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City of Savannah, Georgia
Flood Mitigation Plan

Executive Summary

The purpose of this Flood Mitigation Plan is to reduce or eliminate risk to people and property from flood hazards. Every community faces different hazards and every community has different resources to draw upon in combating problems along with different interests that influence the solutions to those problems. Because there are many ways to deal with flood hazards and many agencies that can help, there is no one solution for managing or mitigating their effects. Planning is one of the best ways to develop a customized program that will mitigate the impacts of flood hazards while accounting for the unique character of a community. The plan provides a framework for all interested parties to work together and reach consensus on how to move forward. A well-prepared flood mitigation plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity.

The City of Savannah (City) followed the planning process prescribed by the Federal Emergency Management Agency (FEMA), and this plan was developed under the guidance of a Floodplain Mitigation Planning Committee (FMPC) comprised of representatives of City Departments, citizens and other stakeholders. The FMPC conducted a risk assessment that identified and profiled flood hazards that pose a risk to the City, assessed the City's vulnerability to these hazards, and examined the capabilities in place to mitigate them. The flood hazards profiled in this plan include:

- Climate Change and Sea Level Rise
- Coastal/Canal Bank Erosion
- Dam/Levee Failure
- Flood: 100/500 year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by floods. Based on the risk assessment developed for each of the flood hazards identified above, the FMPC identified goals and objectives for reducing the City's vulnerability to the hazards. The goals and objectives are summarized as follows:

Goal 1 – Protect the public health, safety, and welfare of Savannah residents from flood hazards.

- Objective 1.1: Protect critical and essential facilities from flood damage.
- Objective 1.2: Reduce damage to development through flood resilient strategies and measures.
- Objective 1.3: Preserve open space areas, especially sensitive natural areas.

Goal 2 – Holistically address repetitive loss areas

- Objective 2.1: Reduce number of repetitively flooded structures.
- Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
- Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.
- Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.

Goal 3 – Enhance flood related public education and outreach efforts.

- Objective 3.1: Expand the City's flood hazard communication and outreach program.
- Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties.
- Objective 3.3: Develop partnerships with local schools to provide flood education to students.
- Objective 3.4: Educate the public on stormwater management techniques and the benefits of acknowledging water as a resource.

Goal 4 – Monitor projections for changing weather and climate conditions and implement plans, policies, and property protection measures to reduce potential damages.

- Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
- Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
- Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

In order to meet the identified goals, this plan recommends 32 mitigation actions, which are summarized in the table that follows. More details on each action can be found in Section 7.4.

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline
1. Comprehensive evaluation of drainage system and implementation of selected projects.	1	SP	CIP Management	SPLOST	Ongoing
2. Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.	1	P, NRP, PIO	CIP Management; Facilities Maintenance	Facilities Maintenance Budget	Ongoing
3. Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	1	P, NRP	Development and Real Property Services	City Budget and FEMA Mitigation grant fund	Ongoing
4. Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.	2	P, PP	Real Property Services; Stormwater Mgmt	City Budget	Ongoing
5. Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.	1	P, PP	Development Services	City Budget	Ongoing
6. Designate GDOT properties that are unused as areas for flood storage.	1	P, PP	Stormwater Management	City Budget	Ongoing
7. Reduce future vulnerability of Vallombrosa area through acquisition or regulation.	2	P, PP	Development Services	City Budget	2-3 Years
8. Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of greater than 300 square feet below the BFE.	2	P, PP	Development Services	City Budget	Ongoing
9. Continue acquisition/demolition of high-risk flood-prone properties.	2	P, PP	Real Property Services	FEMA Mitigation Grant Funds and SPLOST	Ongoing
10. Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.	1	P, PP	Development and Real Property Services	FEMA Mitigation Grant Funds for eligible type projects and SPLOST	Ongoing
11. Target critical facilities for flood mitigation.	1	P, PP, ES	Various City agencies	SPLOST and FEMA mitigation grant funds	Ongoing
12. Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post "potential high water mark" signs.	3	PIO	Development Services	City Budget	Ongoing
13. Continue to enhance newly implemented City website "flood protection information' webpage.	3	PIO	Public Information Office	City Budget	Ongoing

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline
14. Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	3	ES	Public Safety/Emergency Management	City budget for coordination, State/Federal funds for enhancement	Ongoing
15. Continue flood preparedness and outreach activities at local community events	3	PIO	Public Information Office and Development Services	City budget	Ongoing
16. Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.	3	PIO, NRP	Public information office, local environmental organizations, facilities maintenance	City budget	Ongoing
17. Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.	3	PIO	Development Services	City budget	Ongoing
18. Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	3	PIO	local environmental groups, Savannah State and Georgia Tech; Stormwater Services and Engineering	Organizational Budgets	Ongoing
19. Interview and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.	3	PIO	Steering Committee; Public Information Office; Savannah State; Georgia Tech	City budget	Ongoing
20. Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.	3	PIO	Steering committee and development services	City budget	Ongoing
21. Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.	3	PIO	Public Information Office, Development Services, and CEMA	City budget	Ongoing
22. Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	1, 3	PIO	Real Property Services; Savanah State	City Budget	2-3 Years
23. Strategically focus SPLOST funds toward identified drainage improvement projects.	1	SP	CIP Management	City budget	Ongoing

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline
24. Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.	3	PIO	Development Services	City budget	Ongoing
25. Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.	1	P	Development Services	FEMA	Ongoing
26. Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).	3	P, PP	Development Services	City budget	12 Months
27. Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.	1, 2	SP	Stormwater Management	City SPLOST funding	12 Months
28. Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	1	SP	Stormwater Department and City Council	City Budget	36 Months
29. Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	1	P, NRP	Parks and Recreation Department	City and Council Combined funding of the MPO	48 Months
30. Consider participation in FEMA's high water mark initiative.	1, 3	PIO	Development Services	City's operating budget	36 Months
31. Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	1, 2	P, NRP	Parks and Recreation Department in cooperation with the Chatham County-Savannah MPO and the Savannah City Council	SPLOST Funding	36 Months
32. Develop a Watershed Master Plan for the City	1	P, PP, NRP	Development Services	SPLOST Funding	6 Months

The plan has been formally adopted by the City and will be updated every five years at a minimum. This plan fulfills the requirements of Section 104 of the Disaster Mitigation Act of 2000 and qualifies for CRS Credit. The following table provides the 10-step CRS planning credit activity checklist and the section/page number within this plan that describes the completion of each planning step in more detail.

CRS Planning Credit Activity Checklist

CRS Step	Section/Page
1. Organize to prepare the plan.	
a. Involvement of office responsible for community planning	Section 4.1
b. Planning committee of department staff	Section 4.1
c. Process formally created by the community's governing board	Section 4.2.1
2. Involve the public.	
a. Planning process conducted through a planning committee	Section 4.1 / Table 4.1 / Appendix A
b. Public meetings held at the beginning of the planning process	Section 4.2.1 / Table 4.4 / Appendix A
c. Public meeting held on draft plan	Section 4.2.1 / Table 4.4 / Appendix A
d. Other public information activities to encourage input	Section 4.2.1 / Table 4.5 / Appendix A
3. Coordinate with other agencies.	
a. Review of existing studies and plans	Section 4.2.1
b. Coordinating with communities and other agencies	Section 3.2.1 / Appendix A
4. Assess the hazard.	
a. Plan includes an assessment of the flood hazard with:	Sections 5.1 – 5.4
(1) A map of known flood hazards	Sections 5.1 – 5.4
(2) A description of known flood hazard	Sections 5.1 – 5.4
(3) A discussion of past floods	Sections 5.1 – 5.4
b. Plan includes assessment of less frequent floods	Sections 5.1 – 5.4
c. Plan includes assessment of areas likely to flood	Section 5.5.2
d. The plan describes other natural hazards	----
5. Assess the problem.	
a. Summary of each hazard identified in the hazard assessment and their community impact	Section 5.5
b. Description of the impact of the hazards on:	Section 5.5
(1) Life, safety, health, procedures for warning and evacuation	Section 5.5.4
(2) Public health including health hazards to floodwaters/mold	Section 5.5.4
(3) Critical facilities and infrastructure	Section 5.3 – 5.4
(4) The community's economy and tax base	Section 2.1.4
(5) Number and type of affected buildings	Section 5.4
c. Review of all damaged buildings/flood insurance claims	Section 5.4.4
d. Areas that provide natural floodplain functions	Section 2.1.2 / 5.3
e. Development/redevelopment/Population Trends	Sections 2.1.5 – 2.1.6
f. Impact of future flooding conditions outline in Step 4, item c	Section 5.5.3
6. Set goals.	Section 7.2
7. Review possible activities.	
a. Preventive activities	Section 7.3 / Appendix B
b. Floodplain Management Regulatory/current & future conditions	Section 7.3 / Appendix B

CRS Step	Section/Page
c. Property protection activities	Section 7.3 / Appendix B
d. Natural resource protection activities	Section 7.3 / Appendix B
e. Emergency services activities	Section 7.3 / Appendix B
f. Structural projects	Section 7.3 / Appendix B
g. Public information activities	Section 7.3 / Appendix B
8. Draft an action plan.	
a. Actions must be prioritized	Sections 7.3 – 7.4 / Appendix B
(1) Recommendations for activities from two of the six categories	Sections 7.3 – 7.4 / Appendix B
(2) Recommendations for activities from three of the six categories	Sections 7.3 – 7.4 / Appendix B
(3) Recommendations for activities from four of the six categories	Sections 7.3 – 7.4 / Appendix B
(4) Recommendations for activities from five of the six categories	Sections 7.3 – 7.4 / Appendix B
b. Post-disaster mitigation policies and procedures	Sections 7.3 – 7.4 / Appendix B
c. Action items for mitigation of other hazards	Sections 7.3 – 7.4 / Appendix B
9. Adopt the plan.	Section 8
10. Implement, evaluate and revise.	
a. Procedures to monitor and recommend revisions	Sections 9.1 – 9.2
b. Same planning committee or successor committee that qualifies under Section 511.a.2 (a) does the evaluation	Section 9.1.1

Table of Contents

1 Introduction

Section 1 provides a general introduction to hazard mitigation and an overview of the purpose, background, and scope of the City of Savannah Flood Mitigation Plan. It contains the following subsections:

- 1.1 Purpose and Authority
- 1.2 Background and Scope
- 1.3 Plan Organization

1.1 PURPOSE AND AUTHORITY

As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented. The purpose of this plan is to identify, assess and mitigate flood risk in order to better protect the people and property of the City of Savannah from the effects of flood hazards. This plan documents the City of Savannah's hazard mitigation planning process and identifies relevant flood hazards and vulnerabilities and strategies the City will use to decrease vulnerability and increase resiliency and sustainability.

This Plan was developed in a joint and cooperative venture by members of a Floodplain Mitigation Planning Committee (FMPC) which included representatives of City departments, federal and state agencies, citizens and other stakeholders. This Plan will ensure Savannah's continued eligibility for federal disaster assistance including the Federal Emergency Management Agency (FEMA) Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC), and the Flood Mitigation Assistance Program (FMA). Completion of this plan also earns credit for the National Flood Insurance Program (NFIP) Community Rating System (CRS), which allows for discounted flood insurance premiums for residents and property owners in Savannah. This Plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S. C. 5165, enacted under Section 104 of the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October 2007.

1.2 BACKGROUND AND SCOPE

The City of Savannah is a participant in both the NFIP and CRS program; it is currently rated as a Class 5 community in the CRS program. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that (1) reduce flood losses, (2) facilitate accurate insurance ratings, and (3) promote the awareness of flood insurance. As part of the CRS program requirements for a Class 5 rating, Savannah must demonstrate action taken to eliminate or minimize future flood losses by adopting and implementing a floodplain mitigation plan (FMP). The City must accurately identify flood hazards, analyze their impacts on people and property, and identify ways to reduce those impacts through hazard mitigation.

It is the goal of the FMPC to continue to work to make improvements to this plan so as to better serve the citizens of the City of Savannah, and to strive to improve the Class Rating for the City, so that the highest reduction in flood insurance premium rates can be available for its citizens. Through the City's participation in the NFIP and a Class 5 rating with the CRS, owners of properties in the City's Special

Flood Hazard Area (SFHA) are entitled to a 25% discount on their flood insurance premiums. In addition, homeowners in non SFHA's receive a 10% discount on flood insurance premiums.

1.3 PLAN ORGANIZATION

The Savannah Flood Mitigation Plan is organized as follows:

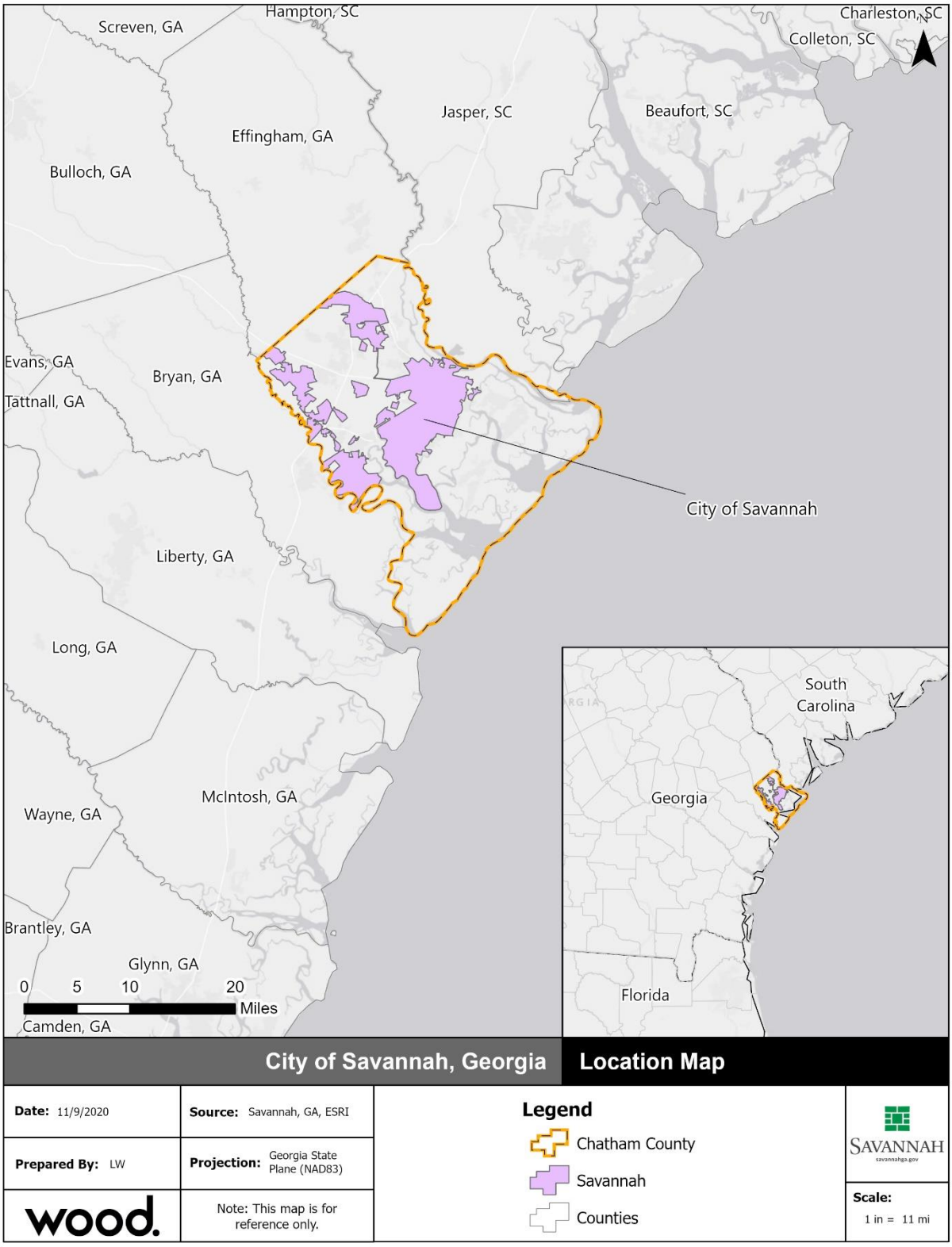
- Section 1: Introduction
- Section 2: Community Profile
- Section 3: Planning Process
- Section 4: Flood Risk Assessment
- Section 5: Capability Assessment
- Section 6: Mitigation Strategy
- Section 7: Plan Adoption
- Section 8: Plan Implementation and Maintenance
- Appendix A: Program for Public Information (PPI)
- Appendix B: Planning Process
- Appendix C: Mitigation Alternatives:
- Appendix D: References

2 Community Profile

2.1 OVERVIEW OF THE COMMUNITY

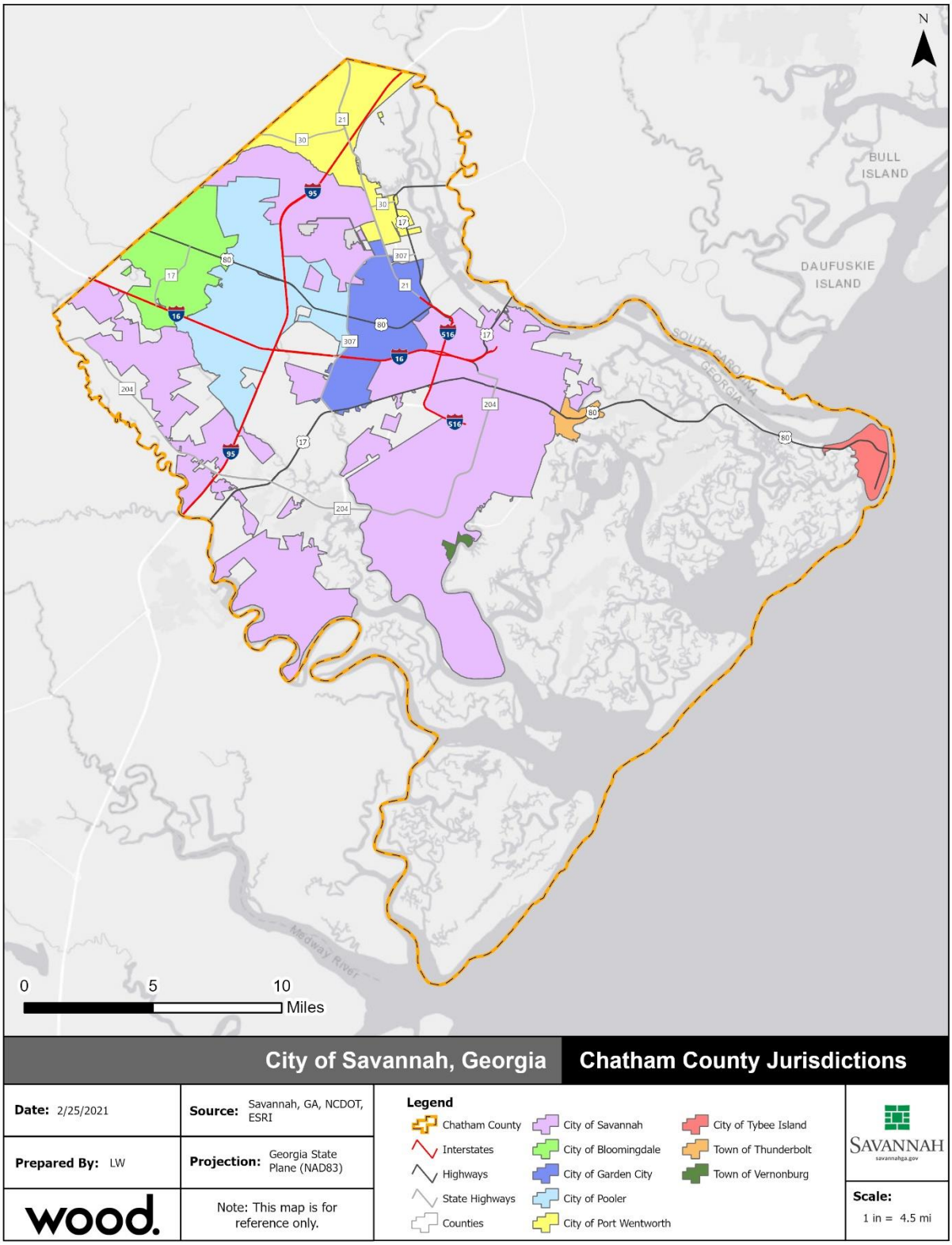
The City of Savannah has a total land area of just over 103 square miles located in southeastern Georgia, nestled in close proximity to the Savannah River and the Atlantic Ocean. In 2019, the City had an estimated total population of 145,403. As Georgia's first City with a rich history dating back to 1733, the City receives millions of visitors each year with tourism being an active and rapidly growing segment of the economy. The City's attractiveness as a visitor destination is enhanced by its internationally renowned historic district, abundant accommodations and easy accessibility. It is served by several primary highways including Interstates 95 and 16, as well as the Savannah / Hilton Head International Airport. The City of Savannah is located in Chatham County. Figure 2.1 reflects the location of the City of Savannah and Chatham County within the State. Figure 2.2 reflects the City of Savannah in comparison to the surrounding jurisdictions within the County. Figure 2.3 provides a base map for the City.

Figure 2.1 – City of Savannah Location Map



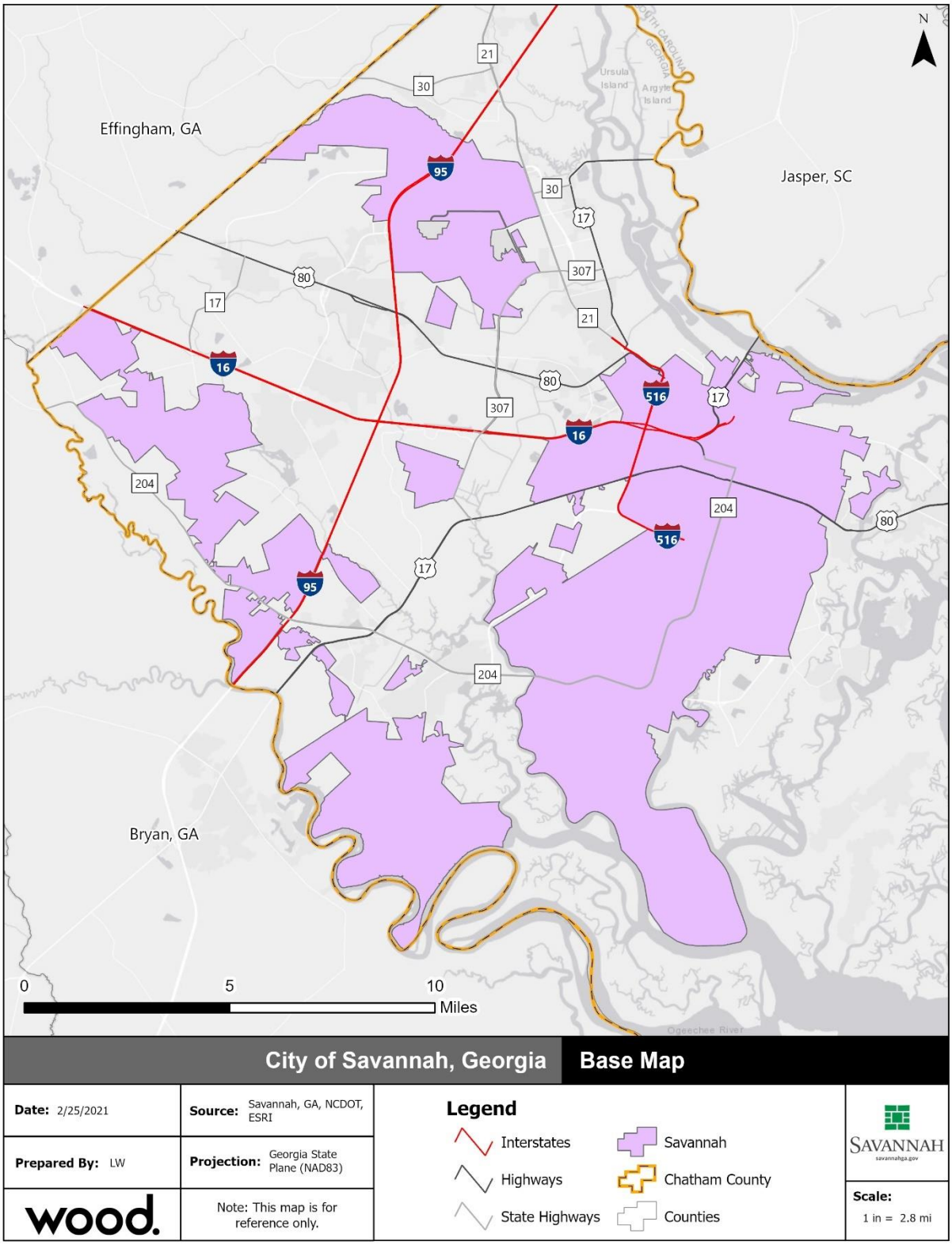
Source: SAGIS, 2020

Figure 2.2 – Chatham County Jurisdictions



Source: SAGIS, 2020

Figure 2.3 – City of Savannah Base Map



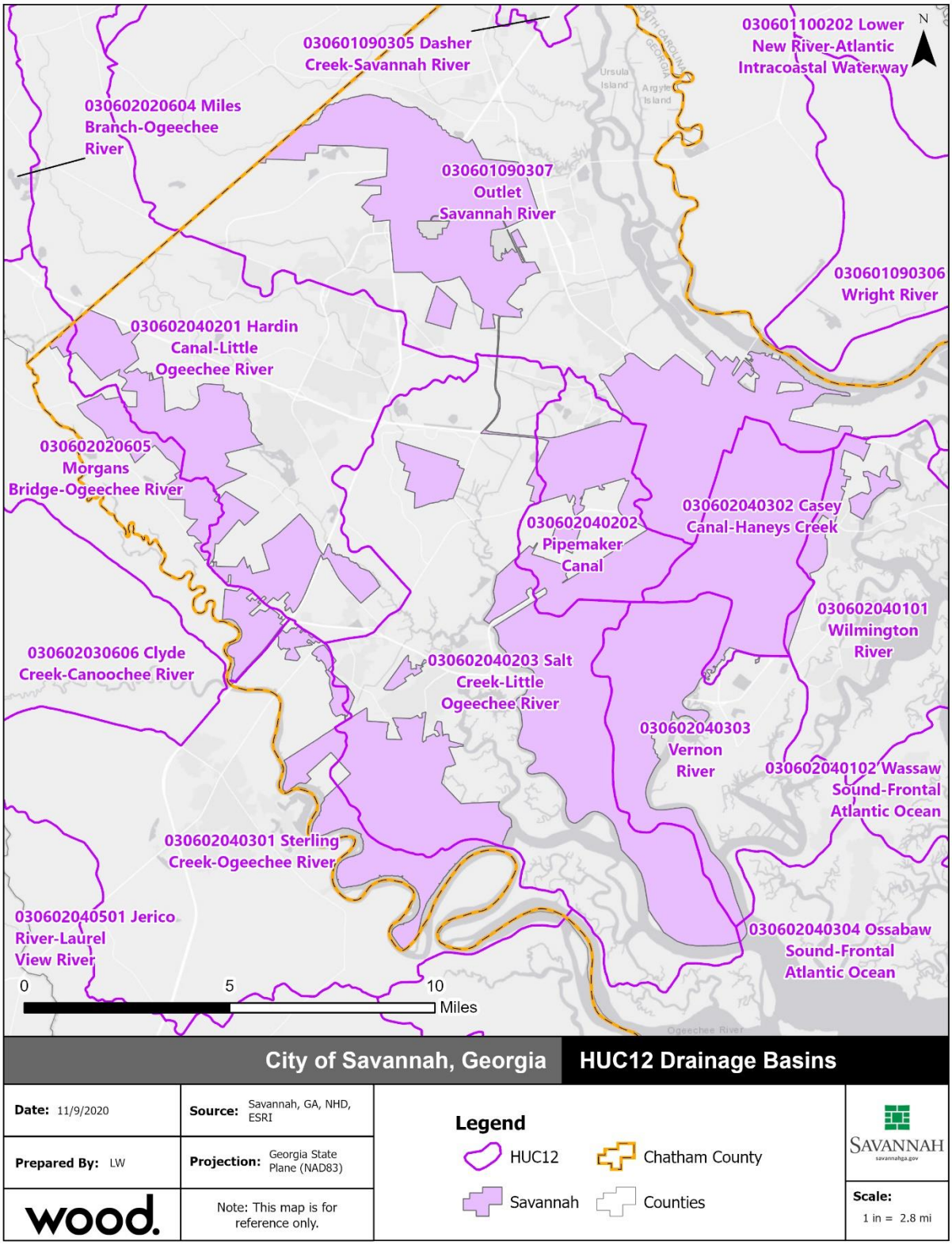
Source: SAGIS, 2020

2.1.1 Topography and Climate

The City of Savannah is situated on a low coastal plain with much of its surrounding area consisting of tidal marshes. Elevations range from sea level along the coast to approximately 40 feet above sea level in downtown Savannah. The Savannah River (north of City) and the Ogeechee River (south of City) have drainage areas extending far beyond the limits of Savannah and Chatham County. Other streams and creeks have chiefly tidal estuaries within the area and include the Little Ogeechee River, Vernon River, Bear River, Wilmington River, Bull River, and numerous tributaries to these. Main openings to the Atlantic Ocean are Ossabaw Sound and Wassaw Sound. Figure 2.4 illustrates the HUC-12 drainage basins within the City of Savannah.

According to the Köppen Climate Classification, Savannah is categorized as a subtype Cfa (Humid Subtropical Climate); this subtype is characterized by relatively high temperatures and evenly distribute precipitation throughout the year. The average maximum temperature in January is 60.4°F and in July is 91.2°F. Average annual precipitation is approximately 49.5 inches, with most precipitation occurring in June through August. Annual temperature and precipitation for the City of Savannah are shown in Figure 2.5 and Figure 2.6 according to data from the National Oceanic and Atmospheric Administration (NOAA). Per this data, average temperature in the City has been trending upward by approximately 0.2°F per decade; average precipitation has been trending upward by approximately 0.24 inches per decade.

Figure 2.4 – Savannah HUC 12- Drainage Basins



Source: SAGIS, 2020

Figure 2.5 – Average Annual Temperature, City of Savannah

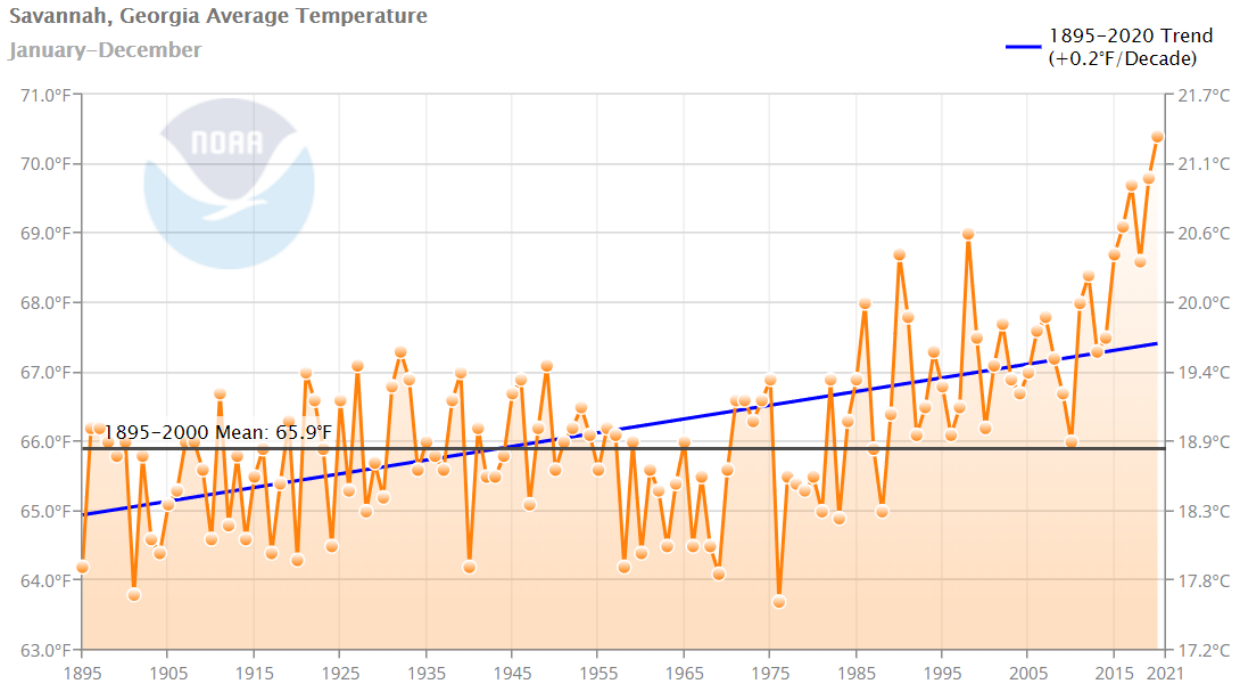
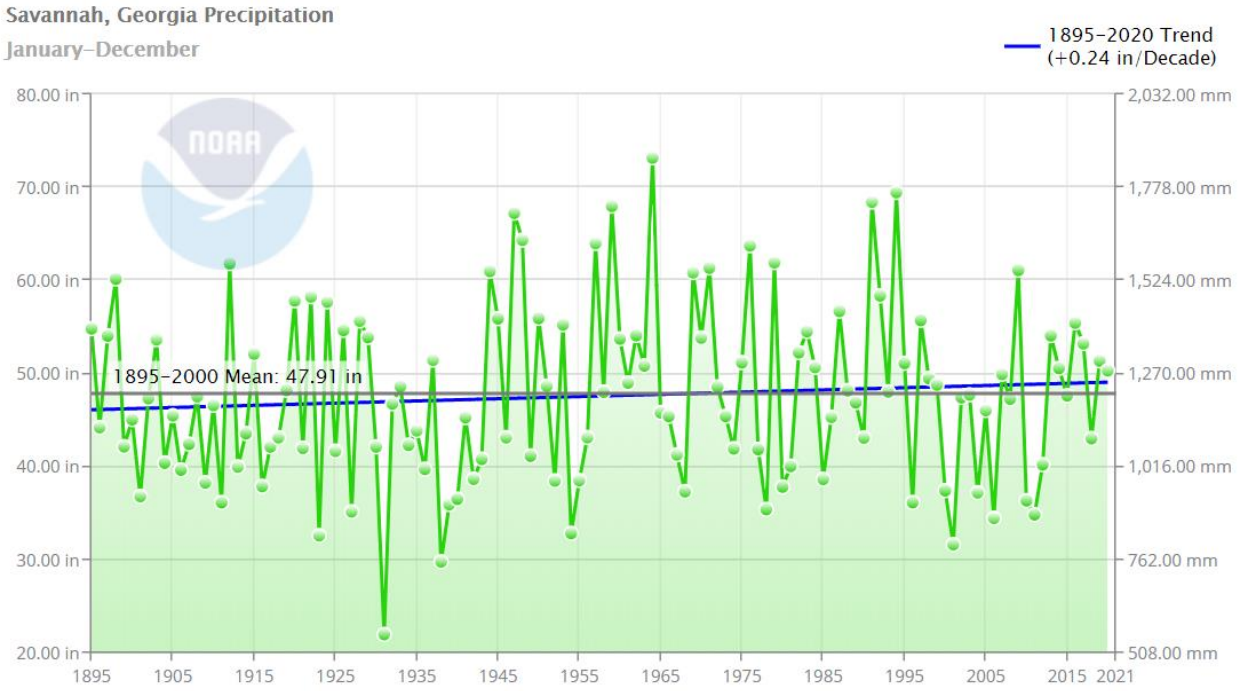


Figure 2.6 – Average Annual Precipitation, City of Savannah



2.1.2 Cultural, Historical, and Natural Resources

Historical and Archeological Resources

There are 13 identified historic neighborhoods within the City of Savannah, listed below in alphabetical order; they are all listed on the National Register of Historic Places. There are additional districts within the city eligible for listing on the Historic Register – these districts can be found in the Chatham County - Savannah Comprehensive Plan.

- **Ardsley Park-Chatham Crescent Historic District:** This district is bounded by Victory Drive on the north to 55th Street on the south, and by Waters Avenue on the east to Bull Street on the west.
- **Carver Village Historic District:** Named for George Washington Carver, the Village was established in 1948 and provided affordable housing for black community members. It includes approximately 600 homes, churches, and other buildings. The district is roughly bounded by W. Gwinnett & Endley Streets, Allen Blun & Collat Avenues.
- **Central of Georgia Railroad: Savannah Shops and Terminal Facilities:** This is an antebellum industrial district, established in the 1850s, and is the nation's oldest surviving and best remaining example of an integrated, comprehensive railroad facility of its period. This district is located at the Georgia State Railroad Museum between W. Jones Street and Louisville Road.
- **Cuyler-Brownsville Historic District:** This district is the result of two land developments which have grown into one community rich in history and character. It is roughly bounded by Anderson Lane, West 31st Street, Montgomery Street, Victory Drive, Ogeechee Road, and Hopkins Street.
- **Daffin Park-Parkside Place Historic District:** Featuring a large city park, a neighborhood of arts and crafts style houses, and Georgia's most intact minor league baseball stadium, this district is bounded by Victory Drive, Waters Avenue, Bee Street and 51st Street Lane.
- **Eastside Historic District:** This district features two-story homes with broad porches as well as smaller cottages and workmen rows, mature live oaks, and flowering azaleas. It is bounded on the north and south by Gwinnett Street and Anderson Street and on the east and west by East Broad Street and Cedar Street.
- **Fairway Oaks-Greenview District:** This district consists of two contiguous suburban and residential subdivision developed between 1950 and the early 1960s on the outskirts of the City. It is bounded approximately by DeRenne Drive, Waters Avenue, Truman Parkway, the Casey Canal, and the Live Oaks Golf Course.
- **Gordonston Historic District:** This district consists of various sizes and types of residential structures, ranging from brick mansions to small craftsmen style cottages. It is roughly bounded by Skidaway Road, Goebel Avenue, Gwinnett Street, and Pennsylvania Avenue.
- **Kensington Park – Groveland Historic District:** This district features one of the best collection of mid-20th century domestic architecture representing a variety of architectural styles and house types built in middle- to upper-class neighborhoods in Savannah. The district is roughly bounded by DeRenne and Waters Avenues and Abercorn and Johnston Streets.
- **Pine Gardens Historic District:** Bounded by Goebel Avenue and Beach & Capitol Streets, this residential district, listed on the National Register of Historic Places but not the Historic Savannah Foundation, was developed to serve the Southeastern Shipbuilding Corporation and features the American Small House.
- **Savannah National Historic Landmark District:** This district contains park-like squares surrounded by residential, commercial and institutional properties, many of them dating from the City's early years (c1733). It is bounded by East Broad Street on the east, Gwinnett Street on the south, West Broad Street on the west, and the Savannah River on the north.

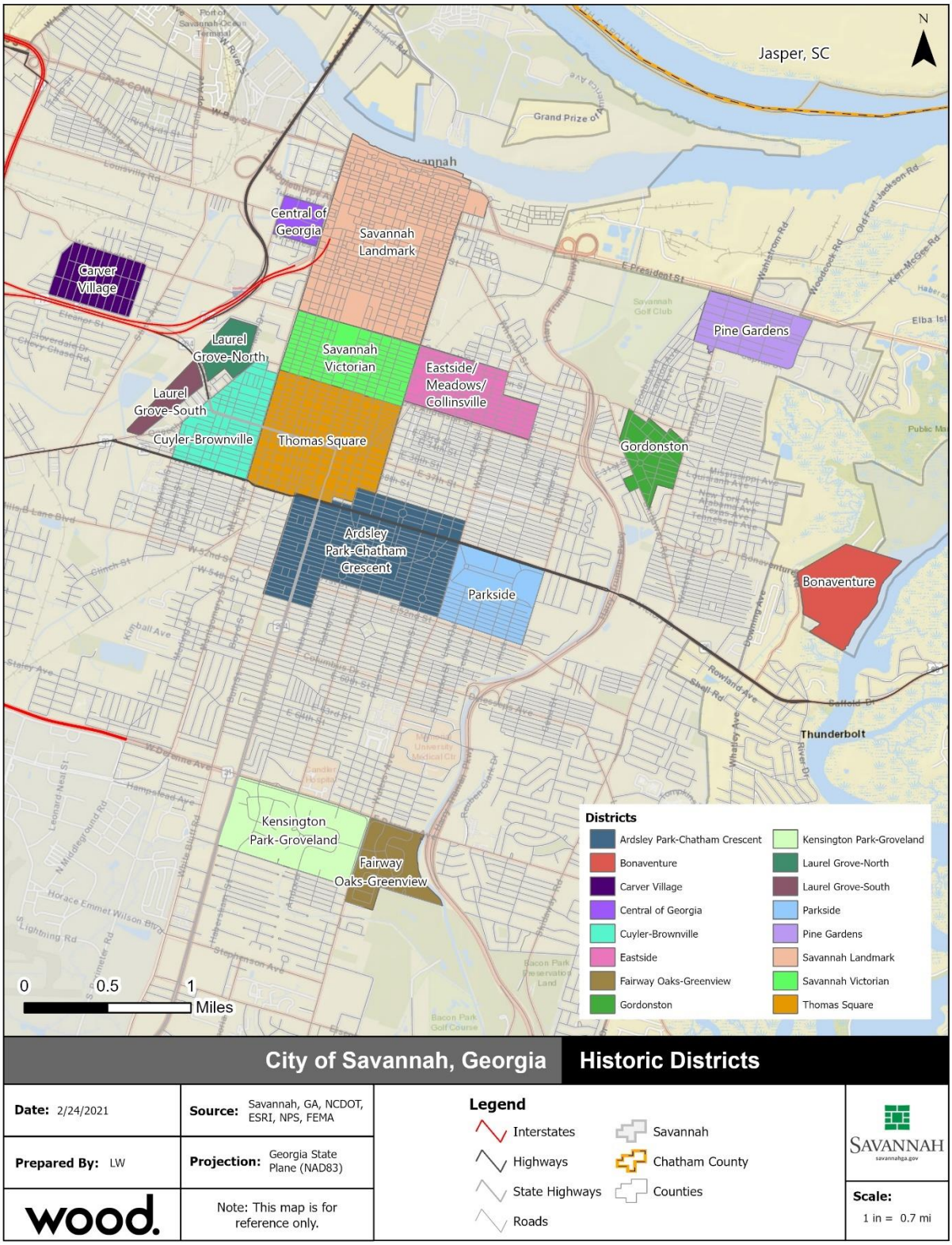
- **Savannah Victorian District:** This district consists of wood frame houses dating from the 1870s and 1880s that are a mixture of several Victorian styles of architecture. The boundaries of the Savannah Victorian Historic District are Gwinnett Street on the north, Anderson Lane on the south, Martin Luther King, Jr. Boulevard on the west, and East Broad Street.
- **Thomas Square Streetcar Historic District:** This district contains primarily historic residential, commercial and community buildings and is one of the largest historic districts in Savannah. It is bounded by Anderson Lane on the north, Broad Street on the east, Victory Drive on the south and Montgomery Street on the west.

Additionally, there are three historically designated cemeteries within the Savannah city limits, listed below:

- Bonaventure
- Laurel Grove North
- Laurel Grove South

Figure 2.7 illustrates the locations of Savannah's historic districts and cemeteries.

Figure 2.7 – Historic Districts and Cemeteries, Savannah, GA



Source: SAGIS 2019, NPS National Register of Historic Places

Natural Features and Resources

According to the U.S. Fish & Wildlife Service's Environment Conservation Online System (ECOS), there are a total of 26 threatened, endangered, or candidate species within Chatham County as shown below in Table 2.1.

Table 2.1 – Savannah Area Threatened and Endangered Species

Group	Common Name	Scientific Name	Federal Status
Amphibians	Striped newt	*Notophthalmus perstriatus*	Resolved Taxon
Amphibians	Gopher Frog	*Litobates capito*	Under Review
Amphibians	Frosted Flatwoods salamander	*Ambystoma cingulatum*	Threatened
Birds	MacGillivray's Seaside sparrow	*Amondramus maritimus magcillivraii*	Resolved Taxon
Birds	Red knot	*Calidris canutus rufa*	Threatened
Birds	Wood stork	*Mycteria americana*	Threatened
Birds	Cardinal honey-eater	*Myzomela cardinalis saffordi*	Resolved Taxon
Birds	Red-cockaded woodpecker	*Picoides borealis*	Endangered
Birds	Piping Plover	*Charadrius melodus*	Threatened
Fishes	Robust redhorse	*Moxostoma robustum*	Under Review
Flowering Plants	Carolina bishopweed	*Ptilimnium ahlesii*	Status Undefined
Flowering Plants	Pondberry	*Lindera melissifolia*	Endangered
Flowering Plants	Yellow annisetree	*Illicium parviflorum*	Resolved Taxon
Flowering Plants	Georgia lead-plant	*Amorpha georgiana*	Under Review
Insects	Monarch butterfly	*Danaus plexippus*	Candidate
Mammals	West Indian Manatee	*Trichechus manatus*	Threatened
Mammals	Tricolored bat	*Perimyotis subflavus*	Under Review
Reptiles	Spotted turtle	*Clemmys guttata*	Under Review
Reptiles	Eastern diamondback rattlesnake	*Crotalus adamanteus*	Under Review
Reptiles	Eastern indigo snake	*Drymarchon corais couperi*	Threatened
Reptiles	Gopher tortoise	*Gopherus polyphemus*	Candidate
Reptiles	Loggerhead sea turtle	*Caretta*	Threatened
Reptiles	Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered
Reptiles	Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Reptiles	Southern hognose snake	*Heterodon simus*	Resolved Taxon
Reptiles	Leatherback sea turtle	*Dermochelys coriacea*	Endangered

Source: USFWS ECOS Online, 2021 (https://ecos.fws.gov/ecp/report/species-listings-by-current-range-county?fips=13051)

Parks, Preserve, and Conservation

The natural and scenic amenities of Chatham County offer many recreational and cultural opportunities. Due to the amount of open space in Chatham County being reduced annually, surveys were performed and a resulting countywide Open Space Plan was completed by the MPC in 1996. This plan was drafted to provide direction in providing and conserving adequate amounts of natural open space for Chatham County to enjoy in the years to follow.

As defined in the open space plan, "open space is an area that is valued for active and passive recreation and protection of the natural resources (including natural processes and wildlife) and which provides public benefit and which is part of one or more of the following categories: developmentally difficult lands, natural resource areas, commercially used natural resources areas, natural amenity areas, recreational areas and urban form areas." Under this definition, there are five areas under Federal

jurisdiction and six areas under State jurisdiction within Chatham County that fall within this title of conservation/recreation areas. Additionally, there are a number of recreational and conservation areas within Chatham County that are not under State or Federal jurisdiction. Some of the conservation and recreational areas within Chatham County include the following sites:

- Fort Pulaski National Monument
- Savannah National Wildlife Refuge
- Tybee National Wildlife Refuge
- Atlantic Intracoastal Waterway
- Wassaw Island National Wildlife Refuge
- Skidaway Island State Park
- Marine Extension Center
- Wormsloe Historic Site
- Ossabaw Island
- Little Tybee Island
- Cabbage Island
- Oatland Island Education Center
- McQueen's Island Trail
- Bacon Park
- Lake Mayer
- L. Scott Stell Community Park / The Jim Golden Complex
- King's Ferry Park
- Tom Triplett Park

In addition to the open space and conservation areas in Chatham County, the City of Savannah maintains over 378 acres of parks and playgrounds, nine walking trails and three biking trails which are listed on the City website as well as in the Chatham County Hazard Mitigation Plan.

Water Bodies and Floodplains

Natural and Beneficial Floodplain Functions: Under natural conditions, a flood causes little or no damage in floodplains. Nature ensures that floodplain flora and fauna can survive the more frequent inundations.

This is the case with Savannah's local marshes. They are flooded daily during high tide and yet life exists without damaging the environment. Historic floodplain areas are canals, and green spaces such as the Henderson and Bacon Park Golf Course and Lake Mayer. Such areas reduce flood damage by allowing flood waters to spread over a large area. This reduces flood velocities and provides flood storage to reduce peak flows downstream. Natural and historic floodplains reduce wind and wave impacts and their vegetation stabilizes soils during flooding.

Chatham County and the City of Savannah have barrier islands such as Little Tybee, Ossabaw, Cabbage and Wassaw Islands. These islands serve as a natural protective barrier to incoming hurricane forces such as wave attack, and serve to reduce tidal and wind energies. These islands serve as natural aquatic habitats, wetlands, marshes and estuaries.

Wetlands

The coast of Georgia comprises a vast array of wetlands ranging from freshwater non-tidal and tidal wetlands to estuarine wetlands, or saltmarshes. With approximately 100 linear miles of coastline, Georgia boasts approximately 348,000 acres of estuarine tidal marsh. These marshes are ecologically significant as habitat for aquatic organisms, including fish, shellfish, waterfowl, and other wildlife

species. In addition to serving as habitat for specific organisms, saltmarshes also function as feeding grounds for terrestrial vertebrates, as a buffer to protect against coastal storm surge, and as a natural filtration system to improve water quality, transform nutrients and retain sediment.

A unique wetland feature of the Southeastern Coastal Plain is the Carolina Bay. Carolina Bays are oval or teardrop shaped wetlands. Carolina Bays range from 6 to 30 feet deep and from several acres to 6,000 acres in size. Due to varying water levels, the vegetation differs dramatically from one Bay to another. Some are characterized by cypress forests, others marsh and some shrub bogs. Carolina Bays are underlain by a clay layer that keeps the water from draining through the otherwise porous soil of the Coastal Plain.

The benefits of wetlands are hard to overestimate. They provide critical habitat for many plant and animal species that could not survive in other habitats. They are also critical for water management as they absorb and store vast quantities of storm water, helping reduce floods and recharge aquifers. Not only do wetlands store water like sponges, they also filter and clean water as well, absorbing toxins and other pollutants. Based on data from the National Wetland Inventory (NWI), there are four different types of wetlands throughout the City of Savannah. These are summarized in Table 2.2 below. According to this data, over 36 percent of the City's land area is wetland area.

Table 2.2 – Wetland Types, Savannah

Wetland Type	Area (Acres)	Area (Sq. Miles)	Percent of City
Estuarine	14,650.9	22.9	21.1%
Lacustrine	310.5	0.5	0.4%
Palustrine	10,225.7	16.0	14.7%
Riverine	27.9	0.0	0.0%
Non-Wetland	44,353.0	69.3	63.8%
TOTAL	**69,568**	**108.7**	**100.0%**

Source: National Wetland Inventory

Waterbodies

According to the Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan, approximately 5.2 percent of the City's area is open water. These areas are primarily associated with the waterways surrounding the City including the Ogeechee River, Little Ogeechee River, Vernon River, Wilmington River, and the South Channel of the Savannah River.

Soils and Minerals

Chatham County, has been labeled as the Atlantic Coast Flatwoods area of Georgia. The Atlantic Coast Flatwoods area occurs along the seaward portion of Georgia and covers approximately seven million acres. It is characterized by nearly level topography and poorly drained soils that are underlain by marine sands, loams or clays.

2.1.3 History

English settlers led by James Edward Oglethorpe, a politician, soldier and philanthropist, established the 13th colony of Georgia in 1733. Oglethorpe selected a bluff on the south side of a mighty river as the site of the colony's first city, and he christened the fledgling town Savannah after the Indian name for the waterway. By 1766, Savannah was home to almost 18,000 people and a healthy economy based on the exportation of rice. The city became a major exporter of cotton in the early 1800s. The Civil War left Savannah bankrupt, but a resurgence in cotton production soon had Savannah back on its feet and prospering.

The decline of cotton production and the Great Depression threatened to curtail Savannah's progress in the 1920s and 1930s, but the town got a boost when the Union Bag and Paper Company opened a large plant just west of the city. The plant — now a part of the International Paper Company empire and still one of the city's largest employers —helped Savannah through those tough times, as did the presence of the military during World War II. Two large Army Air Corps bases were in operation in Savannah, and one has been retained in the present-day form of Hunter Army Airfield.

2.1.4 Economy

Tourism

Savannah's tourism and hospitality is regularly one of the largest economic drivers for the region. The City's beauty and charm along with its well-preserved past and many opportunities for outdoor recreation provide a unique and exciting destination for visitors from around the Country and the world. In 2019, over 14.8 million visitors came to the City, 8.4 million overnight visitors and 6.4 million daytime visitors. While tourists come to the City throughout the year, the busiest months are April, May, and June. In 2019, visitors spent $3.1 billion, stimulating the ongoing development of new hotels, restaurants, and shops. While tourists come to the City throughout the year, the busiest months are April, May, and June.

Port

The Port of Savannah is the fourth largest container port in the U.S. In FY2019, it handled more than 4.3 million TEUs (Twenty Foot Equivalent Units) and landed just outside of the top 30 ports in the world. In May 2019, the Georgia Ports Authority announced a plan to build a rail facility in partnership with the St. Louis Regional Freightway to improve supply chain efficiency as part of a wider $3 billion project to increase port traffic to 8 million TEU by 2028.

Manufacturing

The manufacturing firms in the Savannah Metropolitan Statistical Area (MSA), which is centered on Savannah and includes all of Chatham, Effingham, and Bryan Counties, created approximately 19% of the area's economic input and accounted for $4.3 billion of output in 2019. The sector produces a variety of consumer goods that range from corporate jets to baked goods to dental equipment. Among the high-profile manufacturers are International Paper and Georgia Pacific, two giants of the pulp and paper industry; Gulfstream Aerospace, a producer of world-class business aircraft; and JCB, which produces heavy construction equipment.

Military

The City is the site of Hunter Army Airfield, a vital part of the Fort Stewart complex – the largest military installation east of the Mississippi River. Boasting the U.S. Army's longest runway in the eastern United States, Hunter serves as a location from which troops and equipment based at Hunter and Fort Stewart can be deployed rapidly throughout the world. Fort Stewart, with headquarters located 40 miles southwest of Savannah in the Liberty County town of Hinesville, is home of the 3rd Infantry Division (Mechanized). Stewart and Hunter have a combined economic impact of $4.9 billion in coastal Georgia; military and civilian pay contribute more than $1.4 billion to the economy. Savannah is also home to the 165th Airlift Wing of the Georgia Air National Guard, as well as units of the Coast Guard and other components of the Air Guard.

Wages and Employment

According to the 2014-2019 American Community Survey 5-Year Estimates, the median household income for the City of Savannah is $43,307. 21.9% of the population is considered to be living below the

poverty level. Table 2.3 and Table 2.4 show employment statistics along with industry employment by major classification for the City.

Table 2.3 – Employment Statistics, Savannah, 2019

Employment Status	Estimate	Percentage
Employed	68,746	58.1
Unemployed	6,505	5.5
Not in Labor Force	41,578	35.2

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates; note: employed population estimate based on population 16 years and older, only includes civilian labor force.

Table 2.4 – Occupation Statistics, Savannah, 2019

Occupation	Estimate	Percentage
Management, business, science and arts	21,747	31.6
Service	17,288	25.1
Sales and office	15,248	22.2
Natural resources, construction and maintenance	4,606	6.7
Production, transportation and material moving	9,857	14.3

Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

Table 2.5 lists major employers in the City. According to the US Census Bureau's OnTheMap tool (2018), 66.7 percent of employees in Savannah live outside of the City and 33.3 percent live within the City borders. Additionally, 46.5 percent of Savannah residents are employed outside of the City.

Table 2.5 – Major Employers in Savannah, GA

Corporation/Organization	Service/Product	# of Employees
Gulfstream Aerospace Corp.	Jet aircraft, aerospace equipment	11,391
Savannah-Chatham County Board of Education	Public schools	5,700
St. Joseph's/Candler Health System	Hospital	4,071
Ft. Stewart/Hunter Army Airfield	Civilian personnel	3,299
Memorial Health University Medical Center	Hospital	2,300

Source: SEDA, Savannah Area Chamber

2.1.5 Population

The City of Savannah has an estimated 145,403 residents, according to the U.S. Census Bureau 2019 5-Year Estimates, which is a 6.7 percent increase from the 2010 census. The Savannah population density is 1,283 people per square mile, which is much higher than the state average density of 180.7 people per square mile. Table 2.6 provides demographic profile data from the 2014-2019 American Community Survey 5-year Estimates.

Table 2.6 – Savannah Demographic and Social Characteristics, 2019

Demographic	Percentage
Gender/Age	
Male	47.6
Female	52.4
Median Age (Years)	32.6
Under 5 Years	6.4
65 Years and Over	13.1
Race/Ethnicity	

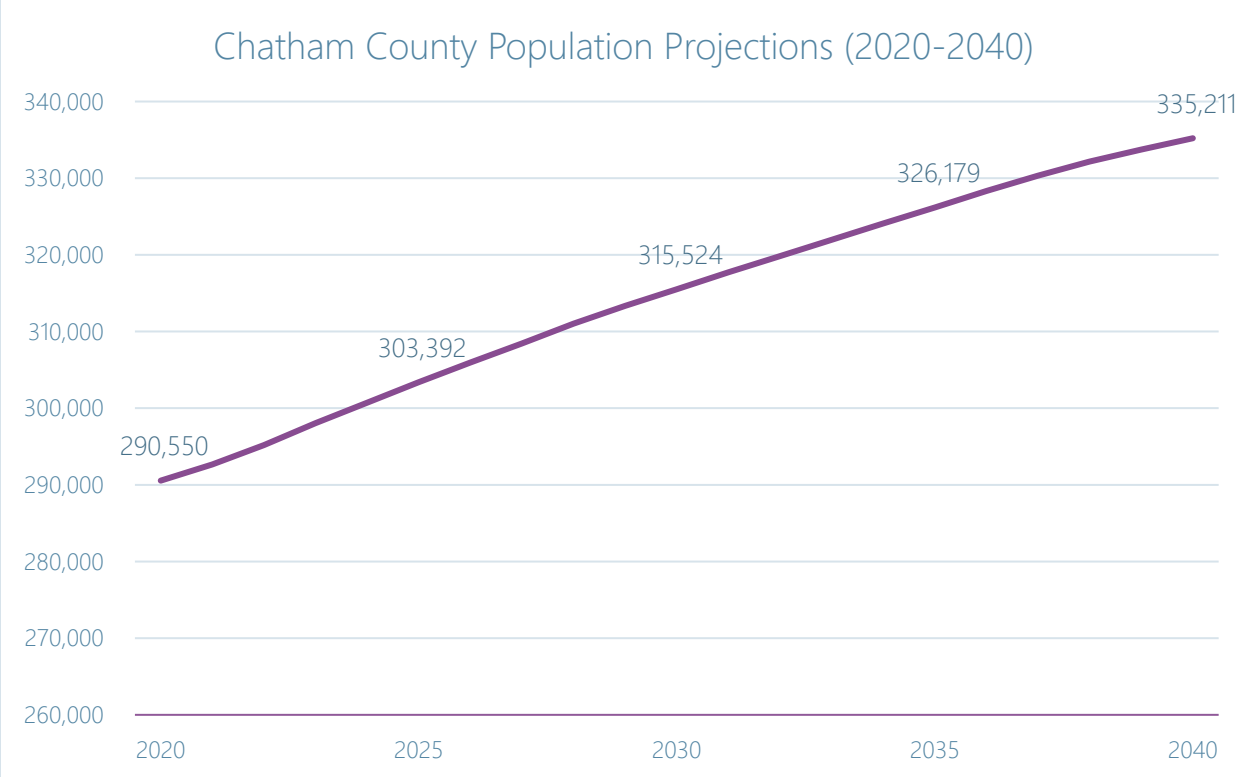
Demographic	Percentage
White	38.9
Asian	2.6
Black or African American	53.9
American Indian/Alaska Native	0.3
Hispanic or Latino, of any race[1]	5.8
Education (Population 25+)	
High School Graduate or Higher	87.6
Bachelor's Degree or Higher	28.2

Source: U.S. Census Bureau, 2014-2019 American Community Survey 5-year estimates
[1]Hispanics may be of any race, so also are included in applicable race categories.

2.1.6 Growth and Development Trends

According to the Georgia Office of Planning and Budget, the population of Chatham County is projected to increase to 335,221 (15.4%) by the year 2040. Population projections for Chatham County are shown below in Figure 2.8. As of 2019, residents of Savannah comprised approximately 50 percent of the total population in Chatham County, down from approximately 51.4 percent at the time of the 2010 census.

Figure 2.8 – Population Projections for Chatham County, Georgia



Source: State of Georgia Office of Planning and Budget, 2020

Land Use

According to the Chatham-County Savannah Comprehensive Plan, developed by the Metropolitan Planning Commission (MPC), the City is highly urbanized with large areas of mixed-use development. While the City is largely built out, at the time of the most recent comprehensive plan in 2016, the main mechanism for growth in Savannah was through annexation.

The City of Savannah is substantially built out and has a limited supply of vacant developable land. Commercial Office and Single Family Residential are the predominant land use types making up 13 and 12 percent of land in the City, respectively. The Chatham County-Savannah Comprehensive Plan includes a Future Land Use Map (FLUM) that is intended to serve as a guide for future zoning decisions. The FLUM is a visual representation of the City's future development and should be used in future zoning decisions and policy reviews. Table 2.7 reflects existing land uses within the City by category and acreage. Figure 2.9 through Figure 2.12 reflect future land uses within Savannah.

Table 2.7 – Existing Land Use in the City of Savannah

Land Use	Acres	Percent of City
Residential-Single Family	10,836	12%
Residential-Multi-Family	762	1%
Public/Institutional	7,078	8%
Commercial-Office	12,587	13%
Commercial-Retail	1,483	2%
Trans/Com/Utilities	759	1%
Agriculture/Forestry	3,746	4%
Industry-Light	5,017	5%
Industry-Heavy	829	1%
Recreation-Active	89	0%
Green Space	527	1%
Right-of-Way	7,152	8%
Tidal Marsh	5,824	6%
Open Water	2,505	3%
Undeveloped Land/Other	34,881	37%
Total	**94,075[1]**	**--**

Source: Chatham County – Savannah Comprehensive Plan, 2016

[1]: This number is larger than the 72,505 acres used in this report, likely due to the comp plan using an alternate City boundary that incorporates more of the surrounding waterways and marshland

Figure 2.9 – Future Land Use Map – Northwest Quadrant

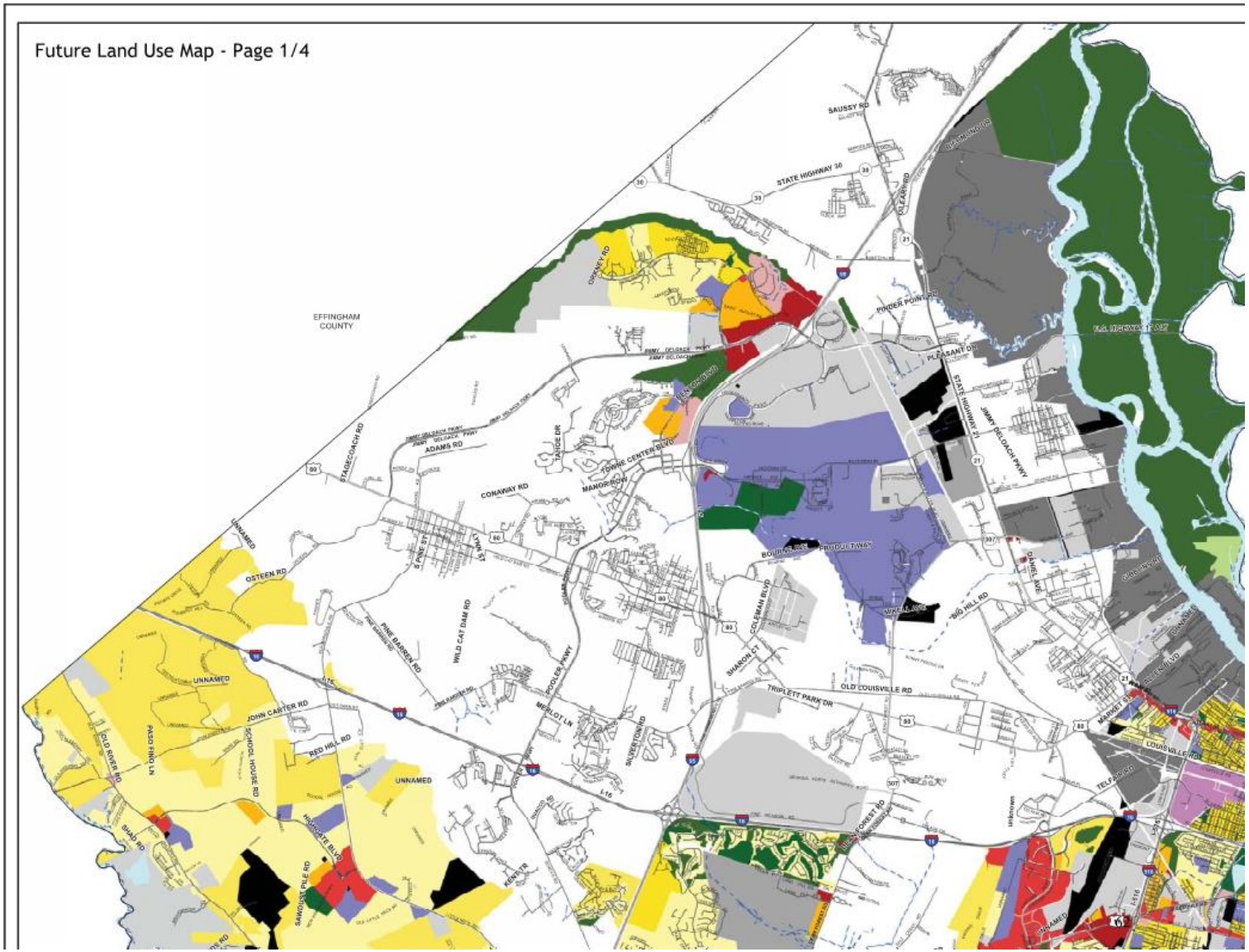


Figure 2.10 – Future Land Use Map – Northeast Quadrant

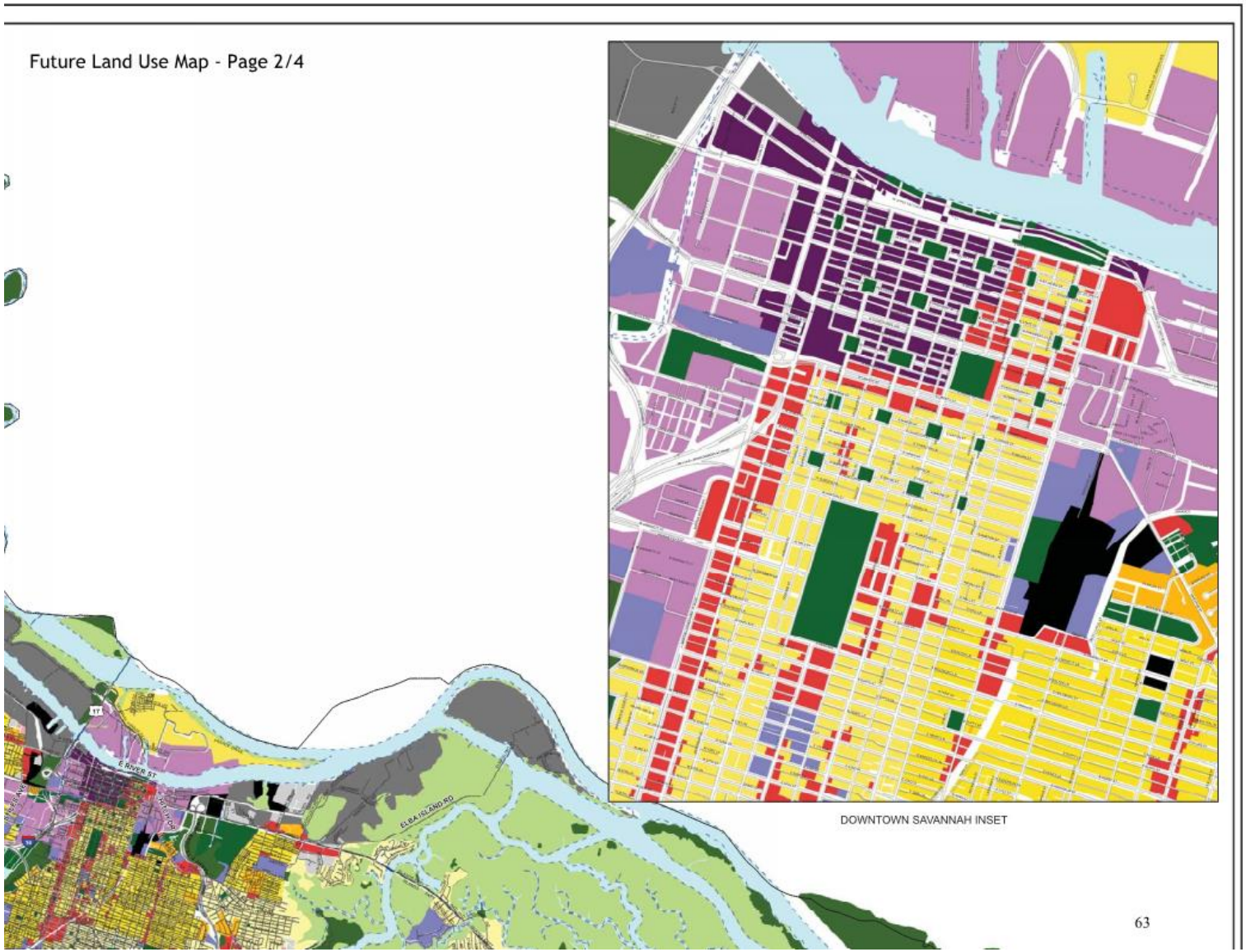


Figure 2.11 – Future Land Use Map – Southwest Quadrant

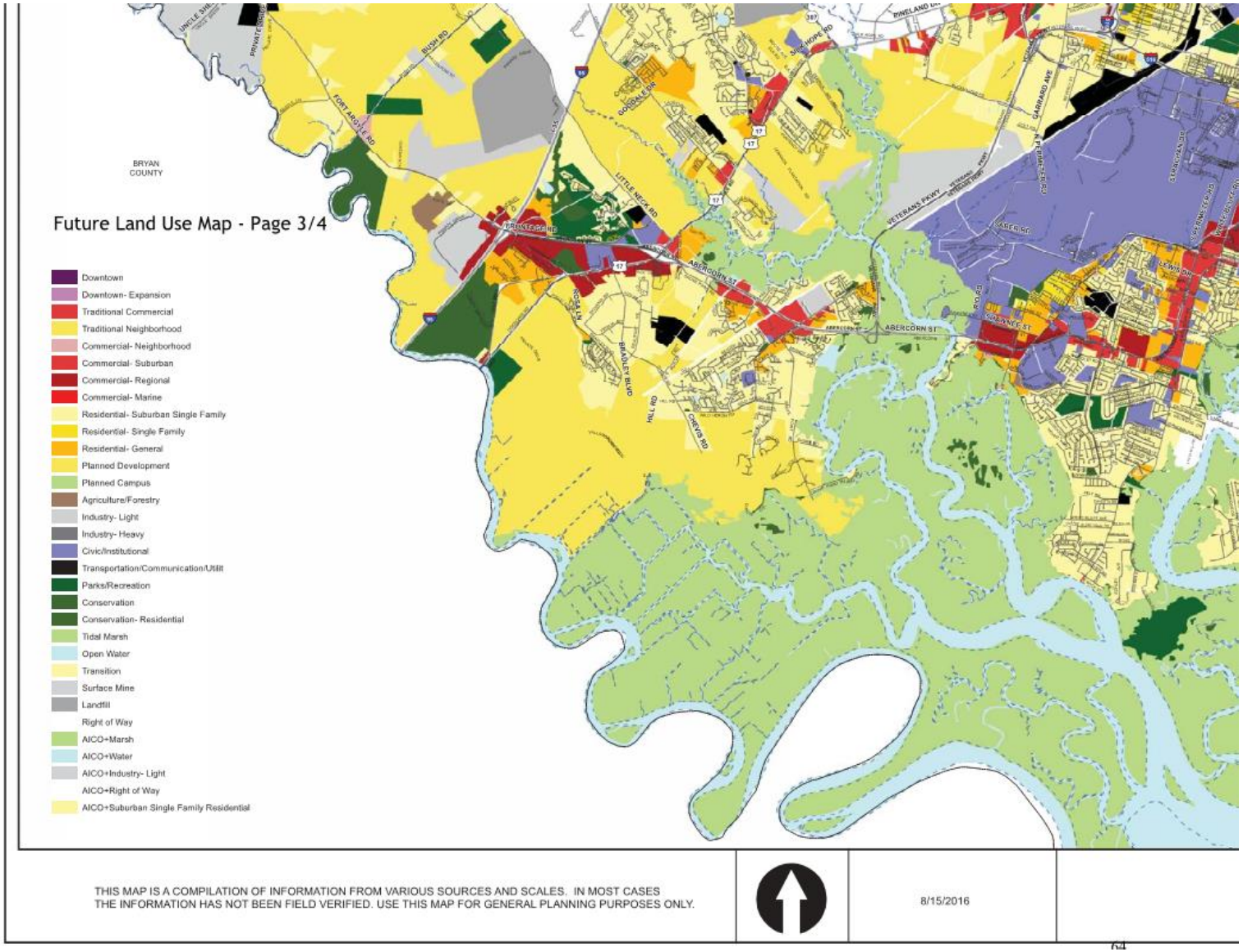
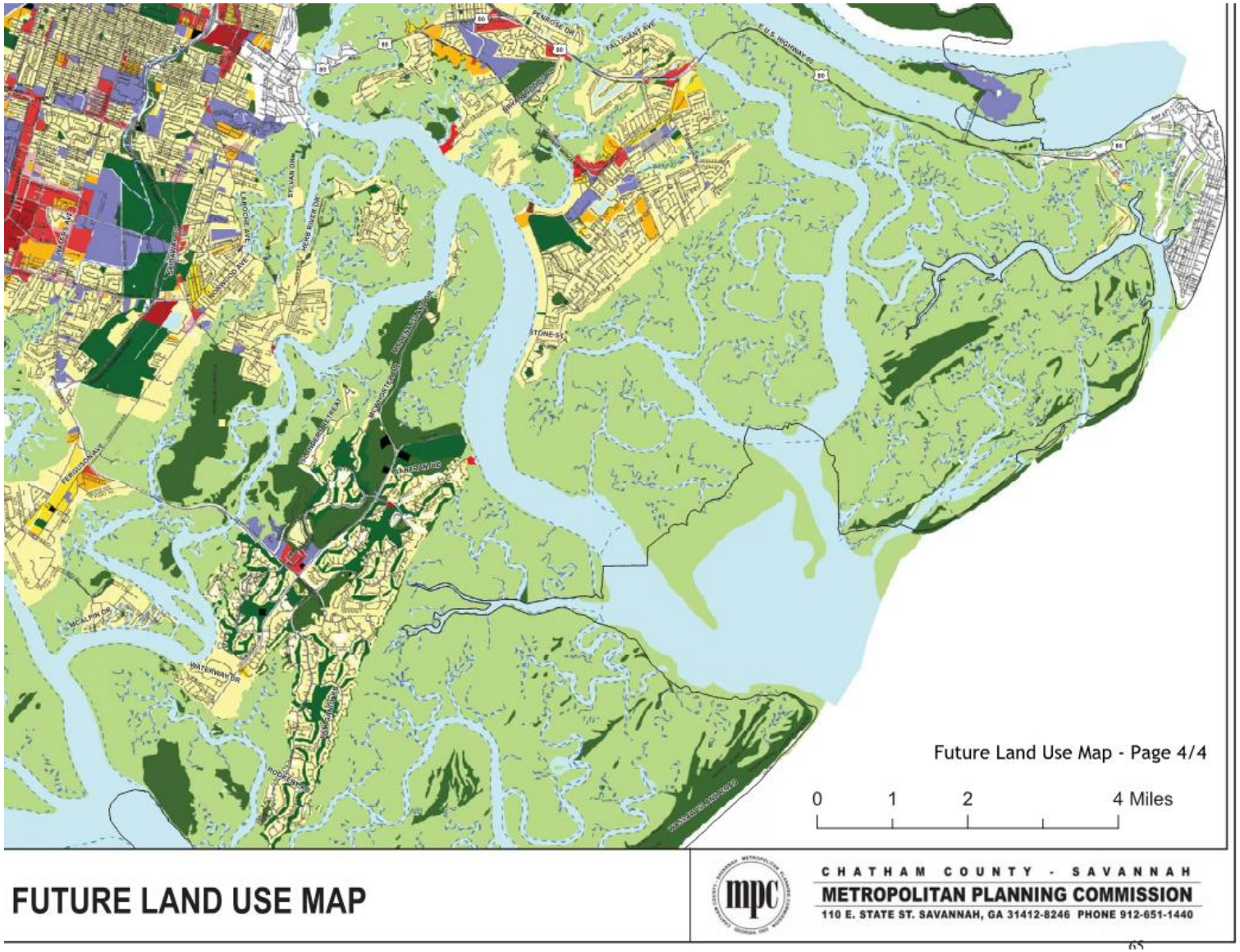


Figure 2.12 – Future Land Use Map – Southeast Quadrant



3 Plan Update

Requirements §201.6(d)(3): A local jurisdiction must review and revise its plan to reflect changes in development, progress in local mitigation efforts, and changes in priorities, and resubmit it for approval within 5 years in order to continue to be eligible for mitigation project grant funding.

