McIntosh County City of Darien Joint Hazard Mitigation Plan Update

2018-2023

McIntosh County Emergency Management Agency

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Prepared by:

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CHAPTER 1 – PLANNING PROCESS

The table below provides a brief description of each section in this chapter and a summary of the changes that have been made to the 2013 McIntosh County Joint Hazard Mitigation Plan Update. As a note, while 2013 Hazard Mitigation Plan Update was approved in 2013, committee meetings to develop this plan occurred from October 2009 to July 2010, and the hazards data included were last updated as of July 15, 2009.

Summary of Updates to Chapter 1

Chapter 1 Section	Updates to Section
I. Purpose, Need, Authority and Statement of Problem	Updated dates for previous Hazard Mitigation Plan Update
II. Planning Methodology	Section updated to include current/active list of participants, committee organization, brief summary of meetings, detailed summary of public involvement, establishment of HMPUC, and connection with neighboring communities.
III. Review and Analysis of the Original Plan	Section updated with narrative on plan development process, additional planning documents that were used, how plans were reviewed/updated, and a summary of major changes to the plan.
IV. Plan Organization	Text revised, and the chapters (formerly 3 and 5) on Technological Hazards (HRV Summary & Mitigation Goals and Objectives) and were removed from this plan because they are no longer a requirement and the HMPUC decided to remove them.
V. Summary of Local Hazard, Risk, and Vulnerability (HRV), and Local Mitigation Goals and Objectives	New data sources and information is provided for updating hazard event history since 2009, the addition of Sea Level Rise is noted as an update to the list of hazards, and Coastal Storm was combined with Hurricane. The process of using parcel-based tax assessor information was added to provide a more appropriate estimate of exposure to hazards and potential damages. HAZUS modeling results were included to estimate damage, displacement, and debris.
VI. Multi-Jurisdictional Considerations	No changes.
VII. Plan Implementation & Maintenance	A specific midpoint progress meeting with approach was outlined for Year 2021, and continued public involvement was added.
VIII. Community Data	Updated to include most recent information from U.S. Census.

SECTION I – PURPOSE, NEED, AUTHORITY, AND STATEMENT OF PROBLEM

This document, referred to as the McIntosh County Joint Hazard Mitigation Plan (HMP), is the second official update to the plan submitted to and approved by the Federal Emergency

Management Agency (FEMA) Region IV in April 2005. The first official update was submitted to and approved by FEMA Region IV in 2013. The contents of this document are intended to provide the framework for hazard mitigation strategies and actions undertaken by local governments within McIntosh County. The purpose of completing these proposed hazard mitigation actions is ultimately the reduction of the overall level of exposure and risk to the citizens of McIntosh County, Georgia. The Hazard Mitigation Plan Update will meet the requirements of the Disaster Mitigation Act of 2000 Public Law 106-390, October 30, 2000, as stipulated in the Interim Final Rule 44 CFR 201.4 Standard State Plan criteria, published on February 26, 2002. Meeting the regulations will allow McIntosh County to maintain eligibility and qualify to secure all federally declared disaster assistance, including certain types of Public Assistance and hazard mitigation grants available through the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288, as amended).

The purpose of the McIntosh County Joint Hazard Mitigation Plan is to create a safer community for McIntosh County residents by reducing the potential for devastation to life and property posed by natural disasters. This purpose will be accomplished by creating a planning document that becomes the foundation for emergency management planning, training and preparedness, and by identifying those hazard mitigation projects that will reduce the impact of hazardous events.

Authority: The Disaster Mitigation Act of 2000 (DMA 2000)

In the past, federal legislation has provided funding for disaster relief, recovery, and some hazard mitigation planning. DMA 2000 is the latest legislation to improve the planning aspect of that process. The Act reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur. The Act establishes a pre-disaster hazard mitigation program and designates new requirements for the national post-disaster Hazard Mitigation Grant Program (HMGP). Section 322 of the Act identifies the new requirements for planning activities and increases the amount of HMGP funds available to states that have developed a comprehensive mitigation plan prior to disaster.

State and communities must have an approved mitigation plan in place prior to receiving post-disaster HMGP funds. Local mitigation plans must demonstrate that their proposed mitigation measures are based on a sound planning process that accounts for the risk to and the capabilities of the individual communities. To implement the new DMA 2000 requirements, the Federal Emergency Management Agency (FEMA) prepared an Interim Final Rule, published in the Federal Register on February 26, 2002 at 44 CFR Parts 201 and 206, which establishes planning and funding criteria for states and local communities. The Rule identifies criteria for detailed Hazard, Risk, and Vulnerability (HRV) assessments.

Failure to meet the new criteria will make state and local governments ineligible for Stafford Assistance, and thus forfeit some types of emergency assistance. The following section describes the existing state planning initiatives and mitigation programs.

Georgia Planning Act

The Georgia General Assembly adopted the Georgia Planning Act in 1989 to encourage better management of growth in previously developed and developing areas of the State while

encouraging smart development in less prosperous areas. Although supporting development, the legislature still strives for the conservation and protection of natural and historic resources, protection and promotion of quality of life through proper land use planning, and protection of community facilities. The cornerstone of the coordinated planning program is the preparation of a long-range comprehensive plan by each local government. This plan is intended to highlight community goals and objectives as well as determine how the government proposes to achieve those goals and objectives. With the passage of the Georgia Planning Act of 1989, all of Georgia's 159 counties and 529 cities were designated "Qualified Local Governments." Each of these local governments must maintain their status in order to remain eligible for a range of state and federal assistance programs. Continuing efforts strive for integrating the local hazard mitigation planning with the local comprehensive planning process.

Coastal Marshland Protection
OCGA 12-5-280

The Coastal Marshland Protection Act provides the Coastal Resources Division with the authority to protect tidal wetlands. The Coastal Marshland Protection Act limits certain activities and structures in marsh areas and requires permits for other activities and structures. Erecting structures, dredging, or filling marsh areas require a Marsh Permit administered through the Coastal Management Program.

Erosion and Sedimentation Control
OCGA 12-7-1

The Georgia Erosion and Sedimentation Act requires that each county or municipality adopt a comprehensive ordinance establishing procedures governing land-disturbing activities based on the minimum requirements established by the act. The Erosion and Sedimentation Act is administered by the EPD of the Georgia DNR and local governments. Permits are required for specified land-disturbing activities, including the construction or modification of manufacturing facilities, construction activities, some activities related to transportation facilities, activities on marsh hammocks, and others.

River Corridor Protection
OCGA 12-2-1

The statute informally known as the Mountain and Corridor Protection Act authorizes DNR to develop minimum standards for the protection of river corridors (and mountains, watersheds, and wetlands) that can be adopted by local governments. The EPD administers the act. All rivers in Georgia with an average annual flow of 400 cubic feet per second are covered by the act, except those within the jurisdiction of the Coastal Marshlands Protection Act. Some of the major provisions of the act include: requirements for a 100-foot vegetative buffer on both sides of rivers, consistency with the Georgia Erosion and Sedimentation Act, and local governments' identification of river corridors in land-use plans developed under their respective comprehensive planning acts.

Shore Protection
OCGA 2-5-230

The Shore Protection Act is the primary legal authority for protection and management of Georgia's shoreline features including sand dunes, beaches, sandbars, and shoals, collectively known as the sand-sharing system. The value of the sand-sharing system is recognized as vitally important in protecting the coastal marshes and uplands from Atlantic storm activity, as

well as providing valuable recreational opportunities. The Shore Protection Act limits activities in shore areas and requires a permit for certain activities and structures on the beach. Construction activity in sand dunes is limited to temporary structures on the beach. Construction activity in sand dunes is limited to temporary structures such as crosswalks, and then only by permit from the Georgia DNR, Coastal Resources Division. Structures such as boat basins, docks, marinas, and boat ramps are not allowed in the dunes.

***The Watershed and Flood Prevention Act, PL 83-566, August 4, 1954 (16 U.S.C. 1001-1008*)**
This act authorized the establishment of programs to aid in protecting the lives and property threatened by natural disasters related to watersheds (such as flooding and erosion). Prior to fiscal year 1996, separate programs addressed small watershed planning activities and cooperative river basin surveys and investigations. After the 1996 appropriations act, the activities specified under the Watershed and Flood Prevention Act were combined into the single program known as the Emergency Watershed Protection (EWP) program. The purpose of the EWP program is to assist federal, state, and local agencies and tribal governments to protect watersheds from damage caused by erosion, floodwater, and sediment as well as to conserve and develop water and land resources. Resource concerns addressed by the program include water quality, water conservation, wetland protection and restoration, water storage capacity, agricultural drought problems, rural development, municipal and industrial water needs, upstream flood damages, and water needs for wildlife and forest-based industries. Methods of planning and surveying addressed by the program include specific watershed plans, river basin surveys, flood hazard analyses, and floodplain management assistance. The purpose of the plans and surveys is to identify solutions that use land treatment and nonstructural measures to resolve resource problems.

Federal Hazard Mitigation Programs
Because GEMA administers federal hazard mitigation programs for Georgia, GEMA's planning process is inherently integrated into these federal programs, specifically the Hazard Mitigation Grant Program (HMGP), Pre-Disaster Mitigation Program (PDM), the National Flood Insurance Program (NFIP), the Community Rating System (CRS), Flood Mitigation Assistance Program (FMA), the Map Modernization Project, Repetitive Flood Claims Program (RFC) and Severe Repetitive Loss Program (SRL). The Hazard Mitigation Grant Program (HMGP), authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration in order to reduce the loss of life and property due to hazard events and to enable the implementation of mitigation measures during the immediate recovery period.

The Repetitive Flood Claims (RFC) Grant Program
This program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). The RFC program provides funds to assist States and communities in reducing flood damages to insured properties that have had one or more claims to the National Flood Insurance (NFIP) Fund. RFC grants are to be awarded on a competitive basis and without reference to state allocations, quotas, or other formula-based allocation of funds. Georgia has utilized project grants in the first two years of this program's existence to permanently mitigate NFIP insured structures through property acquisition.

SECTION II – PLANNING METHODOLOGY

Development of the 2018 McIntosh County Joint Hazard Mitigation Plan Update was a concerted effort on the part of McIntosh County and the City of Darien. To meet federal requirements for the plan review and update process, the McIntosh County Board of Commissioners approved the scope of work for the development of the plan. McIntosh County selected Ecological Planning Group to provide consultation, meeting facilitation, data collection and plan development services. The McIntosh County Joint Hazard Mitigation Plan Update Committee (HMPUC) was re-established and chaired by McIntosh County Emergency Management Agency Director, Ty Poppell.

The HMPUC was re-established and sought membership through four methods: (1) a letter was mailed to 48 members of the community that either participated in the previous hazard mitigation update or were identified as potential representatives based on current roles in the community, (2) a newspaper advertisement of the first meeting, (3) a public hearing at a County Board of Commissioners Meeting, and (4) word of mouth. The HMP Update process began with a public hearing at the McIntosh County Board of Commissioners Meeting on November 8, 2016, and the 1st HMPUC Meeting, the afternoon of November 8th, was advertised in the local newspaper (The Darien News) to invite the public. The Darien News is available online, so anyone in a neighboring county could have seen this announcement and attended too. The public was invited to and made aware of the initial meeting. Everyone who attended the Public Hearing and 1st HMPUC Meeting was invited to join the HMPUC. These individuals were included on future email distribution lists to describe meeting schedules, summaries, and activities. In an effort to increase the publicity of the committee and increase participation, everyone attending the first two HMPUC meetings was asked to invite any colleagues, friends, or neighbors. Anyone attending a HMPUC Meeting was added to the email distribution list to stay up to date on meeting schedules and activities. After the initial invitations through mail and newspaper advertisements, all communication to the HMPUC was through email.

The McIntosh County Emergency Management Agency (EMA) Director also solicited review and input on the draft HMP Update from EMA Directors in neighboring counties. These individuals included: Glynn County (Jay Wiggins), Liberty County (Mike Hodges), Long County (Edward Brewer), and Wayne County (Richard Johnson). They had no comments on the HMP Update.

The following organizations/departments/members involved in the 2013 HMP Update were also represented for the 2018 HMP Update, although some groups had a change in representation:

- City of Darien, Councilman, Augustus Skeen
- City of Darien, Councilman, Griffin Lotson
- City of Darien, Fire Department, David Gardner (currently Building Inspector/Code Enforcement)
- City of Darien, Public Works, James Wayne Johnson and Willie Brudley
- Georgia Department of Natural Resources, Coastal Resources Division, Jennifer Kline
- Georgia Department of Public Health, McIntosh County Health Department, Eric Rumer

- Georgia Forestry Commission, Rusty Clark
- McIntosh County, County Manager, Patrick Zoucks
- McIntosh County Emergency Management Agency, Ty Poppell
- McIntosh County, Vol. Fire Chief, Mark Deverger
- McIntosh County, Sheriff's Office, George Trexler
- McIntosh County, EMS Director, Warnie Nettles
- McIntosh County, Board of Education, Board Attorney, Richard Braun
- McIntosh County School District, Superintendent, John Barge
- Volunteer, Eunice M. Moore
- Wiregrass 911 Director, Vicki Stevenson

The 2018 HMP Update included new representatives from the following organizations and departments:

- City of Darien, City Manager, Tim Sweezey
- City of Darien, Mayor, Hugh Hodge
- City of Darien, Utilities, Keith Wilson
- Coastal Regional Commission – P. Hunter Key
- Council for Aging (volunteer), Alberta Mabry
- McIntosh County, County Clerk, Sherrell Davis
- McIntosh County, Water Department, Tim Cooke
- The Nature Conservancy, Ashby Worley

The plan update process included four facilitated committee meetings to review Hazard, Risk and Vulnerability (HRV) assessment data, formulate mitigation actions based on collected assessments and local capabilities, and discuss the draft plan. The HMP Update process began with a public hearing at the McIntosh County Board of Commissioners Meeting on November 8, 2016. The dates and brief summary of each meeting are included in the Table below. Agendas and minutes were created for each committee meeting, and they are included in Appendix E, along with public notices.

Meeting Summaries

Meeting Name	Date	Brief Description
Coordination Meeting	9/19/2016	GEMA met with McIntosh County and their consultant, Ecological Planning Group, to coordinate the HMP update process and Kickoff Meeting
Project Kickoff Meeting	11/8/2016	Hazard mitigation update process was introduced at McIntosh County Board of Commissioners Meeting by GEMA representative
1st HMPUC Meeting	11/8/2016	HMP process and role of HMPUC was discussed; EPG reviewed HRV assessment data and presented current list of critical facilities for the committee to review and update
2nd HMPUC Meeting	1/24/2017	EPG reviewed current inventory of assets and available hazards data through GMIS and other sources; committee discussed accomplishments since 2013 HMP in order to start identifying new mitigation action steps and completed updates to critical facilities

Meeting Name	Date	Brief Description
3rd HMPUC Meeting	3/7/2017	Updated goals, objectives, and mitigation action steps were reviewed based on comments from the previous meeting; prioritization was also discussed for deferred and new action steps.
4th HMPUC Meeting	9/26/2017	Review of Initial Draft HMP

The initial draft was edited based on comments received from the 4th HMPUC Meeting. The updated draft was posted on the County's website in October 2017 prior to submission to GEMA for their review and while it was under review with GEMA. This step allowed the public, who had not been participating in the planning process, an additional opportunity to review and comment on this plan while it was being edited. From the period of October 2017 to July 2018, the County received zero comments about the draft HMP Update that was available online.

Because the plan was available on the County's website, anyone with internet access at home, work, or local library could have seen this and had the opportunity to review and comment on the HMP Update. This includes people living and working in McIntosh County as well as those in neighboring counties. The HMPUC had participation from people that work in and serve neighboring counties. Two individuals on the HMPUC work outside of McIntosh County and serve neighboring counties – Jennifer Kline at Georgia Department of Natural Resources, Coastal Resources Division in Glynn County (serves Coastal Georgia) and Ashby Worley at The Nature Conservancy in Glynn County (serves Southeast Georgia). Two HMPUC members work in McIntosh County but serve multiple counties – P. Hunter Key at Coastal Regional Commission (serves 10 coastal counties) and Vicki Stevenson at Wiregrass 911 (serves Long and McIntosh counties). As mentioned earlier, the McIntosh County EMA Director also reached out to EMA Directors in neighboring counties to allow for their input to be included in this Plan Update. The EMA Directors at Glynn County (Jay Wiggins), Liberty County (Mike Hodges), Long County (Edward Brewer), and Wayne County (Richard Johnson) had no comments on the HMP Update.

SECTION III – REVIEW AND ANALYSIS OF ORIGINAL PLAN

For the plan update process, several additional or revised planning documents were reviewed and successfully incorporated, including: 2013 McIntosh County Comprehensive Plan Five-Year Update, 2017 Regional Plan of Coastal Georgia, the 2016 Consolidated Tax Digest, 2010 McIntosh County Community Wildfire Protection Plan, 2013 Land Use Planning for Hazard Mitigation Community Report for McIntosh County and City of Darien, 2014 State of Georgia Hazard Mitigation Strategy, the 2013 Georgia Governor's Office of Planning and Budget County Population Projections to 2050, FEMA Flood Insurance Study, and available sections of the Local Emergency Operation Plan. The following planning documents used in the previous HMP Update continued to be utilized: 2008 McIntosh County Partial Comprehensive Plan Update, 2008 City of Darien Comprehensive Plan Partial Update, and the 2006 Georgia Coast 2030: Population Projections for the 10-County Coastal Region. The County does not have a specific Flood Mitigation Assistance Plan. As several planning documents were being updated concurrently, information from the 2018 McIntosh County Comprehensive Plan and 2018 City of Darien Comprehensive Plan were also incorporated into the 2018 HMP Update. The plans

described above are the most up-to-date and approved versions of these plans. As a note, the 2013 county population projections from the Georgia Governor's Office of Planning and Budget, while accessed in 2017, is based on 2013 Census estimates data. It was confirmed that data requested in 2018 still uses 2013 Census data for its projections (https://opb.georgia.gov/population-projections).

The plans and studies listed above were reviewed by the HMPUC to identify new hazard mitigation action steps and shifts in prioritization since the HMP was last updated as well as to determine recent accomplishments and activities related to pre-disaster hazard mitigation. The review was also conducted to determine if there were any changes to land development trends, hazard mitigation planning, or future land use planning.

Information from the 2018 HMP Update will be incorporated into the plans above during their respective future updates. During the time since the Draft 2018 HMP Update was initially submitted for review by GEMA and posted on the County's website, both McIntosh County and City of Darien began to develop updated comprehensive plans. The 2018 HMP Update was available online for review during the comprehensive plan update process, so the information was available for incorporation into the County and City Comprehensive Plans. In addition, members of the HMPUC also helped to develop the Comprehensive Plans, so they were able to include ideas, information, and outcomes developed during the planning process for the 2018 HMP Update. For the 2018 McIntosh County Comprehensive Plan, HMPUC members served on the Steering Committee and Stakeholder Committee. For the 2018 City of Darien Comprehensive Plan, HMPUC members served on the Stakeholder Committee and included the Mayor and members of City Council. In both the City's and County's 2018 Comprehensive Plan, there is a chapter on Coastal Vulnerability and Resilience, which were items added to and discussed within the 2018 HMP Update. As an additional future plan, McIntosh County is pursuing development of a Disaster Recovery and Redevelopment Plan, so the results from the 2018 HMP Update will be able to be incorporated into that plan.

The contracted planner had primary responsibility for collecting updated information and presenting data to the committee. The approved 2013 HMP Update was available to each committee member and for public review upon request. It is also available at the Darien Library. Each chapter was reviewed chronologically with updated hazard, risk, and vulnerability data, as well as previous accomplishments of mitigation strategy efforts. Formal meetings of the HMPUC were held throughout the planning process. Irregularly attending participants were kept informed with emails containing minutes from the previous meeting and plans for future meetings and tasks to be completed.

Each section of the 2013 HMP has been revised in some manner, primarily through text updates from recent data. Therefore, the first section of each chapter will list those changes. Major plan changes include: (1) removing the Chapters on Technological Hazards, (2) adding Sea Level Rise as a subcategory under the hazard "Flooding," and (3) utilizing more detailed GIS mapping and parcel-based information in assessing risks and impacts. Greater level of detail using GIS and parcel-based information was added to the hazard mapping because this was identified as an area in need of improvement from the "Land Use Planning for Hazard Mitigation" community report for McIntosh County and the City of Darien, published by Georgia Department of

Community Affairs (DCA) in June 2013. The HMP Update also includes information from a recent HAZUS modeling study that was performed for the County, which was also a recommendation from the community report.

SECTION IV – PLAN ORGANIZATION

The Hazard Mitigation Plan Update is organized to incorporate the requirements listed in the Interim Final Rule 44 CFR 201.4 Standard State Plan criteria in several chapters. This chapter, "Chapter 1: Introduction to the Planning Process", includes an overview of the document, assurances of compliance, an overview of the various state and federal authorizing authorities, the overall goals of the plan, and details of the planning process, as stipulated by Interim Final Rule 44 CFR 201.4(c)(1).

Chapter 2 outlines the natural hazard history in terms of events and losses, identifies current hazard exposures, assesses the jurisdiction's risks and vulnerabilities, and analyzes potential losses, as stipulated by Interim Final Rule 44 CFR 201.4(c)(2).

Chapter 3 outlines the City's and County's hazard mitigation priorities and goals, related policies, programs, and capabilities at the local level, mitigation actions and activities and specific contributions, and sources of mitigation project funding from all levels, as stipulated by Interim Final Rule 44 CFR 201.4(c)(3).

Chapter 4 outlines the process of plan maintenance, including the methods and schedule of updates, monitoring the implementation of mitigation efforts, and reviewing progress of achieving the goals outlines in Chapter Four, as stipulated by Interim Final Rule 44 CFR 201.4(c) (4).

Finally, Chapter 5 summarizes the planning effort and provides reference material used for the update process.

The summary of changes is included in the overview section of every chapter as a table that details each section and the changes that have occurred within the section since the last approval (2013).

SECTION V – SUMMARY OF LOCAL HAZARD, RISK, AND VULNERABILITY, AND LOCAL MITIGATION GOALS AND OBJECTIVES

A local risk assessment was accomplished by compiling data on the hazards that could affect McIntosh County and its residents, profiling the previous hazard events, and then assessing the community's vulnerability to these hazards. The HMPUC accomplished the risk assessment by conducting the following steps:

(1) Hazard Identification
(2) Hazard Event Profiling

(3) Vulnerability Assessment
(4) Potential Loss Estimates

(1) Hazard Identification: Maps and historical data sources were studied and reviewed in order to identify the geographic extent, intensity, and probability of occurrence for various hazard events. GEMA Worksheet #1, "Identify the Hazard," was used in this process, and a copy of this worksheet is provided in Appendix D.

The HMPUC reviewed the list of hazards from the previous HMP update and decided to keep the current list of natural hazards that post a threat to the residents, property, and economy of McIntosh County as part of this HMP Update. These hazards include:

I. Coastal Erosion
II. Coastal Storm/Hurricane
III. Drought
IV. Extreme Heat
V. Flood
VI. Hailstorm
VII. Tornado
VIII. Wildfire
IX. Windstorm
X. Mosquito Control

One change was that Coastal Storm and Hurricane were combined into the same category because they both have similar hazard mitigation goals and areas exposed to these hazards. In addition, a new natural hazard that the HMPUC wanted to consider with this update of the HMP was Sea Level Rise, so this new hazard was included within the hazard, "Flood."

A comprehensive hazard history for McIntosh County is provided in Appendix D, in the Hazard Frequency Table that was collected with data on historical storm events.

(2) Hazard Event Profiling: Past hazard event data were collected through an extensive process that utilized input from the HMPUC members, research on past disaster declarations in the County, information provided from the National Climatic Data Center and the National Weather Service (National Centers for Environmental Information – Storm Events Database), NOAA database of historical hurricane tracks, GA Forestry Community Fire Report database, a review of current Flood Insurance Rate Maps (FIRM), internet and newspaper data searches. These data sources were used to complete a Hazard Frequency Table for committee analysis purposes. A copy of the Hazard Frequency Table is provided in Appendix D.

The committee analyzed the causes and characteristics of each hazard, how the hazard had affected McIntosh County in the past, and what part of McIntosh County's population and infrastructure had historically been vulnerable to each specific hazard. The Hazard Frequency Table was used to complete this process. A profile of each hazard and associated maps are provided in Chapter 2.

(3) Vulnerability Assessment: The asset inventory component of the HRV assessment data included the development of a database that provides county infrastructure and critical facilities

data as well as estimated structure dollar values for loss estimates. This critical facilities database was developed by the Emergency Management Agency office, local planners and the tax assessor's office. Information collected includes structure location, value, contact information and facility type.

A map of critical facilities was printed and discussed at each of the first two HMPUC meetings in order to update and verify locations of critical facilities and add new facilities that were recently constructed. The updated critical facilities inventory and exposure to various hazards is included in Appendix D. The total number of critical facilities was updated from 40 to 75.

A critical facility, for the purposes of this plan, is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response and/or disaster recovery functions. The critical facilities identified by the committee in the County are governmental services facilities; water and wastewater treatment plants and lift stations; electric and communication utilities; hazardous waste sites; schools; public safety facilities; healthcare facilities; and essential roadways and bridges.

A community's vulnerability can be described in terms of the assets located within the extent of a hazard event and the potential losses if such an event occurs. Therefore, the vulnerability assessment was accomplished by comparing each previously identified hazard with the inventory of affected critical facilities and population exposed to each hazard. GEMA Worksheet #3A, provided in Appendix A, outline this step of the HRV assessment. Maps of each hazard with critical facilities presented are included after each section in Chapter 2. The number and value of structures by occupancy class were based on the 2016 Consolidated Tax Digest (Georgia Department of Revenue).

Assessing vulnerability, for the purposes of this plan, also included a review of the McIntosh County Partial Comprehensive Plan and Five-Year Update, City of Darien Partial Comprehensive Plan, Land Use Planning for Hazard Mitigation (Community Report for McIntosh County and City of Darien), and population projections from the Georgia Governor's Office of Planning and Budget to assess general land use patterns and development trends.

(4) Potential Loss Estimates: Using the best available data and mathematical modeling, estimated damages and financial losses likely to be sustained in a geographic area during a hazard event were calculated. Describing vulnerability in terms of dollar losses provides the county with a common framework in which to measure the effects of hazards on critical facilities. Another tool used was HAZUS modeling, which was conducted for McIntosh County by Coastal Regional Commission. Their 2017 report, "Hazard Risk Analyses: Supplement to the McIntosh County Joint Hazard Mitigation Plan," is included in Appendix A. The modeling exercises simulated a Category 2 hurricane, EF-3 tornado, and 1% chance annual flood – riverine and coastal. Each simulation estimated the number of buildings damaged, building damage value, essential facilities impacted, displaced households, and debris generated.

The number and type of structures in the County have been determined for potential loss estimations. The source of the information was from the parcel-based County Tax Assessor's Office, and the Georgia Department of Revenue's 2016 Consolidated Tax Digest Summary.

Additional information can be found in Appendix A. For the parcel-based County Tax Assessor's data, a parcel or improved-building and associated value was categorized as exposed to the hazard if any part of the hazard was within the parcel limits. This procedure is a more conservative approach for estimating exposure to a hazard.

A summary of the total numbers of structures, parcels, "improved buildings," general building stock, housing units, and occupied housing units based on the various data sources used is provided in the table below for all of McIntosh County and for the City of Darien. The numbers of units vary based on definition of units and how they are defined (e.g., parcel-based, housing unit, structure). The maximum number of persons that could be affected by hazards impacting 100% of the area totaled 19,059 in McIntosh County and 2,614 in City of Darien. These numbers represent the resident population and the workforce population. Further clarification of population categories is included on Worksheet #3A located in Appendix A.

Summary of Units and Associated Value by Source for Estimating Potential Losses

Source	City/ County	Units	Value	Notes
GA Dept. of Revenue 2016 Consolidated Tax Digest Summary	Entire County	37,619 Structures	$1,206,173,503	Used in Worksheet #3A, provides breakdown by Occupancy Class
	City	3,973 Structures	$311,534,523	
McIntosh County Tax Assessor Data, 2016 (parcel-based)	Entire County	12,941 Parcels 4,983 "Improved Buildings"	$479,739,702 ("Improved Bldg. Value")	Used in Chapter 2 and for estimating exposure by % of buildings and % of value in hazard for Worksheet #3A
	City	1,319 Parcels 690 "Improved Buildings"	$47,495,641 ("Improved Bldg. Value")	
Hazard Risk Analyses Report (HAZUS model run by CRC)	County Only	9,219 General Building Stock	$1,394,271,000	Report included in Appendix A
U.S. Census 2016 Estimate, Housing	Entire County	9,289 Housing Units 5,207 Occupied Units		5-year American Community (U.S. Census) Estimate
	City	1,349 Housing Units 1,079 Occupied Units		

The HMPUC used the results of the Hazard, Risk and Vulnerability assessment, as well as the Report of Accomplishments to identify and prioritize appropriate further mitigation goals, objectives and related actions. The committee identified and discussed mitigation strategies over the course of two HMPUC meetings. Input into strategy development was increased as members also discussed meetings with staff from their respective agencies and departments for ideas about additional mitigation actions and comments about the list of mitigation actions being developed.

After ensuring that the HMPUC had ample opportunity to contribute to strategy development, mitigation action steps were next given priority status. To evaluate priorities, a planning tool, prepared by FEMA known as STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria, was used. Each mitigation strategy step was evaluated using STAPLEE criteria as the guiding principle to identify those steps best for McIntosh County. Steps were ranked as high priority, medium priority, or low priority. Past occurrences of disasters and historical trend data aided in assigning priorities.

The public was given the opportunity to comment on the mitigation strategies, including prioritization, through review of the draft 2018 HMP Update that was posted on the County's website prior to submission to GEMA for their review in October 2017 and while it was under review with GEMA. No comments were received from October 2017 to July 2018. The public was invited to participate in the initial kickoff meeting and join the HMPUC through (1) a public notice in the local newspaper, which is also available online, and (2) at a public hearing at a McIntosh County Board of Commissioners Meeting. These notices are included in Appendix E. The public will have a final opportunity to comment on the 2018 HMP Update at the County Commission meeting in which it will be presented for adoption by the County.

SECTION VI – MULTI-JURISDICTIONAL CONSIDERATIONS

The City of Darien and unincorporated McIntosh County were active participants in the planning process. A few mitigation goals, objectives and action items identified in this plan update applied to one or the other, but in general, most were applicable to both the County and City. The Emergency Management Agency (EMA) Director will coordinate with the appropriate city agency personnel in order to execute multi-jurisdictional steps. The EMA Director does not have authority to implement items in the jurisdictions; however, the committee has chosen to coordinate communication efforts to implement and document progress towards goals with the EMA agency.

SECTION VII – ADOPTION, IMPLEMENTATION, MONITORING & EVALUATION

Upon final approval by GEMA, the McIntosh County Board of Commissioners will formally adopt the McIntosh County Joint Hazard Mitigation Plan. The adopted plan will then be submitted to FEMA Region IV. Following approval by FEMA, the governing body for the City of Darien will formally adopt the plan.

After formal adoption of the McIntosh County Joint Hazard Mitigation Plan, the County Commission and City Council will keep in consideration the Priority Task List and oversee the implementation of these tasks using branches of city and county government when appropriate.

Unincorporated McIntosh County and the City of Darien currently utilize comprehensive land use planning, capital improvements planning and building codes to guide and control development in the county. The McIntosh County Joint Hazard Mitigation Plan will be

presented to the Committees and persons responsible for updating Comprehensive Plans and Capital Improvement Plans, for their use in incorporating the Hazard Mitigation goals and strategies. In addition, the Commission and City Council will require that the local authorities responsible for the previous plans listed, along with the Local Emergency Operations Plan (LEOP) and other multi-jurisdictional plans utilize guidance from this Hazard Mitigation Plan.

The McIntosh County Joint HMPUC has developed a method to ensure that regular review and update of the Plan occurs. At the direction of the MEMA Director, the McIntosh County HMPUC members will be invited at least once during the midpoint of the planning period (2018-2023) to convene in order to discuss the progress and whether any action or edits are required to the mitigation action steps or the plan itself. This would likely occur during year 2021. The public will also be notified of this meeting and have an opportunity to participate.

The method of evaluation will consist of utilizing a checklist to determine what mitigation actions were undertaken, the completion date of these actions, the cost associated with each completed action, and whether actions were deemed to be successful. This method was successful in the past; therefore, scheduling a midpoint progress meeting will again provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of this hazard mitigation plan. The parties responsible for the various implementation actions, as assigned by the County Commission and City Council, will provide a project status report and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised. The committee will also review each goal and objective to determine relevance to changing situations in the County, as well as changes in state and federal policy and to ensure that goals are addressing current and expected conditions. The committee will also review the risk assessment portion of the Plan to determine if this information should be updated or modified.

The County Commission and City Council will review recommendations of the committee at the midpoint evaluation. County Commissioners and City Council members will evaluate and update the Plan to ensure mitigation action steps are being established and that existing programs are utilizing the guidance provided by the Hazard Mitigation Plan. The MEMA Director will then forward any changes to GEMA's Hazard Mitigation Planning Specialist.

Unincorporated McIntosh County and the City of Darien are dedicated to involving the public directly in the continual reshaping and updating of the Hazard Mitigation Plan. The MEMA Director and HMPUC are responsible for the midpoint review and 5-year update of the Plan. Although they will represent the public to some extent, the public will be able to directly comment on and provide feedback about the Plan.

Copies of the Plan will be available on the McIntosh County local government website, at McIntosh County Emergency Operations Center, and at the Darien Library. All comments and questions will be directed to the Emergency Management Agency Director for follow-up. The publicly declared County Commission meeting to adopt the Plan will provide the public an additional forum for which they can express concerns, opinions, or ideas about the Plan. Announcements to invite the public will be made ahead of this meeting through the County's website or local newspaper.

SECTION VIII – COMMUNITY DATA

Sources for the following community data are The *New Georgia Encyclopedia* (www.georgiaencyclopedia.com), the authoritative source on the people, places, events, and institutions of Georgia, the McIntosh County Comprehensive Plan Update, the McIntosh County Chamber of Commerce website (www.mcintoshcounty.com), and the City of Darien website (www.cityofdarienga.com). McIntosh is one of Georgia's six ocean-facing counties. The

county has a total area of 575 square miles; 433 square miles is upland and 142 square miles (24.56%) is water. McIntosh County was created from Liberty County by an act of the state legislature in 1793. The county was named for the McIntosh family, who were among the earliest Scottish Highlanders to settle the area three years after the founding of the Georgia colony. The most prominent member of this family was General Lachlan McIntosh, commander of Georgia forces in the Revolutionary War (1775-83) and a primary force in the colony's movement toward independence.

The earliest settlers in the lands that became McIntosh County were Guale Indians, followed by Spanish missionaries from about 1595 to 1686, both on the mainland and on nearby Sapelo Island. The first English presence was established by South Carolina Rangers, who built Fort King George in 1721. The first permanent settlement was a group of Highland Scots from Inverness, who, under the auspices of James Edward Oglethorpe, founded the town Darien in January 1736.

Darien was incorporated and made the seat of McIntosh County in 1816, during a period when the area began to prosper as a primary outlet for the shipment of upland-grown cotton conveyed to the port down the Altamaha River. During the antebellum period rice and Sea Island cotton plantations made McIntosh County one of the wealthiest sections of the south Atlantic coast. Rice shipments from the local Altamaha delta exceeded 6 million pounds in 1859, the peak year for exports. The leaders in the production of this valuable commodity were Pierce Butler, Jacob Barrett, and Robert B. Rhett. Meanwhile, the county's most prominent citizen of the time, Thomas Spalding of Sapelo Island, established one of the leading plantations of the antebellum South.

McIntosh County was devastated by Union military and naval action during the Civil War (1861-65). Darien, deserted and undefended, was sacked and burned by Union colonel Robert Gould Shaw and his 54th Massachusetts regiment in June 1863, and most of the county's river plantations were destroyed in a series of raids in 1862-64.

During Reconstruction, Tunis G. Campbell, an agent of the Freedmen's Bureau, became McIntosh County's first African American elected official, serving in the Georgia General Assembly as well as in various local positions. During his period of public service, Campbell did much to enhance educational and economic opportunities for McIntosh County's freed slaves.

McIntosh County was an international timber market for four decades after the Civil War. The volume of rafts of virgin yellow-pine timber floating down the Altamaha River from the interior of Georgia established Darien as the primary outlet for lumber and timber on the Atlantic coast.

Sawmills and loading docks in the county provided employment for hundreds of local black citizens displaced by the war.

Sailing vessels and steamships from Europe, South America, and the Far East loaded cargoes of lumber processed at mills in and around Darien. Later, investments of northern capital further energized the county and led to the construction of a railroad into Darien in 1895. In 1900, a record of more than 112 million board feet of lumber was processed and shipped overseas from McIntosh County.

