchange for higher local regulatory standards and the provision of additional flood protection measures. Currently, Gretna is rated in class 8 of 10 and receives a discount of 10% for properties within the AE and 5% for those within the X Zone. CRS credited activities must be maintained and the community must annually recertify to FEMA in order to keep receiving discounts. The improvement of the CRS rating is a stated objective in the Jefferson Parish Hazard Mitigation Plan. There are a number of activities that earn additional credit points for the CRS rating, such as implementation of green infrastructure facilities, regulatory stormwater management requirements for all development, the preservation of open space, and the development of a watershed master plan (*NFIP CRS, 2015*). Refer to [Element 2: Land Use](#) for more details. The establishment of FEMA AE Flood Zone development standards for development in all zones would potentially earn additional credit towards the CRS and furthermore strengthen Gretna's resilience to flood events.



Figure 1.1: 2016 FEMA Flood Zones

6. TROPICAL STORMS AND HURRICANES

Southern Louisiana is frequently affected by severe weather events, including hurricanes, tropical storms, and tornadoes. Those naturally occurring hazards can be devastating to the communities they impact. Tropical depressions, tropical storms, and hurricanes originate over tropical waters and are low-pressure areas of closed circulation winds. Storm surges are caused by these coastal storms, resulting in the water level of the ocean increasing above the normal high tide. Jefferson Parish experiences hurricanes and tropical storms with storm surges on average approximately every other year, adding up to 28 hurricanes and tropical storms between 1965 and 2014. Located less than 50 miles from the Gulf Coast, Gretna is vulnerable to storm surges as well as damaging winds. The wetlands, which divide Gretna from the Coast, act as a buffer that reduces storm surges and wind speeds of hurricanes and tropical storms.

7. TORNADOES

Tornadoes are rapidly rotating vortexes that occur during severe thunderstorms. They are characterized by a long, funnel-shaped cloud extending toward the ground, which can become a destructive force when touching the earth. Tornadoes are random events that can potentially occur anywhere in Southeast Louisiana, peaking March through May and into November. According to the National Climatic Data Center, 54 tornadoes have touched down in Jefferson Parish between 1950 and 2014. However, no tornadoes have been reported in Gretna over the past six years.

8. OTHER PLANS

The City of Gretna adopted a Flood Hazard Mitigation Plan in 2007. Such a plan is a requirement for mitigation funds under the FEMA Flood Mitigation Assistance program (FMA) and is recognized through its CRS. The plan documents in detail the flooding issues of the City and features goals and objectives on all discussed topics. However, the plan does not include anything on green infrastructure and, as it is 10 years old, some of the information is outdated. The Flood Hazard Mitigation Plan should thus be updated on a regular basis to reflect Gretna's current situation and needs.

Gretna is also included in the Jefferson Parish Hazard Mitigation Plan (HMP), which was last updated in 2015. It identified ten critical facilities located in the City and assessed the vulnerability of these structures to future flood events. See [Table 1.1: Facilities and Flood Vulnerability](#) and [Figure 1.3: Critical Facilities Map](#).

The designated flood zone in which each facility lies, as well as building construction standards, affects the likelihood of flooding. All critical facilities within Gretna currently have an either moderate or low risk of flooding. The plan states a comprehensive set of goals and objectives addressing hazard mitigation issues in the Parish, including infrastructure upgrades, increased public awareness, facilitation of sound development, and protection of critical facilities. The City of Gretna should continue efforts to reach the goals set in the HMP. Additionally, for critical facilities defined in the HMP, Gretna should aim to adapt all public facilities to meet resiliency standards.

Table 1.1: City of Gretna Facilities and Flood Vulnerability

Name of Facility	Purpose	Address	Year Built	Flood Zone	Flood Risk
Police Substation	Public Safety	804 Gretna Boulevard	n/a	AE	Moderate
Gretna City Hall	Administration	740 Second Street	1906	X	Moderate
Visitor's Center	Administration	337 Huey P. Long Avenue	1906	X	Moderate
Water Plant Complex	Infrastructure	100 Fifth Street	1934	X	Moderate
Police Department Complex	Public Safety	200 Fifth Street	n/a	X	Moderate
Wastewater Complex	Infrastructure	1101 Burmaster Street	1973	X	Moderate
Public Works Building	Administration	224 Fourth Street	1975	X	Moderate
Mel Ott Multi-Purpose Center	Recreation	2301 Belle Chasse Highway	2013	X	Low
General Government Building	Administration	200 Derbigny Street	2004	X	Low
EOC	Administration	910 Third Street	2010	X	Low