The 2015 Floodplain Mitigation Plan for the City of Savannah contained a risk assessment of identified hazards for the City and a mitigation strategy to address the risk and vulnerability from these hazards. Since approval of the plan by FEMA, much progress has been made by the City on implementation of the mitigation strategy. This chapter includes an overview of the approach to updating the plan, identifies new analyses and information included in this plan update, and highlights key mitigation successes.

3.1 WHAT'S NEW IN THE PLAN

This FMP update involved a comprehensive review, reorganization, and update of each section of the 2015 plan and includes an assessment of the success of the City in evaluating, monitoring and implementing the mitigation strategy outlined in the initial plan. Only the information and data still valid from the 2015 plan was carried forward as applicable into this FMP update.

Also to be noted, Section 9 Plan Implementation and Maintenance identifies key requirements for updating future plans:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;
- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to inventories; and
- Incorporate new action recommendations or changes in action prioritization.

These requirements and others as detailed throughout this plan were also addressed during this plan update process. New information and analyses contained in this plan update include the following:

- Increased flood risk analysis based on the new DFIRM and the most recent Tax Assessor's Data.
- All hazards were updated with recent literature as well as state, regional, and local data
- GIS was used, to the extent data allowed, to analyze all priority hazards as part of the vulnerability assessment. This involved utilizing mapped hazard data, combined with the City parcel data.
- Populations at risk to identified hazards were identified utilizing GIS and 2019 ACS data. Assets at risk were identified by property type, and values of properties included based on data from the City Tax Assessor's Database. The discussion on growth and development trends was enhanced utilizing 2019 Census data.
- Hazard impacts to future development were analyzed through the development of future development maps and tables by property type based on the City assessor's data.
- Critical facilities were analyzed for all mapped priority hazards. Maps of critical facilities at risk to identified hazards were included in this Update.

- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of CRS, in addition to DMA requirements.

3.2 2010 FMP MITIGATION STRATEGY STATUS AND SUCCESSES

In the 2015 mitigation strategy for the City of Savannah, the FMPC put forward the following goals:

Goal 1: Protect the health, safety and welfare of the citizens of Cutler Bay from the effects of flooding

- **Objective 1.1:** Reduce flood damage to insurable buildings and public infrastructure through stormwater improvement projects
- **Objective 1.2:** Preserve open space areas, especially where there are sensitive natural areas
- **Objective 1.3:** Promote higher development and design standards to protect new buildings from flood damage

Goal 2: Promote a public education program to encourage residents to promote mitigation measures that reduce the effects of flood damage on private property

- **Objective 2.1:** Encourage residents to assume an appropriate level of responsibility for their own flood protection
- **Objective 2.2:** Promote flood insurance as a property protection measure against potential flood damage
- **Objective 2.3:** Develop a public education program for the local schools

Goal 3: Protect critical and essential facilities from flood damage

- **Objective 3.1:** Seek county, state and federal support for mitigation projects
- **Objective 3.2:** Prioritize critical and essential facilities in need of protection from potential flood damage

Goal 4: Reduce the number of repetitively flooded structures

- **Objective 4.1:** Leverage local, state and federal grant funding to facilitate mitigation actions such as elevation, acquisition, or floodproofing
- **Objective 4.2:** Target repetitive loss properties for implementation of mitigation projects

Past Mitigation Actions Update

The 2015 mitigation strategy contained 43 separate mitigation actions. Of these 43 actions, 11 have been completed and 32 have begun and are ongoing. These projects are still considered viable, and will be carried forward in this plan. More detail on these projects can be found in 7.4. The status of the 2015 mitigation actions is shown in Table 3.1 below.

Table 3.1 – 2015 Actions and Status Summary

Action Description	Status	Action in 2020 FMP Update	Progress
Comprehensive evaluation of drainage system and implementation of selected projects.	Carry Forward	✓	August 2017 City Council adopted "Savannah Forward: Implementation Plan for City Strategic Plan" that includes a hydraulic analysis of all City of Savannah basins by 2023 and reduce structure flooding resulting from a 25-year rain event by 25% by 2025; as well as experience a 5% reducing in street flooding; City is contracting with engineering firms to update basin studies and multiple projects are under design
Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.	Carry Forward	✓	Staff have produced/completed various public education efforts including presentation at various group meetings, social media, and utility bill inserts; staff also produced an educational video and developed an Adopt-a-Drain program. Stormwater resources have otherwise focused on basic response to resident complaints rather than an enhanced program.
Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.	Completed		On Sept 1, 2019, the City approved the new Zoning Ordinance for the COS jurisdiction only
Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	Carry Forward	✓	New draft flood plain maps are incrementally removing low lands from floodplains as BFE's are lowered, making the goal harder to achieve, without writing new regulations; additionally the financial strain the City is experiencing has prevented any further acquisition
Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.	Carry Forward	✓	City used FEMA purchased property to reduce flooding in Bacon Park neighborhood (2016); City developed a plan to use 4 larger acquired properties as a tree farm/nursery which would supply the City's Park and Tree department; growing trees would help absorb flood waters; in 2019, City identified three sites and began the training program; as of 2020, the trees have been planted are continuing to grow

Action Description	Status	Action in 2020 FMP Update	Progress
Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.	Carry Forward	✓	City has adopted the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual by reference in its Stormwater ordinance
Designate GDOT properties that are unused as areas for flood storage.	Carry Forward	✓	GA DOT continues to clear the trees from I-95, I-16, and I-516 rights-of-way creating open space
Reduce future vulnerability of Vallombrosa area through acquisition or regulation.	Carry Forward	✓	Vallombrosa Plantation is currently being developed toward a natural and hunting preserve by its owner. Draft Flood maps add property that may be developed in this area of concern, without additional development regulations; the City does not have the funds to acquire or update regulations, however during the plan review process, the Flood reviewer encouraged builders to elevate finish floor height to match the previous FIRM designation
Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of greater than 300 square feet below the BFE.	Carry Forward	✓	Higher ordinance language was drafted, but upper administration in the City does not want to implement the higher limitations at this time.
Continue acquisition/demolition of high-risk flood-prone properties.	Carry Forward	✓	The City acquired 10 properties in 2015, three of which were in FEMA's RL database; since, the City has maintained a list of citizens who have inquired about buyouts but no more have been purchased.
Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.	Carry Forward	✓	COS promotes homeowners contact City Staff for an "on site visit" through annual outreach (mailers, meetings, phone calls); City staff will provide retrofitting advice that includes elevation that if applied could lower flood damage costs and potentially prevent a home from being substantially damaged; also encourages owners/developers to implement flood protection techniques during plan review process
Target repetitive loss structures by conducting a detailed study as outlined in the RLAA.	Completed		City annually sends letters to properties in the Repetitive Loss Areas that encourage owners to contact the City for mitigation solutions and Flood Insurance Information
Target critical facilities for flood mitigation.	Carry Forward	✓	Critical Facilities continue to be checked for compliance with the Flood Damage Prevention Ordinance; promotion of protection of Critical Facilities continues through outreach (including newspaper inserts, mailings, and letters to RLA) and advertisement of onsite inspections

Action Description	Status	Action in 2020 FMP Update	Progress
Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post “potential high water mark” signs.	Carry Forward	✓	City provides updated flood information in the library and Development Services buildings. COS is working with Chatham County to implement Georgia Tech's "Smart Sea Level Sensor Project" ; COS has also solicited a contractor to develop a Program for Public Information (PPI)
Continue to enhance newly implemented City website “flood protection information’ webpage.	Carry Forward	✓	City continuously updates this website; website provides links to Chatham County HMP, revised 2018 FIRM panels, iPan, "Smart Sea Level Sensor Project," and many other resources; The City also added new EC, LOMA, FEMA Fact Sheets, and building permit forms.
Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	Carry Forward	✓	City of Savannah promotes CEMA Alert system (which also forwards NWS alerts); Additionally, City participates in Georgia Tech's "Smart Sea Level Sensor Project"; Savannah Development Services also has social media
Continue flood preparedness and outreach activities at local community events	Carry Forward	✓	City of Savannah provides flood education outreach at various events around the City
Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.	Completed		
Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.	Carry Forward	✓	In conjunction with statewide River's Alive effort, COS has organized multiple river cleanup events; additional outreach includes inserts in utility bills, video PSAs, and advertisements in the community newspaper; COS also started a pilot program to pay houseless people to pick up litter in wetlands and waterways, looking for grant funding to increase the budget and lengthen the project
Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.	Carry Forward	✓	COS has provided several educational presentations in various schools, as well as to many community organizations. City staff has also held neighborhood meetings in neighborhoods that flood. Staff created a New Water Customer Packet given to every new and existing water customer that includes information on water as well as wastewater and sewer. COS staff initiated a pilot program with SCCPS middle school teachers on water education (cost per student is $8)
Establish program aimed at providing flood protection assistance to owners of flood-prone properties, including site visits and advice on retrofitting and other flood mitigation measures.	Completed		City has set up three annual outreaches (community newspaper insert, SFHA mailer, letters to RLA); City participates in annual events such as Hurricane Expo and Earth Day events; Citizens can also contact City's 311 to request a site visit to discuss their properties stormwater flooding concerns

Action Description	Status	Action in 2020 FMP Update	Progress
Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	Carry Forward	✓	City promotes permeable products during Site Plan review meetings with designers and owners; installed two demonstration rain gardens in 2016; FEMA mitigation grant awarded to the City to plan trees in purchased RL properties that can be transplanted around the City; also received a grant to install green infrastructure in mid town shopping center and green roof in tourist downtown district; City sponsored a rain barrel awareness program; City streets get rehabilitated with the Permeable Paver Program
Interview and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.	Carry Forward	✓	City staff has done multiple interviews after storm events and to promote various flood education resources
Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.	Carry Forward	✓	CEMA and COS sent out notices, emails, tweets, and Facebook posts; Flood protection website is regularly updated to keep material fresh and relevant
Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.	Carry Forward	✓	Conducted community meetings for Casey Canal and Leedsgate Neighborhood projects. Also conducted meetings for the GA Tech Sea Level Sensors Project
Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	Carry Forward	✓	Not much progress, in person outreach paused due to COVID-19
Strategically focus SPLOST funds toward identified drainage improvement projects.	Carry Forward	✓	City has 12 CIP line items addressing failing pipes, drainage studies, pavers replacement, and increase pipe capacity
Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as “mitigated”).	Completed		Completed annually - City has yet to receive the latest requested database; based on 2018 data, no changes from 2019-2020 years
Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.	Carry Forward	✓	Flood Insurance information is part of every flood determination letter and included in other outreach materials (RL areas, Savannah Morning News, and SFHA mailing)

Action Description	Status	Action in 2020 FMP Update	Progress
Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.	Carry Forward	✓	Pipemakers Canal received LOMR 16-1717P; although the LOMR pertains to City of Pooler, the canal effects Savannah; part of updates to Flood Damage Prevention Ordinance includes adding language to ensure a LOMR is completed by owner prior to completing development that alters a watercourse; Received LOMR for development under five acres in New Hampstead; send FEMA request to accept the City drainage improvements study along the Case Canal South; Send GA DNR EPD Floodplain Division requests to provide new studies of the area
Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).	Carry Forward	✓	COS conducted training sessions (11); created a plan review sheet for builders to use when submitting a building permit application; promote this information on the Flood Protection website, newspaper publications; letters to the floodplain, and RLA and realtor workshops
Develop outreach strategy to educate building community on new flood maps.	Completed		COS promoted new FIRM through community meetings and publications; continues to promote new FIRM on city websites
Modify Flood Damage Prevention Ordinance to include LiMWA criteria.	Completed		City updated FDPO to include LiMWA language that meets the GA DNR state model ordinance and ASCE 24-15 requirements
Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.	Carry Forward	✓	Majority of projects deal with street or nuisance flooding; however most remain unfunded; currently on project is under construction, one is under design, and two are in an ongoing design process.
Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	Carry Forward	✓	Consultant has been awarded a contract to perform a study of the Stormwater Unity Program; utility fee is not an option
Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.	Completed		Included in updated Chatham County Multi-Hazard Mitigation Plan
The City of Savannah will adopt the CEMA Post-Disaster Mitigation Plan and Pre-Disaster Mitigation Plan.	Completed		City adopted the Chatham County Multi-Jurisdictional Hazard Mitigation Plan in 2020
Consider expanding riparian impervious surface setbacks including a 25’ setback on coastal marshland and wetlands.	Completed		State of GA requires a 25' setback to coastal marshland and all streams; New zoning ordinance adopted in 2019 created an additional 10' setback beyond these requirements

Action Description	Status	Action in 2020 FMP Update	Progress
Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	Carry Forward	✓	COS working with Chatham County to achieve flood protection mitigation for the Truman Linear Trail Project; COS is specifically working on the City's portion from DeRenne to Henry Street; Concept report has been approved by GA DOT; County has completed its portion, City portion has been delayed due to lack of funds
Consider participation in FEMA's high water mark initiative.	Carry Forward	✓	COS is concentrating on the Sea Level Rise Study and GA Tech's Tide Sensor Project
Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	Carry Forward	✓	COS is coordinating with Chatham County Resource Protection Land to acquire land vulnerable to flooding through SPLOST funds; no recent action due to lack of funding
Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis	Completed		Natural Floodplains Function plan was completed in July 2015 and RLAA was completed and adopted in August 2015
Develop a Watershed Master Plan for the City	Carry Forward	✓	Instead of Watershed Master Plan, COS and Chatham County are completing a Sea Level Rise Plan; Contractor is developing stormwater models based on the City and County's stormwater GIS layers; Phase one has been completed and was presented to the Coastal GA user Group, City Engineering, and Mayor

4 Planning Process

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. 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 nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
Requirement §201.6(c)(1): The plan shall include the following:
1) Documentation of 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.

This Flood Mitigation Plan was developed under the guidance of a Flood Mitigation Planning Committee (FMPC). The Committee's representatives included representatives of City of Savannah Departments, citizens, and other stakeholders.

Information in this plan will be used to help guide and coordinate mitigation activities and decisions for local policy in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage caused by floods. This plan fulfills the requirements of Section 104 of the Disaster Mitigation Act of 2000, qualifies for CRS credit, and most importantly provides Savannah with effective actions for reducing flood hazard impacts on people and properties.

4.1 LOCAL GOVERNMENT PARTICIPATION

The DMA planning regulations and guidance stress that each local government seeking FEMA approval of their mitigation plan must participate in the planning effort in the following ways:

- Participate in the process as part of the FMPC;
- Detail where within the planning area the risk differs from that facing the entire area;
- Identify potential mitigation actions; and
- Formally adopt the plan.

For the City of Savannah FMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the FMPC meetings;
- Completing and returning the Wood Data Collection Guide;
- Collecting and providing other requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and

- Coordinating the formal adoption of the plan by the governing board of the City.

The FMPC met all of the above participation requirements. The FMPC included representatives from key City departments, including Development Services, Office of Emergency Management, Community Planning, and GIS, among others along with stakeholders from the insurance and real estate industries as well as citizen volunteers. The participants comprising the Savannah FMPC are listed in Table 4.1.

Table 4.1 – Flood Mitigation Planning Committee Members

Name	Organization/Title	Stakeholder
Tom McDonald	City of Savannah (Permitting & Floodplain Manager)	
Christopher Parrish	City of Savannah (Public Information Officer)	
Jackie Jackson	Savannah Metropolitan Planning Commission (Advanced Planning & Special Projects)	✓
Jessica Thompson	City of Savannah (GIS)	
David A. Donnelly	City of Savannah (Emergency Management)	
Laura Walker	City of Savannah (Office of Sustainability)	
Brian Bossart	City of Savannah (Parks & Recreation)	
Zack Hoffman	City of Savannah (Stormwater Management)	
Kelsey VanEyl-Godin	American Red Cross of Georgia	✓
Jeffrey Morris	USACE Savannah District	✓
Justin Pratt	Savannah-Chatham County Public School System	✓
Bryn Futrell	Realtor	✓
Jeff M. Brady, ANFI	Allstate Insurance	✓
Vik Sasser	Bank South	✓
Chris Tolleson	Citizen	✓
Gloria Williams	Citizen	✓
Dianne Clabaugh	Citizen	✓

This Section and Appendix B provide additional information and documentation of the planning process that was implemented for the development of this FMP including meeting minutes and attendance as well as public meeting announcements.

Based on the area of expertise of each City representative participating on the FMPC, Table 4.2 demonstrates each member's expertise in the six mitigation categories (Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Flood Control Projects and Public Information). The City of Savannah Development Services Department is responsible for community land use and comprehensive planning and was an active participant on the FMPC and provided data and information to support development of the plan.

Table 4.2 – City of Savannah Staff Capability with Six Mitigation Categories

Community Department/Office	Prevention	Property Protection	Natural Resource Protection	Emergency Services	Structural Flood Control Projects	Public Information
Development Services	✓	✓	✓		✓	✓
Emergency Management	✓			✓		✓
Stormwater Management	✓	✓			✓	✓
Parks and Recreation			✓			✓
Environmental Affairs	✓		✓		✓	✓
Community Planning and Development	✓	✓	✓			✓

4.2 THE 10-STEP PLANNING PROCESS

The planning process for preparing Savannah Flood Mitigation Plan was based on DMA planning requirements and FEMA's associated guidance. This guidance is structured around a four-phase process:

- Planning Process;
- Risk Assessment;
- Mitigation Strategy; and
- Plan Maintenance.

Into this process, the City integrated a more detailed 10-step planning process used for FEMA's Community Rating System (CRS) and Flood Mitigation Assistance programs. Thus, the modified 10-step process used for this plan meets the requirements of six major programs: FEMA's HMGP, BRIC, CRS, FMA, and Severe Repetitive Loss Programs; and new flood control projects authorized by the U.S. Army Corps of Engineers.

Table 4.3 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

Table 4.3 – Mitigation Planning and CRS 10-Step Process Reference Table

DMA Process	CRS Process
Phase I – Planning Process	
§201.6(c)(1)	Step 1. Organize to Prepare the Plan
§201.6(b)(1)	Step 2. Involve the Public
§201.6(b)(2) & (3)	Step 3. Coordinate
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4. Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5. Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6. Set Goals
§201.6(c)(3)(ii)	Step 7. Review Possible Activities
§201.6(c)(3)(iii)	Step 8. Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9. Adopt the Plan
§201.6(c)(4)	Step 10. Implement, Evaluate and Revise the Plan

The development of this FMP involved a comprehensive review of all flood hazards specific to the City. Also to be noted, this plan provides an analysis of climate change impacts on the City.

4.2.1 Phase I – Planning Process

Planning Step 1: Organize to Prepare the Plan

With the City of Savannah's commitment to participate in the DMA planning process and the CRS, City officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process.

To ensure a variety of viewpoints were included, invitations to participate were extended to City officials, citizens, and federal, state, and local stakeholders that might have an interest in participating in the planning process. The list of initial invitees is included in Appendix A. The following local stakeholders were invited to participate in the planning process:

City of Savannah

- Development Services Department
- Office of Emergency Management
- Stormwater Management Department
- Parks and Recreation Department
- Sustainability office
- Planning and Development Department
- Board of Education – Risk Management Department
- Water Supply

Chatham County

- Savannah-Chatham County Emergency Management Agency
- Chatham County-Savannah Metropolitan Planning Commission
- Savannah-Chatham County Public School System
- Chatham County Department of Engineering/Floodplain

Neighboring Communities

- Town of Thunderbolt
- Chatham County
- City of Augusta
- Town of Vernonburg
- City of Bloomingdale
- City of Garden City
- City of Pooler
- City of Port Wentworth
- City of Tybee Island
- Fort Stewart/Hunter Army Airfield

State and Federal Government

- Georgia Emergency Management Agency
- Georgia Department of Natural Resources
- FEMA Region IV

Educational Institutions

- Georgia Southern University, Armstrong Campus
- Savannah State University
- Georgia Southern University
- Savannah College of Arts and Design
- Georgia Institute of Technology
- Skidaway Institute of Oceanography
- Savannah Technical College

Other Stakeholder Representatives

- American Red Cross
- National Weather Service
- Savannah/Hilton Head International Airport
- Georgia Association of Floodplain Managers
- The Georgia Conservancy
- Sierra Club – Coastal Group
- Coastal Georgia Audubon Society

- Ogeechee Audubon Society
- Savannah Boy Scouts
- Wormsloe State Historic Site
- Gulfstream
- Keller Williams Reality
- Corrish Insurance
- WSAV 3
- Home Builders Association of Greater Savannah
- Savannah Tree Foundation

The FMPC kick-off meeting was held on October 14, 2020 at 10:00am via Zoom Video Conference Call. The meeting covered the scope of work and an introduction to the DMA, CRS, and FMA requirements. During the planning process, the FMPC communicated through face-to-face meetings, email and telephone conversations. Draft documents were posted on the City's website so that the FMPC members could easily access and review them. The formal FMPC meetings followed the CRS Planning Steps. Agendas and attendance for the FMPC meetings are included in Appendix A. The meeting dates and topics discussed are summarized below in Table 4.4. All FMPC meetings were open to the public.

Table 4.4 – Summary of FMPC Meeting Dates

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders 3) Introduction to hazard identification	October 24, 2020 10:00am	Zoom Video Conference Call
FMPC #2	1) Review Goals from 2015 FMP 2) Develop Goals and Objectives for FMP update 3) Overview of Program for Public Information (PPI) progress	February 9, 2021 2:00pm	Zoom Video Conference Call
FMPC #3	1) Review/discussion of Flood Risk and Vulnerability Assessment (Assess the Hazard and Assess the Problem) 2) Finalize Goals and Objectives	March 5, 20201 2:00pm	Zoom Video Conference Call
FMPC #4	1) Review/status of existing Mitigation Strategies 2) Development of new/updated Mitigation Strategies 3) Review draft plan	August 11, 2021	Microsoft Teams Conference Call

Planning Step 2: Involve the Public

Early discussions with the FMPC established the initial plan for public involvement. The FMPC agreed to an approach using established public information mechanisms and resources within the community. Public participation is an essential component to any planning process. Through various mechanisms, individual citizen and community-based input provides the entire planning team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community "buy-in" from those directly affected by the decisions of public officials. More involvement from the public creates a greater appreciation of the flood hazards present within the City and encourages citizens to take the steps necessary to reduce their impact.

Public involvement activities for this plan update included press releases and social media announcements, stakeholder and public meetings, public surveys, and the collection of public and

stakeholder comments on the draft plan through a variety of mechanisms. The formal public meetings for this plan update are summarized in Table 4.5.

Table 4.5 – Summary of Public Meeting Dates

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Overview of CRS program and FMP intentions 2) Introduction to DMA, CRS and the planning process	February 9, 2021 5:00pm	Zoom Video Conference Call
Public Meeting #2	1) Review of the draft plan	August 11th, 2021 5:30 PM	Microsoft Teams Conference Call

Involving the Public beyond Attending Public Meetings

The FMPC found eight different ways to involve the public beyond attending public meetings. Documentation to support the additional public outreach efforts can be found in Appendix A. The public outreach activities beyond the formal public meetings are summarized below in Table 4.6.

Table 4.6 – Public Outreach Efforts

Project/Event	Message
City of Savannah Website	Public Meeting Dates posted for public information
Public Survey	A flood Protection Questionnaire was posted for public response
Public Survey (Spanish)	A flood protection questionnaire was posted in Spanish for public response
Mitigation Flyer	A flyer describing the planning process was developed
Draft HIRA	A draft version of the Hazard Identification and Risk Assessment Section of the plan was posted on the website for public comment
Social Media	Use of Twitter and Facebook to inform residents of the planning process
Draft Plan	A draft version of the final plan was posted on the website for public comment
Draft Plan	A hard copy of the draft plan is available for review and comment in the Development Services Office
Press Release	A press release was issued to the news media concerning information on the final draft plan

The public survey which requested public input into the Floodplain Mitigation Plan planning process and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events can be found in Appendix A along with a summary of the completed survey results.

The complete draft of the plan was provided to the FMPC in August 2021. A final public meeting was conducted on August 11, 2021. Advertisements for the public meeting indicated where the plan could be accessed on the City website. Documentation to support to final public meeting can be found in Appendix A.

Planning Step 3: Coordinate

Early in the planning process, the FMPC determined that the risk assessment, mitigation strategy development, and plan approval would be greatly enhanced by inviting other local, state and federal agencies and organizations to participate in the process. A detailed list of agency coordination is provided above under Planning Step 1: Organize to Prepare the Plan.

Coordination involved contacting these agencies through a variety of mechanisms and informing them on how to participate in the plan development process. Coordination with these groups included, holding face-to-face meetings and sending outreach letters. All of these groups and agencies were solicited asking for their assistance and input and telling them how to become involved in the plan development process. A copy of each coordination letter can be found in Appendix A.

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities:
Coordination with other community planning efforts is also paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. The City of Savannah uses a variety of comprehensive planning mechanisms, such as a Comprehensive Plan and land development regulations and ordinances to guide growth and development. Integrating existing planning efforts and mitigation policies and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. The development of this plan incorporated information from the following existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

- Unincorporated Chatham County Floodplain Management Plan, 2018
- Savannah Flood Hazard Mitigation Plan, 2015
- Chatham County-Savannah Comprehensive Plan, 2016
- Savannah Stormwater Management Local Design Manual, 2015
- Chatham County Flood Insurance Study, 2018
- Chatham County Multi-Jurisdictional Pre-Disaster Hazard Mitigation Plan, 2020
- State of Georgia Hazard Mitigation Strategy, 2019
- Savannah Tax Assessor Data, 2020
- Savannah Area Geographic Information System, 2020
- Georgia Coastal Hazards Portal, 2014
- Savannah Flood Damage Prevention Ordinance, 2008
- Savannah Stormwater Management Ordinance, 2018
- Savannah Soil Erosion, Sedimentation and Pollution Control Ordinance, 2009

These and other documents were reviewed and considered, as appropriate, during the collection of data to support Planning Steps 4 and 5, which include the hazard identification, vulnerability assessment, and capability assessment. Data from these plans and ordinances were incorporated into the risk assessment and hazard vulnerability sections of the plan as appropriate. The data was also used in determining the capability of the community in being able to implement certain mitigation strategies. The Capability Assessment can be found in Section 6

4.2.2 Phase II – Risk Assessment

Planning Steps 4 and 5: Identify/Assess the Hazard and Assess the Problem

The FMPC completed a comprehensive effort to identify, document, and profile all flood hazards that have, or could have, an impact on the planning area including an evaluation of climate change and sea level rise. Data collection guides were developed and used in this effort to aid in determining hazards and vulnerabilities and where the risk varies across the planning area. Geographic information systems (GIS) were used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was posted on the City's website for FMPC and public review and comment.

The FMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the FMPC could assess

those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Section 5 Flood Risk Assessment.

4.2.3 Phase III – Mitigation Strategy

Planning Steps 6 and 7: Set Goals and Review Possible Activities

Wood facilitated brainstorming and discussion sessions with the FMPC that described the purpose and process of developing planning goals and objectives, a comprehensive range of mitigation alternatives, and a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 7 Mitigation Strategy. Additional documentation on the process the FMPC used to develop the goals and strategy has been included in Appendix B.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the FMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This complete draft was posted for FMPC and public review and comment on the City's website. Other agencies were invited to comment on this draft as well. FMPC, public and agency comments were integrated into the final draft for GEMA and FEMA Region IV to review and approve, contingent upon final adoption by the City.

4.2.4 Phase IV – Plan Maintenance

Planning Step 9: Adopt the Plan

In order to secure buy-in and officially implement the plan, the plan was reviewed and adopted by the City of Savannah on the dates included in the corresponding resolution in Section 8 Plan Adoption.

Planning Step 10: Implement, Evaluate and Revise the Plan

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, all of the FMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Section 9 Plan Implementation and Maintenance provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The Section also discusses incorporating the plan into existing and future planning mechanisms and how to address continued public involvement.

5 Flood Risk Assessment

Requirement §201.6(c)(2): [The plan shall include] A risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

This section describes the Risk Assessment process for the development of the City of Savannah Floodplain Mitigation Plan. It describes how the City met the following requirements from the 10-step planning process:

- Planning Step 4: Assess the Hazard
- Planning Step 5: Assess the Problem

As defined by FEMA, risk is a combination of hazard, vulnerability, and exposure. "It is the impact that a hazard would have on people, services, facilities, and structures in a community and refers to the likelihood of a hazard event resulting in an adverse condition that causes injury or damage."

This flood risk assessment covers the entire geographical area of the City of Savannah. The risk assessment identifies and profiles the relevant flood hazards for Savannah and assesses the exposure of lives, property, and infrastructure to these hazards. This process allows for a better understanding of Savannah's potential risk to flood hazards and provides a framework for developing and prioritizing mitigation actions to reduce risk from future hazard events. This risk assessment process followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (FEMA 386-2, 2002), which breaks the assessment down to a four-step process:

Data collected through this process has been incorporated into the following subsections of this chapter:

- **Section 5.1**: **Hazard Identification** identifies the flood hazards that threaten the Savannah planning area.
- **Section 5.2**: **Risk Assessment Methodology** reviews the methodology for evaluating risk and outlines the organization of each hazard profile.
- **Section 5.3: Asset Inventory** summarizes overall asset exposure in Savannah, including buildings; critical facilities; cultural, historic, and natural resources; and future growth and development
- **Section 5.4: Hazard Profiles, Analysis, and Vulnerability** discusses the threat to the Savannah planning area, describes previous occurrences of flood hazard events, and the likelihood of future occurrences. For all moderate and high priority flood hazards, this section assesses the Savannah planning area's exposure and potential losses that may occur.
- **Section 5.5: Risk and Vulnerability Conclusions** summarizes areas likely to flood, discusses the potential impact of future flooding conditions, and evaluates the health and safety consequences of the flood hazards.

For this plan update, the plan organization has been modified; the flood risk assessment and the vulnerability assessment have been consolidated in this section to better provide the full picture of risk for each hazard in one location.

5.1 HAZARD IDENTIFICATION

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the type…of all natural hazards that can affect the jurisdiction.

The City of Savannah's FMPC conducted a hazard identification study, summarized below, to determine the flood hazards that threaten the planning area.

5.1.1 Hazard Identification Methodology

Starting with the list of hazards identified in the 2015 City of Savannah Floodplain Mitigation Plan and using existing flood hazard data and input gained through planning meetings, the FMPC identified a list of flood hazards that could affect the City of Savannah.

The flood hazards identified in the 2015 City of Savannah FMP are listed in Table 5.1 along with their previously established ratings for frequency of occurrence, spatial extent, potential magnitude, and overall significance based on FMPC input. Criteria for these ratings are provided at the bottom of the table.

Table 5.1 – Flood Hazard Summary

Hazard	Frequency of Occurrence	Spatial Extent	Potential Magnitude	Significance
Climate Change and Sea Level Rise	Likely	Limited	Limited	Medium
Coastal/Canal Bank Erosion	Highly Likely	Limited	Limited	Medium
Dam/Levee Failure	Unlikely	Limited	Negligible	Low
Flood: 100-/500-year	Occasional	Significant	Critical	High
Flood: Stormwater/Localized Flooding	Highly Likely	Significant	Critical	High
Hurricane and Tropical Storms (including Storm Surge)	Occasional	Extensive	Catastrophic	High

Guidelines:
Frequency of Occurrence:
Highly Likely: Nearly 100% probability within the next year.
Likely: Between 10 and 100% probability within the next year.
Occasional: Between 1 and 10% probability within the next year.
Unlikely: Less than 1% probability within the next year.

Potential Magnitude:
Catastrophic: More than 50% of the area affected.
Critical: 25 to 50% of the area affected.
Limited: 10 to 25% of the area affected.
Negligible: Less than 10% of the area affected.

Spatial Extent:
Limited: Less than 10% of planning area.
Significant: 10-50% of planning area.
Extensive: 50-100% of planning area.

Significance:
Low
Medium
High

Source: Wood Data Collection Guide

All hazards included in the 2015 plan were re-evaluated under expanded criteria for this plan update. Flood hazard data from the Chatham County Hazard Mitigation Plan (HMP), FEMA, the Georgia Emergency Management Agency (GEMA), the National Oceanic and Atmospheric Administration (NOAA), the National Hurricane Center (NHC), the National Center for Environmental Information (NCEI), and many other sources were examined to assess the significance of these hazards to the Savannah planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, including deaths and injuries as well as property damage and economic loss.

In keeping with the 2015 plan, the FMPC maintained that tsunamis are a non-prevalent hazard that should not be included in this plan update. The following is a brief description of the hazard and the reason for its exclusion:

- **Tsunamis** - Defined as a long-term (generally 15 to 60 minutes) wave caused by a large scale movement of the sea floor due to volcanic eruption, marine earthquake or landslide. Barely noticeable at sea, the wave velocity may be as high as 400 knots so that it travels great distances and in shoal water reaches heights up to 15 meters. NOAA indicates that the risk of a tsunami in the Savannah planning area is relatively low due to the absence of subduction zones at the edges of plate boundaries to spawn such waves except small subduction zones under the Caribbean and Scotia arcs. Based on historical data, 12% of the world's tsunamis have occurred in the Atlantic Ocean with the majority occurring in the northeast.

5.1.2 Disaster Declaration History

The FMPC researched past events that resulted in a federal emergency or disaster declaration for Chatham County, GA, which approximates impacts on the Savannah planning area, in order to identify known flood hazards. When the local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Should the disaster be so severe that both the local and state government capacities are exceeded, a federal emergency or disaster declaration may be issued allowing for the provision of federal assistance. Federal disaster declarations may be granted when the Governor certifies that the combined local, county, and state resources are insufficient and that the situation is beyond their recovery capabilities.

Details on federal and state disaster declarations were obtained from FEMA. Table 5.2 displays flood related major disaster declarations that were declared statewide in Georgia and in Chatham County since 1953. This table reflects the vulnerability and historic patterns of flood hazards for Georgia.

Table 5.3 summarizes the Individual Assistance and Public Assistance dollars obligated for each major disaster declaration received by Chatham County since 2004, the first year when Chatham County was specifically designated in a major disaster declaration. Note that disaster-related damage to people and property resulted from wind and flood damage associated with severe storms.

Table 5.2 – FEMA Major Disaster Declarations, Georgia Statewide and Chatham County, 1953-2020

Disaster #	Dec. Date	Dec. Type	Incident Type	Event Title
110	1961-03-02	DR	Flood	Floods
150	1963-03-26	DR	Hurricane	Severe Storms & Flooding
177	1964-09-10	DR	Hurricane	Hurricane Dora
180	1964-11-04	DR	Flood	Flooding
1042	1994-10-19	DR	Severe Storms	Heavy Rains, Tornadoes, Flooding, High Winds
1209	1998-03-11	DR	Severe Storms	Severe Storms and Flooding
3144	1999-09-05	EM	Hurricane	Hurricane Floyd Emergency Declaration
3218	2005-09-05	EM	Hurricane	Hurricane Katrina Evacuation
3379	2016-10-07	EM	Hurricane	Hurricane Matthew
4284	2016-10-09	DR	Hurricane	Hurricane Matthew
3387	2017-09-08	EM	Hurricane	Hurricane Irma
4338	2017-09-16	DR	Hurricane	Hurricane Irma
3406	2018-10-11	EM	Hurricane	Hurricane Michael
3422	2019-09-02	EM	Hurricane	Hurricane Dorian

Source: FEMA

Table 5.3 – FEMA Major Disaster Declarations for Chatham County, 1994 - 2020

Disaster #	Dec. Date	Incident Type	Event Title	Individual Assistance Applications Approved	Total Individual and Households Program Dollars Approved	Total Public Assistance Grant Dollars Obligated
1402	1994-10-19	Severe Storms	Heavy Rain, Tornadoes, Flooding, High Winds	--	--	--
1209	1998-03-11	Severe Storms	Severe Storms and Flooding	--	--	--
4284	2016-10-09	Hurricane	Hurricane Matthew	2,093	$6,611,177.87	$95,732,065.50
4338	2017-09-16	Hurricane	Hurricane Irma	9,371	$13,643,351.67	$120,768,267.10

Source: FEMA, FDEM

[1]Dollar damage values are for all Counties included in the disaster declaration.

5.1.3 Flood Event History

NOAA's NCEI has been tracking flood-related weather data since 1996. The NCEI Storm Events Database contains an archive of destructive storm or weather data and information which includes local, intense and damaging events. This database contains 87 flood-related weather events that occurred in Chatham County between January 1, 1996 and December 31, 2020. Table 5.4 summarizes these events.

Table 5.4 – NCEI Severe Weather Reports for Chatham County and Savannah, 1996-2020

Type	# of Events	Property Loss	Deaths	Injuries
Coastal Flood	22	$40,000	0	0
Flash Flood	35	$8,430,000	0	2
Flood/Urban Flood	1	$2,000	0	0
Heavy Rain	2	$0	0	0
High Surf	6	$17,500	0	0
Hurricane	4[1]	$10,000,000	0	0
Storm Surge/Tide	3	$5,000,000	0	0
Tropical Depression	1	$0	0	0
Tropical Storm	10[1]	$14,500	0	0
Waterspout	3	$0	0	0
Total:	**87**	**$23,504,000**	**10**	**2**

Source: NCEI Storm Events Database

Note: Losses reflect totals for all impacted areas within Chatham County.

[1]Hurricane Matthew and Hurricane Irma are reported as Tropical Storms in the NCEI database but were reclassified by the FMPC to account for their having impacted the planning area as hurricanes

The FMPC previously supplemented NCEI data with data from SHELDUS™ (Spatial Hazard Events and Losses Database for the United States); however, for the sake of consistency, records on past occurrences were updated in this plan update using data from NCEI, which provides more differentiation and detail among event types and locations.

5.2 RISK ASSESSMENT METHODOLOGY

The hazards identified in Section 5.1 Hazard Identification, are profiled individually in Section 5.4. Information provided by members of the FMPC has been integrated into this section with information from other data sources.

Each hazard is profiled in the following format:

Hazard Description

This section provides a description of the hazard followed by details specific to the Savannah planning area. Where available, this section also includes information on seasonal patterns, speed of onset/duration, and any secondary effects.

Location

This section describes or visualizes where the hazard may occur within the planning area.

Extent

This section provides information on the magnitude of the hazard and describes how the severity of the hazard can be measured.

Past Occurrences

This section contains information on historical events, including the extent or location of the hazard within or near the Savannah planning area.

Probability of Future Occurrence

This section gauges the likelihood of future occurrences based on past events and existing data. The frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year (e.g. 10 hurricanes or tropical storms over a 30-year period equates to a 33 percent chance of experiencing a hurricane or tropical storm in any given year). The likelihood of future occurrences is categorized into one of the classifications as follows:

- ***Highly Likely*** – Near 100 percent chance of occurrence within the next year
- ***Likely*** – Between 10 and 100 percent chance of occurrence within the next year (recurrence interval of 10 years or less)
- ***Occasional*** – Between 1 and 10 percent chance of occurrence within the next year (recurrence interval of 11 to 100 years)
- ***Unlikely*** – Less than 1 percent chance or occurrence within the next 100 years (recurrence interval of greater than every 100 years).

This section also discusses the potential impacts of climate change on future probability of the hazard.

Priority Risk Index

The findings from the above sections of the hazard profiles are summarized using the Priority Risk Index (PRI) to score and rank each hazard's significance to the planning area. The PRI provides a standardized numerical value so that hazards can be compared against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk was assigned a value (1 to 4) and a weighting factor as summarized in

Table 5.5.

PRI ratings are provided by category throughout each hazard profile, and a summary of each hazard's PRI score is provided at the beginning of each hazard profile. The results of the risk assessment and overall PRI scoring are provided in Section 5.5.1.

Table 5.5 – Priority Risk Index

RISK ASSESSMENT CATEGORY	LEVEL	DEGREE OF RISK CRITERIA	INDEX	WEIGHT
PROBABILITY What is the likelihood of a hazard event occurring in a given year?	**UNLIKELY**	LESS THAN 1% ANNUAL PROBABILITY	1	30%
	POSSIBLE	BETWEEN 1 & 10% ANNUAL PROBABILITY	2	
	LIKELY	BETWEEN 10 &100% ANNUAL PROBABILITY	3	
	HIGHLY LIKELY	100% ANNUAL PROBABILTY	4	
IMPACT In terms of injuries, damage, or death, would you anticipate impacts to be minor, limited, critical, or catastrophic when a significant hazard event occurs?	**MINOR**	VERY FEW INJURIES, IF ANY. ONLY MINOR PROPERTY DAMAGE & MINIMAL DISRUPTION ON QUALITY OF LIFE. TEMPORARY SHUTDOWN OF CRITICAL FACILITIES.	1	30%
	LIMITED	MINOR INJURIES ONLY. MORE THAN 10% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 DAY	2	
	CRITICAL	MULTIPLE DEATHS/INJURIES POSSIBLE. MORE THAN 25% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES FOR > 1 WEEK.	3	
	CATASTROPHIC	HIGH NUMBER OF DEATHS/INJURIES POSSIBLE. MORE THAN 50% OF PROPERTY IN AFFECTED AREA DAMAGED OR DESTROYED. COMPLETE SHUTDOWN OF CRITICAL FACILITIES > 30 DAYS.	4	
SPATIAL EXTENT How large of an area could be impacted by a hazard event? Are impacts localized or regional?	**NEGLIGIBLE**	LESS THAN 1% OF AREA AFFECTED	1	20%
	SMALL	BETWEEN 1 & 10% OF AREA AFFECTED	2	
	MODERATE	BETWEEN 10 & 50% OF AREA AFFECTED	3	
	LARGE	BETWEEN 50 & 100% OF AREA AFFECTED	4	
WARNING TIME Is there usually some lead time associated with the hazard event? Have warning measures been implemented?	**MORE THAN 24 HRS**	SELF DEFINED	1	10%
	12 TO 24 HRS	SELF DEFINED	2	
	6 TO 12 HRS	SELF DEFINED	3	
	LESS THAN 6 HRS	SELF DEFINED	4	
DURATION How long does the hazard event usually last?	**LESS THAN 6 HRS**	SELF DEFINED	1	10%
	LESS THAN 24 HRS	SELF DEFINED	2	
	LESS THAN 1 WEEK	SELF DEFINED	3	
	MORE THAN 1 WEEK	SELF DEFINED	4	

The sum of all five risk assessment categories equals the final PRI value, demonstrated in the equation below (the lowest possible PRI value is a 1.0 and the highest possible PRI value is 4.0).

PRI = [(PROBABILITY x .30) + (IMPACT x .30) + (SPATIAL EXTENT x .20) + (WARNING TIME x .10) + (DURATION x .10)]

The purpose of the PRI is to categorize and prioritize all flood hazards as high, moderate, or low risk. Those hazards determined to be of high or moderate priority were characterized as significant hazards that required further evaluation through the development of a vulnerability assessment. This process

and these criteria allowed the FMPC to prioritize hazards of greatest significance and focus resources where they are most needed.

Vulnerability Assessment

The FMPC conducted a vulnerability assessment for the hazards identified as a moderate or high priority in order to assess the impact that each hazard would have on the City. The vulnerability assessment quantifies, to the extent feasible using best available data, assets at risk to natural hazards and estimates potential losses.

Vulnerability assessments followed the methodology described in the FEMA publication *Understanding Your Risks—Identifying Hazards and Estimating Losses*. The vulnerability assessment describes the total vulnerability and values at risk, summarized in the Asset Inventory in Section 5.3, and then discusses vulnerability by hazard.

Data used to support this assessment included the following:

- County GIS data (hazards, base layers, and assessor's data)
- Hazard layer GIS datasets from federal agencies
- Written descriptions of inventory and risks provided by the Chatham County Hazard Mitigation Strategy and Georgia Hazard Mitigation Strategy
- Other existing plans and studies provided by the Town

Vulnerability is measured in general, qualitative terms and is a summary of the potential impact based on past occurrences, spatial extent, and damage and casualty potential. It is categorized into the following classifications:

- **Extremely Low** – The occurrence and potential cost of damage to life and property is very minimal to nonexistent.
- **Low** – Minimal potential impact. The occurrence and potential cost of damage to life and property is minimal.
- **Medium** – Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **High** – Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread. Hazards in this category may have occurred in the past.
- **Extremely High** – Very widespread with catastrophic impact.

Vulnerability can also be quantified in instances where there is a known, defined hazard area, such as a mapped floodplain. In these instances, the number and types of buildings subject to the identified hazard can be counted and their values tabulated. Additional information, such as the location of critical community facilities (e.g., a fire station), historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat) can also be evaluated in relation to the hazard area. Together, this information conveys the exposure and vulnerability of the planning area to that hazard.

5.3 ASSET INVENTORY

Chatham County's parcel layer was used as the basis for the inventory of developed parcels. Table 5.6 shows the count, land value, improved value, content value and total value of parcels in Savannah.

Table 5.6 – Savannah Assets at Risk by Property Type

Land Use	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
Commercial	3,730	$2,889,375,478	$2,889,375,478	$5,778,750,956
Education	376	$504,804,835	$504,804,835	$1,009,609,670
Government	1,379	$334,964,860	$334,964,860	$669,929,720
Industrial	970	$448,546,255	$672,819,383	$1,121,365,638
Religious	550	$166,091,310	$166,091,310	$332,182,620
Residential	54,518	$6,991,765,590	$3,495,882,795	$10,487,648,385
Total	**61,523**	**$11,335,548,328**	**$8,063,938,661**	**$19,399,486,989**

Source: SAGIS 2019

5.3.1 Critical Facility Inventory

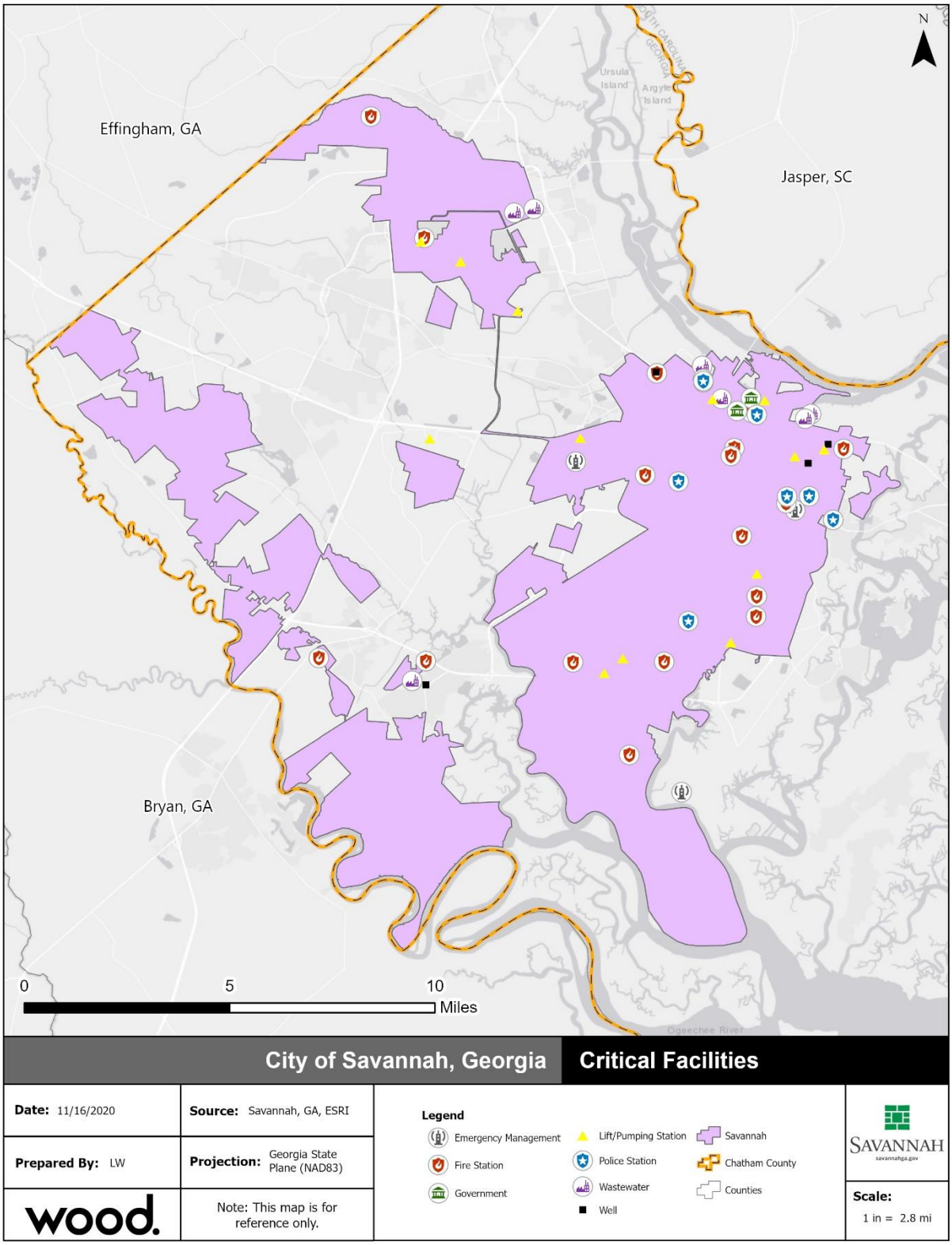
Of significant concern with respect to any disaster event is the location of critical facilities in the planning area. Critical facilities are often defined as those essential services and facilities in a major emergency which, if damaged, would result in severe consequences to public health and safety or a facility which, if unusable or unreachable because of a major emergency, would seriously and adversely affect the health, safety, and welfare of the public. Critical facilities in Savannah are shown in Figure 5.1 and listed in Table 5.7.

Table 5.7 – Critical Facilities by Type

Type	Count of Facilities
Emergency Management	3
Fire Station	17
Government	2
Lift/Pumping Station	15
Police Station	8
Wastewater	8
Well	5
Total	**58**

Source: City of Savannah, GMIS

Figure 5.1 – Savannah Critical Facilities



Source: Savannah, GA

5.4 HAZARD PROFILES, ANALYSIS, AND VULNERABILITY

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:

(A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;

(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and

(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

The following sections, detailed in the table below, provide profiles of the natural flood hazards that the FMPC identified in Table 3.1 Flood Hazard Summary. Note that vulnerability assessments were only developed for moderate and high priority hazards, defined using the Priority Risk Index (PRI) as those hazards with a PRI score of 2.0 or greater.

Section	Hazard	PRI Score	PRI Rating
5.4.1	Climate Change and Sea Level Rise	2.7	Moderate
5.4.2	Coastal/Canal Bank Erosion	1.6	Low
5.4.3	Dam/Levee Failure	1.7	Low
5.4.4	Flood: 100-/500-year	3.4	High
5.4.5	Flood: Stormwater/Localized	3.3	High
5.4.6	Hurricane and Tropical Storm (including Storm Surge)	3.0	High

5.4.1 Climate Change and Sea Level Rise

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Climate Change and Sea Level Rise	Likely	Critical	Small	More than 24 hrs	More than 1 week	2.7

Hazard Description

Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forces such as modulations of the solar cycles, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2014). Climate change is a natural occurrence in which the earth has warmed and cooled periodically over geologic time. The recent and rapid warming of the earth over the past century has been cause for concern, as this warming is very likely due to the accumulation of human-caused greenhouse gases, such as CO_2, in the atmosphere (IPCC, 2007). This warming is occurring almost everywhere in the world which suggests a global cause rather than changes in localized weather patterns.

There are generally two separate mechanics involved in global sea level rise. The first is directly attributed to global temperature increases, which warm the oceans waters and cause them to expand. The second is attributed to the melting of ice over land which simply adds water to the oceans. Global sea level rise is likely caused by a combination of these two mechanics and can be exasperated on the local level by factors such as erosion and subsidence.

Due to sea-level rise projected throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion. The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (IPCC, 2014). The City of Savannah is particularly vulnerable to the effects of climate change and sea level rise, due to its coastal location, subtropical environment, porous geology and low topography.

Warning Time: 1 – More than 24 hours

Duration: 4 – More than 1 week

Climate change has the potential to alter the nature and frequency of flood hazards that the Town already experiences such as hurricane storm surge, coastal erosion, and stormwater drainage. Sea level rise may also place additional stress on aquifers (saltwater intrusion) and gravity flow stormwater and septic systems to a rising groundwater table. An elevated storm surge due to sea level rise could produce a cascade of consequences affecting things such as land use, infrastructure, facilities, waterway navigation, the local economy, public health and safety, drinking water supplies, and ecosystems.

The potential for climate change influences on each flood hazard summarized in this plan is noted within each of the hazard's "Frequency/Likelihood of Future Occurrence" discussion section.

Location

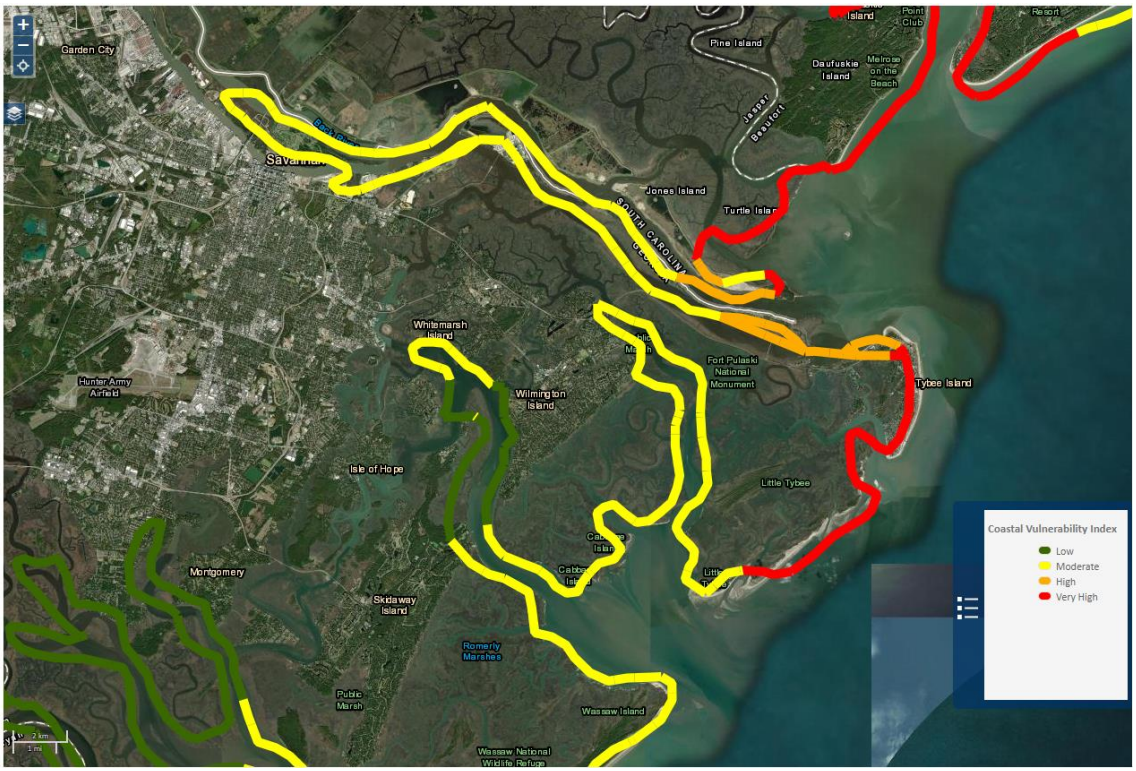
Sea level rise can occur anywhere along major waterways in the City of Savannah. The Coastal Vulnerability Index (CVI), developed by the United States Geological Survey (USGS), provides a preliminary overview of the relative susceptibility of the United States coast to sea level rise. The CVI is based on geomorphology, regional coastal slope, tide range, wave height, relative sea level rise, and

shoreline erosion and acceleration rates. For each study area, each variable is scored on 1-5 scaled based on defined parameters, where "1" indicates low contribution to coastal vulnerability and "5" indicates high contribution to vulnerability. These scores are then aggregated into a single index through a mathematical formula. The resulting index gives an overview of where physical changes may occur due to sea-level rise.

Figure 5.2 shows the CVI for the Savannah area. Shorelines along the Savannah River adjacent to the City area rated as moderate vulnerability. The Atlantic Coast along Tybee Island, a barrier island located near Savannah is rated as Very High; elsewhere on the Atlantic Coast and Savannah River is rated as High to Moderate.

Spatial Extent: 2 – Small

Figure 5.2 – Coastal Vulnerability Index, Savannah



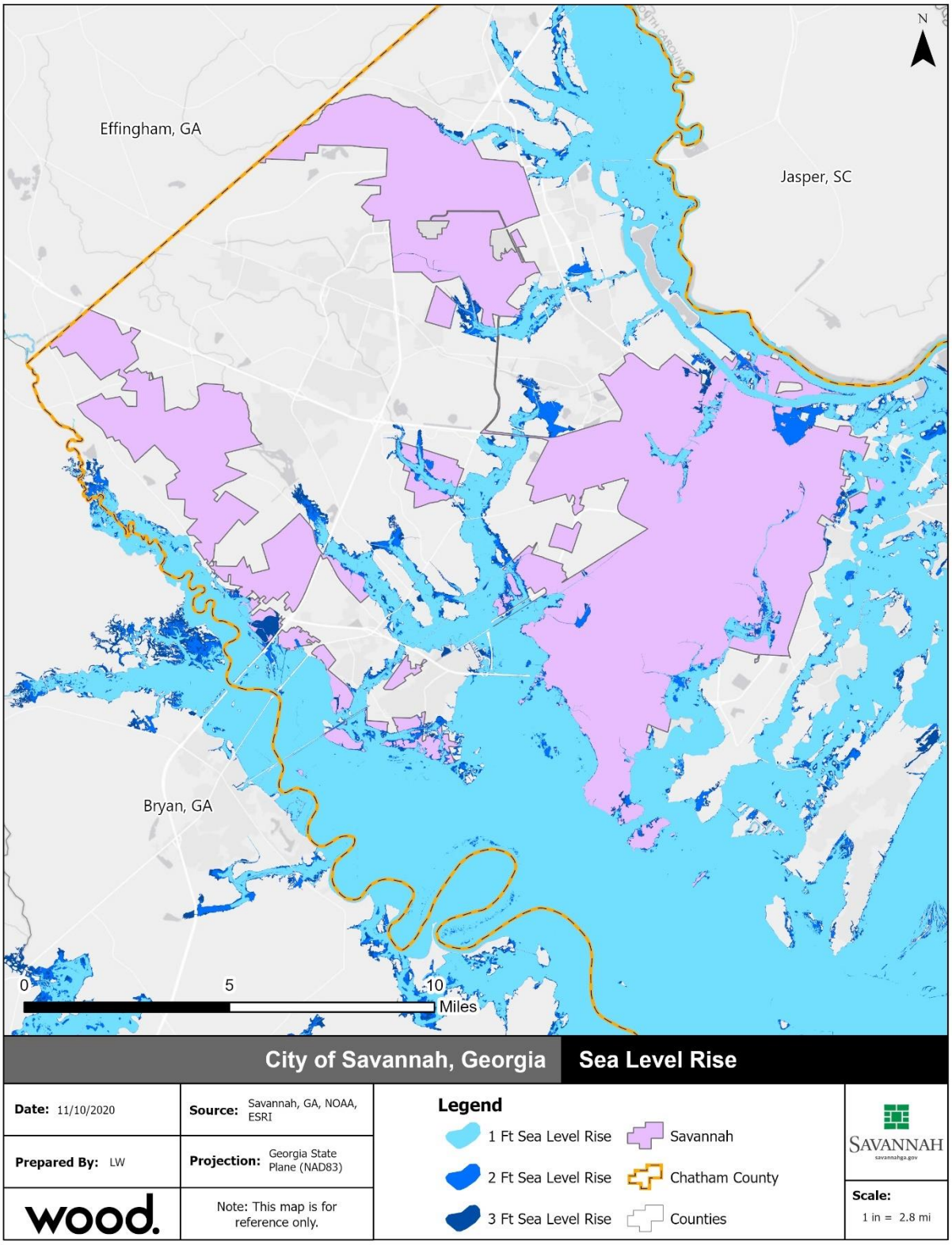
Source: USGS Coastal Change Hazards Portal (https://marine.usgs.gov/coastalchangehazardsportal/)

Extent

Sea level rise is measured by the number of feet of relative rise and the areas that such rise would inundate. The estimated impacts of 1-foot, 2-foot, and 3-foot sea level rise are shown in Figure 5.3 according to data from the NOAA Sea Level Rise viewer. The sea level rise estimate maps show inundation above mean higher high water (the average of each day's higher tide line). Sea level rise will likely affect land along the Savannah river and its tributaries as well as coastal marsh lands along the Atlantic Coast. Sea level rise will likely increase future risk of flooding from the other flood hazards discussed later in this plan, as more land will have a lower elevation relative to sea level. Additionally, with barrier islands and wetlands inundated, inland areas will lose their natural protection and may become susceptible to coastal flooding with velocity wave action.

Impact: 3 - Critical

Figure 5.3 – Projected Inundation from 1-Food, 2-Foot, and 3-Foot Sea Level Rise

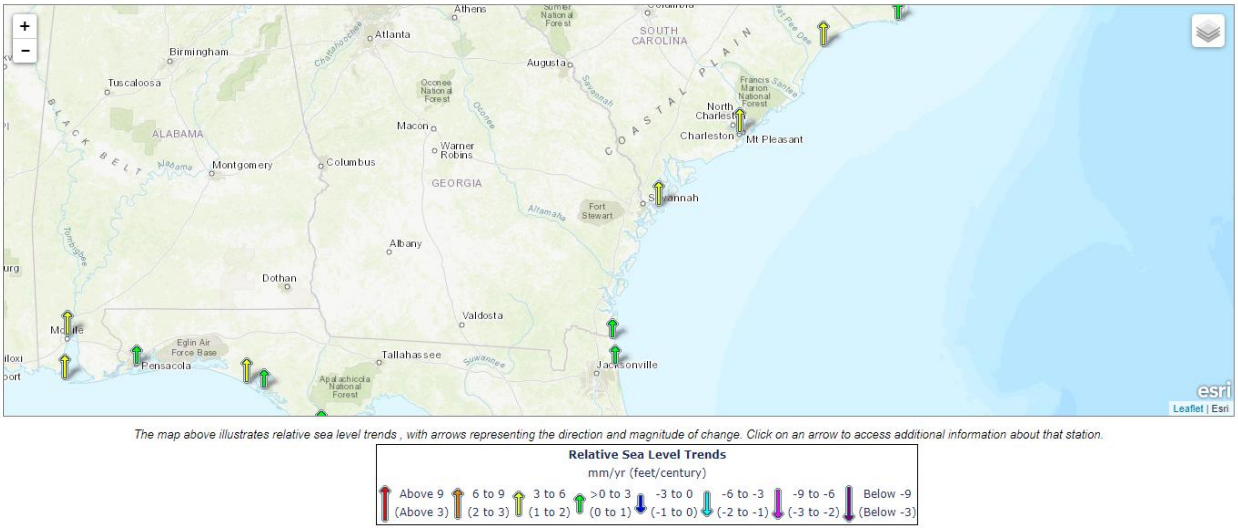


Source: NOAA Sea Level Rise Viewer, City of Savannah

Past Occurrences

The rate of sea level rise has varied throughout geologic history, and studies have shown that global temperature and sea level are strongly correlated. Historic trends in local Mean Sea Level (MSL) are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services within NOAA has been measuring sea level for over 150 years, with tide stations operating on all U.S. coasts. Changes in MSL, either a sea level rise or sea level fall, have been computed at 128 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of higher frequency phenomena (e.g. storm surge) in order to compute an accurate linear sea level trend. Figure 5.4 illustrates the regional trends in sea level measured along the Atlantic coast.

Figure 5.4 – Atlantic Coast Sea Level Trends



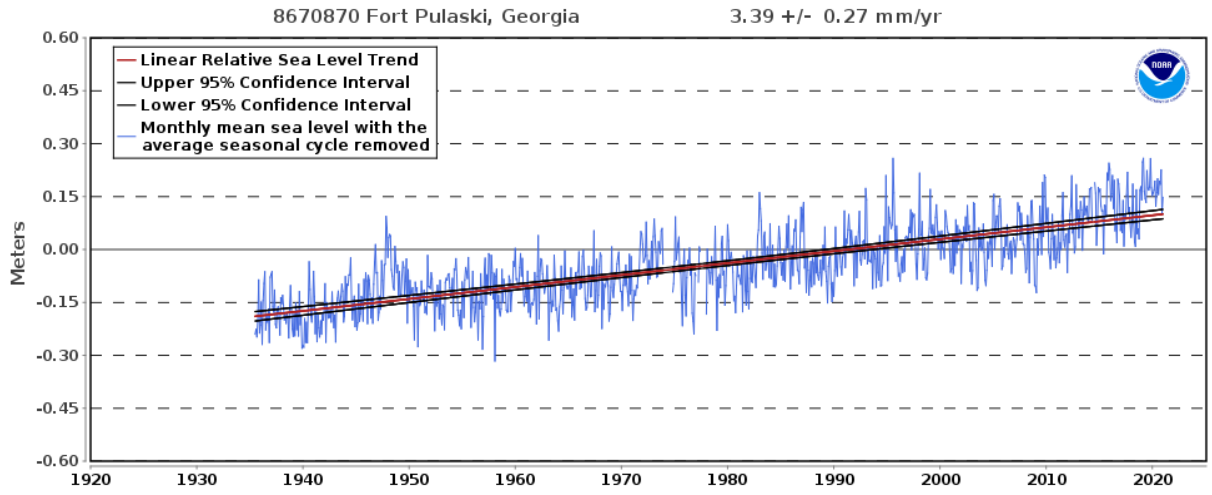
The map above illustrates relative sea level trends , with arrows representing the direction and magnitude of change. Click on an arrow to access additional information about that station.