By 1915, the Altamaha River timber supply was exhausted because of overcutting upriver from Darien, and the local timber trade was all but over by 1925. The demise of timber as an economic resource led numerous county citizens to seek their livelihoods from other sources—primarily the nearby Atlantic Ocean. In the first half of the twentieth century McIntosh County became a leading producer of seafood, especially oysters, shrimp, and crabs. By 1960 McIntosh had one of the largest shrimp-boat fleets on the south Atlantic coast, although the county's population was then only 6,364 residents. About 1975, however, the seafood industry entered a period of steady decline, brought about by rising operating costs and the increasing importation of cheaper foreign shrimp.

During World War II (1941-45) the U.S. Army operated an air training facility with concrete runways, barracks, and support facilities at Harris Neck in a remote section of McIntosh County, for the training of P-40 fighter pilots. The Coast Guard had submarine watch stations on Sapelo and Blackbeard islands. In 1953, the University of Georgia established its Marine Institute on Sapelo Island.

In 1991 Georgia writer Melissa Fay Greene published *Praying for Sheetrock*, an award-winning book that chronicles the coming of the civil rights movement to McIntosh County in the 1970s.

From the 2000 to the 2010 Decennial Census, McIntosh County's population increased by 32% from 10,847 to 14,333, and City of Darien's population increased by 15% from 1,719 to 1,975. Based on the most recent population estimate by the U.S. Census in 2016, McIntosh County's population has slipped 3% since 2010 to 13,927, and Darien's population has decreased by 7% to 1,845. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013, indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The projected population was 13,325 in 2025, 11,362 in 2040, and 9,958 in 2050. Georgia Governor's OPB only provides countywide population projections, so there are no projections for the City of Darien.

Prior to the housing market collapse in 2008, there was a report published in 2006, by Center for Quality Growth and Regional Development at Georgia Tech, that projected populations in Georgia's 10-coastal counties through 2030. This document was used in the previous HMP update, and its projected population increases were incorporated into mitigation strategies to target new development. It projected that McIntosh County's population would be 15,751 by 2015 and 18,626 by 2030, and City of Darien's population would be 2,496 by 2015 and 2,952 by 2030. Based on 2015 population estimates, McIntosh County was 1,812 people (13%) and City of Darien

was 645 people (35%) below the projection created in 2006.

In 2016, McIntosh County had fewer children (18.5%) and more retiree-aged adults (20.1%) than the state average of 24.7% under age 18 and 12.3% age 65 and over. Darien was closer to the state average with 23.0% under age 18 and 15.6% age 65 and over. The racial demographic in 2016 in McIntosh County was 61.5% white, 35.1% black or African American, and 1.4% Hispanic, and in the City of Darien, it was 37.7% white, 55.0% black or African American, and 4.1% Hispanic.

While forestry and commercial fishing have been dominant industries, the area has become increasingly dependent on tourism. In 2016, the top three industries for residents in McIntosh County were:

1. Educational services, and health care and social assistance (20.5%)
2. Manufacturing (12.5%)
3. Retail trade (11.9%)

Darien's top three industries included:

1. Arts, entertainment, and recreation, and accommodation and food services (20.0%)
2. Retail trade (17.7%)
3. Educational services, and health care and social assistance (14.7%).

A strong desire exists among McIntosh citizens to preserve the unique features of McIntosh County. The rich natural habitats and coastal character, the live oak canopied vistas, and abundant wild life areas contribute to a lifestyle that is enviable to a large portion of the population. One unique characteristic of McIntosh County is a popular feeling that their sense of place determines their lifestyle. Residents relate in terms of their natural habitat. In McIntosh County, for instance, farming and agriculture often relate to harvesting crops from the sea, such as shrimp, fish, and crabs. Preservation of farmland in McIntosh County may well refer to protecting clam, oyster, and mussel beds and growing habitat. Transportation alternatives may imply the need for better boat ramps to access waterways; bike trails to better access the wildlife viewing areas and walking paths to better access the Coastal Birding Trails. The barrier islands of McIntosh County immediately identify the region and bring to mind the peace, tranquility, diverse wildlife, and beautiful vistas that are so important to the wellbeing of the population.

The City of Darien is known for beautiful views by the water with ancient live oaks and Spanish moss, historic, landscaped parks, cozy bed and breakfasts, birding, biking, boating, authentic colonial forts, coastal marshlands with five rivers, and opportunities to explore and discover barrier islands, fresh seafood, Gullah-Geechee culture, salt and fresh water fishing, sea kayaks, river tours, Scottish heritage, and shrimp boats returning to waterfront docks at sunset.

CHAPTER 2 – NATURAL HAZARD IDENTIFICATION AND RISK ASSESSMENT

The Hazard, Risk, and Vulnerability assessment of the McIntosh County Joint Hazard Mitigation Plan Update provides the scientifically sound foundation for the goals, objectives, tasks, and actions steps that are proposed in the plan.

The McIntosh County Joint Hazard Mitigation Plan Update Committee reviewed those hazards initially identified as most likely to impact the county. The GEMA Worksheet #1, "*Identify the Hazard*," in Appendix D, and Worksheet #2, "*Profile Hazard Events*," were reviewed along with the updated hazard event data. Previous hazard event data were recorded in the Hazard Frequency Table in Appendix D and reviewed alongside the table from the approved plan. Using this review method, the planning committee determined that 10 natural hazards studied for the 2013 HMP Update would remain. The 2018 HMP Update will continue to focus on the following hazards: coastal erosion, coastal storm/hurricane, drought, extreme heat, flood, hailstorm, tornado, wildfire, windstorm, and mosquito control. Committee members chose to add sea level rise as a subtopic under the hazard "flood."

Summary of Updates to Chapter 2

Chapter 2 Section		Updates to Section
I.	Coastal Erosion	Data source updated to include GCHP and its historical shoreline change datasets; method of estimating potential losses tied to GCHP data; updated data; upgraded maps of hazard; added coastal erosion line item to hazard frequency data table that is based on hazards with the potential to cause coastal erosion (coastal storm/hurricane and flood events); and general text edits.
II.	Coastal Storm/ Hurricane	Hurricanes are a subset of Coastal Storms, so these hazards were combined, and they share similar mitigation goals. Storm tracks from NOAA NHC were used to estimate risk; hazard area was updated to evaluate storm surge for a Category 1 and Category 4 hurricane; updated data from current events, including Matthew and Irma; added potential loss estimates from storm surge data; upgraded maps of hazard; HAZUS model results presented for hypothetical Category 2 hurricane; and general text edits.
III.	Drought	Updated data; added U.S. Drought Monitor as recent data source; and general text edits.
IV.	Extreme Heat	Storm event data was updated to describe those in McIntosh County only, which was zero, so data from neighboring counties was used for correlation; exposed population was updated based on 2016 population estimates of those who had incomes below the poverty level (Census); and general text edits.
V.	Flood	Updated data; presented Existing flood maps (DFIRM) and Preliminary flood maps (DFIRM) that are currently under review; method to estimate potential losses was updated to link to parcels in the flood zones; flood zone data presented separately for V-Zone, A-Zone, and 0.2% chance annual flood; upgraded

Chapter 2 Section	Updates to Section
	maps of hazard; HAZUS model results presented for 1% chance annual flood – Riverine and Coastal scenarios; sea level rise was added as a subtopic in this hazard and it utilized same technique with parcel-based data to estimate risk of 3-ft of sea level rise; and general text edits.
VI. Hailstorm	Storm event data was updated to increase frequency of events; and general text edits.
VII. Tornado	No new events occurred; HAZUS model results presented for hypothetical EF-3 tornado; and general text edits.
VIII. Wildfire	Updated data; added Community Wildfire Protection Plan results and information; upgraded maps of hazard; and general text edits.
IX. Windstorm	Storm event data was updated to increase frequency of events; updated damage associated with this hazard; and general text edits.
X. Mosquito Control	Added threat of Zika virus and background information on that virus; updated costs associated with controlling mosquito population and public safety; and general text edits.

The Georgia Emergency Management Agency defines hazard, risk, vulnerability, and mitigation as presented in the *Georgia Hazard Mitigation Plan Standard and Enhanced,* published March 31, 2008, as follows:

> "A hazard is a potential threat or actual event that impacts a population, infrastructure, or environment. Hazards are spatially and temporally definable but vary in terms of range. For example, compare the examples of a flood and a tornado. Floods are more easily spatially defined than tornadoes due the historical record (and other sources) showing a distinct pattern of flooding events (within flood plain) and a less distinct pattern of tornado events (narrow down to regions of occurrence). For another example, compare earthquake events to drought events in terms of temporality. Earthquake events have a shorter temporal impact (usually a matter of seconds) while drought events by definition can have a longer temporal impact (more than a decade). A wide range of hazards exist and are sometimes categorized as either natural or anthropogenic. However, modern-day hazards are more complex and intertwined, with anthropogenic hazards further complicating natural hazards. For example, a hurricane causes a levee to fail, which floods a town and causes the deposition of toxic chemicals in the water supply. Attempting to categorize this event is fruitless. This type of complexity gives validity to the recent all-hazard approaches to emergency management that also account for the fact that hazards are either wholly or partly a social product and, therefore, must be analyzed in context (social, political, historical, and environmental).
>
> Risk is a quantifiable probability of a specific hazard event actually occurring. This probability is typically based on hazard history profile-driven statistical modeling. Risk is as temporally and spatially variable as hazard events. For example, the risk (probability of occurrence) of a severe winter storm in Georgia is highly seasonal while the risk of an earthquake has no seasonality. In terms of spatiality, the risk of a flood is defined in terms of types of floodplains (100-year, 500-year) while the risk of drought spans the entire

State of Georgia. Calculating the risk of a hazard proves difficult at times because of the absolute dependency on data availability and accuracy as well as reliable statistical modeling.

Vulnerability is essentially the potential for loss. Vulnerability describes the ability and capacity not only to survive the event but also to recover from the event's impacts in both the short and long- term phases. Various types of vulnerability exist including independent, social, and biophysical. Independent vulnerability refers to an individual person or structure's susceptibility to harm from the hazard event. The individual's unique characteristics determine this susceptibility (such a person's physical disability or a building's low structural integrity). Social vulnerability refers to a particular population's general susceptibility to harm from a hazard event. Typically, socioeconomic variables are utilized to determine this type of vulnerability. Along the same scale as social vulnerability is the idea of the vulnerability of the built environment. In other words, the general susceptibility of the infrastructures in an area versus the individual building creates a broader view of vulnerability. Finally, geophysical vulnerability is essentially synonymous with hazard exposure and includes variables like magnitude, duration, frequency, impact, rapidity of onset, and proximity. Like hazards and risk, vulnerability is subject to temporal and spatial variability. For example, the characteristics of the infrastructure and population of an area obviously change through time. However, given the same time period, the characteristics depend on the scale of analysis, whether the analysis occurs at a state, county, or smaller scale.

Mitigation refers to the activities undertaken to reduce or eliminate the threat, occurrence, or the effects of natural hazard events. Mitigation activities serve to protect public health and property and to break the damage-repair cycle in hazardous areas. Mitigation activities often fall into one of two categories: structural and non-structural. Structural mitigation approaches include constructing levees as a form of flood control while non-structural mitigation approaches include using insurance to compensate for flood damage."

The asset inventory component of the assessment data included the development of a database that provides county infrastructure and critical facilities data as well as estimated structure dollar values for loss estimates. The committee utilized GEMA Worksheet #3A (Inventory of Assets) and the 2016 Tax Digest Consolidated Summary from Georgia Department of Revenue to determine the potential dollar losses to vulnerable structures in the region. The figures on the worksheets and included in this text were derived using formulas provided by FEMA and GEMA and represent structure potential loss estimations based on use, square footage, and replacement value. Each of the potential loss estimates is addressed for the individual hazards in the following text. For more specific details, refer to Worksheets #3A located in Appendix A as well as the Critical Facility exposure provided in Appendix D. In addition to this approach, when a hazard had GIS-based mapping, potential loss estimates were calculated using the County Tax Assessor's parcel-based dataset. Based on the parcels in the hazard area, the ones with "improved buildings" and their respective values were summed.

SECTION I – COASTAL EROSION

A. Hazard Identification

Coastal erosion is the wearing away of coastal land. The term is commonly used to describe the horizontal retreat of the shoreline along the ocean. Erosion is considered a function of larger processes of shoreline change, which includes erosion and accretion. Erosion results when more sediment is lost along a particular shoreline than is re-deposited by the water body. Accretion results when more sediment is deposited along a particular shoreline than is lost. When these two processes are balanced, the shoreline is said to be stable.

When evaluating coastal erosion, the focus is on the long-term impacts. However, storms can erode a shoreline that is, over the long-term, classified as accreting, and vice-versa.

Erosion can be caused by a number of events including coastal storms and floods; changes in the geometry of tidal inlets, river outlets, and bay entrances; man-made structures and human activities such as shore protection structures and dredging; long-term erosion; sea level rise; and local scour around buildings and other structures.

Coastal erosion hazard maps (historical shoreline change) for McIntosh County and the City of Darien are presented at the end of Section I. These rates are based on historical records of shoreline change from 1930s to 2000, and the data is presented in units of meters per year. A negative value indicates erosion and a positive value indicates accretion.

B. Hazard Profile

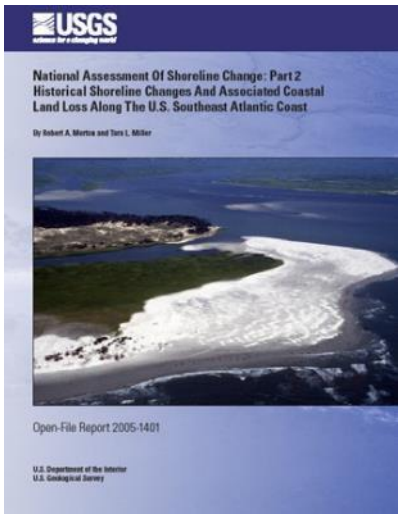
Scientific data to support coastal erosion issues for the previous HMP Update had been scarce. Previous shoreline change data was only available for outer barrier islands, and these are either not inhabited or mostly uninhabited. Since the 2013 update, a new resource available through Skidaway Institute of Oceanography, University of Georgia, that presents historical shoreline change from the 1930s to 2000 for all inner barrier islands is the "Georgia Coastal Hazards Portal" (GCHP). Data from this GIS-based tool was used to analyze the number of parcels and associated "improved building" values that have a history of erosion. County and City maps with historical shoreline change rates during the period from the 1930s to 2000 are presented at the end of Section I. Shoreline rate of change is grouped into 5 categories in these maps: (1) less than –1.00 m/yr [red], (2) –1.00 to –0.21 m/yr [orange], (3) –0.20 to +0.20 m/yr [green], (4) +0.21 to +1.00 m/yr [light blue], and (5) greater than +1.00 m/yr [dark blue]. Categories #1 and #2 indicate erosion, with red (#1) being most severe, and categories #4 and #5 indicate accretion, with dark blue (#5) being most severe. Category #3 indicates little change in either direction. These maps represent the historical extent of the coastal erosion hazard from the 1930s to 2000.

From these maps, most of the red (highest rate of erosion) and dark blue (highest rate of accretion) are located along the ocean side of the outer barrier islands. These islands are either not inhabited or mostly uninhabited. From south to north, these islands include: Egg Island (erosion on southern end and accretion on northern end), Wolf Island (erosion on all of ocean facing land), Sapelo Island (accretion on southern end and erosion on northern end), Blackbeard Island (accretion on southern end and middle and erosion on northern end and middle). Out of these islands, only Sapelo Island is inhabited, but it is sparsely populated. As a note, there are no beach-front

structures built on the ocean facing portion of the island, like Tybee Island or St. Simons Island. Despite a section being identified with shoreline rate of change less than –1.00 m/yr (red), the nearest structure is about 0.5 miles inland, through mostly marshlands.

Green is the dominant color for these maps of the interior islands and tidal channels. This represents shoreline change in Category #3, which had the least change in either direction (between –0.20 and +0.20 m/yr). Most of the shoreline in McIntosh County has a large marshland buffer. Similar to the outer barrier islands, many of the interior islands are also not inhabited or mostly uninhabited. The waterfront section of the City of Darien was also identified in this category with the smallest rate of shoreline change.

Coastal erosion issues, from anecdotal data, also include a loss to the economy when the fishing industry became impacted due to silting of the river channels and when damage to waterfront businesses occurred. Three barrier islands afford McIntosh County some protection from erosion issues: Blackbeard, a national wildlife refuge; Sapelo, a wildlife refuge and research reserve; and Wolf, a national wildlife refuge that is predominately tidal marsh. Blackbeard can be accessed by charter or private boat. Sapelo is reached by a ferry that carries tourists two to three times a day to the island. Wolf Island National Wildlife Refuge can be viewed from the water by private boat or charter, but the beach and all upland areas are closed to the public.



The 2013 HMP Update studied the *National Assessment of Shoreline Change: Part 2 Historical Shoreline Changes and Associated Coastal Land Loss along the U.S. Southeast Atlantic Coast.* Open File Report 2005-1401. This report indicates that in Georgia, coastal land loss is caused primarily by erosion of the Atlantic Ocean beaches. Open lagoons are not present landward of the barrier islands and estuaries are small, so erosion of back barrier shores and interior marshes is not a significant component of coastal land loss in Georgia as it is in other states. Analysis of long term historical shoreline change indicates that 65% of the Georgia shore was stable or accreting, with an overall average shoreline change rate of 1.0± 2.7 m/yr. This report also describes that the highest long-term erosion rates for Georgia occurred along Wolf Island, which is in McIntosh County. The shoreline change was at a rate of -9.4 ± 4.0 m/yr (the negative shoreline change indicates erosion). This unpopulated island is part of the Wolf Island National Wildlife Refuge. The uncertainties (± term) presented above are based on a 90% confidence interval.

As coastal erosion is caused by storm surge, high water levels, and strong currents that occur during coastal storms (hurricanes, tropical storms, and tropical depressions) and other flooding events (flash flood and coastal flood), the coastal erosion hazard profile was explored by analyzing the frequency of these events. These events are likely the major causes of significant coastal erosion since the 1930s that are presented in the maps at the end of this section. For the County and City of Darien, the historical frequency of a coastal storm (hurricanes, tropical storms, and tropical

depressions) is 62.5% chance per year (176 years of records) and a flood event (flash flood or coastal flood) is 17.6% chance per year (68 years of records). Please see Section II and Section V for hazard frequency details for Coastal Storm/Hurricane and Flood, respectively. These two hazards (Coastal Storm/Hurricane and Flood) were combined in the hazard frequency data table in Appendix D for the 68-year history when both have available records, as these events are likely the major causes of significant coastal erosion. The hazard events were summed for those with unique dates (e.g., a named tropical storm with reported flash flood on the same date counts as one event and not two). Based on this methodology, there were a total of 60 unique events over the 68-year history. The frequency of events appears to be increasing, with 1.02 events per year over the previous 50 years and 1.20 events per year over the previous 20 years. It should be noted that data collection, reporting, and accuracy are much better in the past 10 to 20 years. Based on the previous 10 years, there will be, on average, 1.10 events per year. The frequency would be the same for both the County and the City because both have areas of exposure to sounds, marshes, and tidally-influenced rivers.

Since the 2013 HMP Update, McIntosh County has been exposed to the following events likely to cause coastal erosion: 1 Category 2 hurricane (albeit it was not a direct hit), 5 tropical storms, 1 tropical depression, and 1 coastal flood. There was also an additional "flash flood" event reported on the NOAA NCEI Storm Event Database for City of Darien and a "storm surge/tide" event for Coastal McIntosh County (Zone) during Tropical Storm Irma. Please see Section II and Section V for hazard history details for Coastal Storm/Hurricane and Flood, respectively.

C. Assets Exposed to Hazard and Estimate of Potential Losses

Using the "Georgia Coastal Hazards Portal" dataset of historical shoreline erosion, it was identified that in McIntosh County, 4% of parcels, 5% of "improved buildings," and 9% of value of "Improved Buildings" were immediately adjacent to waterways with historical shoreline erosion. In City of Darien, the exposure was 2% of parcels, 1% of "improved buildings," and 1% of value of "improved buildings." These totals are presented in the table below. This was a significant improvement from the 2013 HMP Update, where general percentages were assigned by occupancy class.

Exposure to Coastal Erosion Hazard

Location	Parcels Impacted (% of Total)	"Improved Buildings" Impacted (% of Total)	Value of "Improved Buildings" (% of Total)
McIntosh County (ALL)	525 (4%)	231 (5%)	$43,608,154 (9%)
City of Darien	21 (2%)	7 (1%)	$575,405 (1%)

Data Source: Parcel information and value are from the 2016 McIntosh County Tax Assessor Data.

The percentages identified in the table above were assigned to the GEMA Worksheet #3A to estimate structures, value of structures, and number of people exposed to this hazard by structure occupancy class. As one exception, industrial remained at the previously identified 0% because the McIntosh County Industrial Park (94 acres) is located away from water sources near the intersection of King Swamp Road and State Route 251. These results are presented in Appendix

A, Section I.

Overall, none of the 75 critical facilities are located in this hazard area. Based on the parcel-based, County Tax Assessor database, 231 "improved buildings," valued at $43,608,154 are located within the Coastal Erosion hazard area in the County. The number of people in this hazard area, from Worksheet #3A, was estimated at 923 in the County and 25 in the City. The exposure, as a percentage, was smaller for the City compared with the County as a whole.

D. Land Use and Development Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to coastal erosion hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (*data accessed in 2017, but based on Census data from 2013*), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

Information provided in the 2018 draft Comprehensive Plans for McIntosh County and City of Darien identified commercial development in the future land use maps as occurring along I-95

interchanges and along Highway 17 and 99 corridors, out of the natural hazard area. All the community growth and development are guided by local comprehensive planning for the County and the City. These plans reflect the natural hazard vulnerabilities and risk and include objectives to direct and guide growth away from these areas where they cannot be adequately mitigated.

E. Multi-jurisdictional Concerns

The coastal areas of the county, including the City of Darien, as well as the barrier islands are especially vulnerable to the effects of coastal erosion while the interior of the county is less vulnerable. The exposure, as a percentage, was smaller for the City compared with the County as a whole (2% versus 4% of parcels and 1% versus 5% of "improved buildings").

McIntosh County has a wealth of natural resources such as wetlands, coastal marshes, protected rivers, and floodplains, which are located throughout the County. The importance of these areas cannot be understated for their marshes, mudflats, tidal creeks, and an abundant mix of coastal wildlife enhance the rural feel of McIntosh County, act as a draw for tourism and play a significant role in resident's quality of life.

F. Overall HRV Summary

The committee is concerned that coastal erosion is an economic issue for McIntosh County. They feel the issue is exacerbated by the frequency of coastal storm events and the geographic location of the county. Failure to plan for and protect these assets may detract from McIntosh County's rich biodiversity, and the quality of life, and the draw these assets have for potential residents, tourists, and businesses. Its greatest impact is on waterfront and marsh front development and the seafood industry.

Coastal Erosion: Historical Shoreline Change

City of Darien

Shoreline Change

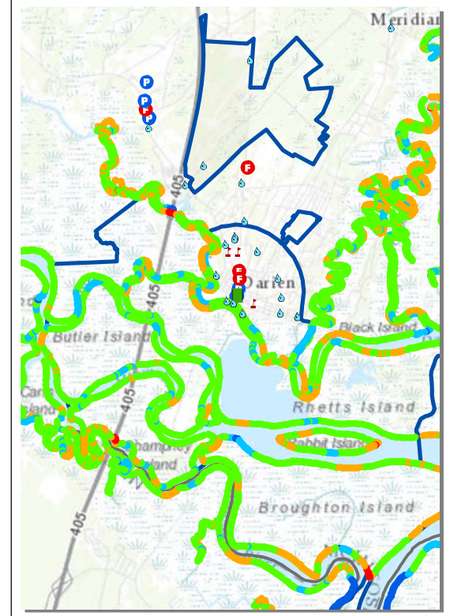
- < -1
- -1 - -0.21
- -0.20 - 0.20
- 0.21 - 1
- > 1

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels



0 0.175 0.35 0.7 Miles

McINTOSH COUNTY

ECOLOGICAL PLANNING GROUP

Coastal Erosion: Historical Shoreline Change

Shoreline Change

- < -1
- -1 - -0.21
- -0.20 - 0.20
- 0.21 - 1
- > 1

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels

0 3 6 12 Miles

ECOLOGICAL PLANNING GROUP

SECTION II – COASTAL STORM/HURRICANE

A. Hazard Identification

Coastal storm systems are characterized by heavy rains and gale force winds. The worst effect of these storms comes from the sea. As the storms move coastward and across the continental shelf, strong winds drive massive amounts of sea water onto land, sometimes increasing mean water level by more than 18 feet. This storm surge is often coupled with normal astronomical tides and wind waves. This coastal flooding has potential to cause severe flooding that not only dampens but destroys exposed structures. The storms can last for several days and can be very large – 1,000-mile wide storms are not uncommon.

A hurricane is a coastal storm that has wind speeds greater than 74 miles per hour. Hurricanes develop over warm waters and are caused by the atmospheric instability created by the collision of warm air with cooler air. Hurricane winds blow in a large spiral around a calm center called the eye, which can be 20-30 miles wide. When a hurricane nears land, it may bring torrential rains, high winds, storm surges, coastal flooding, inland flooding, and sometimes, tornadoes. A single hurricane can last for more than two weeks over water and can extend outward 400 miles. The hurricane season for the Atlantic coast is June 1 to November 30. On average, five hurricanes strike the United States every year. In a two-year period, an average of three significant (category 3 or higher) hurricanes will strike the United States. Some hurricanes are characterized primarily by water – a rainy or wet hurricane – while others are primarily characterized by wind – a windy or dry hurricane. Wet hurricanes can flood both coastal and inland areas, even as the storm dissipates in wind strength; while windy hurricanes primarily affect coastal areas with their high winds and storm surge. Because hurricanes are large moving storm systems, they can affect entire states or entire coastlines.

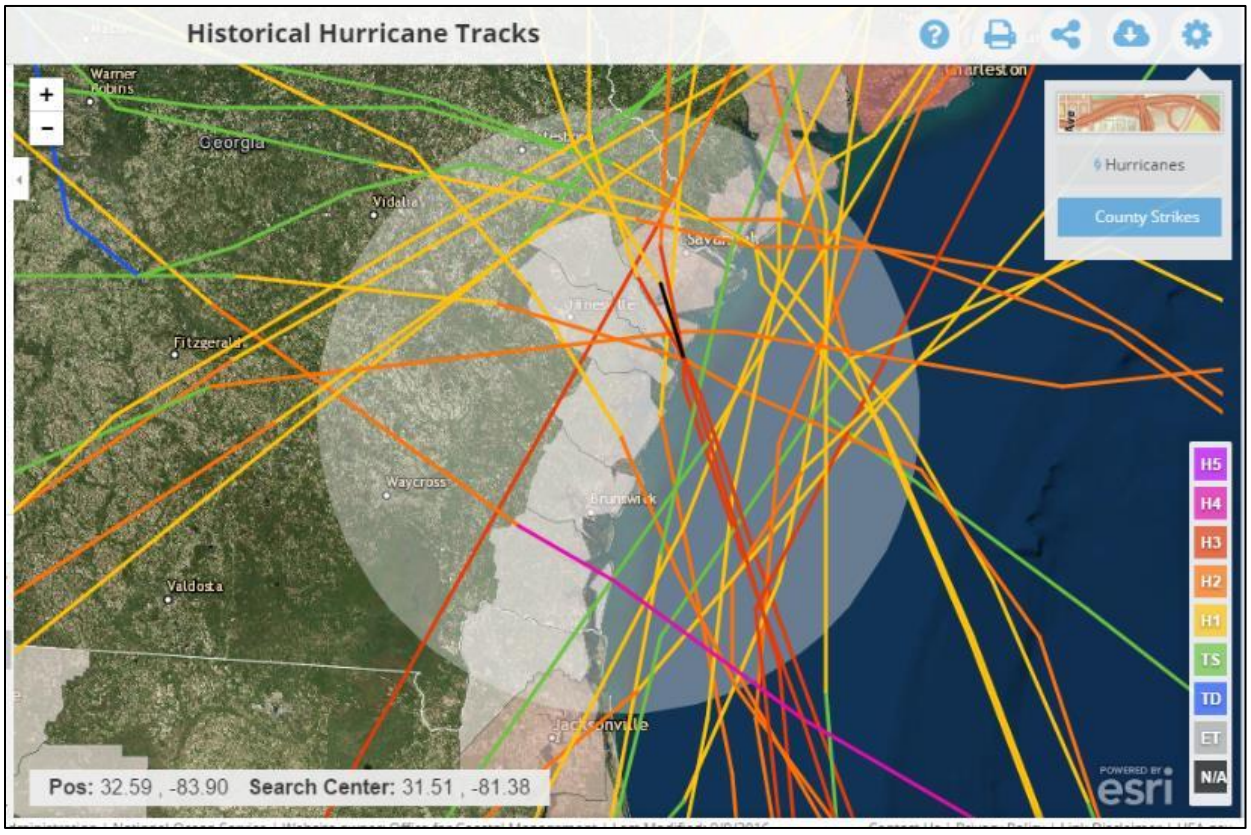
Coastal Storm and Hurricane-associated hazard maps for McIntosh County and the City of Darien are presented at the end of Section II. These hazards include (1) Wind and (2) SLOSH (Sea, Lake, Overland Surge from Hurricanes).

B. Hazard Profile

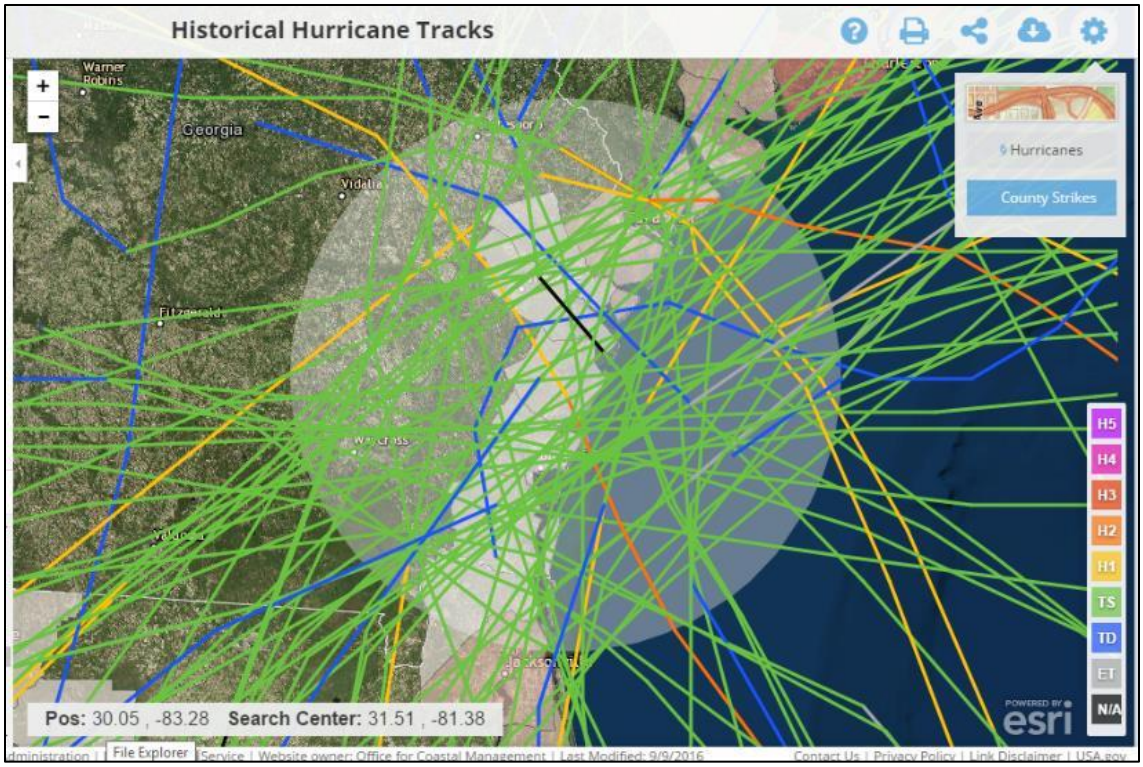
McIntosh County has suffered heavy property damage from coastal storms in the past two hundred years, but most of these instances occurred over 100 years ago. Details of the storms that impacted McIntosh County in years 1804, 1898, and 1964 can be found in the book *Early Days on the Georgia Tidewater* written by local historian, Buddy Sullivan. The storm that hit Georgia on September 7, 1804 is described as the worst to hit the Georgia coast since 1752, as the eye of the storm passed directly over St. Simons Island and Darien (p.69).

Details included in the history book describe the storm on October 2, 1898, as particularly severe along the coast from Sapelo to Fernandina, Florida (p. 421). The storm blew in off the Atlantic Ocean and its center crossed over Sapelo Island at high tide, which created widespread flooding. Reports told of two-story homes completely under water.

The NOAA National Hurricane Center presents historical tracks of hurricanes and tropical storms for 176 years, since 1842. This database was used to find the hurricanes, tropical storms and tropical depressions in which the track of the storm was within 75 miles of the center of McIntosh County. Hurricanes and tropical storms are wide systems that impact large areas, so a 75-mile radius was selected to explore storms that were close to McIntosh County and could have impacted the County. This data source provided excellent historical information, as the NOAA NCEI Storm Event Database only included events that were reported in the past 22 years (since 1996). Graphics of historical hurricanes and tropical storms from 1842-2015 that were within 75 miles of McIntosh County are presented below.



Historical Hurricane Tracks within 75 Miles of McIntosh County [1842-2015] (NOAA NHC)



Historical Tropical Storms within 75 Miles of McIntosh County [1842-2015] (NOAA NHC)

From 1842 to 2015, there were 21 hurricanes, 57 tropical storms, and 21 tropical depressions that had tracks within 75 miles of McIntosh County. Most of these storms occurred in the 1800s. The most severe hurricanes were one Category 4 and three Category 3. Excluding the 2016 and 2017 hurricane seasons, the previous 50 years (January 1, 1966 to December 31, 2015) only had two hurricanes (one Category 2 [David, 1979] and one Category 1 [Bob, 1985]), one hurricane that downgraded to a tropical storm [Kate, 1985], and 12 tropical storms with tracks within 75 miles of McIntosh County.

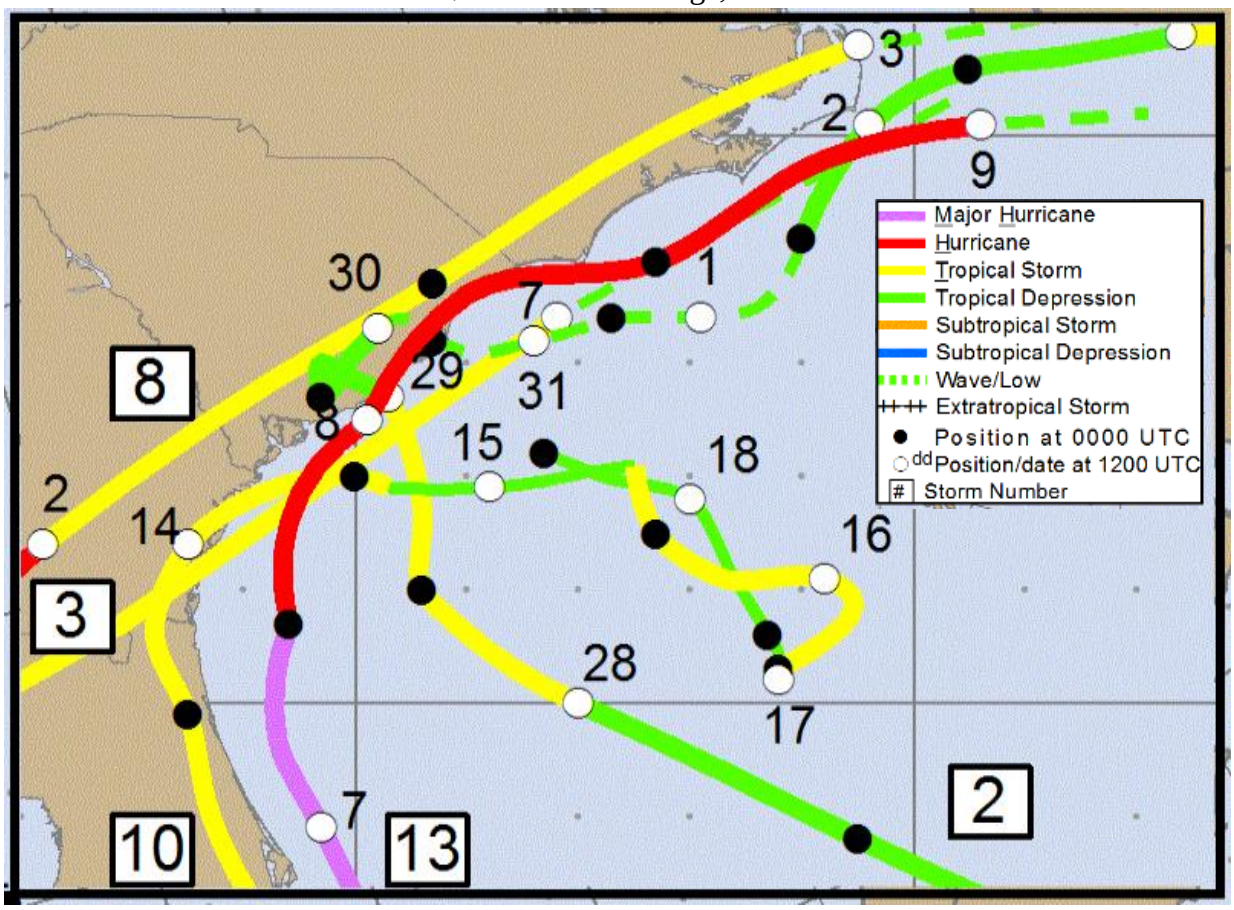
The NOAA NCEI Storm Event Database lists 31 reports from 11 named storms, dating back to 1996, and 5 of the 11 are included in the summary above for coastal storms within 75-miles of McIntosh County. There were an additional 4 tropical storms and 2 hurricanes reported that had impacts of wind, rain, and evacuations in McIntosh County and coastal Georgia, but the centerline of their tracks extended beyond the 75-mile criteria. The two hurricanes occurred in 1996 (Bertha; Category 1 when passing McIntosh County) and 1999 (Floyd; Category 2 when passing McIntosh County), and the 4 tropical storms occurred between 2004 and 2008 (Jeanne, 2004; Alberto, 2006; Ernesto, 2006; and Fay, 2008). All 6 of these storms were counted as Tropical Storms in the Hazard Frequency Table because none of these systems had hurricane-force winds per reports in the Storm Event Database.