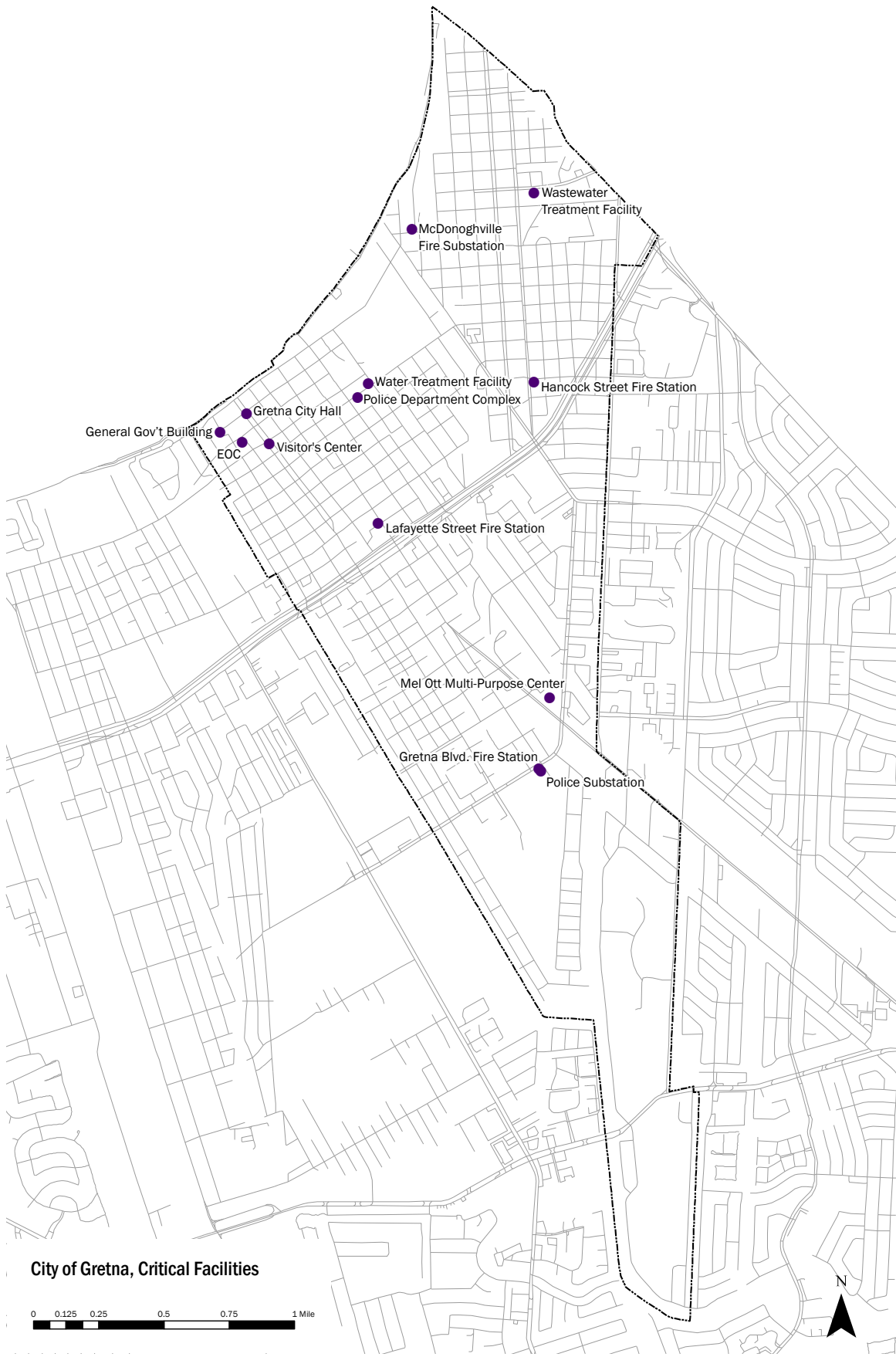


Figure 1.3: Gretna Critical Facilities Map

The Non-Structural Storm Mitigation Assessment and Enhancement Plan for the City of Gretna was drafted by the Center for Hazards Assessment, Response, and Technology of the University of New Orleans in 2010. It also discussed hazards and risks, existing conditions of protection facilities, and additional needs of the City to improve flood protection.