Source: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

At the Fort Pulaski, GA station (indicated by the yellow arrow east of Savannah), the relative sea level trend is 3.39 millimeters/year with a 95% confidence interval of +/- 0.27 mm/year based on monthly mean sea level data from 1935 to 2019, which is equivalent to a change of 0.96 feet in 100 years.

Figure 5.5 shows the monthly mean sea level at NOAA's Fort Pulaski, GA station which is the station located closest to the Savannah planning area. The long-term linear trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS.

Figure 5.5 – Mean Sea Level Trend for Fort Pulaski, Georgie



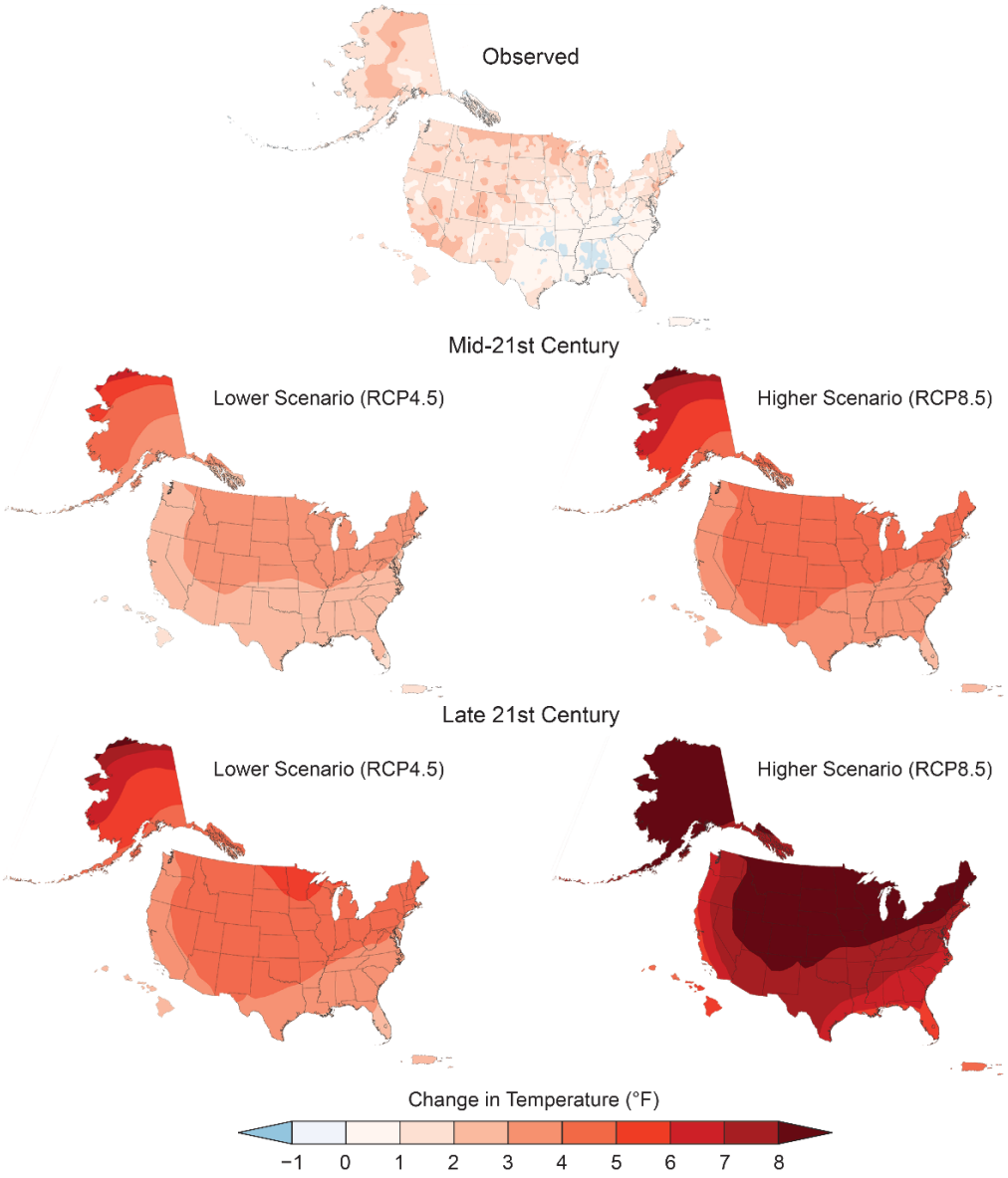
Source: http://tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

Probability of Future Occurrence

Temperature Trends

As previously mentioned, studies have shown that global temperature and sea level are strongly correlated. Since the Fourth National Climate Assessment, average temperature over the contiguous United States has risen by 1.2°F over the last few decades and by 1.8°F since 1901. Additional increases in annual average temperature of about 2.5°F are expected over the next few decades regardless of future emissions and increases ranging from 3°F to 12°F are expected by the end of century depending on emissions scenario. Figure 5.6 below illustrates observed temperature change from 1986-2017 (relative to 1901-1960) as well as projected temperature change by mid-century (2036-2065) and end of century (2070-2099) relative to near present averages (1986-2015).

Figure 5.6 – Observed and Projected Temperature Change in the United States



Source: Fourth National Climate Assessment

Sea Level Trends

The Earth's changing climate will continue to drive nonlinear trends in Sea Level that deviate from historic trends. This is especially pertinent in coastal communities. The U.S. Army Corps of Engineers (USACE) has provided guidance to evaluate a project's life cycle in order to account for the rise in global mean sea level (USACE, 2014). The USACE guidance is based on original guidance by the National Research Council (NRC, 1987). The 1987 NRC report recommended that feasibility studies for coastal projects consider the high probability of accelerating global mean sea level (GMSL) rise and provided three different acceleration scenarios through the year 2100. The NRC committee provided an equation for calculating sea level rise and recommended "projections be updated approximately every decade to incorporate additional data."

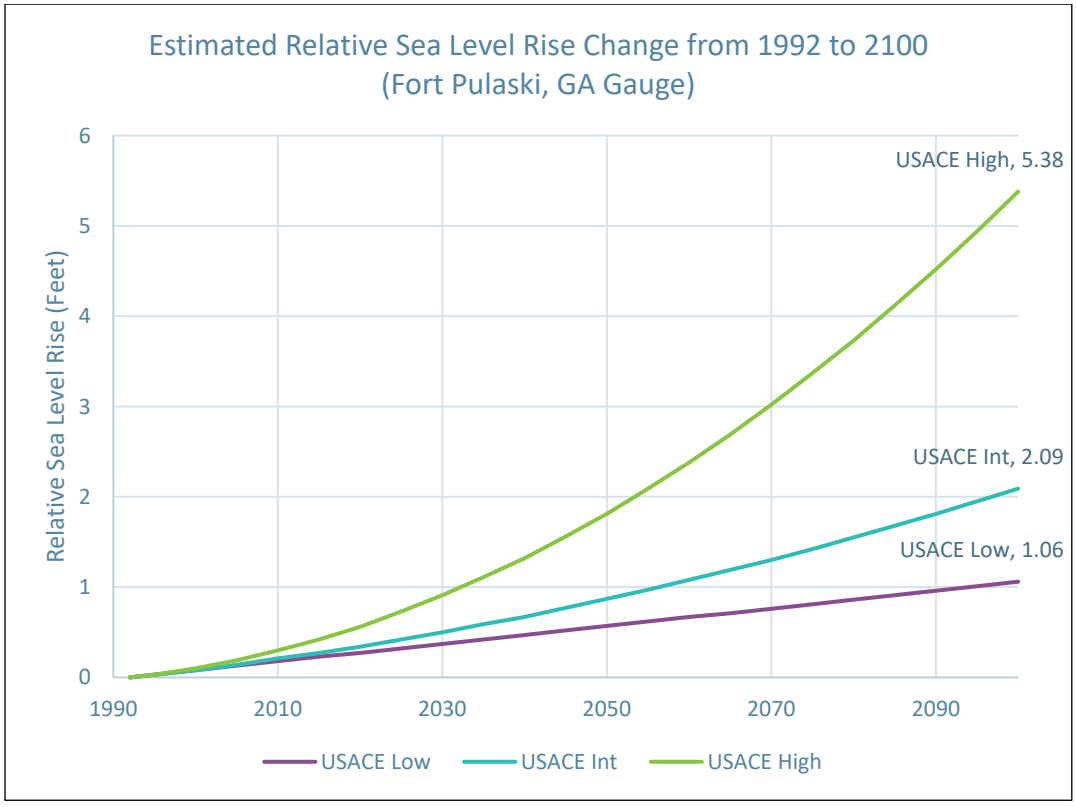
The USACE guidance adjusted the NRC equation to include the historic GMSL change rate of 1.7 mm/year as presented by the IPCC (IPCC, 2007) and the start date of 1992 (which corresponds to the midpoint of the National Tidal Datum Epoch of 1983-2001), instead of 1986 (the start date for NRC's equation). These changes resulted in values for the variable *b* being equal to 2.71E-5 for modified NRC Curve I, 7.00E-5 for modified NRC Curve II, and 1.13E-4 for modified NRC Curve III. The resulting equation is as follows:

$$E(t) = 0.0017m/yr*t + bt^2$$

In the above equation, t represents years, b is a constant, and E(t) is the relative sea-level change, in meters, as a function of t. The three updated GMSL rise acceleration scenarios are depicted in Figure 5.7.

Based on the USACE guidance and data from the Fort Pulaski, GA NOAA gauge, a projected sea level rise to be used for future planning decisions can be calculated. Figure 2.33 shows sea level rise projections for three scenarios from the USACE. The USACE Low curve uses the historic rate of sea level change as the rate, the USACE Intermediate curve uses the NRC Curve I modified by recent IPCC low emissions projections and the local rate of vertical land movement, and the USACE High curve uses the NRC Curve II modified by recent IPCC higher emissions projections and the local rate of vertical land movement. Given that the USACE Low curve does not consider further climate change, the USACE Intermediate and High curves are more likely. However, which of the curves is the most likely scenario depends on future emissions levels.

Figure 5.7 – Sea Level Rise Projections for Savannah Region (1992 to 2100)



Source: USACE, 2014

Probability: 3 – Likely

Vulnerability Assessment

Vulnerability – Medium

The City of Savannah, due to its close proximity to the Atlantic Coast and the tidally influenced Savannah River, is vulnerable to the potential impacts of climate change and sea level rise. Climate-driven hazards such as hurricanes and flooding are likely to increase in frequency, and possibly intensity, in the future. Thus, the 25-year flood of today may become the 10-year event in the future. See the "Climate Change" section within each hazard profile for a discussion of how the hazard may be affected by climate change. This section focuses on an assessment of direct impacts from sea level rise, using best available data from Climate Central. The potential impacts of climate change and sea level rise include increased flooding frequency, potential damage to critical infrastructure, and increasing public costs associated with flood insurance claims, infrastructure repair and maintenance, environmental impacts and increased costs associated with emergency management efforts.

Sea Level Rise

Sea level rise can have the following impacts on property and infrastructure in Savannah:

- Roads and bridges
- Utility infrastructure
- Erosion hazard zones
- Built environment including residential development
- Natural resources
- Recreational facilities and amenities such as beaches, public access points, and parks
- Saltwater intrusion into water supply
- Loss of property and property tax revenue due to inundation

As discussed above, the Savannah area might expect to see anywhere from just over 1 foot to over 5 feet of sea level rise by the year 2100. Table 5.8 summarizes the number of parcels in the City of Savannah expected to be impacted by 1-, 2-, and 3-foot sea level rise levels. Per this GIS assessment, 316 total parcels will be impacted by 3 feet of sea level rise – about one-half of one percent of all parcels in the City. Table 5.9 provides an exposure analysis from Climate Central's Risk Finder tool based on the elevation of land that structure are located on relative to local high tide. The results do not factor in structure elevation.

Based on this assessment, under the USACE's intermediate curve, the City of Savannah is expected to see approximately one foot of sea level rise by 2060, which would impact approximately 40 parcels within City limits with a total value of $9,828,767; this equates to 0.1 percent of all parcels in the City. Per Climate Central, this would impact 437 homes and 1,194 individuals.

Table 5.8 – Parcels Affected by Sea Level Rise, City of Savannah

Occupancy	Estimated Parcel Count (total)	Parcels Affected by Sea Level Rise		
		1 Ft	2 Ft	3 Ft
Total	**61,523**	**40**	**135**	**316**
Commercial	3,730	0	4	6
Education	376	0	4	14
Government	1,379	1	9	10
Industrial	970	5	11	27
Religious	550	3	4	4
Residential	54,518	31	103	255

Source: SAGIS, 2019; Note: Parcels counted above only include improved parcels within the City of Savannah.

Table 5.9 – Sea Level Rise and Coastal Flood Exposure in Savannah, Georgia

Elevation relative to local high tide line (Mean Higher High Water)											
	Unit	**< 1ft**	**< 2ft**	**< 3ft**	**< 4ft**	**< 5ft**	**< 6ft**	**< 7ft**	**< 8ft**	**< 9ft**	**< 10ft**
By Totals											
High social vulnerability population	Count	467	653	830	1,112	1,521	1,997	2,522	3,262	4,407	5,950
Medium social vulnerability population	Count	321	552	940	1,508	2,291	3,420	5,004	6,903	8,996	11,335
Low social vulnerability population	Count	406	625	912	1,289	1,738	2,346	3,052	3,929	4,946	6,225
Property value	$Million	307	528	766	1,031	1,349	1,688	2,085	2,539	3,053	3,589
Population	Count	1,194	1,830	2,681	3,910	5,550	7,764	10,577	14,094	18,349	23,509
Caucasian population	Count	654	987	1,355	1,787	2,288	2,896	3,631	4,474	5,541	6,991
Population of color	Count	567	883	1,385	2,207	3,373	5,013	7,137	9,864	13,107	16,881
African-American population	Count	481	760	1,205	1,958	3,048	4,589	6,582	9,154	12,230	15,808
Asian population	Count	47	69	94	126	162	210	270	337	421	532
Hispanic population	Count	94	129	184	248	319	412	536	679	826	998
Native American population	Count	13	19	29	42	56	74	99	134	173	213
Homes	Count	437	682	1,022	1,527	2,199	3,145	4,355	5,894	7,779	10,085
Hospitals	Count	0	0	0	1	1	1	1	1	1	1
Schools	Count	0	1	1	1	1	1	4	5	7	10
Libraries	Count	1	1	1	3	3	3	3	4	4	4
Museums	Count	1	1	1	1	1	1	1	1	1	1
Houses of worship	Count	0	1	3	3	4	7	9	17	20	32
Government buildings	Count	0	1	2	4	5	5	5	5	6	6
Roads	Miles	7	12	21	31	45	60	78	102	132	171
Federal roads	Miles	0	1	1	1	2	2	3	3	4	5
Local roads	Miles	7	12	20	30	43	57	74	97	126	164
Primary roads	Miles	0	0	0	0	0	0	0	0	0	1
Secondary roads	Miles	0	0	1	1	2	3	4	5	5	6
State roads	Miles	0	0	0	0	1	1	1	2	2	2
Railroads	Miles	1	1	2	3	4	4	5	5	6	7
Mainline rail	Miles	1	1	1	1	1	2	2	3	3	4
Non-mainline rail	Miles	0	0	1	2	2	2	2	3	3	3
Passenger stations	Count	3	3	3	3	3	3	4	4	4	4
Amtrak stations	Count	0	0	0	0	0	0	1	1	1	1
Ferry stations	Count	3	3	3	3	3	3	3	3	3	3

Elevation relative to local high tide line (Mean Higher High Water)											
	Unit	**< 1ft**	**< 2ft**	**< 3ft**	**< 4ft**	**< 5ft**	**< 6ft**	**< 7ft**	**< 8ft**	**< 9ft**	**< 10ft**
Rail stations	Count	0	0	0	0	0	0	1	1	1	1
Commuter or intercity rail stations	Count	0	0	0	0	0	0	1	1	1	1
Transit passenger stations	Count	3	3	3	3	3	3	3	3	3	3
EPA listed sites	Count	0	5	6	7	9	18	22	28	35	49
Biennial Reporters	Count	0	0	0	0	0	0	0	0	1	1
NPDES sites	Count	0	0	0	1	1	1	1	1	1	1
OIL sites	Count	0	0	0	0	0	0	1	1	1	1
RADINFO sites	Count	0	1	2	2	4	12	15	20	26	39
RMP sites	Count	0	0	0	0	0	0	0	1	1	1
TRI sites	Count	0	0	0	0	0	1	1	1	1	2
Hazardous materials facilities	Count	0	0	0	0	0	1	2	3	3	4
Extreme hazmat facilities	Count	0	0	0	0	0	0	0	1	1	1
Oil facilities	Count	0	0	0	0	0	0	1	1	1	1
Hazardous waste sites	Count	0	1	2	2	4	12	15	20	26	39
Major hazwaste source sites	Count	0	0	0	0	0	1	1	1	1	2
Minor hazwaste source sites	Count	0	0	0	0	0	3	4	5	6	9
Unspecified hazardous waste sites	Count	0	1	2	2	4	8	10	14	18	27
Landfills	Count	0	4	4	4	4	4	4	4	4	4
Wastewater sites	Count	0	0	0	1	1	1	1	1	1	1
Nonmajor wastewater sites	Count	0	0	0	1	1	1	1	1	1	1
Land	Acres	4,580	5,548	6,588	7,701	8,899	10,377	12,291	14,408	17,093	19,829
Protected land	Acres	420	514	617	725	818	920	1,023	1,182	1,411	1,600
Local protected land	Acres	367	425	491	552	613	685	756	851	945	1,053

Source: Climate Central 2014, Findings from Surging Seas (riskfinder.climatecentral.org)

5.4.2 Coastal/Canal Bank Erosion

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Coastal/Canal Bank Erosion	Possible	Minor	Negligible	More than 24 hrs	More than 1 week	1.6

Hazard Description

Coastal Erosion

Coastal erosion is a process whereby large storms, flooding, strong wave action, sea level rise, and human activities, such as inappropriate land use, alterations, and shore protection structures, wears away the beaches and bluffs along the coast. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences. According to NOAA, coastal erosion is responsible for approximately $500 million per year in coastal property loss in the United States, including damage to structures and loss of land. To mitigate coastal erosion, the federal government spends an average of $150 million every year on beach nourishment and other shoreline erosion control measures.

Coastal erosion has both natural causes and causes related to human construction activities. Gradual coastal erosion results naturally from the very slow rise of sea-level. Severe coastal erosion can occur over a very short period of time when the state is impacted by hurricanes, tropical storms and other weather systems. In Georgia, sand is moved parallel to most beaches by longshore drift and currents. Sand is continually removed by longshore currents in some areas but it is also continually replaced by sand carried in by the same type of currents. Structures such as piers or sea walls, jetties, and navigational inlets may interrupt the movement of sand, and sand can become “trapped” in one place by these types of structures. The currents will continue to flow, though depleted of sand trapped elsewhere which leads to erosion.

Canal Bank Erosion

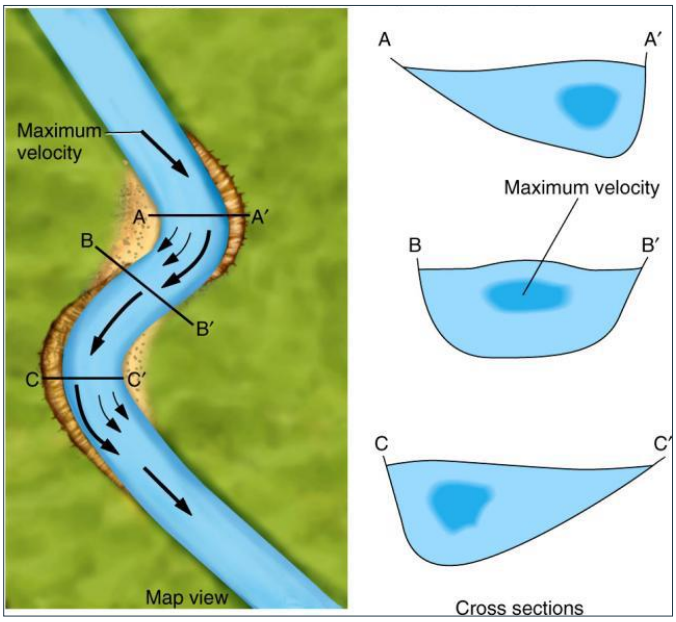
Streams/canals erode by a combination of direct stream processes, like down cutting and lateral erosion, and indirect processes, like mass-wasting accompanied by transportation. When the channel bends, water on the outside of the bend (the cut-bank) flows faster and water on the inside of the bend (the point) flows slower as shown in Figure 3.5. This distribution of velocity results in erosion occurring on the outside of the bend and deposition occurring on the inside of the bend.

Stream bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss and other adverse effects. Stream bank erosion processes, although complex, are driven by two major components: stream bank characteristics (erodibility) and hydraulic/gravitational forces. Many land use activities can affect both of these components and lead to accelerated bank erosion. The vegetation rooting characteristics can protect banks from fluvial entrainment and collapse, and also provide internal bank strength. When riparian vegetation is changed from woody species to annual grasses and/or forbs, the internal strength is weakened, causing acceleration of mass wasting processes. When land use changes occur in a watershed, such as clearing land for agriculture or development, runoff increases. With this increase in runoff the stream channel will adjust to accommodate the additional flow, increasing streambank erosion. Stream bank aggradation or degradation is often a response to stream channel instability. Since bank erosion is often a symptom of a larger, more complex problem, the long-term solutions often involve much more than just bank stabilization.

Warning Time: 1 – More than 24 hours

Duration: 4 – More than 1 week

Figure 5.8 – Stream Meanders



Location

In the Savannah Region, erosion is most likely to occur along the Atlantic Coastline, however it can occur along the estuarine and streambank shorelines closer to the City of Savannah. As inland soils tend to have greater organic matter content as compared to the fine-grained particles such as sand found along the coast, these inland areas are less susceptible to erosion.

Spatial Extent: 1 – Negligible

Extent

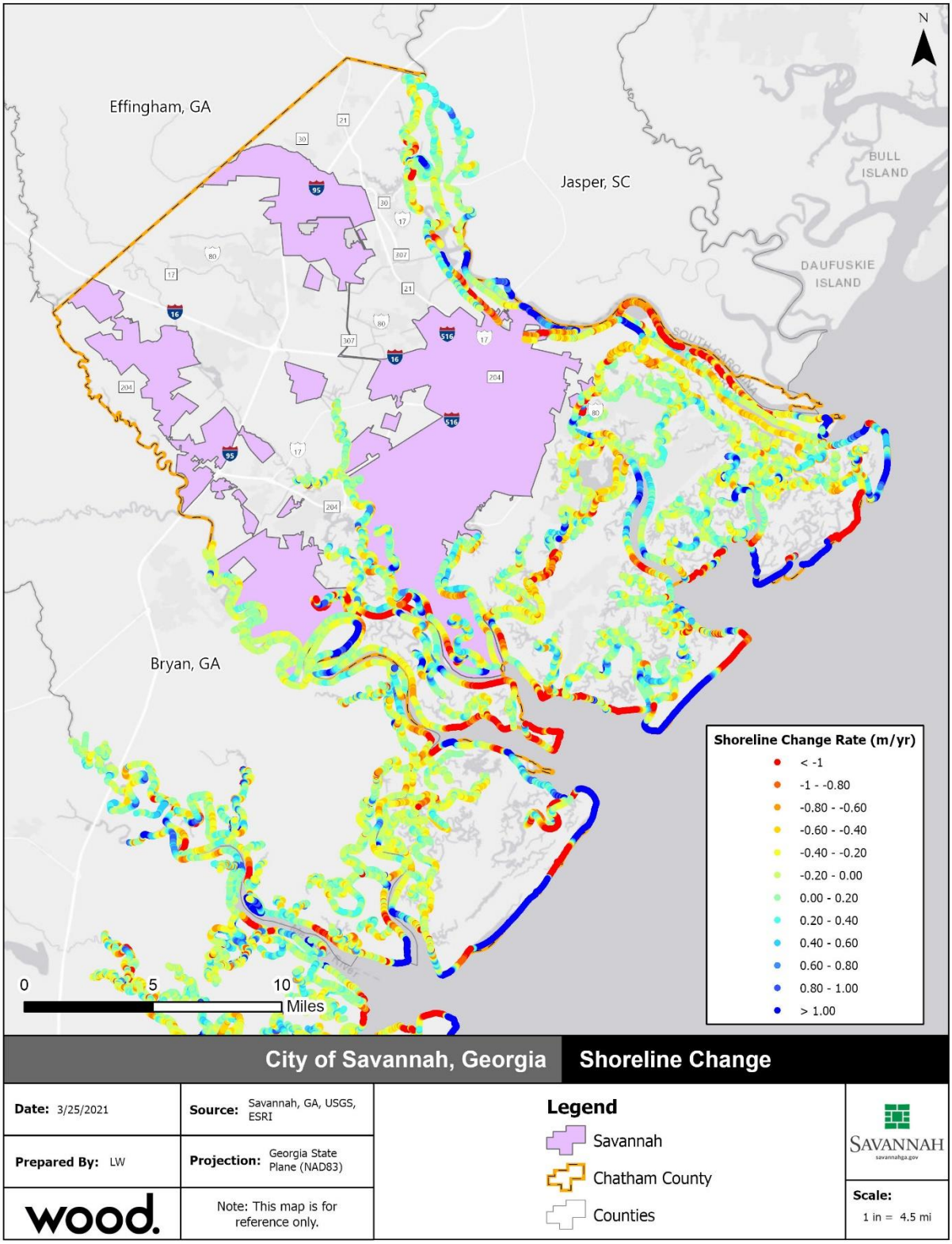
Erosion rates and potential impacts are highly localized. Average coastline recession rates of 25 feet per year are not uncommon on some barrier islands in the Southeast. Severe storms can remove even wider beaches, along with substantial dunes, in a single event. In undeveloped areas, these high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion may be considered catastrophic (NOAA, 2014).

The severity of coastal erosion is typically measured through a quantitative assessment of annual shoreline change for a given beach cross-section profile (feet or meters per year) over a long period of time. Erosion rates vary as a function of shoreline type and are influenced primarily by episodic events but can be used in land use and hazard management to defined areas of critical concern.

On canals, erosion may be measured by mass wasting events or decreased capacity due to sedimentation.

Impact: 1 – Minor

Figure 5.9 – Georgia Shoreline Change, Savannah Area



Past Occurrences

The Skidaway Institute of Oceanography at the University of Georgia maps the state's coastal hazards, including shoreline change and erosional hotspots. Figure 5.9 depicts coastline erosion and accretion changes from the 1930s through 2000. There is a small area of erosion along the Savannah River just east of downtown; there are also areas of erosion along Hutchinson Island across the River from downtown. Throughout Chatham County there are areas of erosion and accretion. Although erosion is an ongoing phenomenon, it can be intensified during storm events such as coastal storms and hurricane storm surges. The Chatham County Hazard Mitigation Plan notes incidences of coastal erosion contained within event narratives in NCEI, however all of these events occurred along the Atlantic coastline.

Savannah has experienced canal bank erosion in the past. Canal bank erosion is a natural process, but acceleration of this natural process leads to a disproportionate sediment supply, stream channel instability, land loss, habitat loss, and other adverse effects.

Probability of Future Occurrence

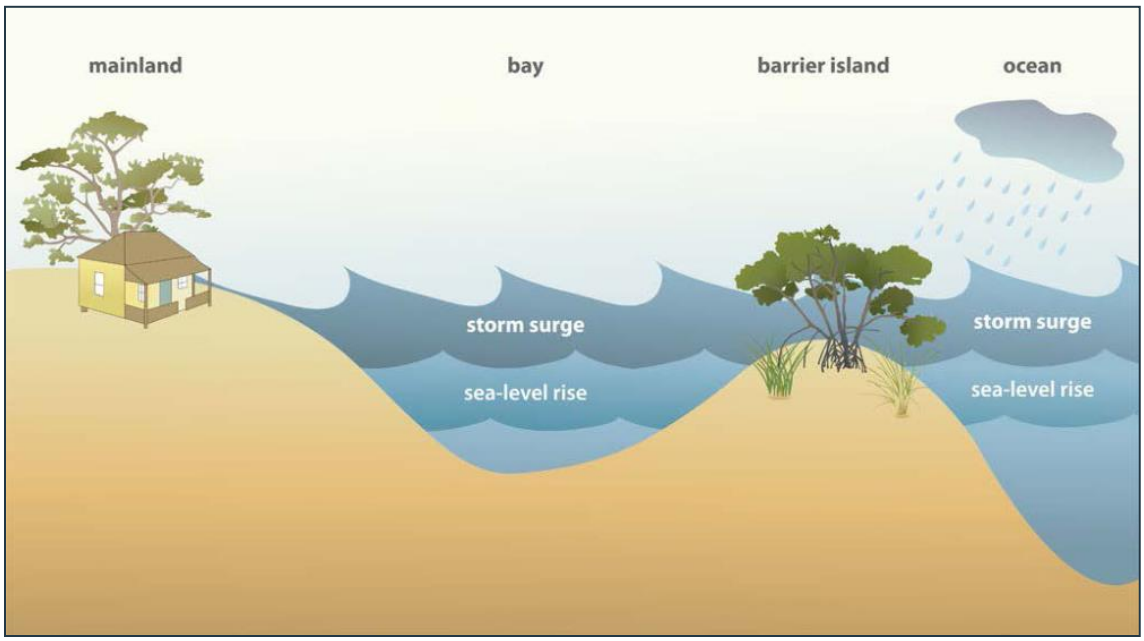
In general, low dune elevations along the southeast Atlantic coast make the region more vulnerable to erosion hazards during hurricanes and other coastal storms. In the region, wave play a large role in elevating shoreline water levels. It is likely coastal erosion will continue along the shoreline in Chatham County, however the planning area for the City of Savannah falls mostly outside of the critical areas of concern for erosion. Canal bank erosion can be expected to occur in the future as a matter of course in all canal bank areas.

Probability: 2 – Possible

Climate Change and Coastal/Canal Bank Erosion

Coastal erosion is expected to increase as a result of rising seas. Sea-level rise will raise all tide levels, from low tide to storm surge. Wave action at higher tide levels may cause erosion of sandy beaches. Higher storm surges, which may be accompanied by stronger storm winds, could wash over the tops of sand dunes, flooding the burrows of dune-nesting animals. The combined effects of wind and waves could damage dunes, leaving the beachfront more vulnerable. (UF/IFAS Extension, 2013).

Figure 5.10 – Sea Level Rise and Coastal Erosion of Dunes



Credits: Jane Hawkey, IAN Image Library (ian.umces.edu/imagelibrary/)

Climate change is also expected to make heavy rain events and tropical storms and hurricanes more frequent and intense. As a result, the erosion typically caused by these storms can be expected to occur more frequently. According to the Center of Ocean Solutions, there has been a dramatic increase in coastal erosion over the last two decades and this is expected to continue as sea level rises and storm frequency and severity increase. Rather than occurring over the same time scale with sea level rise, erosion of beaches and coastal cliffs is expected to occur in large bursts during storm events as a result of increased wave height and storm intensity. Because of these large events, scientific models predict that shoreline erosion may outpace sea level rise by 50- to 200-fold. Erosion will have significant effects on coastal habitats, which can lead to social and economic impacts on coastal communities. With the reduction of coastal habitats and the ecological services they provide, coastal communities will experience more frequent and destructive flooding, compromised water supplies and smaller or fewer beaches.

Vulnerability Assessment

Vulnerability—Medium

Data from the Georgia Coastal Hazards portal notes that there are small areas of erosion along the banks of the Savannah River and larger areas along the Atlantic Coast throughout Chatham County. There is some light development in the area along the Savannah River directly adjacent to downtown that is experiencing erosion, but it is limited. Coastal erosion is expected to continue, but the City of Savannah does not lie within areas of critical concern and is generally protected by the barrier islands along the Atlantic.

5.4.3 Dam/Levee Failure

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Dam/Levee Failure	Unlikely	Limited	Negligible	6 to 12 hours	Less than 1 week	1.7

Hazard Description

Dam Failure

A dam is a barrier constructed across a watercourse that stores, controls, or diverts water. Dams are usually constructed of earth, rock, or concrete. The water impounded behind a dam is referred to as the reservoir and is measured in acre-feet. One acre-foot is the volume of water that covers one acre of land to a depth of one foot. Dams can benefit farm land, provide recreation areas, generate electrical power, and help control erosion and flooding issues.

A dam failure is the collapse or breach of a dam that causes downstream flooding. Dam failures may be caused by natural events, human-caused events, or a combination. Due to the lack of advance warning, failures resulting from natural events, such as hurricanes, earthquakes, or landslides, may be particularly severe. Prolonged rainfall and subsequent flooding is the most common cause of dam failure.

Dam failures usually occur when the spillway capacity is inadequate and water overtops the dam or when internal erosion in dam foundation occurs (also known as piping). If internal erosion or overtopping cause a full structural breach, a high-velocity, debris-laden wall of water is released and rushes downstream, damaging or destroying anything in its path. Overtopping is the primary cause of earthen dam failure in the United States.

Dam failures can result from any one or a combination of the following:

- Prolonged periods of rainfall and flooding;
- Inadequate spillway capacity, resulting in excess overtopping flows;
- Internal erosion caused by embankment or foundation leakage or piping;
- Improper maintenance, including failure to remove trees, repair internal seepage problems, replace lost material from the cross-section of the dam and abutments, or maintain gates, valves, and other operational components;
- Improper design, including the use of improper construction materials and construction practices;
- Negligent operation, including the failure to remove or open gates or valves during high flow periods;
- Failure of upstream dams on the same waterway; and
- High winds, which can cause significant wave action and result in substantial erosion.

Water released by a failed dam generates tremendous energy and can cause a flood that is catastrophic to life and property. A catastrophic dam failure could challenge local response capabilities and require evacuations to save lives. Impacts to life safety will depend on the warning time and the resources available to notify and evacuate the public. Major casualties and loss of life could result, as well as water quality and health issues. Potentially catastrophic effects to roads, bridges, and homes are also of major concern. Associated water quality and health concerns could also be issues. Factors that influence the potential severity of a full or partial dam failure are the amount of water impounded; the density, type, and value of development and infrastructure located downstream; and the speed of failure.

The National Inventory of Dams (NID) is a database of dams in the United States which was developed and is maintained by the USACE. Congress authorized the USACE to inventory dams as part of the 1972

National Dam Inspection Act. Several subsequent acts have authorized maintenance of the NID and provided funding. The USACE collaborates with FEMA and state regulatory offices to collect data on dams. The goal of the NID is to include all dams in the United States which meet at least one of the following criteria:

1) High hazard classification - loss of at least one human life is likely if the dam fails
2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction
3) Equal or exceed 25 feet in height and exceed 15 acre-feet in storage
4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height

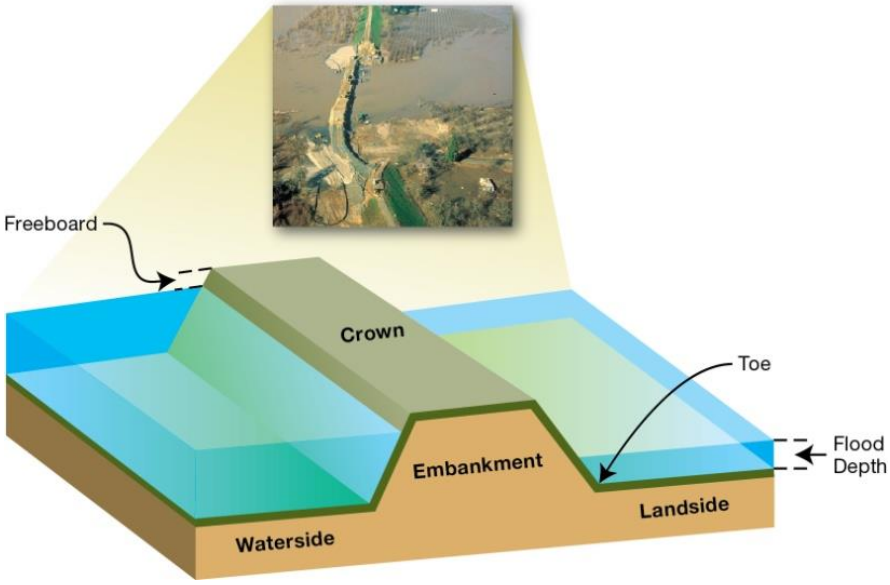
Low hazard dams which do not meet the criteria specified in number 3 or 4 are not included in the NID even if they are regulated according to state criteria. In some states, the number of these dams is several times the number of dams included in the NID.

Levee Failure

FEMA defines a levee as "a man-made structure, usually an earthen embankment, designed and constructed in accordance with sound engineering practices to contain, control, or divert the flow of water in order to reduce the risk from temporary flooding." Levee systems consist of levees, floodwalls, and associated structures, such as closure and drainage devices, which are constructed and operated in accordance with sound engineering practices. Levees often have "interior drainage" systems that work in conjunction with the levees to take water from the landward side to the water side. An interior drainage system may include culverts, canals, ditches, storm sewers, and/or pumps.

Levees and floodwalls are constructed from the earth, compacted soil or artificial materials, such as concrete or steel. To protect against erosion and scouring, earthen levees can be covered with grass and gravel or hard surfaces like stone, asphalt, or concrete. Levees and floodwalls are typically built parallel to a waterway, most often a river, in order to reduce the risk of flooding to the area behind it. Figure 5.11 below shows the components of a typical levee.

Figure 5.11 – Components of a Typical Levee



Source: FEMA, *What is a Levee Fact Sheet*, August 2011

Levees provide strong flood protection, but they are not failsafe. Levees are designed to protect against a specific flood level and could be overtopped during severe weather events. Levees reduce, not eliminate, the risk to individuals and structures behind them. A levee system failure or overtopping can create severe flooding and high water velocities. It is important to remember that no levee provides protection from events for which it was not designed, and proper operation and maintenance are necessary to reduce the probability of failure.

Warning Time: 3 – 6 to 12 hours

Duration: 3 – Less than 1 week

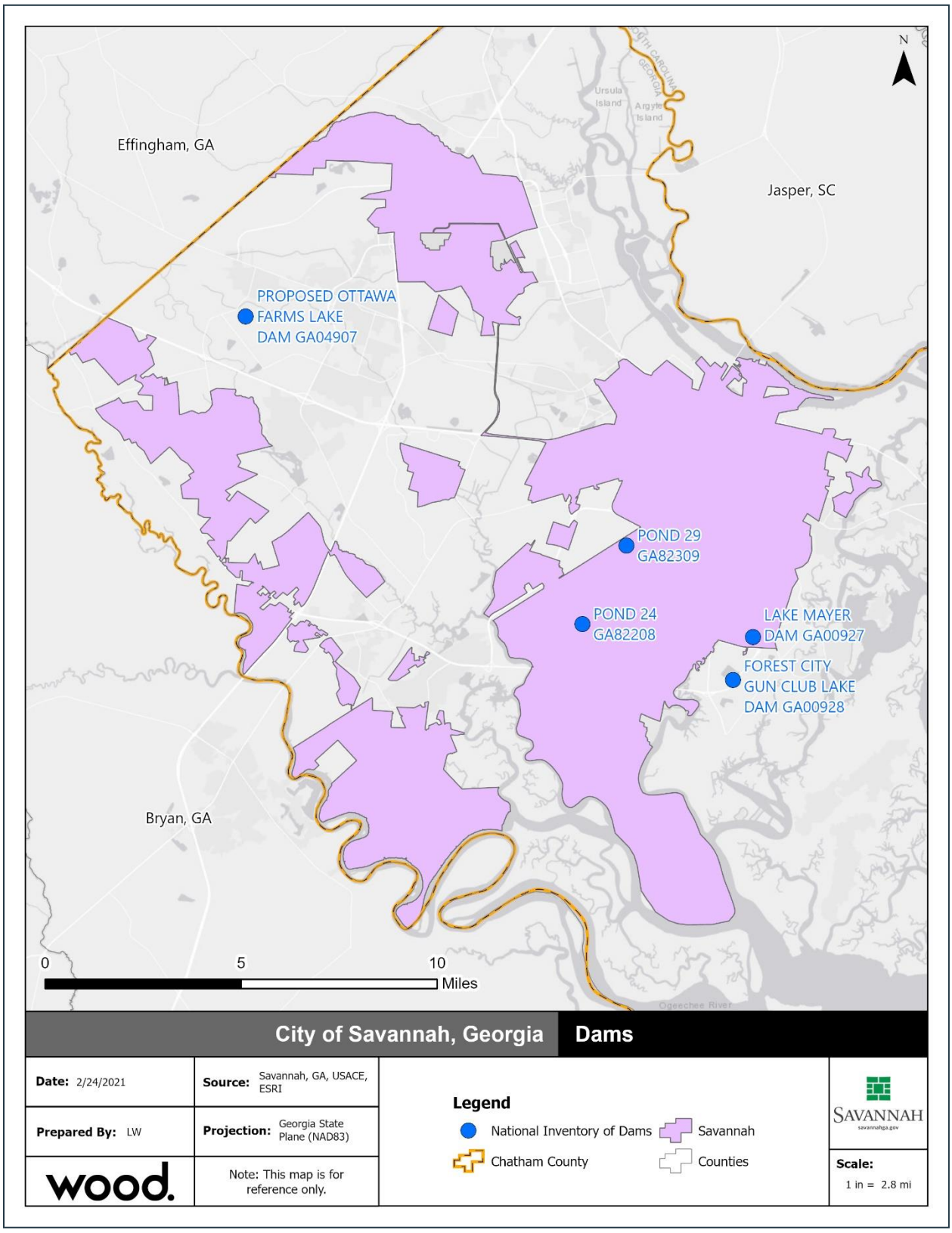
Location

Figure 5.12 reflects all dams included in the NID that are located in Chatham County. Of the five in the County illustrated below, three are located within the boundaries of Savannah. Table 5.10 details all dams located within Chatham County as included in the NID. The State of Georgia also maintains a dam inventory under the Georgia Safe Dams Program, which includes an additional dam, the Savannah Raw Water Storage Impoundment Dam, owned by the Chatham County Board of Commissioners. It has been added to the table below.

There are no levees listed in the U.S. Army Corps of Engineers National Levee Database (NLD) for Chatham County.

Spatial Extent: 1 – Negligible

Figure 5.12 – National Inventory of Dams for Chatham County



Source: U.S. Army Corps of Engineers National Inventory of Dams

Table 5.10 – National Inventory of Dams, Chatham County

Dam Name	NIDID	Owner	Height (Ft.)	NID Storage (acre-feet)	Hazard Potential
Lake Mayer Dam*	GA00927	CCBOC	9	382	Low
Forest City Gun Club Dam*	GA00928	Forest City Gun Club	10	273	Low
Pond 24	GA82208	Fort Stewart	26	45	Low
Pond 29	GA82309	Fort Stewart	19	71	Low
Proposed Ottawa Farms Lake Dam*	GA04907	Private	8.5	144	Low
Savannah Raw Water Storage Impoundment Dam*	--	City of Savannah	29	450	--

Source: U.S. Army Corps of Engineers National Inventory of Dams
Note: CCBOC = Chatham County Board of Commissioners
*Included in the Georgia SDP

Extent

As discussed above, the potential magnitude of a dam failure can be measured by the NID hazard classification; all of the dams located in Chatham County are classified as Low. The Georgia Safe Dam Program (SDP) also classifies dams as follows:

- Category II (Low Hazard) includes dams located where failure will not cause loss of life. Situations constituting probable loss of life are situations that involve frequently occupied structures or facilities, including, but not limited to, residences, commercial and manufacturing facilities, schools, and churches.
- Category I (High Hazard) includes dams located where failure will likely cause loss of human life.

All of the dams in Chatham County included in the Georgia SDP are classified as Category II.

Extent: 2 – Limited

Past Occurrences

There are no past reported dam failures within Savannah.

Probability of Future Occurrence

All of the dams located within Chatham County are classified as Low Hazard in both the NIP and the SDP. Though these dams could impact the planning area, a flooding hazard from a future dam failure is unlikely. Still, regularly monitoring is still necessary to prevent these events from occurring.

Probability: 1 – Unlikely

Climate Change and Dam/Levee Failure

Per the Fourth National Climate Assessment, average annual rainfall is likely to increase, as is the intensity of individual rainfall events. These changes could overwhelm fragile flood control systems. Climate change is unlikely to change the risk of the City to dam failure.

5.4.4 Flood: 100-/500-year

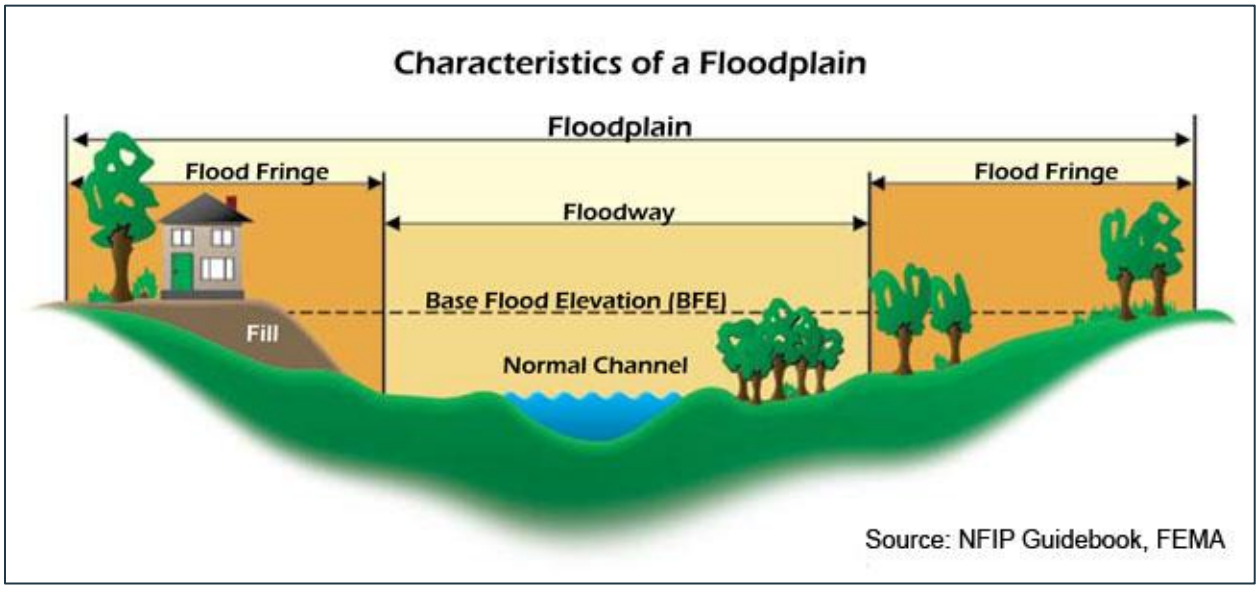
Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Flood	Highly Likely	Critical	Moderate	Less than 6 hours	Less than 1 week	3.4

Hazard Description

Flooding is defined by the rising and overflowing of a body of water onto normally dry land. Flooding can result from an overflow of inland or tidal waters or an unusual accumulation or runoff of surface waters from any source.

The area adjacent to a channel is the floodplain, as shown in Figure 5.13. A floodplain is flat or nearly flat land adjacent to a stream or river that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current.

Figure 5.13 – Characteristics of a Floodplain



In its common usage, the floodplain most often refers to that area that is inundated by the 100-year flood, the flood that has a 1% chance in any given year of being equaled or exceeded. The 100-year flood is the national minimum standard to which communities regulate their floodplains through the National Flood Insurance Program (NFIP). The 500-year flood is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. The potential for flooding can change and increase through various land use changes and changes to land surface, which result in a change to the floodplain. A change in environment can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are most often created by human activity.

Flooding within the City of Savannah can be attributed to three sources: 1) tidal flooding from hurricanes and tropical storms; 2) flash flooding from heavy rainfall that overburdens the drainage system within the community; and 3) riverine flooding resulting from heavy and prolonged rainfall over a given watershed which causes the capacity of the main channel to be exceeded.

Coastal (Tidal) Flooding: All lands bordering the coast are prone to tidal flooding. Coastal land such as sand bars, barrier islands, and deltas provide a buffer zone to help protect human life and real property relative to the sea much as floodplains provide a buffer zone along rivers and other bodies of water. Coastal floods usually occur as a result of abnormally high tides or tidal waves, storm surge and and heavy rains in combination with high tides, tropical storms, and hurricanes. While the City of Savannah is not located along an immediate shoreline, it is located in an area that is vulnerable to tidal flooding and storm surge inundation.

The primary factors contributing to coastal flooding in Savannah are its location in a hurricane prone area, its openness to the Atlantic Ocean storm surges, and unfavorable, shallow bathymetry extending far offshore. Many of the large streams and sounds near the coast have wide mouths and are bordered by extensive areas of low march. In addition, the terrain at the coast is generally too low to provide an effective barrier. The offshore ocean depths are shallow for great distances, capable of generating extremely high storm surges with potential devastating impacts in Savannah, particularly if they occur at times of high tide.

Riverine Flooding: The City is located along the banks of the tidally-influence Savannah River in addition to Wassaw and Ossabaw sounds, with numerous tributaries and manmade canals running throughout that are very susceptible to overflowing their banks during and following excessive precipitation and coastal storm events. While flash flooding caused by surface water runoff is more common in Savannah, riverine flood events (such as the “100-year flood” will cause significantly more damage and economic disruption for the area. Savannah’s floodplains have been studied and mapped by FEMA as Special Flood Hazard Areas (SFHAs)

Flash or Rapid Flooding: Flash flooding is the result of heavy, localized rainfall, possibly from slow-moving intense thunderstorms that cause small streams and drainage systems to overflow. Flash flood hazards caused by surface water runoff are most common in urbanized cities, where greater population densities increase the amount of impervious surface (e.g. pavement and buildings) which increases the amount of surface water generated. Flooding can occur when the capacity of the stormwater system is exceeded or if conveyance is obstructed by debris, sediment, and other materials that limit the volume of drainage.

Warning Time: 4 – Less than six hours

Duration: 3 – Less than one week

Location

Regulated floodplains are illustrated on inundation maps called Digital Flood Insurance Rate Maps (DFIRMs). It is the official map for a community on which FEMA has delineated both the SFHAs and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 1-percent-annual chance flood event. Structures located within the SFHA have a 26-percent chance of flooding during the life of a standard 30-year mortgage.

Flood zones are geographic areas that FEMA has defined according to various levels of flood risk and type of flooding. Flood prone areas were identified within the City of Savannah using the most recent Flood Insurance Study (FIS) and associated DFIRMs developed by FEMA effective on August 16, 2018. Table 5.11 summarizes the flood insurance zones identified by the DFIRMs.

Table 5.11 – Mapped Flood Insurance Zones within Savannah

Zone	Description
VE	Also known as the coastal high hazard areas. They are areas subject to high velocity water including waves; they are defined by the 1% annual chance (base) flood limits (also known as the 100-year flood) and wave effects 3 feet or greater. The hazard zone is mapped with base flood elevations (BFEs) that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.
A	Areas with 1%-annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
AE	AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no wave effects.
0.2% Annual Chance (shaded Zone X)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
Zone X (unshaded)	Minimal risk areas outside the 1-percent and 0.2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. (Zone X (unshaded) is used on new and revised maps in place of Zone C.)

Table 5.12 summarizes the total area within each identified flood zone within the City of Savannah and Figure 5.14 illustrates the locations of mapped flood insurance zones for the City. Figure 5.15 reflects the effective DFIRM panel scheme for Chatham County.

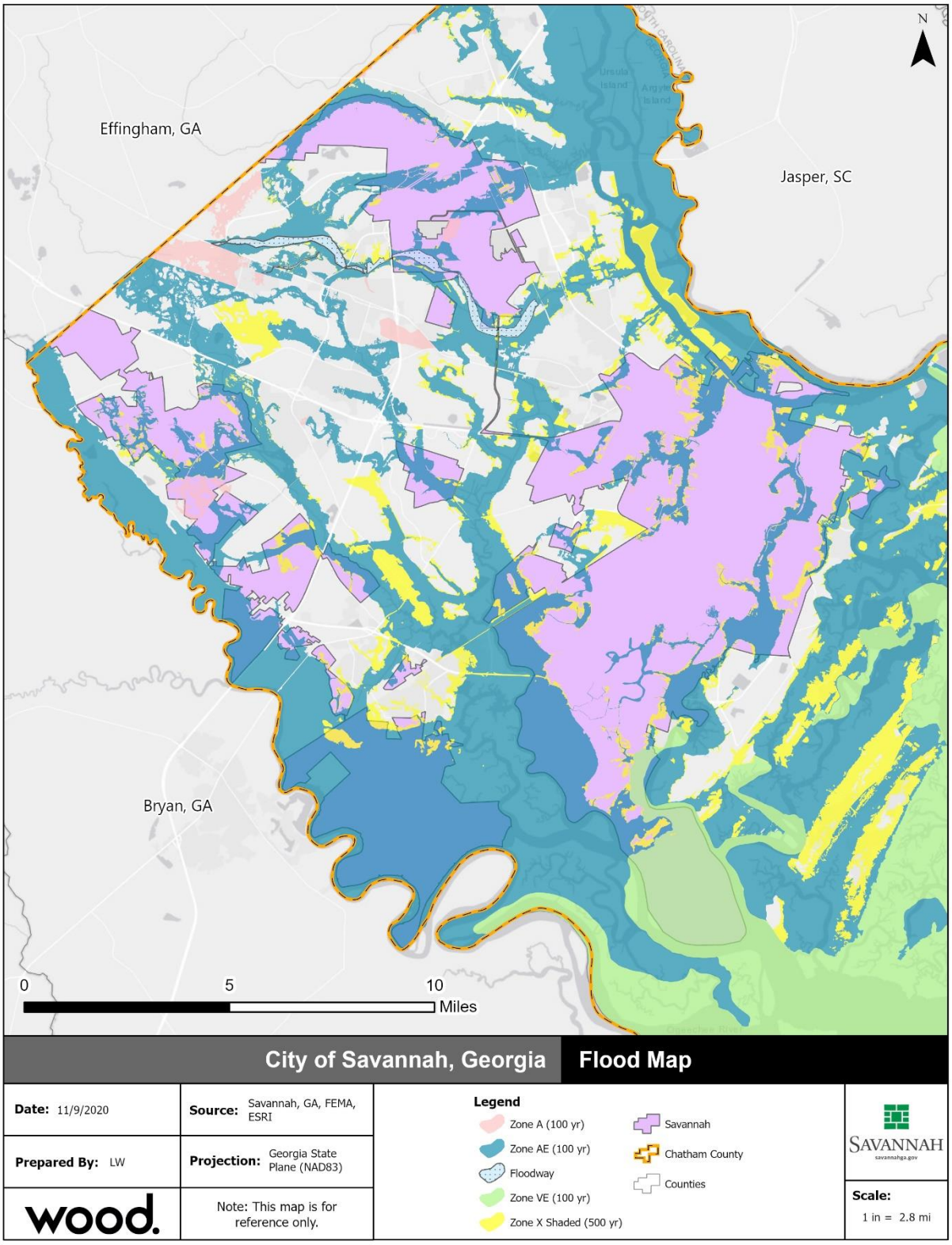
Table 5.12 – Total Acreage by Flood Zone

Flood Zone	Acreage	Percent of Total (%)
A	453	0.6%
AE	25,305	34.9%
Floodway	216	0.3%
VE	4,068	5.6%
0.2% Annual Chance Flood Hazard	3,755	5.2%
Unshaded X	38,708	53.4%
Total	72,505	--
SFHA Total	**30,042**	**41.4%**

Source: SAGIS, FEMA 2018 DFIRM

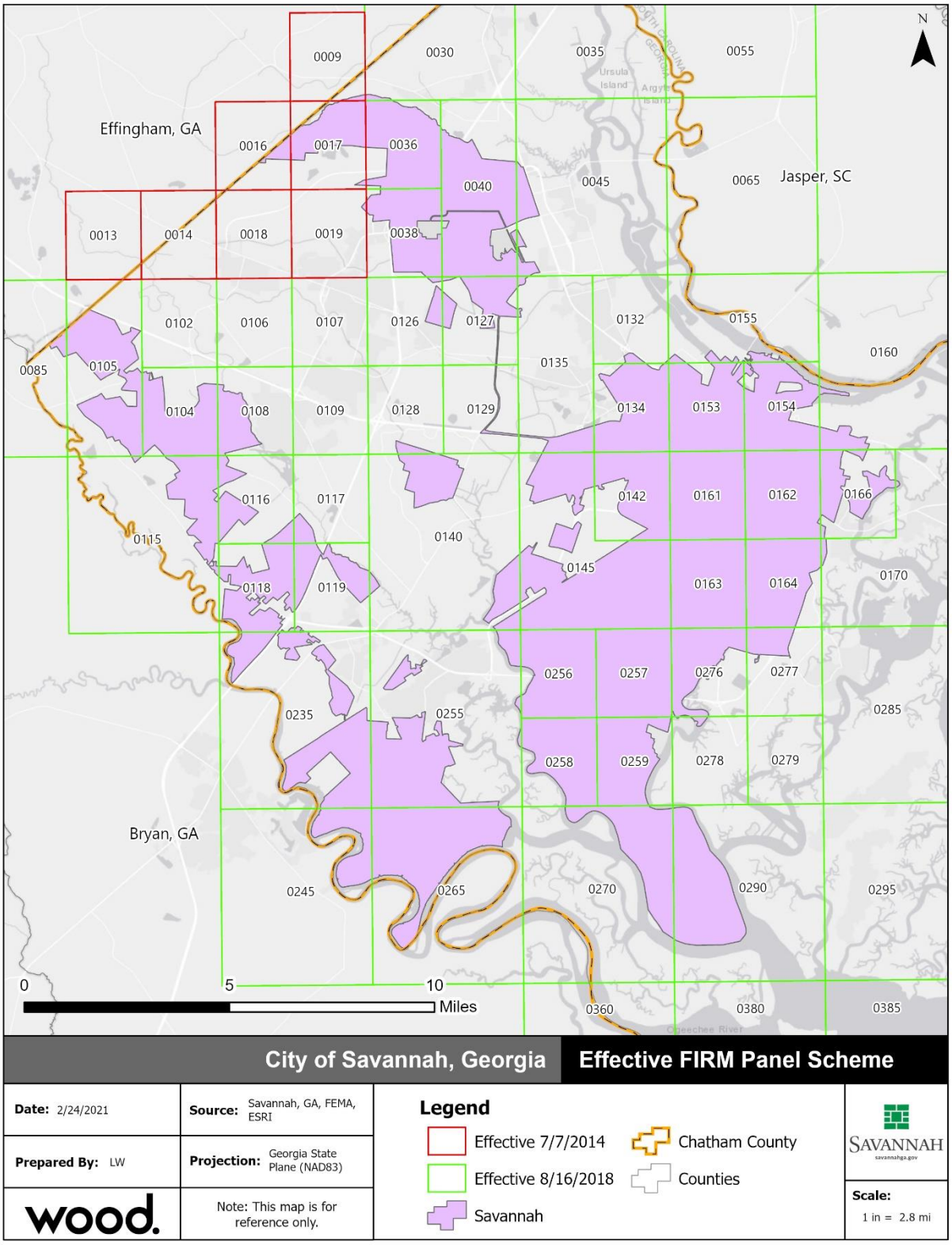
Spatial Extent: 3 – Moderate

Figure 5.14 – Savannah DFIRM Flood Zones



Source: 2018 Effective DFIRM

Figure 5.15 – Chatham County Effective FIRM Panel Scheme



Source: 2018 Effective DFIRM

Extent

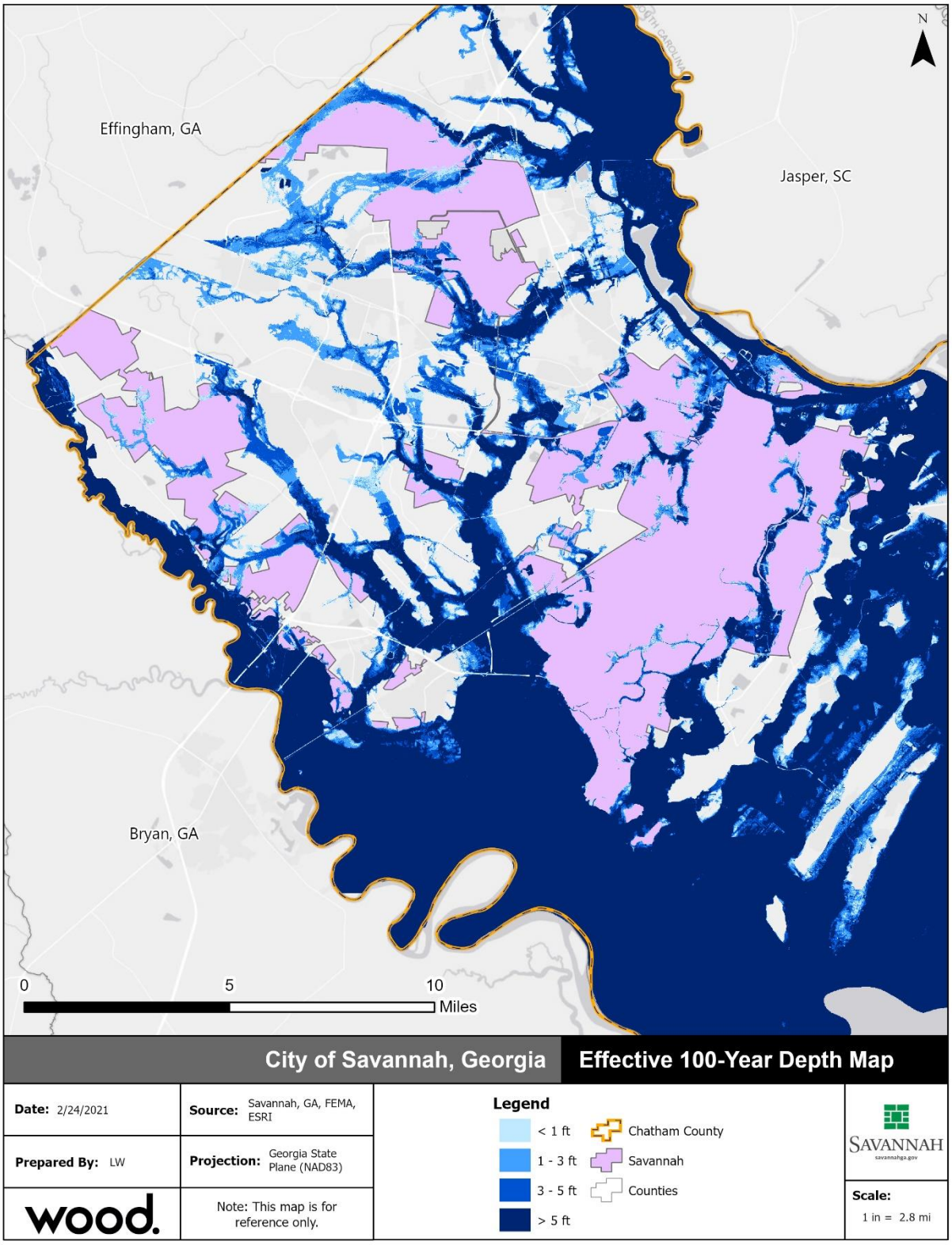
The severity of a flood can be measured by its depth and velocity. The depth of flooding that impacts a property is correlated with the property damages that result, where greater depths cause more substantial damages.

Figure 5.16 shows the flood depths throughout Savannah for the 1-percent-annual-chance flood event, as defined by the August 16, 2018 Effective FIRMs for the City.

Flood extent varies throughout the floodplain, but overall flooding impacts can be critical, with the potential for severe damage and destruction of property and the possibility of injuries and deaths.

Impact: 3 – Critical

Figure 5.16 – SFHA Flood Depths in Savannah



Source: 2018 Effective DFIRM

Past Occurrences

Chatham County has sustained flood events severe enough to warrant federal disaster declarations as shown in Table 5.2 within Section 5.1.2. Flooding can occur in Savannah year-around but flood events are most frequent in the months of May through October. Average annual precipitation is approximately 49.5 inches, with most precipitation occurring in June through August.

Table 5.13 lists the flood events from causes other than hurricanes reported by NCEI between 1996-2020 for Chatham County. Past occurrences for hurricanes, tropical storms, and storm surge can be found in Section 5.4.6.

Table 5.13 – NCEI Flooding in Chatham County – 1996-2020

Location	Date	Event Type	Injuries/Deaths	Property Damages
Coastal Chatham	9/30/2007	Coastal Flood	0/0	$0
Coastal Chatham*	6/22/2009	Coastal Flood	0/0	$0
Coastal Chatham*	6/23/2009	Coastal Flood	0/0	$25,000
Coastal Chatham	1/30/2010	Coastal Flood	0/0	$15,000
Coastal Chatham	5/7/2012	Coastal Flood	0/0	$0
Coastal Chatham	6/5/2012	Coastal Flood	0/0	$0
Coastal Chatham	6/6/2012	Coastal Flood	0/0	$0
Coastal Chatham	8/19/2013	Coastal Flood	0/0	$0
Coastal Chatham	9/28/2015	Coastal Flood	0/0	$0
Coastal Chatham	9/29/2015	Coastal Flood	0/0	$0
Coastal Chatham	9/30/2015	Coastal Flood	0/0	$0
Coastal Chatham*	10/27/2015	Coastal Flood	0/0	$0
Coastal Chatham*	10/28/2015	Coastal Flood	0/0	$0
Coastal Chatham	11/25/2015	Coastal Flood	0/0	$0
Coastal Chatham	11/26/2015	Coastal Flood	0/0	$0
Coastal Chatham	10/17/2016	Coastal Flood	0/0	$0
Coastal Chatham*	11/13/2016	Coastal Flood	0/0	$0
Coastal Chatham*	11/23/2018	Coastal Flood	0/0	$0
Coastal Chatham*	11/24/2018	Coastal Flood	0/0	$0
Coastal Chatham	8/29/2019	Coastal Flood	0/0	$0
Coastal Chatham*	8/30/2019	Coastal Flood	0/0	$0
Coastal Chatham*	8/31/2019	Coastal Flood	0/0	$0
Savannah	7/5/1996	Flash Flood	0/2	$1,000,000
Savannah	8/7/1996	Flash Flood	0/0	$75,000
East Portion	1/23/1998	Flash Flood	0/0	$0
East Portion*	6/29/1999	Flash Flood	0/0	$7,000,000
Savannah	10/11/2002	Flash Flood	0/0	$0
Savannah	4/7/2003	Flash Flood	0/0	$0
Savannah*	4/8/2003	Flash Flood	0/0	$0
Savannah	7/24/2003	Flash Flood	0/0	$0
Savannah	8/12/2004	Flash Flood	0/0	$0
Savannah	10/5/2005	Flash Flood	0/0	$0
Savannah*	7/6/2006	Flash Flood	0/0	$10,000
Savannah	7/30/2007	Flash Flood	0/0	$8,000
Wilmington Is, Savannah*	9/1/2007	Flash Flood	0/0	$0
Central Jct	9/13/2007	Flash Flood	0/0	$0
Central Jct*	9/21/2007	Flash Flood	0/0	$0

Location	Date	Event Type	Injuries/Deaths	Property Damages
Countywide*	12/21/2007	Flash Flood	0/0	$11,000
Central Jct	7/27/2008	Flash Flood	0/0	$0
Meinhard	10/24/2008	Flash Flood	0/0	$0
Savannah	7/27/2009	Flash Flood	0/0	$10,000
Central Jct, Sandfly, Garden City*	8/3/2009	Flash Flood	0/0	$155,000
Savannah	8/12/2009	Flash Flood	0/0	$0
Savannah, Central Jct*	6/27/2010	Flash Flood	0/0	$0
Vernonburg	8/20/2010	Flash Flood	0/0	$0
Savannah, Liberty City, Central Jct*	6/29/2011	Flash Flood	0/0	$0
Thunderbolt, Savannah*	7/14/2011	Flash Flood	0/0	$10,000
Savannah	8/6/2011	Flash Flood	0/0	$0
Savannah, Vernonburg*	7/12/2013	Flash Flood	0/0	$11,000
Oleary	7/13/2013	Flash Flood	0/0	$30,000
Savannah, Fernwood*	7/31/2013	Flash Flood	0/0	$30,000
Savannah, Central Jct*	8/16/2013	Flash Flood	0/0	$20,000
Bona Bella	6/23/2014	Flash Flood	0/0	$15,000
Central Jct	8/10/2014	Flash Flood	0/0	$0
Liberty City	7/17/2016	Flash Flood	0/0	$20,000
Williams	10/7/2016	Flash Flood	0/0	$0
Burnside	9/11/2017	Flash Flood	0/0	$25,000
Savannah	4/23/2018	Flood	0/0	$2,000
Pooler, Savannah*	6/23/2014	Heavy Rain	0/0	$0
Savannah	5/22/2017	Heavy Rain	0/0	$0

Source: NCEI Storm Events Database
Note: * indicates multiple events occurred on that date and have been combined for reporting purposes.

The following narratives provide details on select flood events detailed in the NCEI database and from members of the FMPC.

April 23, 2018 – A late morning mesoscale convection vortex (MCV) developed within a cluster of thunderstorms, helping produce strong to severe wind gusts while moving north along the Southeast Georgia coast. The Savannah Fire Department rescued a motorist who drove through a flooded section of East Henry Street under a railroad bridge.

June 23, 2014 – The combination of a very unstable atmosphere, the presence of a weak surface trough, and the passing of a Mesoscale Convective Vortex (MCV) produced numerous showers and thunderstorms. A line of stationary thunderstorms produced between 4 and 10 inches of rain across Chatham County, which resulted in flash flooding. The Savannah Airport ASOS measured 6.65 inches of rainfall for the day. This is the wettest June day on the record since records began in 1871.

July 31, 2013 – A weak wave of low pressure and a mid-level trough supported widespread convection. Roads were closed due to flooding at East Henry and Waters Ave., 65th and Waters Ave., 52nd and Montgomery, Vine and Anderson, and Martin Luther King Blvd. and Victory Streets.

July 30, 2007 – A weak frontal boundary in combination with sea breeze and numerous low level boundaries in a highly unstable environment resulted in numerous showers and thunderstorms across the region. Numerous road closures were reported in Downtown Savannah. High water was reported entering some apartments. Cars were seen floating down the roadway at 65th and Abercorn Street.

June 29, 1999 – Slow moving showers and thunderstorms developed repeatedly across Chatham County during the day. Twenty-four hour rainfall amounts ranged from about 7 inches to over 13 inches. As a result of the flooding, over 500 homes and businesses were damaged to varying degrees along with almost 600 vehicles. Water was as much as 6 feet deep in some places. Numerous roads were washed out and/or closed during the flooding. Property damage was estimated at $7 million - $4.5 million of which was damage to public property and the remainder damage to private property.

July 5, 1996 – 8 to 10 inches of rain fell in 3-4 hours in and around Savannah; this rain event also coincided with high tide. As a result, 50 streets and 100 homes were flooded to various degrees; numerous businesses had water several inches deep. 31,000 residents were without power for several hours. Some streets had water up to headlights on cars while others had homes with water almost knee deep. Two elderly men barely escaped with their lives when their car stalled; by the time they were rescued, water was within 6 inches of filling the inside of the car.