Since the 2013 HMP Update, Tropical Storm Andrea occurred on June 6-7, 2013. The NOAA NCEI Storm Event Database described: "periods of heavy rain and damaging wind gusts occurred with showers and thunderstorms associated with the tropical system as it passed over the area."

Rainfall total measured at the USGS site Hudson Creek at Meridian Landing (ID: USGS 022035975) was 1.88 inches. Reports from this storm included:

- One tree and power line down near the intersection of Foir Hope Road and Pine Harbor Road (911 Call Center Report).
- A tree down near the intersection of Highway 17 and Harris Neck Road (911 Call Center Report).
- The Sapelo Island NERRS weather station recorded a 36-knot (41 MPH) wind gust associated with Tropical Storm Andrea.

2016 was a busy tropical season in Coastal Georgia, and there was one Category 2 hurricane (Matthew, 13) and three tropical storms (Colin, 3; Hermine, 8; and Julia, 10). The tracks for these are presented in the table below (noted by number of storm). The County Manager estimated that Hurricane Matthew caused about $2 million in damage, and most of this cost was debris cleanup.



2016 Hurricane and Tropical Storms Impacting McIntosh County

Details of Hurricane Matthew from the NOAA NCEI Storm Event Database include:

> "Matthew became a hurricane about 190 miles northeast of Curacao on September 29th before reaching Category 5 strength the following day. Matthew tracked parallel to the northern half of the Southeast Georgia coast as a Category 2 hurricane (110 mph), before continuing to weaken to a Category 1 hurricane (85 mph) while passing much of the lower

Southeast South Carolina coast. Minimum surface pressures of 983.1 mb at Savannah International Airport (KSAV), 980.6 mb at Beaufort Airport (KNBC) and 981.7 mb at Charleston International Airport (KCHS) where recorded as Matthew passed just offshore.

Across southeast Georgia and southeast South Carolina, 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, specifically along coastal locations from Tybee Island, GA north to Edisto Beach, SC. Storm total rainfall amounts generally ranged from 4.5 to 7 inches across western areas of Southeast Georgia and extreme western locations of Southeast South Carolina to 8 to 17 inches closer to the coast, highest in coastal counties of Southeast Georgia and the lower Southeast South Carolina coast. A peak storm total rainfall of 17.49 inches was recorded at Hunter Army Airfield in Georgia while a peak storm total rainfall of 16.90 inches was recorded near Edisto Island, SC. Daily record rainfall totals were also set on October 7th and October 8th at the Savannah International Airport (KSAV), 4.36 inches and 3.84 inches, at the Charleston International Airport (KCHS), 4.7 inches and 5.77 inches and in downtown Charleston (KCXM), 4.36 inches and 3.84 inches respectively. Heavy rains also led to several instances of flash flooding with damage to roads and homes and helped produce long duration flooding along the Edisto River, Ashley River and Santee River. Wind damage produced numerous to widespread power outages and damage to homes and other structures throughout the area, most significantly at locations near the coast where 60 mph to 100 mph wind gusts occurred with rain bands surrounding the passing eye wall. On October 8th, a maximum sustained wind of 75 mph and peak wind gust of 96 mph was recorded at the Tybee Island South sensor (XTYE) in Georgia while a maximum sustained wind of 67 mph was recorded at the Beaufort (XBUF) sensor in South Carolina and peak wind gust of 87 mph was recorded at the Hilton Head Airport (KHXD) sensor in South Carolina. Three deaths and 1 injury occurred from trees falling on homes or cars in Southeast Georgia (but none in McIntosh County). The most extensive damage came with storm surge during Matthew. The entire Southeast Georgia and Southeast South Carolina coast was impacted by storm surge generally ranging between 2 to 5 ft with some locations as high as 6 to 8 ft. A peak surge of 7.69 ft occurred at the Fort Pulaski tide gauge at 2:48 AM October 8th while a peak surge of 6.20 ft occurred at the Charleston Harbor tide gauge at 5 AM October 8th. Damage from surge was most notable on the northern ends of Tybee Island in Georgia, Fripp Island in South Carolina and Edisto Island in South Carolina.

Specifically, on Sapelo Island, the DNR Sapelo Island manager reported that there were thousands of trees that fell during Hurricane Matthew. No trees landed on homes. There was only limited structural damage with just one residence requiring significant repair. An estimated 60 and 80 percent of the island's power lines came down."

In 2017, Irma was another coastal storm/hurricane had major impacts on McIntosh County and coastal Georgia as a Tropical Storm in terms of wind intensity. Details of this extreme event from NOAA NCEI Storm Event Database are described below:

"Irma strengthened into a major hurricane and made landfall on the southwest Florida coast on September 10th. During an extended period as a major hurricane, Irma set numerous

intensity records for a hurricane in the Atlantic basin. 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. The minimum central pressure reached during Irma's life cycle was 914 mb which is the lowest pressure on record by an Atlantic hurricane outside of the western Caribbean and Gulf of Mexico. Furthermore, 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 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. 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, mainly along the southeast South Carolina coast. A peak surge of 4.87 feet occurred at the Charleston Harbor tide gauge at 2:00 pm while 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 in southeast Georgia were $29,150,000. This includes $2,900,000 in McIntosh County.

McIntosh Emergency Management reported extensive storm surge flooding and inundation across coastal portions of the county, including islands. County dispatch reported 2 feet of water on the road on Butler Island at Highway 17 as well as 2 feet of water on Blue N Hall Road due to storm surge. USGS high water mark analysis revealed inundation above ground level ranging from 1.37-3.87 feet in coastal portions of the county. The peak inundation measured occurred on Graystone Road where a high-water mark showed 3.87 feet above ground level. Also, the USGS site Hudson Creek at Meridian Landing (USGS site number 022035975) reached a record level of 7.78 feet during the event. This USGS site dates back to October 2007. McIntosh County Emergency Management also reported numerous trees down across the county due to strong winds associated with Hurricane Irma. The NERRS site (National Estuarine Research Reserve) on Sapelo Island measured

a peak wind gust of 60 mph during the event. Total rainfall measured at this USGS site was 6.00 inches."

Based on a 12.5-year history of available data from the USGS site (ID: USGS 022035975) Hudson Creek at Meridian Landing (since October 2007), the following information regarding stage records is available about the flood events since the 2013 HMP Update. This station also includes rain gauge records.

- Tropical Storm Irma had the highest stage on record of 7.78 feet on September 11, 2017. Total rainfall from this event was 6.00 inches.
- Hurricane Matthew had the second highest stage of 5.99 feet on October 7, 2016. Total rainfall from this event was 4.16 inches.
- None of the other tropical storms in 2012 (Beryl), 2013 (Andrea), or 2016 (Colin, Hermine, or Julia) exceeded an elevation of 5.0 feet.

Additional rainfall records within the County were explored through NOAA NCEI Climate Data Online (https://www.ncdc.noaa.gov/cdo-web/datatools/findstation). Station "Darien 4.2 NNE, GA," (ID: GHCND:US1GAMI0003) measured 2.78 inches for Tropical Storm Andrea in June 2013, 10.99 inches for Hurricane Matthew in October 2016, and 7.70 inches for Tropical Storm Irma on September 11, 2017.

Hurricane and tropical storm frequency has increased recently. Over the past 50 years (January 1, 1968 to December 31, 2017), the frequency was 0.06 hurricanes per year and 0.46 tropical storms per year. The frequency has increased over the past 10 years (January 1, 2008 to December 31, 2017) to 0.10 hurricanes per year and 0.60 tropical storms per year. The frequency of Coastal Storms as a whole (summation of hurricanes, tropical storms, and tropical depressions) decreased slightly from 0.84 events per year over the past 50 years to 0.80 events per year over the past 10 years because of a higher frequency of tropical depressions reported between 10 and 50 years ago. This indicates that there has been little change in the frequency of Coastal Storms, but the intensity of these storms has been increasing.

The magnitude of impact is illustrated in the table below. The wind scale for hurricanes is based on the Saffir-Simpson Scale.

Saffir-Simpson Scale and Magnitude of Impact for Hurricanes

Storm Magnitude	Winds (MPH)	Damage	Storm Surge	# Impacting McIntosh County (1842-2016)
Tropical Storms	Less than 74	Minimal/Some		60
Category 1	74-95	Minimal/Some	4-5 feet	10
Category 2	96-110	Extensive	6-8 feet	8
Category 3	111-130	Devastating	9-12 feet	3
Category 4	131-155	Catastrophic	13-18 feet	1
Category 5	More than 155	Catastrophic	> 18 feet	0

Hurricane Floyd, September 16, 1999, like the recent Hurricane Matthew, caused one of the larger peacetime evacuations in history. Approximately 350,000 coastal residents joined more

than 2 million people from Florida, South Carolina and North Carolina. Floyd was a Category 5 storm while at sea but was downgraded to a Category 2 when it made landfall near Cape Fear, North Carolina. The coastal Georgia counties were spared hurricane damage. Hurricane Matthew stayed just far enough off of the coast and avoided a direct hit. It made direct landfall in Charleston, SC, and caused tremendous flooding in southeastern North Carolina.

The rate of onset of a storm surge has a smaller range than the storm itself. While the storm may show signs of approach up to days before the storm peaks, the storm surge will often appear somewhat suddenly. This rapid rate of onset is the major contributor to the many deaths associated with storm surge. The duration of the surge event depends on the depth of the surge and other environmental factors such as drainage capability. The waters from the surge may remain for days in certain areas. Although Georgia has not sustained a direct hit from a tropical cyclonic system in the recent record, Georgia's coastal counties have experienced some coastal flooding. Georgia's coastal counties, including McIntosh County, have great potential for a massive tropical cyclone to hit directly, causing an overwhelming storm surge.

Due to McIntosh County's location in relation to the coast and its flood area size, all assets are at great risk for hurricane damage from rain and winds. The frequency of an event would be the same for both the County and the City of Darien. Based on historical records, the annual probability of a Category 1 hurricane is 5.7% and a Category 4 hurricane is 0.6%. In terms of extent, McIntosh County has suffered from predominantly Tropical Storm and Category 1 storm effects but storms up to Category 5 cannot be ruled out. The hazard frequency data table is located in Appendix D, and the critical facility inventory report is located in Appendix D.

C. Assets Exposed to Hazard and Estimate of Potential Losses

All structures and facilities within McIntosh County could be damaged by a coastal storm or hurricane, including all public safety facilities, government buildings, water and wastewater treatment facilities, public utilities, education centers, the public library and commercial and residential areas. Based on the 2016 Consolidated Tax Digest Summary, existing structures in the coastal storm and hurricane hazard area may number 37,094 residential, commercial, industrial, agricultural, and nonprofit structures, 37 infrastructure structures, as well as 505 government and education structures. The value of these structures is $1,206,173,503. The entire population, 19,059 people, would also be at risk. This exposure is detailed in Appendix A, Section II, for McIntosh County and the City of Darien (GEMA Worksheet #3A).

All 75 critical facilities are exposed to this hazard. Exposure of these facilities was also explored for storm surge and wind. In total, 5 critical facilities would be exposed to storm surge for a Category 1 hurricane and 44 facilities for a Category 4 hurricane. Of the 5 critical facilities exposed for a Category 1 hurricane, 2 were lift stations and 3 were located on Sapelo Island. For the Wind hazard, 67 were located in the Category 5 zone (most extreme) and 8 were in the Category 4 zone.

The impact of storm surge in McIntosh County and City of Darien were explored based on the SLOSH (Sea, Lake, and Overland Surge from Hurricanes) model using GIS. Storm surge from a Category 1 and a Category 4 hurricane were explored because these represented the most common storm, and the largest on record since 1842. It was identified that in McIntosh County

29% of parcels, 28% of "improved buildings," and 41% of value of "Improved Buildings" were in the storm surge zone for a Category 1 hurricane. The City of Darien was in general on higher ground than most of the County, so only 5% of parcels, 4% of "improved buildings," and 5% of value of "improved buildings" were in this storm surge zone. If a Category 4 hurricane impacts the area, the percentages of exposure jump greatly. In McIntosh County, exposure increased to 89% of parcels, 86% of "improved buildings," and 87% of value of "Improved Buildings," and in Darien, exposure increased to 73% of parcels, 66% of "improved buildings," and 65% of value of "Improved Buildings." These totals are presented in the table below.

Exposure to Coastal Storm/Hurricane Hazard

Location	Parcels Impacted (% of Total)	"Improved Buildings" Impacted (% of Total)	Value of "Improved Buildings" (% of Total)
Category 1 Storm Surge			
McIntosh County (ALL)	3,755 (29%)	1,394 (28%)	$199,042,517 (41%)
City of Darien	65 (5%)	27 (4%)	$2,407,606 (5%)
Category 4 Storm Surge			
McIntosh County (ALL)	11,527 (89%)	4,284 (86%)	$418,134,453 (87%)
City of Darien	959 (73%)	455 (66%)	$30,892,305 (65%)

Data Source: Parcel information and value are from the 2016 McIntosh County Tax Assessor Data.

It should be noted that in addition to storm surge, wind hazard is also of concern. All of City of Darien, and about two-thirds of McIntosh County are located in Category 5 Wind Hazard (highest rating). The remainder of McIntosh County, mostly west of I-95, is in Category 4. Maps of storm surge and wind hazard are presented at the end of this section for McIntosh County and City of Darien. According to the Georgia Office of Insurance and Safety Fire Commissioner, McIntosh County is in Zone 2 of the Georgia Manufactured Housing Wind Zones. This zone is rated for 100 to 109 MPH and is the highest in the state of Georgia. Unincorporated County's code states that all structures must meet wind loading requirements of Federal Emergency Management Administrator and the Southern Building Code Congress International (SBCCI) Codes. The local continuous design wind speed in the unincorporated area is 120 MPH.

HAZUS modeling was conducted for McIntosh County, and it is reported in the 2017 Report, "Hazard Risk Analyses: Supplement to the McIntosh County Joint Hazard Mitigation Plan," by Coastal Regional Commission. This report is included in Appendix A. Damage was calculated for a hypothetical Category 2 hurricane.

<u>HAZUS modeling predicted the following for Wind Damage from a Category 2 Hurricane:</u>

- Impacted 749 buildings, with damage of $8,840,730 and total economic loss of $10,886,780 for a loss ratio of 0.99.
- None of the 27 essential facilities suffered damage greater than 50%, and only 8 facilities had expected loss less than 1 day.

- Total wind-related debris was 203,663 tons.

D. Land Use and Development Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to coastal storm/hurricane hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

Information provided in the 2018 draft Comprehensive Plans for McIntosh County and City of Darien identified commercial development in the future land use maps as occurring along I-95 interchanges and along Highway 17 and 99 corridors, out of the natural hazard area. All the community growth and development are guided by local comprehensive planning for the County and the City. These plans reflect the natural hazard vulnerabilities and risk and include objectives to direct and guide growth away from these areas where they cannot be adequately mitigated.

E. Multi-Jurisdictional Concerns

The greatest concerns during a coastal storm and hurricane event are the impacts of flooding caused by heavy rainfall and storm surge combined with the impact of high winds.

Unincorporated McIntosh County and the City of Darien participate in the National Flood Insurance Program (NFIP), as well as adhere to the Georgia State Minimum Standard Codes (Uniform Codes Act) and the International Building Code. The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with the regulations for most natural hazards.

Due to the county and city's location in relation to the coast, the entire area is at great risk for coastal storms. With respect to storm surge, City of Darien is at less risk than McIntosh County; however, a Category 4 hurricane or greater would impact most of both areas. When factoring in wind and localized flooding from heavy rainfall, the entire area is at risk. There are no hurricane shelters located within the entire county, so evacuation and reentry processes are very important to consider and plan for.

F. Overall HRV Summary

McIntosh County has a high probability for exposure to potential damages caused by coastal storms and hurricanes. The storms would impact all facilities and structures within the county. Due to jurisdiction's location in relation to the coast, considerable damage would be caused, particularly from heavy rainfall, high winds, and storm surge. The storm surge has potential to cause severe flooding that not only dampens but destroys exposed structures. Based on the magnitude of these events, this type of hazard would have the largest impact on property and people per an individual event. The entire exposure area could be impacted from one event.

Storm Surge: SLOSH

City of Darien

Storm Surge

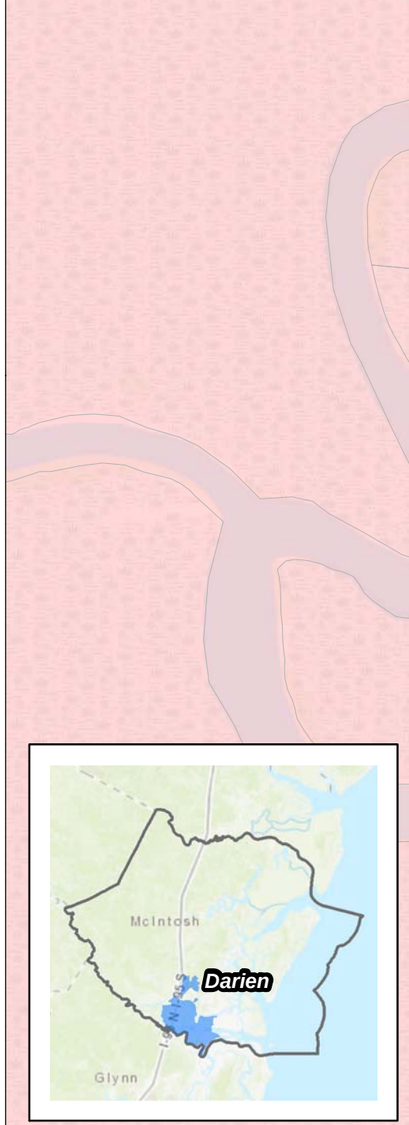
- Tropical Storm
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5

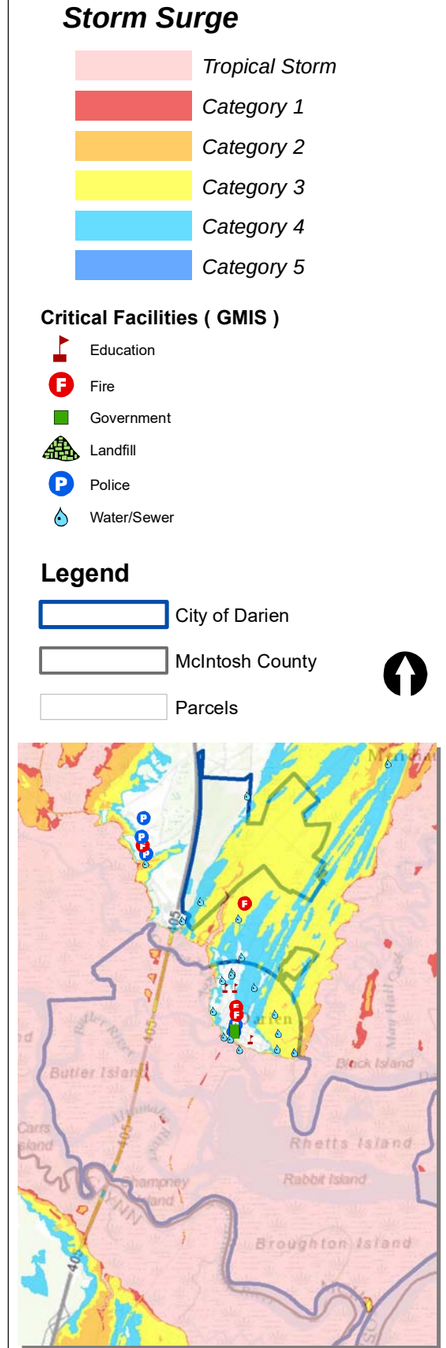
Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels

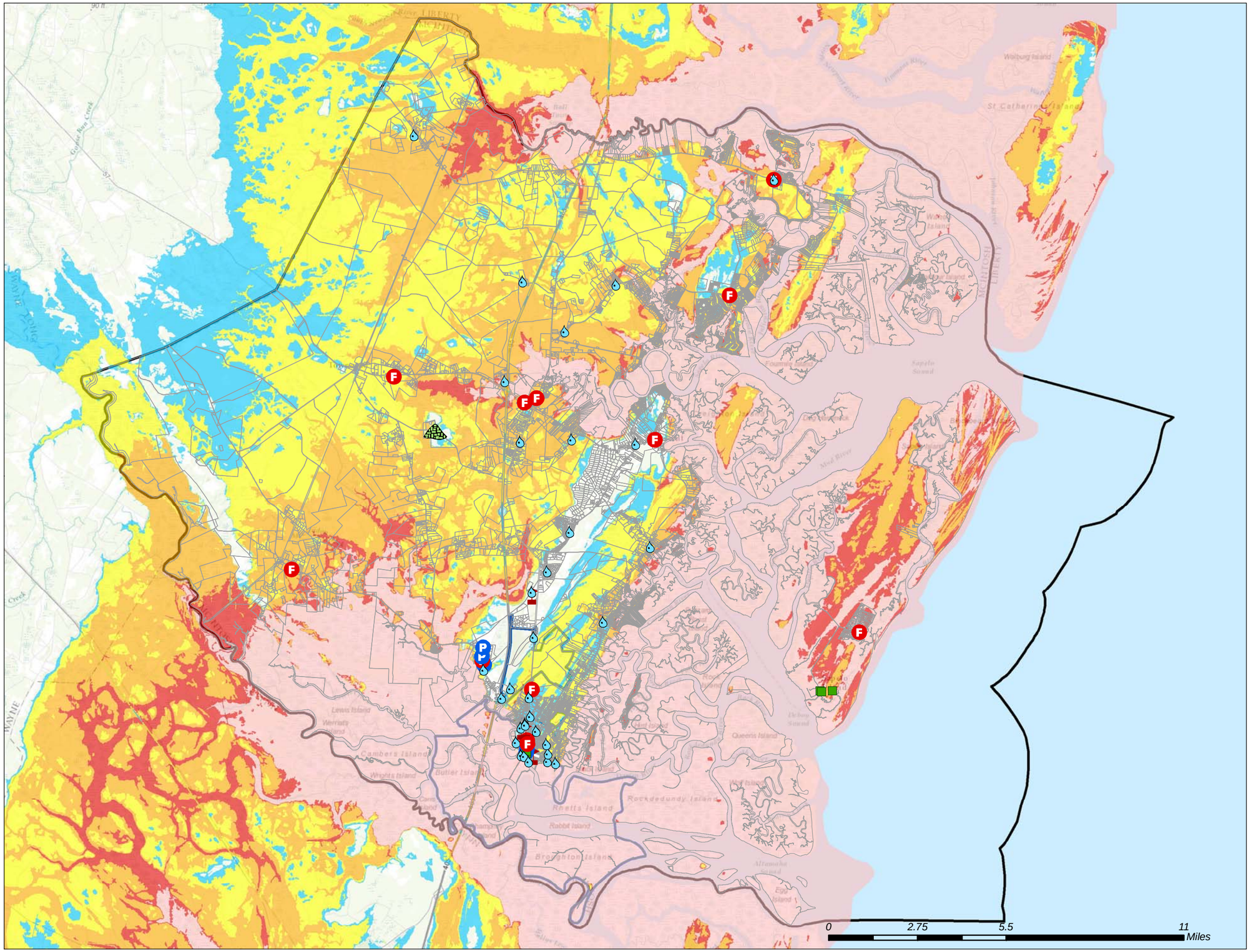




0 0.175 0.35 0.7 Miles

ECOLOGICAL PLANNING GROUP

Storm Surge: SLOSH



Storm Surge

- Tropical Storm
- Category 1
- Category 2
- Category 3
- Category 4
- Category 5

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

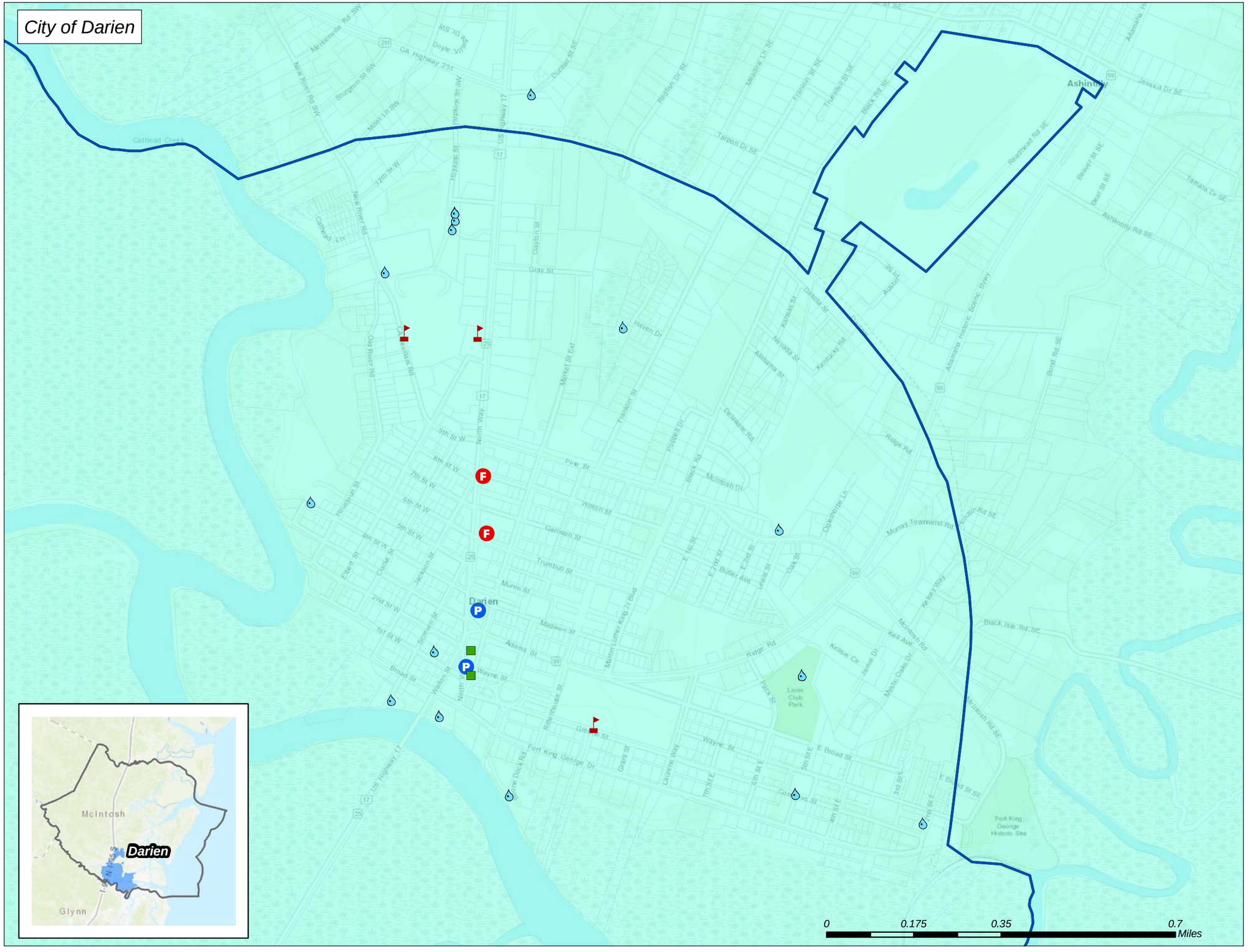
Legend

- City of Darien
- McIntosh County
- Parcels

ECOLOGICAL PLANNING GROUP

Wind

City of Darien



Wind Zones

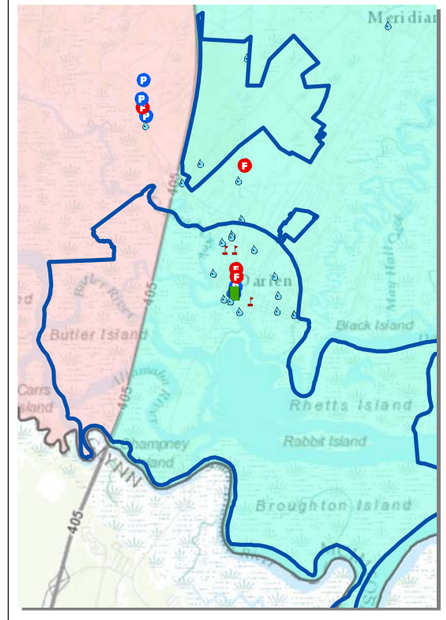
- Zone 4
- Zone 5

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels



ECOLOGICAL PLANNING GROUP

Wind

Wind Zones

- Zone 4
- Zone 5

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels

0 3 6 12 Miles

ECOLOGICAL PLANNING GROUP

SECTION III – DROUGHT

A. Hazard Identification

The 2008 *Georgia Hazard Mitigation Plan Standard and Enhanced* defines drought as a normal, recurrent feature of climate consisting of a deficiency of precipitation over an extended period of time (usually a season or more). Therefore, a drought is a period of abnormally dry weather sufficiently prolonged for the lack of water to cause a serious hydrologic imbalance in the affected area. Drought conditions affect the cultivation of crops as well as a water availability and water quality. Drought is also a key factor in wildfire development. Drought conditions make natural fuels (grass, brush, trees, and dead vegetation) more flammable. According to the 2016 Consolidated Tax Digest Summary, more than 47% of McIntosh County is considered Agricultural, and the majority of this is forestry. There are very few agricultural crops grown in McIntosh County, so one of the biggest concerns for droughts is fuel for wildfires.

Drought conditions may endure from months to decades, which implicate droughts as having high potential to cause devastation on a given area. The duration characteristic of droughts is so important that droughts are classified in terms of length of impact. Droughts lasting 1 to 3 months are considered short term, while droughts lasting 4 to 6 months are considered intermediate and droughts lasting longer than 6 months are long term.

Data from the U.S. Drought Monitor was used to classify the presence and duration of droughts (University of Nebraska-Lincoln). Based on this classification system, there are 5 categories, ranging from D0 (abnormally dry) to D4 (exceptional drought). These are described in the table below along with comparisons to other indicators and indices.

Drought Severity Classification

			Ranges				
Category	Description	Possible Impacts	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: ▪ short-term dryness slowing planting, growth of crops or pastures Coming out of drought: ▪ some lingering water deficits ▪ pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	▪ Some damage to crops, pastures ▪ Streams, reservoirs, or wells low, some water shortages developing or imminent ▪ Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	▪ Crop or pasture losses likely ▪ Water shortages common ▪ Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	▪ Major crop/pasture losses ▪ Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	▪ Exceptional and widespread crop/pasture losses ▪ Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Short-term drought indicator blends focus on 1-3 month precipitation. Long-term blends focus on 6-60 months. Additional indices used, mainly during the growing season, include the USDA/NASS Topsoil Moisture, Keetch-Byram Drought Index (KBDI), and NOAA/NESDIS satellite Vegetation Health Indices. Indices used primarily during the snow season and in the West include snow water content, river basin precipitation, and the Surface Water Supply Index (SWSI). Other indicators include groundwater levels, reservoir storage, and pasture/range conditions.

Drought Classification System from U.S. Drought Monitor (University of Nebraska-Lincoln)

B. Hazard Profile

Historical frequency data for this hazard was researched on the NOAA NCEI Storm Event Database. The Storm Event Database lists 46 occurrences of drought. An occurrence is listed in this database on the 1st of each month if the rainfall and weather conditions indicate a drought, so the reporting does not account for continuous drought conditions. Within the database, two locations are listed for each month with a drought – "Inland McIntosh" Zone and "Coastal McIntosh" Zone. Therefore, there were 23 months with a drought reported. The HMPUC defined a drought event as a continuous event, so overall, there were 5 recorded drought events in the 68-year recorded storm history. There were no new drought events identified in this database since 2002, and all 5 events occurred from 1996 to 2002. These drought events occurred during the following periods: (1) May 1996, (2) August–September 1999, (3) May–September 2000, (4) April–June 2001, and (5) October 2001–September 2002. No crop damage or losses were reported in this database for these events.

Since the most recent drought recorded on the NOAA NCEI Storm Event Database was in 2002 and droughts have been observed in the area within the last decade, drought conditions were also explored using the U.S. Drought Monitor (http://droughtmonitor.unl.edu/). Drought information was downloaded for the period since data was last updated for the 2013 HMP Update, which was July 2009. During the 468 weeks from to July 14, 2009 to July 2, 2018, there was no presence of dry conditions for 55.6% of the weeks. The duration of D0 (abnormally dry) was 16.9%, D1 (moderate drought) was 8.5%, D2 (severe drought) was 8.3%, D3 (extreme drought) was 9.4%, and D4 (exceptional drought) was 0.9%. The longest consecutive period with at least a D2 (severe drought) was 51 weeks from 10/26/2010 to 10/17/2011, including two periods of 19 consecutive weeks with at least a D3 (extreme drought). The other periods with a severe drought (D2) or worse were: (1) a 22-week period from December 2011 to May 2012, (2) an 8-week period from February to March 2013, and a 6-week period from March to April 2018. Based on the results from the U.S. Drought Monitor, at least a severe drought was recorded 4 times over a 9-year period since 2009, with one drought lasting for 12 months.

The drought hazard frequency is not entirely representative since some droughts can last a couple months and others over a year. Based on the 5 events in the NOAA NCEI Storm Event Database, the drought from 2007-2008 that was based on county records and reported in the 2013 HMP Update, and the 4 periods identified since July 2009 from the U.S. Drought Monitor, a total of 10 events have occurred over the past 68 years for a 14.7% chance to occur per year. All of these events have been recorded in the most recent 22 years. Because the data collection, reporting, and accuracy are much better in the past 20 years, the frequency of a drought is 0.45 events per year for the most recent 20 years only. The frequency is the same for both the County and the City. The hazard frequency data table is located in Appendix D.

Previous instances of droughts and responses are described below. Coastal Georgia has experienced a prolonged drought period since 1999. In response to this situation, the United States Department of Agriculture issued an Emergency Disaster Declaration on October 18, 2002. The declaration was in response to continuous drought conditions since January 2002. This declaration allowed agricultural businesses in the indicated counties to become eligible for

emergency farm loans. On February 22, 2001, then Governor Roy Barnes secured Economic Disaster Relief from the Small Business Administration for Georgia's seafood industry in response to the impact of drought. McIntosh County was named in the declaration.

Drought conditions have increased in frequency, magnitude and intensity in recent years. The Georgia governor declared a State of Emergency in Drought Executive Order 011808 on October 20, 2007 that was extended on November 20, 2007 and again on December 19, 2007. Because the condition was declared a Level 4 drought for most of the state, increased levels of drought response are necessary. Thus, the executive order called for establishment of the Drought Response Unified Command and the Drought Response Working Group to be consistent with the Georgia Emergency Operations Plan. The order also called for the implementation of the State of Georgia Drought Response Strategy. More information regarding the drought response can be found on the Drought Response Unified Command's website (https://www.piersystem.com/go/site/1619/) as well as the Conserve Water Georgia's website (http://www.conservewatergeorgia.net/Documents/georgia_drought.html). Also, the most up to date drought monitoring information can be found at the National Drought Mitigation Center's website (http://www.drought.unl.edu/index.htm).