9. CLIMATE CHANGE

Climate change is connected with a number of hazards that impose a potential threat to southern Louisiana communities. Rising temperatures result in increased urban heat island effect, hotter seasons, and increased intensity of severe weather events. Sea level rise endangers the existence of wetlands, which currently act as a buffer for hurricanes and tropical storms. Additional hazards connected with climate change are increasing CO₂ and degrading water quality. The impacts of climate change-related hazards include localized and regional flooding, degradation of public health, increasing cost of utilities and insurance, disappearing habitat, and reduced wildlife populations. The expansion of urban green space and water features, as well as the maintenance of a healthy urban tree canopy, can help mitigate the impacts of climate change. Water features, green spaces, and tree coverage not only provide a cooling effect on the urban environment, but they also detain water during rain events and thus contribute to the prevention of localized flooding. This effectively enhances water quality and contributes to the mitigation of CO₂ emissions.

Facing climate change and sea level rise, a comprehensive transition to a global clean energy economy is needed. The City of Gretna should take a role as a leader in climate friendly policy and, in the future, consider impacts on climate change whenever passing new policies. Primarily, the City's energy efficiency efforts should provide for sustainable transportation modes, improved energy efficiency of businesses and homes, and the support of renewable power technologies. The integration of clean energy into the existing electricity grid will support the system's overall reliability and resiliency, and prepare the City for an energy efficient future. Introducing new, renewable energy systems, such as solar panels and energy storage devices, will reduce the demand on the existing grid during high seasonal usage.

ECONOMIC RESILIENCY & SUSTAINABILITY

A sustainable strategy for a local economy must address two types of risk. First it must foster resistance to the negative impacts of regional, national, and global economic changes, and secondly it must address the impacts of natural disasters on the local economy.

As discussed in depth in *Element 3. Economic Development*, Gretna's pro-business environment has led to a high density of businesses compared to the region and the nation. Furthermore, the City accommodates a comparably large variety of business types, which reduces the risk of short-term volatility in economic growth rates and can potentially enhance long-term growth.

The impact of a natural disaster on the local economy not only affects the built environment, it also affects a community economically. The financial stress placed on residents before and after a natural disaster, including protection of personal property, evacuation costs, and post-disaster repair, negatively affects the local economy by reducing local spending and potentially lost wages.

Economic resilience is dependent on the ability of the local economy to cope with disaster, recover, and reconstruct. This ability is referred to as macro-economic resilience to natural disasters (*Hallegatte, 2014*). Resiliency of any system is typically measured in the time span the system needs to return to pre-disaster conditions. In the case of a disaster, businesses must limit production losses and concurrently reconstruct and recover. In this setting the micro-economic situation of the community has a strong impact on the resiliency of local businesses. Contributing impacts include the distribution of losses within the community and the region and the community's overall wealth, particularly pre-disaster household incomes, and the availability of credits, insurance, and provisions of the social security system. In order to reduce vulnerability to the economic impacts of disasters, a community must generally foster the local economy and strengthen household incomes.

In Gretna, the local business environment includes a very high number of retail establishments, as well as food and beverage services. On the one hand, these businesses play an important role as local employers that bring in non-local revenue, while on the other hand the jobs associated with these businesses are typically low wage positions. To foster economic resiliency, the City should target incentivizing a greater number of moderate- to high-wage positions, as discussed in more detail in *Element 3. Economic Development*.

By promoting a higher quality of life, the City can better establish itself as an ideal place to live and work, therefore ensuring the availability of a well-educated work force, attracting new businesses and fostering existing ones. Criteria for a high quality of life include public safety, the availability of public open space, high quality public education, and environmental quality, and the provision of reliable infrastructure with an effective transportation system (*LaSala, 2014*).

To reach economic resiliency goals, the City should continue its ongoing efforts to provide a high quality of life while also supporting the diversification of the local economy. Primary areas of focus for new, locally owned businesses should be in the Old Gretna and McDonoghville neighborhoods. Furthermore, an effort to foster a multi-modal transportation system that supports the needs of all users would increase the mobility of Gretna's local workforce and therefore mitigate spatial mismatch. Thus, it not only supports employees and businesses, but also opposes the decline of low-income neighborhoods, which are specifically vulnerable to lack of transportation choices and economic change.

SOCIAL RESILIENCY & SUSTAINABILITY

Social resiliency is composed of three aspects: the coping capacity of the community to overcome all types of adversities, the adaptive capacity to adjust to new challenges, and the transformative capacity to structurally foster sustainable social resistance and resiliency regarding future crises. Thus, building social resiliency is a technical as well as a political issue. (*Sakdapolrak, Keck, 2013*).