Probability of Future Occurrence

By definition of the 1-percent-annual-chance flood event, the City of Savannah has a 1 percent chance of flooding in or beyond the SFHA at or above the base flood elevation in any given year. Figure 2.6 in Section 2.1.1 shows the annual precipitation for the City of Savannah. According to this data, the city averages between 49.5 inches of rain annually, with an increasing trend from 1895 to 2020 of approximately 0.24 inches per decade. Based on this data and trend, precipitation increases should be anticipated in the future, which may increase the likelihood of flooding. Based on increasing rainfall amounts and the number of historical flood occurrences, flooding is highly likely to occur in the City of Savannah.

Probability: 4 – Highly Likely

Climate Change and Flood: 100-/500-year

With its populous coastal community and low topography, Savannah is particularly vulnerable to the effects of climate change and sea level rise. Per the Fourth National Climate Assessment, frequency and intensity of heavy precipitation events is expected to increase across the country. More specifically, it is "very likely" (90-100% probability) that most areas of the United States will exhibit an increase of at least 5% in the maximum 5-day precipitation by late 21st century. Additionally, increases in precipitation totals are expected in the Southeast. The mean change in the annual number of days with rainfall over 1 inch for the Southeastern United States is 0.5 to 1.5 days. Therefore, with more rainfall falling in more intense incidents, the area may experience more frequent flash flooding. Increased flooding may also result from more intense tropical cyclone; researchers have noted the occurrence of more intense storms bringing greater rainfall totals, a trend that is expected to continue as ocean and air temperatures rise.

Vulnerability Assessment

Vulnerability— High

Flood damage is directly related to the depth of flooding by the application of a depth damage curve. In applying the curve, a specific depth of water translates to a specific percent damage to the structure which translates to the same percentage of the structure's replacement value. As previously shown in Figure 5.14, 41.4% of the City is located in areas vulnerable to 1%-annual-chance flood event under normal flood circumstances.

Methodology

Parcel counts by FEMA flood zone were determined using a spatial intersection of 2019 tax parcels data, provided by Chatham County, and the effective FEMA flood zones provided in the Chatham County FEMA DFIRM Database, effective 8/16/2018. In the case of parcels affected by multiple zones, the entire parcel assessment value was applied to the highest risk flood zone intersecting the parcel in order to provide exposure estimates for each FEMA flood zone. To determine the correct occupancy class for each parcel, the land use codes provided in the Savannah tax parcel data were translated into FEMA Hazus specific occupancy classes (i.e. RES1, COM4, EDU2, etc.). These were translated to ensure the correct depth damage factor was applied to the parcel based on its occupancy class to ensure a more accurate damage assessment of the parcel.

Wood performed a Level 2 flood loss analysis in Hazus 4.2 by leveraging the 2019 parcel data provided by Chatham County. Wood developed a depth raster for all Zone AE & Zone VE portions of the SFHA and loaded this raster as well as the parcel data into Hazus. Losses were calculated based on Hazus standard depth damage functions. Only areas that were contained within the extent of available LiDAR (and by extension depth grid) were analyzed. This accounted for 99% of all structures in the SFHA. Foundation types were not provided in the parcel data, so Wood assumed 90% slab on grade and 10% crawlspace.

Table 5.14 provides the depth damage factors that were used in calculating flood losses for the City. These depth damage factors were developed based on the USACE Galveston District depth damage curves used in Hazus. All depths assume the structure has no basement.

Table 5.14 – Savannah Flood Loss Damage Factors

	Percent Damaged (%)						
Depth (ft)	Agricultural	Commercial	Education	Government	Industrial	Religious	Residential
0	0	1	0	0	1	0	18
1	6	9	5	5	10	10	22
2	11	14	7	8	12	11	25
3	15	16	9	13	15	11	28
4	19	18	9	14	19	12	30
5	25	20	10	14	22	12	31
6	30	23	11	15	26	13	40
7	35	26	13	17	30	14	43
8	41	30	15	19	35	14	43
9	46	34	17	22	29	15	45
10	51	38	20	26	42	17	46
11	57	42	24	31	48	19	47
12	63	47	28	37	50	24	47
13	70	51	33	44	51	30	49
14	75	55	39	51	53	38	50
15	79	58	45	59	54	45	50
16	82	61	52	65	55	52	50
17	84	64	59	70	55	58	51
18	87	67	64	74	56	64	51
19	89	69	69	79	56	69	52
20	90	71	74	83	57	74	52
21	92	74	79	87	57	78	53
22	93	76	84	91	57	82	53

	Percent Damaged (%)						
Depth (ft)	Agricultural	Commercial	Education	Government	Industrial	Religious	Residential
23	95	78	89	95	58	85	54
24	96	80	94	98	58	88	54

Source: FEMA estimated damage factors

Content values estimations are based on FEMA Hazus methodologies of estimating value as a percent of improved structure values by property type. Table 5.15 shows the breakdown of the different property types in Savannah and their estimated content replacement value percentages.

Table 5.15 – Content Replacement Factors

Property Type	Content Replacement Values
Residential	50%
Commercial	100%
Cultural and Parks	100%
Education	100%
Government	100%
Recreation and Entertainment	100%
Religion	100%
Medical	150%
Transportation	150%
Utilities and Communication	150%

Source: Hazus 4.2

Property at Risk

The property loss estimates for flood are based on the total of improved and contents value. It is important to note that information on those properties mitigated (e.g., floodproofed or elevated) in the SFHA was not available for analysis, thus the resulting flood damage loss estimates could be lower than actual figures. Once the total value of affected parcels was calculated, damage factors were applied to obtain loss estimates by flood zone.

Table 5.16 summarizes the count and improved value of parcels that fall within the 1% annual chance floodplain by occupancy type. Parcels outside the floodplain are also shown (Zone X Shaded and Zone X Unshaded). Based on this analysis, 2,427 improved parcels fall within the 1% annual chance floodplain for a total value of $316,155,949. Additionally, there are 485 improved parcels outside of the SFHA within the Zone X Shaded and Zone X Unshaded zones with a value of $91,499,481.

Table 5.16 – Property Value and Loss Estimates by Flood Zone and Occupancy Type

Occupancy	Total Parcels With Loss	Total Value (Building & Content)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Zone AE						
Commercial	13	$9,331,166	$392,393	$1,186,169	$1,578,562	17%
Educational	7	$9,935,100	$336,364	$1,834,820	$2,171,184	22%
Government	37	$10,323,339	$257,534	$1,655,679	$1,913,212	19%
Industrial	22	$12,052,677	$587,938	$1,443,700	$2,031,638	17%
Religious	2	$225,000	$12,385	$93,985	$106,370	47%
Residential	2338	$273,839,387	$39,351,585	$22,827,509	$62,179,094	23%
Total	**2,419**	**$315,706,669**	**$40,938,199**	**$29,041,861**	**$69,980,060**	**22%**
Zone VE						
Commercial	1	$87,000	$8,086	$36,617	$44,703	51%
Educational	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	7	$362,280	$71,677	$40,162	$111,840	31%
Total	**8**	**$449,280**	**$79,763**	**$76,779**	**$156,542**	**35%**
Zone A						
Commercial	0	$0	$0	$0	$0	0%
Educational	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	0	$0	$0	$0	$0	0%
Total	**0**	**$0**	**$0**	**$0**	**$0**	**0%**
Zone X Shaded (500 yr)						
Commercial	0	$0	$0	$0	$0	0%
Educational	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	479	$90,366,867	$8,116,389	$4,561,383	$12,677,773	14%
Total	**479**	**$90,366,867**	**$8,116,389**	**$4,561,383**	**$12,677,773**	**14%**
Zone X (Unshaded)						
Commercial	0	$0	$0	$0	$0	0%
Educational	0	$0	$0	$0	$0	0%
Government	0	$0	$0	$0	$0	0%
Industrial	0	$0	$0	$0	$0	0%
Religious	0	$0	$0	$0	$0	0%
Residential	6	$1,132,614	$47,460	$28,001	$75,461	7%
Total	**6**	**$1,132,614**	**$47,460**	**$28,001**	**$75,461**	**7%**
SFHA Totals						
Commercial	14	$9,418,166	$400,479	$1,222,786	$1,623,265	17%
Educational	7	$9,935,100	$336,364	$1,834,820	$2,171,184	22%
Government	37	$10,323,339	$257,534	$1,655,679	$1,913,212	19%

Occupancy	Total Parcels With Loss	Total Value (Building &	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Industrial	22	$12,052,677	$587,938	$1,443,700	$2,031,638	17%
Religious	2	$225,000	$12,385	$93,985	$106,370	47%
Residential	2,345	$274,201,667	$39,423,263	$22,867,671	$62,290,933	23%
Total	**2,427**	**$316,155,949**	**$41,017,962**	**$29,118,640**	**$70,136,602**	**22%**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM

Table 5.17 summarizes flood loss estimate values by occupancy for those parcels withing the SFHA. Based on this analysis, the 1% annual chance flood is estimated to cause $70,136,602 in damages, which equates to a 22% loss ratio. The loss ratio is the loss estimate divided by the total potential exposure (i.e., total of improved and contents value for all parcels located within the 1% annual chance flood zone) and displayed as a percentage of loss. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from a flood.

Table 5.17 – Summary of Flood Loss Estimates by Occupancy (SFHA)

Occupancy Type	Total Parcels with Loss	Total Value (Building & Contents)	Estimated Building Damage	Estimated Content Loss	Estimated Total Damage	Loss Ratio
Commercial	14	$9,418,166	$400,479	$1,222,786	$1,623,265	17%
Educational	7	$9,935,100	$336,364	$1,834,820	$2,171,184	22%
Government	37	$10,323,339	$257,534	$1,655,679	$1,913,212	19%
Industrial	22	$12,052,677	$587,938	$1,443,700	$2,031,638	17%
Religious	2	$225,000	$12,385	$93,985	$106,370	47%
Residential	2,830	$365,701,147	$47,587,111	$27,457,056	$75,044,167	21%
Total	**2,912**	**$407,655,430**	**$49,181,811**	**$33,708,025**	**$82,889,836**	**20%**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM

Some protection from flood losses can be provided by flood insurance, which is available to property owners in communities that participate in the National Flood Insurance Program (NFIP). The City of Savannah entered the NFIP via emergency entry in September 1970 and has been a regular participant since May 21, 1971. Savannah has achieved a Class 5 rating through participation in the NFIP's Community Rating System which rewards policyholders in the Town with a 25 percent reduction in their flood insurance premiums. A summary of current flood insurance policy holdings and past claims is provided under Flood Insurance Analysis.

To supplement the above assessment of buildings at risk, the planning team also evaluated the land area affected by the various flood zones. The following is an analysis of flooded acres in the City in comparison to total area within the City limits.

Methodology

GIS was used to calculate acres flooded by FEMA flood zones and FEMA flood zones. The Savannah parcel layer and effective DFIRM were intersected and the flooded parcel area was calculated in acres. The flood zone was assigned to any given parcel based on the intersection of the parcel with a flood zone. Only the flooded acreage within the parcel was counted for each flood zone.

Limitations

One limitation of this analysis is that the parcel layer does not include right-of-way areas. Due to this, there are voids of land that are not accounted for; therefore, this analysis only represents total parcel

acres. Table 5.18 represents a summary analysis of total improved flooded acres by land FEMA DFIRM flood zone.

Table 5.18 – Total Parcel Acres to Flooded Acres by Flood Zone

Flood Zone	Total Parcel Acres	Improved Flooded Acres	% of Total
Zone AE	22,594.0	6,219.1	28%
Zone VE	2,581.2	2,105.9	82%
Zone A	434.7	109.0	25%
Zone X Shaded (500-yr)	3,241.5	1,937.7	60%
Zone X (unshaded)	32,997.0	22,599.7	68%
Total	**61,848.4**	**32,971.4**	**53%**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM

Critical Facilities at Risk

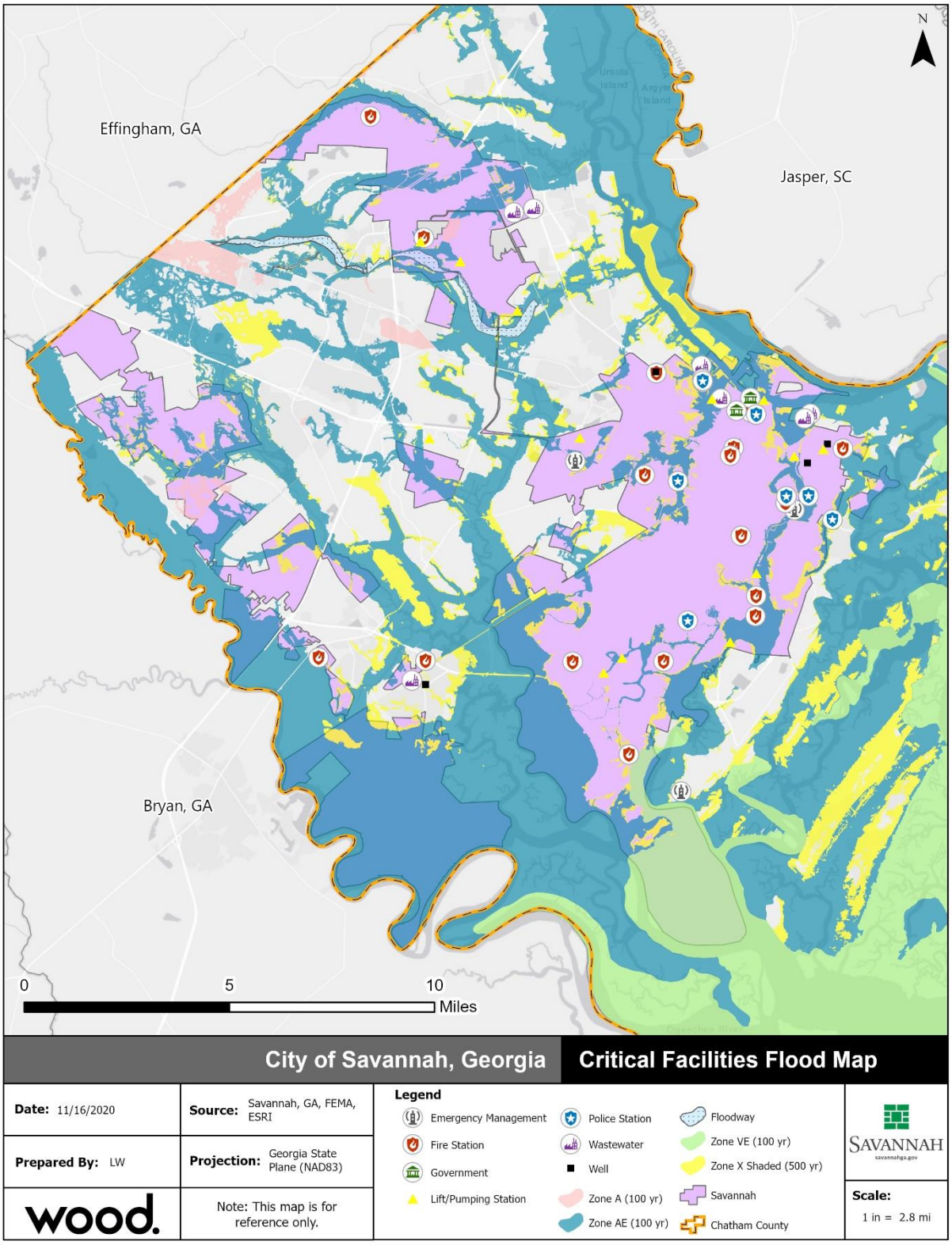
A separate analysis was performed to determine critical facilities in the 1% annual chance floodplain. Using GIS, the DFIRM flood zones were overlayed on the critical facility location data. All critical facilities at risk in Savannah are located in Zone AE on the DFIRM. Table 5.19 summarizes critical facilities by facility type in this zone. Figure 5.17 shows critical facilities and DFIRM flood zones.

Table 5.19 – Summary of Critical Facility at Risk to Flood

Facility Type	Zone AE
Emergency Management	1
Fire Stations	1
Lift/Pumping Station	7
Police Station	1
Wastewater	2
Total	**12**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM

Figure 5.17 – Critical Facilities and FEMA Flood Zones



Source: SAGIS 2019, GMIS, FEMA 2018 DFIRM

Population at Risk

A separate analysis was performed to determine the population at risk to the 1% annual chance flood zones (AE, VE and A Zones). Using GIS, the DFIRM flood zones were overlayed on the improved residential parcel data. Those residential parcels that intersected the flood zones were counted and multiplied by the American Community Survey 2019 estimate of household factor for Savannah (2.55 persons per household). In the case of residential parcels intersected by multiple flood zones, the parcel was assigned to the highest risk flood zone. As shown in Table 3.33, there is an estimated total population of 2,345 at risk within the 1% annual chance flood zones.

Table 5.20 – Savannah Population at Risk to Flood

Flood Zone	Residential Property Count	Population
Zone AE	2,338	18
Zone VE	7	5,962
Zone A	0	0
Zone X Shaded (500 yr)	479	1,221
Zone X Unshaded	6	15
Total	**2,830**	7,217
SFHA Total	**2,345**	5,980

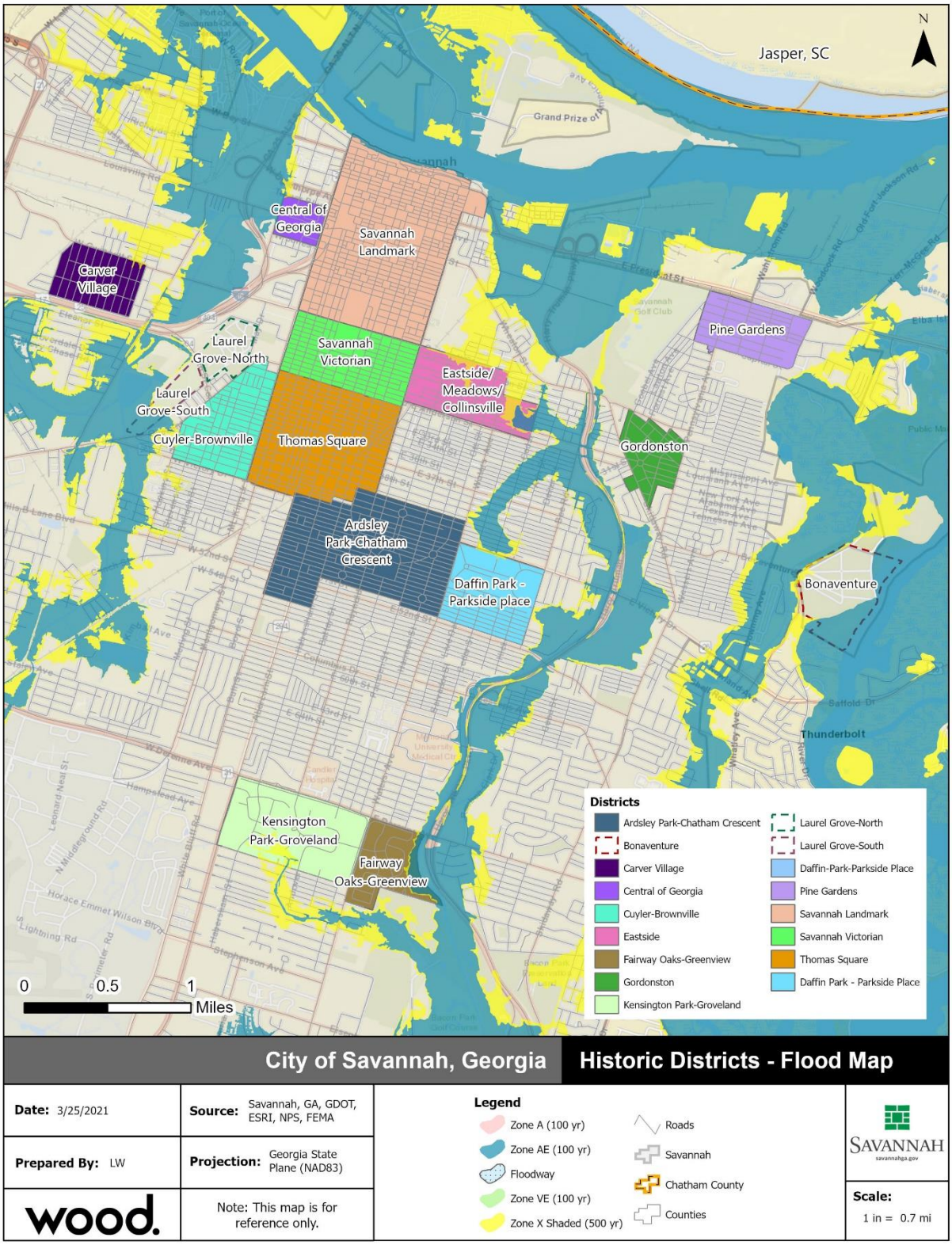
Source: SAGIS 2019 Parcel Data, FEMA 2018, DFIRM, U.S. Census Bureau

Historic Properties at Risk

As noted in Section 2.1.2, there are 13 National Register of Historic Places districts in the City of Savannah and three historic cemeteries. Historic properties are defined, for the purposes of this study, as any historic district, site, building, structure or object included in, or eligible for inclusion in, the National Register of Historic Places maintained by the Secretary of the Interior.

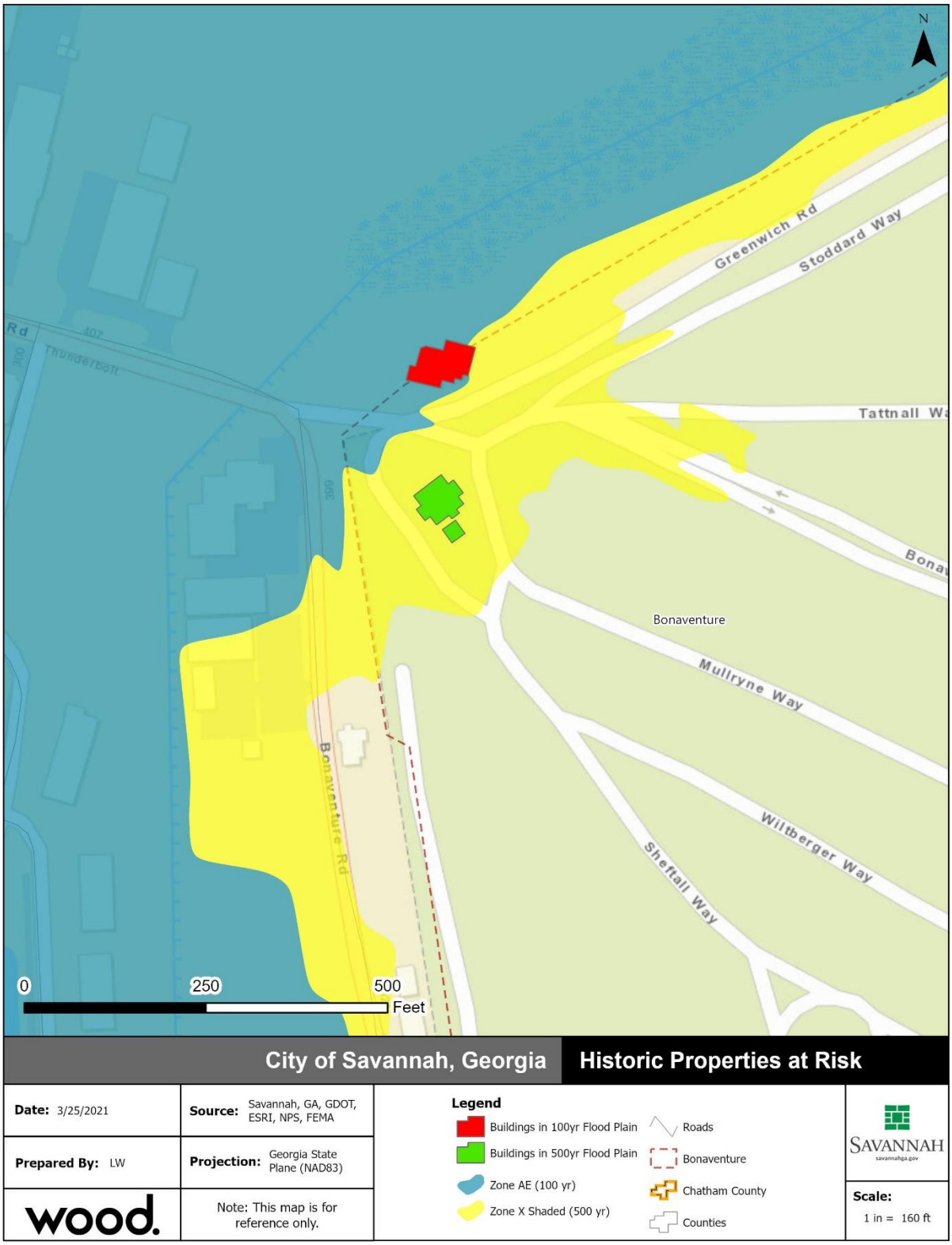
As seen in Figure 5.18 below, the Bonaventure Cemetery, Carver Village, Cuyler-Brownsville, Eastside, Fairway Oaks-Greenview, Kensington Park-Groveland, and Savannah Landmark Historic Districts are all within the 100- or 500-year floodplains and have impacted buildings. The Daffin Park-Parkside, Laurel Grove-South, and Central of Georgia historic districts intersect with flood hazard areas but do not contain actual buildings that intersect with those areas. Figure 5.19 through Figure 5.25 illustrate buildings (based on digital building footprint data) associated with the six historic districts and historic cemetery that contain buildings that intersect with mapped flood hazard areas.

Figure 5.18 – Historic District Exposure to Flood



Source: SAGIS, FEMA Effective DFIRM 2018

Figure 5.19 – Bonaventure Historic Cemetery Properties at Risk



Source: SAGIS, FEMA Effective DFIRM 2018

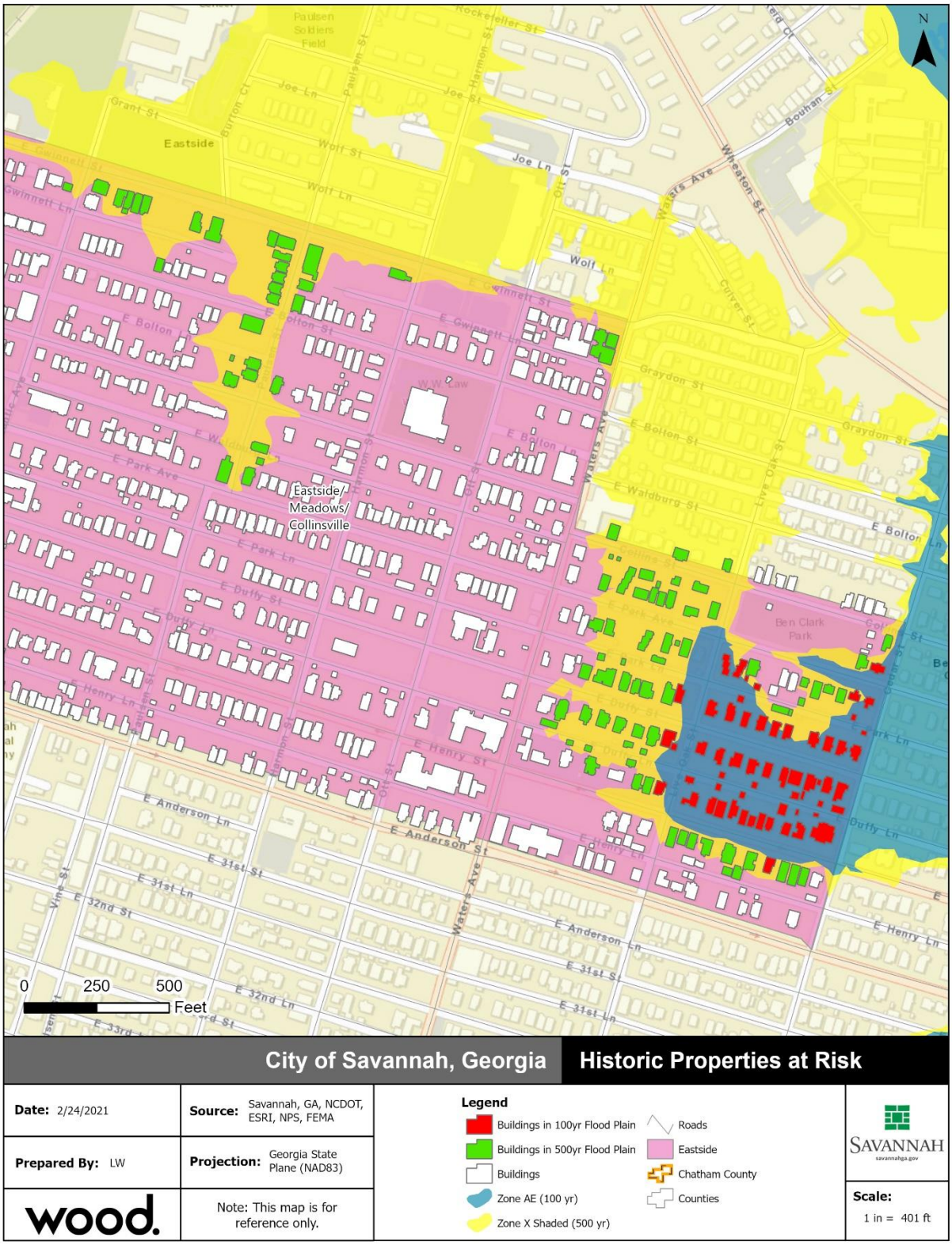
Figure 5.20 – Carver Village Historic District Properties at Risk

Source: SAGIS, FEMA Effective DFIRM 2018

Figure 5.21 – Cuyler-Brownville Historic District Properties at Risk

Source: SAGIS, FEMA Effective DFIRM 2018

Figure 5.22 – Eastside Historic District Properties at Risk



Source: SAGIS, FEMA Effective DFIRM 2018

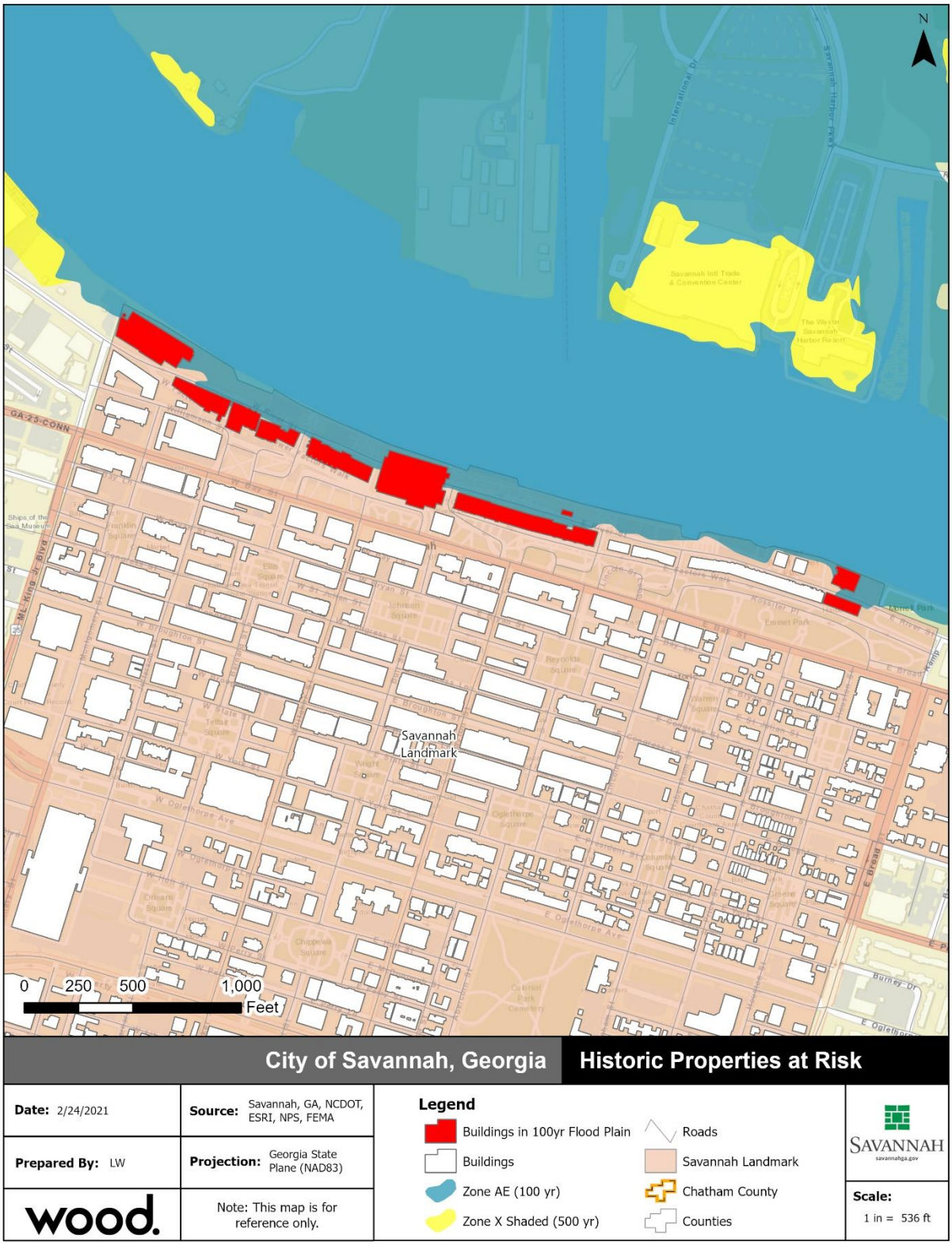
Figure 5.23 – Fairway Oaks-Greenview Historic District Properties at Risk

Source: SAGIS, FEMA Effective DFIRM 2018

Figure 5.24 – Kensington Park-Groveland Historic District Properties at Risk

Source: SAGIS, FEMA Effective DFIRM 2018

Figure 5.25 – Savannah Landmark Historic District Exposure Properties at Risk



Source: SAGIS, FEMA Effective DFIRM 2018

Future Development

Methodology

The 2019 parcel layer provided by the City of Savannah was used to identify potential areas of future development located within FEMA flood zones. Parcel counts by FEMA flood zone were determined using a spatial intersection of the parcels and the effective flood hazard area provided in the Chatham County FEMA DFIRM Database, effective August 16, 2018. If a parcel was affected by multiple zones, the highest risk flood zone covering the parcel was assigned to the parcel. Table 5.21 delineates the future development areas by flood zone and land use. Based on this analysis, there are 2,081 unimproved parcels with a total land value of $339,015,723 located in the SFHA.

Table 5.21 – Future Land Use and FEMA Flood Zones

Future Land Use	Unimproved Parcel Count	Land Value
Zone A	**9**	**$248,**
Commercial	0	$0
Industrial	0	$0
Residential	9	$248,100
Other	0	$0
Zone AE	**2,040**	**$330,395,813**
Agriculture	5	$854,700
Commercial	252	$141,481,230
Industrial	108	$73,982,286
Residential	1339	$25,559,668
Other	336	$88,517,929
Floodway	**4**	**$6,958,400**
Commercial	1	$2,570,800
Industrial	2	$3,701,800
Residential	0	$0
Other	1	$685,800
Zone VE	**28**	**$1,413,410**
Residential	2	$68,010
Other	26	$1,345,400
Zone X (shaded)	**950**	**$52,261,323**
Agriculture	1	$18,200
Commercial	111	$27,472,042
Industrial	18	$2,153,600
Residential	760	$16,563,231
Other	60	$6,054,250
Zone X (unshaded)	**4,452**	**$360,236,747**
Agriculture	3	$600,400
Commercial	814	$230,706,561
Industrial	157	$34,688,840
Residential	3117	$66,698,496
Other	361	$27,542,450
Total	**7,483**	**$751,513,793**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM

Flood Insurance Analysis

The NFIP utilizes the 1-percent-annual-chance flood as a basis for floodplain management. The FIS defines the probability of this flooding as flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 100-year period (recurrence interval). Or considered another way, properties within a SFHA have a one percent probability of flooding during any given year. Mortgage lenders require that owners of properties with federally-backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are insured against flooding. However, due to the risk of flooding from hurricanes and stormwater flooding, all property owners in the City, even if the property is not located in a SFHA, should be encouraged to purchase and maintain flood insurance policies.

Current flood insurance data for activity policies and past claims is valuable source of information on flood hazards. Flood insurance is required as a condition of federal aid or a mortgage or loan that is federally insured for a building located in a FEMA flood zone. Table 5.22 through Table 5.25 reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM. Compared to data from 2014 when the previous FMP was developed, the City of Savannah now has 1,114 fewer policies and $105,704,400 less coverage; however, there are 666 more paid claims.

Table 5.22 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	5,079	$2,597,961	$1,384,620,000	1,989	$23,645,876.58
2-4 Family	225	$108,260	$57,317,500	65	$1,208,585.35
All Other Residential	541	$188,464	$127,277,100	80	$3,943,152.64
Non-Residential	538	$1,125,744	$274,755,400	140	$3,796,960.25
Total	**6,383**	**$4,020,429**	**$1,843,970,000**	**2,274**	**$32,594,574.82**

Source: FEMA Community Information System, March 2021

Table 5.23 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,807	$1,797,361	$448,032,300	934	$15,226,694.81
A Zones	4	$5,795	$879,600	23	$300,310.89
V01-30 & VE Zones	3	$11,133	$723,300	6	$383,291.85
D Zones	1	$2,344	$266,300	74	$612,589.66
B, C & X Zone					
Standard	450	$325,522	$95,161,500	478	$8,569,463.08
Preferred	4,118	$1,878,274	$1,298,907,000	757	$7,552,746.94
Total	**6,383**	**$4,020,429**	**$1,843,970,000**	**2,272**	**$32,645,097.23**

Source: FEMA Community Information System, March 2021

Table 5.24 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	838	$1,207,126	$162,435,300	697	$11,019,151.56

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A Zones	1	$2,365	$80,000	22	$300,310.89
V01-30 & VE Zones	3	$11,133	$723,300	5	$382,484.82
D Zones	0	$0	$0	72	$491,853.87
B, C & X Zone					
Standard	122	$146,301	$35,403,300	359	$5,010,423.40
Preferred	2,242	$934,268	$681,990,000	541	$4,877,070.90
Total	**3,206**	**$2,301,193**	**$880,631,900**	**1,693**	**$22,028,658.22**

Source: FEMA Community Information System, March 2021

Table 5.25 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Total Coverage	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,062	$605,011	$300,627,100	237	$4,207,543.25
A Zones	3	$3,430	$799,600	1	$0.00
V01-30 & VE Zones	0	$0	$0	1	$807.03
D Zones	1	$2,344	$266,300	2	$120,735.79
B, C & X Zone					
Standard	362	$180,783	$62,651,800	119	$3,559,039.68
Preferred	1,884	$937,430	$619,151,000	216	$2,675,676.04
Total	**3,312**	**$1,728,998**	**$983,495,800**	**577**	**$10,563,801.79**

Source: FEMA Community Information System, March 2021

Table 5.26 compares the number of policies in force with the number of buildings (estimated by improved parcel counts) located within each flood zone in order to examine the percentage of buildings that are insured within each zone. Note that this assessment does not account for parcels with multiple insurable buildings and therefore overestimates policy coverage.

Table 5.26 – Percentage of Buildings Insured

Flood Zone	Number of Policies in Force	Number of Buildings	% Insured
AE Zone	1,807	3,599	50.2%
A Zone	4	19	21.2%
VE Zone	3	10	30.0%
Total	**1,814**	**3,628**	**50.0%**

Source: FEMA Community Information System, March 2021; SAGIS 2019 Parcel Data

Table 5.27 compares number of buildings present (estimated by improved parcel counts), number of policies in force, total coverage and a calculation of loss estimate values for the 100-yr flood.

Table 5.27 – Flood Loss Estimates by Flood Zone

Flood Zone	Number of Buildings	Number of Policies in Force	Total Value[1]	Total Coverage	Loss Estimate
AE Zone	1,807	3,599	$978,289,704	$448,032,300	$69,980,060
A Zone	4	19	$1,479,300	$879,600	$0
VE Zone	3	10	$639,855	$723,300	$156,542
Total	**1,814**	**3,628**	**$980,408,859**	**$449,635,200**	**$70,136,602**

Source: SAGIS 2019 Parcel Data, FEMA 2018 DFIRM
[1]Total value does not include land value.

The above analysis of existing flood insurance coverage shows that existing building coverage does meet the loss estimate for the 1%-annual-chance flood event; however, this comparison does not take into account the large number of uninsured proprieties that would have no coverage in the event of a flood loss.

Figure 5.26 shows the location of flood insurance policies. This data still provides an indication of where gaps in coverage may exist.

Repetitive Loss Analysis

Methodology

According to 2018 NFIP records, there were 146 mitigated properties with total payments of $8,887,853 and 187 unmitigated properties with total payments of $10,678,381 within the City of Savannah. Table 5.28 details repetitive loss building counts, FEMA flood zones and total payment.

Table 5.28 – Repetitive Loss Summary Table (Unmitigated Properties)

Flood Zone	Building Count		Total Building Payment	Total Content Payment	Total Paid
	Insured	Uninsured			
AE	3	1	$100,882.69	$24,575.89	$125,458.58
A06	2	1	$107,029.73	$83,716.98	$190,746.71
A07	0	1	$207,107.55	$359,413.91	$566,521.46
A10	1	1	$33,153.19	$9,959.39	$43,112.58
A15	1	0	$67,643.5	$0	$67,643.5
AE	28	22	$2,652,153.66	$336,285.55	$2,988,439.21
VE	0	1	$3,319.53	$0	$3,319.53
C	1	6	$270,576.29	$108,891.78	$379,468.07
D	0	3	$48,656.94	$25,140.31	$73,797.25
X	38	77	$3,826,480.08	$2,413,394.46	$6,239,874.54
Total	**74**	**113**	$7,317,003.16	$3361,378.27	$10,678,381.43

Source: NFIP Repetitive Loss Data 2018

Figure 5.27 illustrates the repetitive loss areas in relation to the known flood hazard areas within Savannah.

Figure 5.26 – Savannah Flood Insurance Policies in Force

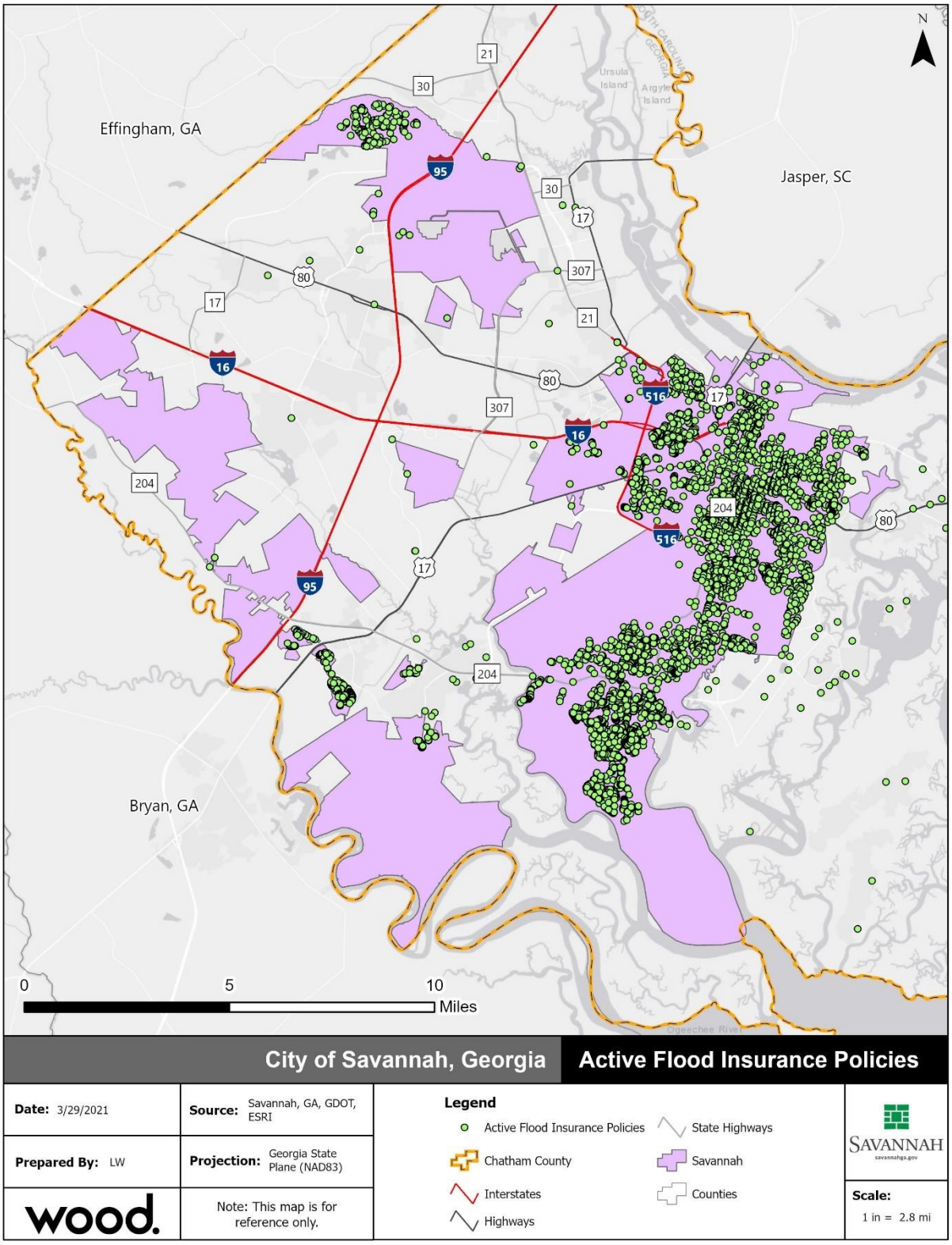
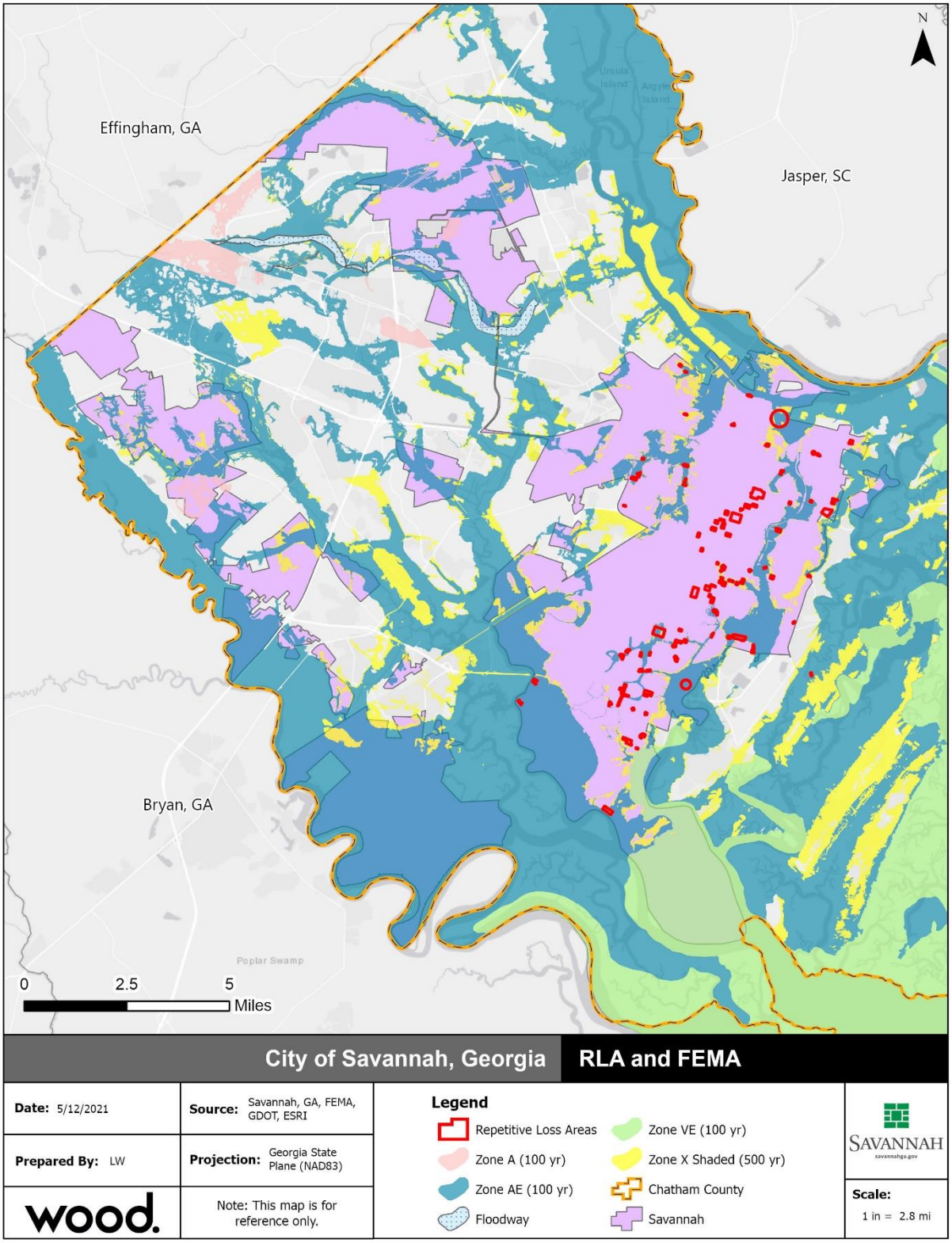


Figure 5.27 – Repetitive Loss Properties and Flood Zones



5.4.5 Flood: Stormwater/Localized Flooding

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Flood: Stormwater/Localized Flooding	Highly Likely	Critical	Moderate	Less than 6 hours	Less than 24 hrs	3.3

Hazard Description

Localized stormwater flooding can also occur throughout the City of Savannah. Localized stormwater flooding occurs when heavy rainfall and an accumulation of runoff overburden the stormwater drainage system within the community. Savannah is situated on a low coastal plain with much of its surrounding area consisting of tidal marshes. The cause of flooding in Savannah can be attributed to a number of factors, including its low elevation, relatively flat terrain, close proximity to the coast, 6 to 9 foot tides, abundance of water features, and the large amount of developed and impervious land, which limits ground absorption and increases surface water runoff. Early in its history, the City constructed a series of canals to convey stormwater. Without these canals, development in many parts of the City would not have been possible, and over the years, these canals have been supplement by additional drainage improvements of varying capacities to alleviate potential flooding. The Savannah canal system is shown in Figure 5.28.

Localized flooding may be caused by the following maintenance related issues:

- **Inadequate Capacity –** An undersized/under capacity pipe system can cause water to back up behind a structure which can lead to areas of ponded water and/or overtopping of banks.
- **Clogged Inlets** – debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system which may cause flooding near the structure. Debris within the basin itself may also reduce the efficiency of the system by reducing the carrying capacity.
- **Blocked Drainage Outfalls** – debris blockage or structural damage at drainage outfalls may prevent the system from discharging runoff which may lead to a back-up of stormwater within the system.
- **Improper Grade** – poorly graded asphalt around catch basin inlets may prevent stormwater from entering the catch basin as designed. Areas of settled asphalt may create low spots within the roadway that allow for areas of ponded water.

Localized flooding can result from smaller rain events, and it typically occurs with little warning. Although the flooding may drain quickly, it can still amount to significant damages. While it may not impact as large an area or produce the damaging wave energy of coastal flooding, it is, nonetheless, a chronic problem. Repetitive losses caused by localized flooding can add up.

Warning Time: 4 – Less than 6 hours

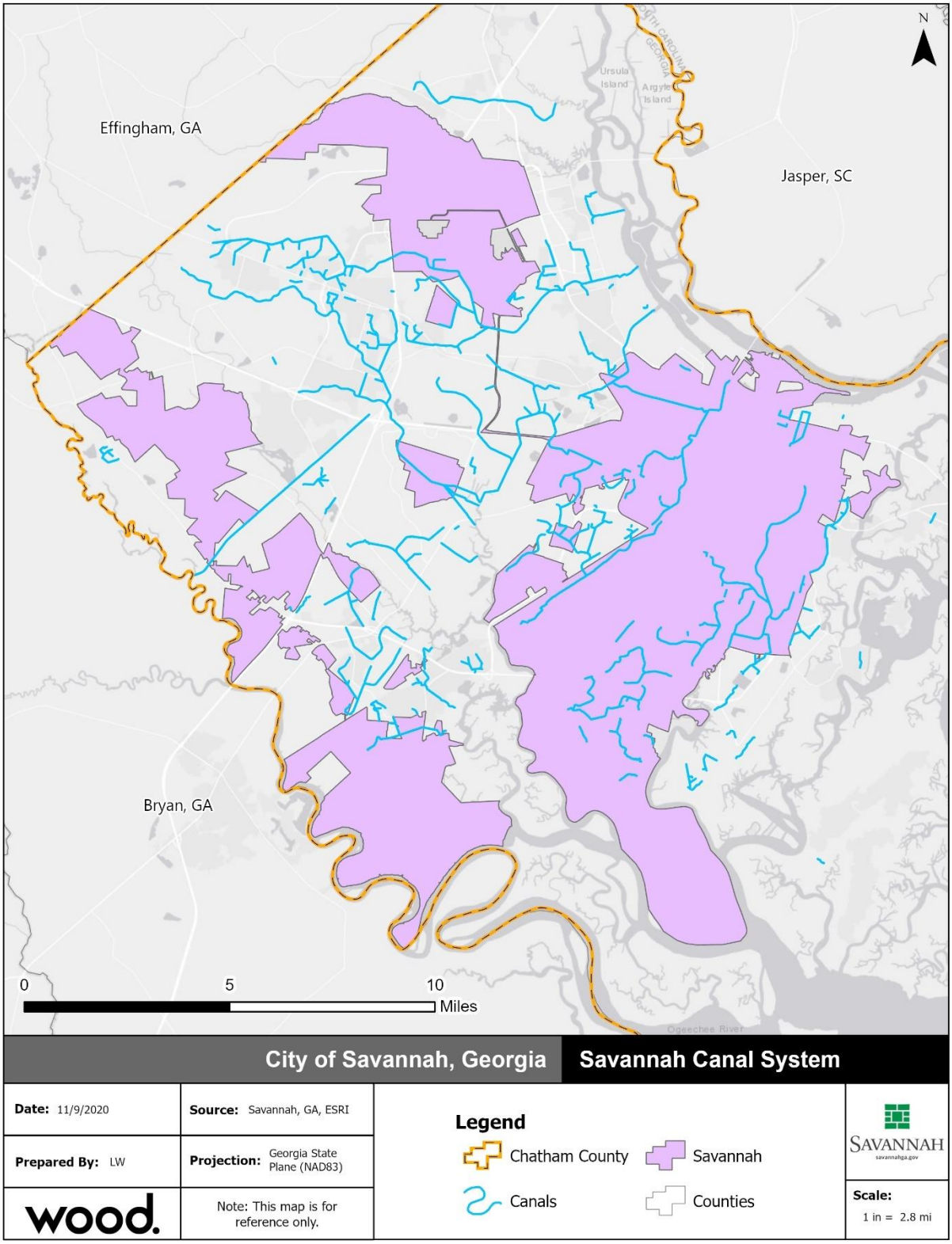
Duration: 2 – Less than 24 hours

Location

Early in its history, the City constructed a series of canals to convey stormwater. Without these canals, development in many parts of the City would not have been possible, and over the years, these canals have been supplement by additional drainage improvements of varying capacities to alleviate potential flooding. The Savannah canal system is shown in Figure 5.28.

Spatial Extent: 3 – Moderate

Figure 5.28 – Savannah Canal System



Source: SAGIS 2019

Extent

The severity of localized stormwater flooding is generally linked to the flood depth, velocity, and how rapidly it occurs. However, unlike with the mapped floodplain, there is limited data on flood depths and recurrence intervals for localized flooding because it is highly variable based on stormwater system maintenance, development and runoff management, recent weather patterns, and each rain event.

Impact: 3 – Critical

Past Occurrences

Table 5.29 lists the areas of localized flooding identified by the FMPC including those areas from the prior plan and those added since, denoted by an asterisk (*); Figure 5.29 maps these locations. Table 5.30 lists the localized flooding locations that have been mitigated since the 2015 FMP; these are mapped in Figure 5.30.

Table 5.29 – Stormwater and Localized Flooding Locations

Neighborhood	Location
Abercorn Heights/ Lamara Heights/Ridgewood/ Poplar*	65th & Paulsen (Clean all Catch Basins)
	65th & Abercorn to Bull (Clean all Catch Basins)
	61st & Habersham (Clean all Catch Basins)
	Habersham, North of Derenne (Clean all Catch Basins)
	Brandywine St. & Battery St.
	E 63rd & Reynolds St.
	E 64th & Reynolds St.
	E 65th & Reynolds St.
Ardmore/Gould Estates/Olin Heights	55th Lane between Habersham & Abercorn (Clean of Grate)
	57th between Reynolds & Atlantic (Clean Grates in Land and in Front of Pipe)
	58th between Reynolds & Atlantic (Clean in Front of Catch Basins)
Ardsley Park/Chatham Crescent	Washington & Paulsen (Clean all Catch Basins)
	E 45th & Harmon St. (Clean all Catch Basins)
	E 49th & Waters St. (Clean Grates in Front of Catch Basins)
	E 45th St & Reynolds Street
	E 45h St & Paulsen St
	E Victory St & Paulsen St
Avondale	2428 Tennessee Ave
	New Jersey & Tennessee Ave
	Delaware Ave & Tennessee Ave
Bacon Park Area/Sandfly	Skidaway, Just South of Bacon Park Golf Course @ Possum Ditch (Clean Pipes)
Bay Street Viaduct Area	Rear of Great Dane through Gate (Clean Bar Screen at Pipe)
	Bay St. @ Viaduct Inside Great Dane (Clean Catch Basins & Check Ditch at Fence Line for Blockages)
Beach High School Area	E 48th to 52nd@ Springfield Canal (Inform Residents of Canal Overflows, Clean Area of Debris)
Benjamin Van Clark Park	Ash & Duffy (4 Inlets)
	1201 E Henry St
	Ash St & E Anderson St
	Ash St & E Henry St
	Cedar St & E Henry St
Blackshear	Kayton Pump Station (Clean Debris Bin)
Brookview/Skidaway	Brookview & Countryside (Check Grates & Catch Basins)

Neighborhood	Location
Terrace/Parkview	Jan St & Bona Bella
Carver Heights	535 Magazine Ave.
	Cornwall St & Hastings
	Dell St. & Heron St.*
Chatham Parkway	Lynes Ave
	Tremont St @ railroad tracks
Coffee Bluff/ Rose Dhu	Back St. Tidegates, East End Of Back St., Then Left On Grant To Tidegate (Clean Tidegate & Pipe Entrance)
	Behind #12 Sutton (Clean Pipe Entrance)
	Behind 63 & 65 Ramsgate (Clean Pipe Entrance)
	Rear Of 3 Bridgeport
	Rear Of 3 Bridgeport Through Woods To Back Street
	13907 Coffee Bluff Rd
Cuyler/Brownville	W 41st & E 42nd Sts @ Ogeechee Rd.
	W. 42nd, Rear Of 1231
	E 42nd & Hopkins
	E 42nd Lane @ Ogeechee Rd.
Dale Terrace/Olympus/ Victory Square	Ditch behind Food Lion of Victory Dr.
East Savannah	2417 Gwinnett St.
East Victorian District	Abercorn St & E Henry St
	Abercorn St & E Park Ave
	Drayton St & E Henry St
	E Henry St & Lincoln St
	Park Ave & Drayton St
Eastside	E Gwinnett St Underpass
	Henry St. Underpass
	Henry St Rr Underpass
	E Henry St & Harmon St
	E Henry St & Paulsen St
Edgemere	1500 Blk E 54th St.
	E 55th St & Waters Ave
Fairway Oaks	Derenne Pump Station
Gordonston	Virginia Lane @ Skidaway Rd, Lane behind Savannah Oaks Bldg. 23
	Edgewood & Kentucky
	Goebel & Pierpoint
Groveland/Kensington Park	318 Kensington Dr, Left of home; 75' down the ditch
	Kensington Dr & Althea – Community Park, SE Corner behind pool
	Harbersham, between Johnston St & Groveland Circle – Hampstead Canal
Highland Park	712 Mall Blvd West of Triple A Auto
	Sallie Mood @ Country Yard, Employee Parking Lot, turn left @ pond and go to end, 100 yds on the left
Hillcrest Area	Goebel & Greenville
	Goebel & Elgin
Hitch Village/Fred Wessels Homes	Marriott Hotel east side tide gate @ Savannah River
	Bilbo Box – tide gate @ Savannah River
	Bilbo Box @ Perry Lane
	Savannah River tide gate
	Tide gate @ Marriott
	Tide gate Bilbo Box N of President, S of East Coast

Neighborhood	Location
	Tide gate W Side under Marriott
	Tide gate E of Marriott @ Savannah River Landing
	New tide gate @ Savannah River Landings
Hudson Hill/Bayview	Rogers St W. of Carolan @ Park
	Fell St Box @ Carolan St. behind Airco
	Fell St Pump Station
	West Bay & Graham @ Ditch #02017 behind Barrett Oil Co.
Hunter Army Airfield	White Bluff @ Savannah tech entrance, White Bluff along Hunter AAF wall
	Mohawk St. & Kingslan Ct.
	5711 White Bluff Rd. at Rutland Tire*
Jackson Park	52nd & Montgomery St
Largo Woods	11011 Largo Dr rear, S @ Ditch
	Rear of Quail Forrest Court, #10
	209 San Fernando between 207 & 211
LaRoche Park/Springhill/Daffin Heights/Wilemere/S*	Dead end of Costa Rica @ Truman Parkway
	E 56th & Honduras @ Parkway
	E 57th & Costa Rica Ave
Laurel Grove/Railroad Area	Louisville & I-16
	Ogeechee Rd & W 42nd St
	I-16 Median @ 4' x 5' Box Culvert*
Leeds Gate/Colonial Village/Hunters Chase	Middleground Rd, Rear of Woodhouse Apts, North of Apts
	328 Tibet Ave, E of Southside Assembly of God
	Tibet Ave W of Elementary School @ Ditch
	Tibet Ave @ Wilshire Canal
	W Montgomery Xrd, W of Indigo @ Canal
Liberty City/Summerside/ Southover/Richfield	Clinch St Bar Screen Springfield Canal
	Stark St @ Springfield Canal
Live Oak	Victory Dr, Waters to Bee Rd.
	1300 Block E 34th St
	1311 E 34th St
Lundhurst/Rivers End	8515 Hurst Ave- Tide gate, left hand side
	613 Rivers End – Tide gate, 50' past mailbox, 150' off road in line with catch basin
	16 Delta Circle – Left between 16 Delta Circle & 18 Delta Circle
Magnolia Park/Blueberry Hill	Woodland Dr & Spaulding Dr – Casey Canal
Mayfair	Montgomery Xrd Pump Station @ Casey Canal
Medical Arts	Paulsen St & 61st St
	Paulsen St & E 63rd St
Midtown	E Anderson St & Harmon St
	E Anderson St & Ott St
Oakdale	Memorial Day School, 300 Hampton St off Habersham
	Wheeler & Waters (714 Wheeler St)
Oakhurst	Abercorn to Edgewater – Harmon Canal – 3 Sites: 1) Edgewater, 2) Atwood & Kandlewood, 3) Whitebluff-Abercorn
Paradise Park	Rear of 107 Paradise Dr @ Arden Apt
	109 Paradise Dr
	125 Paradise Dr
	17 Paradise Dr
	9 Joyce Ct

Neighborhood	Location
Parkside	E 50th St & Waters Ave
Pine Gardens	President St Median Inlets to City Limits
Sackville	Hospital Access Rd between Delesseps & 59th @ Parkway
	Delesseps Ave & Waters Ave
Savannah Gardens	Elgin & Pennsylvania
	Elgin – Mid block between Pennsylvania & Crescent
Savannah State/Glynnwood/ Placentia Plantation/Bren*	Derenne Ave & Bonnie Dr @ Savannah Christian – 50' west of Savannah Christian Entrance
Savannah State/Placentia Plantation	Loroche Ave @ Placentia Canal
Skyland Terrace/Greenway Park/Grove Park/Oglethor	10 Sherwood – Pipe Entrance Behind House*
South Historic District	Alice & Tattnall
	Alice & Jefferson
	Bull St & E Henry St
	W Gwinnett St & Whitaker St
	W. Jones St. & Barnard St.*l
Sylvan Terrace	Herty Dr, Thackery Place to Berkley Place
The Village/Rio/Armstrong	1 Rio Rd
Tremont Park	Tremont Ave @ Musgrove Canal
	3488 Ogeechee Rd
Twickenham	President St. & Goebel St., Pipe Under President, S/Side Screen, East Of Goebel
	Goebel & New Mexico
	Greenville & Lawton
	1825 E Gwinnett St
	50 Goebel Ave
	Beech St & Presidents St
Victory Heights	39th & Skidaway - On 39th East Of Skidaway
	Grate Inlet @ Rear Of Precision Tune - Access From 42nd Street
	2441 E 40th St
	E 38th St & Skidaway Ave
	Skidaway Ave & Victory Dr
	Victory Dr & Wallin St
Victory Manor/East Hill/Donwood	39th & Skidaway - On 39th East Of Skidaway
	Grate Inlet @ Rear Of Precision Tune - Access From 42nd Street
	2441 E 40Th St
	E 38Th St & Skidaway Ave
West Savannah	Comer St. @ Abbott
	Baker St. @ Bay
	Mcintyre & Chester St. & Chester Lane
	Patch St. @ Lily & Tulip
	Jenks St. @ Bay
	Margery & Kenilworth
	Graham St. & Bay St.
	West Lathrop @ Augusta Ave.*
	Fell Street & Newcastle St.*
	Hudson St. @ Bay*
White Bluff Neighborhoods	Robin Rd Tidegates, #6 Robin Rd – back to marsh
	Screen E Side of White Bluff Rd @ Greenbriar

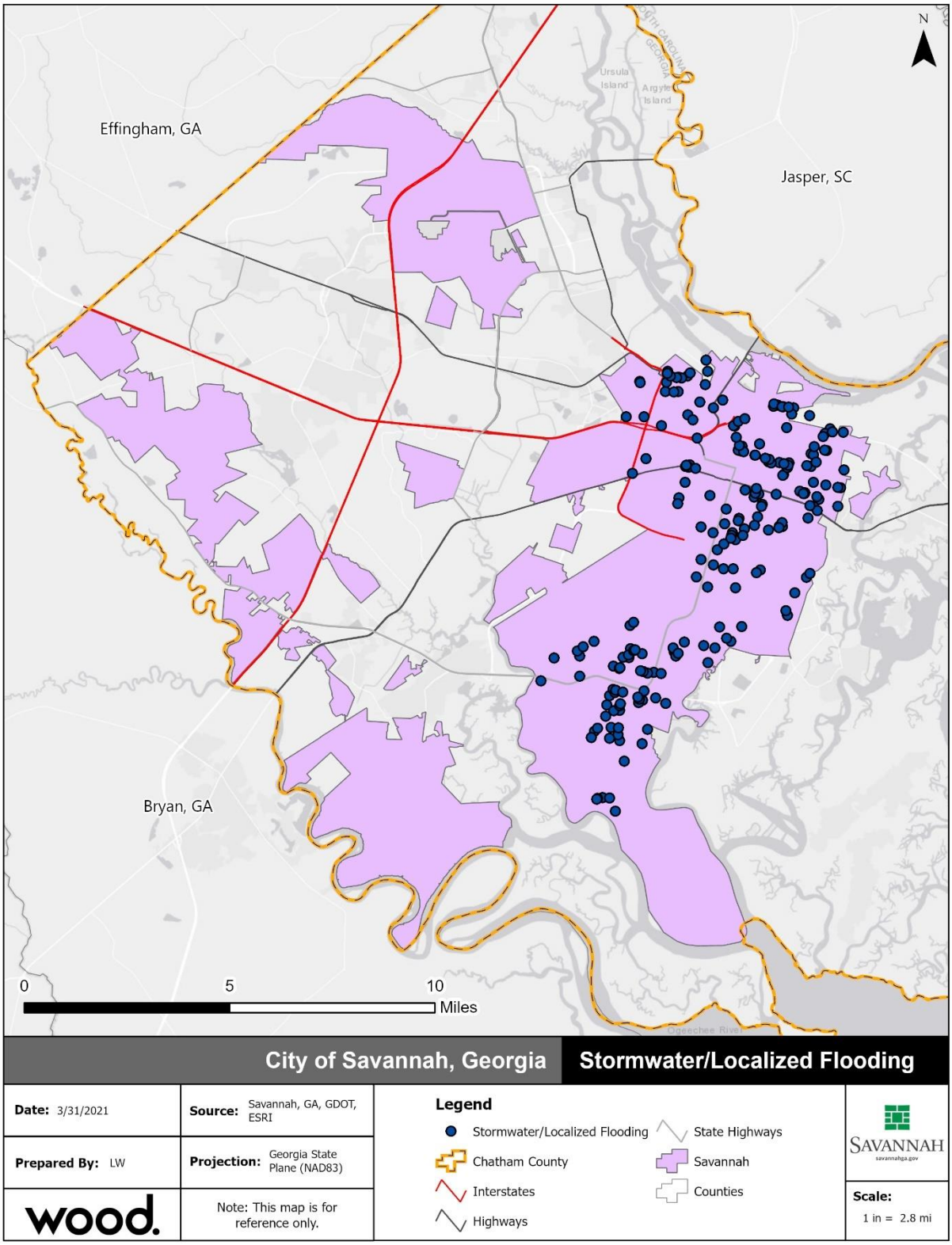
Neighborhood	Location
	Wilshire Canal E of White Bluff Rd @ Outfall Point
	Holland Canal E of White Bluff Rd @ Outfall Point
	13322 Coffee Bluff Rd
White Bluff/Holland Drive	245 Holland Dr @ Royal Dutch Apts, pipe entrance
Wilshire Estates/Savannah Mall/ Tranquilla Woods/Q*	403 Montclair, between 403 & 405, rear
	San Anton Dr @ Wilshire Canal bridge
	San Anton Dr @ Largo Dr
	2 San Anton Dr
	Quail Hollow Rd @ Dutchtown Rd
	Abercorn & Wilshire @ Canal, South of Southside Veterinarian Clinic
	Tibet Ave @ Wilshire Canal
	117 Wilshire
	Wilshire & Montclair Blvd @ Canal
	Middleground Rd & Shawnee, NW Corner
	245 Forest Ridge Dr
	3 Ventura Blvd
	16 Quail Hollow Ct
Windsor Forest	Beside 602 Plantation
	Between 420 & 422 Windsor Rd – From Windsor Rd to Briarcliff Circle
	Windsor Rd @ Pump Station, West of Woodley
	509 Windsor Rd.
	Between 512 & 514 Arlington Rd.
	West of 412 Arlington Rd.
	Beside 12104 Stillwood
	Beside 1510 Stillwood
	419 Briarcliff
	Rear 610 Northbrook Rd
	121 Juniper Circle, rear
	12421 Largo
	12517 Largo – ditch in median
	Largo Rd. & Woodley Rd.
	13101 Largo Dr – rear of house
	119 Hoover Creek Rd
	12403 Woodley Rd
	306 Woodley Rd
	Northwood Rd & Red Oak Dr
	426 Sharondale Rd
	1503 Cedar Grove Plantation Dr
	Northwood Rd & Woodley Rd
	Red Oak Dr & Woodley Rd
Woodville/Bartow	32 Darling St
	39 King @ Ditch #01018
Yamacraw Village	Springfield Pup Station

Source: Savannah FMPC; Note: Locations marked with (*) have been added since the prior FMP

Table 5.30 – Mitigated Stormwater Flooding Locations

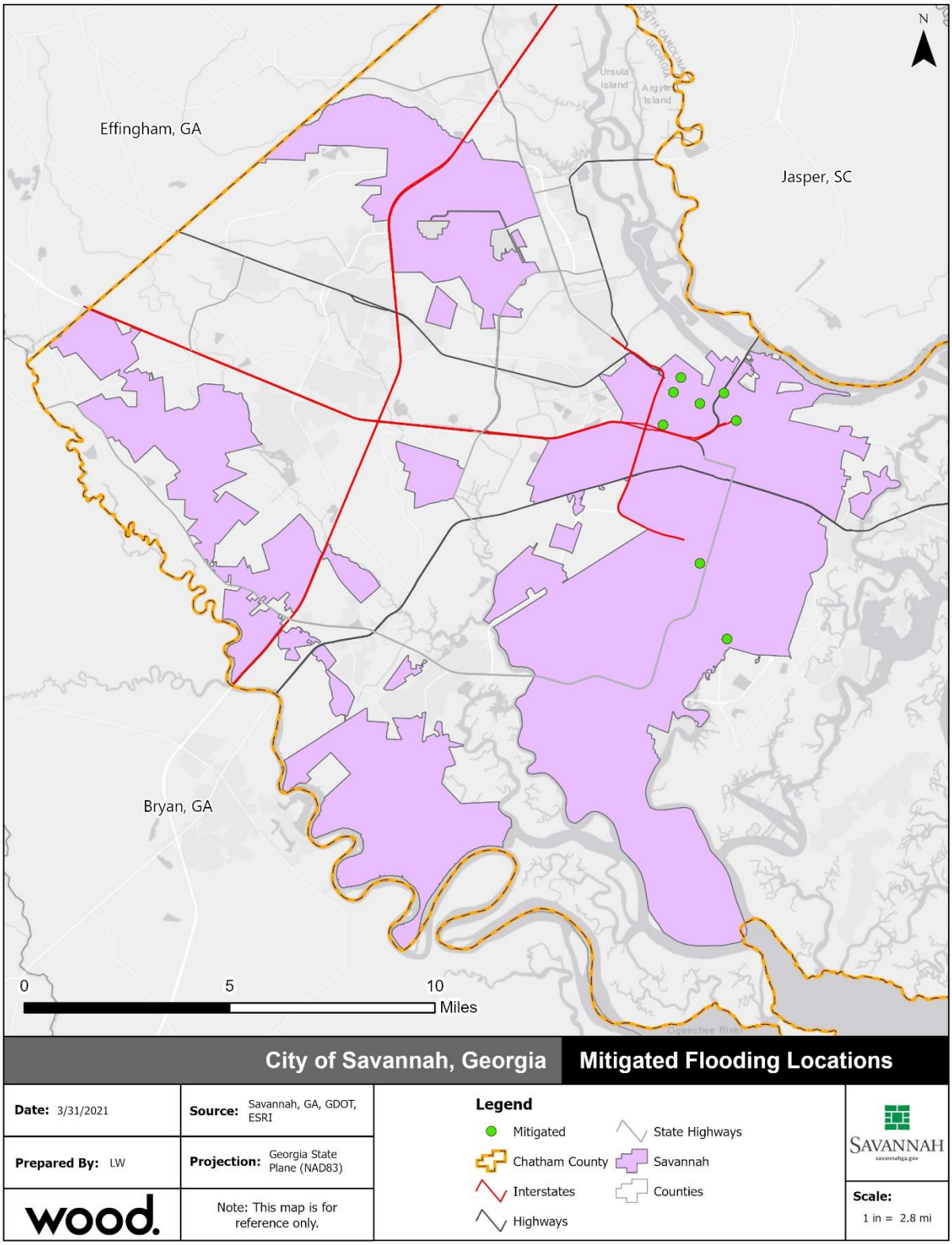
Mitigated Stormwater Flooding Locations
11 Sherwood Place – Pipe Entrance Behind House
403 Tattnall St.
Dell St.
Fell St. @ Bay
Louisville & West Lathrop
Newcastle St.
Travelodge Inn Tide Gate, Enter Through Yamacraw Village at Canal St.
White Bluff at Savannah Tech Entrance

Figure 5.29 - Localized Flooding Identified by the FMPC



Source: City of Savannah FMPC

Figure 5.30 - Localized Flooding Locations Mitigated since 2015 FMP



Source: City of Savannah FMPC

Probability of Future Occurrence

Due to the low elevations, a flat terrain, a consistent level of annual precipitation and the tidal influence on canal drainage resulting from heavy rainstorms, tropical storms, and hurricanes, it is highly likely that unmitigated properties will continue to experience localized flooding.