Because of the slow rate of onset and long duration of droughts in Georgia, long-term management and mitigation measures are appropriate. The Environmental Protection Division (EPD) of Georgia's Department of Natural Resources (DNR) publishes the Georgia Drought Management Plan, which addresses both pre-drought mitigation strategies and drought response strategies. On June 10, 2009 Georgia EPD issued a non-drought schedule for outdoor water use for the first time since June 2006, a 3-year period because significant rainfall and improved water supplies.

C. Assets Exposed to Hazard and Estimate of Potential Losses

Drought conditions typically pose little or no threat to structures; however, fires can occur from the dry weather. The McIntosh County HMPUC concluded that a drought itself presents no credible threat to critical facilities. Droughts could impact some private wells, which are not as deep as the City and County wells. Wildfire, as a result of drought, was considered, and the Committee determined that this hazard does bear a significant threat to the community. The hazard, Wildfire, and associated actions and descriptions are described in Section VIII.

The HMPUC decided to keep the exposure for drought at 100% for agricultural category and 15% for government category. In McIntosh County, the number of structures in the hazard area is 1,446 valued at $100,746,046, and in Darien, the number of structures in the hazard area is 26 structures valued at $5,013,800. These results are presented in Appendix A, Section III.

Potential drought losses are calculated on the value of agriculture in the County. According to data maintained by Georgia Department of Natural Resources, Coastal Resources Division, the market value of production in seafood harvesting represents more than $5 million annually.

D. Land Use & Development Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to drought hazards.

Some guidance comes from the State and Coastal Regional Water Plans for local governments to implement. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

E. Multi-Jurisdictional Concerns

All of McIntosh County could potentially be affected by drought conditions, particularly as concerns the seafood industry and the threat of wildfire. Most of the wildfire danger is in the county because structures are in the Wildland-Urban Interface. Any mitigation steps taken related to wildfire should be undertaken on a countywide basis and include the City of Darien.

F. Overall HRV Summary

Drought can cause severe economic stress to the agricultural and forestry interests in McIntosh County. The potential negative effects of sustained drought are numerous. In addition to an increased threat of wildfires, drought can affect municipal and industrial water supplies, stream water quality, water recreation facilities, as well as agricultural and forest resources. Shallow private wells are more likely to be impacted from prolonged droughts than municipal water supplies.

SECTION IV – EXTREME HEAT

A. Hazard Identification

Extreme heat is defined as temperatures that hover 10 degrees or more above the average high temperature for a particular region and last for an extended period of time. Humid or muggy conditions can exacerbate the effects of high heat and occur when a dome of high atmospheric pressure traps hazy, damp air near the ground.

Heat kills by pushing the human body beyond its limits. Under normal conditions an internal thermostat produces perspiration that evaporates and cools the body. The human body dissipates heat by varying the rate and depth of blood circulation, by losing water through the skin and sweat glands, and as a last resort by panting, when blood is heated above 98.6°F. Sweating cools the body through evaporation. However, high relative humidity retards evaporation, robbing the body of its ability to cool itself. When heat gain exceeds the level the body can remove, body temperature begins to rise, and heat-related illnesses and disorders, such as heat exhaustion, may develop. In extreme cases, heat stroke and even death can occur. Older adults, young children, and those who are sick, overweight, or living in poverty are more susceptible to the effects of extreme heat.

Most heat disorders occur because the victim has been overexposed to heat or has over-exercised for his or her age and physical condition. The Heat Index (HI) is the temperature the body feels when heat and humidity are combined. The chart below shows the HI that corresponds to the actual air temperature and relative humidity. This chart is based upon shady, light wind conditions. Exposure to direct sunlight can increase the heat index by up to 15°F. Due to the nature of the heat index calculation, the values in the tables below have an error +/- 1.3°F.

Temperature (F) versus Relative Humidity (%)

°F	90%	80%	70%	60%	50%	40%
80	85	84	82	81	80	79
85	101	96	92	90	86	84
90	121	113	105	99	94	90
95		133	122	113	105	98
100			142	129	118	109
105				148	133	121
110						135

HI	Possible Heat Disorder:
80°F - 90°F	Fatigue possible with prolonged exposure and physical activity.
90°F - 105°F	Sunstroke, heat cramps and heat exhaustion possible.
105°F - 130°F	Sunstroke, heat cramps, and heat exhaustion likely, and heat stroke possible.
130°F or greater	**Heat stroke highly likely with continued exposure.**

Heat Index Calculations Based on Temperature and Relative Humidity

Conditions that can induce heat-related illnesses include stagnant atmospheric conditions and

poor air quality. Consequently, people living in urban areas may be at greater risk from the effects of a prolonged heat wave than those living in rural areas. Also, asphalt and concrete store heat longer and gradually release heat at night, which can produce higher nighttime temperatures known as the "urban heat island effect."

B. Hazard Profile

The McIntosh County Joint HMPUC reviewed updated information on extreme heat conditions. Based on the NOAA NCEI Storm Event Database, there were no extreme heat events in McIntosh County for the 68 years of available data. The 2013 HMP Update noted five extreme heat events on record; however, the data source of these events and whether it actually was recorded in McIntosh County could not be confirmed. It is suspected that Chatham County data was used. Since this is not a neighboring county, its data should not have been applied.

With new data of zero events, the frequency of an occurrence per year, from the previous 10 years, has decreased from 0.30 to 0.00. It is likely that this type of hazard is not adequately reported and available from the NOAA NCEI Storm Event Database for McIntosh County. The hazard frequency data table is located in Appendix D.

However, extreme heat is known to be a concern and hazard that impacts the population of coastal Georgia. Data from the neighboring counties of Liberty County and Long County were used to highlight the potential threat of this hazard for McIntosh County. Both Liberty and Long counties recorded two events each – July 26, 2010 and July 30, 2010. Details of these events showed heat indices reaching 115^{o}F to 125^{o}F. The event narrative for one of these events on the NOAA NCEI Storm Event Database stated the "unseasonably hot and humid airmass resulted in heat index values of 115 degrees or higher across much of coastal South Carolina and coastal Georgia." Extreme heat is an event affecting large, multi-county or multi-state areas and not an isolated event such as a tornado; therefore, it this use of data from neighboring counties is to document potential risk for McIntosh County. Based on the data from Long and Liberty counties, the probability of an extreme heat event for the previous 10 years would be 0.20 events per year or a 20% chance of occurrence per year. With documented heat index values greater than 115^{o}F in neighboring counties, the impact to McIntosh County with a similar heat index is the potential for residents and visitors to suffer from heat exhaustion, heat stroke, or even death if they work outdoors or if they do not have access to places of relief with air conditioning. Since extreme heat events are regional weather patterns, the impacts from an individual event will be felt countywide.

The present economic conditions have resulted in more people leaving air conditioners off. Therefore, HMPUC members chose to study possible actions steps to reduce this impact. This vulnerability of the low-income and elderly population segment is a concern for emergency medical and law enforcement personnel.

C. Assets Exposed to Hazard and Estimate of Potential Losses

The economic impacts of this hazard cannot be evaluated geographically. The impacts are more concerning for personal health of residents than property damage. Although, excessive heat

can cause utility outages due to an increased demand for electricity. Utility outages could severely hamper the County's ability to provide services as facilities become inoperable and must be closed due to a lack of power or water. Overall, critical infrastructure is unlikely to be affected by this hazard.

The most vulnerable individuals to this hazard are the lower-income population because they are less likely to have access to air conditioning, but it also affects the very old and young, and individuals who live alone, suffer from illness, lack transportation, or are overweight. Since the impact is most strongly tied to income-level, the most recent, Census-reported, poverty status of the population was investigated. Census data for 2016 showed the percentage of the population with an income below the poverty level was 20% for McIntosh County and 37% for City of Darien. The HMPUC decided to set the residential population exposed to this hazard at these levels. There was no change in exposure for the County at 20%, but the City increased greatly from 28% to 37%. The previous HMP Update also identified 10% of the agricultural assets in both the County and City exposed to this hazard. The HMPUC decided to keep this exposure the same.

Overall, an extreme heat event could potentially impact 2,802 people in McIntosh County, including 683 people in City of Darien. More details on the inventory of exposed assets are reported in Appendix A, Section IV (GEMA Worksheet #3A).

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to extreme heat hazards. As poverty is one factor that can affect a population's ability to respond to extreme heat events, because of the access to air conditioning, there was no change for McIntosh County's population as a whole from 2010 to 2016. However, the City of Darien had an increase in poverty rate from 28% to 37% during this same time period.

Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien

River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

E. Multi-Jurisdictional Concerns

The City of Darien has the greater potential for negative impact for this hazard because it has a higher percentage of the population with an income below the poverty level. However, residents in the unincorporated sections of the county have less access to transportation and are farther from emergency services, if they experience heat-related symptoms.

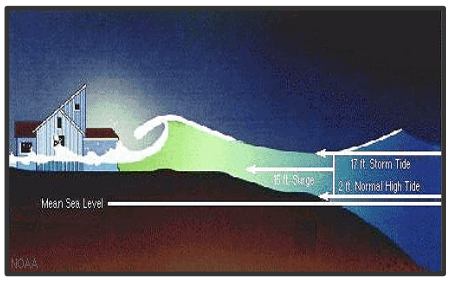
F. Overall HRV Summary

Although the risk of deaths during extreme heat events is low for McIntosh County, the HMPUC feel this is a relevant issue to include in the Hazard Mitigation Plan. Many of the issues that pose a danger to resident health exist in portions of McIntosh County. High levels of poverty, increased rates of obesity and chronic illness, and lack of access to transportation exacerbate the problems.

SECTION V – FLOOD

A. Hazard Identification

A flood is a natural event for rivers and streams. Excess water from rainfall or storm surge accumulates and overflows onto the banks and adjacent floodplains. Floodplains are lowlands, adjacent to rivers and oceans that are subject to recurring floods. Adverse impacts may include structural damages, temporary backwater effects in sewers and drainage systems, and unsanitary conditions by deposition of materials during recession. McIntosh County is subject to flooding from coastal storm surge tides, in addition to rainfall induced by hurricanes, tropical storms, and other storms. Hurricanes and tropical storms normally occur in the summer and early fall. Other significant flooding sources within McIntosh County include rivers and streams. The South Newport River, which delineates the county boundary with Liberty County, has a drainage area of approximately 160 square miles and flows generally southeasterly. The Altamaha River also flows generally southeasterly and delimits the county boundary with Glynn County. Other flooding sources include the Darien River/ Cathead Creek system with a drainage area of 98.3 square miles, and the Sapelo River with a drainage area of 34.6 square miles. The McIntosh County Joint Hazard Mitigation Plan Update Committee examined historical data from the National Climatic Data Center to update research on the effects of flooding in McIntosh County.



Flood hazard maps for McIntosh County and the City of Darien are presented at the end of Section V. The flood hazard maps are based on the Effective Georgia DFIRM (digital flood insurance rate map), as of September 2017. There are Preliminary maps for Coastal Georgia that are currently under review but have not been adopted yet; as a result, the statistics of exposed properties will be presented for the Preliminary maps, but the Effective ones will be presented in this HMP Update. As with the previous HMP Update, there were no repetitive loss properties identified in the County (see Page 17, Appendix A). Base Flood Elevation (BFE) is 12 Feet NAVD. During rainy periods, the water table rises sharply, and water remains near the surface, with flooding occurring at 1-3 feet above BFE.

Another hazard map associated with flooding that is presented at the end of Section V is for sea level rise. Although there is no historical evidence on which to base future estimates of damage from sea level rise in McIntosh County, the County is at risk for sea level rise. It was discussed in the HMPUC meetings to explore sea level rise impacts for a 1-m (3-ft) rise in sea level because this is a typical depth used by other coastal counties.

B. Hazard Profile

Within McIntosh County, flooding has caused significant damage on several occasions. Most flooding issues occur in the western portion and northeastern portion of the county. Flooding issues in the western portion of the county are attributable to the Altamaha River rising over the banks from the heavy rainfall that occurs in the central portion of Georgia. Problems occur in the unincorporated area along the Townsend Cox Road. The 2013 HMP Update estimated that flooding along Townsend Cox Road occurs, on average, every three years. Problems include road erosion and property damage.

According to the 2013 HMP Update, there were 5 "flood" events prior to approval of the 2005 HMP that caused $850,000 in damage, and all of these events were not captured in the NOAA NCEI Storm Event Database as a flood event, so they have been included in the hazard frequency table as based on County records. These pre-2005 flood events included: (1) & (2) coastal storms in 1993 and 1994, resulting in excess of $350,000 in flood damage; (3) flooding from Hurricane Bertha in 1996, resulting in excess of $300,000 in flood damage; and (4) & (5) severe storms in 1994 and 1998, resulting in excess of $200,000 in flood damage. Hurricane Bertha (1996), while not listed as a "flood" event, it was listed as a "Hurricane (typhoon)" in the NOAA NCEI Storm Event Database.

According to the NOAA NCEI Storm Event Database, there were 6 instances of "Flash Flood" and 7 instances of "Coastal Flood" in the 68-year history. Several of these instances were associated to the same weather system, so they were counted as a collective weather event. In total, there were 3 "Coastal Storm" events and 4 "Flash Flood" events, in which one was associated with Tropical Storm Tammy in 2005 and another with Tropical Storm Irma in 2017. Many of the coastal storms (hurricane, tropical storm, and tropical depression) have flooding associated with them but they are not always reported as a specific flooding event in the NOAA NCEI Storm Event Database. In the years since the HMP was last updated in 2013, only 2 "flood" events were reported on the NOAA NCEI Storm Event Database. The "Flash Flood" and "Coastal Flood" event details from the NCEI Storm Event Database, including those since the 2013 HMP Update, are described below:

- Pre-2005
    1. A "Flash Flood" event occurred on August 18, 2003, due to heavy rainfall. It was reported by law enforcement that streets in Darien flooded and at least 1 car was inundated by water.
- 2005-2010
    1. Details of flooding during Tropical Storm Tammy (October 5-7, 2005) include: flooded numerous roads throughout the County, including Murray Townsend Road; 5 homes were damaged by flood waters; 15-20 roads washed out; and 2 pond dams burst. Tropical Storm force wind gusts as high as 50 mph affected the County for many hours.
    2. A "Coastal Flood" event occurred on September 30, 2007. Strong Northeast winds and High Astronomical Tides combined to produce significant beach erosion. Roads were flooded or damaged on the south end of Sapelo Island, and all docks along North Back River near Ridgeville were submerged. Catastrophic beach erosion was reported on Sapelo Island, with approximately 20-30 feet of beach being washed away.
    3. A "Flash Flood" event occurred on April 2, 2009 due to several waves of low pressure along a quasi-stationary front. This system promoted showers and thunderstorms over the area, including a few storms with heavy rain. The emergency manager reported that several dirt roads were closed due to flooding near Darien.
    4. Another "Coastal Flood" event occurred on June 22-23, 2009. Anomalously high Perigean Spring Tides resulted in significant coastal flooding. Landing Road flooded around high tide in Meridian, Georgia. The employee at the NOAA

National Estuarine Research Reserve stated that this road had never flooded at high tide before, and some culverts washed out. The 2013 HMP Update also described that this event had $700,000 in reported damages as roads flooded on Sapelo Island and washed out culverts.

- 2010-Present (Since 2013 HMP Update)
    1. A "Coastal Flood" event occurred on October 27-28, 2015. A combination of persistent and strong east/northeast winds, the Perigean spring tide and a full moon produced 2 days of elevated high tide cycles. Major coastal flood stage levels were recorded at the Fort Pulaski, GA (FPKG1) tide gauge on Oct 27, 2015, which claimed 3rd place on the all-time historic crest list. Moderate coastal flood stage levels were also recorded at the Fort Pulaski, GA (FPKG1) tide gauge on Oct 28, 2015, which claimed 9th place on the all-time historic crest list. In McIntosh County, a ferry dock was flooded on Sapelo Island and severe erosion was reported at the beach. Many shrimp docks were flooded around Darien. In addition, flooding was reported at many parts of the Fort King George historical site, including nature trails, parking lots, docks and some exhibitions.
    2. A "Flash Flood" event was reported on September 11, 2017, in Darien, during Tropical Storm Irma. Local broadcast media reported flash flooding from heavy rainfall associated with Tropical Storm Irma. Pictures showed several structures submerged due to flood waters on Highway 17 south of Darien. Water was nearly up to the windows on one structure. Feeder bands around Irma produced very heavy rainfall rates with rainfall totals generally ranging from 3 to 9 inches. The strongest winds were confined to coastal locations, but frequent gusts into the 40-50 mph range occurred well inland. McIntosh Emergency Management reported extensive storm surge flooding and inundation across coastal portions of the county, including islands. County dispatch reported 2 feet of water on the road on Butler Island at Highway 17 as well as 2 feet of water on Blue N Hall Road due to storm surge. USGS high water mark analysis revealed inundation above ground level ranging from 1.37-3.87 feet in coastal portions of the county. The peak inundation measured occurred on Graystone Road where a high-water mark showed 3.87 feet above ground level. Also, the USGS site Hudson Creek at Meridian Landing (USGS site number 022035975) reached a record level of 7.78 feet during the event. This USGS site dates back to October 2007. The total precipitation at this USGS site was 6.0 inches, over a 24-hour period.

Based on a 12.5-year history of available data from the USGS site Hudson Creek at Meridian Landing (since October 2007), the following information regarding stage records is available about the flood events since the 2013 HMP Update. This station also includes rain gauge records.

- Tropical Storm Irma had the highest stage on record of 7.78 feet on September 11, 2017. Total rainfall from this event was 6.00 inches.
- Hurricane Matthew had the second highest stage of 5.99 feet on October 7, 2016. Total rainfall from this event was 4.16 inches.
- The coastal flood event on October 27, 2015, had the third highest stage event at 5.64 feet. This event was not influenced by rainfall but rather a combination of persistent and strong east/northeast winds, the Perigean spring tide and a full moon.

Additional rainfall records within the County were explored through NOAA NCEI Climate Data Online (https://www.ncdc.noaa.gov/cdo-web/datatools/findstation). Station "Darien 4.2 NNE, GA," (ID: GHCND:US1GAMI0003) measured 10.99 inches for Hurricane Matthew in October 2016 and 7.70 inches for Tropical Storm Irma on September 11, 2017.

The hazard frequency history included 7 total "Flash Flood" and "Coastal Flood" events from the NOAA NCEI Storm Event Database, as well as the 5 events prior to the 2005 HMP that were described in the 2013 HMP Update as based on County records. According to this database and search criteria and the County records, there were 12 recorded events in the 68-year recorded storm history for a 17.6% chance to occur per year, but all were reported in the previous 25 years. While the frequency of events appears to be increasing, it should be noted that data collection, reporting, and accuracy are much better in the past 20 years. As a result, data from the most recent 20 years was used to project frequency of this hazard, and during the most recent 20 years there were 0.40 events per year. The frequency would be the same for both the County and the City. The hazard frequency data table is located in Appendix D.

Since Coastal Storms are known to produce flooding as well, hazard frequency was also explored for flooding by including these events. When Coastal Storms (hurricane, tropical storm, tropical depression) were added to the "Flash Flood" and "Coastal Flood" events [and in not double-counting Tropical Storms Tammy (2005) and Irma (2017) which also had "flood" events], there were 11 events in the last 10 years and 24 events in the last 20 years. The corresponding event frequency of a coastal storm or other flood is 1.10 and 1.20 events per year for the previous 10-year and 20-year periods, respectively. More details about the Coastal Storm hazard history is included in Section II.

C. Assets Exposed to Hazard and Estimate of Potential Losses

Several bridges within McIntosh County have the potential of being flooded should waters rise significantly. Low-lying bridges span the creeks and marshlands along White Chimney, Shellman Bluff and Youngman in the northeast section of the county. The roads could be covered with water, rendering roads near the interstate temporarily impassable.

One of the largest concerns within McIntosh County, related to flooding, is evacuation of residents during storm events. Many of the residential areas are accessed by county roads that would quickly be flooded during storm surge or flooding events. Some areas of the County would have limited access by Emergency Services personnel during and after a flooding event.

In the previous HMP Update, the estimated exposed assets were based on the percentage of land area within the flood zone. This update utilizes a technique that linked the flood zones with the McIntosh County Tax Assessor's parcel-based data using GIS. The following FEMA flood zones were explored: (1) V-Zone (1% annual chance flood, with wave action [e.g., 100-year event]), (2) A-Zone (1% annual chance flood, no wave action [e.g., 100-year event]), (3) 0.2% annual chance flood [e.g., 500-year event]. Because of the risk of wave action, the V-Zone has a greater risk of damage, so insurance premiums are higher than for the A-Zone.

The 2013 HMP Update identified that 68% of McIntosh County and 75% of City of Darien were exposed to flood hazard, which includes the 1% annual chance floods (V-Zone and A-Zone). These percentages were based on exposure by area. In the 2018 HMP Update, an

improved GIS-based technique was used to examine parcel data to determine exposure to buildings and their respective values. The results of the new approach are presented in the table below. Overall, the exposed assets/"improved buildings" in McIntosh County were cut in half to 39%, and City of Darien was reduced drastically to 4%. While most of the land area of the City and County are in the flood zone, many of these areas do not have buildings.

Exposure to Flood Hazard (Effective Flood Maps)

Flood Hazard	Parcels Impacted (% of Total)	"Improved Buildings" Impacted (% of Total)	Value of "Improved Buildings" (% of Total)
McIntosh County			
V-Zone (100-year event)	1,300 (10%)	440 (9%)	$56,126,214 (12%)
A-Zone (100-year event)	4,165 (32%)	1,476 (30%)	$195,911,826 (41%)
0.2% Annual Chance Flood (500-year event)	1,079 (8%)	357 (7%)	$38,423,006 (8%)
City of Darien			
V-Zone (100-year event)	2 (0%)	0 (0%)	$0 (0%)
A-Zone (100-year event)	84 (6%)	31 (4%)	$2,796,206 (6%)
0.2% Annual Chance Flood (500-year event)	8 (1%)	3 (0%)	$245,726 (1%)

Data Source: Parcel information and value are from the 2016 McIntosh County Tax Assessor Data.

The FEMA flood maps (DFIRM) were updated in coastal Georgia in 2016-2017, but the New/"Preliminary" flood maps are awaiting adoption by McIntosh County to become "Effective." These New/"Preliminary" flood maps are based on more accurate elevation data and a refined model. Since it has not been adopted by the County yet, the results are only presented in the table below. Overall, there would be very little change for the City of Darien. However, McIntosh County would see a large reduction in the "improved buildings" within the V-Zone, from 9% to 4%. While the A-Zone stayed around 30%, the 0.2% annual chance flood increased from 7% to 16%. Based on these shifts, it seemed that many properties in the V-Zone shifted to the A-Zone, and a similar number in the A-Zone shifted to the 0.2% annual chance flood. The flood hazard exposure for McIntosh County will decrease if and when the Preliminary flood maps are approved. This will result in lower insurance premiums for those purchasing flood insurance.

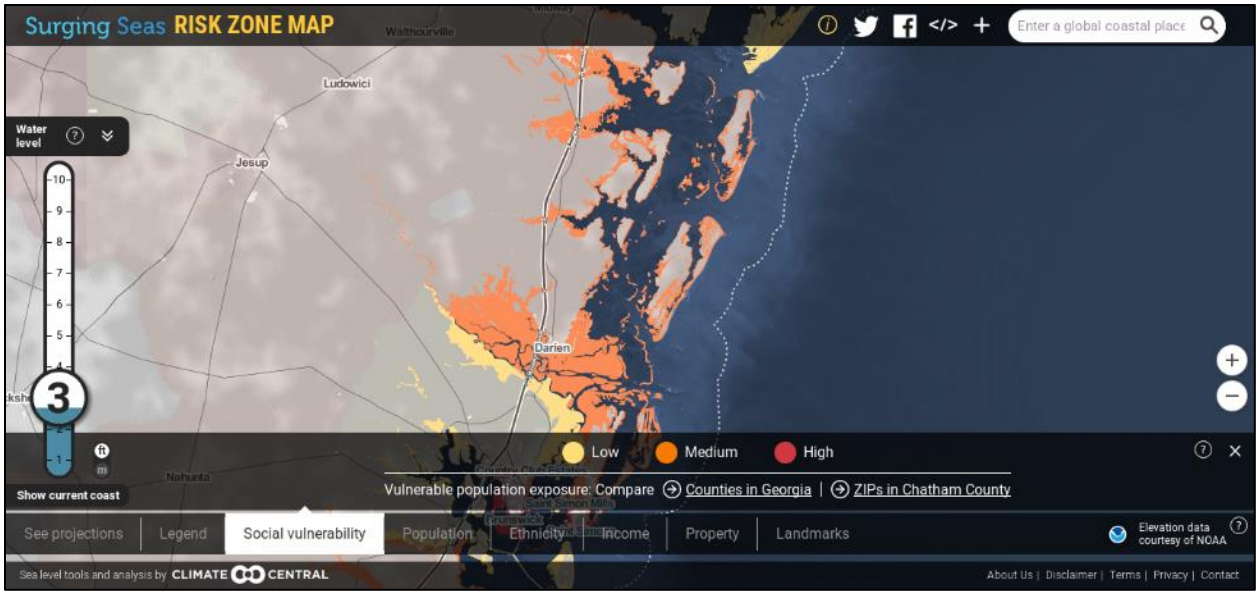
Exposure to Flood Hazard (Preliminary Flood Maps)

Flood Hazard	Parcels Impacted (% of Total)	"Improved Buildings" Impacted (% of Total)	Value of "Improved Buildings" (% of Total)
McIntosh County			
V-Zone (100-year event)	520 (4%)	202 (4%)	$32,151,586 (7%)
A-Zone (100-year event)	4,007 (31%)	1,462 (29%)	$194,745,486 (41%)
0.2% Annual Chance Flood (500-year event)	2,043 (16%)	782 (16%)	$94,654,376 (20%)
City of Darien			
V-Zone (100-year event)	2 (0%)	0 (0%)	$0 (0%)
A-Zone (100-year event)	72 (5%)	28 (4%)	$2,447,806 (5%)
0.2% Annual Chance Flood (500-year event)	1 (0%)	0 (0%)	$0 (0%)

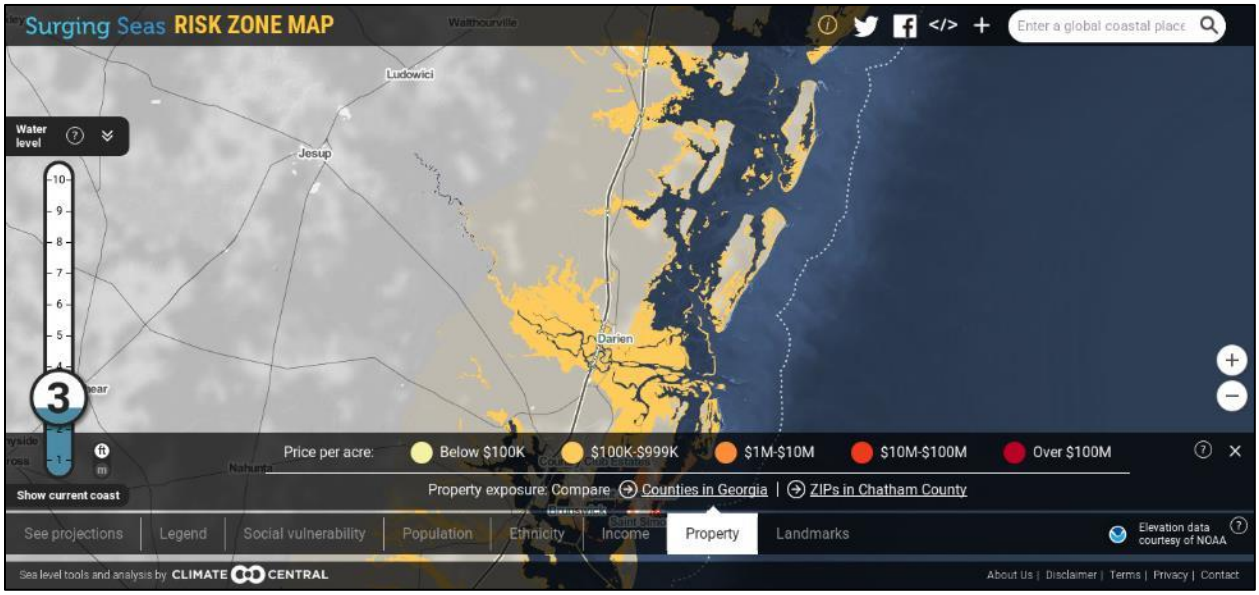
Data Source: Parcel information and value are from the 2016 McIntosh County Tax Assessor Data.

In order to estimate population, property, and other structures that will potentially be exposed to sea level rise impacts, Climate Central's online forecast tool was utilized. This tool (http://sealevel.climatecentral.org/maps) provides projections for different sea level rise scenarios and estimates exposure of population density, social vulnerability, and property values. For this plan, a sea level rise scenario that estimates 3 feet of rise in the Mean Higher High Water level was utilized. Based on this scenario, McIntosh County has the following exposures: 712 residents, 674 homes, 39 miles of roads (38 miles are local roads), and 57 square miles of land (37 square miles are protected land). The City of Darien has the following exposures: 19 residents, 41 homes, 3 miles of roads (2 miles are local roads), and 12 square miles of land (9.2 square miles are protected land). Property values were not identified on this website. Overall, most of the population, homes, and roads exposed are located in the unincorporated portion of the County.

The figures below show the Social Vulnerability Exposure and Property Value Exposure. The areas exposed to sea level rise in the county were subject to Medium Social Vulnerability Exposure. Based on McIntosh County's current population, about 5% of the population would be exposed to this hazard. Based on the Property Value Exposure map, areas with exposure were identified in the tier of $100K-$999K per acre, which was 2nd lowest of the five groupings available. Because of the percentage of population exposed, as well as the number of homes and miles of road, action should be taken to reduce overall risk to this hazard. While this tool allows the County to explore the area exposed to inundation from sea level rise, it does not account for the subsequent increase in the base flood elevation.



Social Vulnerability of Sea Level Rise (Source: Climate Central)



Property Value Exposure to Sea Level Rise (Source: Climate Central)

The exposure to sea level rise was also calculated using the GIS-based technique that linked the McIntosh County Tax Assessor's parcel-based data with the area identified as being inundated with 3 feet of sea level rise. Overall, 3 feet of sea level rise would result in 20% of the parcels and "improved buildings" and 30% of the value of "improved buildings" to be impacted in the County. The greater percentage of value compared with total buildings is likely attributed to the more expensive structures built closer to the waterfront and marsh front. In the City of Darien, only 4% of parcels, "improved buildings," and value of "improved buildings" are exposed to 3 feet of sea level rise. This exposure does not account for the subsequent increase in the base flood elevation.

Exposure to 3-ft of Sea Level Rise

Location	Parcels Impacted (% of Total)	"Improved Buildings" Impacted (% of Total)	Value of "Improved Buildings" (% of Total)
McIntosh County (ALL)	2,585 (20%)	980 (20%)	$144,281,773 (30%)
City of Darien	52 (4%)	27 (4%)	$2,133,131 (4%)

Data Source: Parcel information and value are from the 2016 McIntosh County Tax Assessor Data.

Overall, out of 75 critical facilities, 0 are in the V-Zone, 8 are in the A-Zone, 1 is in the 0.2% chance annual flood, and 3 are in the 3-ft sea level rise zone. Of the 8 critical facilities in the A-Zone flood hazard, 3 are lift stations (1 is in the sea level rise category), 1 is a back-up well, 1 is a community water system, and the other 3 are located on Sapelo Island (2 are in the sea level rise category). The one critical facility in the 0.2% chance annual flood is a lift station. Overall, the critical facilities exposed to flood risk and sea level rise are primarily lift stations and a back-up well. The only major structures at risk are those on Sapelo Island, owned by University of Georgia Marine Institute.

Based on the parcel-based, County Tax Assessor database, 1,916 "improved buildings," valued at $252,038,040 are located within the 1% chance annual flood hazard area (V-Zone and A-Zone) in the County, and 31 "improved buildings," valued at $2,796,206 in the City. The number of people in this hazard area, from Worksheet #3A, was estimated at 7,242 in the County and 100 in the City. The exposure, as a percentage, was smaller for the City compared with the County as a whole. If the Preliminary flood maps are approved as they are currently presented, the exposure will decrease to 1,664 "improved buildings," valued at $226,897,072 are located within the 1% chance annual flood hazard area (V-Zone and A-Zone) in the County, and 28 "improved buildings," valued at $2,447,806 in the City.

Unincorporated McIntosh County and the City of Darien participate in the National Flood Insurance Program (NFIP), as well as adhere to the Georgia State Minimum Standard Codes (Uniform Codes Act) and the International Building Code. The minimum standards established by these codes provide reasonable protection to persons and property within structures that comply with the regulations for most natural hazards. As with the previous HMP Update, there were no repetitive loss properties identified in the County (see Page 17, Appendix A).

The County and City plan to maintain their adherence to NFIP regulations through their building codes, performing inspections, requiring elevation certificates, following the land development codes, and implementing their respective "Flood Damage Prevention" ordinances. The County had applied to be part of the Community Rating System (CRS) because their program exceeds the minimum NFIP standards. They will continue to implement public education as part of this program.

HAZUS modeling was also conducted for McIntosh County, and it is reported in the Coastal Regional Commission's 2017 Report, "Hazard Risk Analyses: Supplement to the McIntosh County Joint Hazard Mitigation Plan." This report is included in Appendix A. Damage was

calculated for a 1% chance annual flood (e.g., 100-year event) for riverine and coastal scenarios. The HAZUS modeling predicts total damage, where the values presented in the paragraphs above represent the total building value. Not all the buildings in this hazard area will suffer a total loss, so the results presented below help to estimate the potential losses of these types of hazards.

HAZUS modeling predicted the following for Riverine Flooding Scenario:

- Impacted 822 buildings in the County, and caused damage totaling $11,184,260.
- 12 buildings with damage totaling $477,891 were located in the City of Darien.
- 3 of the County's 11 fire stations were damaged – 2 had moderate damage and 1 had loss of use.
- 3,371 households might be displaced due to flood, and 2,618 may require short-term shelter.
- 4,141 tons of debris might be generated, which includes 1,931 tons from finishes, 901 tons from structural, and 1,309 tons from foundations.

HAZUS modeling predicted the following for Riverine Flooding Scenario:

- Impacted 181 buildings, all within the unincorporated portion of the County, and the damage totaled $3,226,749.
- No essential facilities were identified as exposed.
- 1,126 households might be displaced due to flood, and 934 may require short-term shelter.
- 626 tons of debris might be generated, which includes 319 tons from finishes, 119 tons from structural, and 188 tons from foundations.

The 1% chance annual flood for both riverine and coastal scenarios totaled 1,003 buildings. The total damage was $14,411,009, and 4,767 tons of debris generated. It was predicted up to 4,497 households could be displaced due to the flood and 3,552 might need short-term housing. Overall, these numbers may be overestimated because the model did not account for elevated housing and parcel centroids were used, which may be located within the marsh.

D. Land Use & Development Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to flood hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

E. Multi-Jurisdictional Concerns

A large portion of McIntosh County could potentially be affected by flood conditions, particularly as concerns with a hurricane or coastal storm event. Based on the City of Darien's annexation of the Altamaha Wildlife Management area, which is primarily marshland and not developable, the City actually has a larger land area located in the 100-year flood zone. The previous HMP Update stated roughly 92% (over 12,000 acres) of the current City Limits falls within the 100-year flood zone, while the former area of the City (1,270 acres), only had 22% within the 100-year flood zone. While the City of Darien has a larger percentage of area located in the 100-year flood zone than the County, there is a smaller percentage of parcels and "improved buildings" within the City; therefore, the County is at greater risk for flooding.

F. Overall HRV Summary

Severe flooding has inflicted significant damage in McIntosh County in the past due to heavy rainfall and river rising events. The committee reviewed previous mitigation action steps proposed in the HMP Update. Assessments of stormwater and runoff issues were a major factor in flooding problems in the previous plans. The Storm Water Local Design Manual was adopted November 21, 2006. The City has adopted a number of ordinances designed to regulate development and to prevent adverse impacts to the city's current residents and existing resources. Black Island Bridge was rebuilt in 2009 with matching funds from Department of Transportation. Maintaining stormwater drainage ditches continue to be an ongoing task. The City recently purchased new equipment to facilitate ditch maintenance, and they will share this resource with the County.

Many of the assets in the County, unincorporated and incorporated, remain extremely vulnerable to flooding events, and committee members recognized the destructive nature of flooding and identified as a high priority for many mitigation measures. In addition to current flooding risks, sea level rise has the potential to impact existing and future buildings, critical facilities, and populations in McIntosh County. As the sea level rises, so will the regulatory flood zones, but this increase will not occur linearly with the depth of sea level rise.