Stable incomes and strong social ties can foster a community from within and strengthen its capacity to respond to crises more quickly and efficiently. In order to improve the social fabric of the City, it is important to target investment in neighborhoods that are home to marginalized demographic groups and to revitalize areas that suffer from underutilization and neglect. One way to stabilize a troubled neighborhood is to ensure long-term investment. Neighborhoods that are subject to major infrastructure improvements typically gain revitalization momentum quickly.

Possible revitalization efforts include the addition of green infrastructure to mitigate localized flooding, the transformation of vacant land into pocket parks or community gardens, the establishment of public amenities like good public schools and health care facilities, and the redesign of streetscapes to meet

Complete Streets principles. Specifically for low-income groups, transportation choices beyond individual motorized traffic are of great importance to ensure their mobility to and from workplaces. Thus, the strengthening of walkability and bikeability of all neighborhoods, as well as public transportation options, is crucial to foster social resiliency.

On the other hand, neighborhoods that are subject to gentrification must be addressed with counteractions to fight the displacement of vulnerable social groups. Specifically, the designation of historic districts can impose cost burdens on homeowners in Old Gretna - Mechanickham and parts of McDonoghville for upkeep and construction. To address the threat of gentrification in the historic neighborhood, the City should find creative ways to support low-income homeowners in complying with historic district requirements.

Increasing housing choices for low and moderate incomes in all neighborhoods should be a goal of the City. Zoning and subdivision regulations should establish lot size requirements that allow for small houses and ensure the possibility of multifamily development, especially in those neighborhoods that are well connected to public transportation and the local bicycle and pedestrian network. The City should also provide a variety of housing options in each neighborhood, which allows residents to age in place. More on this can be found in [Element 4: Housing](#).

A community's overall resiliency is strongly dependent on the individual members. Therefore, it is critical to engage all residents through education. A community is most resilient when every member contributes and is working towards a common goal: a socially, economically, and environmentally resilient urban fabric.

GOALS

Goal 1: Make the City of Gretna more Environmentally Resilient and Sustainable.

Objective 1.1:

Reduce localized flooding.

Objective 1.2:

Require low impact design strategies for new public projects and encourage for private development.

Objective 1.3:

Increase implementation of green infrastructure on public property, including streetscapes, parks, plazas, and around public buildings.

Objective 1.4:

Ensure the preservation of green space in the City of Gretna.

Objective 1.5:

Require a percentage of land be preserved as open space and/or require impervious surface percentages for new developments.

Objective 1.6:

Establish development regulations that require tree plantings for parking lots and buffer areas to increase the urban tree canopy.

Objective 1.7:

Mandate, to the greatest extent feasible, the incorporation of urban ecology principles in new public projects.

Objective 1.8:

Introduce energy-efficient and alternative-fuel vehicles into the City's fleet.

Goal 2: Make the City of Gretna more Economically Resilient and Sustainable

Objective 2.1:

Strive to increase the diversity and number of businesses in the City.

Objective 2.2:

Support retention and growth of local businesses as well as facilitate establishment of new local businesses.

Objective 2.3:

Strive to improve energy efficiency of businesses and residences.

Objective 2.4:

Improve access to transportation for citizens of all abilities and means.

Objective 2.5:

Increase transportation choices.

Goal 3: Make the City of Gretna more Socially Resilient and Sustainable.

Objective 3.1:

Strengthen the identity of neighborhoods.

Objective 3.2:

Provide access to quality neighborhood amenities in all areas of the City.

Objective 3.3:

Improve neighborhood walkability.

Objective 3.4:

Improve circulation and connections between neighborhoods.

Objective 3.5:

Strive to make each neighborhood more livable.

Objective 3.6:

Conduct public outreach to educate homeowners and business owners on resiliency and sustainability principles for the City and for their families.

Goal 4: Strengthen the City's Disaster Recovery and Hazard Mitigation Strategies

Objective 4.1:

Create a citywide Stormwater Master Plan for Gretna to address current conditions and needs.

Objective 4.2:

Formalize FEMA AE Flood Zone flood protection development standards for development outside the FEMA AE Flood Zone.

Objective 4.3:

Implement the goals and objectives stated in the most recent Jefferson Parish Hazard Mitigation Plan.

Objective 4.4:

Encourage the purchase of flood insurance for all properties located in the City.

Objective 4.5:

Ensure all municipal facilities and systems meet resiliency requirements.

Objective 4.6:

Continue mitigating Repetitive Loss (RL) and Severe Repetitive Loss (SRL) structures within the City.

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