Probability: 4 – Highly Likely

Climate Change and Flood: Stormwater/Localized Flooding

Climate change and sea level rise do have the potential to affect localized flooding in Savannah. As discussed in Section 5.4.4, the frequency and intensity of individual rainfall events is expected to increase across the U.S., and total precipitation amounts are expected to increase in the Southeast according to the Fourth National Climate Assessment. Increases in the intensity of individual rainfall events may cause increases in localized flooding, as stormwater drainage systems designed for smaller floods become overwhelmed more frequently.

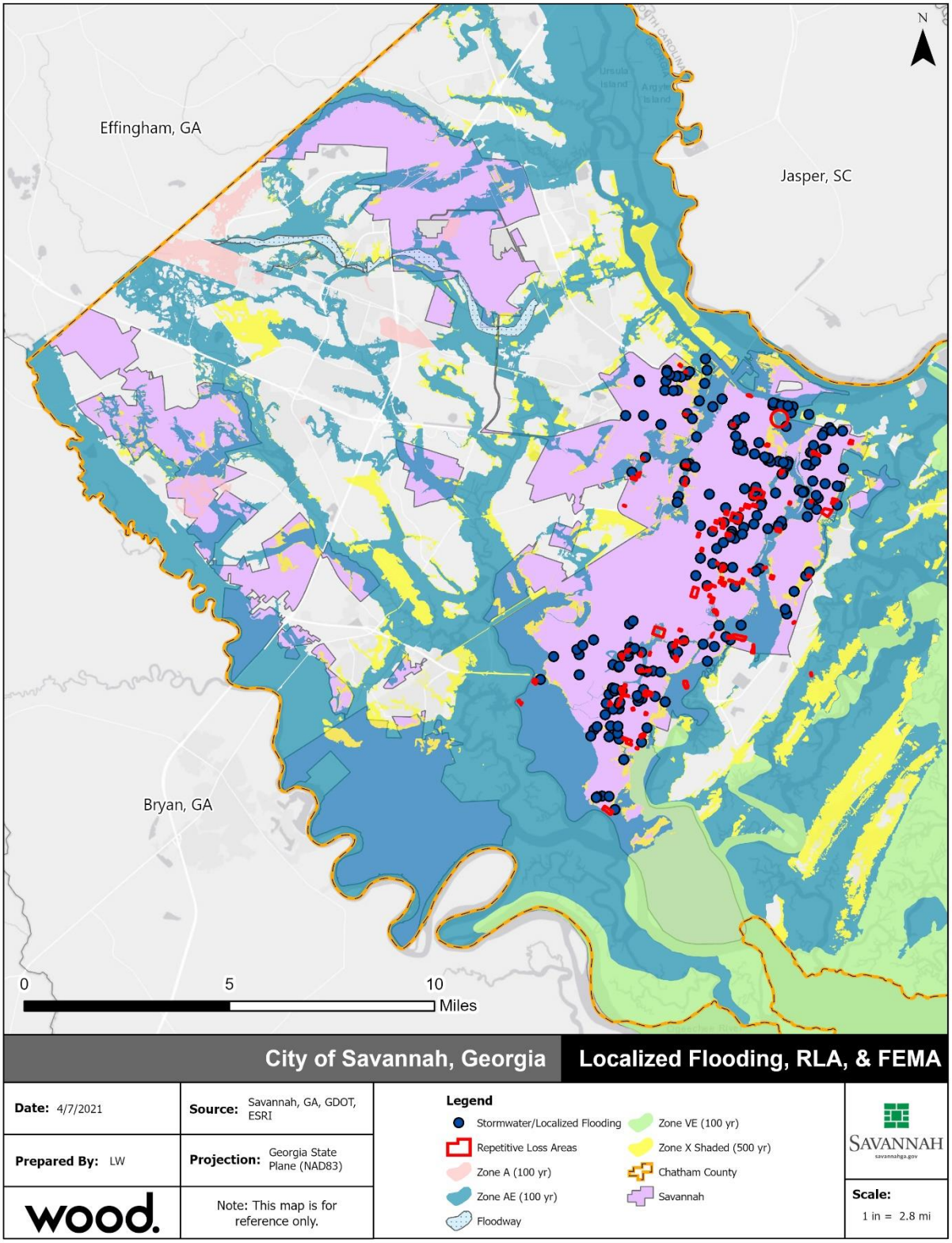
Vulnerability Assessment

Vulnerability—High

Localized flooding occurs at various times throughout the year with several areas of primary concern to the City, as noted in Table 5.29 above. Localized flooding and ponding affect streets and property.

Figure 5.31 depicts localized flooding in relation to repetitive loss areas and flood zones.

Figure 5.31 – Localized Flooding, Repetitive Losses and Flood Zones



5.4.6 Hurricane and Tropical Storm (including Storm Surge)

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Hurricane and Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 1 week	3

Hazard Description

A hurricane is a type of tropical cyclone or severe tropical storm that forms in the southern Atlantic Ocean, Caribbean Sea, Gulf of Mexico, and in the eastern Pacific Ocean. A typical cyclone is accompanied by thunderstorms, and in the Northern Hemisphere, a counterclockwise circulation of winds near the earth's surface. All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

While hurricanes pose the greatest threat to life and property, tropical storms and depression also can be devastating. A tropical disturbance can grow to a more intense stage through an increase in sustained wind speeds. Broadly defined, the stages of a tropical disturbance are tropical depression, tropical storm, hurricane, and major hurricane.

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. This process generally occurs over many days, allowing for ample warning and preparation.

The heavy rains associated with tropical weather systems are not only responsible for major flooding in areas where the storm initially strikes, but can also affect areas hundreds of miles inland. Torrential rains from hurricanes and tropical storms can produce extensive urban and riverine flooding, especially if the storm systems are large and slow moving. Winds from these storms located offshore can drive ocean water up the mouth of a river or canal, compounding the severity of inland overbank flooding.

In addition to the combined destructive forces of wind, rain, and lightning, hurricanes can cause a surge in the ocean, which can raise the sea level as high as 25 feet or more in the strongest hurricanes. As a hurricane approaches the coast, its winds drive water toward the shore. Once the edge of the storm reaches the shallow waters of the continental shelf, the water begins to pile up. Winds of hurricane strength eventually force the water onto the shore. At first, the water level climbs slowly, but as the eye of the storm approaches, water rises rapidly. Furthermore, storm surge can also cause extensive damage on the backside of a hurricane as storm surge waters are sucked back out to sea.

Hurricane force winds can extent outward by about 35 miles from the eye of a small hurricane to more than 150 miles from the center of a large hurricane. Tropical storm force winds may extend even further, up to approximately 300 miles from the eye of a large hurricane. In general, the front right quadrant of a storm, relative to its direction of movement, is the most dangerous part of the storm. Wind speeds are highest in this area due to the additive impacts of the atmospheric steering winds and the storm winds.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than 1 week

Tropical Storm

Tropical depressions and tropical storms are both categorized by the National Weather Service as a tropical cyclone. The differentiation between these two is wind speed and organization:

Tropical Depression - a tropical cyclone in which the maximum 1-minute sustained surface wind is 33 knots (38 mph) or less. When viewed from a satellite, tropical depressions appear to have little organization. However, the slightest amount of rotation can usually be perceived when looking at a series of satellite images. Instead of a round appearance similar to hurricanes, tropical depressions look like individual thunderstorms that are grouped together.

Tropical Storm - a tropical cyclone in which the maximum 1-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph) inclusive. As the storm transitions from tropical depression to tropical storm, the storm itself becomes more organized and begins to become more circular in shape - resembling a hurricane.

While hurricanes pose the greatest threat to life and property, tropical storms and depressions also can be devastating. Floods from heavy rains and severe weather, such as tornadoes, can cause extensive damage and loss of life.

Hurricane

A hurricane is a tropical cyclone in which the maximum sustained surface wind is 74 mph or more. Hurricanes are classified by intensity into one of five categories on the Saffir-Simpson Hurricane Wind Scale as shown in Table 5.31. This scale estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage. Category 1 and 2 storms are still dangerous, however, and require preventative measures.

Table 5.31 – Saffir-Simpson Hurricane Wind Scale

Category	Maximum Sustained Wind Speed (mph)	Potential Damage
1	74-95	**Very dangerous winds will produce some damage**: Well-constructed frame homes could have damage to roof, shingles, vinyl siding and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3	111-129	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.
4	130-156	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5	$\geq$ 157	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and

Category	Maximum Sustained Wind Speed (mph)	Potential Damage
		power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

Source: National Hurricane Center/NOAA

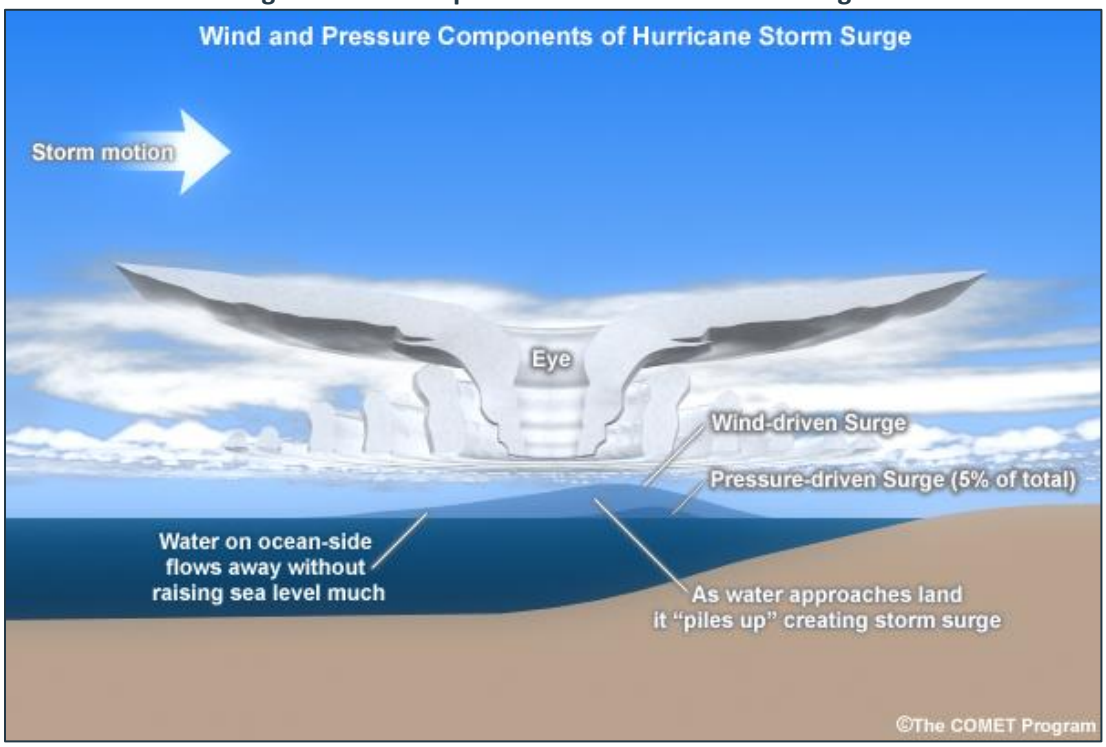
Storm Surge

The greatest potential for loss of life related to a hurricane is from the storm surge. Storm surge is simply water that is pushed toward the shore by the force of the winds swirling around the storm as shown in Figure 5.32. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the mean water level to heights impacting roads, homes and other critical infrastructure. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides. Because much of the densely populated Atlantic coastline lies less than 10 feet above mean sea level, the danger from storm tides is tremendous.

The storm surge combined with wave action can cause extensive damage, severely erode beaches and coastal highways. With major storms like Katrina, Camille and Hugo, complete devastation of coastal communities occurred. Many buildings withstand hurricane force winds until their foundations, undermined by erosion, are weakened and fail.

The maximum potential storm surge for a particular location depends on a number of different factors. Storm surge is a very complex phenomenon because it is sensitive to the slightest changes in storm intensity, forward speed, size (radius of maximum winds-RMW), angle of approach to the coast, central pressure (minimal contribution in comparison to the wind), and the shape and characteristics of coastal features such as bays and estuaries. Other factors which can impact storm surge are the width and slope of the continental shelf. A shallow slope will potentially produce a greater storm surge than a steep shelf. For example, a Category 4 storm hitting the Louisiana coastline, which has a very wide and shallow continental shelf, may produce a 20-foot storm surge, while the same hurricane in Miami Beach, Florida, where the continental shelf drops off very quickly, might see an 8 or 9-foot surge.

Figure 5.32 - Components of Hurricane Storm Surge



Source: NOAA/The COMET Program

Location

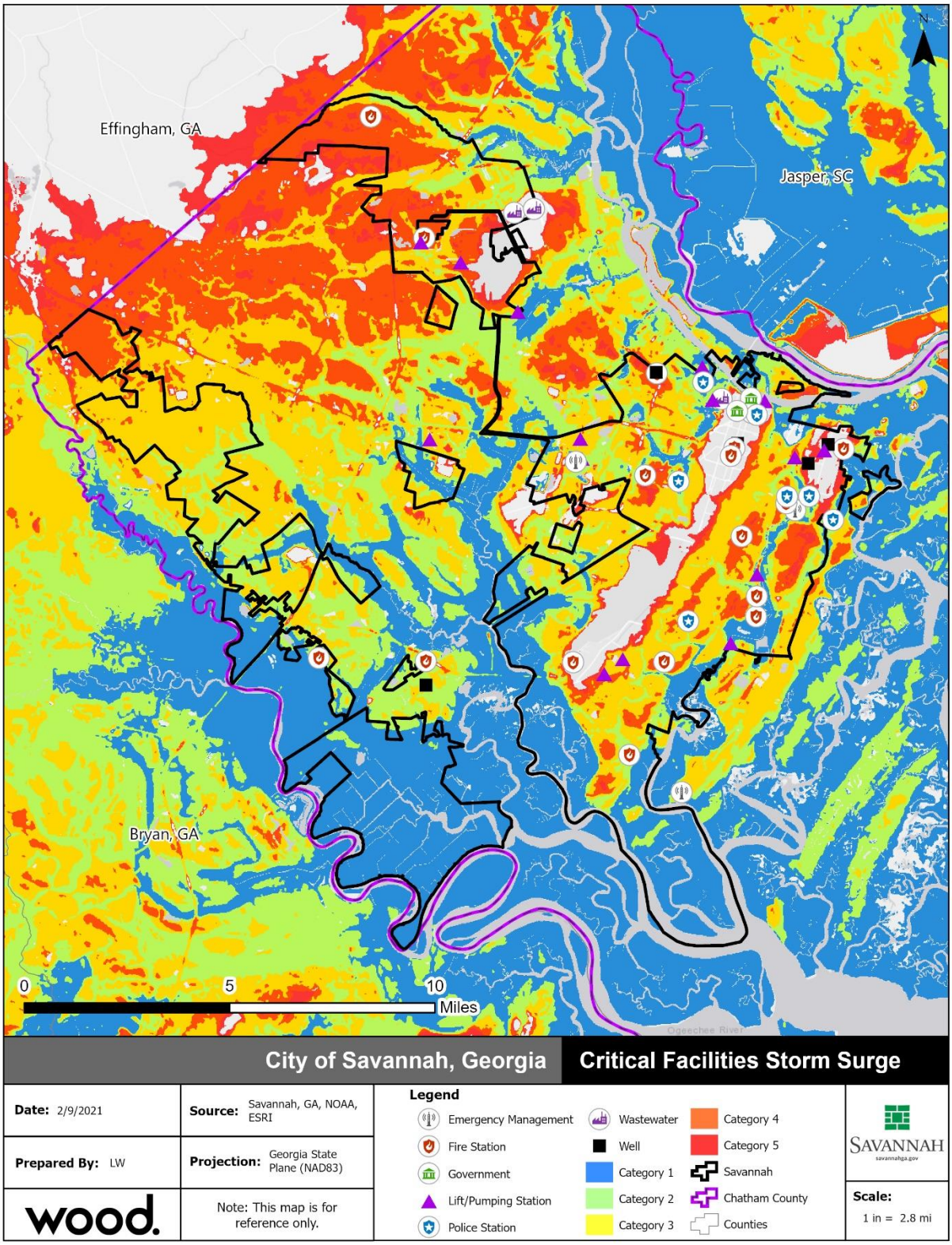
Hurricanes and tropical storms can cause catastrophic damage to coastlines and several hundred miles inland. Hurricanes can produce winds exceeding 157 miles per hour as well as tornadoes and microbursts. Additionally, hurricanes and tropical storms can create storm surges along the coast and cause extensive damage for heavy rainfall. Floods and flying debris from the excessive winds are often the deadly and destructive results of these weather events. Flash flooding can occur due to intense rainfall. All of the planning area can be impacted by hurricanes and tropical storms.

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model is a computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features.

Anticipated SLOSH model surge elevations for Category 1-5 hurricanes are shown for the City of Savannah in Figure 5.33. The feature set depicting surge zones in this figure was created using data derived from National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Georgia. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) fore each category of storm (1-5), and all directions combined results in a MOMs (maximum of minimums) set of data. The MOMs are used in this surge model.

Location: 4 – Large

Figure 5.33 – Category 1 through Category 5 Storm Surge Zones for Savannah



Source: SAGIS 2019, GMIS, NOAA

Extent

Wind speed is the determining factor in the Saffir-Simpson scale, which is used as a measure of hurricane intensity. Storm surge is also significant to a hurricane's magnitude, and storm surge projections are often tied to a storm's category on the Saffir-Simpson scale; however, storm surge values are highly dependent on the slope of the continental shelf, the shape of the coastline in the landfall region, and the storm's path. The following describes the characteristics of each category storm from the Saffir-Simpson Hurricane Wind Extended Table:

Category 1 Hurricane - Winds 74 – 95 mph. Very dangerous winds will produce some damage. People, livestock, and pets struck by flying or falling debris could be injured or killed. Older (mainly pre-1994 construction) mobile homes could be destroyed, especially if they are not anchored properly as they tend to shift or roll off their foundations. Newer mobile homes that are anchored properly can sustain damage involving the removal of shingle or metal roof coverings, and loss of vinyl siding, as well as damage to carports, sunrooms, or lanais. Some poorly constructed frame homes can experience major damage, involving loss of the roof covering and damage to gable ends as well as the removal of porch coverings and awnings. Unprotected windows may break if struck by flying debris. Masonry chimneys can be toppled. Well-constructed frame homes could have damage to roof shingles, vinyl siding, soffit panels, and gutters. Failure of aluminum, screened-in, swimming pool enclosures can occur. Some apartment building and shopping center roof coverings could be partially removed. Industrial buildings can lose roofing and siding especially from windward corners, rakes, and eaves. Failures to overhead doors and unprotected windows will be common. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. There will be occasional damage to commercial signage, fences, and canopies. Large branches of trees will snap and shallow rooted trees can be toppled. Extensive damage to power lines and poles will likely result in power outages that could last a few to several days.

Category 2 Hurricane - Winds 96-110 mph. Extremely dangerous winds will cause extensive damage. There is a substantial risk of injury or death to people, livestock, and pets due to flying and falling debris. Older (mainly pre-1994 construction) mobile homes have a very high chance of being destroyed and the flying debris generated can shred nearby mobile homes. Newer mobile homes can also be destroyed. Poorly constructed frame homes have a high chance of having their roof structures removed especially if they are not anchored properly. Unprotected windows will have a high probability of being broken by flying debris. Well-constructed frame homes could sustain major roof and siding damage. Failure of aluminum, screened-in, swimming pool enclosures will be common. There will be a substantial percentage of roof and siding damage to apartment buildings and industrial buildings. Unreinforced masonry walls can collapse. Windows in high-rise buildings can be broken by flying debris. Falling and broken glass will pose a significant danger even after the storm. Commercial signage, fences, and canopies will be damaged and often destroyed. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks. Potable water could become scarce as filtration systems begin to fail.

Category 3 Hurricane - Winds 111-129 mph. Devastating damage will occur. There is a high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. Most newer mobile homes will sustain severe damage with potential for complete roof failure and wall collapse. Poorly constructed frame homes can be destroyed by the removal of the roof and exterior walls. Unprotected windows will be broken by flying debris. Well-built frame homes can experience major damage involving the removal of roof decking and gable ends. There will be a high percentage of roof covering and siding damage to apartment buildings and industrial buildings. Isolated structural damage to wood or steel framing can occur. Complete failure of older

metal buildings is possible, and older unreinforced masonry buildings can collapse. Numerous windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Most commercial signage, fences, and canopies will be destroyed. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to a few weeks after the storm passes.

Category 4 Hurricane - Winds 130 to 156 mph. Catastrophic damage will occur. There is a very high risk of injury or death to people, livestock, and pets due to flying and falling debris. Nearly all older (pre-1994) mobile homes will be destroyed. A high percentage of newer mobile homes also will be destroyed. Poorly constructed homes can sustain complete collapse of all walls as well as the loss of the roof structure. Well-built homes also can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Extensive damage to roof coverings, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will break most unprotected windows and penetrate some protected windows. There will be a high percentage of structural damage to the top floors of apartment buildings. Steel frames in older industrial buildings can collapse. There will be a high percentage of collapse to older unreinforced masonry buildings. Most windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

Category 5 Hurricane - Winds 157 mph or higher. Catastrophic damage will occur. People, livestock, and pets are at very high risk of injury or death from flying or falling debris, even if indoors in mobile homes or framed homes. Almost complete destruction of all mobile homes will occur, regardless of age or construction. A high percentage of frame homes will be destroyed, with total roof failure and wall collapse. Extensive damage to roof covers, windows, and doors will occur. Large amounts of windborne debris will be lofted into the air. Windborne debris damage will occur to nearly all unprotected windows and many protected windows. Significant damage to wood roof commercial buildings will occur due to loss of roof sheathing. Complete collapse of many older metal buildings can occur. Most unreinforced masonry walls will fail which can lead to the collapse of the buildings. A high percentage of industrial buildings and low-rise apartment buildings will be destroyed. Nearly all windows will be blown out of high-rise buildings resulting in falling glass, which will pose a threat for days to weeks after the storm. Nearly all commercial signage, fences, and canopies will be destroyed. Nearly all trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Long-term water shortages will increase human suffering. Most of the area will be uninhabitable for weeks or months.

Impact: 3 – Critical

Past Occurrences

Major disaster declarations for hurricanes and tropical storms in Chatham County can be found in Table 5.2. Table 5.32 shows hurricane and tropical storm data reported by NCEI for Chatham County since 1996. Figure 5.34 reflects the tracks of past land-falling hurricanes in the Savannah area from 1900-2017 according to NOAA NCEI's International Best Track Archive for Climate Stewardship (IBTrACS) data set. This data set includes records through 2017 and is the best available data.

Table 5.32 – NCEI Hurricane/Tropical Storm Events for Chatham County, 1996-2020

Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
7/11/1996	Hurricane	0/0	$0	$0
9/15/1999	Hurricane	0/0	$0	$0
9/27/2004	Tropical Storm	0/0	$0	$0
10/5/2005	Tropical Storm	0/0	$0	$0
6/12/2006	Tropical Storm	0/0	$0	$0
8/30/2006	Tropical Storm	0/0	$0	$0
8/21-22/2008	Tropical Storm	0/0	$4,500	$0
5/27/2012	Tropical Storm	0/0	$2,500	$0
6/6-7/2013	Tropical Storm	0/0	$7,500	$0
9/2/2016	Tropical Storm	0/0	$0	$0
10/7-8/2016	Tropical Storm*	0/0	$0	$0
9/11/2017	Tropical Storm*	0/0	$10,100,000	$0
10/10/2018	Tropical Storm	0/0	$0	$0
9/4/2019	Tropical Storm	0/0	$0	$0
10/29/2020	Tropical Storm	0/0	$0	$0
Total		0/0	$10,114,500	$0

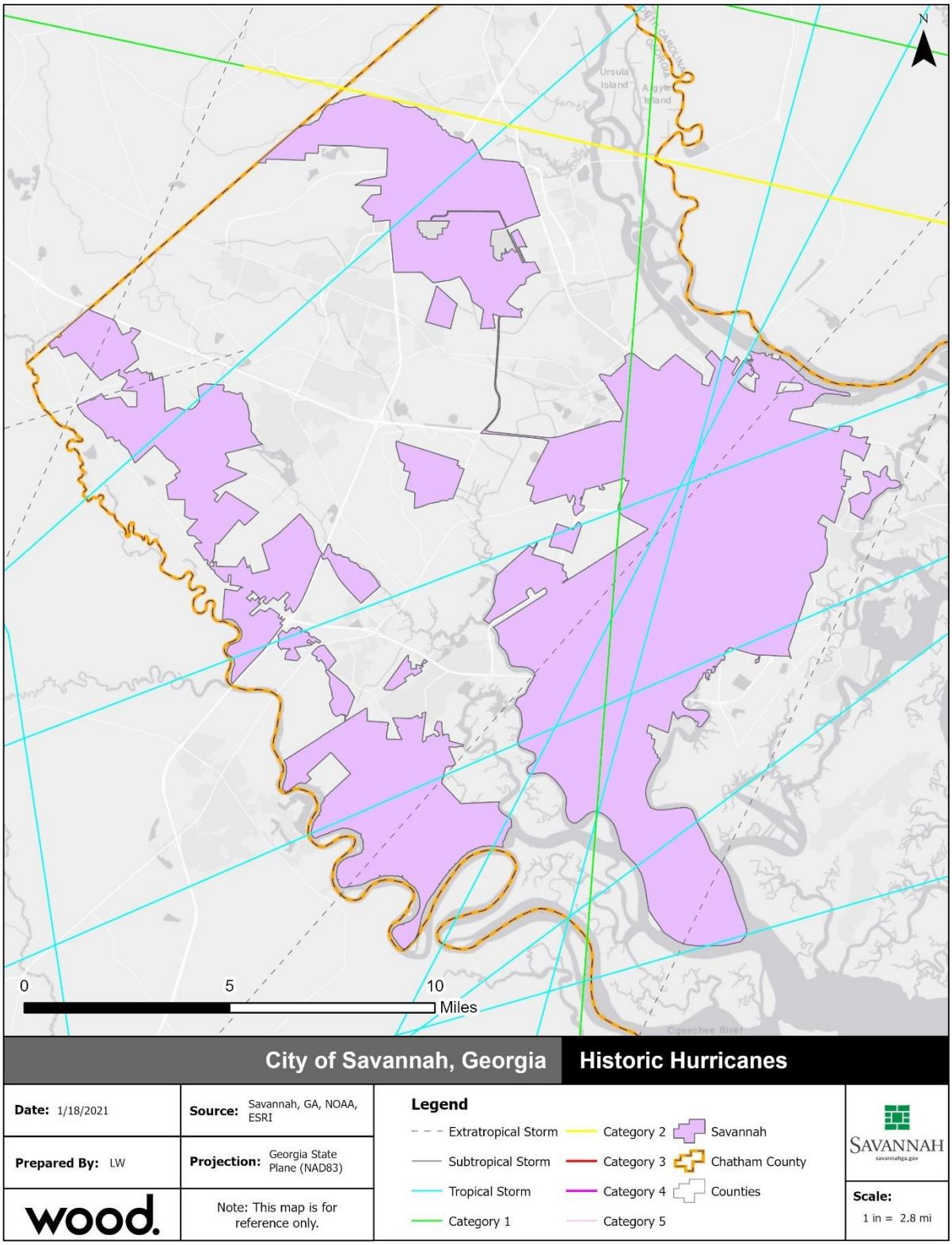
Source: NCEI Storm Events Database

Table 5.33 – Storm Surge Events for Chatham County, 1996-2020

Date	Event Type	Deaths/ Injuries	Property Damage	Crop Damage
9/2/2016	Storm Surge	0/0	$0	$0
10/7/2016	Storm Surge	0/0	$0	$0
9/11/2017	Storm Surge	0/0	$10,000,000	$0
Total		**0/0**	**$10,000,000**	**$0**

Source: NCEI Storm Events Database

Figure 5.34 – Past Tracks of Hurricanes Passing within 50 miles of Savannah



The following descriptions of past occurrences of hurricanes, tropical storms, and storm surge come from NCEI.

September 15, 1999 - Hurricane Floyd approached from the south but turned more northeast on the afternoon of the 15th and just brushed southeast Georgia. Well over 200,000 citizens in the affected counties evacuated the area. Because Floyd turned to the northeast, damage was minimal and confined mostly to the coastal counties. Scattered trees and a few power lines were down. Highest winds over land were 40 mph with a gust to 53 mph at the Savannah Airport. Maximum tide at Savannah was 12.39 ASL (8.69 MLLW) with a maximum departure of 3.3 feet.

August 22, 2008 – Tropical Storm Fay moved eastward into northeast Florida, resulting in Tropical Storm force conditions across southeast Georgia. Law enforcement reported downed power lines and trees across Savannah and Chatham County as well as power and traffic light outages. Flooding was reported as well, including portions of Avercorn Street, 40th Street, Bull Street, and Montgomery Street.

June 6, 2013 – Tropical Storm Andrea lifted northeast out of the Gulf of Mexico and over southeast Georgia and southeast South Carolina. Periods of heavy rain and damaging wind gusts occurred with showers and thunderstorms associated with the tropical system as it passed over the area and eventually to the northeastern United States. Multiple trees were reported down throughout the County. Wind gusts of up to 40 mph were recorded at Fort Pulaski.

October 7-8, 2016 – Hurricane Matthew first developed into a tropical storm before strengthening into a powerful hurricane. Hurricane Matthew made landfall three times in Haiti, Cuba, and Grand Bahama, it then continued toward Florida before paralleling much of the Southeast coast in a slowly weakening state. Matthew tracked parallel to the northern half of the Southeast Georgia coast as a category 2 hurricane before weakening to a category 1 hurricane. Across southeast Georgia, the main impacts from Matthew included heavy rain, wind damage in the form of scattered to widespread trees and power lines blown down, and storm surge. Storm total rainfall amounts ranged from 4.5 to 7 inches across western areas of southeast Georgia. A peak storm total rainfall of 17.49 inches was recorded at Hunter Army Airfield. The Tybee Island sensor recorded maximum sustained wind of 75 mph and peak wind gust of 96 mph. The entire southeast Georgia coast was impacted by storm surge; a peak surge of 7.69 ft occurred at the Fort Pulaski tide gauge. Trees were reported down across Chatham County, including multiple instances of trees fallen on homes.

September 11, 2017 – Irma strengthened into a major hurricane on September 3rd and maintained major hurricane status through September 10th when it made landfall on the southwest Florida coast. Maximum sustained winds reached 185 mph, making Irma the strongest storm on record to exist in the Atlantic Ocean outside of the Caribbean and Gulf of Mexico. Irma maintained Category 5 status for 3 consecutive days which is the longest on record for an Atlantic hurricane. Irma officially made landfall at Marco Island, FL at 3:35 pm September 10 as a Category 3 hurricane. Following landfall, Irma tracked to the north-northwest and eventually the northwest as it progressed up the western side of the Florida peninsula. Irma steadily weakened during this time and was downgraded to a tropical storm near the big bend of Florida at 8:00 am on September 11th. Through the rest of September 11th, Irma tracked to the northwest into southern Georgia and widespread impacts occurred across the Southeast. Despite the fact that the center of Irma tracked well to the west of the southeast Georgia and southeast South Carolina region, it still caused significant impacts due to heavy rainfall, strong winds, tornadoes, and storm surge. Feeder bands around Irma continuously moved onshore on September 11th and produced very heavy rainfall rates with rainfall totals generally ranging from 3 to 9 inches. The daily record rainfall total for September 11th was 4.74 inches at the Savannah-Hilton Head International Airport (KSAV). This widespread heavy rain resulted in several reports of flash flooding with water entering homes and

businesses. Wind damage produced numerous power outages across the region with some damage to structures and numerous downed trees. The strongest winds were confined to coastal locations, but frequent gusts into the 40-50 mph range occurred well inland. At Savannah-Hilton Head International Airport,

The entire southeast Georgia and southeast South Carolina coast was impacted by storm surge generally ranging from 3 to 6 feet. This storm surge produced numerous reports of 4 to 6 feet of inundation above ground level. A peak surge of 5.63 feet occurred at the Fort Pulaski tide gauge at 5:42 am. Significant beach erosion occurred at area beaches with widespread damage to docks and piers all along the coast, as well as numerous reports of inundated roadways. According to data received from the Georgia Emergency Management Agency, total damages from Irma were $20,000,000 in Chatham County. County Emergency Management reported numerous tress down across the county.

Probability of Future Occurrence

Given the 16 hurricane and tropical storm occurrences recorded by the NCEI over a period of 24 years (1996- 2020), .67 hurricane or tropical storm events affect Chatham County on average each year – or about a 67% probability of a hurricane or tropical storm event impacting the County every year. Hurricane Wind is rated as a High Priority hazard in the 2019 State of Georgia Hazard Mitigation Strategy.

Probability: 3 – Likely

Climate Change and Hurricane and Tropical Storms

One of the primary factors contributing to the origin and growth of tropical storm and hurricanes systems is water temperature. According to NOAA, weather extremes will likely cause more frequent, stronger storms in the future due to rising surface temperatures. NOAA models predict that while there may be less frequent, low-category storm events (Tropical Storms, Category 1 Hurricanes), there will be more, high-category storm events (Category 4 and 5 Hurricanes) in the future. This means that there may be fewer hurricanes overall in any given year, but when hurricanes do form, it is more likely that they will become large storms that can create massive damage.

Hurricanes and other coastal storms may result in increased flooding, injuries, deaths, and extreme property loss. According to the US Government Accountability Office, national storm losses from changing frequency and intensity of storms is projected to increase anywhere from $4-6 billion soon.

Sea level change will be particularly important in influencing storm surge flooding in the Savannah area, since the area is already subject to flooding from above normal tides, surge and rainfall events from hurricanes and less powerful tropical storms. Anticipated sea level rise along the Georgia coast will increase the risk of damage and losses due to future coastal flooding and storm surge events. Rising sea level over time will shorten the return period (increasing the frequency) of significant flood events. For example, sea level rise of 1 foot over a typical project analysis period (50 years) may cause a flood event currently of 2-percent annual probability (50-year event) to become an event of 10-percent annual probability (10-year flood).

Vulnerability Assessment

Vulnerability— High

Methodology

A hurricane surge analysis was conducted by intersecting the parcel layer provided by the City of Savannah with the polygon shapefile for each hurricane surge layer. The hurricane surge layer data was

derived from the National Hurricane Center SLOSH model runs on all the NOAA SLOSH basins throughout Georgia. The runs create outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelop of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of minimums) set of data. The MOMs are used in this surge model. The application uses three input parameters or data: elevation (from LiDAR), SLOSH basin results, and contiguous shoreline or sea polygons.

Property at Risk

Table 5.34 provides a summary of assets at risk to hurricane surge based on each hurricane category and Figure 5.35 through Figure 5.39 illustrated critical facilities at risk. The assets at risk estimate for each hurricane category is based on the total of improved and contents value. The value of land is not included in the loss estimates as generally the land is not subject to loss from hurricane and tropical storm damage. Per this assessment, over 50 percent of the City is likely to experience some level of damage from a Category 3 storm surge.

Table 5.34 – Savannah Assets at Risk to Storm Surge (Category 1 – Category 5)

Occupancy	Parcels Affected by Storm Surge	Structure Value	Estimated Content Value	Total Value
Category 1				
Commercial	30	$8,920,515	$8,920,515	$17,841,030
Education	19	$8,869,073	$8,869,073	$17,738,145
Government	68	$11,727,749	$11,727,749	$23,455,498
Industrial	44	$14,797,950	$22,196,925	$36,994,876
Religious	5	$739,050	$739,050	$1,478,100
Residential	1,231	$221,231,913	$110,615,956	$331,847,869
Total	**1,397**	**$266,286,249**	**$163,069,268**	**$429,355,518**
Category 2				
Commercial	391	$216,675,443	$216,675,443	$433,350,886
Education	54	$32,548,779	$32,548,779	$65,097,558
Government	160	$29,622,445	$29,622,445	$59,244,889
Industrial	236	$64,190,391	$96,285,587	$160,475,978
Religious	68	$11,006,178	$11,006,178	$22,012,357
Residential	8,665	$945,428,010	$472,714,005	$1,418,142,015
Total	**9,574**	**$1,299,471,246**	**$858,852,437**	**$2,158,323,683**
Category 3				
Commercial	1,780	$1,279,607,588	$1,279,607,588	$2,559,215,177
Education	182	$223,516,138	$223,516,138	$447,032,276
Government	559	$163,679,864	$163,679,864	$327,359,727
Industrial	623	$223,649,198	$335,473,797	$559,122,995
Religious	223	$44,261,295	$44,261,295	$88,522,590
Residential	30,356	$3,314,718,765	$1,657,359,383	$4,972,078,148
Total	**33,723**	**$5,249,432,848**	**$3,703,898,065**	**$8,953,330,913**
Category 4				
Commercial	2,602	$2,167,342,844	$2,167,342,844	$4,334,685,687
Education	280	$333,127,555	$333,127,555	$666,255,110
Government	643	$183,024,705	$183,024,705	$366,049,410
Industrial	844	$326,817,792	$490,226,688	$817,044,479
Religious	339	$70,705,694	$70,705,694	$141,411,388
Residential	40,747	$4,635,171,533	$2,317,585,766	$6,952,757,299
Total	**45,455**	**$7,716,190,122**	**$5,562,013,252**	**$13,278,203,374**

Occupancy	Parcels Affected by Storm Surge	Structure Value	Estimated Content Value	Total Value
Category 5				
Commercial	2,825	$2,340,797,432	$2,340,797,432	$4,681,594,863
Education	295	$345,778,136	$345,778,136	$691,556,272
Government	735	$192,025,487	$192,025,487	$384,050,974
Industrial	898	$355,065,056	$532,597,584	$887,662,640
Religious	387	$92,407,112	$92,407,112	$184,814,223
Residential	44,666	$5,020,902,334	$2,510,451,167	$7,531,353,500
Total	**49,806**	**$8,346,975,556**	**$6,014,056,917**	**$14,361,032,472**

Source: SAGIS 2019 Parcel Data, NOAA, GEMA

Table 5.35 provides an overall summary of parcels at risk in the City by hurricane category.

Table 5.35 – Overall Summary of Savannah Assets at Risk to Storm Surge

Hurricane Category	Total Parcel Count	Percent of all Parcels in Savannah	Structure Value	Estimated Content Value	Total Value
1	1,397	2.3%	$266,286,249	$163,069,268	$429,355,518
2	9,574	15.6%	$1,299,471,246	$858,852,437	$2,158,323,683
3	33,723	54.8%	$5,249,432,848	$3,703,898,065	$8,953,330,913
4	45,455	73.9%	$7,716,190,122	$5,562,013,252	$13,278,203,374
5	49,806	81.9%	$8,346,975,556	$6,014,056,917	$14,361,032,472

Source: SAGIS 2019 Parcel Data, NOAA, GEMA

Figure 5.35 – Category 1 Storm Surge Impact in Savannah

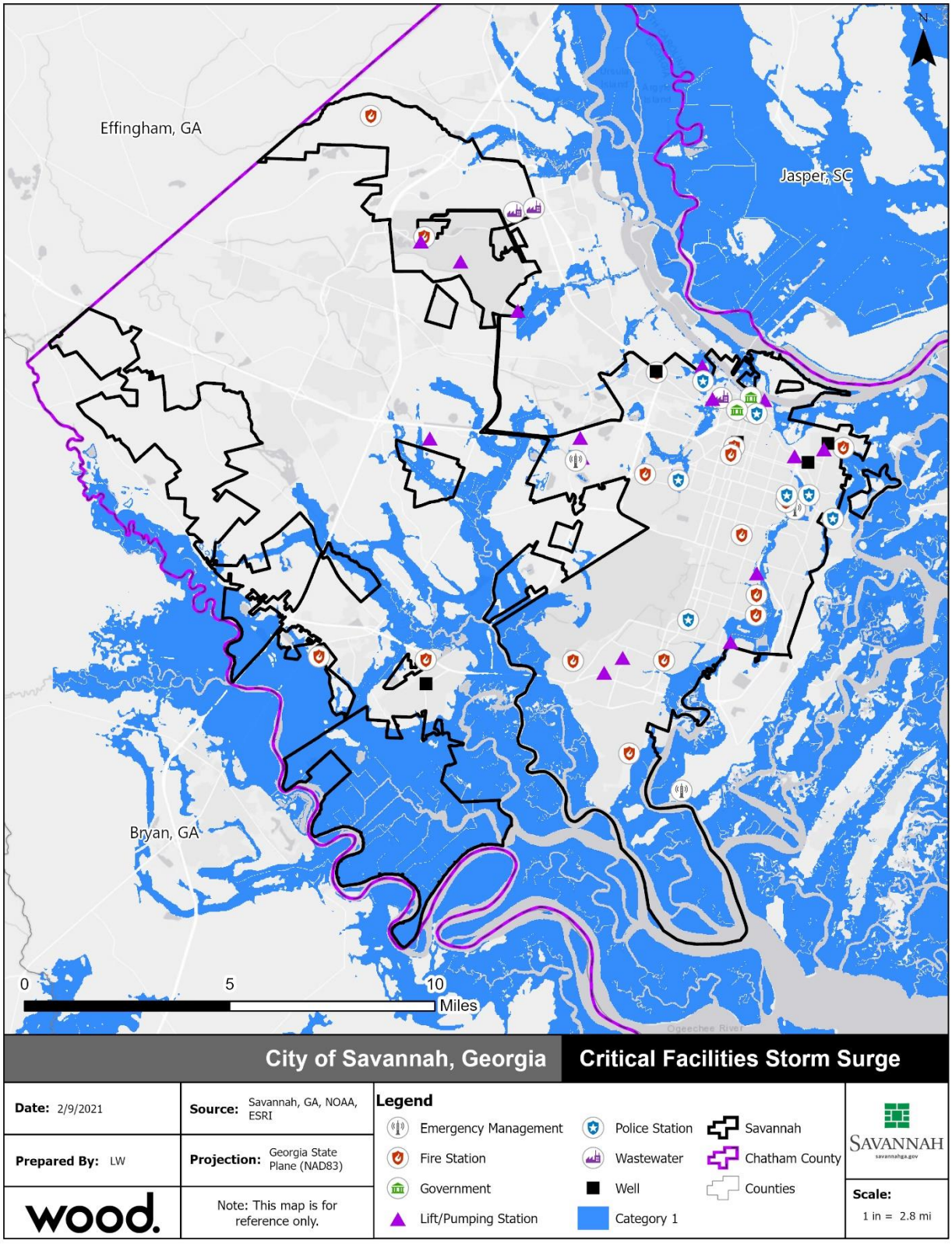


Figure 5.36 – Category 2 Storm Surge Impact in Savannah

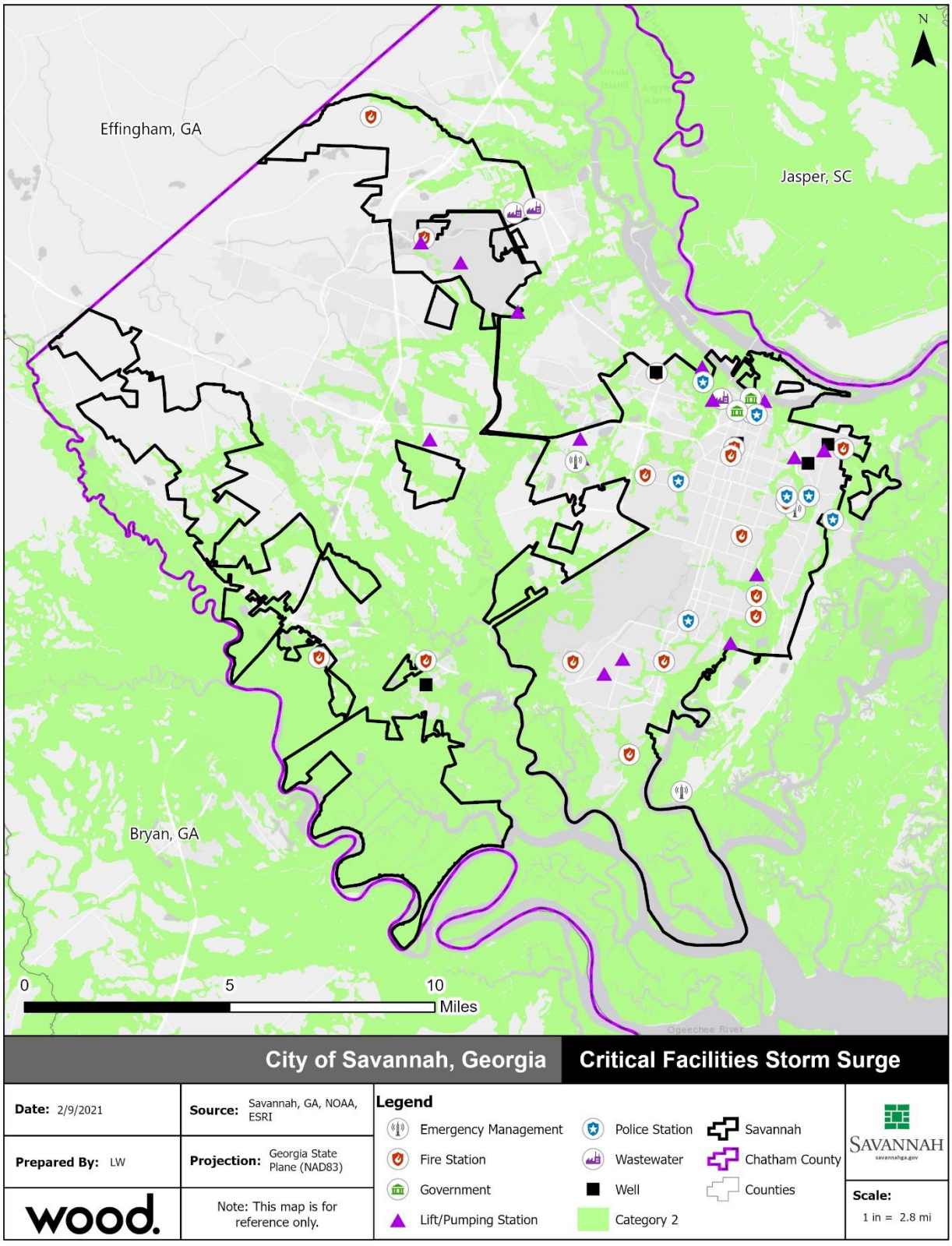


Figure 5.37 – Category 3 Storm Surge Impact in Savannah

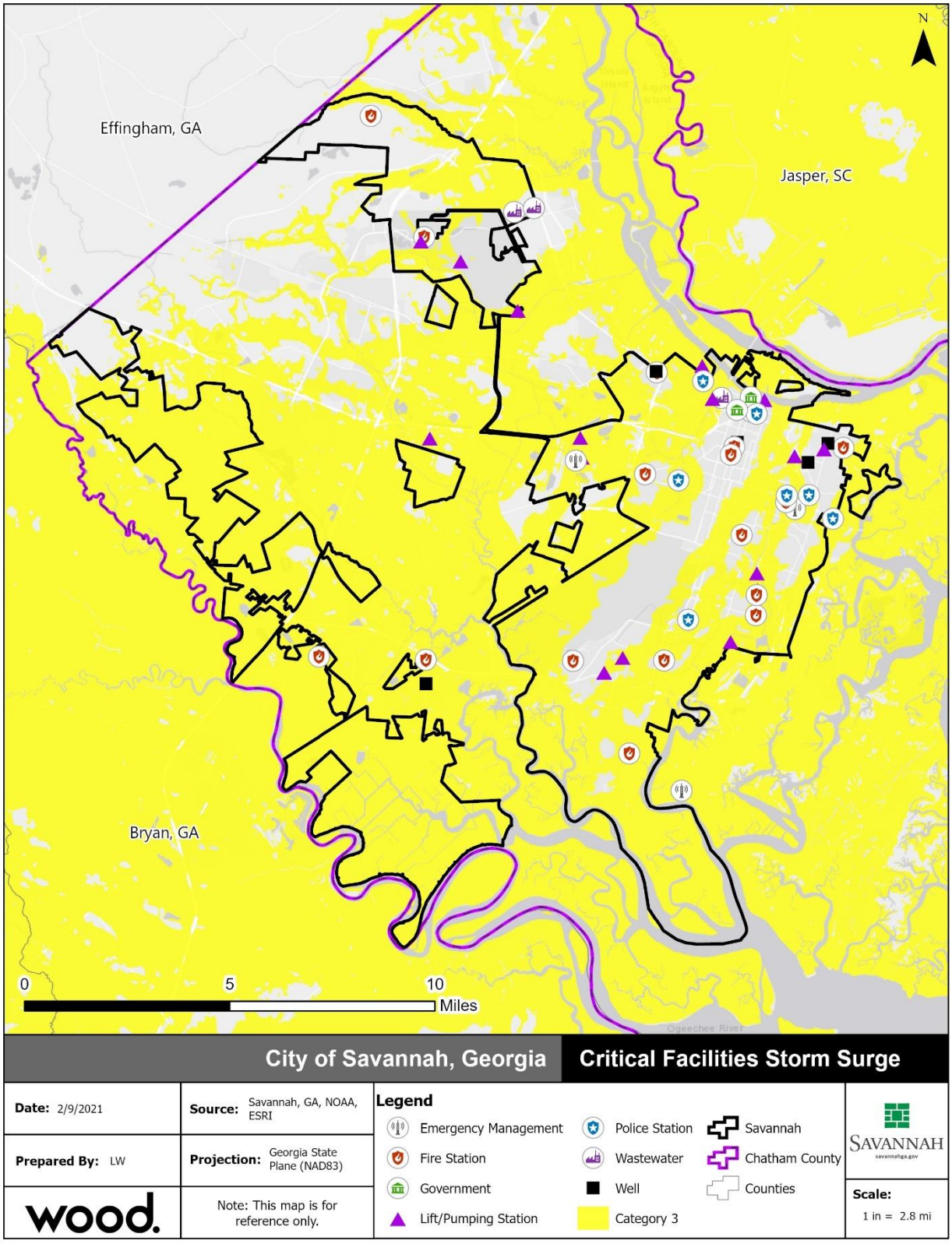


Figure 5.38 – Category 4 Storm Surge Impact in Savannah

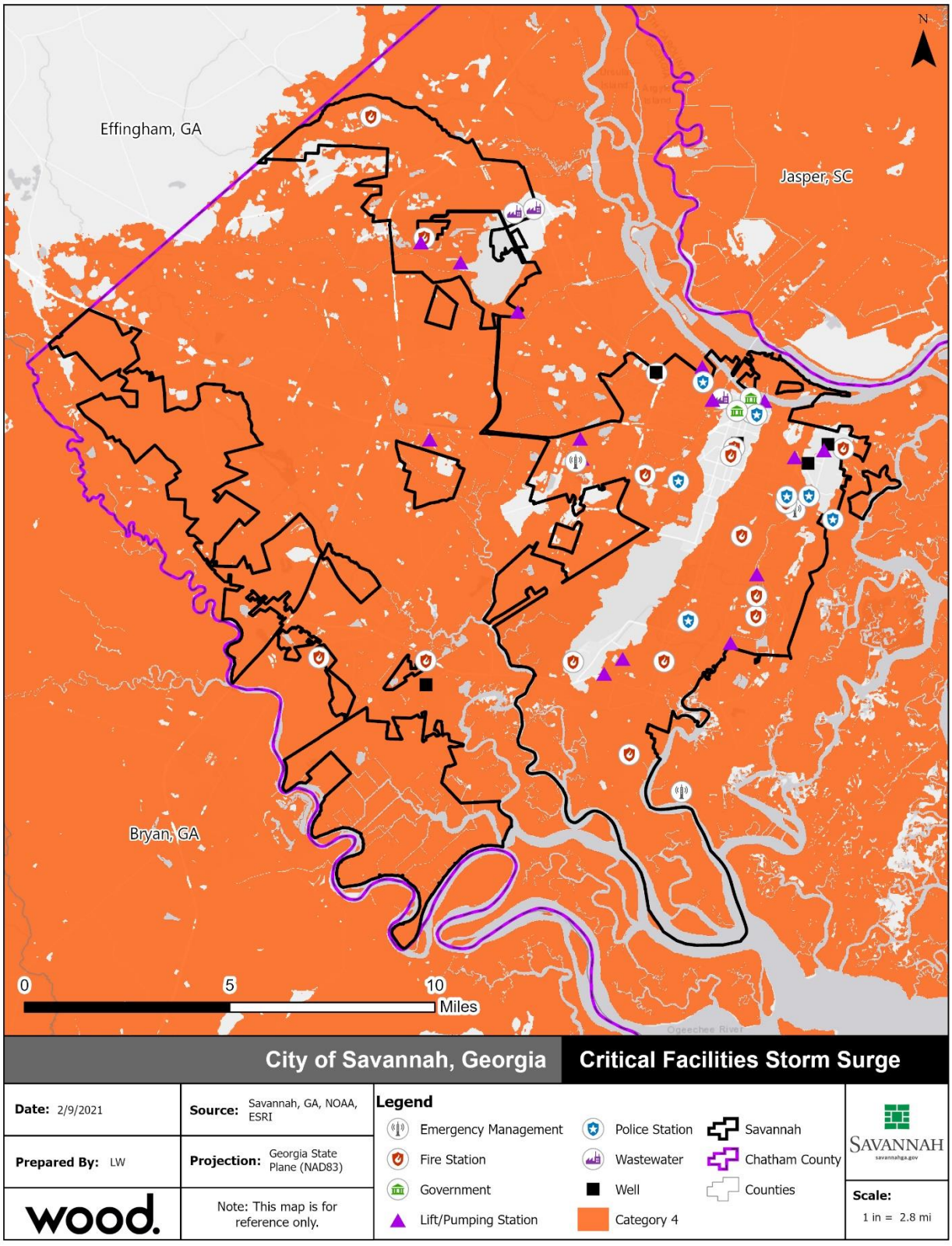
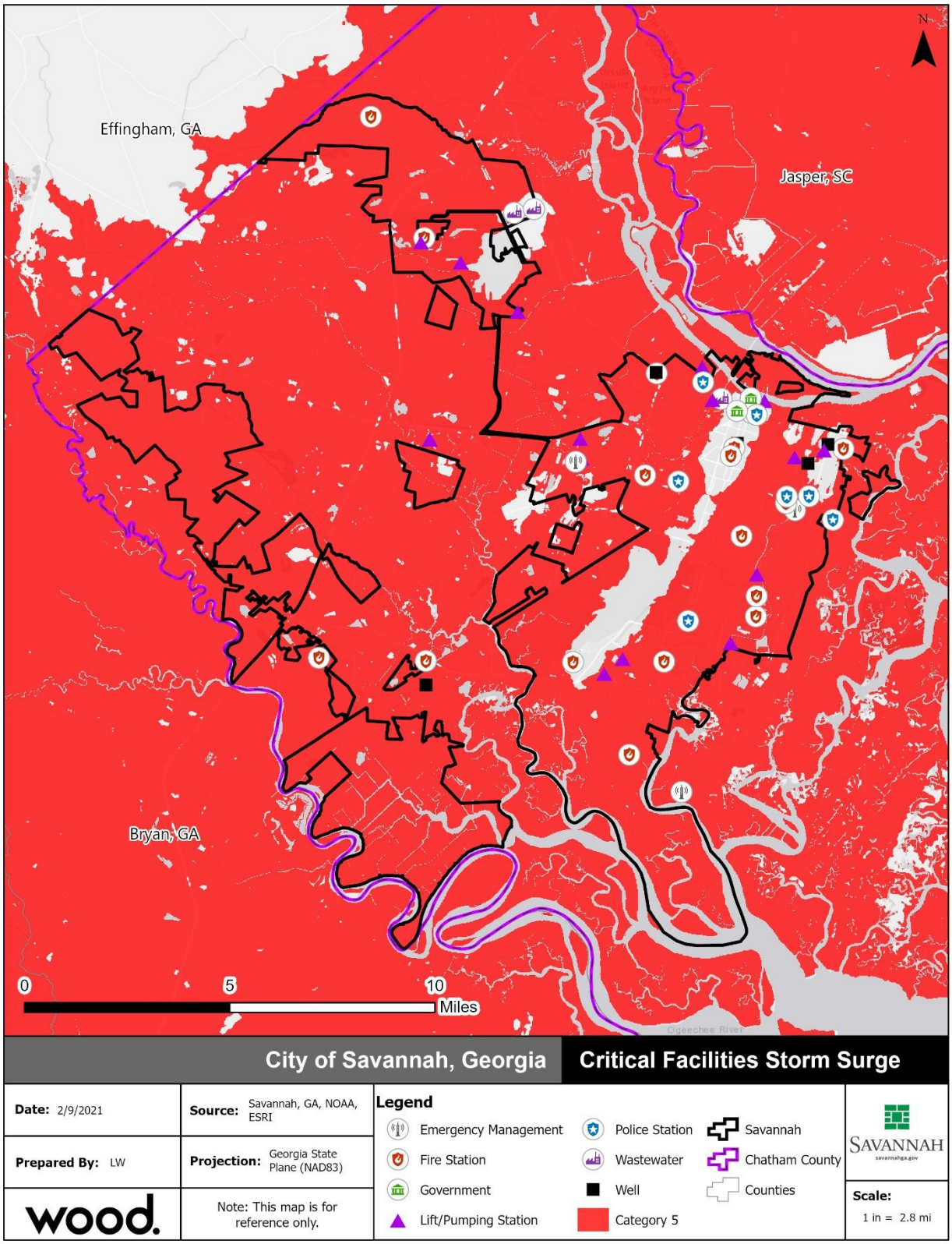


Figure 5.39 – Category 5 Storm Surge Impact in Savannah



Critical Facilities at Risk

Table 5.36 and Table 5.37 provide an overall summary of critical facilities at risk due to storm surge from a Category 1 through a Category 5 hurricane.

Table 5.36 – Savannah Critical Facilities at Risk by Storm Surge Category

Type	Facility Name	Jurisdiction	Storm Surge				
			Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Lift/Pumping Station	DeRenne Station #A1, A2, B1, B2, and House	Savannah	✓	✓	✓	✓	✓
Wastewater	Kayton Station #01, 02, and 03	Unincorporated	✓	✓	✓	✓	✓
Fire Station	Fire Training	Savannah	✓	✓	✓	✓	✓
Wastewater	Springfield Station #01, 02, 03, and House	Savannah	✓	✓	✓	✓	✓
Police Station	Police Precinct - Eastside	Savannah	✓	✓	✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #115	Savannah		✓	✓	✓	✓
Wastewater	President Street Plant WPCP	Unincorporated		✓	✓	✓	✓
Wastewater	Lathrop Street Station #01 and 02	Unincorporated		✓	✓	✓	✓
Emergency Management	Radio Tower	Savannah		✓	✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #021	Savannah		✓	✓	✓	✓
Wastewater	Fell Street Station #01 and 02	Unincorporated		✓	✓	✓	✓
Police Station	Police Traffic Operations	Unincorporated		✓	✓	✓	✓
Fire Station	Fire Station #07	Savannah		✓	✓	✓	✓
Fire Station	Fire Station #10	Savannah		✓	✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #065	Savannah		✓	✓	✓	✓
Wastewater	Georgetown Treament Plant	Unincorporated		✓	✓	✓	✓
Well	Well #29	Unincorporated		✓	✓	✓	✓
Police Station	Police Professional Standards	Savannah		✓	✓	✓	✓
Police Station	Police Precinct - Northwest	Unincorporated		✓	✓	✓	✓
Fire Station	Fire Station #12	Savannah		✓	✓	✓	✓
Fire Station	Fire Station #15	Savannah		✓	✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #016	Savannah			✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #148	Savannah			✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #116	Savannah			✓	✓	✓
Police Station	Police Precinct - Southside	Savannah			✓	✓	✓
Emergency Management	Savannah Morning News	Savannah			✓	✓	✓
Police Station	Police Training	Savannah			✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #083	Savannah			✓	✓	✓
Fire Station	Fire Station #06	Savannah			✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #040	Savannah			✓	✓	✓
Lift/Pumping Station	Sav Lift Stations #064	Savannah			✓	✓	✓
Emergency Management	Radio Tower - South	Unincorporated			✓	✓	✓
Lift/Pumping Station	Lift Station #134	Unincorporated			✓	✓	✓
Fire Station	Fire Station #04	Savannah				✓	✓
Lift/Pumping Station	Sav Lift Stations #023	Savannah				✓	✓

Type	Facility Name	Jurisdiction	Storm Surge				
			Cat 1	Cat 2	Cat 3	Cat 4	Cat 5
Fire Station	Fire Station #08	Savannah				✓	✓
Fire Station	Fire Station #01	Savannah				✓	✓
Police Station	Police Precinct - Central	Savannah				✓	✓
Well	Sav Well #08	Savannah				✓	✓
Well	Sav Well #10	Savannah				✓	✓
Fire Station	Fire Station #13	Savannah				✓	✓
Lift/Pumping Station	Sav Lift Stations #149	Savannah				✓	✓
Lift/Pumping Station	Sav Lift Stations #063	Savannah					✓
Fire Station	Fire Station #02	Savannah					✓
Fire Station	Fire Station #14	Savannah					✓
Lift/Pumping Station	Montgomery Crossroads #01, 02, and House	Savannah					
Well	Sav Well #05	Savannah					
Wastewater	Crossroads Waste Treatment	Savannah					
Fire Station	Fire Station #09	Savannah					
Fire Station	Fire Station #11	Savannah					
Wastewater	I&D Water	Savannah					
Fire Station	Fire Station #03	Savannah					
Government	City Hall	Savannah					
Police Station	Police Headquarters	Savannah					

Source: City of Savannah; GEMA

Table 5.37 – Summary of Savannah Critical Facilities at Risk to Storm Surge

Facility Type	Category 1	Category 2	Category 3	Category 4	Category 5	Not at Risk
Emergency Management		1	3	3	3	
Fire Station	1	5	6	10	12	5
Government						2
Lift/Pumping Station	1	4	11	13	14	1
Police Station	1	4	6	7	7	1
Wastewater	2	6	6	6	6	2
Well		1	1	3	3	2
Total	**5**	**21**	**33**	**42**	**45**	**13**

Source: City of Savannah; GEMA

Population at Risk

A hurricane surge analysis was conducted by intersecting the improved parcel layer provided by the City of Savannah with the polygon shapefile for each hurricane surge layer. In evaluating populations at risk, only those people residing in the hurricane storm surge zones are included. Thus, those improved residential parcels intersecting the hurricane surge zones were counted and multiplied by the American Community Survey 2019 estimated household factor for Savannah (2.53). Savannah's population at risk to storm surge is shown in Table 5.38

Table 5.38 – Savannah Population at Risk to Storm Surge

Hurricane Category	Improved Residential Parcels	Population
Hurricane Category 1	1,231	3,114
Hurricane Category 2	8,665	21,922
Hurricane Category 3	30,356	76,801
Hurricane Category 4	40,747	103,090
Hurricane Category 5	44,666	113,005

Source: SAGIS 2019 Parcel Data, GEMA, U.S. Census Bureau

The very young, the elderly and individuals with disabilities are especially vulnerable to harm from hurricanes and may face difficulty in evacuating. For those who are unable to evacuate for medical reasons, there should be provision to take care of special-needs patients and those in hospitals and nursing homes. Many of these patients are either oxygen-dependent, insulin-dependent, or in need of intensive medical care. There is a need to provide ongoing treatment for these vulnerable citizens, either on the coast or by air evacuation to upland hospitals. The stress from disasters such as a hurricane can result in immediate and long-term physical and emotional health problems among victims.

Evacuation Zones

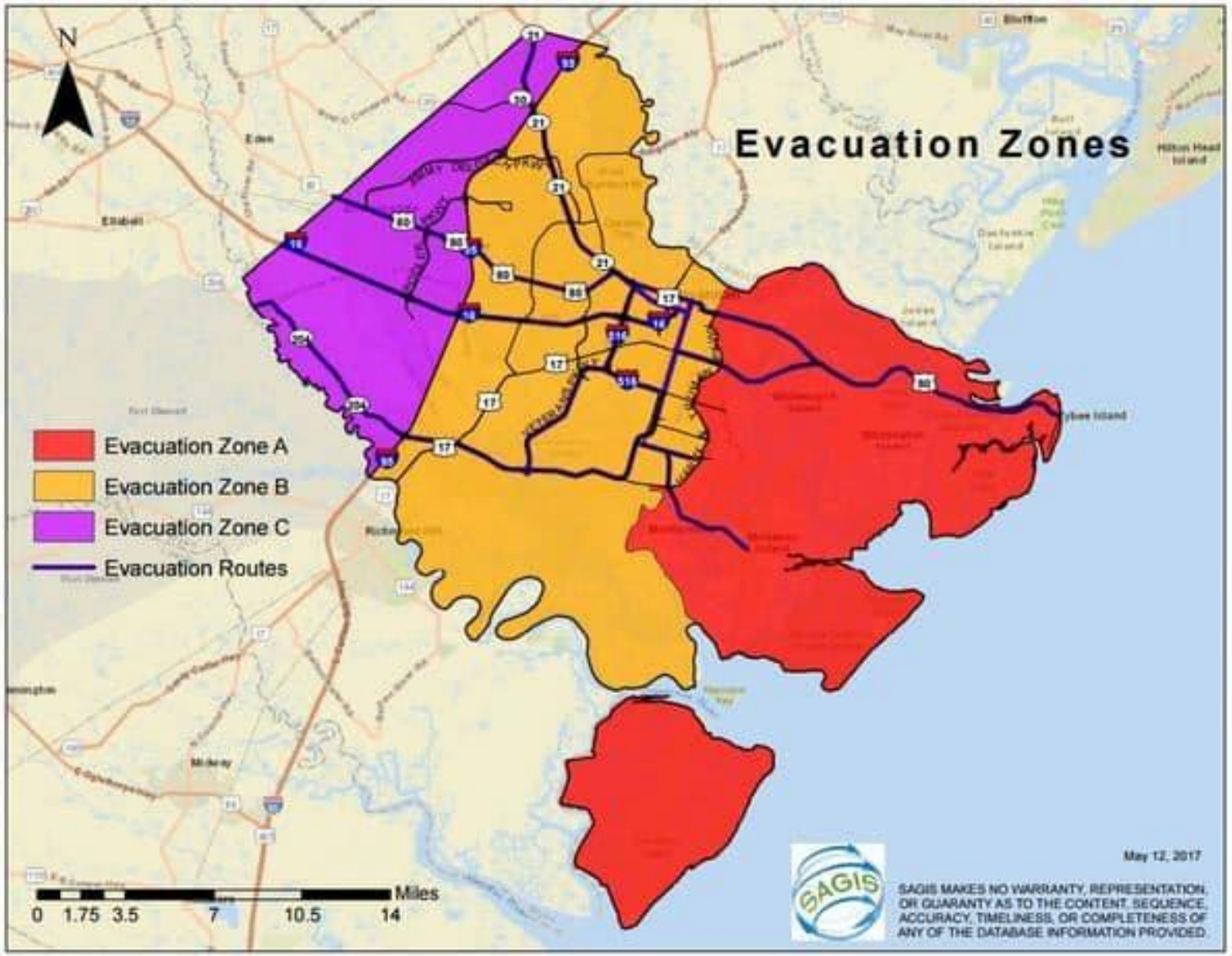
Chatham County has three hurricane evacuation zones (Evacuation Zones A, B, and C) as shown in Figure 5.40; these zones are summarized in the table below. Chatham County developed new evacuation zones following Hurricane Matthew. Once an evacuation order is issues, all major roadway networks within Chatham County will be considered evacuation routes for local travel. Evacuation from the County to inland areas have also been designated. They include GA 204, GA 21, US 80, and I-16.