Flood Hazard Map

City of Darien

Critical Facilities (GMIS)

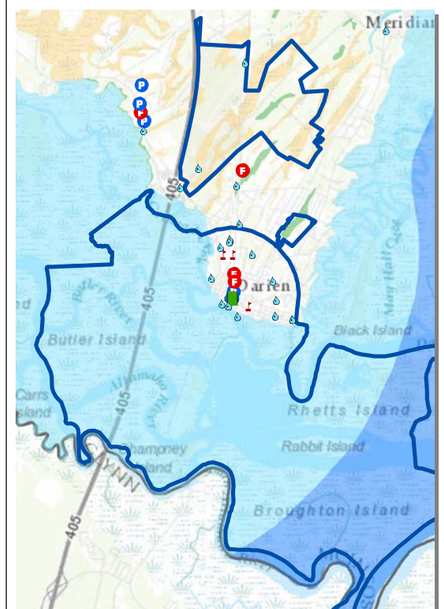
- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Flood Zones

- A
- AE
- VE
- X 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

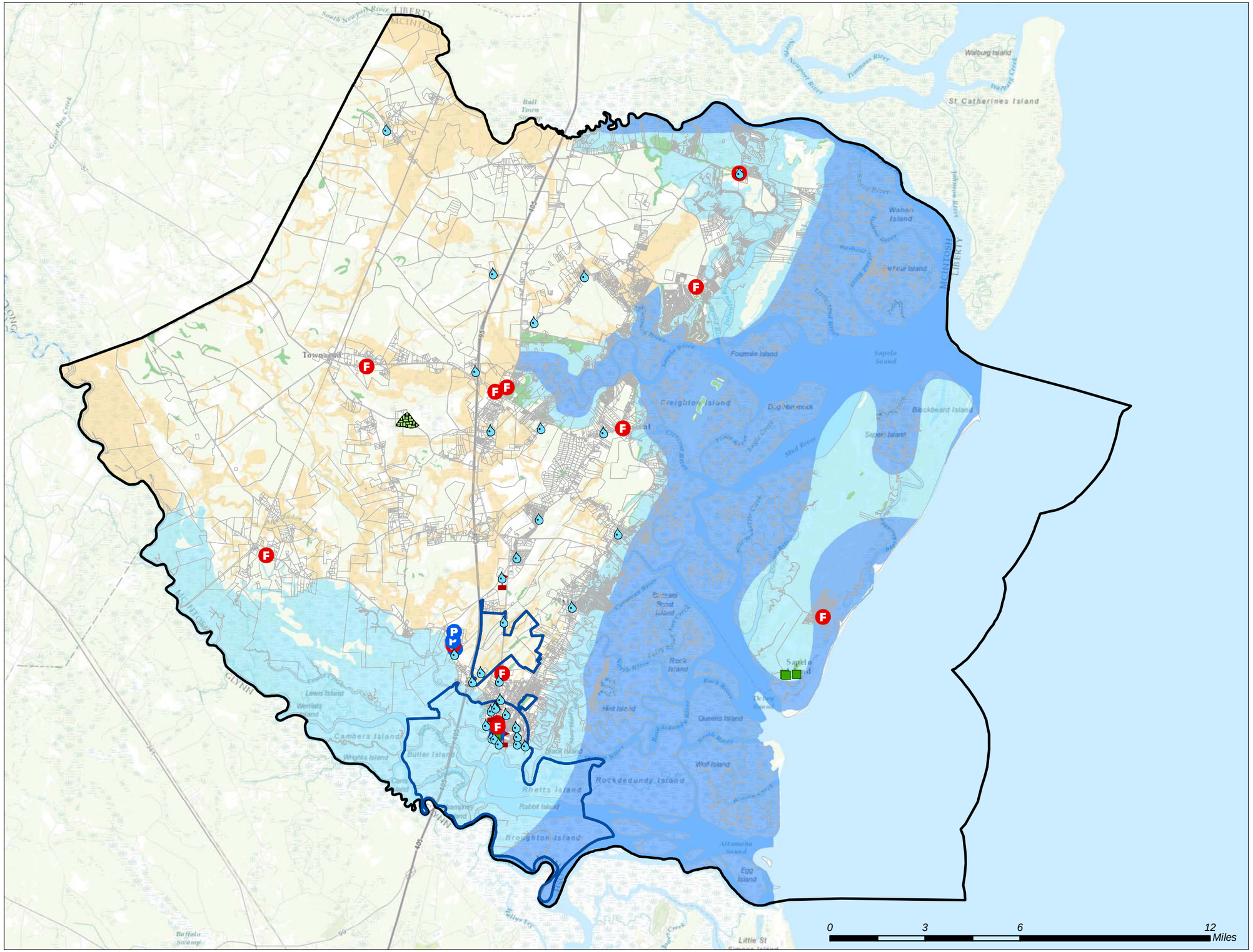
Legend

- City of Darien
- McIntosh County
- Parcels



ECOLOGICAL PLANNING GROUP

Flood Hazard Map



Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Flood Zones

- A
- AE
- VE
- X 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

Legend

- City of Darien
- McIntosh County
- Parcels

ECOLOGICAL PLANNING GROUP

3 Foot Sea Level Rise

City of Darien

Sea Level Rise

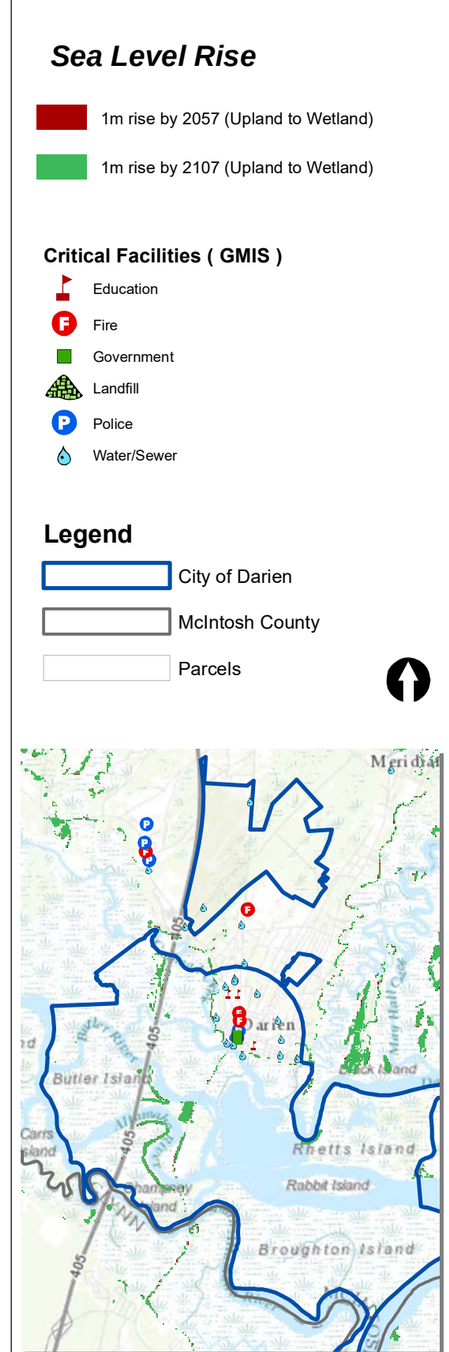
- 1m rise by 2057 (Upland to Wetland)
- 1m rise by 2107 (Upland to Wetland)

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

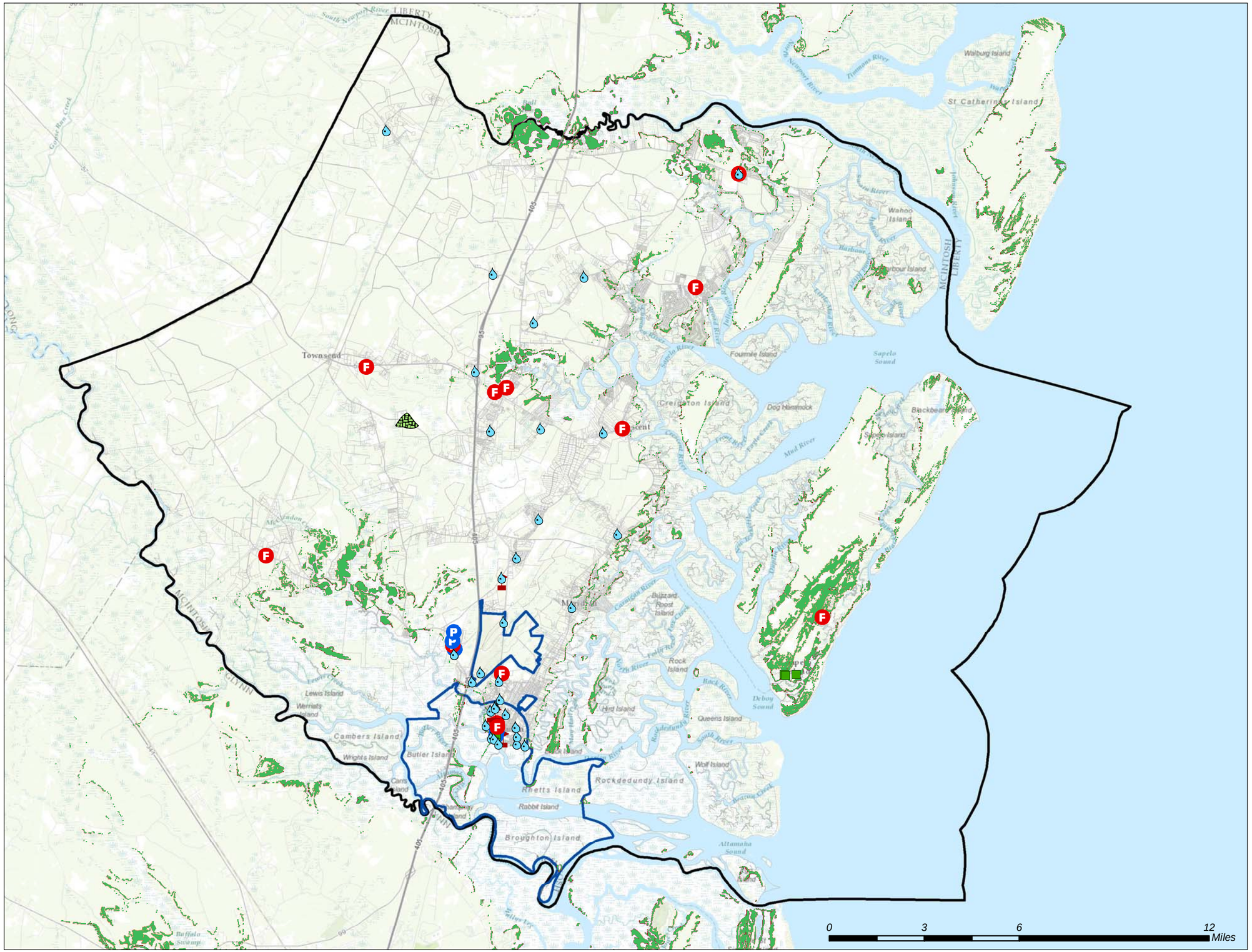
- City of Darien
- McIntosh County
- Parcels



0 0.175 0.35 0.7 Miles

ECOLOGICAL PLANNING GROUP

3 Foot Sea Level Rise



Sea Level Rise

- 1m rise by 2057 (Upland to Wetland)
- 1m rise by 2107 (Upland to Wetland)

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

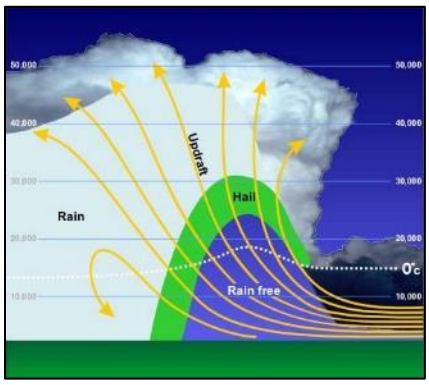
- City of Darien
- McIntosh County
- Parcels

ECOLOGICAL PLANNING GROUP

SECTION VI – HAILSTORM

A. Hazard Identification

Hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere. Hail can damage aircraft, homes and cars, and can be deadly to livestock and people.



Hailstones grow by collision with super-cooled water drops. (Super-cooled drops are liquid drops surrounded by air that is below freezing which is a common occurrence in thunderstorms.) There are two methods by which the hailstone grows, wet growth and dry growth, and which produce the "layered look" of hail.

In wet growth, the hailstone nucleus (a tiny piece of ice) is in a region where the air temperature is below freezing, but not super cold. Upon colliding with a super-cooled drop the water does not immediately freeze around the nucleus. Instead liquid water spreads across tumbling hailstones and slowly freezes. Since the process is slow, air bubbles can escape resulting in a layer of clear ice. With dry growth, the air temperature is well below freezing and the water droplet immediately freezes as it collides with the nucleus. The air bubbles are "frozen" in place, leaving cloudy ice.

B. Hazard Profile

Historical frequency data for this hazard was researched on the NOAA NCEI Storm Event Database. The Storm Event Database lists 53 reports of hail, but in some cases multiple reports were given on the same day that might be associated to the same storm event. Therefore, the HMPUC defined a hailstorm event as a unique event by date, so overall, there were 37 recorded events in the 68-year recorded storm history for a 54.4% chance to occur per year. More than half, 20, were recorded in the previous 10 years, and all but four was recorded in the previous 20 years. While the frequency of events appears to be increasing, it should be noted that data collection, reporting, and accuracy are much better in the past 10 to 20 years. As stated in the Georgia State Plan, Georgia has experienced so many severe weather events that they have become common.

The size of hail for the 37 events ranged from 0.75 inches to 1.75 inches in diameter. Based on the National Weather Service comparison chart for the size of hail, this ranges from penny-sized to golf ball-sized hail. The frequency of events based on hail size is described in the table below. No losses in property and crop damages were reported in this database; however, committee members noted damage by hail events to homes and vehicles. Insurance claim data was not available to the committee.

Distribution of Historical Hailstorm Event Magnitude (1950-2018).

Diameter of Hail (inches)	National Weather Service Comparison of Hail Size	Frequency of Events During the 68-Year Historical Record
0.75	Penny	8
0.88	Nickel	5
1.00	Quarter	10
1.25	Half Dollar	3
1.75	Golf Ball	11
Total Number of Events		**37**

Source: NOAA NCEI Storm Event Database

From 2013 to 2018, there were 5 reports of hail in the NOAA NCEI Storm Event Database during 4 separate dates. Hail events occurred on 6/23/2013, 5/12/2015, 5/30/2017, and 3/20/2017. The maximum hail size by date were: 1.75, 0.88, 1.75, and 0.75 inches, respectively. No property damage, crop damage, or injuries were reported in the NCEI Storm Event Database.

The perceived increase in frequency provides major concern for keeping this hazard and for utilizing the most recent 10 years of data when projecting frequency of this hazard. Based on the previous 10 years, there will be, on average, 2.0 events per year. The frequency would be the same for both the County and the City. As a note, there were only 1.65 events per year when including the previous 20 years. The hazard frequency data table is located in Appendix D.

C. Assets Exposed to Hazard and Estimate of Potential Losses

Vulnerable assets in the County include all buildings, and crops, excluding timber. The timber industry, aggregated in the agricultural category, was thought to be immune from hail damage. Therefore, the committee decided that 15% of the agriculture category in the County would be excluded from the vulnerability data.

For McIntosh County, the number of structures in the hazard area is 37,413 valued at $1,193,176,203 and exposing 19,033 people to a storm event. In Darien, 100% of the City's assets were included, providing the number of structures in the hazard area as 3,973 structures valued at $311,534,523, and exposing 2,614 people to the hazard. The exposure includes all 75 critical facilities; however, some have been protected or reinforced to limit damage from this type of hazard. While these numbers seem large, they represent the exposed population and structures and associated value and not the actual damage from one event. An individual hailstorm event would only be expected to impact a small portion of the area, as these storms tend to be very isolated. More details on the inventory of exposed assets are reported in Appendix A, Section VI (GEMA Worksheet #3A).

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to hailstorm hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from

Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

E. Multi-Jurisdictional Concerns

All of McIntosh County and City of Darien can equally be impacted by hailstorm events. The impacts from these storms are typically isolated.

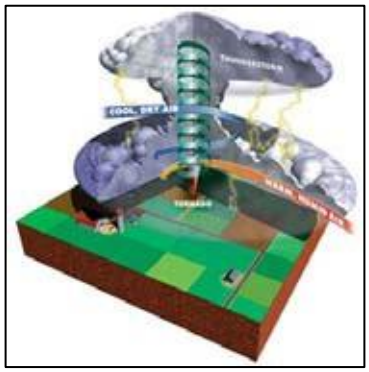
F. Overall HRV Summary

Hailstorms are an element of severe weather that may include lightning and tornadoes. Typically, these storm events afford communities some limited advanced warning. The National Weather Service issues storm warnings and advisories as these storms approach. Advanced warning may allow citizens to protect life and some property, but crops, buildings and automobiles may sustain severe damage. Also, motorists pose an additional danger on roads and highways. Overall, the entire County and City are exposed to this hazard; however, the anticipated damage will likely only affect a small area since these storms are generally isolated.

SECTION VII – TORNADO

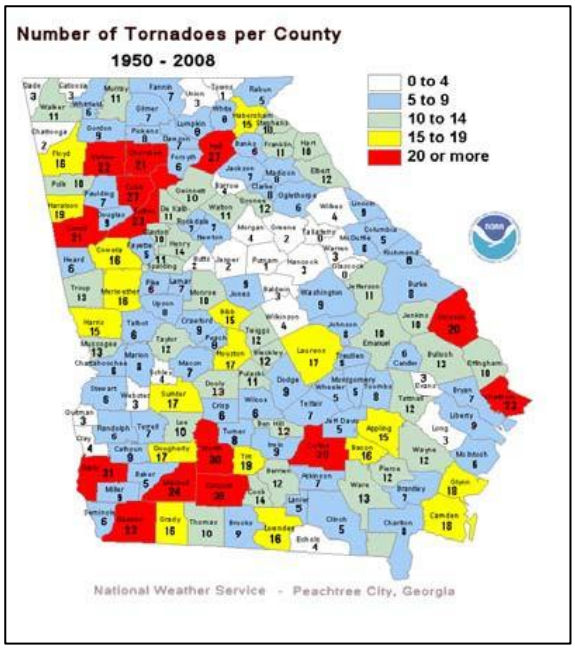
A. Hazard Identification

A tornado is a violently-rotating column of air extending from thunderstorms and cyclonic events. Thunderstorms and hurricanes spawn tornadoes when cold air overrides a layer of warm air, causing the warm air to rise rapidly. Funnel clouds are rotating columns of air not in contact with the ground; however, the violently-rotating column of air can reach the ground very quickly and become a tornado. If the funnel cloud picks up and blows debris, it has reached the ground and is a tornado. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 miles per hour or more. A wind velocity of 200 miles per hour will result in a wind pressure of 102.4 pounds per square foot of surface area—a load that exceeds the tolerance limits of most buildings. Damage paths can be seen in excess of 1-mile wide and 50-miles long. Tornadoes are among the most unpredictable of weather phenomena. Tornado season typically from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present. Tornadoes pose a great risk to the state of Georgia and its citizens, and their unpredictability makes them one of Georgia's most dangerous hazards.



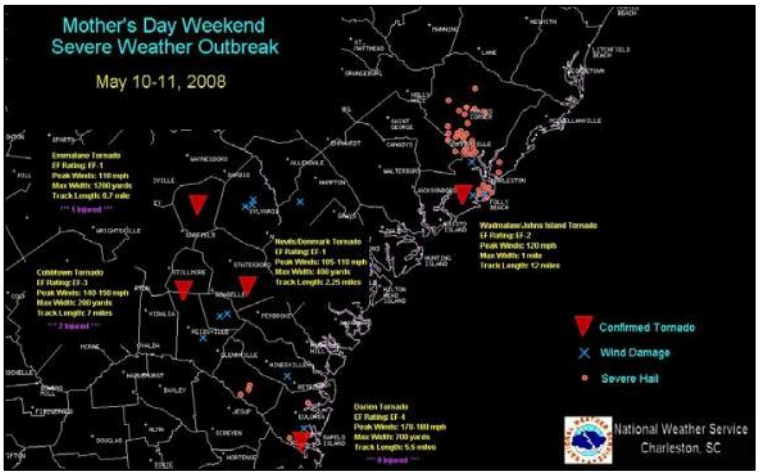
B. Hazard Profile

According to records maintained by the NOAA NCEI Storm Event Database, McIntosh County has been impacted by 7 tornadoes in the last 68 years. There have been none since the last HMP Update. The frequency of occurrence can be expected at once every 9.7 years (10.3% per year).



Two tornado events occurring in 2008 and 2009 in McIntosh County resulted in more than $12.5 million in property damage. On May 11, 2008, five tornadoes struck Southeast Georgia and Southeast South Carolina. The strongest tornado, a violent EF-4, caused significant damage in McIntosh County, GA. This was only the second EF-4 tornado to ever hit in the NWS Charleston, SC Forecast Area, and only the 9th EF-4 tornado to strike anywhere in the State of Georgia since 1950. The only other EF-4 tornado to hit in the Charleston, SC Forecast Area was in Bulloch County, GA on April 25, 1929. That tornado killed 40 people and injured 300.

The May 2008 tornado formed at 9:52 am, approximately 3 miles northwest of Darien, Georgia and tracked east about 11 miles before dissipating at 10:07 am as a water spout in Doboy Sound. The tornado struck a Marine Sales and Services business located on the east side of



Route 251. Approximately 50 boats were tossed around and destroyed. No one was in the building at the time the tornado struck and damage to the building and all the boats were estimated to be $5 million.

Approximately 100 yards to the south-southeast of the Marine Sales and Services Building, the McIntosh Emergency Medical Services Building was destroyed by the tornado with damage to three ambulances and one fire truck. Many of the metal support beams from this facility were torn from the concrete slab or snapped off. This building was rated for 120 mph winds. No one was in this building at the time of the tornado because they were out on a non-weather-related call. The Gateway Behavioral Health and Services Building was totally destroyed. Of the 12 people that were in the building when the tornado hit, 9 were injured sustaining broken bones and or lacerations. Six vehicles around this building were damaged or destroyed. Damage to the Marine Sales and Services Business and the Gateway Behavioral Health and Services Building indicated that EF-4 damage had occurred with winds estimated to be between 170 and 180 mph. The tornado reached its maximum width of 700 yards as it crossed Interstate 95, and then decreased in size and was mainly from 200 to 500 yards wide during the remainder of the path. The tornado damaged or destroyed four billboards along Interstate 95, produced mainly minor roof damage to several dozen homes mainly in the Ridgeville area, snapped off or uprooted thousands of trees, some of them falling on homes or vehicles, and damaged or destroyed numerous outbuildings. A Ridgeville resident's home suffered minor damage in the Tornado, and they took shelter in a closet after seeing a National Weather Service Severe Weather Statement on the television mentioning that Ridgeville was in the path of the Tornado. The tornado also damaged the Blue-N-Hall Marina and Fishing Dock. In this area, a large boat hoist along with 18 boats and several boat trailers were damaged or destroyed. Several power poles were also snapped off and several vehicles were damaged. Numerous trees were also snapped off on Hird Island. The Tornado likely dissipated over Doboy Sound as a waterspout. Besides portions of the Gateway roof, debris including signs were deposited on Sapelo Island.

Because the McIntosh County Emergency Medical Services Building was destroyed, it was rebuilt as the McIntosh County Emergency Operations Center (EOC) at 1019 Production Row SW. This new facility was built with state of the art materials to protect it from extreme weather events, and it serves as a storm shelter. This facility, built with FEMA funds, also houses the Wiregrass Emergency 911 Center.

Another tornado struck April 13, 2009. A National Weather Service Storm Survey Team determined the tornado occurred south of the Credit Hill community off Briardam Road around 4:40 PM Eastern Daylight Time, which is located about 3 miles southeast of Townsend. Both the tree and structural damage to the church were consistent with an EF-1 tornado on the Enhanced Fujita Scale with winds estimated to be around 100 miles per hour. The tornado

continued to move rapidly northeast while skirting the ground in various locations. The tornado appeared to have lifted around 4:57 PM eastern daylight time shortly before reaching highway 17 near the intersection with Tramm Road. The total track length of the tornado was 8 miles with a maximum width of 770 yards. No fatalities or injuries were reported with this event. A vehicle was hit by a snapped tree. This event resulted in $200,000 in property damage claims.

Tornadoes are classified according to the Fujita tornado intensity scale. Originally introduced in 1971, the scale was modified in 2007 to better define the damage and estimated wind scale. The Enhanced Fujita Scale ranges from low intensity EF0 with effective wind speeds of 65 to 85 miles per hour, to EF5 tornadoes with effective wind speeds of over 200 miles per hour. The Enhanced Fujita intensity scale is included in Table 12.

Enhanced Fujita Scale		
Category	**Wind Speed**	**Potential Damage**
EF0	105–137 km/h 65–85 mph	Light damage. Peels surface off roofs; some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; mobile homes pushed off foundations or overturned; sign boards damaged.
EF1	138–179 km/h 86–110 mph	Moderate damage. Roofs torn off frame houses; windows and glass doors broken; moving autos blown off roads; mobile homes demolished; boxcars overturned.
EF2	180–217 km/h 111–135 mph	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
EF3	218–266 km/h 136–165 mph	Severe damage. Some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.
EF4	267–324 km/h 166–200 mph	Devastating damage. Well-constructed houses and whole frame houses completely leveled; structures with weak foundations blown away some distance; trees debarked; cars thrown and small missiles generated.
EF5	>324 km/h >200 mph	Incredible damage. Strong frame houses leveled off foundations and swept away; with strongest winds, brick houses completely wiped off foundations; automobile-sized missiles fly through the air in excess of 100 m (109 yd); cars thrown and large missiles generated; incredible phenomena will occur.

NOAA's NWS: The Enhanced F-scale is a set of wind estimates (not measurements) based on damage.

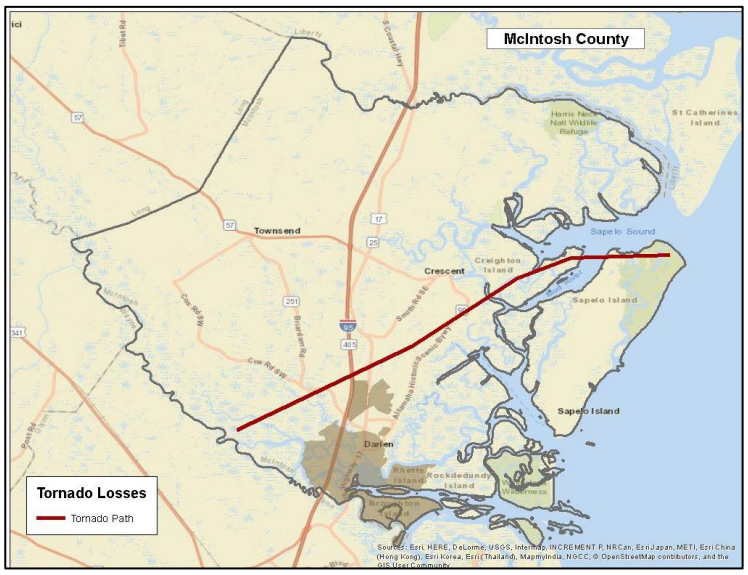
While there were 2 tornadoes in the previous 10 years, none have occurred since the last HMP Update nor in the most recent 9 years. Including the entire 68-year dataset shows the probability of a tornado in McIntosh County is 10.3% per year. Only one of the seven tornadoes on record was larger than an EF-1, and it was the EF-4 that struck the County in May 2008. Based on the previous 10 years, there will be, on average, 0.20 tornadoes per year, and when including the previous 20 years, it remains as 0.20 tornadoes per year. The frequency would be the same for both the County and the City because of the unpredictability with tornadoes. The hazard frequency data table is located in Appendix D.

C. Assets Exposed to Hazard and Estimate of Potential Losses

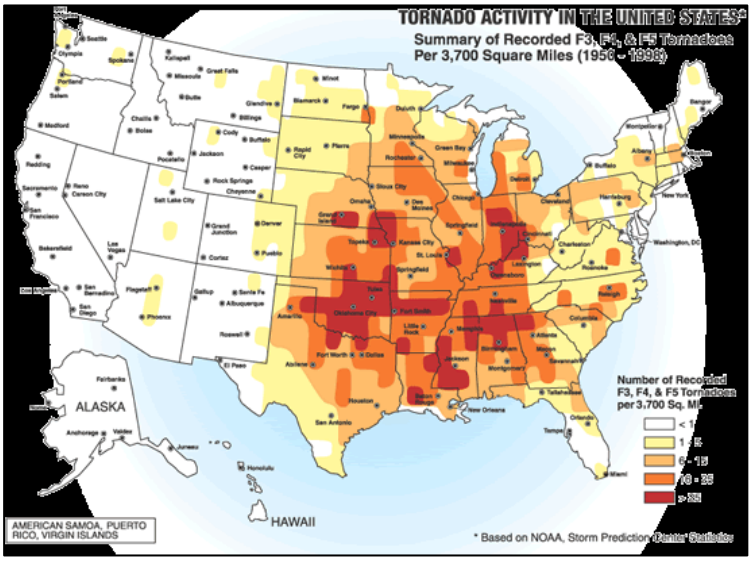
All structures and facilities within McIntosh County could be damaged by a tornado, as tornadoes are among the most unpredictable of weather phenomena and are indiscriminate as to when or where they strike. All 75 critical facilities, as well as all public, private and commercial property, are susceptible to thunderstorm winds. Based on the 2016 Consolidated Tax Digest Summary, existing structures in the windstorm hazard area may number 37,094 residential, commercial, industrial, agricultural, and nonprofit structures, 37 infrastructure structures, as well

as 505 government and education structures. The value of these structures is $1,206,173,503. The entire population, 19,059 people, would also be at risk. This exposure is detailed in Appendix A, Section VII, for McIntosh County and the City of Darien (GEMA Worksheet #3A).

HAZUS modeling was conducted for McIntosh County, and it is reported in the Coastal Regional Commission's 2017 Report, "Hazard Risk Analyses: Supplement to the McIntosh County Joint Hazard Mitigation Plan." This report is included in Appendix A. Damage was calculated for a hypothetical EF-3 tornado. The tornado path was placed to travel through Arlington and Leary, which is one of less densely-populated portions of the County. Tornado damage impacted 58 buildings, and the total damage was $1,572,802. No essential facilities suffered damage.



As was seen with the May 2008, EF-4 tornado, the track has a major influence on the amount of destruction and damage. The 2008 tornado, while one category more intense, caused about 10 times as much damage ($12.5 million).



Strong winds are a threat associated with tornadoes. While the threat of strong winds in McIntosh County and the hazard ratings described below are primarily from hurricanes, the potential for tornadoes also contributes to these ratings and corresponding design codes. According to the GEMA Georgia Mitigation Information System (GMIS) online mapping tool developed by UGA Information Technology Outreach Services (ITOS), all of Darien and about two-thirds of the County (mostly east of I-95) is located in Wind Hazard Area 5 (most extreme), and the western portion of the County is in Wind Hazard Area 4. According to the Georgia Office of Insurance and Safety Fire Commissioner, McIntosh County is in Zone 2 of the Georgia Manufactured Housing Wind Zones. This zone is rated for 100 to 109 MPH and is the highest in the state of Georgia. Therefore, structures in McIntosh County, especially in Darien and the unincorporated section east of I-95, have the greatest potential within the state to exposure of strong winds, and as a result, structures need to be built to withstand higher wind speeds. Unincorporated County's code states that all structures must meet wind loading requirements of Federal Emergency

Management Administrator and the Southern Building Code Congress International (SBCCI) Codes. The local continuous design wind speed in the unincorporated area is 120 MPH. Therefore, McIntosh County is following appropriate building codes to withstand the elevated threat of high winds in the county.

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to tornado hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

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E. Multi-Jurisdictional Concerns

All of McIntosh County has the same design wind speed, as determined by the American Society of Civil Engineers (ASCE). Both the city and county have personnel trained in code enforcement. McIntosh County is an official StormReady community. To be designated, a community or site must:

- Establish a 24-hour warning point and emergency operations center;

- Have redundant communications systems to receive severe weather forecasts and warnings and to alert the public.
- Create a system that monitors local weather conditions;
- 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.

At a minimum, NOAA Weather Radios, with tone alert and/or Specific Area Message Encoding capability, must be located at four sites within StormReady communities including emergency operations centers, 24-hour warning points, city hall, and all school superintendent offices. StormReady communities must stay freshly prepared, because the designation is only valid for two years.

F. Overall HRV Summary

Due to the threat of a tornado occurrence during a hurricane, coastal storm or thunderstorm event, McIntosh County has a fairly high potential for damage from tornadoes. McIntosh County residents need to be prepared for a tornado event as much as is possible. Should a tornado hit certain portions of the county that are highly concentrated with homes, or any of the critical facilities identified, significant damage could occur. Due to the destructive nature of tornadoes and recent history, mitigation actions related to tornadoes should be implemented.

SECTION VIII – WILDFIRE

A. Hazard Identification

A wildfire is an uncontrolled fire spreading through vegetative fuels, exposing and possibly consuming structures. Wildfires often begin unnoticed and spread quickly and are usually signaled by dense smoke that fills the area for miles. Naturally occurring and non-native species of grasses, brush and trees fuel wildfires.

A wildland fire is a wildfire in an area in which development is essentially nonexistent, except for roads, railroads, power lines and similar facilities.

An urban-wildland interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels. A concern for McIntosh County is the increasing amount of residential "sprawl" that dilutes a definitive line between urban/rural areas.

Communities with a large amount of wooded brush and grassy areas are at highest risk of wildfires. Additionally, areas that have experienced prolonged droughts, or are excessively dry, are also at risk of wildfires. People start more than four out of every five wildfires, usually as debris burns, arson, or carelessness. Lightning strikes are the next leading cause of wildfires. The Georgia Forestry Commission tracks the following causes of fires: campfire, children, debris burning, incendiary, lightning, machine use, miscellaneous, and smoking.

There are three different classes of wildfires: (1) "surface fire," (2) "ground fire," and (3) "crown fire." "Surface fire" is the most common type and burns along the floor of a forest, moving slowly and killing or damaging trees. "Ground fire" is usually started by lightning and burns on or below the forest floor in the humus layer down to the mineral soil. "Crown fires" spread rapidly by wind and move quickly by jumping along the tops of trees.

Wildfire hazard potential maps for McIntosh County and the City of Darien are presented at the end of Section VIII.

B. Hazard Profile

McIntosh County is one of the most rural coastal counties, and it is also one of the most heavily forested. Most of the upland land area is extensive forested tracts. Even though a large portion of the eastern half of the county is tidal marsh and barrier islands, there are still almost 150,000 acres (234 square miles) of commercial timberland within the confines of the County. While the traditional population centers were Darien and a handful of small waterfront communities along the waterways, there are now numerous small communities and developments spread the length of the county, primarily east of I-95 with a significant risk as from the wildland urban interface around them.

The hazard frequency data table is located in Appendix D. According to the McIntosh County Community Wildfire Protection Plan (CWPP), McIntosh County has averaged 138.0 reported wildland fires per year over the past 50 years for a total of 6,900 wildfires over the 50-year period. Over the most recent 10 years, this has declined to 30.8 per year. The average area burned annually

has also decreased from 705 acres over the past 50 years to 345 acres over the most recent 10 years. The number of fires and acreage lost has noticeably declined over the past 20 plus years since the advent of the burning permit law. Despite this trend in fire behavior, more homes are being built outside of traditional communities into the wildland urban interface.

According to the CWPP, 70% of the acreage lost over the past 50 years occurred during the months of January, February, March, and April. During the most recent 20 years, these months accounted for 75% of the fires. There was a shift in this pattern in the past 10 years. The period of peak activity in terms of numbers of fires has broadened to also include May – 74% of the reported fires. Total area burned shifted to later in the year too. March through July accounted for 91% of the annual average acres lost. The McIntosh County HMPUC worked with the Georgia Forestry Commission to collect information and formulate mitigation strategies.

NASA Satellite Captures Image of Georgia Wildfires 05.02.07

In the most recent CWPP, Georgia Forestry Commission wildfire records showed that from 2006 to 2010, only one home was damaged by wildfire in McIntosh County resulting in estimated losses of $2,600 along with 2 outbuildings valued at $3,500. According to reports during this period 113 homes have been directly or indirectly threatened by these fires. Additionally, 3 vehicles valued at $2,750 were lost. Since 2010, the Georgia Forestry Commission wildfire records showed that there has not been any damage to homes or outbuildings from wildfires or wildland fires. In the years since the 2013 HMP Update was last approved, the total number of wildland fires by year, as reported by the Georgia Forestry Commission, were 9 in 2013, 11 in 2014, 10 in 2015, 17 in 2016, and 21 in 2017 for an average of 13.6 fires per year. Data for 2018 is still being generated. The total acreage burned each year were 34.1 acres in 2013, 21.8 acres in 2014, 18.1 acres in 2015, 121.7 acres in 2016, and 190.5 acres in 2017, for an average of 77.2 acres per year. Both are well below the 10-year average of 30.8 fires per year and 345 acres burned per year and the 50-year averages.