Table 5.39 – Chatham County Evacuation Zones

Evacuation Zone	Area Description
Evacuation Zone A	Areas east of the Truman Parkway and the Vernon River
Evacuation Zone B	Areas west of the Truman Parkway, but east of Interstate 95
Evacuation Zone C	Areas west of Interstate 95

Source: Chatham County Emergency Management

Figure 5.40 – Chatham County Evacuation Zones



Source: Chatham County Emergency Management

5.5 RISK AND VULNERABILITY CONCLUSIONS

5.5.1 Flood Hazards Profile Summary

Table 5.40 summarizes the degree of risk of each identified hazard for the City of Savannah according to the results of the Priority Risk Index (PRI).

Table 5.40 – Summary of Flood Hazard PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Climate Change and Sea Level Rise	Likely	Critical	Small	More than 24 hrs	More than 1 week	2.7
Coastal/Canal Bank Erosion	Possible	Minor	Negligible	More than 24 hrs	More than 1 week	1.6
Dam/Levee Failure	Unlikely	Limited	Negligible	6 to 12 hours	Less than 1 week	1.7
Flood: 100-/500-year	Highly Likely	Critical	Moderate	Less than 6 hours	Less than 1 week	3.4
Flood: Stormwater/Localized	Highly Likely	Critical	Moderate	Less than 6 hours	Less than 1 week	3.3
Hurricane and Tropical Storm	Likely	Critical	Large	More than 24 hrs	Less than 1 week	3.0

5.5.2 Assessment of Areas Likely to Flood

Identified Area #1: 100yr SFHAs

According to a August 16, 2018 Flood Insurance Study prepared by FEMA, over 40 percent of the City is already located within a Special Flood Hazard Area (SFHA). Given that the population of Chatham County is projected to increase by 15% between 2020 and 2040, changes in floodplain development and development within the watershed in general is likely to increase the size of the SFHAs due to an increase in impervious area. Furthermore, with its low topography and coastal location, Savannah's infrastructure and groundwater are particularly vulnerable to the effects of climate change and sea level rise.

Identified Area #2: Areas of Localized Stormwater Flooding

Due to the low elevations, a flat terrain, a consistent level of annual precipitation and the tidal influence on canal drainage resulting from heavy rainstorms, tropical storms, and hurricanes, it is highly likely that unmitigated properties will continue to experience localized flooding. The projected increase in population by 2040 will likely lead to new development. An increase in imperious area will only exacerbate the localizing flooding issues unless measures are taken to reduce the volume of runoff. Furthermore, the intensity of individual rainfall events is likely to increase in the future due to climate change which will further overwhelm stormwater drainage systems.

Identified Area #3: Repetitive Loss Areas

Properties categorized as repetitive loss properties have a greater need for flood protection. Repetitive loss can be attributed to development within the 100-yr floodplain as well as localized stormwater flooding. As mentioned above, both types of flooding are likely to increase in the future due to development in the floodplain/watershed as well as the effects of climate change and sea level rise. Therefore, is it very likely that repetitive loss properties will continue to flood in the future.

Identified Area #4: The Entire City of Savannah

Sea level change will be particularly important in influencing storm surge flooding in the Savannah area. A 2-foot sea level rise would increase the likelihood of a Category 5 hurricane to once every 5 years

(WRI, 2014). As shown in Section 5.4.6 above, over half the entire City becomes vulnerable to property damaging flooding from a Category 3 or stronger hurricane.

5.5.3 Impact of Future Flooding Conditions

Changes in the watersheds (particularly an increase in impervious area) as well as changes in climate could make these identified areas even more likely to flood in the future. Portions of the City of Savannah lie within ten (10) different HUC 12 watersheds, as listed in the table below.

HUC 12 Watershed Name	HUC 12 Watershed Number
Sterling Creek - Ogeechee River	030602040301
Salt Creek - Little Ogeechee River	030602040203
Vernon River	030602040303
Hardin Canal - Little Ogeechee River	030602040201
Ossabaw Sound - Frontal Atlantic Ocean	030602040304
Wilmington River	030602040101
Casey Canal - Haneys Creek	030602040302
Morgans Bridge - Ogeechee River	030602020605
Outlet Savannah River	030601090307
Pipemakers Canal	030302040202

The SFHA extends throughout the City in all watersheds. There is a small area of Zone AE in the southeasternmost portion of the City. Zone AE covers much of the areas in the City along the various rivers, tributaries, and canals. There are small areas of Zone A in the northern portion of the City. Areas of localized stormwater flooding are located throughout the City.

Repetitive loss properties are associated with both 100-/500-year flooding, flooding along the rivers and canals, and localized stormwater flooding, all of which may be vulnerable to increased risk in the future. Localized stormwater flooding can increase as a result of increased development. The City undertakes capital improvements and stormwater management projects, including updating the Stormwater Master Plan, to improve the capacity and operation of the stormwater system. These efforts can mitigate some of the potential impacts of future flooding conditions associate with development changes in the watersheds.

However, future flood conditions in all areas likely to flood will also be affected by climate change and sea level rise, as discussed in Section 5.4.1. As sea levels continue to rise, the SFHA may increase, meaning the 1% annual chance flood event will affect areas currently mapped as Zone X. Additionally, the City's stormwater drainage capacity may decrease due to greater tidal effects, and, as discussed above, storm surge risk will likely increase.

5.5.4 Health & Safety Consequence Analysis

Life Safety

Flood waters may prevent access to areas in need of response or to the critical facilities themselves which may prolong response time. The public must understand that they should never drive through flooded streets. The Centers for Disease Control and Prevention report that over half of flood-related drownings occur when a vehicle is driven into flood water, and the next highest percentage of deaths is due to people walking into or near flood waters. The National Weather Service warns that just 6 inches of fast-moving flood water can knock down an adult, 12 inches can carry away a small car, and 2 feet can carry away most vehicles. When someone drives through floodwaters, they put their life and the lives of first responders at risk. First responders are at risk when attempting to rescue people from floodwaters.

They are subject to the same health hazards as the public and are more likely to be exposed to these hazards during their response efforts.

Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed by flood waters. Floods can severely disrupt normal operations, especially when there is a loss of power. This can affect the operations of critical facilities, which affects response times. Loss of power also puts the public at risk. Downed power lines pose a serious hazard and should always be treated as if they are still energized. When a building loses power during a flood, electricity should be turned off and not used until the wiring can be inspected, to avoid risk of electrocution or fire. Damage to electrical equipment can result from exposure to flood waters contaminated with chemicals, sewage, oil, and other debris.

Public Health

Certain health hazards are common to flood events. While such problems are often not reported, three general types of health hazards accompany floods. The first comes from the water itself. Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm, and industrial chemicals. Pastures and areas where farm animals are kept, or their wastes are stored, can contribute polluted waters to the receiving streams.

Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as e.coli and other disease causing agents. Residents with private wells will need to have their water quality tested to ensure it is safe for use.

The second type of health problem arises after most of the water has gone. Stagnant pools can become breeding grounds for mosquitoes, and wet areas of a building that have not been properly cleaned breed mold and mildew. A building that is not thoroughly cleaned becomes a health hazard, especially for small children and the elderly.

Another health hazard occurs when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. Flooding can also cause extensive mold growth in building walls and floors, which also poses a respiratory health hazard.

The third problem is the long-term psychological impact of having been through a flood and seeing one's home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home puts a severe strain on people, especially the unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Another health risk from flooding comes from animals, such as snakes and rodents, that make their way through floodwaters and come into contact with people. Animals can pose a risk of physical attack and/or spread of disease.

Debris also poses a risk both during and after a flood. During a flood, debris carried by floodwaters can cause physical injury from impact. During the recovery process, people may often need to clear debris out of their properties, but may encounter dangers such as sharp materials or rusty nails that pose a risk of tetanus. People must be aware of these dangers prior to a flood so that they understand the risks and take necessary precautions before, during, and after a flood.

6 Capability Assessment

The Metropolitan Planning Commission is a joint planning agency for the City of Savannah and Chatham County. Each governmental body appoints seven members to the board. Two of these members are the City and County Managers. These fourteen members serve without pay and represent government, private enterprise, and citizens' interest groups. Commissioners are appointed for three year overlapping terms. MPC staff, headed by an Executive Director, research and evaluate issues and prepare information for the Board's consideration and action.

SAGIS (Savannah Area Geographic Information System) is focused on providing access to geospatial data in a standardized format to all interested parties. The SAGIS mission is to consolidate geospatial information into one central location, providing a one stop access to information. SAGIS works with the City of Savannah, Chatham County, The Metropolitan Planning Commission and a variety of other non-profit and private organizations to maintain standards, manage data, educate and coordinate projects that affect the greater Savannah - Chatham County area.

Table 6.1 lists regulatory mitigation capabilities, including planning and land management tools, typically used by local jurisdictions to implement hazard mitigation activities and indicates those that are in place in the City of Savannah.

Table 6.1 – Savannah Regulatory Mitigation Capabilities

Regulatory Tool (ordinances, codes, plans)	Y/N	Date	Comments
Comprehensive Plan	Y	2016	Chatham County-Savannah MPC
Zoning Ordinance	Y	09/1/2019	
Subdivision Ordinance	Y	2005	
Floodplain Ordinance	Y	2008	
Stormwater Ordinance	Y	2018	
Erosion, Sedimentation, and Pollution Control Ordinance	Y	2009	
Building Code	Y	2019	Georgia Building Code; International Building Code (2019)
BCEGS Rating	Y		4/4
Stormwater Management Program	Y		NPDES Permit #GAS000205
Site Plan Review Requirements	Y		
Capital Improvements Plan	Y		SAGIS Layer & Quarterly Updates
Economic Development Plan			Economic Element of Comprehensive Plan
Local Emergency Operations Plan	Y		Chatham County Emergency Management
Flood Insurance Study or Other Engineering Study for Streams	Y	08/16/2018	
Repetitive Loss Area Analysis	Y	2015	Created by Consultants
Elevation Certificates	Y		

6.1.1 Administrative/Technical Mitigation Capabilities

Table 6.2 identifies City personnel responsible for activities related to mitigation and loss prevention in the City of Savannah.

Table 6.2 – Savannah Administrative/Technical Capabilities

Resource	Y/N	Responsible Department
Planner/Engineer with knowledge of land development/land management practices	Y	Planning & Urban Design
Engineer/Professional trained in construction practices related to buildings and/or infrastructure	Y	Development Services
Planner/Engineer/Scientist with an understanding of natural hazards	Y	Development Services
Personnel skilled in GIS	Y	SAGIS
Full time building official	Y	Development Services
Floodplain Manager	Y	Development Services
Emergency Manager	Y	Emergency Preparedness
Grant writer	Y	Department of Cultural Affairs
GIS data – hazard areas	Y	Development Services/SAGIS
GIS data – critical facilities	Y	Development Services/SAGIS
GIS data – building footprints	Y	Development Services/SAGIS
GIS data – land use	Y	Development Services/SAGIS
GIS data – links to assessor's data	Y	Development Services/SAGIS
Warning systems/services	Y	Emergency Preparedness

6.1.2 Fiscal Mitigation Capabilities

Table 6.3 identifies financial tools or resources that the City could potentially use to help fund mitigation activities.

Table 6.3 – Savannah Fiscal Mitigation Capabilities

Resource	Accessible? Y/N	Comments
Community development block grants	Y	
Capital improvements project funding	Y	
Authority to levy taxes for specific purposes	Y	
Fees for water, sewer, gas or electric services	Y	
Impact fees for new development	Y	
Incur debt through general obligation bonds	N	
Incur debt through special tax bonds	N	
Incur debt through private activities	N	
Withhold spending in hazard prone areas	N	

7 Mitigation Strategy

Requirement §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.

This section describes the mitigation strategy process and mitigation action plan for the Savannah Floodplain Mitigation Plan. It describes how the City met the following requirements from the 10-step planning process:

- Planning Step 6: Set Goals
- Planning Step 7: Review Possible Activities
- Planning Step 8: Draft an Action Plan

7.1 MITIGATION STRATEGY: OVERVIEW

The results of the planning process, the risk assessment, the goal setting, and the identification of mitigation actions led to the mitigation strategy and mitigation action plan for this FMP. Section 7.2 below identifies the goals and objectives of this plan and Section 7.4 details the new mitigation action plan. The following umbrella mitigation strategy was developed for this FMP:

- **Communicate** the hazard information collected and analyzed through this planning process as well as FMPC success stories so that the community better understands what can happen where and what they themselves can do to be better prepared.
- **Implement** the action plan recommendations of this plan.
- **Use** existing rules, regulations, policies, and procedures already in existence.
- **Monitor** multi-objective management opportunities so that funding opportunities may be shared and packaged and broader constituent support may be garnered.

7.1.1 Continued Compliance with NFIP

Given the flood hazards in the planning area, an emphasis will be placed on continued compliance with the NFIP and participation in the CRS. The City meets or exceeds the following minimum requirements as set by the NFIP:

- Issuing or denying floodplain development/building permits
- Inspecting all development to assure compliance with the local ordinance
- Maintaining records of floodplain development
- Assisting in the preparation and revision of floodplain maps
- Helping residents obtain information on flood hazards, floodplain map data, flood insurance and proper construction measures

The City's Development Services Department is responsible for the review and approval of all development applications to the City. The Department coordinates all required plan reviews by city infrastructure departments (stormwater, water & sewer, park & tree, traffic, and streets), the zoning department, the Metropolitan Planning Commission (MPC), and building specialties (structural, plumbing, electrical, mechanical, etc.). The Department also coordinates the issuance of the Certificate of Occupancy for all new or renovated building construction, completion letters for site work and building shells and acceptance of new publicly maintained infrastructure (streets, drainage, water,

sewer, etc...). Once a development begins actual construction, there are a number of periodic on-site inspections performed by trained inspection staff to ensure compliance before the construction can proceed toward completion. The Development Services Department also maintains the record of all map revisions and changes received from FEMA. As a part of the services offered to the public, the Development Services Department provides FEMA floodplain mapping information, flood insurance program information, flooding hazards, and proper construction methods within the special flood hazard area.

The CRS was created in 1990. It is designed to recognize floodplain management activities that are above and beyond the NFIP's minimum requirements. The City of Savannah is currently classified as a Class 5 community, which gives a 25% premium discount to individuals in the Special Flood Hazard Area, and a 10% discount to policyholders outside the Special Flood Hazard Area. The following is a summary of the CRS Activities for which the City of Savannah currently receives credit based on the 2018 verification report:

Activity 310 – Elevation Certificates: The Building Department maintains elevation certificates for new and substantially improved buildings. Copies of elevation certificates are made available upon request. Elevation Certificates are also kept in computer format.

Activity 320 – Map Information Service: Credit is provided for furnishing inquirers with flood zone information from the community's latest Flood Insurance Rate Map (FIRM), publicizing the service annually and maintaining records.

Activity 330 – Outreach Projects: A community brochure is mailed to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the community's SFHA. The community also displays flood information at public buildings and public events.

Activity 340 – Hazard Disclosure: Credit is provided for state and community regulations requiring disclosure of flood hazards.

Activity 350 – Flood Protection Information: Documents relating to floodplain management are available in the reference section of the Live Oak Public Library. Credit is also provided for floodplain information displayed on the community's website.

Activity 360 – Flood Protection Assistance: The community provides technical advice and assistance to interested property owners and annually publicizes the service.

Activity 370 – Flood Insurance Promotion: The community provides advice about flood insurance.

Activity 420 – Open Space Preservation: Credit is provided for preserving land in the SFHA as open space. Credit is also provided for open space land that is deed restricted.

Activity 430 – Higher Regulatory Standards: Credit is provided for enforcing regulations that require freeboard for new and substantial improvement construction, cumulative substantial improvement, protection of critical facilities, protection of floodplain storage capacity, enclosure limits, other higher regulatory standards, state mandated regulatory standards, and for enforcing the Georgia Building Code. Credit is also provided for a Building Code Effectiveness Grading Schedule (BCEGS) Classification of 4/4 and for staff education and certification as a floodplain manager.

Activity 440 – Flood Data Maintenance: Credit is provided for maintaining and using digitized maps in the day to day management of the floodplain. Credit is also provided for establishing and maintaining a system of benchmarks and maintaining copies of all previous FIRMs and Flood Insurance Study Reports.

Activity 450 – Stormwater Management: The community enforces regulations for soil and erosion control.

Activity 510 – Floodplain Management Planning: Based on the updates made to the NFIP Report of Repetitive Losses as of 2019, the City of Savannah has 183 repetitive loss properties and is a Category C community for CRS purposes. All requirements for the 2018 cycle have been met. Credit is provided for the adoption and implementation of the Floodplain Management Plan. Since the City of Savannah is a Category C community with an approved Floodplain Management Plan, a progress report must be submitted on an annual basis.

Activity 520 – Acquisition and Relocation: Credit is provided for acquiring and relocating buildings from the community's flood hazard area.

Activity 610 – Flood Warning Program: Credit is provided for a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities.

7.2 GOALS AND OBJECTIVES

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

Section 5 documents the flood hazards and associated risks that threaten the City of Savannah including the vulnerability to structures, infrastructure, and critical facilities. Section 6 also evaluates the capacity of the City to reduce the impact of those hazards. The intent of Goal Setting is to identify areas where improvements to existing capabilities (policies and programs) can be made so that community vulnerability is reduced. Goals are also necessary to guide the review of possible mitigation measures. This Plan needs to make sure that recommended actions are consistent with what is appropriate for Savannah. Mitigation goals need to reflect community priorities and should be consistent with other plans in the City and within Chatham County.

Goals: are general guidelines that explain what it to be achieved. They are usually broad-based policy type statements, long term and represent Global visions. Goals help define the benefits that the plan is trying to achieve.

Objectives: are short term aims, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

7.2.1 Coordination with Other Planning Efforts

The goals of this plan need to be consistent with and complement the goals of other planning efforts. The primary planning document where the goals of this Plan must complement and be consistent with is the Chatham County Hazard Mitigation Plan and the Chatham County-Savannah Comprehensive Plan. The Comprehensive Plan is important as it is developed and designed to guide future growth within the community. Therefore, there should be some consistency in the overall goals and how they relate to each other. Likewise, the goals of the County's Hazard Mitigation Plan play an important role as it also focuses on flood hazards and mitigation projects.

7.2.2 Goal Setting Exercise

At the second FMCP meeting, held on February 9, 2021, the Savannah FMPC reviewed the goals and objectives of the previous flood mitigation plan and conducted an open discussion to determine

whether the goals and objectives were still applicable or whether any changes should be made. The goals and objectives from the 2015 plan were as follows:

Goal 1: Protect the health, safety and welfare of the citizens of Cutler Bay from the effects of flooding

- **Objective 1.1:** Reduce flood damage to insurable buildings and public infrastructure through stormwater improvement projects
- **Objective 1.2:** Preserve open space areas, especially where there are sensitive natural areas
- **Objective 1.3:** Promote higher development and design standards to protect new buildings from flood damage

Goal 2: Promote a public education program to encourage residents to promote mitigation measures that reduce the effects of flood damage on private property

- **Objective 2.1:** Encourage residents to assume an appropriate level of responsibility for their own flood protection
- **Objective 2.2:** Promote flood insurance as a property protection measure against potential flood damage
- **Objective 2.3:** Develop a public education program for the local schools

Goal 3: Protect critical and essential facilities from flood damage

- **Objective 3.1:** Seek county, state and federal support for mitigation projects
- **Objective 3.2:** Prioritize critical and essential facilities in need of protection from potential flood damage

Goal 4: Reduce the number of repetitively flooded structures

- **Objective 4.1:** Leverage local, state and federal grant funding to facilitate mitigation actions such as elevation, acquisition, or floodproofing
- **Objective 4.2:** Target repetitive loss properties for implementation of mitigation projects

The City's planning consultant made recommendations for revisions to the goals and objectives: the exiting goals read more like objectives while the objectives were more akin to actions; the consultants recommended the FMPC create more broad based goals with nested objectives that will help determine projects later in the process.

7.2.3 Resulting Goals and Objectives

The FMPC was given the opportunity to comment on the recommended goals and objectives, and at the third FMPC meeting, the FMPC agreed upon four revised general goals and several objectives to support each goal. The resulting goals and objectives are as follows:

Goal 1: Protect the public health, safety, and welfare of Savannah residents from flood hazards

- Objective 1.1: Protect critical and essential facilities from flood damage
- Objective 1.2: Reduce damage to development through flood resilient strategies and measures
- Objective 1.3: Preserve open space areas, especially sensitive natural areas

Goal 2: Holistically address repetitive loss areas

- Objective 2.1: Reduce number of repetitively flooded structures.
- Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
- Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.

- Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.

Goal 3: Enhance flood related public education and outreach efforts

- Objective 3.1: Expand the City's flood hazard communication and outreach program
- Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties
- Objective 3.3: Develop partnerships with local schools to provide flood education to students.
- Objective 3.4: Educate the public on the stormwater management techniques and the benefits of acknowledging water as a resource.

Goal 4: Monitor projections for changing weather and climate conditions and implement plans, policies, and property protection to reduce potential damages.

- Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
- Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
- Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

7.3 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIVITIES

Requirement §201.6(c)(3)(ii): [The mitigation strategy section 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. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

In order to identify and select mitigation projects to support the mitigation goals, each hazard identified in Section 4.1 Hazard Identification was evaluated. The following were determined to be priority flood-related hazards:

- Climate Change and Sea Level Rise
- Flood: 100-/500-year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Once it was determined which flood hazards warranted the development of specific mitigation actions, the FMPC analyzed viable mitigation options that supported the identified goals and objectives. The FMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention (Required to be evaluated)
- Floodplain Management Regulatory/current & future conditions
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

The FMPC was also provided with examples of potential mitigation actions for each of the above categories. The FMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. A facilitated discussion then took place to examine and analyze the

options. Appendix C, Mitigation Strategy, provides a detailed discussion organized by CRS mitigation category of possible mitigation alternatives to assist the City in the review and identification of possible mitigation activities. This comprehensive review of possible mitigation activities details why some were appropriate for implementation and why others were not. As promoted by CRS, Prevention type mitigation alternatives were discussed for the flood hazards. This discussion was followed by a brainstorming session that generated a list of preferred mitigation actions by hazard.

The result of this discussion was a list of mitigation actions to be pursued for implementation in the next five years, including newly identified actions and actions carried forward from the 2015 plan. Actions that were completed or not carried forward (deleted) are detailed in Table below.

Action ID & Description	Status & Comments
2010 - 3. Ensure the City's new zoning code limits development in floodplains and wetlands to low density, and that a certain percentage of land remains protected as open space to provide a natural buffer from water bodies.	Completed - On Sept 1, 2019, the City approved the new Zoning Ordinance for the COS jurisdiction only
2010 - 12. Target repetitive loss structures by conducting a detailed study as outlined in the RLAA.	Completed - City annually sens letters to properties in the Repetitive Loss Areas that encourage owners to contact the City for mitigation soluions and Flood Insurance Information
2010 - 18. Mail information to all structures in the floodplain promoting flood insurance and sound floodplain management practices.	Completed
2010 - 21. Establish program aimed at providing flood protection assistance to owners of flood-prone properties, including site visits and advice on retrofitting and other flood mitigation measures.	Completed - City has set up three annual outreaches (community newspaper insert, SFHA mailer, letters to RLA); City participates in annual events such as Hurricane Expo and Earth Day events; Citizens can also contact City's 311 to request a site visit to discuss their properties stormwater flooding concerns
2010 - 28. Complete AW-501 forms for acquired Repetitive Loss properties to remove from FEMA Repetitive Loss Property list (or classify each as "mitigated").	Completed - Completed annually - City has yet to receive the latest requested database; based on 2018 data, no changes from 2019-2020 years
2015 - 2. Develop outreach strategy to educate building community on new flood maps.	Completed - COS promoted new FIRM through community meetings and publiciations; continues to promote new FIRM on city websites
2015 - 3. Modify Flood Damage Prevention Ordinance to include LiMWA criteria.	Completed - City updated FDPO to include LiMWA language that meets the GA DNR state model ordinance and ASCE 24-15 requirements
2015 - 6. Chatham County Emergency Management (CEMA) will provide a prioritized list of critical facilities.	Completed - Included in updated Chatham County Multi-Hazard Mitigation PLan
2015 - 7. The City of Savannah will adopt the CEMA Post-Disaster Mitigation Plan and Pre-Disaster Mitigation Plan.	Completed - City adopted the Chatham County Multi-Jurisdictional Hazard Mitigation Plan in 2020
2015 - 8. Consider expanding riparian impervious surface setbacks including a 25' setback on coastal marshland and wetlands.	Completed - State of GA requires a 25' setback to coastal marshland and all streams; New zoning ordinance adopted in 2019 created an additional 10' setback beyond these requirements
2015 - 12. Create a Natural Floodplain Functions Plan and a Repetitive Loss Area Analysis	Completed - Natural Floodplains Function plan was completed in July 2015 and RLAA was completed and adopted in August 2015

7.3.1 Prioritization Process

Once the mitigation actions were identified, the FMPC was provided with several decision-making tools, including FEMA's recommended STAPLEE prioritization criteria. The FMPC was asked to consider each of the follow STAPLEE elements:

- **Socially Acceptable:** Is the action acceptable to the community? Does it have a greater impact on a certain segment of the population? Are the benefits fair?
- **Technically Feasible:** Is the action technically feasibly? Is it a long-term solution to the problem? Does it capitalize on existing planning mechanisms for implementation?
- **Administrative Resources:** Are there adequate staffing, funding and other capabilities to implement the project? Is there adequate additional capability to ensure ongoing maintenance?
- **Politically Supported:** Will there be adequate political and public support for the project? Does the project have a local champion to support implementation?
- **Legally Allowable:** Does the community have the legal authority to implement the action?
- **Economically Sound:** Can the action be funded locally? Will the action need to be funded by an outside entity, and has that funding been secured? How much will the project cost? Can the benefits be quantified, and do they outweigh the costs?
- **Environmentally Sound:** Does the action comply with environmental regulations? Does the action meet the community's environmental goals? Does the action impact land, water, endangered species, or other natural assets?

Next, the FMPC was asked to consider each action's potential efficacy by answering the following questions:

- Will the action result in lives saved?
- Will the action reduce property damages?
- Will the action reduce the need for response actions?
- Will the benefits exceed the cost?

The FMPC also considered sustainable disaster recovery principles and smart growth principles when considering, refining, and evaluating mitigation project alternatives. Using these criteria, the FMPC was able to prioritize the importance of each mitigation project based on whether the project should be a low, medium, or high priority. The process of identification and analysis of mitigation alternatives allowed the FMPC to come to consensus and to prioritize recommended mitigation actions. The team agreed that prioritizing the actions collectively enabled the actions to be ranked in order of relative importance and helped steer the development of additional actions that meet the more important objectives while eliminating some of the actions which did not garner much support.

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority, as reflected in the prioritization criteria above. However, this was not a quantitative analysis. For each action, the FMPC considered the benefit-cost analysis in terms of:

- Ability of the action to address the problem
- Contribution of the action to save life or property
- Available technical and administrative resources for implementation
- Availability of funding and perceived cost-effectiveness

The consideration of these criteria helped to prioritize and refine mitigation actions but did not constitute a full benefit-cost analysis. The cost-effectiveness of any mitigation alternative will be considered in greater detail through performing benefit-cost project analyses when seeking FEMA mitigation grant funding for eligible actions associated with this plan.

7.4 MITIGATION ACTION PLAN

Requirement §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.

The action plan was developed to present the recommendations developed by the FMPC for how the City of Savannah can reduce the risk and vulnerability of people, property, infrastructure, and natural and cultural resources to future flood events. Emphasis was placed on protecting both future and existing development. The action plan summarizes who is responsible for implementing each of the prioritized actions as well as when and how the actions will be implemented. Estimated costs and benefits are also identified for each action to support the benefit-cost review conducted to meet the regulatory requirements of the Disaster Mitigation Act. Table 7.1 details the mitigation actions identified for implementation through this planning process.

It is important to note that the City has many existing, detailed action descriptions, which include benefit-cost estimates, in other planning documents, such as stormwater plans and capital improvement budgets and reports. These actions are considered to be part of this plan, and the details, to avoid duplication, should be referenced in their original source document. The FMPC also realizes that new needs and priorities may arise as a result of a disaster or other circumstances and reserves the right to support new actions, as necessary, as long as they conform to the overall goals of this plan.

It should also be clarified that the actions included in this mitigation strategy are subject to further review and refinement; alternatives analyses; and reprioritization due to funding availability and/or other criteria. The City is not obligated by this document to implement any or all of these projects. This mitigation strategy represents the desires of the community to mitigate the risks and vulnerabilities from identified hazards. The actual selection, prioritization, and implementation of these actions will also be further evaluated in accordance with the CRS mitigation categories and criteria contained in Appendix C.

Table 7.1 – City of Savannah Mitigation Action Plan

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline	Status
1. Comprehensive evaluation of drainage system and implementation of selected projects.	1	SP	CIP Management	SPLOST	Ongoing	Carry Forward - August 2017 City Council adopted "Savannah Forward: Implementation Plan for City Strategic Plan" that includes a hydraulic analysis of all City of Savannah basins by 2023 and reduce structure flooding resulting from a 25-year rain event by 25% by 2025; as well as experience a 5% reducing in street flooding; City is contracting with engineering firms to update basin studies and multiple projects are under design
2. Enhance Drainage system maintenance program to unclog storm drains/ clear drainage channels and a public education component on proper yard waste disposal and eliminate brush disposal in canals.	1	P, NRP, PIO	CIP Management; Facilities Maintenance	Facilities Maintenance Budget	Ongoing	Carry Forward - Staff have produced/completed various public education efforts including presentation at various group meetings, social media, and utility bill inserts; staff also produced an educational video and developed an Adopt-a-Drain program. Stormwater resources have otherwise focused on basic response to resident complaints rather than an enhanced program.
3. Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	1	P, NRP	Development and Real Property Services	City Budget and FEMA Mitigation grant fund	Ongoing	Carry Forward - New draft flood plain maps are incrementally removing low lands from floodplains as BFE's are lowered, making the goal harder to achieve, without writing new regulations; additionally the financial strain the City is experiencing has prevented any further acquisition
4. Evaluate FEMA-purchased properties for the highest use in floodwater/stormwater storage.	2	P, PP	Real Property Services; Stormwater Mgmt	City Budget	Ongoing	Carry Forward - City used FEMA purchased property to reduce flooding in Bacon Park neighborhood (2016); City developed a plan to use 4 larger acquired properties as a tree farm/nursery which would supply the City's Park and Tree department; growing trees would help absorb flood waters; in 2019, City identified three sites and began the training program; as of 2020, the trees have been planted are continuing to grow
5. Require in the revision of the Subdivision Ordinance that all new subdivisions dedicate 20% of land as green space.	1	P, PP	Development Services	City Budget	Ongoing	Carry Forward - City has adopted the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual by reference in its Stormwater ordinance
6. Designate GDOT properties that are unused as areas for flood storage.	1	P, PP	Stormwater Management	City Budget	Ongoing	Carry Forward - GA DOT continues to clear the trees from I-95, I-16, and I-516 rights-of-way creating open space
7. Reduce future vulnerability of Vallambrosa area through acquisition or regulation.	2	P, PP	Development Services	City Budget	2-3 Years	Carry Forward - Vallombrosa Plantation is currently being developed toward a natural and hunting preserve by its owner. Draft Flood maps add property that may be developed in this area of concern, without additional development regulations; the City does not have the funds to acquire or update regulations, however during the plan review process, the Flood reviewer encouraged builders to elevate finish floor height to match the previous FIRM designation
8. Add additional higher regulations to the Flood Damage Prevention Ordinance that will prohibit enclosures of areas of greater than 300 square feet below the BFE.	2	P, PP	Development Services	City Budget	Ongoing	Carry Forward - Higher ordinance language was drafted, but upper administration in the City does not want to implement the higher limitations at this time.
9. Continue acquisition/demolition of high-risk flood-prone properties.	2	P, PP	Real Property Services	FEMA Mitigation Grant Funds and SPLOST	Ongoing	Carry Forward - The City acquired 10 properties in 2015, three of which were in FEMA's RL database; since, the City has maintained a list of citizens who have inquired about buyouts but no more have been purchased.
10. Evaluate the feasibility of a floodproofing program for homes where acquisition is not an option – especially historic structures.	1	P, PP	Development and Real Property Services	FEMA Mitigation Grant Funds for eligible type projects and SPLOST	Ongoing	Carry Forward - COS promotes homeowners contact City Staff for an "on site visit" through annual outreach (mailers, meetings, phone calls); City staff will provide retrofitting advice that includes elevation that if applied could lower flood damage costs and potentially prevent a home from being substantially damaged; also encourages owners/developers to implement flood protection techniques during plan review process
11. Target critical facilities for flood mitigation.	1	P, PP, ES	Various City agencies	SPLOST and FEMA mitigation grant funds	Ongoing	Carry Forward - Critical Facilities continue to be checked for compliance with the Flood Damage Prevention Ordinance; promotion of protection of Critical Facilities continues through outreach (including newspaper inserts, mailings, and letters to RLA) and advertisement of onsite inspections
12. Post flood mitigation information at libraries, post offices, heavily trafficked municipal buildings and community centers. Develop and post “potential high	3	PIO	Development Services	City Budget	Ongoing	Carry Forward - City provides updated flood information in the library and Development Services buildings. COS is working with Chatham County to implement Georgia Tech's "Smart Sea Level Sensor Project" ; COS has also solicited a contractor to develop a Program for Public Information (PPI)

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline	Status
water mark" signs.						
13. Continue to enhance newly implemented City website "flood protection information' webpage.	3	PIO	Public Information Office	City Budget	Ongoing	Carry Forward - City continuously updates this website; website provides links to Chatham County HMP, revised 2018 FIRM panels, iPan, "Smart Sea Level Sensor Project," and many other resources; The City also added new EC, LOMA, FEMA Fact Sheets, and building permit forms.
14. Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	3	ES	Public Safety/Emergency Management	City budget for coordination, State/Federal funds for enhancement	Ongoing	Carry Forward - City of Savannah promotes CEMA Alert system (which also forwards NWS alerts); Additionally, City participates in Georgia Tech's "Smart Sea Level Sensor Project"; Savannah Development Services also has social media
15. Continue flood preparedness and outreach activities at local community events	3	PIO	Public Information Office and Development Services	City budget	Ongoing	Carry Forward - City of Savannah provides flood education outreach at various events around the City
16. Organize public information campaign and organize public cleanups to reduce litter/debris in storm drains.	3	PIO, NRP	Public information office, local environmental organizations, facilities maintenance	City budget	Ongoing	Carry Forward - In conjunction with statewide River's Alive effort, COS has organized multiple river cleanup events; additional outreach includes inserts in utility bills, video PSAs, and advertisements in the community newspaper; COS also started a pilot program to pay houseless people to pick up litter in wetlands and waterways, looking for grant funding to increase the budget and lengthen the project
17. Conduct public outreach and direct technical assistance – particularly targeting repetitive loss properties and discussion of potential funding.	3	PIO	Development Services	City budget	Ongoing	Carry Forward - COS has provided several educational presentations in various schools, as well as to many community organizations. City staff has also held neighborhood meetings in neighborhoods that flood. Staff created a New Water Customer Packet given to every new and existing water customer that includes information on water as well as wastewater and sewer. COS staff initiated a pilot program with SCCPS middle school teachers on water education (cost per student is $8)
18. Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	3	PIO	local environmental groups, Savannah State and Georgia Tech; Stormwater Services and Engineering	Organizational Budgets	Ongoing	Carry Forward - City promotes permeable products during Site Plan review meetings with designers and owners; installed two demonstration rain gardens in 2016; FEMA mitigation grant awarded to the City to plan trees in purchased RL properties that can be transplanted around the City; also received a grant to install green infrastructure in mid town shopping center and green roof in tourist downtown district; City sponsored a rain barrel awareness program; City streets get rehabilitated with the Permeable Paver Program
19. Interview and coverage on local news, in newspaper articles and through advertisement to promote flood mitigation.	3	PIO	Steering Committee; Public Information Office; Savannah State; Georgia Tech	City budget	Ongoing	Carry Forward - City staff has done multiple interviews after storm events and to promote various flood education resources
20. Provide flood mitigation update and outreach to neighborhood groups and other interested parties via an email group address.	3	PIO	Steering committee and development services	City budget	Ongoing	Carry Forward - CEMA and COS sent out notices, emails, tweets, and Facebook posts; Flood protection website is regularly updated to keep material fresh and relevant
21. Organize annual/semi-annual single-focus public workshops/meetings to discuss flood mitigation.	3	PIO	Public Information Office, Development Services, and CEMA	City budget	Ongoing	Carry Forward - Conducted community meetings for Casey Canal and Leedsgate Neighborhood projects. Also conducted meetings for the GA Tech Sea Level Sensors Project
22. Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	1, 3	PIO	Real Property Services; Savanah State	City Budget	2-3 Years	Carry Forward - Not much progress, in person outreach paused due to COVID-19
23. Strategically focus SPLOST funds toward identified drainage	1	SP	CIP Management	City budget	Ongoing	Carry Forward - City has 12 CIP line items addressing failing pipes, drainage studies, pavers replacement, and increase pipe capacity

Action ID & Description	Related to Goal(s)	Mitigation Category	Responsible Office	Potential Funding Source	Timeline	Status
improvement projects.						
24. Promote flood insurance through community notification to citizens and business personnel by newspapers, letters, and public outreach.	3	PIO	Development Services	City budget	Ongoing	Carry Forward - Flood Insurance information is part of every flood determination letter and included in other outreach materials (RL areas, Savannah Morning News, and SFHA mailing)
25. Document drainage improvements in SFHAs and request revisions to the applicable FIRM maps to reflect new conditions through the FEMA LOMR process.	1	P	Development Services	FEMA	Ongoing	Carry Forward - Pipemakers Canal received LOMR 16-1717P; although the LOMR pertains to City of Pooler, the canal effects Savannah; part of updates to Flood Damage Prevention Ordinance includes adding language to ensure a LOMR is completed by owner prior to completing development that alters a watercourse; Received LOMR for development under five acres in New Hampstead; send FEMA request to accept the City drainage improvements study along the Case Canal South; Send GA DNR EPD Floodplain Division requests to provide new studies of the area
26. Remove building code/insurance disconnect through education of builders/realtors and modification of technical review checklist (cross-check NFIP/Insurance/Ordinance/IBC).	3	P, PP	Development Services	City budget	12 Months	Carry Forward - COS conducted training sessions (11); created a plan review sheet for builders to use when submitting a building permit application; promote this information on the Flood Protection website, newspaper publications; letters to the floodplain, and RLA and realtor workshops
27. Prioritize CIP projects to address flooding in the following areas: Victory Drive, Skidaway & 41st, 37th MLK, Montgomery & 52nd, Abercorn & 65th, Springfield Canal, Cloverdale, Detention Pond @ 52nd Derenne, Bilbo basin and Placentia basin.	1, 2	SP	Stormwater Management	City SPLOST funding	12 Months	Carry Forward - Majority of projects deal with street or nuisance flooding; however most remain unfunded; currently on project is under construction, one is under design, and two are in an ongoing design process.
28. Complete a study to evaluate the effectiveness of a stormwater utility based on impervious area and its impact on the typical homeowner.	1	SP	Stormwater Department and City Council	City Budget	36 Months	Carry Forward - Consultant has been awarded a contract to perform a study of the Stormwater Unity Program; utility fee is not an option
29. Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	1	P, NRP	Parks and Recreation Department	City and Council Combined funding of the MPO	48 Months	Carry Forward - COS working with Chatham County to achieve flood protection mitigation for the Truman Linear Trail Project; COS is specifically working on the City's portion from DeRenne to Henry Street; Concept report has been approved by GA DOT; County has completed its portion, City portion has been delayed due to lack of funds
30. Consider participation in FEMA's high water mark initiative.	1, 3	PIO	Development Services	City's operating budget	36 Months	Carry Forward - COS is concentrating on the Sea Level Rise Study and GA Tech's Tide Sensor Project
31. Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	1, 2	P, NRP	Parks and Recreation Department in cooperation with the Chatham County-Savannah MPO and the Savannah City Council	SPLOST Funding	36 Months	Carry Forward - COS is coordinating with Chatham County Resource Protection Land to acquire land vulnerable to flooding through SPLOST funds; no recent action due to lack of funding
32. Develop a Watershed Master Plan for the City	1	P, PP, NRP	Development Services	SPLOST Funding	6 Months	Carry Forward - Instead of Watershed Master Plan, COS and Chatham County are completing a Sea Level Rise Plan; Contractor is developing stormwater models based on the City and County's stormwater GIS layers; Phase one has been completed and was presented to the Coastal GA user Group, City Engineering, and Mayor

8 Plan Adoption

Requirement §201.6(c)(5): [The plan shall include] documentation that the plan has been formally approved by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

The purpose of formally adopting this plan is to secure buy-in from the City of Savannah, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 of the 10-step planning process: Adopt the Plan, in accordance with the requirements of DMA 2000. The City Council has adopted the Floodplain Mitigation Plan by passing a resolution. A copy of the executed resolution will be shown below.

9 Plan Implementation and Maintenance

Requirement §201.6(c)(4): [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.

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This is Planning Step 10 of the 10-step planning process. This section provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

9.1 IMPLEMENTATION

Once adopted, the plan must be implemented in order to be effective. While this plan contains many worthwhile actions, the City of Savannah will need to decide which action(s) to undertake first. The priority assigned the actions in the planning process and funding availability will affect that decision. Low or no-cost actions most easily demonstrate progress toward successful plan implementation.

An important implementation mechanism that is highly effective and low-cost is incorporation of the hazard mitigation plan recommendations and their underlying principles into other plans and mechanisms, such as the City's Comprehensive Plan and Stormwater Management Plan. The City of Savannah already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms.

Mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government. Implementation will be accomplished by adhering to the schedules identified for each action and through constant, pervasive, and energetic efforts to network and highlight the multi-objective, win-win benefits to each program and the Savannah community. This effort is achieved through the routine actions of monitoring agendas, attending meetings, and promoting a safe, sustainable community. Additional mitigation strategies could include consistent and ongoing enforcement of existing policies and vigilant review of programs for coordination and multi-objective opportunities.

Simultaneous to these efforts, it is important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the more costly recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the City will be in a position to capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

Responsibility for Implementation of Goals and Activities

The elected officials and officials appointed to head each department within the City are charged with implementation of various activities in the plan. During the quarterly reviews as described later in this section, an assessment of progress on each of the goals and activities in the plan will be determined and noted. At that time, recommendations will be made to modify timeframes for completion of activities,

funding resources, and responsible entities. On a quarterly basis, the priority standing of various activities may also be changed. Some activities that are found not to be doable may be deleted from the plan entirely and activities addressing problems unforeseen during plan development may be added.

9.1.1 Role of FMPC in Implementation, Monitoring and Maintenance

With adoption of this plan, the City of Savannah will be responsible for the plan implementation and maintenance. The FMPC Steering Committee identified in Appendix B will reconvene quarterly each year to ensure mitigation strategies are being implemented and the City continues to maintain compliance with the NFIP. As such, Savannah agrees to continue its relationship with the FMPC Steering Committee and:

- Act as a forum for hazard mitigation issues;
- Disseminate hazard mitigation ideas and activities to all participants;
- Pursue the implementation of high-priority, low/no-cost recommended actions;
- Ensure hazard mitigation remains a consideration for community decision makers;
- Maintain a vigilant monitoring of multi-objective cost-share opportunities to help the community implement the plan's recommended actions for which no current funding exists;
- Monitor and assist in implementation and update of this plan;
- Report on plan progress and recommended revisions to the Town Council; and
- Inform and solicit input from the public.

The primary duty is to see the plan successfully carried out and report to the City Council, GEMA, FEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about hazard mitigation, passing concerns on to appropriate entities, and posting relevant information on the City's website (and others as appropriate).

9.2 MAINTENANCE

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized.

9.2.1 Maintenance Schedule

The City of Savannah's Floodplain Administrator is responsible for initiating plan reviews. In order to monitor progress and update the mitigation strategies identified in the action plan, Savannah will revisit this plan quarterly and following a hazard event. The City will submit a five-year written update to GEMA and FEMA Region IV, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be fully approved and adopted in 2021, the next plan update for the City will occur in 2026.

9.2.2 Maintenance Evaluation Process

Evaluation of progress can be achieved by monitoring changes in vulnerabilities identified in the plan. Changes in vulnerability can be identified by noting:

- Decreased vulnerability as a result of implementing recommended actions;
- Increased vulnerability as a result of failed or ineffective mitigation actions; and/or
- Increased vulnerability as a result of new development (and/or further annexation).

Updates to this plan will:

- Consider changes in vulnerability due to action implementation;
- Document success stories where mitigation efforts have proven effective;

- Document areas where mitigation actions were not effective;
- Document any new hazards that may arise or were previously overlooked;
- Incorporate new data or studies on hazards and risks;
- Incorporate new capabilities or changes in capabilities;
- Incorporate growth and development-related changes to infrastructure inventories; and
- Incorporate new action recommendations or changes in action prioritization.

Changes will be made to the plan during the update process to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed as well during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the plan will be by written changes and submissions, as is appropriate and necessary, and as approved by the City Council. In keeping with the five-year update process, the FMPC will convene public meetings to solicit public input on the plan and its routine maintenance and the final product will be adopted by the City Council.

Specifically, the City will adhere to the following process for the next update of this FMP:

Quarterly Plan Review Process

For the 2026 flood mitigation plan update review process, the City's Floodplain Administrator, on behalf of the City Council, will be responsible for facilitating, coordinating, and scheduling reviews and maintenance of the plan. The review of the Floodplain Mitigation Plan will normally occur on a quarterly basis each year and will be conducted as follows:

- The City's Floodplain Administrator will place an advertisement in the local newspaper advising the public of the date, time, and place for each quarterly review of the plan and will be responsible for leading the meeting to review the plan.
- Notices will be mailed to the members of the Steering Committee/FMPC, federal, state, and local agencies, non-profit groups, local planning agencies, representatives of business interests, neighboring communities, and others advising them of the date, time, and place for the review.
- City officials will be noticed by email and telephone or personal visit and urged to participate.
- Members of the City's Planning Commission and other appointed commissions and groups will also be noticed by email and either by telephone or personal visit.
- Prior to the review, department heads and others tasked with implementation of the various activities will be queried concerning progress on each activity in their area of responsibility and asked to present a report at the review meeting.
- The local news media will be contacted and a copy of the current plan will be available for public comment.
- After the review meeting, minutes of the meeting and a quarterly report will be prepared by the Steering Committee/FMPC and forwarded to the news media (public) and the ISO/CRS specialist for the CRS program. The report will also be presented to the City Council for review, and a request will be made that the Council take action to recognize and adopt any changes resulting from the review.

Criteria for Quarterly Reviews

The criteria recommended in 44 CFR 201 and 206 will be utilized in reviewing and updating the plan. More specifically, the quarterly reviews will include the following information:

- Community growth or change in the past quarter.
- The number of substantially damaged or substantially improved structures by flood zone

- The renovations to public infrastructure including water, sewer, drainage, roads, bridges, gas lines, and buildings.
- Natural hazard occurrences that required activation of the Emergency Operations Center (EOC) and whether or not the event resulted in a presidential disaster declaration.
- Natural hazard occurrences that were not of a magnitude to warrant activation of the EOC or a federal disaster declaration but were severe enough to cause damage in the community or closure of businesses, schools, or public services.
- The dates of hazard events descriptions.
- Documented damages due to the event.
- Closures of places of employment or schools and the number of days closed.
- Road or bridge closures due to the hazard and the length of time closed.
- Assessment of the number of private and public buildings damaged and whether the damage was minor, substantial, major, or if buildings were destroyed. The assessment will include residences, mobile homes, commercial structures, industrial structures, and public buildings, such as schools and public safety buildings.
- Review of any changes in federal, state, and local policies to determine the impact of these policies on the community and how and if the policy changes can or should be incorporated into the Floodplain Mitigation Plan. Review of the status of implementation of projects (mitigation strategies) including projects completed will be noted. Projects behind schedule will include a reason for delay of implementation.

9.2.3 Incorporation into Existing Planning Mechanisms

Another important implementation mechanism that is highly effective and low-cost is incorporation of the Floodplain Mitigation Plan recommendations and their underlying principles into other City plans and mechanisms. Where possible, plan participants will use existing plans and/or programs to implement hazard mitigation actions. As previously stated, mitigation is most successful when it is incorporated into the day-to-day functions and priorities of government and development. As described in this plan's capability assessment, the City of Savannah already implements policies and programs to reduce losses to life and property from hazards. This plan builds upon the momentum developed through previous and related planning efforts and mitigation programs and recommends implementing actions, where possible, through these other program mechanisms. These existing mechanisms include:

- MPC Comprehensive Plan (Chatham County-Savannah Comprehensive Plan)
- City Emergency Operations Plans
- City ordinances
- Chatham-County Multi-Jurisdictional Hazard Mitigation Plan
- Flood/stormwater management/master plans
- Other plans, regulations, and practices with a mitigation focus

Those involved in these other planning mechanisms will be responsible for integrating the findings and recommendations of this plan with these other plans, programs, etc, as appropriate. As described in Section 9.1 Implementation, incorporation into existing planning mechanisms will be done through the routine actions of:

- Monitoring other planning/program agendas;
- Attending other planning/program meetings;
- Participating in other planning processes; and
- Monitoring community budget meetings for other community program opportunities.

The successful implementation of this mitigation strategy will require constant and vigilant review of existing plans and programs for coordination and multi-objective opportunities that promote a safe, sustainable community.

Efforts should continuously be made to monitor the progress of mitigation actions implemented through other planning mechanisms and, where appropriate, their priority actions should be incorporated into updates of this hazard mitigation plan.

9.2.4 Continued Public Involvement

Continued public involvement is imperative to the overall success of the plan's implementation. The update process provides an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. The plan maintenance and update process will include continued public and stakeholder involvement and input through attendance at designated committee meetings, web postings, press releases to local media, and through public hearings.

Public Involvement Process for Quarterly Reviews

The public will be noticed by placing an advertisement in the newspaper specifying the date and time for the review and inviting public participation. The FMPC/Steering Committee, local, state, and regional agencies will be notified and invited to attend and participate.

Public Involvement for Five-year Update

When the FMPC reconvenes for the update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the Steering Committee and HMPC plan to identify a public outreach subcommittee, which will be responsible for coordinating the activities necessary to involve the greater public. The subcommittee will develop a plan for public involvement and will be responsible for disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held and public comments will be solicited on the plan update draft. The subcommittee will also coordinate this public outreach process with the public information program established pursuant to the 2017 guidelines from the Community Rating System (CRS).

Appendix A Program for Public Information

Appendix B Planning Process

B.1 PLANNING STEP 1: ORGANIZE TO PREPARE THE PLAN

Table B.1 – FMPC Meetings

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders 3) Introduction to hazard identification	October 24, 2020 10:00am	Zoom Video Conference Call
FMPC #2	1) Review Goals from 2015 FMP 2) Develop Goals and Objectives for FMP update 3) Overview of Program for Public Information (PPI) progress	February 9, 2021 2:00pm	Zoom Video Conference Call
FMPC #3	1) Review/discussion of Flood Risk and Vulnerability Assessment (Assess the Hazard and Assess the Problem) 2) Finalize Goals and Objectives	March 5, 20201 2:00pm	Zoom Video Conference Call
FMPC #4	1) Review/status of existing Mitigation Strategies 2) Development of new/updated Mitigation Strategies 3) Review Draft Plan	August 11, 2021 10:30 AM	Microsoft Teams Video Conference

FMPC Meetings were open to the public. Meeting notices were posted on the City's website.

B.1.1 FMPC Meeting Agendas, Minutes, and Attendance Records

FMPC Meeting 1: October 14, 2020

City of Savannah Flood Mitigation Plan Update and PPI Planning Process
FMPC Meeting 1 – Wednesday, October 14, 2020, 10:00-11:30 a.m.
Zoom Video Conference Call

David Stroud from Wood, the consultant supporting the City through this planning process, facilitated the meeting as follows:

Introductions

- Tom McDonald, City of Savannah,
- Jessica Thompson, City of Savannah, Development Services – GIS Analyst
- Dave Donnelly, City of Savannah – Emergency Management Director
- Diane Clabo, Retired City of Savannah Department Head with Real Property Services
- Jackie Jackson, Chatham County-Savannah Metropolitan Planning Commission – Resiliency and Environmental Planner
- Jeff Brady, Brady Insurance – Insurance Agent
- Justin Pratt, Savannah Chatham BOE – Emergency Manager
- Kelsey Vaneyl Godin, American Red Cross
- Vic Sasser, Bank South Mortgage – Mortgage Lender
- Zack Hoffman, City of Savannah Stormwater Management
- Gloria Williams, Neighborhood Association

Overview of the CRS Program

David provided an overview of the CRS program. The three primary goals of the program are to 1) reduce and avoid flood damage to insured buildings, 2) strengthen and support the insurance aspects of the NFIP, and 3) foster comprehensive floodplain management. The CRS program is governed by the Coordinator's Manual, which breaks the program into four main series of activities: 300 Public Information, 400 Mapping and Regulations, 500 Flood Damage Reduction, and 600 Warning and Response. Within these four series there are 19 Activities which include 94 Elements of Credit.

Currently, there are 1,522 CRS Communities. In Georgia, CRS communities are clustered around the Atlanta Metro area and along the coast. Typically, participating communities have a large policy base, which increases the financial benefits.

In Savannah, the current Class 5 rating provides a 25% reduction in flood insurance premiums, which averages $102 per policy (or $330 per policy in the SFHA). This equates to a total savings of $673,395. An increase to a Class 4 rating would provide a $121 per policy discount ($395 per policy in the SFHA) totaling $801,065 across the City. This means this money stays in the community, insurance savings offset costs, the community has a better organized program and access to technical assistance, and the public education builds support among the constituency and an incentive to continue participation.

Flood Mitigation Plan Update

Why Plan?

This current planning process involves updating the City's Floodplain Management Plan (worth 382 possible points) and the Repetitive Loss Area Analysis (worth 140 possible points), and developing a Program for Public Information (worth 350 possible points). Together these projects can earn up to 854 possible points. Every 500 points in the CRS program earn a Class increase.

Trends show increasing costs associated with natural disasters. There is greater exposure due to increasing population, buildings, and infrastructure, as well as more frequent and intense storm events resulting in more frequent and costly disaster declarations. Additionally, studies show that mitigation makes financial sense, with an average 6:1 return on investment for mitigation activities.

The Planning Process

The planning process is governed by federal legislation – the Disaster Mitigation Act of 2000 and 44CFR201.6 in the Code of Federal Regulations – which set four phases for the process: Organize Resources, Risk Assessment, Develop a Mitigation Plan, and Adoption and Implementation. Wood blends the DMA phases with the CRS's more robust 10-Step planning process.

Organize Resources

In the FMP planning process, it is critical to capture credit in Step 2 – Involve the public, which amounts to 31% of the total credit for the plan. The average score across the country is 171 points, but Wood will facilitate this process to maximize planning process and public involvement credit. This includes the makeup of the FMPC, which must be 50% City staff and 50% outside stakeholders, and the public involvement plan. Outreach efforts will include public meetings, a public survey, and stakeholder outreach.

Risk Assessment

The risk assessment will cover all flood hazards that impact the City of Savannah, including riverine and coastal flood, hurricane and storm surge, localized stormwater flooding, and other related hazards. The updated risk assessment will also include the

Mitigation Strategy

The FMPC will need to review and update the Goals and Objectives from the previous plan. The committee will also need to review mitigation alternatives across all six FEMA mitigation categories: Prevention, Property Protection, Natural Resource Protection, Emergency Services, Structural Projects, and Public Information.

Adopt the Plan

Once the plan is complete, it must be formally adopted and the FMPC must continue regular reviews of the plan. Annual reviews are required, but David recommends meeting quarterly, which provides 24 points of credit and also supports improved implementation of the plan.

Program for Public Information

A PPI is an ongoing local effort to identify, prepare, implement and monitor a range of public information activities that help educate the public on the flood risks. The PPI must also be developed under the guidance of a committee, so it is beneficial to develop it alongside an FMP so that the FMPC can oversee the development of both plans. David provided an overview of the PPI and the planning process as follows:

Step 1 – Establish a PPI Committee

The PPI committee (FMPC) requires participation from insurance, real estate, and banking stakeholders as well as City representation from the Floodplain Manager and Public Information Officer.

The FMPC must assess the City's Public Information needs. David reviewed the City's primary flood hazards: climate change and sea level rise, coastal/canal bank erosion, dam/levee failure, 100-year

flood, stormwater/localized flood, and hurricane and storm surge. David emphasized stormwater flooding as a particular issue for the City. Dave Donnelly noted that the City owns a raw water storage impoundment in Port Wentworth, which would not affect the City of Savannah but would impact Port Wentworth residents if it would fail. David agreed that it should be included in this PPI process to improve outreach regarding that risk.

Step 2 – Assess Community's Public Information Needs

The FMPC needs to identify Priority Areas for outreach. Targeting outreach to a priority area increases the CRS credit points for the outreach effort and ensures information reaches individuals who need it most. David suggested the SFHA, Repetitive Loss Areas, areas of localized stormwater flooding, or the entire community. The City already does a direct mailing to the SFHA and Repetitive Loss Areas, so this effort could be incorporated easily into the PPI. Including "Insurance, Real Estate, and Lending Agents" as a Target Area/Audience can also build off existing efforts, since a letter is already sent annually to this group.

This step also involves assessing flood insurance coverage to understand the distribution of policies, policy types, and where there may be gaps in insurance.

Additionally, the FMPC must determine Priority Audiences, or people who need different types of flood-related information. David suggested renters, non-English speaking residents, tourists, vulnerable populations, the business community, landscapers, and contractors as examples.

Lastly, the FMPC will inventory existing public outreach efforts in order to understand what information is already being conveyed, what can be incorporated into the PPI, and what gaps in information exist.

Step 3 – Formulate Messages

The FMPC will decide on four additional topics and the messages to convey within these topics.

Step 4 – Identify Outreach Projects to Convey the Messages

The FMPC will identify outreach projects as well as responsible parties, timelines for implementation, and stakeholder that can support outreach.

Step 5 – Examine Other Public Information Initiatives

This step involves an inventory of other CRS-related activities that involve public information and how to improve outreach for these efforts.

Step 6 – Prepare the PPI

Wood will develop a document detailing the City's PPI. This document must be adopted by the governing body.

Step 7 – Implement, Monitor, and Evaluate the Program

The FMPC must review the PPI annually and complete an update every five years.

Discussion

David asked the FMPC for their input on the Priority Areas and Priority Audiences.

Jeff Brady asked about the rollout of Risk Rating 2.0 next October and whether there is a need to address it in this effort because there are many questions about it and it will drastically change insurance and risk rating. David noted that while Risk Rating 2.0 will attempt to remove the "line on the

map" to delineate flood risk and instead provide true risk, but it is still unclear specifically how those changes will be implemented.

Jessica Thompson noted that the Mayor's office has established three task forces that may be able to support dissemination of information.

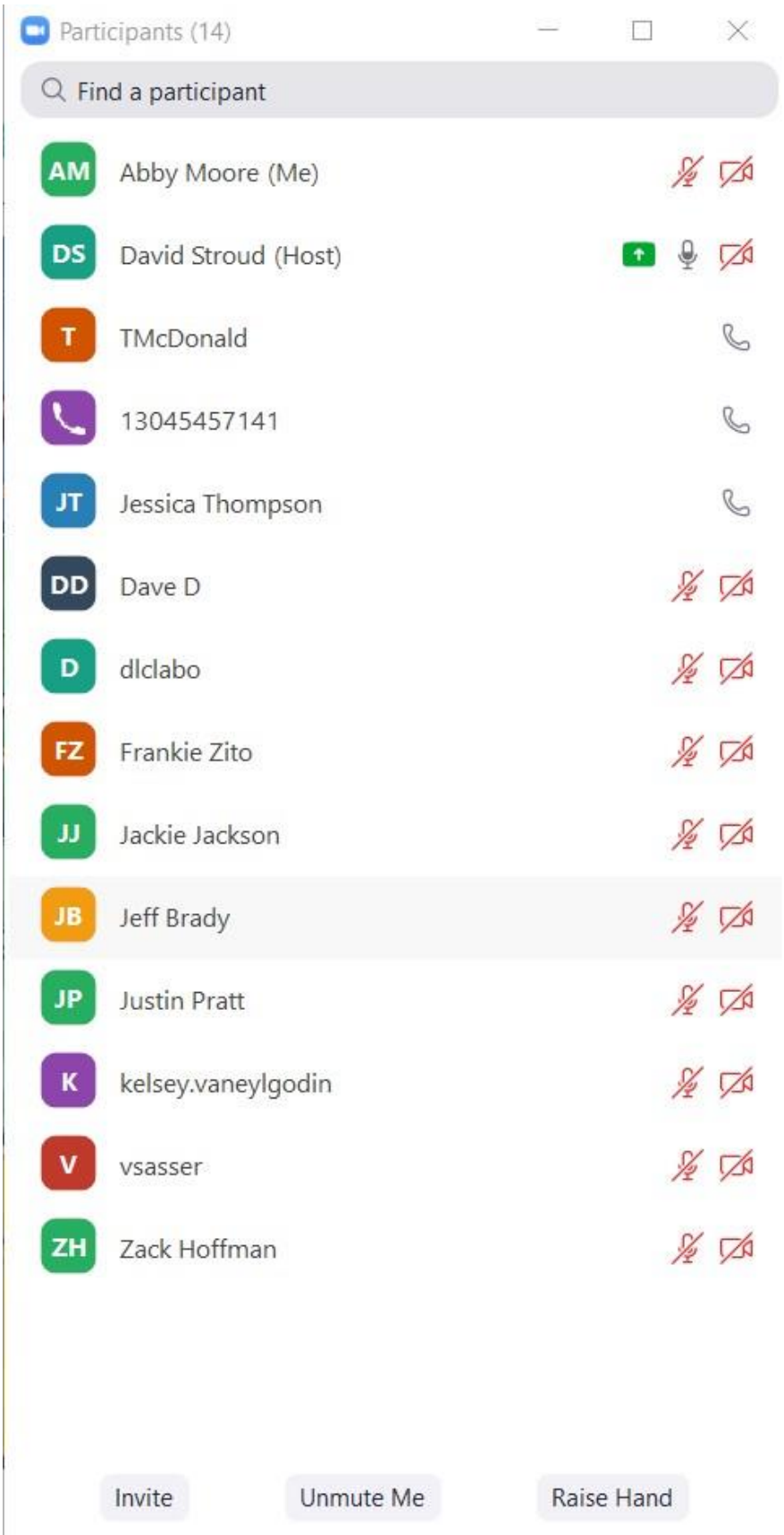
Jackie Jackson agreed that we need to target the Spanish-speaking population and that there are groups that may be able to support outreach efforts. She also noted the communities of East and West Savannah needing targeted outreach – some of these areas are in the SFHA, but the entire communities should receive outreach. Jackie also asked about outreach to the visually impaired, such as providing an optional version for print media.

Next Steps

David noted we will get a page set up on the City's website to provide meeting materials and continue coordination throughout the planning process.

Dave Donnelly asked about the survey and how to share it online. He also suggested using NextDoor to reach out to residents.

Jackie Jackson noted that the MPC is in the process of updating the Comprehensive Plan and suggested coordinating on the surveys to share results and also ensure that the survey requests to residents are staggered.


Participants (14)
Find a participant
AM Abby Moore (Me)
DS David Stroud (Host)
T TMcDonald
13045457141
JT Jessica Thompson
DD Dave D
D dlclabo
FZ Frankie Zito
JJ Jackie Jackson
JB Jeff Brady
JP Justin Pratt
K kelsey.vaneylgodin
V vsasser
ZH Zack Hoffman
Invite
Unmute Me
Raise Hand

FMPC Meeting 2: February 9, 2021

City of Savannah Flood Mitigation Plan Update and PPI Planning Process
FMPC Meeting 2 – Tuesday, February 9, 2021, 2 - 3:30 p.m.
Zoom Video Conference Call

Attendance

- Tom McDonald, City of Savannah,
- Jessica Thompson, City of Savannah, Development Services – GIS Analyst
- Dave Donnelly, City of Savannah – Emergency Management Director
- Diane Clabaugh, Retired City of Savannah Department Head with Real Property Services
- Jackie Jackson, Chatham County-Savannah Metropolitan Planning Commission – Resiliency and Environmental Planner
- Jeff Brady, Brady Insurance – Insurance Agent
- Kelsey VanEyl-Godin, American Red Cross
- Zack Hoffman, City of Savannah Stormwater Management
- Gloria Williams, Neighborhood Association
- Chris Tolleson, Savannah Citizen
- Christopher Parrish, Savannah Public Information Officer
- Laura Walker, Savannah Office of Sustainability

David Stroud from Wood, the consultant supporting the City through this planning process, facilitated the meeting according to the following agenda:

- Where we are in the FMP process
- Review and Update Goals and Objectives (FMP/PPI)
- Where we are in the PPI process
    - PPI steps 3, 4, 5
- Review of Target Areas and Audiences
- Decide on four (4) additional outreach topics
- Inventory of existing outreach projects and other public information Initiatives
- Development of Outreach Projects
- Open discussion/Project brainstorming

FMP Planning Process

David updated the FMPC on where the consultants are in the Planning Process. Wood had some initial difficulty obtaining the data necessary to update the FMP, particularly foundation type. Wood has since obtained all the data needed with the help of the Chatham County Assessor's office and can now run this data through FEMA's Hazus program to obtain a more detailed Level 2 output. Wood is in the process of completing the Hazard Identification and Risk Assessment. This portion of the plan has three sub-elements: identifying the hazards, inventorying assets, and assessing vulnerability. The results of this process will be presented at the next meeting, likely in March. During meeting 2, Wood will work with the community to update the FMP's goals and objectives.

FMP Goals

David first presented the goals and objectives of the existing FMP, which are listed below:

- **Goal 1: Expand the City's flood hazard communication and outreach program**

  - Objective 1.1: Engage the Chatham County Schools to develop a flood mitigation curriculum
  - Objective 1.2: Demonstrate the flood model to school students at science nights.
  - Objective 1.3: Evaluate the City's flood hazard outreach program through development of a CRS Program for Public Information
  - Objective 1.4: Encourage residents to assume an appropriate level of responsibilities for their own flood protection
- **Goal 2: Reduce damage to insurable buildings in repetitively flooded areas**
  - Objective 2.1: Prioritize stormwater management projects that target repetitive loss areas
  - Objective 2.2: Develop a property buyout master plan to identify and purchase repetitive loss properties.
  - Objective 2.3: Recommend purchase of flood insurance and use of Increased Cost of Compliance (ICC) provision to mitigate flood damage.
- **Goal 3: Protect critical and essential facilities from flood damage**
  - Objective 3.1: Prioritize critical and essential facilities in need of protection from flood damage.
  - Objective 3.2: Provide 100- and 500-year flood protection to critical and essential facilities for dry land access.
  - Objective 3.3: Leverage emergency management and other funding sources to retrofit critical facilities
- **Goal 4: Reduce damage to development through flood resilient strategies and measures**
  - Objective 4.1: Encourage a no adverse impact approach to reduce damage to existing development.
  - Objective 4.2: Consider increasing riparian impervious surface setbacks to help protect the natural and beneficial functions of the floodplain.
  - Objective 4.3: Purchase vulnerable lands through available funding mechanisms to protect development and provide park and recreation opportunity for residents.
  - Objective 4.4: Improve building checklist and technical review process to ensure buildings are constructed in accordance with the flood damage prevention ordinance and meet appropriate insurance standards
  - Objective 4.5: Prioritize capital improvement projects to address areas where poor drainage causes substantial flooding.
  - Objective 4.6: Encourage the location of development outside of areas of special flood hazard (100-year flood zone) and provide standards to minimize public and private losses due to flood conditions in areas of special flood hazard.

David noted that the existing goals read more like objectives and the existing objectives more like actions He recommended the FMPC choose 3 to 4 broad based goals with associated objectives; projects determined later in the FMP process would be nested under these goals and objectives. David also noted that these goals should remain consistent with the goals of the Chatham County FMP and HMP. David recommended a set of three goals:

- **Goal 1: Protect the public health, safety, and welfare of Savannah residents from flood hazards**

  - Objective 1.1: Protect critical and essential facilities from flood damage
  - Objective 1.2: Reduce damage to development through flood resilient strategies and measures
  - Objective 1.3: Preserve open space areas, especially sensitive natural areas
- **Goal 2: Holistically address repetitive loss areas**
  - Objective 2.1: Reduce number of repetitively flooded structures.
  - Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
  - Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.
  - Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.
- **Goal 3: Enhance flood related public education and outreach efforts**
  - Objective 3.1: Expand the City's flood hazard communication and outreach program
  - Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties
  - Objective 3.3: Develop partnerships with local schools to provide flood education to students.
  - Objective 3.4: Educate the public on the stormwater management techniques and the benefits of acknowledging water as a resource.

The FMPC extensively discussed these goals, the discussion went as follows:

Dave Donnelly: Does Savannah have any severe repetitive loss (SRL) properties? Should these be reflected in the goals? David noted that there are SRL properties in Savannah, but they are included in the repetitive loss properties and are therefore included under goal 2. SRL properties differ from RL properties in the value of loss or number of losses. These claims are managed by the National program rather than by local insurance agents.

Tom McDonald: Where does Sea Level Rise come into play? David noted that it could fall as an objective under Goal 1; **Jackie Johnson** agreed that it needed to be included and would be successful as a stand-alone goal, especially given forthcoming local resolutions. Chris Parrish agreed. David (Wood) recommended a Climate Change goal with associated objectives including SLR and other climate change impacts such as more intense storms. There was agreement, but hesitation with use of the term Climate Change. Wood proposes the following goal and objectives to address this discussion:

Goal 4: Monitor projections for changing future conditions and implement plans, policies, and property protection to reduce potential damages.

- Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
- Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
- Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

It was asked whether Objective 1.2 relates to only new development. David noted that this includes existing and new development as well as renovations. The City should address the existing problems and plan to avoid additional flood problems in the future.

It was recommended to add an objective under Goal 2 relating to policy in RL areas.

Jessica Thompson recommended including establishing demonstration sites for mitigation techniques. Water as a resource: water harvesting, permeable surfaces, curb cuts into native vegetation basin to Goal 3. David noted that the stormwater management perspective is important, will include an objective related to educating the public on stormwater management techniques and water as a resource.

PPI Goals

David explained to the FMPC that the PPI goals are distinct from the FMP goals. The recommended PPI goals are as follows:

- **Goal 1: Recognize the risk associated with flooding and what individuals can do to reduce damage to property and save lives.**
- **Goal 2: Promote the purchase of flood insurance to ensure greater protection of property within the City.**
- **Goal 3: Increase the preparedness capability of the public to respond to and recover from flood events.**

There were no comments regarding the PPI goals.

PPI Process

The goal of the PPI is to identify the outreach needs for the City of Savannah and potential projects that can be undertaken to meet those needs and ensure the public is aware of their options for mitigation. Wood is currently working through Steps 2, 3, and 5 of the PPI process. Details on the steps are available in the presentation from this meeting.

Target Areas and Target Audiences

David went through the recommended target areas and target audiences with the FMPC and noted that the group needed to decide on one to two more for each. The target areas and audiences are as follows:

Target Areas:

- Special Flood Hazard Area (Zones A, AE, and V)
- Repetitive Loss Areas (including RL and SRL properties)
- Real Estate, Lenders, and Insurance (Area and Audience) –
    - For Activity 320 (Map Information Service) the City is required to notify at least the real estate agents, mortgage brokers, lenders, and insurance agents within Savannah that they have a map information program, and the City can provide information from the FIRM; this group is included as an area to piggy back off of an existing program.
- Areas of Localized Stormwater Flooding
    - The group discussed potential additional target areas including East/West Savannah – two communities that have known flooding issues and lower income populations that tend to be more impacted by flooding. These areas are difficult to define. The group determined that they are generally areas of localized stormwater flooding. Wood will work with Tom to define these areas.

Target Audiences:

- **Target Audience 1: Spanish Speaking Population** – this group was mentioned in the first meeting and will be targeted in this PPI.

- **Target Audience 2: Elderly Population** – residents 65 and older make up 13% of the City's population. These residents may have unique information needs.
- **Potential Target Audience: Landscapers and Contractors –** David noted that landscapers often dump leaves and other clippings down storm drains and contractors may not know the requirements of the NFIP, such as the elevation of HVAC units. FMPC members noted that they have been working to contact these groups for many years.
    - Wood has already developed brochures for landscapers and contractors that could be adapted for the City of Savannah and used in concert with City outreach materials. The group mentioned mirror hangers for contractors and landscapers to keep in their work vehicles.
- **Potential Target Audience: Tourists –** Savannah is a known tourist destination; tourists, however, are less likely to understand the flood hazards in the City. This group is more difficult to reach.
    - Laura Walker asked what the PPI projects would try to convey to tourists as an audience. David noted that it could be messaging such as not driving through flooded streets; the group noted that resources are limited to target this sort of group.
- **Potential Target Audience: Renters –** Over 55% of occupied housing units in the City are renter occupied. This group is also more difficult to reach.
- **Potential Target Audience: Homeowners Associations –** There are multiple homeowners' associations throughout Savannah that could be leveraged to distribute flood hazard and mitigation information to members.

Messages and Outcomes

CRS requires 6 primary topics to be covered by the PPI; each topic needs associated messages and outcomes. The 6 primary topics are below, and the messages and outcomes devoted to each topic are included in the meeting presentation:

- Know your flood hazard
- Insure your property
- Protect yourself and your family
- Protect your property from the hazard
- Build Responsible
- Protect natural floodplain functions

David noted that the committee would need to choose 4 additional topics, the group agreed on the following:

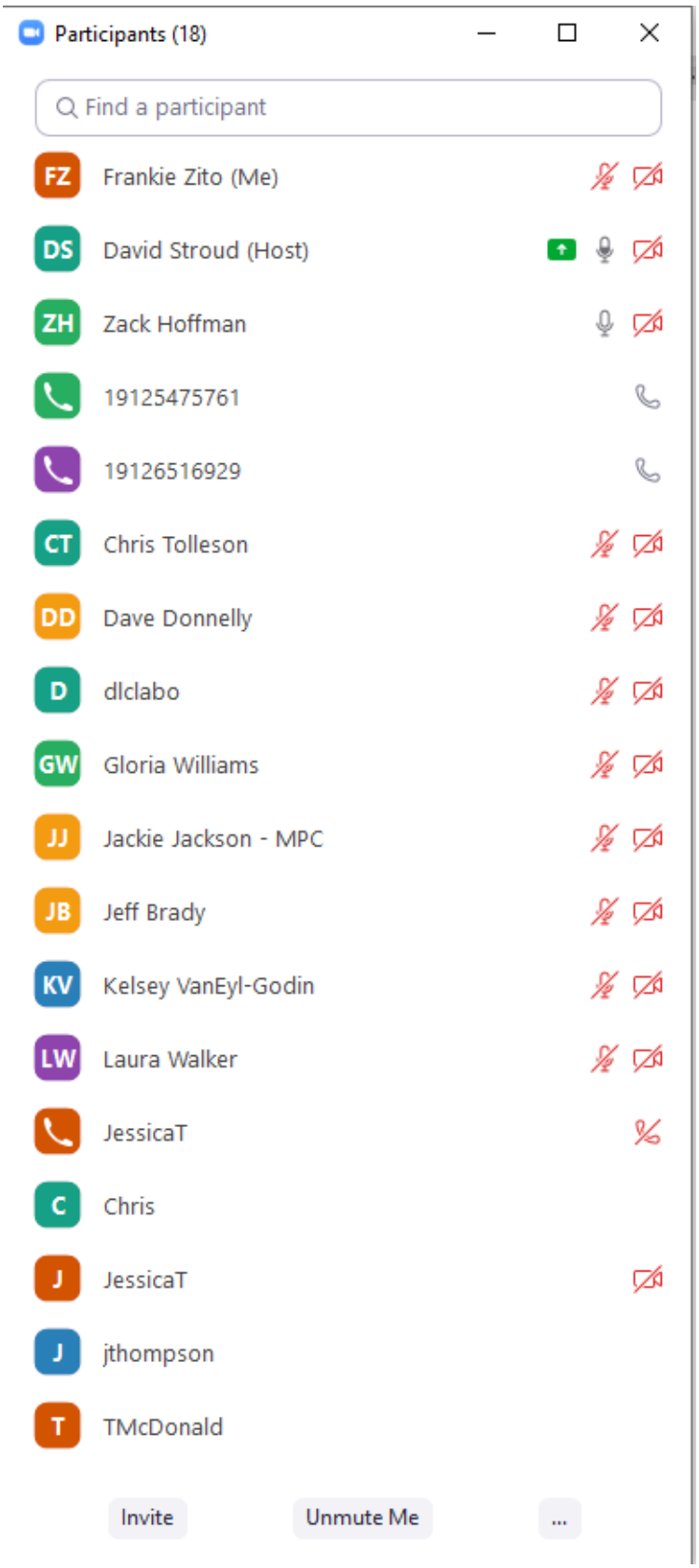
- **General preparedness** – Dave Donnelly noted this might include messaging such as "Get a Plan, Get a Kit, Be Informed)
- **Flood education** – Kelsey VanEyl-Godin offered that the Red Cross already had several presentations that could be adapted for this topic, including a program for adults and two programs for children of varying ages. David noted that such a project would receive extra points for involving a stakeholder (such as the Red Cross) or using stakeholder information
- **Reducing stormwater runoff** – This topic is important across the City; message might include that reducing stormwater runoff on your own property using various means can have a collective impact on overall localized flooding, recharges groundwater, and supports tree roots, etc.
- **Buy flood insurance in low-risk zones –** The group agreed that this topic should be included; especially making sure homeowners outside of the SFHA are protected from stormwater and

localized flooding. The messages and outcomes for this topic should tie in the financial benefits of mitigation.

To end the meeting, David reminded the group that an important part of the PPI is leveraging outside stakeholders. By including stakeholder information as part of a project or including them in the implementation of the project, Savannah can earn extra credits. Stakeholder involvement in a PPI project provides a 30% credit impact.

Next Steps

1) Review the goals and objectives listed in this document; send any comments or recommendations to Frankie Zito at francesca.zito@woodplc.com by **Thursday, February 25th.**
2) Review the recommendations for target audiences and send feedback to Frankie by **Thursday, February 25th.**
3) Publicize the public meeting, scheduled for **Tuesday, February 16th at 5pm.** Interested participants can email Frankie for the zoom link.


Participants (18)
Find a participant
FZ Frankie Zito (Me)
DS David Stroud (Host)
ZH Zack Hoffman
19125475761
19126516929
CT Chris Tolleson
DD Dave Donnelly
D dlclabo
GW Gloria Williams
JJ Jackie Jackson - MPC
JB Jeff Brady
KV Kelsey VanEyl-Godin
LW Laura Walker
JessicaT
C Chris
J JessicaT
J jthompson
T TMcDonald
Invite
Unmute Me
...

FMPC Meeting 3:

City of Savannah Flood Mitigation Plan Update and PPI Planning Process
Floodplain Management Planning Committee (FMPC) Meeting 3
Wednesday, May 5, 2021, 2-3:30 p.m. via Zoom Video Conference Call

Attendance

- Tom McDonald, City of Savannah, Development Services – Permitting & Floodplain Manager
- Dave Donnelly, City of Savannah – Emergency Management Director
- Chris Tolleson, Savannah Citizen
- Jessica Thompson, City of Savannah, Development Services – GIS Analyst
- Diane Clabo, Retired City of Savannah Director of Property Development
- Gloria Williams, Neighborhood Association
- Corey Kemp, GEMA – Risk Reduction Specialist for Southeast Georgia
- Justin Pratt, Savannah-Chatham Public Schools – Emergency Management Coordinator
- Kelsey VanEyl-Godin, American Red Cross
- Jackie Jackson, Chatham County-Savannah Metropolitan Planning Commission – Director of Advance Planning and Special Projects
- Zack Hoffman, City of Savannah – Stormwater Director
- Laura Walker, Savannah Office of Sustainability
- Jared Lopes, USACE

David Stroud and Frankie Zito from Wood, the consultants supporting the City through this planning process, facilitated the meeting according to the following agenda:

- Floodplain Management Plan
    - Review the Hazard Identification & Risk Assessment
        - Identified Hazards
        - Past Events
        - Asset Inventory
        - PRI Methodology
        - Hazard Profiles
    - Finalize Goals & Objectives
- Program for Public Information
    - Finalize Target Areas & Audiences
    - Other Public Information Efforts

David began the meeting by asking all attendees to introduce themselves.

Hazard Identification & Risk Assessment (HIRA) – Identified Hazards

David presented the hazards included and evaluated in the Flood Mitigation Plan, with a summary of each hazard's Priority Risk Index (PRI) score and overall risk rating based on those PRI scores, as shown below:

Hazard	PRI Score	PRI Rating
Climate Change and Sea Level Rise	2.7	Moderate
Coastal/Canal Bank Erosion	1.6	Low
Dam/Levee Failure	1.7	Low
Flood: 100-/500-year	3.4	High
Flood: Stormwater/Localized	3.3	High
Hurricane and Tropical Storm (including Storm Surge)	3.0	High

HIRA – PRI Methodology

The PRI scores are determined by rating each hazard across five weighted criteria: probability, impact, spatial extent, warning time, and duration. These ratings produce a PRI score for each hazard using the following formula:

PRI = (PROBABILITY X .30) + (IMPACT X .20) + (SPATIAL EXTENT X .20) + (WARNING TIME X .10) + (DURATION X .10)

HIRA – Past Events

Frankie presented a summary of past flood events from NOAA's NCEI database. NCEI reports Hurricanes Irma and Matthew as Tropical Storms; however, the impacts were more on the scale of a hurricane and the Chatham County Hazard Mitigation Planning Committee noted these hazards as hurricanes in the 2020 HMP.

- Jackie Jackson asked if there is a downside to revising the NCEI data. Jackie and Tom McDonald both recommended reclassifying the NCEI data in the FMP to align with the Chatham County Hazard Mitigation Plan.

Frankie also presented the Disaster Declaration history for flood-related events in Chatham County: there have been four disaster declarations, including two for hurricanes and two for severe storms.

HIRA – Asset Inventory

Frankie presented the asset inventory based on parcel data, which indicates there is over $19 billion in structure and contents value exposure throughout the City. Over $10 million is residential. Frankie also presented a summary table of the critical facilities by type. While 70 facility locations were provided by the City, some of these buildings were considered together as single facilities for the purpose of the risk assessment. Details on how critical facilities were classified can be found in the HIRA draft.

HIRA – Hazard Profiles

Climate Change & Sea Level Rise (Moderate Risk)

- USACE projects range from 1.06 ft to 5.38 ft of sea level rise from 1992 to 2100. The intermediate projection is 2.09 ft.
- Areas along City of Savannah have a moderate Coastal Vulnerability Index (CVI), but some more coastal areas that provide protection to the City of Savannah have a High or Very High CVI score.

Coastal/Canal Bank Erosion (Low Risk)

- Some areas of erosion are occurring along the Savannah River, Little Ogeechee River, and Vernon River. Other areas are experiencing some accretion.

Dam/Levee Failure (Low Risk)

- Five dams are located within Chatham County per National Inventory of Dams and one additional dam listed in the Georgia Safe Dams Program; three are located in Savannah
- All are low-hazard dams
- There is no data available on inundation areas
- There are no levees that would impact Savannah

Flood: 100-year/500-year (High Risk)

- Over 41% of the City is in the high-risk Special Flood Hazard Area (Zone A, Zone AE, Floodway, Zone VE)
- Estimated damages from the 1% annual change flood event are over $82 million, which equates to a 20% loss ration; FEMA considers a loss ratio above 10% as indicative that a community will have difficulty recovering from the event
- 12 critical facilities are located in the SFHA (Zone AE)
- $980 million in property is located in SFHA and total coverage is $449 million, which exceeds the loss estimate but still indicated that many properties are uninsured
- Four historic districts and one historic cemetery would be impacted by the 1% annual chance flood; two additional historic districts would be impacted by the 0.2% annual chance flood

Stormwater/Localized Flooding (High Risk)

- 214 identified areas of localized flooding throughout the City; 8 areas have been mitigated since the previous plan but 8 new areas have been identified.
- Comparison with repetitive loss areas shows some overlap with localized stormwater flooding

Hurricane & Tropical Storm (High Risk)

- NCEI reports 2 hurricanes, 13 tropical storms, and 3 storm surge events impacting the City from 1996-2020; these events caused over $20 million in property damages.
- Estimated damages by storm surge category show that a Category 3 storm impacts nearly 55% of parcels in Savannah; a Category 5 storm impacts nearly 82% of all parcels
- Only 13 critical facilities are not at risk from a Category 1-5 storm surge.

Frankie asked that if anyone has comments on the data in the plan or the PRI ratings that they submit these comments for consideration and revision to the plan.

FMP Goals & Objectives

Frankie presented the revised goals and objectives that were discussed at the previous FMPC meeting to provide a final opportunity for discussion before considering them finalized. There were no comments.

- **Goal 1: Protect the public health, safety, and welfare of Savannah residents from flood hazards**
  - Objective 1.1: Protect critical and essential facilities from flood damage
  - Objective 1.2: Reduce damage to development through flood resilient strategies and measures
  - Objective 1.3: Preserve open space areas, especially sensitive natural areas
- **Goal 2: Holistically address repetitive loss areas**
  - Objective 2.1: Reduce number of repetitively flooded structures.

  - Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
  - Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.
  - Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.
- **Goal 3: Enhance flood related public education and outreach efforts**
  - Objective 3.1: Expand the City's flood hazard communication and outreach program
  - Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties
  - Objective 3.3: Develop partnerships with local schools to provide flood education to students.
  - Objective 3.4: Educate the public on the stormwater management techniques and the benefits of acknowledging water as a resource.
- **Goal 4: Monitor projections for changing future conditions and implement plans, policies, and property protection to reduce potential damages.**
  - Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
  - Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
  - Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

PPI Outreach Topics

David reviewed the six CRS Priority Topics and the four additional PPI topics chosen by the FMPC at the last meeting:

CRS Priority Topics:

- Know your flood hazard
- Insure your property
- Protect people from the hazard
- Protect your property from the hazard
- Build responsibly
- Protect natural floodplain functions

Four Additional PPI Topics:

- General preparedness
- Flood education
- Reducing stormwater runoff
- Buy flood insurance in low-risk zones

David asked whether the FMPC wanted to continue with general preparedness or focus in on hurricane preparedness:

- David Donnelly suggested that the information might be very similar.
- Jessica Thompson noted that severe weather preparedness would be important to cover because they get a lot of heavy rains.
- Jackie Jackson suggested it would be more effective to cover general preparedness because it allows them to discuss sunny day flooding, tidal flooding, and other flood risks not related to storms. CEMA already covers hurricane preparedness well.

The group decided to maintain general preparedness as the preferred additional topic.

Target Areas and Target Audiences

David reviewed the Target Areas and Target Audiences discussed by the FMPC at the previous meeting:

Target Areas:

1. Special Flood Hazard Area
2. Repetitive Loss Areas
3. Areas of Localized Stormwater Flooding *(removed after meeting discussion)*
4. Real Estate, Lenders, and Insurance

Target Audiences:

1. Spanish Speaking/Non-English-Speaking Population
2. Elderly Population
3. Landscapers and Contractors
4. Real Estate, Lenders, and Insurance

David noted that the SFHA and Repetitive Loss Areas as well as Real Estate, Lenders, and Insurance Agents are already receiving outreach and these efforts can easily piggyback with the PPI. David suggested that areas of localized stormwater flooding are more difficult to define and quantify and it may be difficult to target outreach to this area. David Donnelly agreed that localized stormwater flooding areas could be removed because they can receive general information through the newspaper and the website.

For target audiences, David noted project suggestions for the Spanish-speaking population; landscapers and contractors; and real estate, lending, and insurance agents. He asked whether the FMPC had ideas for how to target the elderly population or if that target audience should be removed:

- Jackie Jackson suggested tapping into resources such as the Housing Authority that can assist in targeting the elderly population. She also suggested that neighborhood associations could support.
- Gloria Williams suggested using senior citizen centers for outreach.
- Kelsey VanEly-Godin also suggested using Meals on Wheels to distribute brochures along with meals.
- Laura Walker suggested adding a page in the new water customer packet.

David asked what existing efforts the City currently has that can be incorporated into the PPI. Tom McDonald noted that his office currently has a six-topic brochure.

David reviewed how the scoring for PPI projects works in order to help the FMPC be strategic in selecting and prioritizing projects. The goal is to have the fewest number of projects for the highest amount of credit in order to maximize the benefit of the City's outreach efforts. David asked about other ideas for projects to include in the PPI:

- Laura Walker asked if the brochure that was mentioned is the one that goes in the Savannah News and if it will be increased from six to ten pages. David explained that the CRS program now encourages short, targeted messaging directing individuals on where to find more information. Wood typically provides tri-fold brochures that cover all ten topics in two pages.
- Dave Donnelly asked about using social media such as NextDoor. EM has a large network on NextDoor and could send out text or a link to all followers. Dave also asked whether there's any benefit to incorporating polls or other interactive elements. David explained that interactive elements or surveys would be for the City's own benefit but wouldn't add to CRS credit.
- Jared Lopes added that there are multiple neighborhood specific Facebook pages in the City.

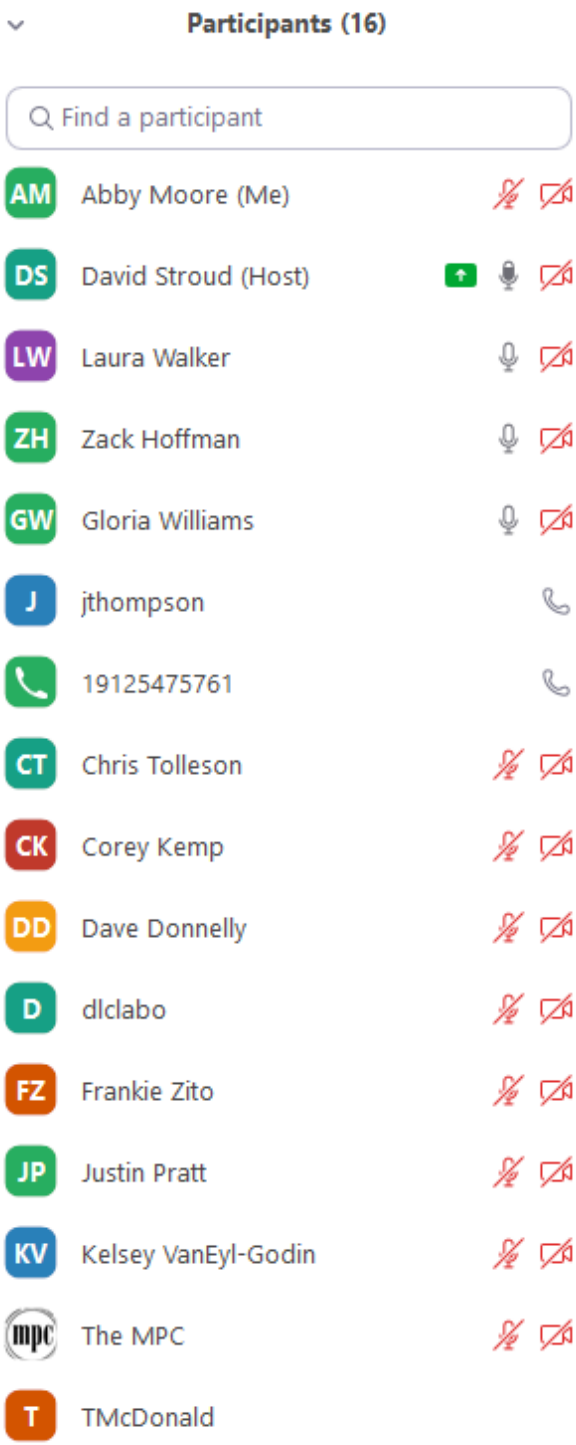
- Laura Walker suggested a QR code that sends someone to the website with the brochure information. That could be used to count the number of hits to the site.
- Laura Walker is developing QR codes distributed at paint stores that tell people how they can properly dispose of their paint; this type of project could also be used for distributing the brochure and home improvement stores could serve as stakeholders.
- The City has no dumping markers on storm drains and manhole covers that could be incorporated as a project. This wouldn't get stakeholder credit but it would get the PPI bonus.
- Jared Lopes shared that bilingual outreach was identified as a concern in the South Atlantic Coastal Study, specific to Chatham County. The Silver Jackets interagency Non-Structural FPMS proposals could be submitted in the future to assist in issues such as outreach and literature and other non-structural based more technical work. David noted that this would be a good effort but all projects including in the PPI must be completed at least annually.
- Jackie Jackson asked if you can get credit for the outreach work that CEMA does. David said that if CEMA does something that benefits the City it could be incorporated in the PPI. The same goes for other agencies or surrounding jurisdictions' outreach efforts, but these projects must reach the City and be completed at least annually.
- Jessica Thompson said that most of the projects sound brochure or announcement related. David clarified that there are three tiers of outreach, direct outreach like a mailing gets the most credit, but you can also give talks, hold meetings, set up a booth at a festival or event, or just post information or brochures.
- Kelsey VanEyl-Godin added that Red Cross has a presentation that they can use for general preparedness and flood education.
- Diane Clabo asked if we know how realtors address the sale of properties that lie within target areas and what information they provide prospective buyers.
- Jackie Jackson asked if outreach/education required for NPDES permits can be used for credit. For example, a general stormwater program committee meeting that the public is invited to participate in. David said that if it covers the topic of Reducing Stormwater Runoff then it could be included and receive credit. Savannah may also be able to tap into efforts of the surrounding cities. David suggested the Cities may be an outside stakeholder but the direct involvement in Savannah's efforts would be more effective and important for outreach.

David also noted that Wood has a number of resources such as FEMA, NFIP, and EPA brochures that can be used for Flood Response Projects.

Next Steps

1) Review the HIRA; send any comments or recommendations to Frankie Zito at francesca.zito@woodplc.com by **Friday, May 28st.**
2) Projects from the previous FMP will be sent out. Review these existing FMP projects and send project status and comments to Frankie by **Friday, June 4th.**
3) Begin thinking about PPI projects that address topics agreed upon and reach the target areas and audiences. A draft PPI will be distributed

FMPC Meeting #4:



City of Savannah Flood Mitigation Plan Update and PPI Planning Process
Floodplain Management Planning Committee (FMPC) Meeting 4
Wednesday, August 11, 2021, 2:30-3:30 p.m. via Microsoft Teams Video Conference Call

Attendance

- Tom McDonald
- Dave Donnelly
- Chris Tolleson
- Jessica Thompson
- Diane Clabaugh
- Gloria Williams
- Gregory Harris
- Kelsey VanEyl-Godin
- Jackie Jackson
- Jeff Brady
- Christopher Parrish

David Stroud and Frankie Zito from Wood, the consultants supporting the City through this planning process, facilitated the meeting according to the following agenda:

- Floodplain Management Plan
  - Review the Organization of the Plan
  - Review Key Plan Components
    - Hazards & Priority Risk Index
    - Goals & Objectives
    - Mitigation Action Plan
  - Plan Implementation & Maintenance
- Program for Public Information
  - Review Target Areas & Audiences
  - Review Outreach Projects

Review Organization of the Plan and Review Key Plan Components

David presented the organization of the plan, which is as follows:

1) Introduction
2) Community Profile
3) Plan Update
4) Planning Process
5) Flood Risk Assessment
6) Capability Assessment
7) Mitigation Strategy
8) Plan Adoption
9) Plan Implementation and Maintenance
Appendix A: Program for Public Information
Appendix B: Planning Process Documentation
Appendix C: Mitigation Alternative

David then went through a general overview of each section, with specific details for a few sections.

Planning Process – The planning process included 4 FMPC meetings and 2 public meetings, all held virtually due to the COVID 19 Pandemic. David also summarized the different Public Outreach efforts used to get the public involved in the planning process. David included a brief mention of the planning

survey, although the planning committee only received two survey responses back. The FMPC and Public meetings are summarized in the below tables:

Meeting Type	Meeting Topic	Meeting Date	Meeting Location
FMPC #1 (Kick-off)	1) Introduction to DMA, CRS and the planning process 2) Organize resources: the role of the FMPC, planning for public involvement, and coordinating with other agencies and stakeholders 3) Introduction to hazard identification	October 24, 2020 10:00am	Zoom Video Conference Call
FMPC #2	1) Review Goals from 2015 FMP 2) Develop Goals and Objectives for FMP update 3) Overview of Program for Public Information (PPI) progress	February 9, 2021 2:00pm	Zoom Video Conference Call
FMPC #3	1) Review/discussion of Flood Risk and Vulnerability Assessment (Assess the Hazard and Assess the Problem) 2) Finalize Goals and Objectives	March 5, 20201 2:00pm	Zoom Video Conference Call
FMPC #4	1) Review/status of existing Mitigation Strategies 2) Development of new/updated Mitigation Strategies 3) Review draft plan	August 11, 2021	Microsoft Teams Conference Call

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Overview of CRS program and FMP intentions 2) Introduction to DMA, CRS and the planning process	February 9, 2021 5:00pm	Zoom Video Conference Call
Public Meeting #2	1) Review of the draft plan	August 11th, 2021 5:30 PM	Microsoft Teams Conference Call

Flood Risk Assessment – David also went into detail on the Flood Risk Assessment, particularly reminding the FMPC of the hazards included and how they scored on the Priority Risk Index. He shared some of the mapping created for the plan and went into details specifically regarding the Stormwater/Localized Flooding hazard. The PRI Summary is below:

Hazard	PRI Score	PRI Rating
Climate Change and Sea Level Rise	2.7	Moderate
Coastal/Canal Bank Erosion	1.6	Low
Dam/Levee Failure	1.7	Low
Flood: 100-/500-year	3.4	High
Flood: Stormwater/Localized	3.3	High
Hurricane and Tropical Storm (including Storm Surge)	3.0	High

Goals and Objectives – David then reminded the committee of the final goals and objectives used for this planning effort, which are as follows:

- **Goal 1: Protect the public health, safety, and welfare of Savannah residents from flood hazards**
  - Objective 1.1: Protect critical and essential facilities from flood damage
  - Objective 1.2: Reduce damage to development through flood resilient strategies and measures
  - Objective 1.3: Preserve open space areas, especially sensitive natural areas
- **Goal 2: Holistically address repetitive loss areas**
  - Objective 2.1: Reduce number of repetitively flooded structures.
  - Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
  - Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.
  - Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.
- **Goal 3: Enhance flood related public education and outreach efforts**
  - Objective 3.1: Expand the City's flood hazard communication and outreach program
  - Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties
  - Objective 3.3: Develop partnerships with local schools to provide flood education to students.
  - Objective 3.4: Educate the public on the stormwater management techniques and the benefits of acknowledging water as a resource.
- **Goal 4: Monitor projections for changing future conditions and implement plans, policies, and property protection to reduce potential damages.**
  - Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
  - Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
  - Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

Mitigation Action Plan – David then quickly overviewed the mitigation action plan, which contains 32 actions entirely carried over from prior planning processes. He noted that there were no new actions for the mitigation action plan and asked the community to brainstorm new actions. Tom McDonald said he would do so with the Stormwater department.

- **Dave Donnelly** mentioned that the HMP for the County only has 17 actions, and noted that we should coordinate with this plan so that any actions that are different are included in both plans. It is good to have project in more than one place to show FEMA the City is serious about getting it implemented. Dave also noted that there is a list of completed/deleted projects there and they should be cross-referenced.
- **David Stroud** asked about the Sea Level Rise study and if its complete. Tom said the first stage is completed but they are doing a second stage now; he asked if that information could be shared to include in the plan.

Plan Implementation and Maintenance – David shared the proposed plan implementation & maintenance schedule and the FMPC's role in maintaining and updating the plan over the next 5 years.

PPI Target Areas and Audiences

David reviewed the PPI Target Areas and Audiences as follows:

Target Areas:

- Special Flood Hazard Area
- Repetitive Loss Areas
- Real Estate, Lenders, and Insurance

Target Audiences:

- Spanish Speaking/Non-English-Speaking Population
- Elderly Population
- Landscapers and Contractors
- Real Estate, Lenders, and Insurance

He also reviewed the six CRS Priority Topics and the four additional PPI topics chosen by the FMPC:

CRS Priority Topics:

- Know your flood hazard
- Insure your property
- Protect people from the hazard
- Protect your property from the hazard
- Build responsibly
- Protect natural floodplain functions

Four Additional PPI Topics:

- General preparedness
- Flood education
- Reducing stormwater runoff
- Buy flood insurance in low-risk zones

Target Areas and Target Audiences

David reviewed the Target Areas and Target Audiences discussed by the FMPC at the previous meeting:

Target Areas:

1. Special Flood Hazard Area
2. Repetitive Loss Areas
3. Areas of Localized Stormwater Flooding *(removed after meeting discussion)*
4. Real Estate, Lenders, and Insurance

Target Audiences:

1. Spanish Speaking/Non-English-Speaking Population
2. Elderly Population
3. Landscapers and Contractors
4. Real Estate, Lenders, and Insurance

PPI Projects

David shared a summary of all the projects contained in the PPI, and explained again how the scoring would work. The projects are included in the draft PPI.

Next Steps

1) Review the Draft Plan; send any comments or recommendations to Frankie Zito at francesca.zito@woodplc.com.
2) Review Mitigation Action Plan and send any updates or NEW actions to Frankie.
3) Review PPI Projects

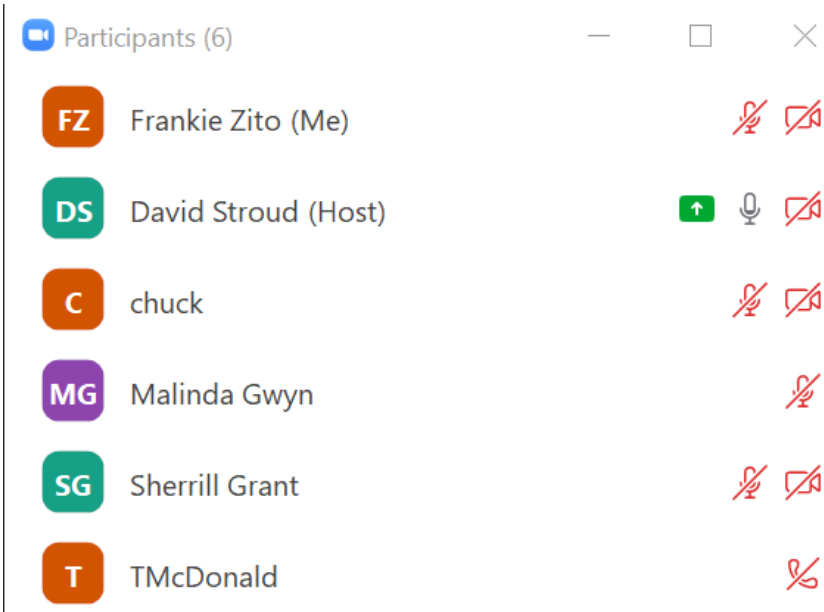
B.2 PLANNING STEP 2: INVOLVE THE PUBLIC

Table B.2 – Public Meetings

Meeting Type	Meeting Topic	Meeting Date	Meeting Locations
Public Meeting #1	1) Overview of CRS program and FMP intentions 2) Introduction to DMA, CRS and the planning process	February 9, 2021 5:00pm	Zoom Video Conference Call
Public Meeting #2	1) Review of the draft plan	August 11, 2021 5:30pm	Microsoft Teams Conference Call

B.2.1 Public Meeting Outreach and Attendance Records

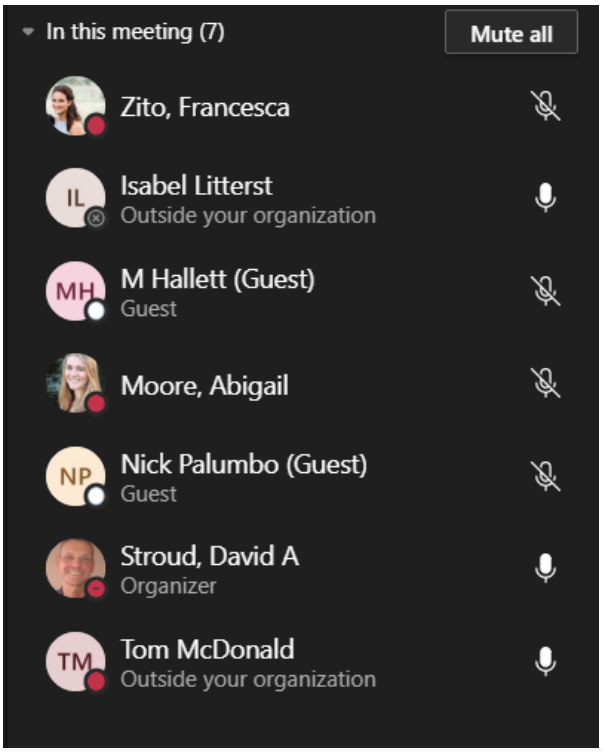
Public Meeting 1: February 9, 2021




City of Savannah Government
59m ·
A public meeting will be held on the update to the Savannah Floodplain Management Plan and a presentation on that process will be held at 5PM on Tuesday, February 1bth via Zoom.
To sign up for this meeting, Please contact francesca.zito@woodplc.com and indicate that you would like an invitation to this meeting. Additionally, you can also help this effort by completing a Flood Protection Survey. Go to savanahga.govfloodplainparticipation or savannahga.gov/floodplainparticipationespanol for the Spanish version.
Thanks for being a part of this planning process. If you have any further questions, please contact Tom McDonald, Permit and Floodplain Manager, at (912) 651-6530 Extension 1895.
Floodplain Managment Plan
Public Meeting
February 16, 5:00 PM
Like
Comment
Share


Floodplain Managment Plan
Public Meeting
February 16, 5:00 PM
cityofsavannah • Follow
cityofsavannah A public meeting will be held on the update to the Savannah Floodplain Management Plan and a presentation on that process will be held at 5PM on Tuesday, February 16th via Zoom. To sign up for this meeting, Please contact francesca.zito@woodplc.com and indicate that you would like an invitation to this meeting. Additionally, you can also help this effort by
Liked by savannahmossco
28 MINUTES AGO
Add a comment...
Post

Public Meeting 2: August 11, 2021



August 11, 2021
PUBLIC MEETING NOTICE Via Zoom

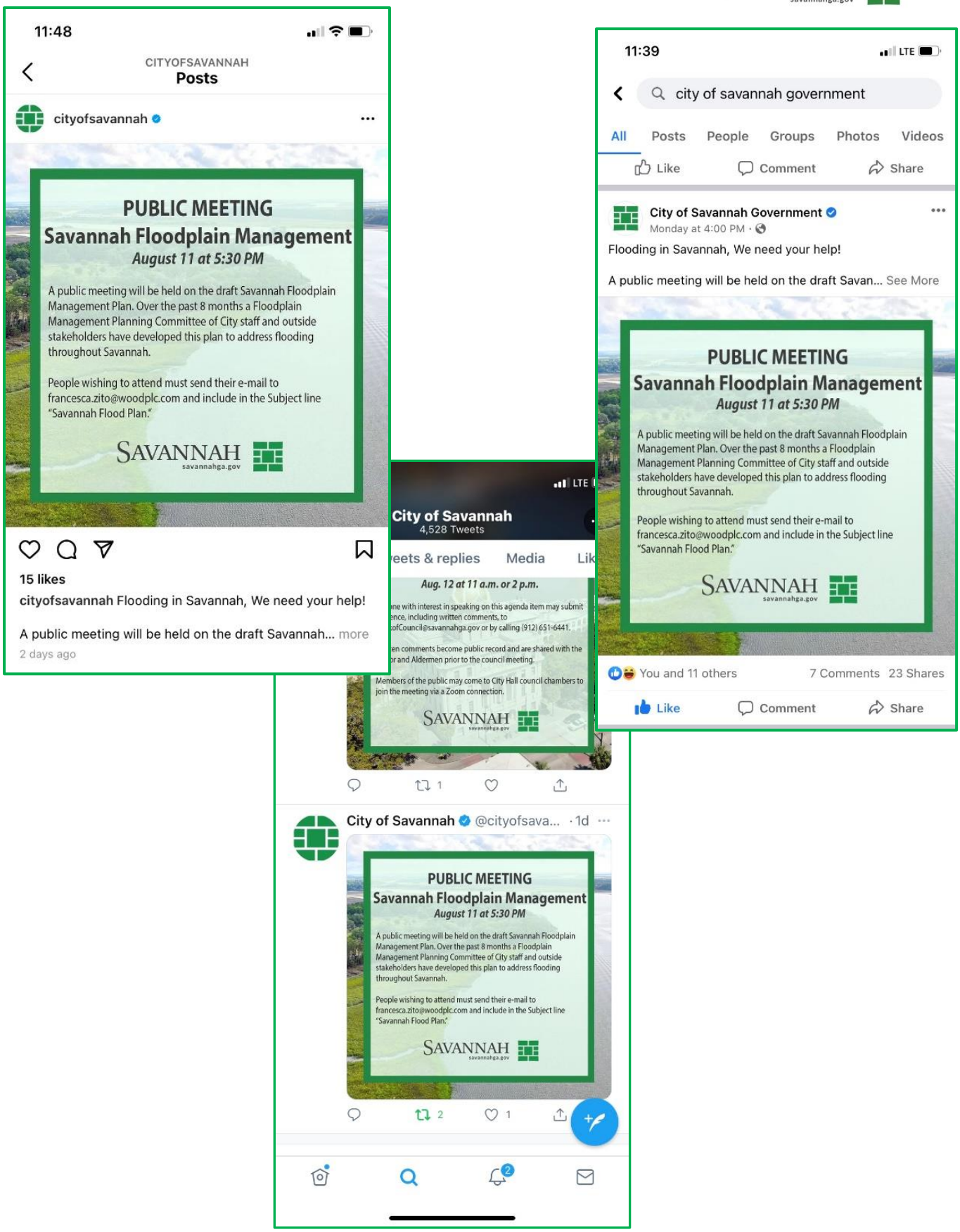
The Community Meeting will happen August 11, 2021.

2021 Savannah Flood Hazard Mitigation Plan

Flooding in Savannah, We need your help!

A public meeting will be held on the draft Savannah Floodplain Management Plan. Over the past 8 months a Floodplain Management Planning Committee of City staff and outside stakeholders have developed this plan to address flooding throughout Savannah. To find out more, plan on attending this online Microsoft TEAMS meeting on Wednesday, August 11th at 5:30 PM.

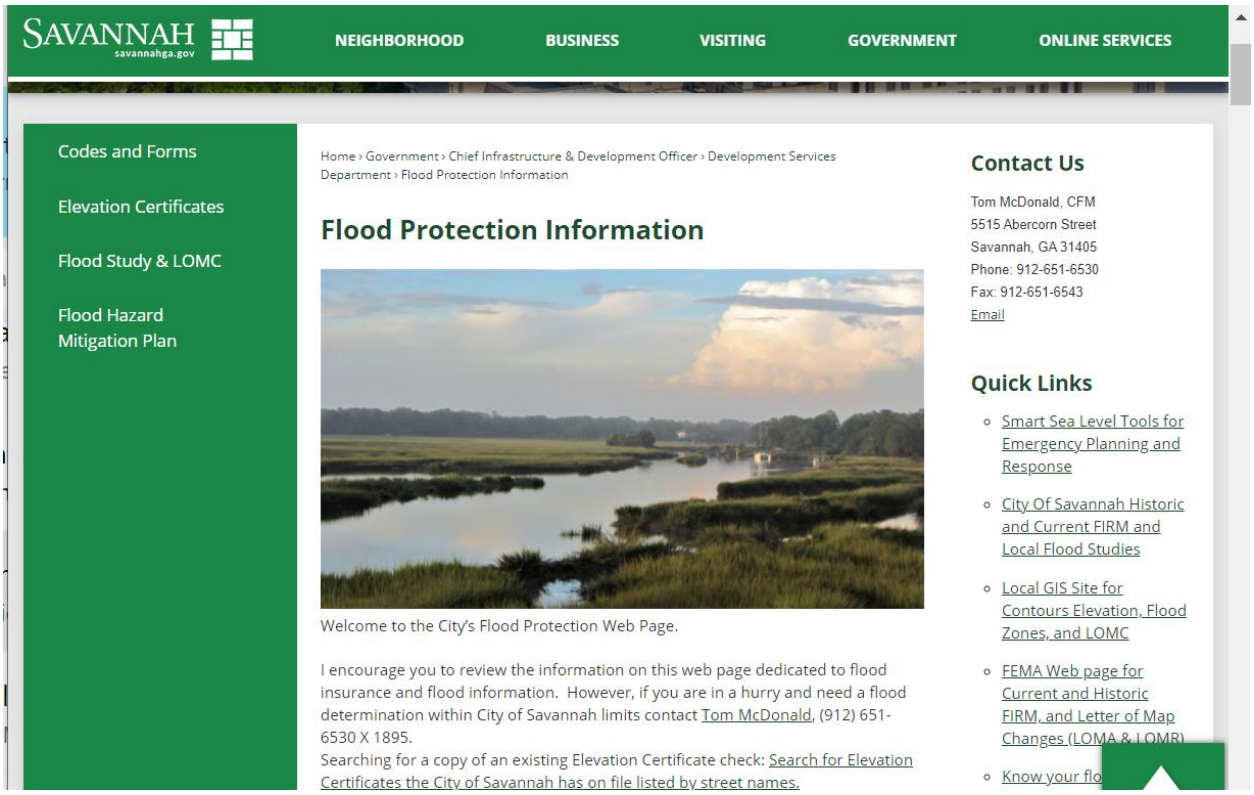
People wishing to attend must send their e-mail to francesca.zito@woodplc.com and include in the Subject line "Savannah Flood Plan." Ms. Zito will send you a link to the


11:48
CITYOFSAVANNAH
Posts
cityofsavannah
PUBLIC MEETING
Savannah Floodplain Management
August 11 at 5:30 PM
A public meeting will be held on the draft Savannah Floodplain Management Plan. Over the past 8 months a Floodplain Management Planning Committee of City staff and outside stakeholders have developed this plan to address flooding throughout Savannah.
People wishing to attend must send their e-mail to francesca.zito@woodplc.com and include in the Subject line "Savannah Flood Plan."
SAVANNAH
savannahga.gov
15 likes
cityofsavannah Flooding in Savannah, We need your help!
A public meeting will be held on the draft Savannah... more
2 days ago
11:39
city of savannah government
All
Posts
People
Groups
Photos
Videos
Like
Comment
Share
City of Savannah Government
Monday at 4:00 PM
Flooding in Savannah, We need your help!
A public meeting will be held on the draft Savan... See More
PUBLIC MEETING
Savannah Floodplain Management
August 11 at 5:30 PM
A public meeting will be held on the draft Savannah Floodplain Management Plan. Over the past 8 months a Floodplain Management Planning Committee of City staff and outside stakeholders have developed this plan to address flooding throughout Savannah.
People wishing to attend must send their e-mail to francesca.zito@woodplc.com and include in the Subject line "Savannah Flood Plan."
SAVANNAH
savannahga.gov
You and 11 others
7 Comments 23 Shares
Like
Comment
Share
City of Savannah
4,528 Tweets
eets & replies
Media
Aug. 12 at 11 a.m. or 2 p.m.
Members of the public may come to City Hall council chambers to join the meeting via a Zoom connection.
SAVANNAH
City of Savannah @cityofsava... · 1d
PUBLIC MEETING
Savannah Floodplain Management
August 11 at 5:30 PM
A public meeting will be held on the draft Savannah Floodplain Management Plan. Over the past 8 months a Floodplain Management Planning Committee of City staff and outside stakeholders have developed this plan to address flooding throughout Savannah.
People wishing to attend must send their e-mail to francesca.zito@woodplc.com and include in the Subject line "Savannah Flood Plan."
SAVANNAH

B.2.2 Other Public Outreach Efforts

Table B.3 – Public Outreach Efforts

Project/Event	Message
City of Savannah Website	Public Meeting Dates posted for public information; Flood Protection Information
Public Survey	A flood protection questionnaire was posted for public response
Public Survey (Spanish)	A flood protection questionnaire was posted in Spanish for public response
Mitigation Flyer	A flyer describing the planning process was developed
Draft HIRA	A draft version of the Hazard Identification and Risk Assessment Section of the plan was posted on the website for public comment
Social Media	Use of Twitter and Facebook to inform residents of the planning process
Draft Plan	A draft version of the final plan was posted on the website for public comment
Draft Plan	A hard copy of the draft plan is available for review and comment in the Development Services Office
Press Release	A press release was issued to the news media concerning information on the final draft plan



August 11, 2021
PUBLIC MEETING NOTICE Via Zoom

The Community Meeting will happen August 11, 2021.

2021 Savannah Flood Hazard Mitigation Plan

Flooding in Savannah, We need your help!

A public meeting will be held on the draft Savannah Floodplain Management Plan. Over the past 8 months a Floodplain Management Planning Committee of City staff and outside stakeholders have developed this plan to address flooding throughout Savannah. To find out more, plan on attending this online Microsoft TEAMS meeting on Wednesday, August 11th at 5:30 PM.

People wishing to attend must send their e-mail to francesco.zito@woodplc.com and include in the Subject line "Savannah Flood Plan." Ms. Zito will send you a link to the public meeting.

The purpose of the plan is to assess current flood hazard conditions, including historically flooded areas and the most critical repetitively flooded properties, and to develop appropriate mitigation strategies for the City to consider in reducing or eliminating future flood losses. Upon completion of the plan, the City of Savannah intends to continue its aggressive floodplain management efforts by evaluating, targeting and applying for Federal grant funds to assist in the implementation of future flood hazard mitigation projects. The plan will also serve as a means to help reduce the flood insurance premiums for all those property owners insured through the National Flood Insurance Program.

Should you have any questions about the open public meetings or Savannah's Flood Hazard Mitigation Plan, please contact Tom McDonald, Permit and Floodplain Manager, at (912) 651-6530 Extension 1895.

SAVANNAH
Development Services Department

PUBLIC SURVEY FOR
FLOOD MITIGATION PLANNING

The City of Savannah needs your help!

The City of Savannah is working to become less vulnerable to flooding and your participation is important to us!

The City is preparing a *Flood Mitigation Plan*. This Plan will identify and assess our community's flood hazard risks and determine how to best minimize or manage those risks and what outreach materials may be necessary to better communicate those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Please help us by completing this survey by March 30, 2021 and returning it to:

Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Surveys can also be faxed to: (912) 651-6543 or emailed to tmcdonald@savannahga.gov.

1. **Where do you live?**
   - ❑ City of savannah (City limits)
   - ❑ Other:_____

2. **Have you ever experienced or been impacted by high water or flooding in Savannah?**
   - ❑ Yes
   - ❑ No

   a. **If "Yes," please explain:**

_____

_____

_____

Page 1 of 3

3. **How concerned are you about the possibility of your community being impacted by flooding?**
   - ❑ Extremely concerned
   - ❑ Somewhat concerned
   - ❑ Not concerned

4. **Is your home located in a Federal Emergency Management Agency (FEMA) floodplain?**
   - ❑ Yes
   - ❑ No
   - ❑ I don't know

5. **Do you have flood insurance for your home/personal property?**
   - ❑ Yes
   - ❑ No
   - ❑ I don't know

   a. **If "No," why not?**
      - ❑ My home is not located in a floodplain
      - ❑ I rent
      - ❑ It's too expensive
      - ❑ I don't need it because it never floods
      - ❑ I don't need it because my home is elevated or otherwise protected
      - ❑ I never really considered it
      - ❑ Other (please explain): _____

6. **Have you taken any actions to protect your home from flood damage?**
   - ❑ Yes
   - ❑ No

   b. **If "Yes," please explain:**

   _____

   _____

   _____

Page 2 of 3

7. **Do you know what government agency/office to contact regarding the risks associated with flooding?**
   - ❑ Yes
   - ❑ No

8. **What is the most effective way for you to receive information about how to make your home or neighborhood more resistant to flood damage?**
   - ❑ Newspaper
   - ❑ Television advertising or programs
   - ❑ Radio advertising or programs
   - ❑ Internet
   - ❑ Email
   - ❑ Mail
   - ❑ Public workshops/meetings
   - ❑ School meetings
   - ❑ Other (please explain): _____

9. **In your opinion, what are some steps your local government could take to reduce the risk of flooding in your neighborhood?**

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION!

*This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (**optional**):*

Name: _____

Address: _____

Phone: _____ **E-Mail:** _____

Page 3 of 3

SAVANNAH
Development Services Department

ENCUESTA PÚBLICA PARA
PLAN DE MITIGACIÓN DE INUNDACIONES

¡La ciudad de Savannah necesita su ayuda!

¡La ciudad de Savannah esta trabajando en disminuir nuestro riesgo a inundaciones y su participación nos es importante!

La Ciudad está preparando un *Plan de Mitigación de Inundación*. Este Plan identificará y evaluará los riesgos de peligro de inundación de nuestra comunidad y determinará como minimizar o manejar mejor esos riesgos y que materiales de divulgación serán necesarios para mejorar la comunicación de esos riesgos al público.

Esta encuesta es una oportunidad para que usted comparta sus opiniones y participe en el proceso de planeación de mitigación. La información que usted provea nos ayudará a comprender mejor sus preocupaciones de riesgo y puede conducir a que las actividades de mitigación reduzcan los impactos de eventos de emergencia en el futuro.

Por favor ayúdenos en completar esta encueste antes del 30 de Marzo, 2021 y devolverlo a:

Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Las encuestas pueden ser enviadas por fax al: (912) 651-6543 o por correo electrónico a:
tmcdonald@savannahga.gov

1. **¿Donde vive usted?**
   - ❑ La ciudad de Savannah (Limites de la ciudad) ❑ Otro:_____
2. **¿Alguna vez ha sufrido o ha sido afectado por una inundación o agua alta en la Ciudad de Savannah?**
   - ❑ Si
   - ❑ No

   a. **Si respondió "Si", por favor explique:**

   _____

   _____

Página 1 de 3

3. **¿Que tan preocupado está usted sobre la posibilidad de que la comunidad se vea afectada por inundaciones?**
   - ❑ Extremadamente preocupado
   - ❑ Algo preocupado
   - ❑ No está preocupado

4. **¿Está su propiedad ubicada en una zona de inundación?**
   - ❑ Si
   - ❑ No
   - ❑ No sé

5. **¿Tiene usted seguro de inundación para su casa/propiedad personal?**
   - ❑ Si
   - ❑ No
   - ❑ No sé

   a. **Si respondió "No," porque no:**
      - ❑ Mi propiedad no se encuentra en un terreno aluvial
      - ❑ Soy inquilino
      - ❑ Es muy costoso
      - ❑ No lo necesito porque nunca se inunda
      - ❑ No lo necesito porque mi propiedad esta elevada y por lo tanto protegida
      - ❑ No lo había considerado
      - ❑ Otra razón (por favor explique): _____

6. **¿Ha tomado alguna acción para proteger su casa de daños de inundación?**
   - ❑ Si
   - ❑ No

   b. **Si respondió "Si," por favor explique:**

   _____

   _____

   _____

Página 2 de 3

7. **¿Sabe usted qué oficina debe de contactar con respecto a los riesgos asociados con las inundaciones?**
   - ❑ Si
   - ❑ No

8. **¿Cuál es la manera más efectiva para que usted reciba información sobre cómo hacer que su propiedad, vecindario, o familia sean más resistentes a los daños de inundación?**
   - ❑ Periódico
   - ❑ Publicidad en los programas de televisión
   - ❑ Publicidad en los programas de radio
   - ❑ Internet
   - ❑ Correo electrónico
   - ❑ Correo
   - ❑ Talleres/reuniones públicos
   - ❑ Reuniones en las escuelas
   - ❑ Otro (por favor explique): _____

9. **En su opinión, ¿cuales son algunos pasos que su gobierno local puede tomar para reducir el riesgo de inundación en su vecindario?**

   _____

   _____

   _____

Gracias Por Su Participación!

Esta encuesta puede ser entregada anónimamente; Si decide darnos sus datos, podemos contactarles en el futuro para saber más sobre sus sugerencias e ideas. (opcional)

Nombre: _____

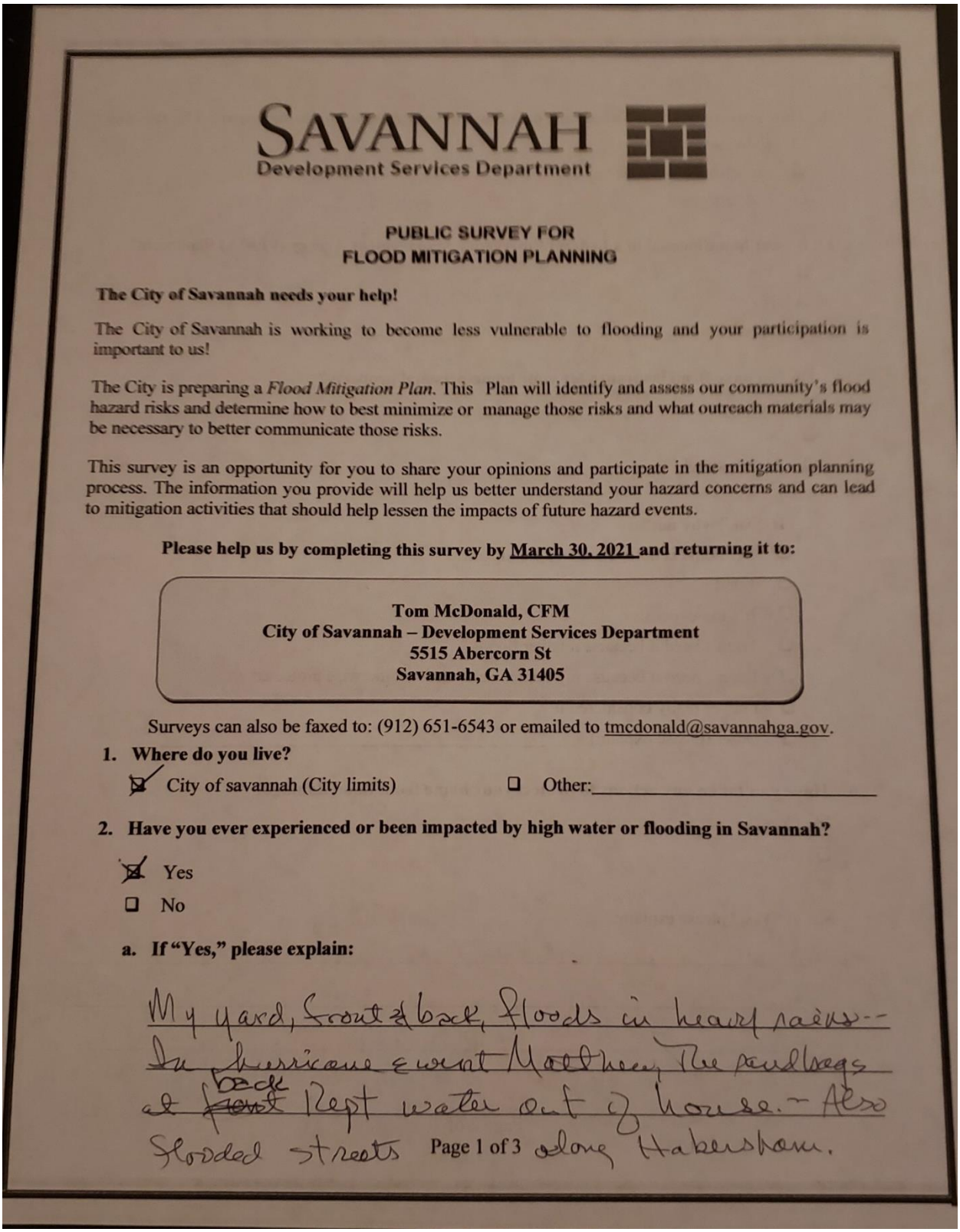
Dirección: _____

Teléfono: _____ **Correo Electrónico:** _____

Página 3 de 3

B.2.3 Public Survey Results

The City receive two responses to the public survey. These responses area included below.



SAVANNAH
Development Services Department

PUBLIC SURVEY FOR
FLOOD MITIGATION PLANNING

The City of Savannah needs your help!

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The City is preparing a *Flood Mitigation Plan*. This Plan will identify and assess our community's flood hazard risks and determine how to best minimize or manage those risks and what outreach materials may be necessary to better communicate those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Please help us by completing this survey by March 30, 2021 and returning it to:

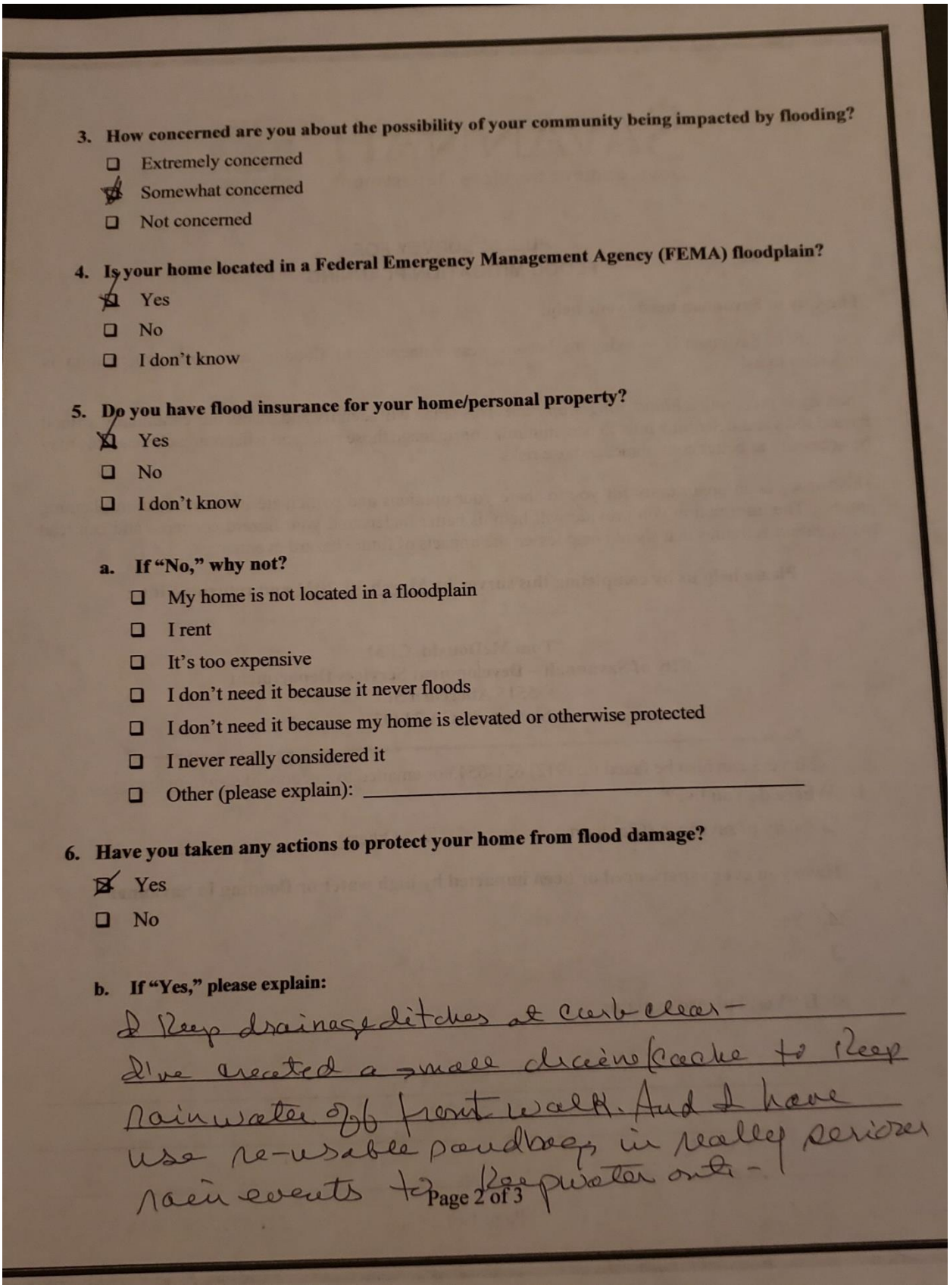
Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Surveys can also be faxed to: (912) 651-6543 or emailed to tmcdonald@savannahga.gov.

1. **Where do you live?**
   ☒ City of savannah (City limits) ☐ Other:_____
2. **Have you ever experienced or been impacted by high water or flooding in Savannah?**
   ☒ Yes
   ☐ No
   a. **If "Yes," please explain:**

My yard, front & back, floods in heavy rains-- In hurricane event Matthew, The sandbags at ~~front~~ back kept water out of house. - Also flooded streets along Habersham.

Page 1 of 3



3. **How concerned are you about the possibility of your community being impacted by flooding?**
   - ☐ Extremely concerned
   - ☒ Somewhat concerned
   - ☐ Not concerned

4. **Is your home located in a Federal Emergency Management Agency (FEMA) floodplain?**
   - ☒ Yes
   - ☐ No
   - ☐ I don't know

5. **Do you have flood insurance for your home/personal property?**
   - ☒ Yes
   - ☐ No
   - ☐ I don't know

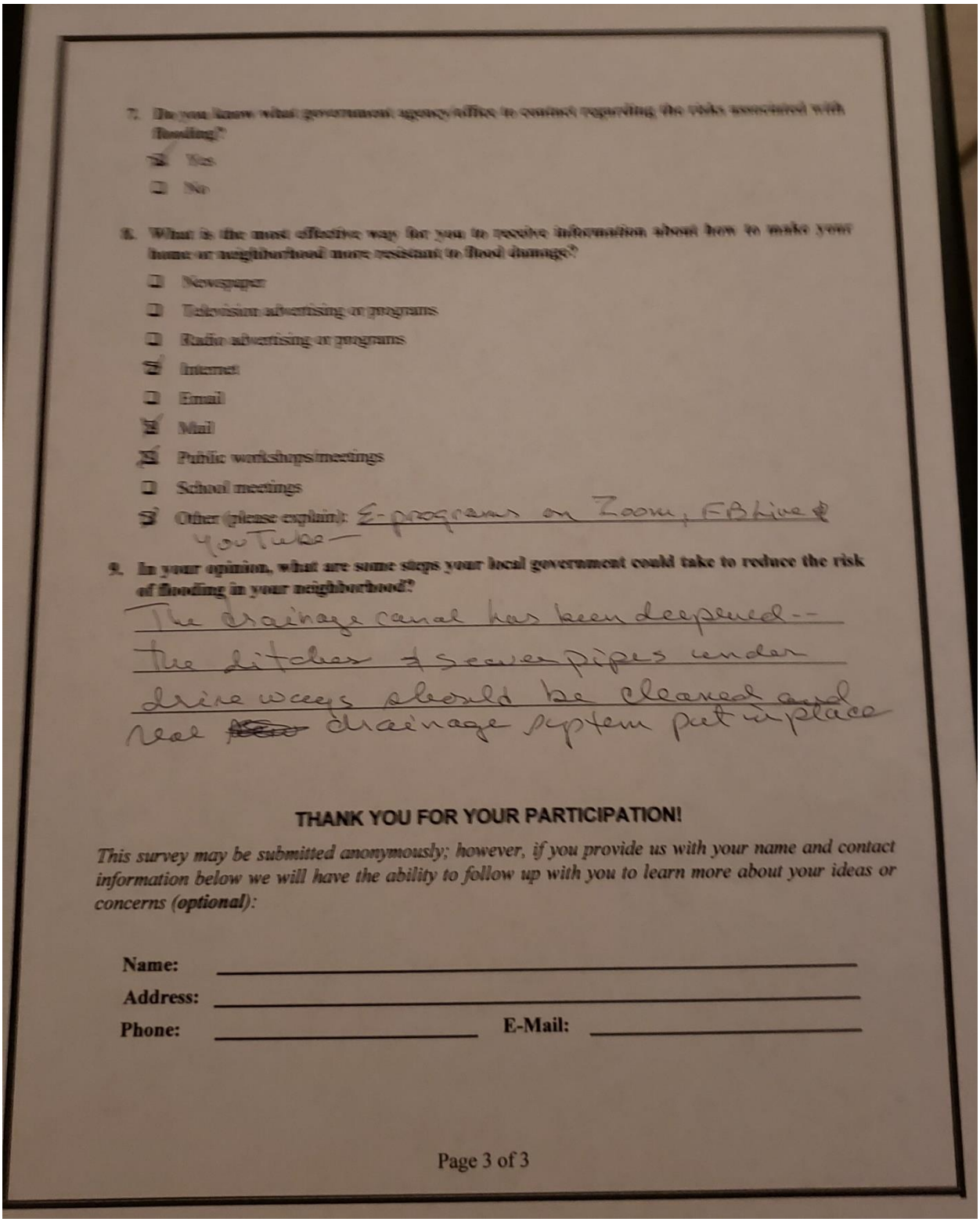
   a. **If "No," why not?**
      - ☐ My home is not located in a floodplain
      - ☐ I rent
      - ☐ It's too expensive
      - ☐ I don't need it because it never floods
      - ☐ I don't need it because my home is elevated or otherwise protected
      - ☐ I never really considered it
      - ☐ Other (please explain): _____

6. **Have you taken any actions to protect your home from flood damage?**
   - ☒ Yes
   - ☐ No

   b. **If "Yes," please explain:**

I Keep drainage ditches at curb clear - I've created a small drainage Creek to Keep rainwater off front walk. And I have use re-usable sandbags in really serious rain events to Keep water out -

Page 2 of 3



7. Do you know what government agency/office to contact regarding the risks associated with flooding?
   - ☑ Yes
   - ☐ No

8. What is the most effective way for you to receive information about how to make your home or neighborhood more resistant to flood damage?
   - ☐ Newspaper
   - ☐ Television advertising or programs
   - ☐ Radio advertising or programs
   - ☑ Internet
   - ☐ Email
   - ☑ Mail
   - ☑ Public workshops/meetings
   - ☐ School meetings
   - ☑ Other (please explain): E-programs on Zoom, FB Live & YouTube

9. In your opinion, what are some steps your local government could take to reduce the risk of flooding in your neighborhood?
   The drainage canal has been deepened -- the ditches & sewer pipes under driveways should be cleaned and real ~~[illegible]~~ drainage system put in place

THANK YOU FOR YOUR PARTICIPATION!

*This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (**optional**):*

Name: _____

Address: _____

Phone: _____ **E-Mail:** _____

Page 3 of 3

SAVANNAH
Development Services Department

PUBLIC SURVEY FOR
FLOOD MITIGATION PLANNING

The City of Savannah needs your help!

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The City is preparing a *Flood Mitigation Plan*. This Plan will identify and assess our community's flood hazard risks and determine how to best minimize or manage those risks and what outreach materials may be necessary to better communicate those risks.

This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand your hazard concerns and can lead to mitigation activities that should help lessen the impacts of future hazard events.

Please help us by completing this survey by March 30, 2021 and returning it to:

Tom McDonald, CFM
City of Savannah – Development Services Department
5515 Abercorn St
Savannah, GA 31405

Surveys can also be faxed to: (912) 651-6543 or emailed to tmcdonald@savannahga.gov.

1. **Where do you live?**

☒ City of savannah (City limits) ☐ Other:_____

2. **Have you ever experienced or been impacted by high water or flooding in Savannah?**

☒ Yes
☐ No

a. **If "Yes," please explain:**

I have had 2 move from my home on 2 separate occasions due to flooding in my home. There is currently construction going on behind me and I am worried about continued flooding. Please help me!

Page 1 of 3

3. **How concerned are you about the possibility of your community being impacted by flooding?**
   - ☒ Extremely concerned
   - ☐ Somewhat concerned
   - ☐ Not concerned

4. **Is your home located in a Federal Emergency Management Agency (FEMA) floodplain?**
   - ☐ Yes
   - ☐ No
   - ☐ I don't know

5. **Do you have flood insurance for your home/personal property?**
   - ☐ Yes
   - ☐ No
   - ☐ I don't know

   a. **If "No," why not?**
      - ☐ My home is not located in a floodplain
      - ☐ I rent
      - ☐ It's too expensive
      - ☐ I don't need it because it never floods
      - ☐ I don't need it because my home is elevated or otherwise protected
      - ☐ I never really considered it
      - ☐ Other (please explain): _____

6. **Have you taken any actions to protect your home from flood damage?**
   - ☐ Yes
   - ☐ No

   b. **If "Yes," please explain:**
   Several years ago I had dirt added to the back yard.

Page 2 of 3

7. **Do you know what government agency/office to contact regarding the risks associated with flooding?**
   - ☐ Yes
   - ☒ No

8. **What is the most effective way for you to receive information about how to make your home or neighborhood more resistant to flood damage?**
   - ☐ Newspaper
   - ☐ Television advertising or programs
   - ☐ Radio advertising or programs
   - ☐ Internet
   - ☐ Email
   - ☒ Mail
   - ☐ Public workshops/meetings
   - ☐ School meetings
   - ☐ Other (please explain): _____

9. **In your opinion, what are some steps your local government could take to reduce the risk of flooding in your neighborhood?**

Build a detention or retention pond; repave the street to make it higher because there is a dip in front of my house. Clean ditches and drainage more frequently.

THANK YOU FOR YOUR PARTICIPATION!

*This survey may be submitted anonymously; however, if you provide us with your name and contact information below we will have the ability to follow up with you to learn more about your ideas or concerns (**optional**):*

Name: _____

Address: _____

Phone: _____ **E-Mail:** _____

Page 3 of 3

B.3 PLANNING STEP 3: COORDINATE

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the Flood Mitigation Plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the Flood Mitigation Plan, to determine if their programs or initiatives may affect the community's program, and to see if they could support the community's efforts. City representatives were asked to identify stakeholders to invite to participate on the FMPC at the beginning of the planning process. Additionally, to further incorporate stakeholder input into the plan, a variety of stakeholders were identified by the FMPC and sent a letter inviting them to provide data or information relevant to the planning process, review the draft plan documents, and provide feedback and comments. An example coordination letter sent by the City is provided on the following page. A list of the stakeholders who were contacted is provided in Table B.4.