The correlation between drought and wildfire threat is obvious during the past 10 years. In 2011, when nearly the entire year had conditions with at least a severe drought (D2) and long periods of extreme (D3) and exceptional (D4) droughts, the wildfire total and total acreage burned was the highest during this 10-year period with 83 events and 2,428 acres burned.

C. Assets Exposed to Hazard and Estimate of Potential Losses

All structures and facilities within McIntosh County could be damaged by a wildfire. All 75 critical facilities, as well as all public, private and commercial property, are susceptible to wildfire. Based on the 2016 Consolidated Tax Digest Summary, existing structures in the wildfire hazard area may number 37,094 residential, commercial, industrial, agricultural, and nonprofit structures, 37 infrastructure structures, as well as 505 government and education structures. The value of these structures is $1,206,173,503. The entire population, 19,059 people, would also be at risk. This exposure is detailed in Appendix A, Section VII, for McIntosh County and the City of Darien (GEMA Worksheet #3A).

The previous HMP Update identified that 68% of the County was vulnerable to wildfires, and 25% of City of Darien was vulnerable. The HMPUC decided to update the risk area to the entire County and City being vulnerable because of a recent major wildfire hazard event from November 2016 to December 2016 in Gatlinburg, Tennessee. Gatlinburg is about 300 miles northwest of McIntosh County, so this event had no direct impact on McIntosh County; however, it made the HMPUC concerned that something similar could happen in their County. The Gatlinburg (and Great Smokey Mountain) fires burned more than 17,900 acres (28 square miles), destroyed more than 2,400 structures, and 14 people died. The Gatlinburg fire which was the worst on record in Tennessee in a century was only 6.6% of the entire land area of McIntosh County, so while the entire County and City are vulnerable, it seems that the maximum percentage of the area exposed from one major event would be less than 5% of the County; however, the location of the wildfire and structure density will affect the potential losses. As a note, the area of the Gatlinburg wildfires would encompass the entire City of Darien. From the most recent 10 years of available data (2008-2017), a more typical average area burned each year is about 345 acres from 30.8 separate fires, so the average area burned per fire is about 10 acres. While McIntosh County has been fairly lucky compared to most counties in this regard, the potential is present for significant losses to non-timber property from wildfire.

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to wildfire hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

In 2008, when development was still booming, land use and developmental trends were identified in the 2008 McIntosh County and the 2008 City of Darien Comprehensive Plan Update processes. These plans identified that areas of rapid development were waterfront property along the Darien River for multi-family condominiums and commercial services development. Other areas in high demand for high-end single-family and occasionally condominium developments were Cooper's

Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. These areas would be prone to increased vulnerability due to the wildland-urban interface. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

Information provided in the 2018 draft Comprehensive Plans for McIntosh County and City of Darien identified commercial development in the future land use maps as occurring along I-95 interchanges and along the Highway 17 and 99 corridors out of the natural hazard area. All the community growth and development are guided by local comprehensive planning for the County and the City. These plans reflect the natural hazard vulnerabilities and risk and include objectives to direct and guide growth away from these areas where they cannot be adequately mitigated.

McIntosh County is dominated by large tracts of undeveloped land, much of it in state or federal ownership, or held in commercial forest land by pulp and paper companies. According to the 2016 Consolidated Tax Digest Summary, 47.4% of the land in McIntosh County is considered Agricultural, dominated by forestry, and an additional 18.2% is considered Forest Land Conservation Use. Since the most recent HMP Update, the Georgia Forestry Commission updated McIntosh County's Fire Wildfire Risk Assessment. This assessment includes enhanced mapping features that are published in the current version of the Community Wildfire Protection Plan, April 2010. This plan provides an action plan for wildfire mitigation and conservation of natural resources, which were used as tools to provide greater mitigation action steps in the HMP Update.

E. Multi-Jurisdictional Concerns

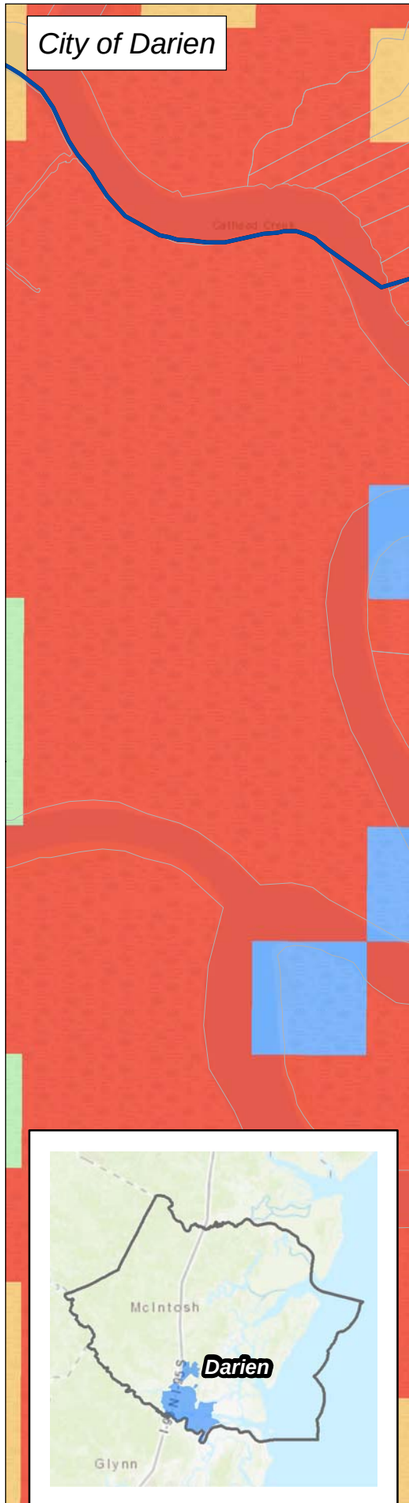
Most of the wildfire danger is in the county, but as lightning strikes can cause a wildfire in any location, any mitigation steps taken related to wildfire should be undertaken on a countywide basis and include the City of Darien. In addition, many of the County's structures are exposed to the Wildland-Urban Interface.

F. Overall HRV Summary

As so much of McIntosh County is forest, wildfire remains a critical threat and remains a frequently occurring hazard. Wildfire threatens not only structures, but the health and safety of County residents. Due to the destructive nature of wildfires, the HMPUC feels that mitigation strategies for reducing the likelihood or impact of wildfire are critical to the health and safety of McIntosh County residents.

Wildfire Hazard Potential

City of Darien



0 0.175 0.35 0.7 Miles

Wildfire Hazard Potential

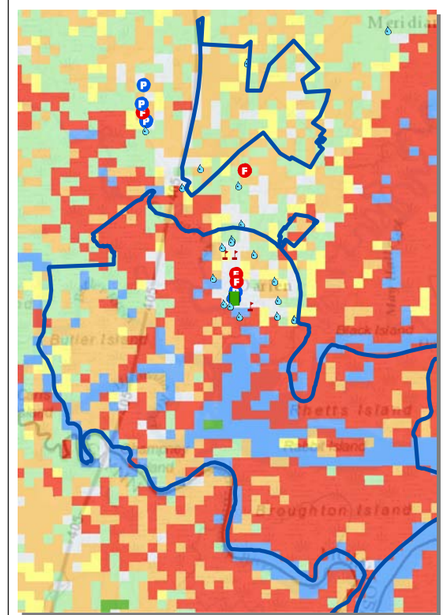
- Very Low
- Low
- Moderate
- High
- Very High
- Non-burnable

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels



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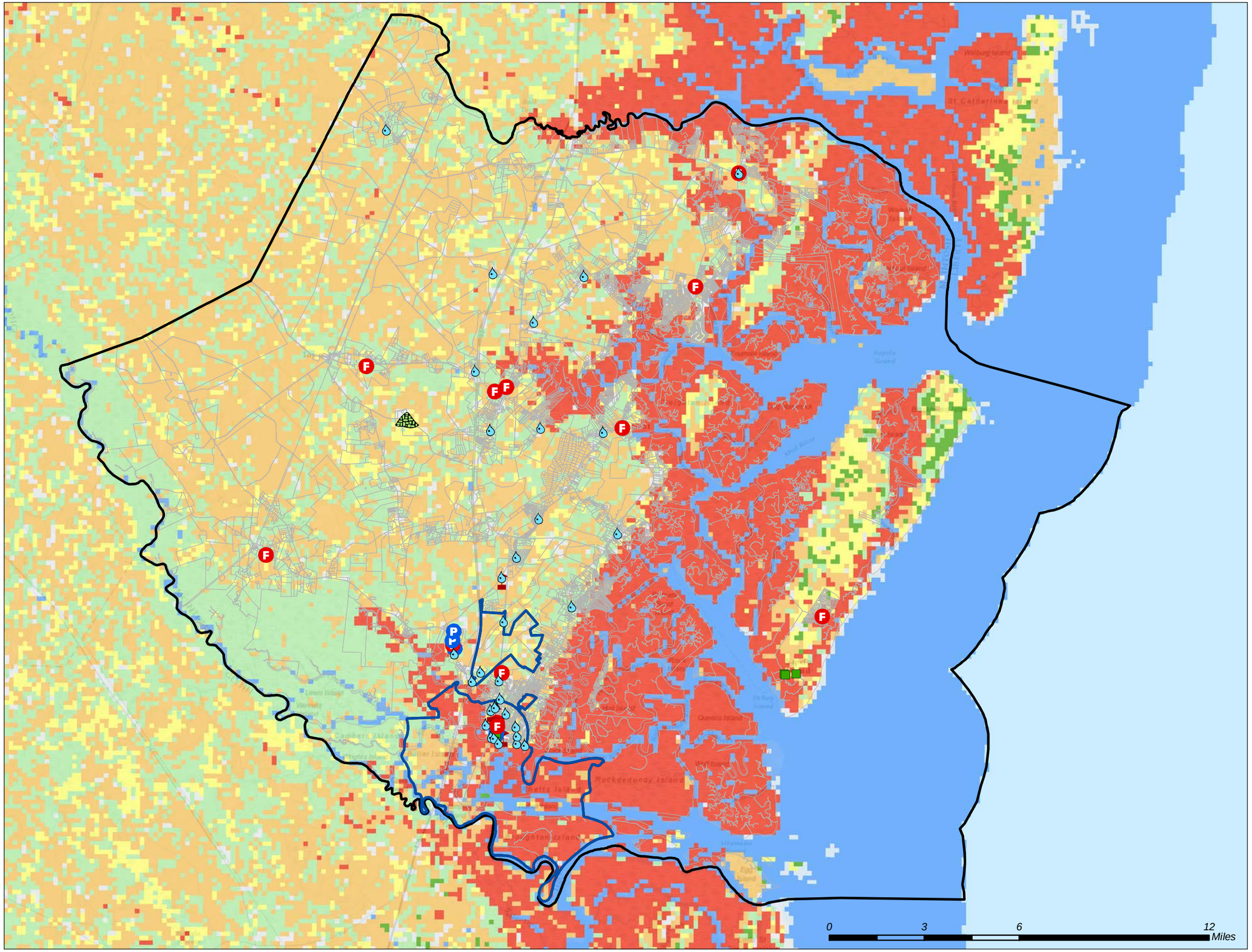
Wildfire Hazard Potential



Wildfire Hazard Potential

- Very Low
- Low
- Moderate
- High
- Very High
- Non-burnable

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels

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SECTION IX – WINDSTORM

A. Hazard Identification

Windstorms are formed when moist air near the earth's surface is forced upward through some catalyst (convection or frontal system). As the moist air rises, the air condenses to form clouds. Because condensation is a warming process, the cloud continues to expand upward. When the initial updraft is halted in the upper atmosphere, the characteristic anvil shape forms as well as a downdraft. This system of up-drafting and down-drafting air columns is termed a "cell". As the process of updrafts and downdrafts feeds the cell, the interior particulates of the cloud collide and combine to form rain and hail which falls when the formations are heavy enough to push through the updraft. The collision of the water and ice particles within the cloud creates a large electrical field that must discharge to reduce charge separation. This discharge is the lightning that occurs from cloud to ground or cloud to cloud in the thunderstorm cell. In the final stage of development, the updraft weakens as the downdraft-driven participation continues until the cell dies. Duration of thunderstorm winds are generally short and involve straight-line winds and/or gusts in excess of 50 mph. Thunderstorm winds tend to affect areas of the county with significant tree stands, as well as areas with exposed property and infrastructure, and above ground utilities. Thunderstorm winds can cause power outages, transportation and economic disruptions, significant property damage and pose a high risk for injuries and loss of life.

Lightning is a major threat during thunderstorms. Lightning is very unpredictable, which increases the risk to individuals and property. Lightning is the second leading cause, following human-caused, of wildfires. Another threat accompanying thunderstorms is the threat of tornadoes. Wind hazard maps for McIntosh County and the City of Darien are provided at the end of this section.

B. Hazard Profile

A prevalent natural hazard event occurring in McIntosh County is thunderstorm winds. During the spring and summer months, the county typically experiences countless thunderstorms, some packing significant winds. Historical frequency data for this hazard was researched on the NOAA NCEI Storm Event Database. The Storm Event Database lists 110 reports of thunderstorm wind, but in some cases multiple reports were given on the same day that might be associated to the same storm event. Therefore, the HMPUC defined a thunderstorm wind event as a unique event by date, so overall, there were 75 recorded events in the 68-year recorded storm history for a historic recurrence interval of one event per 0.91 years. The magnitude of winds ranged from 50-75 knots (58-86 MPH), but only two events exceeded 60 knots (69 MPH). This database reported $337,550 in property damage and $30,000 in crop damage from these events. The most prevalent damage caused by the high winds is downed trees and power lines and the impacts of these falling on cars, homes, and buildings.

Magnitude is measured by the Beaufort Wind scale represented below. McIntosh County should prepare for winds of a violent storm, Beaufort Wind Scale of 11, wind speeds of 56-63 knots, but could expect winds on the Beaufort Wind Scale of 12 (64 knots or greater).

Beaufort Wind Scale and Descriptions

Specifications and equivalent speeds									
Beaufort wind scale	Mean Wind Speed		Limits of wind speed		Wind descriptive terms	Probable wave height in metres*	Probable maximum wave height in metres*	Seastate	Sea descriptive terms
	Knots	m/s	Knots	m/s					
0	0	0	<1	0-0.2	Calm	-	-	0	Calm (glassy)
1	2	0.8	1-3	0.3-1.5	Light air	0.1	0.1	1	Calm (rippled)
2	5	2.4	4-6	1.6-3.3	Light breeze	0.2	0.3	2	Smooth (wavelets)
3	9	4.3	7-10	3.4-5.4	Gentle breeze	0.6	1.0	3	Slight
4	13	6.7	11-16	5.5-7.9	Moderate breeze	1.0	1.5	3-4	Slight-Moderate
5	19	9.3	17-21	8.0-10.7	Fresh breeze	2.0	2.5	4	Moderate
6	24	12.3	22-27	10.8-13.8	Strong breeze	3.0	4.0	5	Rough
7	30	15.5	28-33	13.9-17.1	Near gale	4.0	5.5	5-6	Rough-Very rough
8	37	18.9	34-40	17.2-20.7	Gale	5.5	7.5	6-7	Very rough-High
9	44	22.6	41-47	20.8-24.4	Severe gale	7.0	10.0	7	High
10	52	26.4	48-55	24.5-28.4	Storm	9.0	12.5	8	Very High
11	60	30.5	56-63	28.5-32.6	Violent storm	11.5	16.0	8	Very High
12	-	-	64+	32.7+	Hurricane	14+	-	9	Phenomenal

From 2013 to 2018, there were 27 reports of thunderstorm wind in the NOAA NCEI Storm Event Database during 16 separate dates (4 in 2013; 5 in 2014; 4 in 2015; 3 in 2016; 0 in 2017; and 0 in 2018 as of 3/31/2018), for a total of 16 unique events. The distribution by month was: 4 in April; 5 in June; 3 in July; 3 in August; and 1 in October. They were concentrated in the spring and summer months. The wind speed distribution was: 1 at 75 knots; 1 at 65 knots; 2 at 60 knots; 2 at 55 knots; and 10 at 50 knots. The two highest wind speeds in the 68-year record were recorded in the last 5 years. The 75-knot event was on 4/14/2013, 1 mile west of Doboy, and it was reported that an 86 MPH gust was measured at the National Estuarine Research system on Sapelo Island. The 65-knot (75-MPH) event was on 6/1/2016, 4 miles west of Townsend, and it was reported that numerous trees were down on Blues Reach Road near Cox Road. No monetary crop or property damage was reported in the Storm Event Database for either report. For all 27 reports from 2013 to 2018, the reported property damage on the Storm Event Database totaled $42,500. Damage reports included: tree on parked car, damage to numerous aluminum signs, power lines down, and trees down.

Similar with hailstorms, more than half of the thunderstorm wind events, 38 out of 75 events, were recorded in the previous 10 years. While the frequency of events appears to be increasing, it should be noted that data collection, reporting, and accuracy are much better in the past 10 to 20 years. As stated in the Georgia State Plan, Georgia has experienced so many severe weather events that they have become common. The perceived increase in frequency provides major concern for keeping this hazard and for utilizing the most recent 10 years of data when projecting frequency of this hazard. Based on the previous 10 years, there will be, on average, 3.8 events per year. The frequency would be the same for both the County and the City. As a note, there were only 2.9 events per year when including the previous 20 years. The hazard frequency data table is located in Appendix D.

C. Assets Exposed to Hazard and Estimate of Potential Losses

In evaluating assets that are susceptible to thunderstorm winds, the committee determined that all 75 critical facilities, as well as all public, private and commercial property, are susceptible to thunderstorm winds. Based on the 2016 Consolidated Tax Digest Summary, existing structures in the windstorm hazard area may number 37,094 residential, commercial, industrial, agricultural, and nonprofit structures, 37 infrastructure structures, as well as 505 government and education structures. The value of these structures is $1,206,173,503. The entire population, 19,059 people, would also be at risk. This exposure is detailed in Appendix A, Section II, for McIntosh County and the City of Darien (GEMA Worksheet #3A).

According to the GEMA Georgia Mitigation Information System (GMIS) online mapping tool developed by UGA Information Technology Outreach Services (ITOS), all of Darien and about two-thirds of the County (mostly east of I-95) is located in Wind Hazard Area 5 (most extreme), and the western portion of the County is in Wind Hazard Area 4. According to the Georgia Office of Insurance and Safety Fire Commissioner, McIntosh County is in Zone 2 of the Georgia Manufactured Housing Wind Zones. This zone is rated for 100 to 109 MPH and is the highest in the state of Georgia. Unincorporated County's code states that all structures must meet wind loading requirements of Federal Emergency Management Administrator and the Southern Building Code Congress International (SBCCI) Codes. The local continuous design wind speed in the unincorporated area is 120 MPH. Only two events reported had wind speeds in excess of 69 MPH, so these design wind speeds are more directed towards hurricane-force winds and winds associated with tornadoes.

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to windstorm hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

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condominium developments were Cooper's Point, Shellman Bluff, Julienton Plantation area, Tolomato Island, and the barrier islands because of their proximity to the water and coastal marshland. Most of the development in McIntosh County was taking place north of Darien, along State Highway 99, Youngman Road, Shellman Bluff Road, east of Eulonia, and along coastal marsh areas. This type and level of development was not identified in current drafts of 2018 Comprehensive Plans for McIntosh County and City of Darien because it stalled with the housing market crash in 2008. The 2018 draft Comprehensive Plans noted increased vacancy rates and presence of blight, so opportunities currently exist for infill housing and redevelopment, which will be held to the most recent building codes and ordinance requirements. These draft Plans also listed protecting environmentally-sensitive areas and natural areas and implementing an urban redevelopment plan as community objectives related to land use and development trends.

E. Multi-Jurisdictional Concerns

All of McIntosh County has the same design wind speed, as determined by the American Society of Civil Engineers (ASCE). Both the city and county have personnel trained in code enforcement. In addition, McIntosh County is an official StormReady community. To be designated, a community or site must:

- Establish a 24-hour warning point and emergency operations center;
- Have redundant communications systems to receive severe weather forecasts and warnings and to alert the public;
- Create a system that monitors local weather conditions;
- 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.

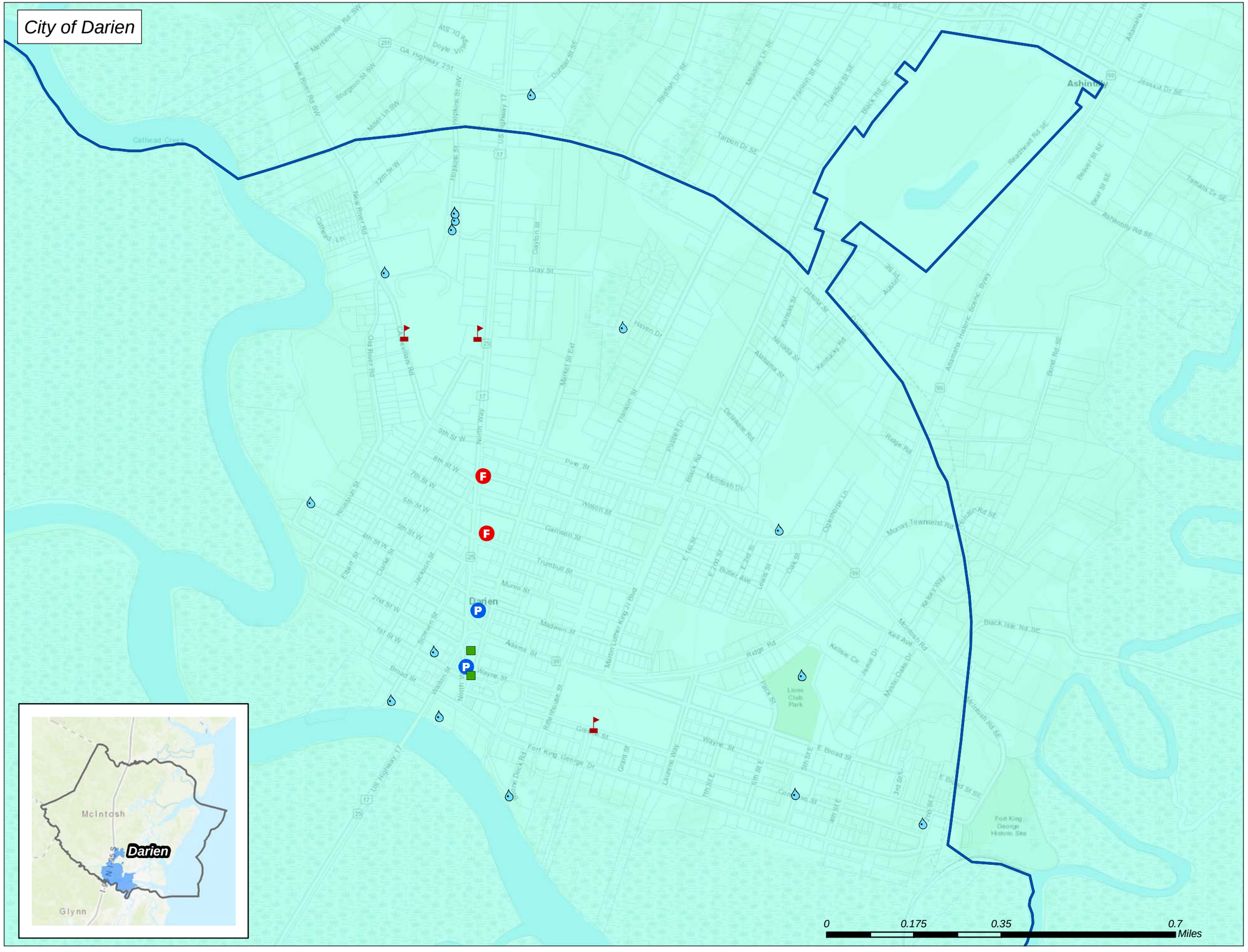
At a minimum, NOAA Weather Radios, with tone alert and/or Specific Area Message Encoding capability, must be located at four sites within StormReady communities including emergency operations centers, 24-hour warning points, City Hall, and all school superintendent offices. StormReady communities must stay freshly prepared, because the designation is only valid for two years.

F. Overall HRV Summary

Overall, thunderstorm winds pose a great threat to McIntosh County in terms of property damage. Thunderstorm winds occur frequently and have the greatest chance of affecting the county each year.

Wind

City of Darien



Wind Zones

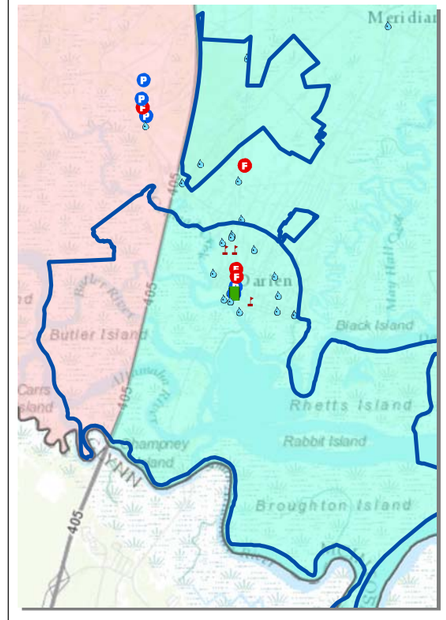
- Zone 4
- Zone 5

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels



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Wind

Wind Zones

- Zone 4
- Zone 5

Critical Facilities (GMIS)

- Education
- Fire
- Government
- Landfill
- Police
- Water/Sewer

Legend

- City of Darien
- McIntosh County
- Parcels

0 3 6 12 Miles

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SECTION X – MOSQUITO CONTROL

A. Hazard Identification

Mosquitoes are found throughout the world and many transmit pathogens which may cause disease. These diseases include mosquito-borne viral encephalitis, dengue, yellow fever, malaria, and filariasis. Most of these diseases have been prominent as endemic or epidemic diseases in the United States in the past, but today, only the insect-borne (arboviral) encephalitis occur annually and dengue occurs periodically in this country. The major types of viral encephalitis in the United States include St. Louis, LaCrosse, Eastern equine and Western equine. These viruses are normally infections of birds or small mammals. During such infections, the level of the virus may increase in these infected animals facilitating transmission to humans by mosquitoes. The West Nile virus, which can also cause encephalitis, was found in the northeastern United States for the first time in 1999, is a good example of this mode of transmission. Most people who become infected with West Nile Virus will have either no symptoms or only mild symptoms. However, on rare occasions, West Nile Virus can result in severe and sometimes fatal illnesses. Human cases of encephalitis range from mild to very severe illnesses that, in a few cases, can be fatal. Dengue is a viral disease transmitted from person to person by mosquitoes. It is usually an acute, nonfatal disease, characterized by sudden onset of fever, headache, backache, joint pains, nausea, and vomiting. While most infections result in a mild illness, some may cause the severe forms of the disease. Dengue hemorrhagic fever, for example, is characterized by severe rash, nosebleeds, gastrointestinal bleeding and circulatory failure resulting in dengue shock syndrome and even death. Dengue is endemic in the Caribbean, Central and South America. Recently, dengue has occurred with increasing frequency in Texas. Other pathogens transmitted by mosquitoes include a protozoan parasite which causes malaria, and *Dirofilaria immitis*, a parasitic roundworm and the causative agent of dog heartworm. Disease carrying mosquito species are found throughout the U.S., especially in urban areas and coastal or in inland areas where flooding of low lands frequently occurs.

A recent health-concern associated with mosquitos that has received a lot of publicity is the Zika virus. According to the Center for Disease Control (CDC), Zika is spread mostly by the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*). Zika can be passed from a pregnant woman to her fetus, and infection during pregnancy can cause certain birth defects. There is no vaccine or medicine for Zika. Local mosquito-borne Zika virus transmission has been reported in the continental United States, including Miami-Dade County in Florida. Pregnant women were advised not to travel to this area between August 1, 2016, and June 2, 2017. The travel restriction was recently lifted, but people living in or traveling to this area should still be on alert to protect themselves from mosquito bites. Internationally, there are areas with risk of Zika in Africa, Asia, the Caribbean, Central America, Pacific Islands, and South America. The virus can be carried by travelers and transmitted to others can be transmitted through mosquito bites, from mother to child, and through sex.

B. Hazard Profile

Vector-borne diseases have been recorded since the 1600's. In 1847, thirteen persons living in McIntosh County succumbed to Yellow Fever. A worse epidemic in 1854 resulted in hundreds of deaths in McIntosh County. Cases of West Nile Virus have been reported in Georgia by the Center for Disease Control (CDC) for year 2003. Local mosquito-borne Zika virus transmission

was reported in Miami-Dade County in Florida in 2016 and 2017. Vector borne diseases have not been reported in McIntosh County. However, mosquito control remains costly, and the possibility of mosquito related diseases is a concern.

In inland areas of the U.S. where these mosquitoes breed, heavy rains and flooding can produce millions of mosquitoes in a short time. Similar situations occur along coastal areas with mosquitoes adapted to salt marsh habitats. Some salt marsh mosquitoes are strong fliers and can sometimes travel up to 50 miles from the breeding site. Some mosquitoes can fly from floodplains, coastal marsh areas, or protected habitats to impact urban residential areas. In these cases, it is often necessary to apply pesticides to kill adult mosquitoes. Surveillance data may prompt insecticide applications when mosquitoes are abundant. Applications usually coincide with the maximum adult mosquito activity in urban residential areas.

To be successful, mosquito control officials must apply insecticides under proper environmental conditions (e.g., temperature and wind) and at the time of day when the target species is most active. They must also apply these pesticides with carefully calibrated equipment that generates the proper-sized insecticide droplets that will impinge on adult mosquitoes while they are at rest or flying. If the droplets are too large, they will fall to the ground. If they are too small, the prevailing winds will carry them away from the target area. Once the insecticide spray mist dissipates, they break down in the environment (generally within 24 hours) producing little residual effect. Depending on the situation, mosquito control officials may safely apply these insecticides from spray equipment mounted on trucks, airplanes or helicopters. All insecticides used in the U.S. for public health use have been approved and registered by the EPA following the review of many scientific studies.

C. Assets Exposed to Hazard and Estimate of Potential Losses

The mosquito hazard does not impact value of structures, but rather impacts the county and city budgets. Mosquito control activities are important to the public health, and responsibility for carrying out these programs rests with local governments. The current interests in ecology and environmental impact of mosquito control measures, and the increasing problems that have resulted from insecticide resistance emphasize the need for "integrated" control programs. EPA and CDC encourage maximum adherence to *integrated pest management* (IPM). IPM is an ecologically-based strategy that relies heavily on natural mortality factors and seeks out control tactics that are compatible with or disrupt these factors as little as possible. IPM uses pesticides, but only after systematic monitoring of pest populations indicates a need. Ideally, an IPM program considers all available control actions, including no action, and evaluates the interaction among various control practices, cultural practices, weather, and habitat structure. This approach thus uses a combination of resource management techniques to control mosquito populations with decisions based on surveillance. Fish and game specialists and natural resources biologists should be involved in planning control measures whenever delicate ecosystems could be impacted by mosquito control practices.

It is difficult to estimate potential losses mosquito control has on the economy of McIntosh County. Mosquito control activities are important to public health and estimates of the impact on tourism and business are approximations. Many commercial and industrial concerns are located along the waterfront and are impacted during the mosquito season. A recent quote after

Hurricane Matthew for an aerial spray was $60,000 for each spray. Because of this high cost, the County has not done airborne spraying since 2012. The County currently does regular ground spraying with 3 trucks.

The HMPUC decided to keep the exposure thresholds identified in the previous HMP Update constant. This exposure was 90% of commercial entities, 100% of industrial entities, and 20% of residential, government, education and other entities. Therefore, a mosquito infestation could potentially impact 6,143 people in the County and 871 in the City. The exposure is detailed in Appendix A, Section X, for McIntosh County and the City of Darien (GEMA Worksheet #3A).

D. Land Use & Developmental Trends

Overall, there has been very limited new development or redevelopment in the County since the previous HMP Update that would affect the overall vulnerability of the County to mosquito control hazards. Current and recent economic conditions have made it difficult to predict future growth. According to the U.S. Census Bureau, population in McIntosh County decreased by 3% and City of Darien decreased by 7% from 2010 to 2016. The most recent population projections from Georgia Governor's Office of Planning and Budget (OPB) in 2013 (data accessed in 2017, but based on Census data from 2013), indicate that the projected population in McIntosh County is expected to continue to decrease over the next couple of decades. The housing stock age estimated by the U.S. Census Bureau, American Community Survey, along with margin of error for the estimate, indicated that 209 ± 149 out of 9,289 total housing units were built between 2010 and 2016 in McIntosh County. In Darien, the results were 83 ± 103 out of 1,349 housing units. With the margin of error for this estimate by the U.S. Census Bureau, the housing growth since 2010 has been almost nonexistent. Based on the recent results from the U.S. Census Bureau and projected decline in population from the Georgia Governor's OPB, future development in McIntosh County is expected to be limited.

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E. Multi-Jurisdictional Concerns

All of McIntosh County and City of Darien can equally be impacted by mosquito infestations.

F. Overall HRV Summary

There is no vaccine against Eastern equine encephalitis virus (EEEV) or Zika virus for humans. Reducing exposure to mosquitoes is the best defense against infection with EEEV and other mosquito-borne viruses. To be of maximum effectiveness, residents of McIntosh County must understand and support mosquito control. An integral part of most organized mosquito control programs is public education. It is important that residents have a good understanding of mosquitoes, the benefits realized from their control and the role people have in preventing certain mosquito-borne diseases. Being aware of pesticide application times is also important for individuals so they may decide on precautions they may need to take. While this usually involves education of the public through announcements in the media, some control programs have staffs that develop and present educational programs in public schools. People who are informed about mosquito biology and controls are more likely to mosquito-proof their homes and eliminate mosquito breeding places on their own property.

CHAPTER 3 – NATURAL HAZARD MITIGATION STRATEGY

The table below provides a brief description of each section in this chapter and a summary of the changes that have been made.

Summary of Updates to Chapter 3

Chapter 3 Section	Updates to Section
I. Introduction to Mitigation Strategy	The layout of this section is mostly new. A lot of material that was listed for each individual hazard was repetitive, so much of it was condensed and stated once up front. In addition, background information of hazards studied were updated based on committee recommendations. A section on a capability assessment was added. All of the goals and objectives were updated to be more targeted and consistent with the identified hazards.
II. Natural Hazards	Specific objectives, and associated action steps are referenced in this section. Material previously in this section was moved to Sections I and III to avoid repetition. New action steps are summarized in the rows below for each of the natural hazards.
Natural Hazard I: Coastal Erosion	Action steps updated to focus strictly on erosion only. Objective and action steps related to flooding were shifted to other hazards. Revision of objectives, tasks, and actions steps to meet recommendations of committee.
Natural Hazard II: Coastal Storm/Hurricane	Coastal Storms and Hurricanes were merged into the same hazard because they are similar. In addition, they have the same goals and objectives. New action steps focused on updating the evacuation and return plan based on lessons learned from Matthew and Irma; seeking funding for back-up generators at well sites, lift stations, and wastewater treatment plants; and conducting a campaign to encourage all residents to sign up for Code Red system.
Natural Hazard III: Drought	New action steps focused on implementing additional water conservation measures during periods of droughts and involving the local county Cooperative Extension agent.
Natural Hazard IV: Extreme Heat	New action steps focused on improving public education and developing a plan to assist vulnerable populations.
Natural Hazard V: Flooding	New action steps focused on completing a stormwater drainage study, identifying structural stormwater drainage projects, adding the Coastal Stormwater Supplement to the Water Resources Protection Ordinance, participating in FEMA's NFIP Community Rating System, expanding public outreach and education, and incorporating flood zones and risks into future land use planning.
Natural Hazard VI: Hailstorm	New action steps focused on improving advanced notification and alert systems.
Natural Hazard VII: Tornado	New action steps focused on improving advanced notification and alert systems.
Natural Hazard VIII: Wildfire	New action steps focused on adding a new fire station in Shellman, upgrading the fire station on Sapelo Island, supporting the Community Wildfire Protection Plan, issuing air quality warnings, and identifying evacuation routes.
Natural Hazard IX: Windstorm	New action steps focused on improving advanced notification and alert systems.

Chapter 3 Section	Updates to Section
Natural Hazard X: Mosquito Control	New action steps focused on preventative measures and public education and outreach because aerial spraying is so expensive.
III. Mitigation Action Step List	Instead of a separate table that was repeated under each hazard that had the same action step, this section was revised to include all action steps and associated hazards in one table. The table is organized by Goal and Objective. New action steps were added based on committee recommendations. A second table was added for Action Steps that were completed and no longer necessary, and they are summarized by hazard type. A third table was added for Action Steps that were deleted either because they were not relevant, no longer a priority, or needed substantial edits.