Stakeholders were also involved in development of the plan through specific requests for data.

Table B.4 - Stakeholders

Name	Organization	Address	City	State	Zip
Non-Profit Organizations					
Gretchen Germinger	Wormsloe State Historic Site Manager	7601 Skidaway Rd	Savannah	GA	31406
Clif Morris	Savannah Boy Scouts; Scout Executive, CEO	11900 Abercorn Street	Savannah	GA	31406
Bob Sattelmeyer	Coastal Georgia Audubon Society; President	PO Box 21726	St. Simons Island	GA	31522
Leslie Weichsel	Ogeechee Audubon Society; President	PO Box 13424	Savannah	GA	31416
Zoe Rinker	Savannah Tree Foundation, Executive Director	502 Fair Street	Savannah	GA	31415
Karen Grainey	Sierra Club – Coastal Group	520 E. Washington Ave	Savannah	GA	31405
Charles McMillan	The GA Conservancy – Natural Resource Director, Coastal Director	Coastal Office, 428 Bull St. Suite 210	Savannah	GA	31401
Robin Wingate	American Red Cross, Savannah Chapter CEO	41 Park of Commerce Way, Bldg 200	Savannah	GA	31405
Educational Institutions					
Clark Alexander	Skidaway Institute of Oceanography- Director	10 Ocean Science Circle	Savannah	GA	31411
Hermann Fritz	Georgia Institute of Technology, Water Resources Engineering, Resilient Infrastructure Systems	Mason Building 2237, 790 Atlantic Drive	Atlanta	GA	30332
Rob Gordon	Savannah Board of Education, The Risk Management Department, Director	208 Bull Street	Savannah	GA	31401
Dionne Hoskins-Brown	Savannah State University, Director of NOAA Sponsored Programs	3219 College St	Savannah	GA	31404
Helen Morgan	Savannah College of Arts and Design; Executive Director of Physical Resources	PO Box 2072	Savannah	GA	31402
Robert Hisey	Georgia Southern University, Armstrong Campus, Assistant Director of Maintenance and Repair	13040 Abercorn Street	Savannah	GA	31419
Wei Tu	Georgia Southern University, Geology & Geography	Post Office Box 8149	Statesboro	GA	30460
Ben Robinson	Emergency Communications Officers, Savannah Tech	5717 White Bluff Rd	Savannah	GA	31405
Gary Strickland	Director of Facilities, Savannah Tech	5717 White Bluff Rd	Savannah	GA	31405
Neighboring Communities					
Michael Blakely	Chatham County Department of Engineering / Floodplain	124 Bull Street, Room 430	Savannah	GA	31401
Thomas Cawthorn	City of Savannah - Stormwater; Sr. Civil Engineer	802 W Anderson St. P.O. Box 1027	Savannah	GA	31402
Nick Deffley	City of Savannah Office of Sustainability, Director	P.O. Box 1027	Savannah	GA	31402
Dennis Jones	Savannah-Chatham Co. Emergency Mgmt Agency	24 Bull Street, Suite 140	Savannah	GA	31401
Caroline Hankins	Town of Thunderbolt - Town Administrator	2821 River Dr	Thunderbolt	GA	31404
Terri Turner	City of Augusta Planning, Zoning, and Development	535 Telfair Street	Augusta	GA	30901
Heath Lloyd	Savannah Water Supply - I & D WATER	P.O. Box 1027	Savannah	GA	31401
Randall Matthews	Emergency Preparedness Manager, Chatham County EMA	124 Bull Street, Room 140	Savannah	GA	31401
James Hungerpiller	Town of Vernonburg	P.O. Box 61512	Savannah	GA	31420
Ferman Taylor	Bloomingdale	104 US-Hwy 90	Bloomingdale	GA	31320
Corbin Madeiros	Garden City, Fire Chief	100 Central Ave	Garden City	GA	31405
Robert Byrd	City Manager, Pooler	100 SW US HW 80	Pooler	GA	31322
Edwin Booth	City Manager, Port Wentworth	7224 GA Highway 21	Port Wentworth	GA	31407
George Shaw	Tybee Island, Planning and Zoning Manager	P.O. Box 2749, 403 Butler Avenue	Tybee Island	GA	31328
To Whom it May Concern	Fort Stewart/Hunter Army Airfield Fire Department	1164 W. 15th Street Bldg. 1850	Fort Stewart	GA	31314
Regional Planning Organizations					
Leah Michalak	Chatham County-Savannah MPC; Urban Planning and Historic Review Director	110 East State Street	Savannah	GA	31401
Marcus Lotson	Chatham County-Savannah MPC; Development Services Director	110 East State Street	Savannah	GA	31401
State Government					

Name	Organization	Address	City	State	Zip
Josh Krolikowski	Georgia Association of Floodplain Managers (GAFM) Vice Chair; Deputy Manager, Hazard Mitigation Department, GEMA	935 United Ave. SE	Atlanta	GA	30316
Terry Lunn	GEMA, Hazard Mitigation Unit, Director	P.O. Box 18055	Atlanta	GA	30316
Kelly O'Rourke	GA DNR, Coastal Resources Division, Coastal Resources Specialist	1 Conservation Way Suite 300	Brunswick	GA	31520
Haydn Blaize	Georgia Dept of Natural Resources Environmental Protection Division Floodplain Management	2 Martin Luther King Jr. Drive SE Suite 1456, East Tower	Atlanta	GA	30334
Jennifer Kline	GA DNR, Coastal Resources Division	1 Conservation Way	Brunswick	GA	31520
Federal Government					
Jonathan Lamb	National Weather Service Meteorologist	5777 South Aviation Avenue	North Charleston	SC	29406
Susan Wilson	FEMA Region IV, Floodplain Management and Insurance Branch, Chief	3003 Chamblee-Tucker Road	Atlanta	GA	30341
Business Community					
Brooke Bass	Keller Williams Reality; Gracious Moves	1 Lachlan Ln.	Savannah	GA	31411
Tracey Burdette	The Home Builders Association of Greater Savannah	7116 Hodgson Memorial Drive	Savannah	GA	31406
Walter Corish	Corish Insurance	6811 **Waters Ave**	Savannah	GA	31406
George Fidler	Savannah/ Hilton Head International Airport; Director of Engineering	400 Airways Avenue	Savannah	GA	31408
Steve Hudson	Gulfstream Aerospace Corporation	500 Gulfsteam Rd	Savannah	GA	31408
Russ Riesinger	WSAV 3: Anchor/Reporter	1430 East Victory Dr.	Savannah	GA	31404
Mary Landers	Savannah Now, Reporter	1375 Chatham Parkway	Savannah	GA	31405

Appendix C Mitigation Strategy

As part of the process of developing the mitigation action plans found in Section 6, the FMPC reviewed and considered a comprehensive range of mitigation options before selecting the actions identified for implementation. This section summarizes the full range of mitigation measures evaluated and considered by the FMPC, including a review of the categories of mitigation measures outlined in the 2017 CRS Coordinator's Manual, a discussion of current local implementation and CRS credits earned for those measures, and a list of the specific mitigation projects considered and recommended for implementation.

Mitigation alternatives identified for implementation by the FMPC were evaluated and prioritized using the criteria discussed in Section 6.3 of this plan.

C.1 CITY OF SAVANNAH PRIORITY HAZARDS

Priority Hazards

- Climate Change and Sea Level Rise
- Flood: 100/500 year
- Flood: Stormwater/ Localized Flooding
- Hurricane and Tropical Storms (including Storm Surge)

Non-Priority Hazards

- Coastal/Canal Bank Erosion
- Dam/Levee Failure

C.2 MITIGATION GOALS AND OBJECTIVES

Goal 1: Protect the public health, safety, and welfare of Savannah residents from flood hazards

- Objective 1.1: Protect critical and essential facilities from flood damage
- Objective 1.2: Reduce damage to development through flood resilient strategies and measures
- Objective 1.3: Preserve open space areas, especially sensitive natural areas

Goal 2: Holistically address repetitive loss areas

- Objective 2.1: Reduce number of repetitively flooded structures.
- Objective 2.2: Leverage local, state, and federal grant funding to facilitate mitigation actions on repetitive loss properties.
- Objective 2.3: Reduce damage to insurable buildings in repetitively flooded areas.
- Objective 2.4: Develop policies that address repetitive loss areas and compliment mitigation activities.

Goal 3: Enhance flood related public education and outreach efforts

- Objective 3.1: Expand the City's flood hazard communication and outreach program
- Objective 3.2: Utilize education and outreach tools to encourage residents to undertake mitigation projects on individual properties
- Objective 3.3: Develop partnerships with local schools to provide flood education to students.
- Objective 3.4: Educate the public on the stormwater management techniques and the benefits of acknowledging water as a resource.

Goal 4: Monitor projections for changing weather and climate conditions and implement plans, policies, and property protection to reduce potential damages.

- Objective 4.1: Prioritize critical facilities and infrastructure with projected sea level rise impacts for elevation and/or relocation.
- Objective 4.2: Implement growth management policies to guide new development away from current or future high-risk areas.
- Objective 4.3: Monitor shorelines and wetlands to identify and mitigate erosion hotspots.

C.3 CATEGORIES OF MITIGATION MEASURES CONSIDERED

Once it was determined which flood hazards warranted the development of specific mitigation actions, the FMPC analyzed viable mitigation options that supported the identified goals and objectives. The FMPC reviewed mitigation alternatives within the following list of mitigation categories which are utilized as part of the CRS planning process:

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information

C.4 ALTERNATIVE MITIGATION MEASURES PER CATEGORY

Note: the CRS Credit Sections are based on the 2017 CRS Coordinator's Manual.

C.4.1 Preventative Measures

Preventive measures are designed to keep a problem - such as flooding - from occurring or from getting worse. The objective of preventive measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventive measures. Some examples of types of preventive measures include:

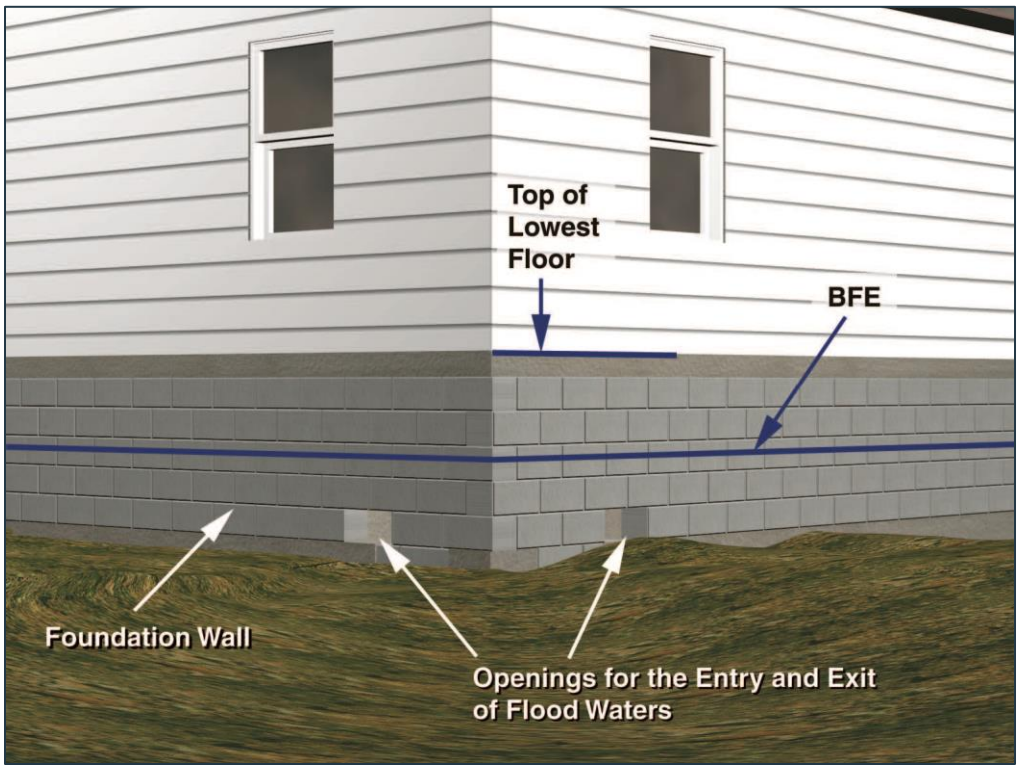
- Building codes
- Planning and zoning
- Open space preservation
- Floodplain regulations
- Stormwater management

Building Codes

Building codes provide one of the best methods of addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure C.1.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.

Figure C.1 – Building Codes and Flood Elevations



Source: FEMA Publication: Above the Flood: Elevating Your Floodprone House, 2000

Local Implementation

The City of Savannah has adopted the *2018 International Building Code*.

CRS Credit

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. Savannah's BCEGS rating is a Class 4 for both residential and commercial. The City of Savannah has adopted the *2018 International Building Code*. Savannah currently receives credit for Activity 430 – Higher Regulatory Standards.

Planning and Zoning

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Planning and zoning activities can also provide benefits by simply allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach.

Local Implementation

Comprehensive Plan

The Chatham County-Savannah Comprehensive Growth Management Plan was adopted in 2016. A Comprehensive Plan, in broad terms, is a policy statement to guide the future placement and development of community facilities. It is the basis for a community's zoning, subdivision and design

regulations and a community's official maps and amendments to the zoning, subdivision and design ordinances. The future land use section of the land use element of the plan represents the City's vision for its development and redevelopment into the future. The future land use maps and districts will serve as the foundation for subsequent development of more detailed Land Development Regulations and special area plans. These regulations and plans must be consistent with and further the implementation of the future land use element of the Comprehensive Plan and its goals, objectives and policies in accordance with the City's master planning document.

Zoning and Subdivision Regulations

The City of Savannah's Zoning Ordinance was effective September 2019. The purpose of the City's Zoning Ordinance is to provide the minimum regulations necessary to facilitate safe and orderly growth, and to also ensure that growth forms an integral part of a community of functional neighborhoods, retail and commercial centers; increases collective security and community identity to promote civic awareness and responsibility; and enhances the quality of life for the entire City to ensure the greatest possible economic and social benefits for all residents. These regulations are intended to promote consistency with the goals, objectives and policies of the City's Comprehensive Plan.

Capital Improvement Plan

The City of Savannah Capital Improvements Program and Capital Projects Management Office identify numerous Capital Improvements projects by district around the City; these projects and their status can be viewed via an interactive map on the City's GIS interface by district. Projects are also classified by category, including Drainage Improvement Projects. The quarterly CIP report lists the number of projects, appropriated budget, and expenditures by category. As of June 10, 2020, there were 14 drainage projects included in the CIP.

Open Space Preservation

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes. These are usually linear areas along property lines or channels. Maintenance easements also can be donated by streamside property owners in return for a community maintenance program.

Local Implementation

The City of Savannah has developed a Community Gardens program, allowing more than 1,250 city-owned parcels, stretching from Woodville and Hudson Hill to Paradise Park and Wilshire Estates, to be made available to residents and neighborhood associations to start community gardens. The City of Savannah recognizes community gardens as valuable recreational and educational activities that can contribute to community development, environmental awareness, positive social interaction, and community education.

The City of Savannah Park and Tree Commission was created by council in December 1895, with the first meeting to be held in January 1896. The purpose of the City's Landscape and Tree Ordinance is to protect and maintain the urban forest through the management of the impact of development, to preserve the environmental and aesthetic assets of the community through requirements for tree planting and landscaping, and provide protection from removal without a permit for all trees within the City of Savannah. The provisions of the Landscape and Tree Ordinance apply to all property in the city being developed or redeveloped for commercial, industrial, institutional, multi-family and single family subdivisions.

The Savannah Tree Foundation is not-for-profit urban and community forestry organization dedicated to preserving, protecting and planting canopy trees in Savannah and Chatham County, Georgia. The Savannah Tree Foundation promotes, through direct action and education, an awareness of trees as vital environmental resources and an important part of cultural heritage.

CRS Credit

Savannah currently receives credit for Activity 420 – Open Space Preservation. Preserving flood prone areas as open space is one of the highest priorities of the Community Rating System. Credit is based on the area of the floodplain that is designated as public undeveloped properties, parks, wildlife refuges, golf courses, or other uses that can be kept vacant through ownership or regulations.

Floodplain Regulations

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). As a condition of making flood insurance available for their residents, communities that participate in the NFIP agree to regulate new construction in the area subject to inundation by the 100-year (base) flood. The floodplain subject to these requirements is shown as an A or V Zone on the Flood Insurance Rate Map (FIRM).

There are five major floodplain regulatory requirements. Additional floodplain regulatory requirements may be set by state and local laws.

1) All development in the 100-year floodplain must have a permit from the community. The NFIP regulations define "development" as any manmade change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials.

2) Development along a river or other channel cannot obstruct flows so as to cause an increase in flooding on other properties. An analysis must be conducted to demonstrate that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood more than one foot at any point within the community.

3) New buildings may be built in the floodplain, but they must be protected from damage from the base flood. In riverine floodplains, the lowest floor of residential buildings must be elevated to be at or above the base flood elevation (BFE). Nonresidential buildings must be either elevated or floodproofed.

4) Under the NFIP, a "substantially improved" building is treated as a new building. The NFIP regulations define "substantial improvement" as any reconstruction, rehabilitation, addition, or other improvement of a structure, the cost of which equals or exceeds 50% of the market value of the structure before the start of construction of the improvement. This requirement also applies to buildings that are substantially damaged.

5) Communities are encouraged to adopt local ordinances that are more comprehensive or provide more protection than the federal criteria. The NFIP's Community Rating System provides insurance premium credits to recognize the additional flood protection benefit of higher regulatory standards.

Local Implementation

The City of Savannah's Flood Damage Prevention Ordinance requires that all construction, additions, conversions and/or development located in areas of special flood hazard comply with certain minimum standards intended to minimize damage from floods. Furthermore, any substantially improved or substantially damaged home must be brought up to the NFIP and the City's Flood Ordinance requirements. This is known as the 50% Rule. The "50% Rule" states that if the lowest finished floor of an existing house is below the base flood elevation (BFE) and the cost of repairs or renovations will increase the structure's original Fair Market Value by more than 50%, then the lowest finish floor elevation must be raised or elevated to at least the BFE. In the VE zone, the bottom of the lowest horizontal member must be brought up to or exceed the BFE.

In all areas of special flood hazard designated as A1-30, AE, AH, A (with estimated BFE), the following provisions are required:

(1) *New construction and/or substantial improvements.* Where base flood elevation data are available, new construction and/or substantial improvement of any structure or manufactured home shall have the lowest floor, including basement, elevated no lower than one foot above the base flood elevation. Should solid foundation perimeter walls be used to elevate a structure, openings sufficient to facilitate the unimpeded movements of flood waters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures and other service facilities shall be elevated at or above one foot above the base flood elevation.

(2) *Nonresidential construction.* New construction and/or the substantial improvement of any structure located in A1-30, AE, or AH zones, may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water-tight to one foot above the base flood elevation, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above, and shall provide such certification to the official as set forth above and in subsection 8-7032(6).

(3) *Standards for manufactured homes and recreational vehicles.* Where base flood elevation data are available:

(a) All manufactured homes placed and/or substantially improved on:

(i) Individual lots or parcels,

(ii) In new and/or substantially improved manufactured home parks or subdivisions,

(iii) In expansions to existing manufactured home parks or subdivisions, or

(iv) On a site in an existing manufactured home park or subdivision where a manufactured home has incurred "substantial damage" as the result of a flood, must have the lowest floor including basement, elevated no lower than one foot above the base flood elevation.

(b) Manufactured homes placed and/or substantially improved in an either existing manufactured home park or subdivision must be elevated so that:

(i) The lowest horizontal structural member to the lowest floor of the manufactured home is elevated no lower than one foot above the level of the base flood elevation, or

(ii) The manufactured home chassis is elevated and supported by reinforced piers (or other foundation elements of at least an equivalent strength) of no less than 36 inches in height above grade.

(c) All manufactured homes must be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement.

(d) All recreational vehicles placed on sites must either:

(i) Be on the site for fewer than 180 consecutive days.

(ii) Be fully licensed and ready for highway use, (a recreational vehicle is ready for highway use if it is licensed, on its wheels or jacking system, attached to the site only by quick disconnect type utilities and security devices, and has no permanently attached structures or additions), or

(iii) The recreational vehicle must meet all the requirements for "New Construction", including the anchoring and elevation requirements of subsections (3)(a) and (b), above.

Floodway. Located within areas of special flood hazard established in section 8-7011 are areas designated as floodway. A floodway may be an extremely hazardous area due to velocity floodwaters, debris or erosion potential. In addition, the area must remain free of encroachment in order to allow for the discharge of the base flood without increased flood heights. Therefore, the following provisions shall apply:

(a) Encroachments are prohibited, including earthen fill, new construction, substantial improvements or other development within the regulatory floodway. Development may be permitted however, provided it is demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the encroachment shall not result in any increase in flood levels or floodway widths during a base flood discharge. A registered professional engineer must provide supporting technical data and certification thereof.

(b) Only if subsection (4)(a) above is satisfied, then any new construction or substantial improvement shall comply with all other applicable flood hazard reduction provisions of this article.

The following provisions apply in special flood hazard areas where streams exist but no base flood data have been provided (A-zones), or where base flood data have been provided but a floodway has not been delineated:

When base flood elevation data or floodway data have not been provided in accordance with section 8-7011, then the city engineer shall obtain, review, and reasonably utilize any scientific or historic base flood elevation and floodway data available from a federal, state, or other source, in order to administer the provisions of this article. Only if data are not available from these sources, then the following provisions ([subsections] (2) and (3)) shall apply.

No encroachments, including structures or fill material, shall be located within an area equal to the width of the stream or 25 feet, whichever is greater, measured from the top of the stream bank, unless:

(a) An equal or greater volume of material is excavated from the floodway at the point of encroachment, such that there is no increase in the base flow elevation at any point within the community; and

(b) Certification by a registered professional engineer is provided demonstrating that such encroachment and its mitigation shall not result in any increase in flood levels during the occurrence of the base flood discharge.

In special flood hazard areas without base flood elevation data, new construction and substantial improvements of existing structures shall have the lowest floor of the lowest enclosed area (including basement) elevated no less than three feet above the highest adjacent grade at the building site. (NOTE: Require the lowest floor to be elevated one foot above the estimated base flood elevation in A-zone areas where a limited detail study has been completed). Openings sufficient to facilitate the unimpeded movements of floodwaters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

All heating and air conditioning equipment and components (including ductwork), all electrical (except the main disconnect, the electric meter, and one ground fault interrupted outlet and switch), ventilation, plumbing fixtures, and other service facilities shall be elevated no less than three feet above the highest adjacent grade at the building site.

The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

The following provisions apply in SFHAs where streams with base flood elevations are provided but no floodways have been designated (zones AE):

(1) No encroachments, including fill material, new structures or substantial improvements shall be located within areas of special flood hazard unless:

(a) Any fill material or portion of any other improvement placed inside a special flood hazard area (SFHA) below base flood elevation shall be mitigated on site or on an adjacent site by an equal or greater volume of excavated material. The mitigation excavation must be connected to the special flood hazard area at an elevation less than or equal to an elevation two feet below the 100 year flood plain elevation; or,

(b) A stormwater conveyance system is sized and constructed to convey the 100-year 24-hour storm to a suitable outfall.

In either case, certification by a registered professional engineer shall be provided demonstrating that the cumulative effect of the proposed development, when combined with all other existing and anticipated development, will not increase the water surface elevation of the base flood at any point within the community. The engineering certification should be supported by verifiable technical data that conforms to standard hydraulic engineering principles.

New construction or substantial improvements of buildings shall be elevated or flood-proofed to elevations established in accordance with section 8-7046

The following provisions apply in SFHAs designated "AO" shallow flooding areas. These areas have base flood depths of one to three feet above ground, with no clearly defined channel.

All new construction and substantial improvements of residential and non-residential structures shall have the lowest floor, including basement, elevated to the flood depth number specified on the flood insurance rate map (FIRM), above the highest adjacent grade. If no flood depth number is specified, the lowest floor, including basement, shall be elevated at least three feet above the highest adjacent grade. Openings sufficient to facilitate the unimpeded movements of flood waters shall be provided in accordance with standards of subsection 8-7045(4), "Elevated buildings".

The development services director shall certify the lowest floor elevation level and the record shall become a permanent part of the permit file.

(2) New construction or the substantial improvement of a nonresidential structure may be floodproofed in lieu of elevation. The structure, together with attendant utility and sanitary facilities, must be designed to be water tight to the specified FIRM flood level plus one foot, above highest adjacent grade, with walls substantially impermeable to the passage of water, and structural components having the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy. A registered professional engineer or architect shall certify that the design and methods of construction are in accordance with accepted standards of practice for meeting the provisions above, and shall provide such certification to the official as set forth above and as required in subsections 8-7031(1) and (2).

(3) Drainage paths shall be provided to guide floodwater around and away from any proposed structure.

The following provisions apply in areas designated as coastal high hazard areas (V-zones). These areas have special flood hazards associated with wave action and storm surge.

All new construction and substantial improvements of existing structures shall not be located within the buffer of the state waters and salt marsh as determined by the Georgia Department of Natural Resources;

All new construction and substantial improvements of existing structures shall be elevated on piles, columns, or shear walls parallel to the flow of water so that the bottom of the lowest supporting horizontal structural member (excluding pilings or columns) is located no lower than one foot above the base flood elevation level. All space below the lowest supporting member shall remain free of obstruction or constructed with non-supporting breakaway walls. Open wood lattice work or decorative screening may be permitted for aesthetic purposes only and must be designed to wash away in the event of abnormal wave action and in accordance with subsection (6) below;

(3) All new construction and substantial improvements of existing structures shall be securely anchored on pilings, columns, or shear walls; and

(4) All pile and column foundations and the structures attached thereto shall be anchored to resist flotation, collapse, and lateral movement due to the combined effects of wind and water loads acting simultaneously on all building components, both (nonstructural and structural). Water loading values shall equal or exceed those of the base flood. Wind loading values shall be in accordance with the most current edition of the Standard Building Code.

(5) A registered professional engineer or architect shall certify that the design, specifications and plans for construction are in compliance with the provisions contained in subsections (2), (3), and (4) herein.

(6) All space below the lowest horizontal supporting member must remain free of obstruction. Breakaway walls, open wood lattice work or decorative screening may be permitted and must be designed to wash away in the event of abnormal wave action without causing structural damage to the supporting foundation or elevated portion of the structure. The following design specifications are allowed:

(a) The design safe loading resistance of each wall shall not be less than ten nor more than 20 pounds per square foot; or

(b) If more than 20 pounds per square foot, a registered professional engineer or architect shall certify that the design wall collapse would result from a water load less than that which would occur during the base flood event, and the elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement, or other structural damage due to the effects of wind and water loads acting simultaneously on all building components during the base flood event. Maximum wind and water loading values to be used in this determination shall each

have one percent chance of being equaled or exceeded in any given year (100-year mean recurrence interval).

(c) Any such enclosed space shall not be used for human habitation, but shall be designed to be used only for parking of vehicles, building access, or limited storage of maintenance equipment used in connection with the premises.

(d) To have a breakaway wall, other than screening or open wood latticework, the owner must sign a non-conversion agreement stating that these areas shall not be converted to habitable space allowing the Development Services Director access to ensure the enclosed area is not in violation to this ordinance. The owner must record the agreement with the deed for future owners.

(7) Prior to construction, plans for any structures having open wood latticework or decorative screening must be submitted to the Development Services Director for approval;

(8) Any alteration, repair, reconstruction or improvement to any structure shall not enclose the space below the lowest floor except with open wood latticework or decorative screening, as provided in this Section.

(9) There shall be no fill used as structural support, or to elevate areas used for septic tank drain fields. Non-compacted fill may be used around the perimeter of a building for landscaping/aesthetic purposes provided the fill will wash out from storm surge, (thereby rendering the building free of obstruction) prior to generating excessive loading forces, ramping effects, or wave deflection. The Development Services Director may approve design plans for landscaping/aesthetic fill only after the applicant has provided an analysis by an engineer, architect, and/or soil scientist, which demonstrates that the following factors have been fully considered:

(a) Particle composition of fill material does not have a tendency for excessive natural compaction;

(b) Volume and distribution of fill will not cause wave defection to adjacent properties; and

(c) Slope of fill will not cause wave run-up or ramping.

(10) There shall be no alteration of sand dunes, mangrove stands or hammocks, which would increase potential flood damage;

(11) Prohibit the placement of manufactured homes (mobile homes), except in an existing manufactured homes park or subdivision. A replacement manufactured home may be placed on a lot in an existing manufactured home park or subdivision provided the anchoring standards of subsection (4) are met.

CRS Credit

Savannah currently receives credit for Activity 430 – Higher Regulatory Standards. The City receives credit for enforcing regulations that require freeboard for new and substantial improvement construction, cumulative substantial improvement, lower substantial improvement, other higher regulatory standards, and state mandated regulatory standards. Credit is also provided for a BCEGS classification of 4/4 and for staff education and certification as a floodplain manager. The City of Savannah has several CFMs on staff.

Stormwater Management

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality.

There are three ways to prevent flooding problems caused by stormwater runoff:

1) Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties, and
2) Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions.
3) Set construction standards so buildings are protected from shallow water.

Local Implementation

The City's Stormwater Management Department is responsible for the operation and maintenance of the stormwater drainage systems of the City of Savannah. This includes the operation of seven stormwater pump stations, over 390 miles of storm sewers, over 160 miles of drainage ditches and canals, and five detention ponds. Another function of the Department is to ensure compliance with a state-issued stormwater permit, which requires stormwater monitoring, private site inspections, and site development permitting. And lastly, the Department develops engineering plans, bids and installs capital drainage improvements projects.

The City of Savannah's NPDES MS-4 Permit No. GAS000205 requires that the City adopt and enforce certain environmental regulations as the permittee. These regulations require adoption of the model ordinance contained within the Coastal Stormwater Supplement (CSS) to the Georgia Stormwater Management Manual (GSMM). Therefore, the City of Savannah updated its Stormwater Management Ordinance pursuant to the permit; the updated Stormwater Management Ordinance became effective in April 2012. The following minimum stormwater design standards are included in the Ordinance:

a) There shall be no increase in the base flood elevation within the special flood hazard area (SFHA), as delineated by the latest National Flood Insurance Program (NFIP) maps, or in any areas that are known to have flooded repetitively, or areas where a hydrologic model predicts flooding will occur in the 100-year, 24-hour event. Where hydrologic model results are conflicting, the stormwater management director shall decide which model will be used.
b) Finished floor elevations for structures not included in the special flood hazard area shall be equal to or higher than that shown on the original subdivision plat or neighborhood grading and drainage plan or as determined by a registered civil engineer.
c) The post-development peak rate of runoff shall not exceed the predevelopment peak rate of runoff for the one-, five-, ten-, and 25-year, 24-hour events.
d) If drainage calculations indicate that post-development runoff will exceed predevelopment runoff, then on-site detention for the one-, five-, ten-, and 25-year, 24-hour events is required at a discharge rate equal to the pre-developed 24-hour peak rate of discharge for all storm events from the one-, five-, ten-, and including the 25-year event, or the capacity of the existing downstream conveyance system must be upgraded in capacity to accommodate the additional 25-year, 24-hour discharge generated by the new development.
e) All stormwater management systems shall be designed to comply with the requirements of the latest City of Savannah Local Design Manual and comply with the latest edition of the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual.
f) Drainage and/or access easements. The width and configuration requirements of drainage and maintenance easements/rights-of-way are listed in section 4.3.8 of the Stormwater Management Local Design Manual. Access and flow-through easements shall be provided to all stormwater management structures and outfalls.

The City of Savannah Stormwater Management Local Design Manual (LDM) has been developed to serve as a comprehensive guide to implementing stormwater management facilities, controls and systems in the City of Savannah. Additionally, the City of Savannah LDM has been developed to supplement the

technical guidance information contained in the Georgia Stormwater Management Manual (GSMM) first Edition (August 2001) and the Coastal Stormwater Supplement (CSS) to the GSMM, latest edition. The City's MS-4 permit requires that the City adopt a local design manual that implements the use of either the Georgia Stormwater Management Manual or an equivalent local design manual, and that, as a part of Chatham County, that the adopted manual should include the Coastal Supplement. Therefore, the Local Design Manual serves as the required manual, and the GSMM and the CSS serve as technical reference guidance for the design, construction, and maintenance of stormwater management systems within the City. Any conflicts or issues that may arise pertaining to information contained in the GSMM and the CSS should be addressed at the onset of the project through correspondence with the appropriate City Staff.

CRS Credit

Cutler Bay currently receives credit for Activity 450 – Stormwater Management. The community enforces regulations for stormwater management, freeboard in non-SFHA zones, soil and erosion control and water quality.

The table below summarizes prevention measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
1.	Ensure that storm drains are cleaned on a regular and consistent bi-annual basis in order to maintain adequate stormwater drainage as they were designed.	Storm drains throughout the Town's jurisdiction need regular cleaning/ maintenance so that nearby properties are not adversely affected by inadequate drainage and ponding of stormwater.	Yes
2.	Improve drainage capacity in the Saga Bay sub basin through upgraded stormwater piping in order to discharge the volume of runoff necessary to meet desired performance criteria for modeled storm events, as determined through hydrologic and hydraulic calculations.	Observed flooding across roadway and localized ponding in roadway in multiple locations within the sub-basins. Multiple complaints have been received.	Yes
3.	Continue implementation of drainage system maintenance on all surface water channels, canals and ditches to ensure proper storage, disposal, and water quality treatment of runoff.	Drainage features throughout the Town are in need of regular maintenance so that nearby properties are not adversely affected by reduced function.	Yes
-	Complete a Post-Disaster Redevelopment Plan to determine if and how development changes should be enacted to incorporate mitigation in post-disaster redevelopment	There is not currently local or political support to develop a post-disaster redevelopment plan. Policies controlling post-flood redevelopment are included in the flood damage prevention ordinance.	No

C.4.2 Property Protection Measures

Property protection measures are used to modify buildings or property subject to damage. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building,

- Modify the building (retrofit) so it can withstand the impacts of the hazard, and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

Keeping the Hazard Away

Generally, natural hazards do not damage vacant areas. As noted earlier, the major impact of hazards is to people and improved property. In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.

There are five common methods to keep a flood from reaching and damaging a building:

- Erect a barrier between the building and the source of the flooding.
- Move the building out of the floodprone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.

Barriers

A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier.

Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained. A berm can also settle over time, lowering its protection level. A floodwall can crack, weaken, and lose its watertight seal. Therefore, barriers need careful design and maintenance (and insurance on the building, in case of failure).

Relocation

Moving a building to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. However, experienced building movers can handle any job. In areas subject to flash flooding, deep waters, or other high hazard, relocation is often the only safe approach. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

Building Elevation

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

Demolition

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move - such as larger, slab foundation or masonry structures - and for dilapidated structures that are not worth protecting. Generally, demolition projects are undertaken by a government agency, so the cost is not borne by the property owner, and the land is converted to public open space use, like a park.

Pilot Reconstruction

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction:

- Pilot reconstruction is only possible after it has been shown that acquisition or elevation are not feasible, based on the program's criteria.
- Funds are only available to people who owned the property at the time of the event for which funding is authorized.
- It must be demonstrated that the benefits exceed the costs.
- The new building must be elevated to the advisory base flood elevation.
- The new building must not exceed more than 10% of the old building's square footage.
- The new building must meet all flood and wind protection codes.
- There must be a deed restriction that states the owner will buy and keep a flood insurance policy.
- The maximum federal grant is 75% of the cost, up to $150,000. FEMA is developing a detailed list of eligible costs to ensure that disaster funds are not used to upgrade homes.

Local Implementation

The City of Savannah currently receive credits for Activity 520 – Acquisition and Relocation. The City's Real Properties Department has submitted and received HMGP approval for 17 houses to be demolished in high-risk, flood-prone areas. Furthermore, the City's Real Properties Department has a list of repetitive loss properties on file for demolition once additional mitigation funds become available. The City does not receive credit for Activity 530 – Flood Protection.

CRS Credit

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. The CRS credits barriers and elevating existing buildings under Activity 530. Elevating a building above the flood level will also reduce the flood insurance premiums on that individual building. Because barriers are less secure than elevation, not as many points are provided. Higher scores are possible, but they are based on the number of buildings removed compared to the number remaining in the floodplain.

Retrofitting

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

Dry Floodproofing

Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

Wet Floodproofing

The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

Local Implementation

The City of Savannah does not currently receive credit for Activity 530 – Flood Protection.

CRS Credit

The credit for Activity 530 is based on the combination of flood protection techniques used and the level of flood protection provided. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities.

Insurance

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, as long as the policy is in force, without requiring human intervention for the measure to work.

Private Property

Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

Public Property

Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

Under Section 406(d) of the Stafford Act:

"If an eligible insurable facility damaged by flooding is located in a [mapped floodplain] … and the facility is not covered (or is underinsured) by flood insurance on the date of such flooding, FEMA is required to reduce Federal disaster assistance by the maximum amount of insurance proceeds that would have been received had the buildings and contents been fully covered under a National Flood Insurance Program (NFIP) standard flood insurance policy. [Generally, the maximum amount of proceeds for a non-residential property is $500,000.]

[Communities] Need to:

- Identify all insurable facilities, and the type and amount of coverage (including deductibles and policy limits) for each. The anticipated insurance proceeds will be deducted from the total eligible damages to the facilities.
- Identify all facilities that have previously received Federal disaster assistance for which insurance was required. Determine if insurance has been maintained. A failure to maintain the required insurance for the hazard that caused the disaster will render ineligible for Public Assistance funding…
- [Communities] must obtain and maintain insurance to cover [their] facility - buildings, equipment, contents and vehicles - for the hazard that caused the damage in order to receive Public Assistance funding. Such coverage must, at a minimum, be in the amount of the eligible project costs. FEMA will not provide assistance for that facility in future disasters if the requirement to purchase insurance is not met. - FEMA Response and Recovery Directorate Policy No. 9580.3, August 23, 2000
- In other words, the law expects public agencies to be fully insured as a condition of receiving federal disaster assistance.

Local Implementation

Flood insurance information for the Town is provided in Section 5.4.4 as well as the Program for Public Information found in Appendix A.

CRS Credit

There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. The City of Savannah currently receives credit for Activity 330 – Outreach Projects.

The table below summarizes property protection measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
3.	Reserve vacant low-lying/flood-prone/wetland areas for open space through acquisition or regulation	Any vacant land in the City should be reserved for open space that can serve to protect surrounding property from flood damages.	Yes
7.	Reduce future vulnerability of Valambrosa area through acquisition or regulation.	By acquiring/regulating this particular flood prone area, property in and around the area can be protected from future flood losses. A part of the area is currently being developed as a natural preserve.	Yes

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
-	Pursue relocation of at-risk structures including repetitive loss properties.	Much of Savannah is built out, making it difficult to support relocation to lower risk areas within the City. Additionally, slab on grade foundations present a difficulty and increased cost for relocations and/or elevations.	No

C.4.3 Natural Resource Protection

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and snow melt in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Seven areas are reviewed:

- Wetland protection
- Erosion and sedimentation control
- River restoration
- Best management practices
- Dumping regulations
- Urban forestry
- Farmland protection

Wetland Protection

Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.

Local Implementation

In 1970, the State of Georgia established the Coastal Marshlands Protection Act (CMPA) to protect the marsh and estuarine areas, and to regulate the activities within these public trust lands that are held for the citizens of Georgia. Through the Georgia Department of Natural Resources, Coastal Resources Division (GADNR-CRD), the CMPA is enacted to protect the estuarine area. Activities and structures in the coastal marshlands are regulated to ensure that the values and functions of the coastal marshlands

are not impaired. GADNR-CRD allows for the sustainable use of the estuarine area through permits and other methods of authorization that will preserve the condition of the marsh while still allowing for its enjoyment.

CRS Credit

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. The City of Savannah currently receives credit for Activity 420 – Open Space Preservation.

Erosion and Sedimentation Control

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil.

Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands. When channels are constricted and flooding cannot deposit sediment in the bottomlands, even more sediment is left in the channels. The result is either clogged streams or increased dredging costs.

Not only are the drainage channels less able to perform their job, but the sediment in the water reduces light, oxygen and water quality, and often carries chemicals, heavy metals and other pollutants. Sediment has been identified by the US EPA as the nation's number one nonpoint source pollutant for aquatic life.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

If erosion occurs, other measures are used to capture sediment before it leaves the site. Silt fences, sediment traps and vegetated filter strips are commonly used to control sediment transport. Runoff from the site can be slowed down by terraces, contour strip farming, no-till farm practices, hay or straw bales, constructed wetlands, and impoundments (e.g., sediment basins and farm ponds). Slowing surface water runoff on the way to a drainage channel increases infiltration into the soil and reduces the volume of topsoil eroded from the site.

Erosion and sedimentation control regulations mandate that these types of practices be incorporated into construction plans. The most common approach is to require applicants for permits to submit an erosion and sediment control plan for the construction project. This allows the applicant to determine the best practices for the site.

Local Implementation

Savannah's Soil Erosion, Sedimentation and Pollution Control Ordinance contains the following minimum requirements:

a) *General provisions.* Excessive soil erosion and resulting sedimentation can take place during land-disturbing activities if requirements of the chapter and the NPDES general permit are not met. Therefore, plans for those land-disturbing activities which are not exempted by this chapter shall contain provisions for application of soil erosion, sedimentation and pollution control measures and practices. The provisions shall be incorporated into the erosion,

sedimentation and pollution control plans. Soil erosion, sedimentation and pollution control measures and practices shall conform to the minimum requirements of subsections (b) and (c) of this section. The application of measures and practices shall apply to all features of the site, including street and utility installations, drainage facilities and other temporary and permanent improvements. Measures shall be installed to prevent or control erosion, sedimentation and pollution during all stages of any land-disturbing activity in accordance with requirements of this chapter and the NPDES General Permit.

b) *Minimum requirements/BMPS.*

1) Best management practices as set forth in this subsection and subsection (c) shall be required for all land-disturbing activities. Proper design, installation, and maintenance of best management practices shall constitute a complete defense to any action by the director or to any other allegation of noncompliance with subsection (b)(2) or any substantially similar terms contained in a permit for the discharge of stormwater issued pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act". As used in this subsection the terms "proper design" and "properly designed" mean designed in accordance with the hydraulic design specifications contained in the "Manual for Erosion and Sediment Control in Georgia" specified in O.C.G.A. § 12-7-6(b).
2) A discharge of stormwater runoff from disturbed areas where best management practices have not been properly designed, installed, and maintained shall constitute a separate violation of any land-disturbing permit issued by a local issuing authority or of any state general permit issued by the division pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act", for each day on which such discharge results in the turbidity of receiving waters being increased by more than 25 nephelometric turbidity units for waters supporting warm water fisheries or by more than ten nephelometric turbidity units for waters classified as trout waters. The turbidity of the receiving waters shall be measured in accordance with guidelines to be issued by the director. This paragraph shall not apply to any land disturbance associated with the construction of single-family homes which are not part of a larger common plan of development or sale unless the planned disturbance for such construction is equal to or greater than five acres.
3) Failure to properly design, install, or maintain best management practices shall constitute a violation of any land-disturbing permit issued by a local issuing authority or of any state general permit issued by the division pursuant to subsection (f) of O.C.G.A. § 12-5-30, the "Georgia Water Quality Control Act", for each day on which such failure occurs.
4) The director may require, in accordance with regulations adopted by the board, reasonable and prudent monitoring of the turbidity level of receiving waters into which discharges from land-disturbing activities occur.
5) The LIA may set more stringent buffer requirements than stated in subsections (c)(15) and (16), in light of O.C.G.A. § 12-7-6(c).

c) *[Minimum requirements.]* The rules and regulations, ordinances, or resolutions adopted pursuant to O.C.G.A. § 12-7-1 et. seq. for the purpose of governing land-disturbing activities shall require, as a minimum, protections at least as stringent as the state general permit; and best management practices, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the Manual for Erosion and Sediment Control in Georgia published by the Georgia Soil and Water Conservation Commission as of January 1 of the year in which the land-disturbing activity was permitted, as well as the following:

1) Stripping of vegetation, regrading and other development activities shall be conducted in a manner so as to minimize erosion;
2) Cut-fill operations must be kept to a minimum;
3) Development plans must conform to topography and soil type so as to create the lowest practicable erosion potential;
4) Whenever feasible, natural vegetation shall be retained, protected and supplemented;
5) The disturbed area and the duration of exposure to erosive elements shall be kept to a practicable minimum;
6) Disturbed soil shall be stabilized as quickly as practicable;
7) Temporary vegetation or mulching shall be employed to protect exposed critical areas during development;
8) Permanent vegetation and structural erosion control practices shall be installed as soon as practicable;
9) To the extent necessary, sediment in runoff water must be trapped by the use of debris basins, sediment basins, silt traps, or similar measures until the disturbed area is stabilized. As used in this paragraph, a disturbed area is stabilized when it is brought to a condition of continuous compliance with the requirements of O.C.G.A. § 12-7-1 et seq.;
10) Adequate provisions must be provided to minimize damage from surface water to the cut face of excavations or the sloping of fills;
11) Cuts and fills may not endanger adjoining property;
12) Fills may not encroach upon natural watercourses or constructed channels in a manner so as to adversely affect other property owners;
13) Grading equipment must cross flowing streams by means of bridges or culverts except when such methods are not feasible, provided, in any case, that such crossings are kept to a minimum;
14) Land-disturbing activity plans for erosion, sedimentation and pollution control shall include provisions for treatment or control of any source of sediments and adequate sedimentation control facilities to retain sediments on-site or preclude sedimentation of adjacent waters beyond the levels specified in subsection (b)(2);
15) Except as provided in paragraph (16) of this subsection, there is established a 25-foot buffer along the banks of all state waters, as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, except

where the director determines to allow a variance that is at least as protective of natural resources and the environment, where otherwise allowed by the director pursuant to O.C.G.A. § 12-2-8, where a drainage structure or a roadway drainage structure must be constructed, provided that adequate erosion control measures are incorporated in the project plans and specifications, and are implemented; or along any ephemeral stream. As used in this provision, the term "ephemeral stream" means a stream that under normal circumstances has water flowing only during and for a short duration after precipitation events; that has the channel located above the groundwater table year round; for which groundwater is not a source of water; and for which runoff from precipitation is the primary source of water flow. Unless exempted as along an ephemeral stream, the buffers of at least 25 feet established pursuant to part 6 of article 5, chapter 5 of title 12 [O.C.G.A. § 12-5-6 et seq.], the "Georgia Water Quality Control Act", shall remain in force unless a variance is granted by the director as provided in this paragraph. The following requirements shall apply to any such buffer:

a. No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed state of vegetation until all land-disturbing activities on the construction site are completed. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; provided, however, that any person constructing a single-family residence, when such residence is constructed by or under contract with the owner for his or her own occupancy, may thin or trim vegetation in a buffer at any time as long as protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; and

b. The buffer shall not apply to the following land-disturbing activities, provided that they occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream; cause a width of disturbance of not more than 50 feet within the buffer; and adequate erosion control measures are incorporated into the project plans and specifications and are implemented:
    1. Stream crossings for water lines; or
    2. Stream crossings for sewer lines; and

16) There is established a 50-foot buffer as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any state waters classified as "trout streams" pursuant to article 2 of chapter 5 of title 12 [O.C.G.A. § 12-5-2 et seq.], the "Georgia Water Quality Control Act", except where a roadway drainage structure must be constructed ; provided, however, that small springs and streams classified as trout streams which discharge an average annual flow of 25 gallons per minute or less shall have a 25-foot buffer or they may be piped, at the discretion of the landowner, pursuant to the terms of a rule

providing for a general variance promulgated by the board, so long as any such pipe stops short of the downstream landowner's property and the landowner complies with the buffer requirement for any adjacent trout streams. The director may grant a variance from such buffer to allow land-disturbing activity, provided that adequate erosion control measures are incorporated in the project plans and specifications and are implemented. The following requirements shall apply to such buffer:

a. No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed. Once the final stabilization of the site is achieved, a buffer may be thinned or trimmed of vegetation as long as a protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed: provided, however, that any person constructing a single-family residence, when such residence is constructed by or under contract with the owner for his or her own occupancy, may thin or trim vegetation in a buffer at any time as long as protective vegetative cover remains to protect water quality and aquatic habitat and a natural canopy is left in sufficient quantity to keep shade on the stream bed; and

b. The buffer shall not apply to the following land-disturbing activities, provided that they occur at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream; cause a width of disturbance of not more than 50 feet within the buffer; and adequate erosion control measures are incorporated into the project plans and specifications and are implemented:
    1. Stream crossings for water lines; or
    2. 2. Stream crossings for sewer lines.

d) Nothing contained in O.C.G.A. § 12-7-1 et seq. shall prevent any local issuing authority from adopting rules and regulations, ordinances, or resolutions which contain stream buffer requirements that exceed the minimum requirements in subsections (b) and (c).

The fact that land-disturbing activity for which a permit has been issued results in injury to the property of another shall neither constitute proof of nor create a presumption of a violation of the standards provided for in this chapter or the terms of the permit.

CRS Credit

Credit is available for the Erosion and Sediment Control (ESC) element under Activity 450 for regulating activities throughout the watershed to minimize erosion on construction sites that result could in sedimentation and water pollution.

Stream Restoration

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Local Implementation

The Coastal Georgia Regional Development Center prepared a Regional River Corridor Protection Plan that describes the ten local governments and the associated rivers that are affected by the River Corridor Protection Act, and puts forward a regional plan for the protection of river corridors. The plan provides for construction of road crossings, acceptable uses of river corridors, maintenance of a vegetative buffer along rivers for a minimum of 100 feet from the river's edge (residential structures are allowed within the buffer zone), timber production standards, wildlife and fisheries management, recreation, and other uses. Chatham County is one of the eight coastal counties affected by the River Corridor Protection Act and therefore, as required, has adopted a Regional River Corridor Protection Plan for the Savannah River. The maintenance of a 100-foot natural vegetative buffer, often referred to as a “riparian buffer”, on both sides of any protected river is required under the River Corridor Protection Act. Similarly, under the State of Georgia Erosion and Sedimentation Act, one provision requires that land-disturbing activities shall not be conducted within 25 feet of the banks of any State waters, thus mandating a riparian buffer 25 feet in width.

Savannah’s Soil Erosion, Sedimentation and Pollution Control Ordinance establishes a 50-foot buffer as measured horizontally from the point where vegetation has been wrested by normal stream flow or wave action, along the banks of any state waters classified as "trout streams" pursuant to article 2 of chapter 5 of title 12 [O.C.G.A. § 12-5-2 et seq.], the "Georgia Water Quality Control Act”. No land-disturbing activities shall be conducted within a buffer and a buffer shall remain in its natural, undisturbed, state of vegetation until all land-disturbing activities on the construction site are completed.

CRS Credit

The City of Savannah currently receives credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition. There are also credits for channel setbacks, buffers and protecting shorelines.

Best Management Practices

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

Local Implementation

In accordance with the City's Stormwater Management Ordinance, all stormwater management systems shall be designed to comply with the requirements of the latest City of Savannah Local Design Manual and comply with the latest edition of the Coastal Stormwater Supplement to the Georgia Stormwater Management Manual. The City of Savannah Local Design Manual requires stormwater runoff reduction and stormwater water quality BMPs. Post-construction stormwater management and site planning and design criteria must be applied to all new development and redevelopment activities that are subject to the Stormwater Management Ordinance. The criteria include a natural resources inventory, use of Green Infrastructure/Low Impact Development practices, stormwater runoff reduction, stormwater quality management and protection, aquatic resource protection and energy dissipation, overbank flood protection, and extreme flood protection.

CRS Credit

The City of Savannah currently receives credit for Activity 450 – Stormwater Management. To receive WQ credit, the community's stormwater management regulations must either specify one or more measures or refer to BMPs as published in an official government reference.

Dumping Regulations

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how regarding their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

Local Implementation

The City of Savannah prohibits dumping in ditches as outlined in Code Sec. 4-11004 and 5-2005. Citizens are instructed to not sweep or blow yard leaves, pine needles, grass clippings or soil into the street or storm water system and to keep the banks of drainage ditches clear of brush and debris. Citizens are also requested to report someone dumping debris in the canals to the City. A portion of the community's drainage system is inspected regularly throughout the year and maintenance is performed

as needed by the City of Savannah Public Works Department. Records are being maintained for both inspections and required maintenance.

CRS Credit

The City of Savannah does not currently receives credit for Activity 540 – Drainage System Maintenance. Credit is provided under the Stream Dumping Regulations (SDR) element if the community has and publicizes regulations prohibiting dumping in streams and ditches.

Farmland Protection

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land. Eligible land includes cropland, rangeland, grassland, pastureland, or forest land that is part of an agricultural operation. Certain lands within historical or archaeological resources are also included.

The hazard mitigation benefits of farmland protection are similar to those of open space preservation:

- Farmland is preserved for future generation,
- Farmland in the floodplain keeps damageable structures out of harm's way
- Farmland keeps more stormwater on site and lets less stormwater runoff downstream
- Rural economic stability and development is sustained
- Ecosystems are maintain, restored or enhanced
- The rural character and scenic beauty of the area is maintained

Local Implementation

According to the Georgia Guide, Chatham County had 228 farms in 1964, 51 farms in 1987 and 42 in 1997. The average size of a farm in 1997 was 207 acres, down from 209 acres in 1987. Lastly, there were 927 acres of harvested cropland in Chatham County in 1997. In 1997, Chatham County ranked 154 out of 159 counties statewide with the percent of total land being used as farms. Only 3.1 percent of the total land area of the county was being used for agriculture.

According to the Chatham County-Savannah Comprehensive Plan Natural Resources Element, Chatham County has 92,980 acres of timberland. This equates to 32.8 percent of all land in the county. There are 10,999 acres of long-leaf slash pine; 25,873 acres of loblolly-shortleaf pine; 14,305 acres of oak-pine; 23,810 acres of oak-hickory; and 17,993 acres of oak-gum-cypress. And the ownership of the forest land is classified either as government (17.3 percent), forest industry (39.5 percent) and other private (43.2 percent).

The City of Savannah is highly urbanized with exceptionally large areas of mixed use development. Except for the western airport area, the city is largely built-out and growing chiefly through annexation.

However, urban neighborhoods that have declined in population and former industrial lands represent an opportunity for land preservation.

CRS Credit

The City of Savannah currently receives credit for Activity 420 – Open Space Preservation. The CRS provides credit for preserving open space in its natural condition or restored to a state approximating its natural condition.

The table below summarizes natural resource protection measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
29.	Support the Chatham County-Savannah MPC Greenway Plan and coordinate with the MPC on the Plan as needed.	Greenways have the potential to protect property as well as maintain natural resources throughout the City.	Yes
31.	Coordinate with the Chatham County Resource Protection Land to acquire lands vulnerable to flooding through SPLOST funds.	The City is encouraging maintaining natural resources by acquiring land and maintaining it in conjunction with Chatham County	Yes
-	Implement BMPs to increase storage capacity for floodwaters.	The City encourages developers to implement BMPs through its Stormwater Management Local Design Manual.	No

C.4.4 Emergency Services Measures

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. At the state level, emergency services programs are coordinated by the Florida Department of Emergency Management (FDEM). Locally, Cutler Bay's emergency services are coordinated by Miami-Dade County Emergency Management.

This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

Threat Recognition

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition

equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

Local Implementation

The Chatham County Emergency Operations Center (EOC) operates at one of three levels of readiness in order to carry out its mission. CEMA is constantly monitoring the County for threats, unusual events, or situations. A CEMA Duty Officer (DO) is on-call 24 hours a day, 7 days a week, and is advised of any such events by dispatch, the National Weather Service, concerned citizens, or other agencies. The Duty Officer also has the responsibility to monitor and follow-up on any threat, unusual event, or situation that has the potential to impact Chatham County such as media reports, weather advisories, etc. It is important to note that although CEMA is constantly monitoring the progression of events within the County, the EOC is not considered activated. During day-to-day operations where no specific situation is occurring, the EOC is not activated.

CRS Credit

The City of Savannah currently receives credit for Activity 610 – Flood Warning Program. Credit can be received for using National Hurricane Center warnings and river flood stage predictions for the NWS's gages. The actual score is based on how much of the community's floodplain is affected by these systems.

Warning

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

- Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
- Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Multiple or redundant systems are most effective - if people do not hear one warning, they may still get the message from another part of the system. Each has advantages and disadvantages:

- Radio and television provide a lot of information, but people have to know when to turn them on. They are most appropriate for hazards that that develop over more than a day, such as a tropical storm, hurricane, or winter storm.

- NOAA Weather Radio can provide short messages of any impending weather hazard or emergency and advise people to turn on their televisions for more information, but not everyone has a Weather Radio.
- Outdoor warning sirens can reach many people quickly as long as they are outdoors. They do not reach people in tightly-insulated buildings or those around loud noise, such as at a factory, during a thunderstorm, or in air conditioned homes. They do not explain what hazard is coming, but people should know to turn on a radio or television when they hear the siren.
- Automated telephone notification services are also fast, but can be expensive and do not work when phone lines are down. Nor do they work for unlisted numbers, call screening services, or cellular service, unless people sign up for notifications.

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

StormReady

The National Weather Service established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a StormReady community by the National Weather Service is a good measure of a community's emergency warning program for weather hazards. It is also credited by the CRS.

Local Implementation

In the entire Chatham County area, the Chatham Emergency Management Agency (CEMA) manages the flood warning system. Once CEMA receives a potential dangerous warning, sirens will be activated. The sirens can give as little as fifteen minutes warning time. When you hear the sirens, information can be heard on the television (WTOC, WSAV, or WJCL) or on the radio at WCHY (94.1) on what to do. Information can be heard on the NOAA weather radio broadcast at frequency 162.40. Local evacuation routes can be found in the phone book.

The City of Savannah is not currently designated as a StormReady community; however, Chatham County is designated as StormReady. Should a storm threaten Chatham County, the Emergency Operations Center will activate. During activation, the county will give regularly advisories to the media and to local municipalities.

CRS Credit

The City of Savannah currently receives credit for Activity 610 – Flood Warning Program. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits if there are additional measures, like telephone trees. Being designated as a StormReady community can provide additional credits.

Response

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)
- Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

A flood stage forecast map shows areas that will be under water at various flood stages. Different flood levels are shown as color coded areas, so the emergency manager can quickly see what will be affected. Emergency management staff can identify the number of properties flooded, which roads will be under water, which critical facilities will be affected, and who to warn. With this information, an advance plan can be prepared that shows problem sites and determines what resources will be needed to respond to the predicted flood level.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

Local Implementation

Activation of the Chatham County EOC will be determined by CEMA's Director and Assistant Director (AD). The expected, actual or perceived severity of the incident is paramount in determining the level of activation. In the event the EOC is activated, the AD will make notifications to CEMA Staff and the GEMA Area V Field Coordinator. The Director will make notifications to County Commissioners as required, the County Manager and appropriate County Department Heads.

CRS Credit

The City of Savannah currently receives credit for Activity 610 – Flood Warning Program.

Evacuation and Shelter

There are six key components to a successful evacuation:

- Adequate warning
- Adequate routes
- Proper timing to ensure the routes are clear
- Traffic control
- Knowledgeable travelers

- Care for special populations (e.g., the handicapped, prisoners, hospital patients, and schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

Local Implementation

Once an evacuation order is issued all major roadway networks within Chatham County will be considered evacuation routes for local travel. Evacuation routes from the County to inland areas have also been designated. They include GA 204, GA 21, US 80, and I-16. Before any anticipated or actual evacuation orders are issued, CEMA will communicate and coordinate with its counterparts in adjacent coastal and inland risk counties, including those in South Carolina. They will be informed of the level and type of evacuation, the time it will begin, anticipated volume of traffic and the status of I-16. Periodic status reports on evacuation progress will also be issued to these jurisdictions. In all cases the Georgia Emergency Management Agency will be kept informed and included in any and all coordinating activities.

Georgia's Public Broadcast Systems are Peach State Public Radio (PSPR) and Georgia Public Television (GPTV). They are under the Georgia Public Telecommunications Commission and will be collaborating with GEMA and other state agencies to broadcast taped and live interviews and provide "real-time" information to the rapidly changing events of a hurricane threat. Some information could be transmitted on television but the PSPR network will be a more likely resource for evacuees because they will be able to have access as they travel. The PSPR station for Savannah is 91.1FM WSVH.

CRS Credit

Because it is primarily concerned with protecting insurable buildings, the CRS does not provide any special credit for evacuation or sheltering of people (minimal credit is given in Activity 510 - Floodplain Management for evacuation policies and procedures). It is assumed that the emergency response plan would include all necessary actions in response to a flood.

Post-Disaster Recovery and Mitigation

After a disaster, communities should undertake activities to protect public health and safety and facilitate recovery. Appropriate measures include:

- Patrolling evacuated areas to prevent looting
- Providing safe drinking water
- Monitoring for diseases
- Vaccinating residents for tetanus and other diseases
- Clearing streets
- Cleaning up debris and garbage

Following a disaster, there should be an effort to help prepare people and property for the next disaster. Such an effort would include:

- Public information activities to advise residents about mitigation measures they can incorporate into their reconstruction work
- Evaluating damaged public facilities to identify mitigation measures that can be included during repairs
- Identifying other mitigation measures that can lessen the impact of the next disaster
- Acquiring substantially or repeatedly damaged properties from willing sellers

- Planning for long-term mitigation activities
- Applying for post-disaster mitigation funds

Regulating Reconstruction

Requiring permits for building repairs and conducting inspections are vital activities to ensure that damaged structures are safe for people to reenter and repair. There is a special requirement to do this in floodplains, regardless of the type of disaster or the cause of damage. The NFIP requires that local officials enforce the substantial damage regulations. These rules require that if the cost to repair a building in the mapped floodplain equals or exceeds 50% of the building's market value, the building must be retrofitted to meet the standards of a new building in the floodplain. In most cases, this means that a substantially damaged building must be elevated above the base flood elevation.

Local Implementation

This Chatham County Post-Disaster Recovery Plan (2013) was developed for use by County and local governments and volunteer organizations to ensure a timely recovery from emergencies affecting Chatham County. This Plan was designed to identify potential actions required and the assistance necessary to support the citizens of Chatham County and to return the County to normal conditions.

The City's Flood Damage Prevention Ordinance requires that all new residential construction or substantial improvement shall have the lowest floor, including the basement, elevated to no lower than one foot above the base flood elevation.

CRS Credit

The CRS does credit post-disaster mitigation procedures if the policies and procedures are incorporated into a flood mitigation or multi-hazard plan through Activity 510 - Floodplain Management Planning.

The table below summarizes emergency services measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
11.	Target critical facilities for flood mitigation.	Protecting critical facilities such as police stations, hospitals, and fire stations ensure Emergency Services are able to operate at full capacity following a flood event.	Yes
14.	Continue coordination with CEMA, NWS and USGS to enhance flood warning system.	Enhancing the flood warning system ensures that residents can get out of Savannah easily and quickly and reduces load on emergency service providers.	Yes
-	Complete a Post-Disaster Redevelopment Plan to determine if and how development changes should be enacted to incorporate mitigation in post-disaster redevelopment	There is not currently local or political support to develop a post-disaster redevelopment plan. Policies controlling post-flood redevelopment are included in the flood damage prevention ordinance.	No

C.4.5 Structural Projects

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings
- Many projects can be built without disrupting citizens' homes and businesses
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

- Advantages
  - They may provide the greatest amount of protection for land area used
  - Because of land limitations, they may be the only practical solution in some circumstances
  - They can incorporate other benefits into structural project design, such as water supply and recreational uses
  - Regional detention may be more cost-efficient and effective than requiring numerous small detention basins
- Disadvantages
  - They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
  - They require regular maintenance
  - They are built to a certain flood protection level that can be exceeded by larger floods
  - They can create a false sense of security
  - They promote more intensive land use and development in the floodplain

Levees and Floodwalls

Probably the best known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour. Key considerations when evaluating the use of a levee include:

- Design and permitting costs
- Right of way acquisition
- Removal of fill to compensate for the floodwater storage that will be displaced by the levee
- Internal drainage of surface flows from the area inside the levee
- Cost of construction
- Cost of maintenance
- Mitigation of adverse impacts to wetlands and other habitats
- Loss of river access and views
- Creating a false sense of security, because while levees may reduce flood damage for smaller more frequent rain events, they may also overtop or breach in extreme flood events and subsequently create more flood damage than would have occurred without the levee

Reservoirs and Detention

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

Diversion

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

Dredging

Dredging is often viewed as a form of conveyance improvement. However, it has the following problems:

- Given the large volume of water that comes downstream during a flood, removing a foot or two from the bottom of the channel will have little effect on flood heights.
- Dredging is often cost prohibitive because the dredged material must be disposed of somewhere.
- Unless in-stream or tributary erosion is corrected upstream, the dredged areas usually fill back in within a few years, and the process and the expense have to be repeated.
- If the channel has not been disturbed for many years, dredging will destroy the habitat that has developed.

To protect the natural values of the stream, federal law requires a U.S. Army Corps of Engineers permit before dredging can proceed. This can be a lengthy process that requires a lot of advance planning and many safeguards to protect habitats, which adds to the cost of the project.

CRS Credit

Structural flood control projects that provide 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS in order to avoid duplicating the larger premium reduction provided by removing properties from the mapped floodplain.

The CRS credits smaller flood control projects that meet the following criteria:

- They must provide protection to at least the 25-year flood
- They must meet certain environmental protection criteria
- They must meet federal, state and local regulations, such as the Corps of Engineers' 404 permit and State dam safety rules
- They must meet certain maintenance requirements

These criteria ensure that credited projects are well-planned and permitted. Any of the measures reviewed in this section would be recognized under Activity 530 - Flood Protection. Credit points are based on the type of project, how many buildings are protected, and the level of flood protection provided.

Local Implementation

The City of Savannah does not currently receive credit for Activity 530 - Flood Protection.

The table below summarizes structural project measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
1.	Comprehensive evaluation of drainage system and implementation of selected projects.	Consistently evaluating, maintaining, and updating the drainage system reduces incidences of flooding, particularly stormwater and localized flooding events.	Yes
23.	Strategically focus SPLOST funds toward identified drainage improvement projects.	Improving drainage systems allows for better functioning during storm events.	Yes
-	Specific drainage improvement projects to address stormwater/localized flooding hotspots	Many of these projects are included in the City's constantly updated Capital Improvements program.	No

C.4.6 Public Information

Outreach Projects

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

Other approaches: Examples of other outreach projects include:

- Presentations at meetings of neighborhood, civic or business groups
- Displays in public buildings or shopping malls
- Signs in parks, along trails and on waterfronts that explain the natural features (such as the river) and their relation to the hazards (such as floods)
- Brochures available in municipal buildings and libraries
- Special meetings, workshops and seminars

Local Implementation

A community brochure is mailed to all properties in the community on an annual basis. An outreach brochure is mailed annually to all properties in the SFHA. The community also provides flood information at public buildings and public events. Savannah maintains a City website that provides flood

protection information including flood insurance, property protection, flood warning system, permit requirements, and drainage system maintenance.

CRS Credit

The City of Savannah currently receives credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information.

Real Estate Disclosure

Many times after a flood or other natural disaster, people say they would have taken steps to protect themselves if they had known they had purchased a property exposed to a hazard. There are some federal and state requirements about such disclosures:

- Federal law: Federally regulated lending institutions must advise applicants for a mortgage or other loan that is to be secured by an insurable building whether the property is in a floodplain as shown on the Flood Insurance Rate Map. If so, flood insurance is required for buildings located within the floodplain if the mortgage or loan is federally insured.
- State law: State laws set standards for real estate sales and licensing of agents and brokers.

Local Implementation

Savannah currently receives credits under Activity 340 – Hazard Disclosure for requiring local real estate agents to disclose flood hazards to prospective buyers.

Libraries and Websites

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources.

Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

Local Implementation

The City of Savannah provides documents relating to floodplain management in the reference section of the Live Oak Public Library. Savannah maintains a City website that provides flood protection information including flood insurance, property protection, flood warning system, permit requirements, and drainage system maintenance.

CRS Credit

The City of Savannah currently receives credit under Activity 350 – Flood Protection Information.

The Community Rating System provides credits for having a variety of flood references in the local public library and for providing similar material on municipal websites.

Technical Assistance

Hazard Information

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's Flood Insurance Rate Maps (FIRMs) and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

Property Protection Assistance

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors
- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

Local Implementation

FEMA floodplain maps are available on Savannah's website, and the City responds to requests on whether a property is located in a Special Flood Hazard Area. Property protection measures are also included on the City's website. Savannah also responds to drainage complaints and provides technical advice and assistance to interested property owners and annually publicizes the service.

CRS Credit

Savannah currently receives credit under Activity 360 – Flood Protection Assistance.

Public Information Program

A public information program (PPI) is a document that receives CRS credit. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts, which are incorporated into this plan:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program
- The outreach projects that will be done each year to reach the goals
- The process that will be followed to monitor and evaluate the projects

Local Implementation

A PPI for Savannah has been included as Appendix A of this Plan.

CRS Credit

The CRS provides credit for a PPI under Activity 330 – Outreach Projects.

The table below summarizes public information and outreach measures considered by the FMPC and provides the rationale for whether or not the FMPC recommended pursuing each alternative.

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Recommended?
18.	Educate the public on the use of permeable concrete paving and establishment of rain gardens to reduce flash flooding impacts.	City is committed to public outreach programs dedicated to informing the public about property scale flood property protection	Yes
22.	Provide flood protection assistance to vulnerable populations (elderly, disabled and low-income individuals) so they can purchase flood insurance.	Directly targeting vulnerable populations ensures those most likely to be impacted by floods are getting the education needed.	Yes
-	Increase awareness of the flood hazard through development of a PPI.	The City has already developed a PPI so no longer needs to focus on this project.	No

C.5 MITIGATION ALTERNATIVE SELECTION CRITERIA

The following criteria were used to select and prioritize proposed mitigation measures:

STAPLEE

- **Socially Acceptable:** Is the action acceptable to the community? Does it have a greater impact on a certain segment of the population? Are the benefits fair?
- **Technically Feasible:** Is the action technically feasibly? Is it a long-term solution to the problem? Does it capitalize on existing planning mechanisms for implementation?
- **Administrative Resources:** Are there adequate staffing, funding and other capabilities to implement the project? Is there adequate additional capability to ensure ongoing maintenance?
- **Politically Supported:** Will there be adequate political and public support for the project? Does the project have a local champion to support implementation?
- **Legally Allowable:** Does the community have the legal authority to implement the action?
- **Economically Sound:** Can the action be funded locally? Will the action need to be funded by an outside entity, and has that funding been secured? How much will the project cost? Can the benefits be quantified, and do they outweigh the costs?
- **Environmentally Sound:** Does the action comply with environmental regulations? Does the action meet the community's environmental goals? Does the action impact land, water, endangered species, or other natural assets?

Action Efficacy

- Will the action result in lives saved?
- Will the action reduce property damages?
- Will the action reduce the need for response actions?
- Will the benefits exceed the cost?

Sustainable Disaster Recovery Principles

- Quality of life
- Social equity
- Hazard mitigation
- Economic development
- Environmental protection/enhancement

- Community participation

Smart Growth Principles

- Infill versus sprawl
- Efficient use of land resources
- Full use of urban resources
- Mixed uses of land
- Transportation options
- Detailed, human-scale design