SECTION I – INTRODUCTION TO MITIGATION STRATEGY

A. How Have Priorities Changed Since Plan Last Adopted

Similar to how the EF-4 tornado that struck McIntosh County in May 2008 strongly impacted the priorities in the 2013 HMP Update, there were several major natural hazard events that occurred recently that impacted new priorities. These recent hazard events included: (1) Hurricane Matthew in October 2016, (2) Tropical Storm Irma in September 2017, (3) the busy tropical storm/hurricane season locally in 2016 (3 tropical storms and 1 hurricane), (4) presence of Zika virus in Florida in 2016-2017, and (5) the major wildfires in Gatlinburg, Tennessee (Great Smokey Mountains) in Fall 2016. While the wildfires in Tennessee had no direct impact in McIntosh County, this major event caused the HMPUC to feel that something similar could happen in their County. In addition to these natural hazard events, the recent studies and research on sea level rise caused this hazard to come on the radar for the McIntosh County as it touches the Atlantic Ocean. Recent storm event data shows that the frequency of hailstorm and windstorm events are increasing; however, this is partially attributed to better data collection, reporting, and accuracy of these types of events.

B. Capability Assessment

A capability assessment helps to determine the ability of a local jurisdiction to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. As in any planning process, it is important to try to establish which goals, objectives, and/or actions are feasible based on an understanding of the organizational capacity of those agencies or departments tasked with their implementation. A capability assessment helps to determine which mitigation actions are practical, and likely to be implemented over time, given a local government's planning and regulatory framework, level of administrative and technical support, amount of fiscal resources, and current political climate.

A capability assessment has two primary components: 1) an inventory of a local jurisdiction's relevant plans, ordinances, or programs already in place and 2) an analysis of its capacity to carry them out. Careful examination of local capabilities will detect any existing gaps, shortfalls, or weaknesses with ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. A capability assessment also highlights the positive mitigation measures

already in place or being implemented at the local government level, which should continue to be supported and enhanced through future mitigation efforts. The Capability Assessment helps identify and target meaningful mitigation actions for incorporation in the Mitigation Strategy portion of the Pre-Disaster Hazard Mitigation Plan. It not only helps establish the goals and objectives for the County to pursue under this Plan, but it also ensures that those goals and objectives are realistically achievable under given local conditions.

A list of plans, ordinances, and programs currently in place include:

- Joint Hazard Mitigation Plan (McIntosh County and City of Darien, being updated)
- Comprehensive Land Use Plan (in process of being updated in early 2018)
- Comprehensive Plan (in process of being updated in early 2018).
- Floodplain Management Program (County); the County also submitted their application for the NFIP Community Rating System (CRS)
- Watershed Management Plan (City of Darien)
- Water Conservation Plan (City of Darien)
- Water Resources Protection Ordinance (City of Darien)
- Evacuation Plan (State of Georgia Evacuation Plan, GEMA)
- FEMA Flood Insurance Study (through flood insurance maps)
- Capital Improvement Plan (McIntosh County; SPLOST schedule is used as the CIP)
- Economic Development Plan (Unified Economic Development Plan [UEDP])
- Historic Preservation Ordinance (Ordinance – Chapter 24)
- Zoning Ordinance (Ordinance – Appendix C)
- Subdivision Ordinance (Ordinance – Appendix B)
- Land Development Code
- Building Code
- Flood Damage Prevention Ordinance (City of Darien's is in Water Resources Protection Ordinance, and McIntosh County's is in its Building Code Chapter)

The County does not have a complete Local Emergency Operations Plan to include in the Appendix of this HMP Update. Most components of the Local Emergency Operations Plan are complete, but the plan as a whole document is in the process of being completed. The County does not have a specific Flood Mitigation Assistance Plan nor a Flood Insurance Plan.

The above list of plans, codes, ordinances, and studies were reviewed by the HMPUC to determine the ability of the County and City to implement a comprehensive mitigation strategy and to identify potential opportunities for establishing or enhancing specific mitigation policies, programs, or projects. This review helped to identify new action steps and shifts in prioritization since the HMP was last updated as well as determine recent accomplishments, activities, and trends.

Information from the 2018 HMP Update will be incorporated into the plans above during their respective future updates. As a recent example, both McIntosh County and City of Darien began to develop updated Comprehensive Plans during the time when the Draft 2018 HMP Update was under review by GEMA and being revised. The Draft 2018 HMP Update was available on the County's website for review during the comprehensive plan update

process, so the information was available for incorporation into the County and City Comprehensive Plans. In addition, members of the HMPUC also helped to develop the Comprehensive Plans, so they were able to include ideas, information, and outcomes developed during the planning process for the 2018 HMP Update. For the 2018 McIntosh County Comprehensive Plan, HMPUC members served on the Steering Committee and Stakeholder Committee. For the 2018 City of Darien Comprehensive Plan, HMPUC members served on the Stakeholder Committee and included the Mayor and members of City Council. In both the City's and County's 2018 Comprehensive Plan, there is a chapter on Coastal Vulnerability and Resilience, which were items added to and discussed within the 2018 HMP Update. This new chapter was a recommendation of the 2017 Regional Plan of Coastal Georgia, to promote integrating hazard mitigation into updates to the local comprehensive plans. As an additional future plan, McIntosh County is currently pursuing development of a Disaster Recovery and Redevelopment Plan, and the City of Darien is invited to participate in this process, so the results from the 2018 HMP Update will be able to be incorporated into that plan. The engagement of the HMPUC members in the HMP Update process will allow future City and County plans to incorporate goals, ideas, and information from this document. The methodology of incorporating information from the 2018 HMP Update will be the same for Unincorporated McIntosh County and the City of Darien. Both will incorporate information from the 2018 HMP Update into their individual and combined plans during their respective future updates through the review of the 2018 HMP Update and since members of the HMPUC also serve on committees to update these plans. In a few instances, for multi-jurisdictional items, the McIntosh County EMA Director will also coordinate with the appropriate city agency personnel in order to execute multi-jurisdictional steps. The EMA Director will also coordinate the midpoint evaluation meeting in 2021 with HMPUC members from both McIntosh County and the City of Darien to ensure steps are being taken by each jurisdiction to implement the HMP Update and associated mitigation action steps.

C. Community Mitigation Goals

Coastal Erosion

The McIntosh County HMPUC developed the goal of reducing the threat of riverine and coastal erosion in McIntosh County and City of Darien to minimize losses to structures and existing land. Storm events create the tidal surge, winds, and heavy rainfall that erode the land supporting roads, bridges and structures in the county.

Coastal Storm/Hurricane

Coastal storms, including hurricanes, can cause significant damage in McIntosh County and City of Darien through the impact of heavy rainfall, coastal erosion, storm surge, flooding, high winds, and even tornadoes. Exposure to coastal storms and hurricanes impact all critical facilities, structures, and populations in McIntosh County and City of Darien. Specific mitigation measures identified by the HMPUC are designed to lessen the effects of flooding and wind damage in the future, as well as address evacuation procedures, educate the public on storm preparation measures, and enhance the ability of local governments to recover quickly from a catastrophic event.

Drought

Drought conditions can negatively impact the local economy by affecting the seafood and agricultural industry. Potential drought losses are calculated on the value of agriculture in the county. According to data maintained by Georgia DNR, Coastal Resources Division, the market value of production in seafood harvesting represents more than $5 million annually.

The greatest threat posed by drought conditions for the county is the potential for wildfires. Forest fires are generally the result of dry conditions combined with lightning or human carelessness. Much of the county is made up of forest and woodlands. The McIntosh County Joint Hazard Mitigation Plan Update Committee remains concerned about the correlation between drought conditions and the threat of wildfire. Another threat is to shallow private wells for some County residents. Therefore, an additional goal is to conserve water to protect these private water supplies during periods of drought.

Extreme Heat

The most vulnerable individuals to extreme heat are the very old and the young, as well as low-wealth individuals. Older adults, young children, and those who are sick or overweight are also impacted. The present economic conditions have resulted in more people leaving their air conditioners off to save money. The vulnerability of the low-income population segment is a concern for emergency medical and law enforcement personnel. The committee determined that extreme heat events may potentially impact 20% of the residential population in McIntosh County and 37% in the City of Darien.

Flood

Flooding has caused considerable damage in McIntosh County and City of Darien in the past 200 years. Flooding issues can be the result of many types of hazard events, including heavy rainfall and storm surge coming from coastal storms, hurricanes and thunderstorms. Adverse impacts may include structural damages, temporary backwater effects in sewers and drainage systems, and unsanitary conditions by deposition of materials during recession. Floods are classified as either coastal or riverine, and McIntosh County is vulnerable to both types. Coastal flooding is typically the result of storm surge from the sea. The storm surge is often coupled with astronomical tides and wind waves. Coastal flooding has the potential to cause severe flooding that not only dampens but destroys exposed structures. The storm surge is often the catalyst behind many of the deaths associated with coastal storms and hurricanes. Riverine flooding occurs from inland water bodies such as streams and rivers. Riverine flooding is often classified based on rate of onset, and is typically slow to build, peak, and recede – often allowing sufficient time for evacuations. Mitigation measures are designed to buttress structures, especially critical facilities, provide for more early warning measures, prepare better evacuation processes, and minimize the potential for water contamination.

Hailstorm

Hazard frequency data indicates that storm events that include hailstorms are increasing in occurrence. The community has reported damages to property; however, no crop damage has been reported. The committee developed mitigation measures aimed at public information and awareness measures.

Tornado

The potential for injury, loss of life, and property damage caused by a tornado event in McIntosh County and City of Darien is great. The threat of a tornado event can come from many of the other hazard events that impact the county, including hurricanes and thunderstorms. The two tornado events occurring in 2008 and 2009 in McIntosh County resulted in more than $12.5 million in property damage. The McIntosh County Emergency Management Agency has implemented the StormReady program and opened a new Emergency Operations Center. The Wiregrass 911 system also became operational. These successful endeavors facilitated the implementation of a Code Red Weather Warning system, which delivers severe weather warnings affecting the area to telephones within seconds after being issued by the National Weather Service. It is important to still conduct a campaign to encourage all residents to use this system. The mitigation goals intend to educate the community on safety practices during an event, particularly to shelter in place, provide for quick public service response time, and buttress structures, especially critical facilities.

Wildfire

Potential wildfire situations are an extreme threat in McIntosh County and City of Darien. Much of the County is forest and woodlands, 47 percent of the county is zoned Agriculture/Forestry. Large tracts of timberland are found in the western portion of the county. Recent drought conditions combined with the threat of lightning strikes from thunderstorms have created a serious potential hazard to the life and property of McIntosh County residents. The HMPUC have focused on continuing the previous successful efforts to reduce the impact of drought conditions on wildfire threats. Additional mitigation efforts are focused on public education, support fire rescue and suppression efforts, and develop and implement effective community ordinances and codes.

Windstorm

Historically, thunderstorms pose a great threat to life and property of McIntosh County. Thunderstorm winds occur frequently and have a great chance of affecting the county each year. Thunderstorm events pose the additional threat of lightning strikes, a wildfire danger. Specific mitigation measures identified by the HMPUC are designed to lessen the effects of wind damage in the future, as well as educate the public on storm preparation measures, and enhance the ability of local governments to recover quickly from a catastrophic event.

Mosquito Control

The mosquito hazard does not impact value of structures, but rather impacts people and the county and city budgets. Mosquito control activities are important to the public health, and responsibility for carrying out these programs rests with local governments. Because of the cost, it is important to emphasize public education and preventative measures.

D. Identification & Analysis of Range of Mitigation Options

a. Structural and Non-Structural Mitigation

Coastal Erosion

The HMPUC identified non-structural mitigation measures to ensure that the community adequately addresses relevant erosion issues, including adopting the new state model ordinance for erosion and sediment control and reviewing land use planning.

Coastal Storm/Hurricane

The HMPUC identified the full range of mitigation options, both structural and non-structural mitigation measures, to ensure that the community adequately addresses relevant coastal storm and hurricane issues. Structural actions include property protection measures retrofitting critical facilities to withstand storm winds and flooding and building stormwater retention facilities. Several non-structural measures were identified, including assessing stormwater runoff issues, participating in FEMA NFIP's Community Rating System, updating ordinances, expanding public education, protecting natural resources, and enhancing the ability of emergency services to respond to events.

Drought & Wildfire

One of the primary concerns with droughts was potentially destructive effects of drought-inflicted wildfires, so the mitigation measures are summarized together for these two hazards in this section.

The HMPUC identified structural and non-structural mitigation measures to reduce the threat of a wildfire event. Non-structural measures include better training and equipment as well as public education efforts. There is interest in expanding the FireWise Community Initiative. Structural measures propose adding or upgrading fire stations in underserved areas, such as Shellman and Sapelo Island, as well as adding more dry hydrants.

Extreme Heat

The HMPUC identified non-structural mitigation options to ensure that the community adequately addresses relevant extreme heat issues. Several non-structural measures were identified, including assessing the locations of vulnerable populations, supporting public education initiatives and developing a plan to identify shelters for vulnerable populations.

Flood

The HMPUC identified the full range of mitigation options, both structural and non-structural mitigation measures, to ensure that the community adequately addresses relevant flooding issues. Structural actions include property protection measures retrofitting critical facilities to withstand storm surges and flooding and building stormwater retention facilities. Several non-structural measures were identified, including assessing stormwater runoff issues, updating ordinances, participating in FEMA NFIP's Community Rating System, expanding public education, protecting natural resources, and enhancing the ability of emergency services to respond to events.

Hailstorm

The HMPUC identified non-structural mitigation measures to ensure that the community addresses relevant hailstorm issues, focused on increasing public education safety measures.

Tornado

The HMPUC identified the full range of mitigation options, both structural and non-structural mitigation measures, to ensure that the community adequately addresses tornado issues. Structural actions include property protection measures retrofitting critical facilities to withstand strong winds. Several non-structural measures were identified including implementing a campaign for all residents to sign up for the Code Red System and increasing the public education safety measures.

Windstorm

The HMPUC identified the full range of mitigation options, both structural and non-structural mitigation measures, to ensure that the community adequately addresses relevant wind storm issues. Structural actions include property protection measures retrofitting critical facilities to withstand storm winds. Non-structural measures include increasing the public education safety measures

Mosquito Control

The HMPUC identified non-structural mitigation measures to ensure that the community addresses this localized issue. The committee feels that public education and preventative measures, including improving stormwater management and ditch maintenance in the County will help to alleviate the problems and perhaps control costs.

b. Existing Policies, Regulations, Ordinances, and Land Use

Coastal Erosion

Current land use policies and building codes have been reviewed and erosion and sedimentation control statutes have been enacted. The committee recommends continued enforcement and further study into stormwater assessments. Both the City and County follow the state's 25-ft buffer rule.

Coastal Storm/Hurricane & Flood

These two hazards were related, so they were combined for this section. Current land use policies and building codes have been reviewed and measures have been implemented. Existing FEMA Firm maps have been recently updated again (previously in 2010 shortly after the 2013 HMP Update was written), using enhanced LIDAR technology and a refined model. The updated mapping and modeling is expected to yield more valuable elevation data for many of the proposed measures, including the flood hazard analysis. The new flood maps have not been approved, so the results from both the current and proposed flood maps are presented in this HMP Update. The previous update in 2013 contributed to McIntosh County's continued compliance with the NFIP requirements to participate in the FEMA's map modernization initiative. The maps will allow the County and the City to better identify floodplains and to regulate new construction in Special Flood Hazard Areas. A new strategy that is currently underway is for the County to apply to participate in the NFIP's Community Rating System. The proposed measures correlate with those strategies published in the Comprehensive Plan Partial Update.

Drought

Suggested measures may result in modifications to current policies and the implementation of local ordinances to ensure suggested mitigation measures are initiated.

Extreme Heat

There are no specific regulations, ordinances, or land uses tied to extreme heat. Some policies in place include pre-season public information campaigns for extreme heat, including public education and distribution of brochures. The Division of Family and Children Services (DFCS) also distributes fans to those in need of special assistance during extreme heat conditions. The HMPUC is interested in expanding the public education program and providing additional support for programs to help those in need of special assistance, such as a "Helping Your Neighbors" program.

Hailstorm

Current land use policies and building codes have been reviewed. Recommendations can be made for roofing materials that do not require changes to the building code.

Tornado

Current land use policies and building codes have been reviewed and several measures implemented. Further accomplishments include increasing the public awareness of storm safety procedures and implementing more effective tornado drills in the school system.

Wildfire

Current land use policies and building codes have been reviewed and several measures implemented. The Community Wildfire Protection Plan has been created which helps to address issues at the Wildland-Urban Interface. The HMPUC is interested in expanding the FireWise Community Initiative to further engage builders and planners.

Windstorm

Current land use policies and building codes have been reviewed and several measures implemented. A Public Awareness Campaign educated the community on the Project Impact Weather Radio Stations and safety procedures to follow during storm events.

Mosquito Control

There are no specific regulations, ordinances, or land uses tied directly to mosquito control. Some policies in place include public education events on mosquito source reduction techniques, and there is a mosquito fish stocking program. The HMPUC is interested in expanding the public education program, reinstituting the tire round-up events across the County and City, and developing a prevention and response plan to vector-borne diseases. Both the City and County could review ordinances and enhance code enforcement regarding property maintenance, as unattended items may become sources for standing water.

c. Community Values, Historic, and Special Considerations (STAPLEE)

Coastal Erosion

The proposed strategies hold no inherent risk for historic or special considerations in the community. These strategies will contribute to the community's sense of place as a coastal community and uphold the values expressed in the Comprehensive Plan Partial Updates for the city and the county; therefore, support is strong for the enactment of these measures. The STAPLEE criteria worksheet scores well for the erosion action steps. All other considerations apply affirmatively as many mitigation steps have been identified in the recently updated Partial Comprehensive Plan.

Coastal Storm/Hurricane

The proposed strategies hold no inherent risk for historic or special considerations in the community, but they do take into consideration the needs and location of vulnerable populations. The STAPLEE criteria worksheet scores well for the coastal storm and hurricane action steps. Shortcomings exist for the Technical section under the feasibility consideration; the Administrative section under the funding consideration; and Economic section for the costs of actions and outside funding will be required considerations. The Social, Political, Legal, and Environmental considerations are affirmative as many mitigation steps have been identified in the Comprehensive Plan Partial Updates for both McIntosh County and the City of Darien.

Drought

The proposed strategies hold no inherent risk for historic or special considerations in the community, but they do take into consideration the needs and location of vulnerable populations. STAPLEE criteria scores well for all measures. Local governments now have guidance from the state in the Coastal Regional Water Plan, so the Legal section is no longer a shortcoming.

Extreme Heat

Community values are reflected in the proposed measures. McIntosh County residents are quick to help needy neighbors and respond to emergency events. The STAPLEE criteria worksheet scores well for the extreme heat action steps.

Flood

Community values are reflected in the proposed measures. The coastal environment provides a sense of place, recreation, and a quality of life to McIntosh County residents. The proposed measures are intended to balance the natural ability of the environment to absorb flood waters with the safety measures needed to protect life and property. Special considerations include reinforcing critical facilities and those facilities that may lead to possible water contamination sources after floodwaters recede. The STAPLEE criteria worksheet scores well for the flooding action steps. Shortcomings exist for the Technical section under the feasibility consideration; the Administrative section under the funding consideration; and Economic section for the costs of actions and outside funding will be required considerations. The Social, Political, Legal, and Environmental considerations are affirmative as many mitigation steps have been identified in the recent Comprehensive Plan Partial Update.

Hailstorm; Tornado; Windstorm

These three hazards shared common goals and objectives and had many similar action steps. Community values are reflected in the proposed measures, as reflected in concerns expressed in Comprehensive Plan Partial Updates for both McIntosh County and the City of Darien. Special considerations include reinforcing critical facilities, enhancing notification prior to an event, and providing for critical operations after an event. The STAPLEE criteria worksheet scores well for these action steps. Shortcomings exist for the Technical section under the feasibility consideration; the Administrative section under the funding consideration; and Economic section for the costs of actions and outside funding will be required considerations. The Social, Political, Legal, and Environmental considerations are affirmative as many mitigation steps have been identified in the Comprehensive Plans.

Wildfire

Community values are reflected in the proposed measures to keep the natural and rural feel of the County. The STAPLEE criteria worksheet scores well for the wildfire prevention action steps. Shortcomings exist for the Administrative section under the funding consideration; and Economic section for the costs of actions and outside funding will be required considerations. The Technical, Social, Political, Legal, and Environmental considerations are affirmative as many mitigation steps have been identified in the Comprehensive Plan Partial Updates for both McIntosh County and the City of Darien.

Mosquito Control

Community values are reflected in the proposed measures to control costs and protect residents from vector-borne diseases and lessen the environmental impacts of pesticide agents. The STAPLEE criteria worksheet scores well for the mosquito control action steps. Shortcomings exist under the Administrative section under the funding consideration.

d. Prioritization of Actions

To evaluate action step priorities, committee members used a planning tool prepared by FEMA known as STAPLEE (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) criteria as a guide. Each mitigation strategy step was evaluated using STAPLEE criteria as the guiding principle to identify those steps best for McIntosh County and City of Darien. The STAPLEE criteria has 23 items, such as "benefit of action" and "cost of action" under the Economic criteria. Action steps were ranked as high priority, medium priority, or low priority based on the results of the STAPLEE. The HMPUC did not assign any of the action items as low priority. Past occurrences of disasters and historical trend data aided committee members in assigning priorities. The ranking is listed next each action step in Section III. General descriptions are provided above, and the detailed STAPLEE worksheet results are located in Appendix D.

E. Introduction to the Action Plan

The McIntosh County HMPUC analyzed the updated risk assessment data, and reviewed the implementation status of the 2013 goals, objectives and mitigation strategies. This update confirmed that McIntosh County experiences the greatest amount of damage from: (1) hazard events that create flooding issues, causing property damage, erosion, and water contamination, (2) hazard events that create high winds, causing destruction of property, and (3) hazard events that create wildfire issues. Committee members also chose to continue to address the other following natural hazards: (1) extreme heat, (2) drought, (3) hailstorms, and (4) mosquito control. Committee members chose to exclude technological hazards, such as hazardous material spills, in this plan update because it is not a natural hazard and therefore not a requirement for this plan.

Goals and objective statements have been changed from the 2013 Plan to reflect the shift in focus to the updated hazards list and enhanced mitigation strategies. Unincorporated McIntosh County and the City of Darien have implemented many of the previously identified mitigation strategies. Additional mitigation actions have been added that contain those steps still felt to be relevant from the previously approved plan and new steps have been taken to create a safer community for all McIntosh County residents. The new strategies reflect the committee's concern for reinforcing critical facilities to withstand storm events, educating the community about protecting their families and property, and ensuring that the community can react, respond, and recover quickly from a disaster. The following goals and objectives are representative of what each jurisdiction wishes to accomplish.

The goals and objectives developed by the McIntosh County Joint HMPUC are as follows:

Goal 1: Minimize losses to existing and future structures, especially critical facilities, caused by flooding from coastal storms, hurricanes and excessive rainfall.

Goal 2: Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms.

Goal 3: Minimize damage to structures and forests caused by wildfire, including during periods of drought.

Goal 4: Minimize losses to structures and existing land caused by coastal erosion and erosion from coastal storms, hurricanes, and flood events.

Goal 5: Protect health and safety of residents in McIntosh County and City of Darien

Objective 5.1: Protect life and health of residents before and after coastal storm and hurricane events.

Objective 5.2: Protect life and health of residents from force of tornadoes, hailstorms, and windstorms.

Objective 5.3: Reduce the threat of water contamination caused by contaminated wells and septic systems.

Objective 5.4: Reduce the risk of mosquito-borne illnesses.

Objective 5.5: Protect residents, especially vulnerable populations, from the effects of extreme heat.

Objective 5.6: Conserve water during periods of drought to maintain supply.

Objective 5.7: Protect life and health of residents from threat of wildfire.

Summary of numbers of action steps by Goal and Objective, and status of steps

Goal # (Objective)	Number of Action Steps	New	Ongoing	Deferred
1	18	12	1	5
2	3			3
3	13	3	8	2
4	2	1	1	
5.1	10	6	2	2
5.2	7	3		4
5.3	10	1	7	2
5.4	6	5	1	
5.5	7	2	4	1
5.6	3	2		1
5.7	2	2		
Total	**81**	**37**	**24**	**20**

Goals, objectives and action steps detailed in this Plan are applicable to and will be implemented within all jurisdictions participating in this plan. Some action steps vary between jurisdictions. Section III identifies the completed and deleted mitigation actions in a separate table. Deferred action steps are noted in the Mitigation Action Step List. These are all listed to benchmark progress. If activities are deferred, an explanation will be provided describing the reasons for including the steps in the update. The committee chose to delete non-natural hazards from this update because they were no longer required for this planning process.

Local Public Information and Awareness Strategy

The HMPUC incorporates several methods of public information and awareness strategies regarding hazard mitigation. Regarding erosion issues, property owners are made aware of potential erosion problems with information given during the building permit process. All public information efforts are aimed at keeping the citizens of McIntosh County fully engaged in the implementation and periodic maintenance of this mitigation plan. A kick-off informational meeting was held to provide a general introduction of the planning process to the public. A public hearing was held. Information and awareness strategies for keeping residents informed include the distribution of informational brochures or pamphlets.

As funding is questionable in these times of tight government budgets and economic uncertainty,

unconventional means should be identified whereby the need for funding can be reduced or eliminated. Local public information efforts provide many methods to reach a larger audience with effective strategies at little cost. Many publications are available for free or can be made available via the county and/or agency websites. All public information efforts are aimed at keeping the citizens of McIntosh County fully engaged in the implementation and periodic maintenance of this mitigation plan. Many of these education and awareness tools are multi-hazard in nature and include the following: implementing a countywide crisis alert or notification system, distribution of informational brochures or pamphlets, and public and private sector briefings through newspaper articles and bulletins concerning general natural hazard dangers.

SECTION II – NATURAL HAZARDS

This section describes the Mitigation Goals and Objectives that are applicable to each natural hazard.

Natural Hazard I – Coastal Erosion

Mitigation Strategy for Coastal and Riverine Erosion –

Mitigation Goal #4:

Minimize losses to structures and existing land caused by coastal erosion and erosion from coastal storms, hurricanes, and flood events.

Natural Hazard II – Coastal Storm/Hurricane

Mitigation Strategy for Coastal Storms –

Mitigation Goal #1:

Minimize losses to existing and future structures, especially critical facilities, caused by flooding from coastal storms, flooding from excessive rainfall.

Mitigation Goal #2:

Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms.

Mitigation Goal #4:

Minimize losses to structures and existing land caused by coastal erosion and erosion from coastal storms, hurricanes, and flood events.

Mitigation Goal #5, Objective #1:

Protect health and safety of residents in McIntosh County and City of Darien; protect life and health of residents before and after coastal storm and hurricane events.

Natural Hazard III – Drought

Mitigation Strategy for Drought -

Mitigation Goal #3:

Minimize damage to structures and forests caused by wildfire, including during periods of drought.

Mitigation Goal #5, Objective #6:
Protect health and safety of residents in McIntosh County and City of Darien; Conserve water during periods of drought to maintain supply.

Natural Hazard IV – Extreme Heat

Mitigation Strategy for Extreme Heat –
Mitigation Goal #5, Objective #5:
Protect health and safety of residents in McIntosh County and City of Darien; Protect residents, especially vulnerable populations, from the effects of extreme heat

Natural Hazard V – Flood

Mitigation Strategy for Flooding –
Mitigation Goal #1:
Minimize losses to existing and future structures, especially critical facilities, caused by flooding from coastal storms, flooding from excessive rainfall.

Mitigation Goal #4:
Minimize losses to structures and existing land caused by coastal erosion and erosion from coastal storms, hurricanes, and flood events.

Mitigation Goal #5, Objective #3:
Protect health and safety of residents in McIntosh County and City of Darien; Reduce the threat of water contamination caused by contaminated wells and septic systems.

Natural Hazard VI – Hailstorm

Mitigation Strategy for Hailstorms –
Mitigation Goal #2:
Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms.

Mitigation Goal #5, Objective #2:
Protect health and safety of residents in McIntosh County and City of Darien; Protect life and health of residents from force of tornadoes, hailstorms, and windstorms.

Natural Hazard VII – Tornado

Mitigation Strategy for Tornadoes –
Mitigation Goal #2:
Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms.
Mitigation Goal #5, Objective #2:
Protect health and safety of residents in McIntosh County and City of Darien; Protect life and health of residents from force of tornadoes, hailstorms, and windstorms.

Natural Hazard VIII – Wildfire

Mitigation Strategy for Wildfires-

Mitigation Goal #3:

Minimize damage to structures and forests caused by wildfire, including during periods of drought.

Mitigation Goal #5, Objective #7:

Protect health and safety of residents in McIntosh County and City of Darien; Protect life and health of residents from threat of wildfire.

Natural Hazard IX – Windstorm

Mitigation Strategy for Windstorms -

Mitigation Goal #2:

Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms.

Mitigation Goal #5, Objective #2:

Protect health and safety of residents in McIntosh County and City of Darien; Protect life and health of residents from force of tornadoes, hailstorms, and windstorms.

Natural Hazard X – Mosquito Control

Mitigation Strategy for Mosquito Control –

Mitigation Goal #5, Objective #4:

Protect health and safety of residents in McIntosh County and City of Darien; Reduce the risk of mosquito-borne illnesses.

SECTION III – MITIGATION ACTION STEP LIST

The mitigation action step list is presented in the table below. It is organized by Goal and Objective. The action steps are prioritized as "Medium" or "High" based on the results of the STAPLEE criteria worksheet. As a note, none of the action items were determined to be low priority. The table includes the status as "New," "Ongoing," or "Deferred." Other information includes: Responsible Agency, Anticipated Cost, Funding Sources, Jurisdiction, Timeframe, and Notes. The funding source for many of these action steps is through the "General Fund" which is the City's or County's primary operating fund. A few other funding sources include SPLOST (Special Purpose Local Option Sales Tax) and grants. Since many of the action steps are internal activities led by City and County staff, the Anticipated Cost is listed as "Staff Time." An approximate cost was listed when available, but in many cases, the cost was listed as "Variable" due to the uncertainty with the scale of the project that can be undertaken during the current planning period. The scale of the project will depend on availability of funding. Most action steps apply to both McIntosh County and the City of Darien. Lastly, the "Notes" column describes why action steps were deferred as well as recent activities and future plans.

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
Goal #1: Minimize losses to existing and future structures, especially critical facilities, caused by flooding from coastal storms, flooding from excessive rainfall. Hazards: Coastal Storm/Hurricane & Flood									
1.1	Seek funding to construct stormwater retention facilities and improve storm drain and ditch capacity and conveyance to protect existing and new developments.	Medium	Deferred	County & City Administration	Variable, Depends on Project Scale	General Fund, SPLOST, grants	Both (City & County)	2018-2020	Funding was not available to conduct. Text was revised.
1.2	Seek funding to hire engineer (external consultant) to evaluate effectiveness of present drainage systems, conduct watershed planning, study erosion control issues in the county including waterways and tributaries,	High	Deferred	County & City Administration	$200,000	General Fund, grants	Both (City & County)	2018-2020	Funding was unavailable to conduct. Text was revised.

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	make retrofit suggestions, and review stormwater management plans.								
1.3	Complete a stormwater drainage study for areas with regular flooding issues (work with Darien City Council's Committee for Drainage) and develop structural stormwater management project list (e.g., installing, re-routing, or increasing the capacity of storm drainage system)	High	New	County & City Administration	$120,000	General Fund, SPLOST, grants	Both (City & County)	2018-2020	
1.4	Identify critical facilities in flood zones and develop a plan to relocate or retrofit these facilities to withstand hazards. (Add these projects to Capital Improvements Plan.)	Medium	Deferred	County & City Administration, MEMA	Staff time, $75,000 for engineer	General Fund	Both (City & County)	2018-2020	Funding was unavailable to conduct. During Irma Lift Station near Skippers flooded.
1.5	Identify bridges and roads in flood zones and develop a plan to retrofit these structures to withstand hazards. (Add these projects to Capital Improvements Plan.)	Medium	Deferred	County & City Administration, MEMA, GDOT	Staff time, $75,000 for engineer	General Fund	Both (City & County)	2018-2020	Funding was unavailable to conduct. State provides info on State Rte. bridges and County Rte. box culverts
1.6	For future expansions to water and wastewater treatment plants, ensure that they are retrofitted to withstand flood hazard, as	High	Deferred	County & City Administration, MEMA, Georgia EPD	Variable, Depends on Project Scale	General Fund, SPLOST, grants	Both (City & County)	2018-2020	No upgrades occurred at county level, and none planned for foreseeable

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	well as the collection and distribution systems								future, but keep in case if upgrades occur.
1.7	Investigate retrofits to wastewater treatment plant to reduce inadequate treatment during flood conditions.	High	New	County & City Administration, MEMA, Georgia EPD	Variable, Depends on Project Scale	General Fund, SPLOST, grants	Both (City & County)	2018-2020	Need to look at how floods affect the WWTP
1.8	Update Water Resources Protection Ordinance to recommend use of Coastal Stormwater Supplement or 2016 Edition of the Georgia Stormwater Management Manual.	High	New	County & City Administration	Staff time, $5,000	General Fund	Both (City & County)	2018-2020	
1.9	Incorporate information about flood zones and risks into future land use planning and zoning determination.	High	New	County & City Administration	Staff time, $30,000	General Fund	Both (City & County)	2018-2020	
1.10	Participate in FEMA's NFIP Community Rating System	High	New	County Administration	Staff time, $90,000	General Fund, Grants	County	2018	Application has recently been submitted
1.11	Distribute flood protection brochures to the owners of flood-prone property.	High	New	County & City Administration	Staff time, $5,000	General Fund, grants	Both (City & County)	2018-2019	
1.12	Educate property owners regarding options for mitigating their properties from flooding through outreach activities	Medium	New	Environmental Health, UGA Extension, MEMA	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	
1.13	Expand public education and brochures on keeping storm drains and ditches clear of debris	Medium	New	Environmental Health, UGA Extension, MEMA	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
1.14	Continue to maintain drainage ditches and cleaning culverts, catch basins, and drainage pipes.	High	Ongoing	County Road Department, City Public Works	Staff time, Variable, Depends on Additional Equipment Needs	General Fund	Both (City & County)	2018 and ongoing	Ongoing task where complaints are addressed as they are received.
1.15	Explore obtaining easements to access primary ditches for maintenance.	High	New	County & City Administration	Staff time	General Fund	Both (City & County)	2018-2020	They have an issue with ditches being on private property for accessibility.
1.16	Continue partnership between City and County to share maintenance equipment (e.g., allow the County to borrow the City's Jet Vac truck for catch basin and drainage pipe maintenance).	High	New	Public Works Department, County & City Administration	Staff time	General Fund	Both (City & County)	2018 and ongoing	
1.17	Install 10 quick connects on crucial Darien lift stations to allow for generator support during a power outage	High	New	City Administration, Public Works	$80,000	General Fund, Grants	City	2018-2019	During Irma 33 of 37 lift stations lost power.
1.18	Continue with floodplain modeling efforts in the County to define base flood elevations for areas classified as "A" Zone	Medium	New	U.S. Army Corps, Georgia EPD, FEMA, GEMA	Variable, Depends on Project Scale	Federal/ State funding	Both (City & County)	2018-2020	Preliminary Flood Maps still contain areas without a defined BFE in the County ("A" Zone)
Goal #2: Minimize losses to existing and future structures, especially critical facilities, caused by strong winds and hail from coastal storms, hurricanes, tornadoes, windstorms, and hailstorms. **Hazards: Coastal Storm/Hurricane, Hailstorm, Tornado, & Windstorm**									

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
2.1	Seek funds to retrofit public buildings and critical facilities so they are more storm proof (e.g., reinforce windows, roofs, and doors; anchor roof-mounted HVAC units).	High	Deferred	MEMA, HMPUC	Staff time, Variable, Depends on Project Scale	General Fund, grants	Both (City & County)	2018-2020	Funding was not available to conduct. Text was revised to include public buildings.
2.2	Educate public about the different roofing materials and techniques to minimize wind and hail damage (e.g., structural bracing, shutters, laminated glass in window panes, and hail-resistant roof coverings or flashing.)	Medium	Deferred	MEMA, Building Inspector	Staff time, $5,000	General Fund	Both (City & County)	2018-2020	Not completed, but desired to keep.
2.3	For future expansions to critical facilities, ensure that they are retrofitted to withstand wind hazard.	High	Deferred	County & City Administration, MEMA, Building Inspector	Variable, Depends on Project Scale	General Fund, SPLOST, grants	Both (City & County)	2018-2020	Revised
Goal #3: Minimize damage to structures and forests caused by wildfire, including during periods of drought. Hazards: Wildfire & Drought									
3.1	Continue to seek funds to install more dry hydrants.	High	Ongoing	County, City, MEMA	$15,000	General Fund, grants	Both (City & County)	2018 and ongoing	Dry hydrants were installed (especially in critical areas), but needs to continue.
3.2	Construct new fire station in Shellman.	High	New	County, MEMA, Fire Department	$180,000 budgeted	SPLOST, General Fund, grants	County	2018	
3.3	Upgrade fire station on Sapelo Island.	High	New	County, MEMA, Fire Department	$50,000 budgeted	SPLOST, General Fund, grants	County	2019	One was constructed on Sapelo Island,

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
									but upgrade is needed
3.4	Continue to seek state and federal grants to acquire additional fire equipment.	Medium	Ongoing	Fire & EMS Departments, MEMA	$300,000	Grants	Both (City & County)	2018 and ongoing	Ongoing process. Recently got a 50/50 grant to get new PPE (personal protective equipment). With SPLOST, purchased 3 fire tankers
3.5	Continue to seek grants to train firefighters on tactics and equipment.	Medium	Ongoing	Fire & EMS Departments, Georgia Forestry, MEMA	Staff time	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing step. They had some free trainings offered
3.6	Continue to improve wildland fire training at the local fire department level.	Medium	Ongoing	Fire & EMS Departments, Georgia Forestry	$5,000	Grants	Both (City & County)	2018 and ongoing	This is an ongoing step.
3.7	Investigate implementing impact fees to cover fire service costs associated with new development	Medium	Deferred	County Administration, MEMA	Staff time, $15,000	General Fund	County	2019-2020	Do not currently have impact fees but wish to keep this step.
3.8	Support Community Wildfire Protection Plan	Medium	New	County & City Administration, Georgia Forestry, Fire Department	Staff time	General Fund	Both (City & County)	2018-2020	Listed online as “in progress”
3.9	Sponsor a FireWise Community Initiative workshop/event to continue to engage developers,	High	Deferred	County & City Administration, Georgia Forestry,	Staff time, $10,000	General Fund, grants	Both (City & County)	2018 and ongoing	Belvedere Island Plantation is one (Townsend)

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	planners, EMS, and government officials within the county about FireWise concepts to protect new buildings and infrastructure.			MEMA, Fire & EMS Departments					
3.10	Plan and develop building and zoning requirements for an urban interface to protect new buildings and infrastructure.	High	Ongoing	County & City Administration, Georgia Forestry, MEMA	Staff time	General Fund	Both (City & County)	2018 and ongoing	Belvedere Island Plantation is a FireWise Community (Townsend)
3.11	Seek funding for more public awareness events	Medium	Ongoing	MEMA, Georgia Forestry	Staff time, $15,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity
3.12	Work with 4-H to provide public awareness opportunities	High	Ongoing	MEMA, UGA Extension, Georgia Forestry	Staff time, $10,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity.
3.13	Broadcast public education videos on local cable stations	High	Ongoing	MEMA, UGA Extension	Staff time, $10,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity.
Goal #4: Minimize losses to structures and existing land caused by coastal erosion and erosion from coastal storms, hurricanes, and flood events. Hazards: Coastal Erosion, Coastal Storm/Hurricane, & Flood									
4.1	Evaluate the County's and City's land use pattern as reflected in their Comprehensive Plans and encourage consistency with riparian buffer protection using Best Management Practices (BMPs), and similar measures.	Medium	Ongoing	County & City Administration	Staff time, $15,000	General Fund	Both (City & County)	2018 and ongoing	Completed through updated ordinances being consistent with comp. plans, but this action step should keep going.
4.2	Update ordinance to adopt the new (2016) state model	Medium	New	County Administration	Staff time, $5,000	General Fund	County	2018-2019	

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	ordinance – "Model Soil Erosion, Sedimentation, and Pollution Control Ordinance."								
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. Objective #1: Protect life and health of residents before and after coastal storm and hurricane events. Hazards: Coastal Storm/Hurricane									
5.1.1	Provide more Storm Preparedness information to community through City/County website, brochures, and outreach events (e.g., evacuation procedures, emergency kits, securing debris and personal items).	High	Ongoing	MEMA, HMPUC, UGA Extension, Health Department	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity. They distribute brochures, but details were enhanced
5.1.2	Conduct campaign to encourage all residents to sign up for Code Red system.	High	New	MEMA, 911 Director	Staff time, $5,000	General Fund, GEMA, grants	Both (City & County)	2018	
5.1.3	For residents without transportation, develop a new plan for evacuation and communicate it appropriately	High	New	MEMA, HMPUC	Staff time	General Fund	Both (City & County)	2018	Buses during Hurricane Matthew were not effective, but Irma went smoother
5.1.4	Based on experiences learned from Hurricane Matthew, develop new plan to ensure safe resident return after an evacuation.	High	New	MEMA, HMPUC	Staff time	General Fund	Both (City & County)	2018	Updated previous action step to include lessons learned during Matthew
5.1.5	Implement CERT program to assist emergency personnel with recovery efforts- plan and develop volunteer program ahead of typical	High	Ongoing	MEMA, HMPUC	Staff time, $10,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is ongoing, and it is important for the County's DRRP.

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	storm seasons using COADs and VOADs (Community/ Volunteer Organizations Active in Disaster).								
5.1.6	Educate public about proper disposal of hazardous waste products that have the potential to contaminate water sources after a disaster.	Medium	Deferred	Environmental Health, UGA Extension, MEMA, Georgia EPD	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Nothing completed, but desired to keep.
5.1.7	Plan for a coordinated effort after storm events to ensure water supply is safe.	High	Deferred	MEMA, Environmental Health, HMPUC, Georgia EPD	Staff time	General Fund, grants	Both (City & County)	2018-2019	Not completed, keep as action step.
5.1.8	Seek funding to install back-up generators at well sites, lift stations, and sewer treatment plant.	High	New	MEMA, Water Department, County & City Administration	Staff time	General Fund, grants	Both (City & County)	2018-2020	
5.1.9	Develop post-disaster communication plan (e.g., drinking water availability and safety, and sharing resources).	High	New	County & City Administration	Staff time	General Fund	Both (City & County)	2018	Things went smoothly during Irma between City & County, but there was some mis-communication with the public.
5.1.10	Coordinate critical needs shelters and logistics ahead of hazards (and emergency declaration by State)	High	New	County & City Administration	Staff time	General Fund	Both (City & County)	2018	This was an issue during Irma that could be improved
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. **Objective #2: Protect life and health of residents from force of hailstorms, tornadoes, and windstorms.** **Hazards: Hailstorm, Tornado, & Windstorm**									

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
5.2.1	Increase public awareness of Safe Rooms and where to go for tornadoes and hailstorms	High	Deferred	MEMA	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Not completed, need to know where to go for tornadoes.
5.2.2	Educate public on tornado awareness and safety tips by posting on City/County website, distributing information to children at schools, and conducting drills at schools.	High	Deferred	MEMA, 911 Director	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Not completed, need an education system for tornado awareness.
5.2.3	Educate public on safety procedures to follow during hail events	Medium	Deferred	MEMA	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Not completed, desired to keep.
5.2.4	Continue to enhance County's communication equipment with repeaters to enable capacity to notify all public safety staff.	High	Deferred	MEMA, County Administration	Variable, Depends on Project Scale	General Fund, grants	County	2018-2020	
5.2.5	Conduct campaign to encourage all residents to sign up for Code Red system.	High	New	MEMA, 911 Director	Staff time, $5,000	General Fund, GEMA, grants	Both (City & County)	2018	
5.2.6	Set up local radio station broadcasts during extreme events to alert citizens to imminent danger.	Medium	New	MEMA	Staff time, $10,000	General Fund	Both (City & County)	2018 and ongoing	
5.2.7	Promote use of National Oceanic and Atmospheric Administration (NOAA) weather radios	Medium	New	MEMA, 911 Director	Staff time, $5,000	General Fund, GEMA, grants	Both (City & County)	2018 and ongoing	
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. **Objective #3: Reduce the threat of water contamination caused by contaminated wells and septic systems.** **Hazards: Flood**									

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
5.3.1	Continue inventory of all septic and well systems in McIntosh County in WelSTROM and with the Coastal Health District.	Medium	Ongoing	Environmental Health, County Administration, Georgia EPD	Staff time	General Fund	County	2018-2019	Worked on septic tank inventory, but still ongoing. They update locations in WelSTROM and with Coastal Health District. They are supposed to be doing wells too.
5.3.2	Continue to repair and replace malfunctioning septic systems.	Medium	Ongoing	Environmental Health, County Administration, Georgia EPD	Staff time, $15,000	General Fund	County	2018 and ongoing	
5.3.3	Combine public education about importance of wellhead protection with enforcement measures	Medium	Ongoing	Environmental Health, Georgia EPD	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing educational activity.
5.3.4	Educate the public about the importance of routine septic system maintenance.	Medium	New	Environmental Health, UGA Extension, Georgia EPD	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	
5.3.5	Perform annual public in-services on well decontamination techniques	Medium	Ongoing	Environmental Health	Staff time, $5,000	General Fund, grants	County	2018 and ongoing	This is an ongoing educational activity.
5.3.6	Distribute brochures on well decontamination methods	Medium	Ongoing	Environmental Health	Staff time, $5,000	General Fund, grants	County	2018 and ongoing	This is an ongoing activity.
5.3.7	Educate public on local resources available for testing water quality	Medium	Ongoing	Environmental Health, MEMA, UGA Extension, GA EPD	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Completed, but should remain as an ongoing activity.

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
5.3.8	Provide brochures on Environmental Health issues with localized information	Medium	Ongoing	Environmental Health, MEMA	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity.
5.3.9	Continue to seek grant funding to implement a Wellhead Protection Program (individual systems)	Medium	Deferred	MEMA, Environmental Health, Georgia EPD	Staff time, $25,000	General Fund, grants	Both (City & County)	2018-2020	Unsuccessful, but should continue seeking funds.
5.3.10	Continue to investigate all opportunities for conservation of protected animal and plant habitats, achievement of water quality standards and management of water resources, conservation of freshwater and saltwater marshlands, and protection of aquifer recharge areas.	High	Ongoing	County & City Administration, Environmental Health, Georgia EPD	Staff time	General Fund	Both (City & County)	2018 and ongoing	This is an ongoing exercise. They adopted some more stringent ordinances related to these items. Done to ensure compliance with NFIP.
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. Objective #4: Reduce the risk of mosquito-borne illnesses. Hazards: Mosquito Control									
5.4.1	Reinstitute tire round-up events in Darien and McIntosh County by partnering with "Keep McIntosh Beautiful"	High	New	County & City Administration	Staff time, $15,000	General Fund, grants	Both (City & County)	2018 and ongoing	Action step updated to reinstitute event and develop new partnership
5.4.2	Educate public on mosquito source reduction techniques; yard containers, tires, etc. that hold water, account for a large portion of the summer mosquito population in many urban areas.	High	Ongoing	Environmental Health, MEMA	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	Public education events have been held, but this activity should keep going

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
5.4.3	Continue support for mosquito fish stocking programs.	Medium	New	County & City Administration	Variable, Depends on Project Scale	General Fund	Both (City & County)	2018 and ongoing	
5.4.4	Work with the Health Department to develop a plan for vector-borne disease prevention and response.	Medium	New	Environmental Health, MEMA	Staff time	General Fund	Both (City & County)	2018 and ongoing	
5.4.5	Work with the Health Department to educate the public on how to avoid and prevent mosquito bites.	Medium	New	Environmental Health, MEMA, County & City Administration	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	
5.4.6	Develop plan for preventative actions to control mosquitoes.	High	New	Environmental Health, MEMA	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. **Objective #5: Protect residents, especially vulnerable populations, from the effects of extreme heat.** **Hazards: Extreme Heat**									
5.5.1	Conduct pre-season public information campaigns	High	Ongoing	MEMA, Division Family & Children Services (DFCS), Health Department	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	This is an ongoing activity.
5.5.2	Publish a special section with emergency information on extreme heat. Localize the information by including the phone numbers of local emergency services offices, the American Red Cross, shelters, and hospitals.	Medium	Ongoing	MEMA, DFCS	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	DFCS has information in the newspaper. This is an ongoing activity.
5.5.3	Expand public education and brochures on the dangers of sunburn, heat exhaustion, heat stroke, and other	Medium	New	Health Department, DFCS, MEMA	Staff time, $5,000	General Fund, grants	Both (City & County)	2018 and ongoing	County Health Department distributes brochures

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	possible conditions caused by excessive heat.								addressing heat but could be expanded.
5.5.4	Issue advisory and warnings	High	Ongoing	MEMA	Staff time	General Fund	Both (City & County)	2018 and ongoing	Advisories and warnings are issued through local radio station, but this should be ongoing.
5.5.5	Identify location of vulnerable populations	High	Deferred	DFCS, Health Department, MEMA	Staff time	General Fund	Both (City & County)	2018-2020	Funding was not available to conduct.
5.5.6	Develop a plan that identifies shelters for those in need to have respite from extreme heat and organize outreach to vulnerable populations.	High	New	DFCS, Health Department, MEMA	Staff time	General Fund	Both (City & County)	2018-2020	
5.5.7	Support a "Helping Your Neighbors" program through local schools and non-profit agencies to encourage people to help those who require special assistance such as elderly people, infants or people with disabilities during severe weather conditions through gifts of box fans, etc.).	High	Ongoing	DFCS, Red Cross, MEMA	Staff time, $10,000	General Fund	Both (City & County)	2018 and ongoing	This is done through DFCS, and they do fans. Red Cross does blankets for cold weather.
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. Objective #6: Conserve water during periods of drought to maintain supply. Hazards: Drought									
5.6.1	During a drought, run an education campaign suggesting ways that	Medium	Deferred	Environmental Health, UGA	Staff time, $10,000	General Fund, grants	Both (City & County)	2018-2020	Funding was not available to

Action #	Action Step	Priority	Status	Responsible Agency	Anticipated Cost	Funding Sources	Jurisdiction	Timeframe	Notes
	individuals can conserve water and energy in their homes and their workplaces.			Extension, MEMA					conduct. Text was revised.
5.6.2	Implement water conservation measures and instructions during periods of drought (e.g., rotating water usage on alternating days east/west of Hwy 17).	Medium	New	County & City Administration, MEMA	Staff time, $5,000	General Fund	Both (City & County)	2018 and ongoing	
5.6.3	Cooperative Extension and Local Ag Agent to educate farmers about steps they can take to conserve water and establish alternative water supplies for their crops.	Medium	New	UGA Cooperative Extension	Staff Time, $10,000	General Fund	County	2018 and ongoing	
Goal #5: Protect health and safety of residents in McIntosh County and City of Darien. **Objective #7: Protect the life and health of residents from threat of wildfire.** **Hazards: Wildfire**									
5.7.1	Issue air quality warnings when there are wildfires in the area.	High	New	MEMA	Staff time	General Fund	Both (City & County)	2018 and ongoing	
5.7.2	Identify evacuation routes and provide that information to the public in the event that a wildfire occurs.	High	New	MEMA	Staff time	General Fund	Both (City & County)	2018 and ongoing	

A. How the local jurisdictions considered reducing risks and vulnerabilities to Future Buildings and Infrastructure and identified appropriate actions in the action plan

The following steps were considered to reduce risks and vulnerabilities for New buildings and infrastructure:

- For those planned near waterways, they will be subjected to mitigation steps if enacted.
- They will also be subject to stronger building requirements to withstand wind and flood conditions, as well as receive stronger building recommendations to withstand hailstorm conditions.
- They may be subject to Wildland-Urban Interface requirements to reduce destruction of property by wildfire.

B. How the local jurisdictions considered reducing risks and vulnerabilities to Existing Buildings and Infrastructure and identified appropriate actions in the action plan.

The following steps were considered to reduce risks and vulnerabilities for Existing buildings and infrastructure:

- Those adjacent to river corridors will be impacted by changes in stormwater run-off plans and drainage systems, if enacted. These measures should provide a measure of relief from the flooding issues causing erosion problems.
- They will also be included in recommendations to retrofit to withstand wind and flood damage, as well as hailstorm damage.
- They will be included in recommendations to retrofit to comply with Wildland-Urban Interface requirements to reduce destruction of property by wildfire.

C. Special Multi-Jurisdictional Strategies and Considerations.

Multi-jurisdictional strategies and considerations are identified for each hazard, and ones with similar approaches are grouped together.

<u>Coastal Erosion</u>

Both McIntosh County and City of Darien are affected by coastal erosion, but the vulnerability is greater for the County. The River Corridor Protection Act requires a 100-foot buffer of natural vegetation along both sides of any protected river. Additionally, the Georgia Erosion and Sedimentation Act does not allow for any land-disturbing activity within 25 feet of the banks of any State waters. The Coastal Georgia Regional Development Center prepared a Regional River Corridor Protection Plan that describes the applicability of the River Corridor Protection Act to the local governments within the Coastal RDC jurisdiction. McIntosh County adopted a Regional River Corridor Protection Plan for the Altamaha River. The City also contains a protected river corridor that extends 2.5 miles along Cathead Creek and the Darien River to the west and southwest of the City's downtown. The City has recently adopted a Water Resources Protection Ordinance, consistent with the Part V Environmental Planning Criteria, which addresses the protected river corridor, wetlands, and groundwater recharge areas.

<u>Drought</u>

All areas of McIntosh County could potentially be affected by drought conditions, particularly the seafood industry and agriculture interests. The committee's greatest concern is potential for the threat of wildfire from dry conditions.

Extreme Heat

Vulnerability to extreme heat does not contrast much between jurisdictions. Excessive heat does not have particular impacts in any one geographical section of the county. The most vulnerable individuals to this hazard are the very old and the young, as well as low-wealth individuals. Extreme heat events may potentially impact 20% of the residential population and 10% of the agricultural assets in McIntosh County. The impact to residents is increased for the City of Darien to 37%.

Flood

Vulnerability to flooding is greater for the County than the City of Darien. Using the Existing FEMA flood maps (DFIRM), flooding vulnerability for the County is estimated at 39% of all county structures ("improved buildings"), and the City is only 4%. These percentages decreased dramatically from the previous plan, especially for the City. Preliminary FEMA flood maps (DFIRM), if approved, will reduce the County's vulnerability to 33% of structures ("improved buildings"). The update is based on improved LIDAR and modeling inputs. There is also more vulnerability in the County than the City for sea level rise. Sea level rise of 3-feet will impact 20% of "improved buildings" in the County versus 4% in the City.

A concern within McIntosh County and City of Darien, related to flooding, is evacuation of residents during storm events. Many of the residential areas are accessed by county roads that would quickly be flooded during storm surge or flooding events. Some areas of the County would have limited access by Emergency Services personnel during and after a flooding event.

Coastal Storm/Hurricane; Hailstorm; Thunderstorm; Tornado

Vulnerability to these hazards do not contrast between jurisdictions. All structures and critical facilities within McIntosh County and City of Darien could be damaged by these hazards. Vulnerable populations are located in the City of Darien as well as in unincorporated areas of the county. Alerting and protecting all residents of impending high winds and potential storm and flood conditions is a county-wide concern. The scale of the impacts varies for each of these hazards and their respective storm intensity.

Wildfire

Most of the wildfire danger is in the County, but as lightning strikes can cause a wildfire in any location, any mitigation steps taken related to wildfire should be undertaken on a countywide basis and include the City of Darien. The Wildland-Urban Interface from a fire management perspective is commonly defined as an area where structures and other human development meet or intermingles with undeveloped wildland or vegetative fuels. These conditions exist and are more common throughout the County.

The Georgia Forestry Commission recently updated McIntosh County's Fire Wildfire Risk Assessment. This assessment will include enhanced mapping, strategies and detailed mitigation action steps. Detailed jurisdictional information and mitigation efforts are addressed in the Community Wildfire Protection Plan.

Mosquito Control

Mosquito control has an impact on the economy of all of McIntosh County. Mosquito control

activities are important to the public health and impact tourism and businesses. Many commercial and industrial concerns are located along the waterfront and are impacted during the mosquito season. An aerial spray can cost the city and the county up to $60,000 each spray, which makes this financially burdensome, so this has not been done since 2012.

D. Completed and Deleted Action Steps from Previous Plan

Completed: The table below summarized the Action Steps that have been completed since the last plan and which hazard they were associated with. Some steps have notes provided in italics. In addition to the steps listed in this table, all of the steps in the Mitigation Action Step List with the status "Ongoing" were completed since the last update. The "Ongoing" action steps remained on the active mitigation action step list because the HMPUC considered them important to continue implementing.

Completed Action Step	Hazard(s)
Complete a natural resource inventory.	Coastal Erosion
Maintain buffers in natural areas between roadway and housing or commercial development.	Coastal Erosion
Complete review of county-wide ordinances to ensure compliance with Coastal Comprehensive Plan.	Coastal Erosion
Explore implementation of a storm water utility.	Coastal Storms /Hurricane, Flood
Continue to review county and municipal building codes for proper wind strength and safety regulations and for consistency with state to insure new buildings and infrastructure are protected from high winds.	Coastal Storms /Hurricane, Windstorms
Convert and retrofit the old Ford Building to combine police and fire services. (*Converted for fire only*)	Coastal Storms /Hurricane, Windstorms
Plan coordinated effort to ensure safe resident return after an evacuation and storm event.	Coastal Storms /Hurricane
Seek funding to provide more fire services protection in Townsend.	Drought, Wildfire
Install clarifiers to enhance effectiveness (WWTP).	Flood
Seek funding for mobile water testing laboratory.	Flood
Consider implementing the Point of Distribution System to administer vaccines. (*Completed, and they practice every year using closed and open pods*)	Flood
Implement a Code Red system- a reverse 911.	Tornado
Investigate need for additional building codes to insure new buildings and infrastructure are protected from high winds.	Tornado
Enhance county's communication equipment with repeaters to enable capacity to notify all residents of imminent danger.	Tornado

While not a specific action step from the 2013 HMP, the following activities were completed which will help the County and City respond to and protect its residents from natural hazards:

- The City recently purchased a $280,000 jet vac truck which will help with stormwater system maintenance. The City and County currently share resources, so it was discussed at this meeting that this could also be shared.
- The County provides funding to Cooperative Extension, and they recently added a

county agricultural agent, so this employee can help with drought conservation efforts and education.

- The County purchased 3 fire tankers, 2 ambulances, and constructed a fire station on Sapelo Island, but the fire station is very basic and in need of an upgrade.

Deleted: The table below summarized the Action Steps that have been deleted since the last plan and which hazard they were associated with. Most of these steps have notes provided in italics as to why they were deleted. In some cases, they were substantially edited into a new action step to be more specific and direct.

Deleted Action Step	Hazard(s)
Promote soft-engineering practices for erosion control rather than hardening shorelines, i.e. bulkheads. (*This is ongoing but falls under DNR*)	Coastal Erosion
Hire engineer to review Erosion and Sedimentation plans. (*NRCS does these reviews*)	Coastal Erosion
Identify critical facilities and those facilities that shelter vulnerable populations; seek funding to retrofit structures to strengthen resistance to damage; include adding storm windows to City Hall and County Courthouse buildings. (*Updated and combined into Action Step 2.1*)	Coastal Storms /Hurricane, Windstorms
Install generators in Courthouse and City Hall. (*Access to portable ones, but since not an evacuation center, not needed*)	Coastal Storms /Hurricane, Flood
Interview local officials and representatives of the U.S. Department of Agriculture about special steps farmers can take to establish alternative water supplies for their crops. (*Not applicable for type of agriculture in the County*)	Drought
Interview local physicians about the dangers of sunburn, heat exhaustion, heat stroke, and other possible conditions caused by excessive heat. (*Updated in New Action Step 5.5.3*)	Extreme Heat
Request local churches to provide respite from extreme heat in their facilities for those in need. (*Suggested to be edited. See New Action Step 5.5.6*)	Flood
Investigate the need for a local ordinance to create wider easements to keep drainage ditches and culverts accessible for maintenance. (*Issue with ditches on private property exists, so an edit was suggested. See New Action Step 1.15*)	Flood
Plan and seek funding for Water Jet Pump and a heavy truck to hold water. (*City recently purchased a Jet Vac truck, and they can share with County*)	Flood
Investigate an incentive plan to add preventers on all outdoor faucets. (*Backflow preventers are at all water meters for public water systems, but they are not on faucets*)	Flood
Educate public about installing backflow preventers on residential systems.	Flood
Study ultraviolet treatment methods for wastewater treatment. (*Beyond the needs for the current system's size*)	Flood
Have 911 staff provide community education concerning tornado awareness and safety tips; some information can be included in the telephone billing envelopes. (*Merged ideas into New Action Step 5.2.2*)	Tornado
Investigate increased and more timely land based and airborne spraying.	Mosquito

Deleted Action Step	Hazard(s)
(*Airborne spraying is too expensive, so they will focus on preventative actions*)	Control
Continue tire round-up events in Darien. (*Reinstate this event with a new partner. See New Action Step 5.4.1*)	Mosquito Control
Implement tire round-up events in County. (*Reinstate this event with a new partner. See New Action Step 5.4.1*)	Mosquito Control

E. Unchanged Action Steps

The HMPUC reviewed each action step from the 2013 HMP Update and decided whether it should be deleted or deferred to this HMP Update. The most common reason for deferring was due to cost or lack of resources to implement during the previous period. The STAPLEE worksheet, in Appendix D, scores well for these action steps. This proves that these are all still valid and effective mitigation action steps to pursue. Many still have shortcomings in the Economic and Administrative sections as they pertain to funding allocations, cost of action, and outside funding source required. All other considerations apply affirmatively as many mitigation steps have been identified in the Comprehensive Plans for both McIntosh County and the City of Darien.

There were no additional action steps that the HMPUC looked into that were not included in the 2018 HMP Update. The HMPUC chose to implement every new action step that was proposed.

CHAPTER 4 – EXECUTING THE PLAN

Summary of Updates to Chapter 4

Chapter 4 Section	Updates to Section
I. Action Plan Implementation	General text edits based on current conditions and schedules; elaborated on how HMP is incorporated into other plans.
II. Monitoring, Evaluating, Updating	Text edits based on previous experiences; a specific midpoint progress meeting with approach was outlined for Year 2021; subheadings were added to this section; continued public involvement was also added.

SECTION I – ACTION PLAN IMPLEMENTATION

Administrative Actions

The hazard mitigation planning process was overseen by the McIntosh County Emergency Management Agency. Facilitation of the planning process was conducted by Ecological Planning Group, LLC. The McIntosh County Board of Commissioners has authorized the submission of this plan to GEMA for review and approval. After GEMA approval, the McIntosh County Commissioners will act to formally adopt this plan, and then it will be submitted to FEMA for their approval. After FEMA approval, the Darien City Council will act to formally adopt this plan.

Authority and Responsibility

The City of Darien and unincorporated McIntosh County were included in this planning process. Participation from each jurisdiction was solicited and received by the McIntosh County Emergency Management Agency. As a result, a truly multi-jurisdictional plan was created for all of McIntosh County with ideas and viewpoints of all participants included. The McIntosh County Emergency Management Agency is the overall implementing agency for projects such as Hazard Mitigation. McIntosh County and the City of Darien have authorized the MEMA to act, in a prudent manner, on their behalf.

After formal adoption of the McIntosh County Joint Hazard Mitigation Plan, the County Commissioners and City Council members will keep in consideration the proposed mitigation action steps and oversee the implementation of said tasks using branches of city and county government when appropriate.

The parties responsible for the various mitigation action steps, as assigned by this Plan, the County Commission, or City Council, will provide a project status report and will include which implementation processes worked well, any difficulties encountered, how coordination efforts were proceeding, and which strategies should be revised. This planning process identified that the HMPUC will provide regular review and update of the Plan every five years. At the direction of the MEMA Director, the McIntosh County HMPUC members will be invited at least once during the midpoint of the planning period (2018-2023) to convene in order to discuss the progress and whether any action or edits are required to the mitigation action steps or the plan

itself. HMPUC members will be responsible for monitoring and evaluating the progress of the mitigation strategies in the Plan.

The County Commission and City Council will review recommendations of the committee at the midpoint evaluation. County Commissioners and City Council members will evaluate and update the Plan to ensure mitigation action steps are being established and that existing programs are utilizing the guidance provided by the Hazard Mitigation Plan. The MEMA Director will then forward any changes to GEMA's Hazard Mitigation Planning Specialist.

Prioritization

Members of the McIntosh County HMPUC prioritized the identified mitigation actions based on what would be perceived as most beneficial to the community. A list of mitigation goals, objectives and related action items was compiled from the input of the planning committee, as well as from others within the community. Several criteria were established to assist committee members in the prioritization of these suggested mitigation actions. Criteria included perceived cost benefit or cost effectiveness, availability of potential funding sources, overall feasibility, measurable milestones, multiple objectives, and both public and political support for the proposed actions. Through this prioritization process, several projects emerged as being a greater priority than others. Some of the projects involved expending considerable amounts of funds to initiate the required actions. The determination of the cost benefit analysis (such as the FEMA B/CA model) of a project will be implemented at time of project application or funding request. Other projects allowed the community to pursue completion of the project using potential grant funding. Still others required no significant financial commitment by the community.

Incorporation of Local Hazard Mitigation Plan into Other Plans

The 2013 HMP Update was incorporated into City and County plans as they reviewed their respective Capital Improvement Plans and annual budgets. It has also been incorporated into sections of the McIntosh County Local Emergency Operations Plan (LEOP). The 2013 HMP Update was also used in the County's application for the NFIP Community Rating System, which is a part of the County's Floodplain Management Program. Since 2013, when the HMP Update was last approved, only unincorporated McIntosh County prepared a partial update to its Comprehensive Plans in 2013. In this Comprehensive Plan Update, many of the previously identified hazard mitigation strategies were incorporated into the Short-Term Work Program. Based on the timing of the previous HMP Update, the City and Comprehensive Plans were not at a stage of a major update, and there were no other major plans being updated during this period. Therefore, there were not many other plans in which the 2013 HMP Update was incorporated. However, in the time since the 2018 HMP Update was drafted there have been several major City and County plans that were in the process of being developed and a couple other planned. These are described below.

The 2017 Regional Plan for Coastal Georgia promoted integrating hazard mitigation into updates to the local comprehensive plans through a section on Coastal Vulnerability and Resilience. Integrating hazard mitigation planning with comprehensive planning promotes consistency between plans; increases the visibility of mitigation goals, objectives and policies; properly guides future development and land use; and, improves coordination between planners and

emergency managers. Both unincorporated McIntosh County and City of Darien were working on updating their respective Comprehensive Plans in early 2018, after the Draft 2018 HMP Update had been prepared. The 2018 HMP Update was available online for review during the comprehensive plan update process, so the information was available for incorporation into the County and City Comprehensive Plans. In addition, members of the HMPUC also helped to develop the Comprehensive Plans, so they were able to include ideas, information, and outcomes developed during the planning process for the 2018 HMP Update. For the 2018 McIntosh County Comprehensive Plan, HMPUC members served on the Steering Committee and Stakeholder Committee. For the 2018 City of Darien Comprehensive Plan, HMPUC members served on the Stakeholder Committee and included the Mayor and members of City Council. In both the City's and County's 2018 Comprehensive Plan, there is a chapter on Coastal Vulnerability and Resilience, which were items added to and discussed within the 2018 HMP Update. This new chapter was mentioned in the 2017 Regional Plan for Coastal Georgia. In addition, there were several Mitigation Action Steps listed in Chapter 3, Section III of this 2018 HMP Update matched action items/implementation strategies listed in the Short-Term Work Program in both the City's and County's 2018 Comprehensive Plan. This ensures that these action items have exposure in multiple City and County plans and that they are on the minds of both local governments and their respective staff.

Information from the 2018 HMP Update will continue to be incorporated into other local plans during their respective future updates. The McIntosh County Joint Hazard Mitigation Plan will be presented to the committees and persons responsible for updating the Capital Improvement Plans, for their use in incorporating the hazard mitigation goals and strategies. In addition, relevant sections of this Hazard Mitigation Plan should be included in the next revision of the McIntosh County LEOP, as well as any other relevant plan update or development in the future. Estimation of potential damages and costs in the event of a natural hazard achieves two ends: it enables the identification of critical economic targets for hazard mitigation measures, as well as to enhance the ability to prioritize post-disaster response in aiding the community to recover. As an additional future plan, McIntosh County is currently pursuing development of a Disaster Recovery and Redevelopment Plan (DRRP), so the results from the 2018 HMP Update will be able to be incorporated into that new plan as well. The City of Darien has also been invited to participate in the DRRP.

SECTION II – MONITORING, EVALUATION, UPDATING

Monitoring & Evaluation

As determined by this planning process, the desire of the McIntosh County HMPUC is to review the plan and evaluate the status of the mitigation action steps at least once during the midpoint of the planning period (2018-2023), which would occur during year 2021. At the direction of the MEMA Director, the McIntosh County HMPUC members will be invited to convene in order to discuss the progress and whether any action or edits are required to the mitigation action steps or the plan itself. The meeting notice will also be posted on the County's website or in the local newspaper to invite the public and anyone new that had not been involved in the 2018 HMP Update process. The method of evaluation will consist of utilizing a checklist to determine what mitigation actions were undertaken, the completion date of these actions,

the cost associated with each completed action, and whether actions were deemed to be successful. This method was successful in the past; therefore, scheduling a midpoint progress meeting will again provide an opportunity to discuss the progress of the action items and maintain the partnerships that are essential for the sustainability of this hazard mitigation plan.

The MEMA Director will ensure the results of the evaluation(s) are reported to the McIntosh County Board of Commissioners, the Mayor and City Council of the City of Darien, as well as to any agencies or organizations having an interest in the hazard mitigation activities identified in the plan.

Updating

Per the requirements set forth in the Disaster Mitigation Act of 2000, McIntosh County is required to update and revise the plan every five years. Toward the end of the current planning period (2018-2023), the HMPUC will reconvene to work on the revision process and HMP Update. The revision process will include a firm schedule and timeline, and identify any agencies or organizations participating in the plan revision. The HMPUC will review the mitigation goals, objectives and action items to determine their relevance to changing situations in the county, as well as changes in State or Federal policy, and to ensure they are addressing current and expected conditions. The HMPUC will also review the risk assessment portion of the plan to determine if this information should be updated or modified, given any new available data.

No later than the conclusion of the five-year period following initial approval of the plan, the MEMA Director shall submit a revised Hazard Mitigation Plan to the Georgia Emergency Management Agency and the Federal Emergency Management Agency for their review and coordination. The MEMA Director will ensure the revised plan is presented to the McIntosh County Board of Commissioners for formal adoption. In addition, all holders of the HMP Update will be notified of affected changes.

Public Involvement

McIntosh County is dedicated to involving the public directly in review and revision of the Hazard Mitigation Plan Update. During this recent plan revision process, a public hearing was conducted near the beginning of the planning process and the HMPUC was re-established. The public was invited to volunteer for the HMPUC at the initial public hearing. The public was also given the opportunity to comment on the draft HMP Update. The draft HMP Update was posted on the County's website prior to submission to GEMA for their review and while it was under review with GEMA and being revised. After approved by GEMA, the public will be invited to provide comments at a County Commission meeting prior to the 2018 HMP Update being adopted by the McIntosh County Board of Commissioners and submitted to FEMA for approval. After the plan is adopted and approved, the public will also be invited to the midpoint evaluation meeting, in 2021, in which the MEMA Director and HMPUC will discuss progress and whether any action or edits are required to the mitigation action steps or the plan itself. In about five years, the public will be invited again to participate in the HMP Update process. During each of these steps, the public is offered a forum in which they can express concerns, opinions, or ideas about the Plan, as well discuss the maintenance and future updates to this Plan.

MEMA will continue to maintain documentation for all efforts of continued public involvement. This documentation will include newspaper clippings reflecting the advertised public hearing notice, sign-in sheets, meeting minutes, etc. All relevant information will be forwarded to GEMA and FEMA as a product of the proposed plan revision.

The HMP Update will be readily available upon request, and copies of the Plan will be available on the McIntosh County local government website, at McIntosh County Emergency Operations Center, and at the Darien Library. The McIntosh County Emergency Management Agency will be available to answer questions, comments, and any public input about the hazard mitigation process in McIntosh County.

CHAPTER 5 – CONCLUSION

SECTION I – SUMMARY

As a result of initiating the hazard mitigation planning process, McIntosh County officials have obtained a great deal of information and knowledge regarding the County's disaster history, the presence of natural hazards, the likelihood of each of these hazards occurring within the county, and the potential impacts and challenges these hazards present to the community.

The general planning process began with the identification of hazards that have occurred within McIntosh County over the past 68 years for most hazards and 176 years for others. This was followed with data collection of critical facilities within the community and updating the previous inventory. Assessments were then made to determine the vulnerability of the community to various hazards, and to determine hazard-specific losses. After evaluation of potential losses within the community, mitigation goals, objectives, and related action items were then prioritized and used to formulate a hazard mitigation action plan.

The planning process included the review of accomplished mitigations strategies. The HMPUC, being formally tasked by the McIntosh County Board of Commissioners, prepared the review. A public hearing was conducted at the onset of the project, providing McIntosh County citizens with the opportunity to participate in, comment on, and offer suggestions concerning disaster mitigation actions within the community. The public also had an opportunity to comment on the draft version of the 2018 HMP Update, which was posted online during the GEMA review process. Once approved by GEMA, the plan will be presented to the Board of Commissioners for approval, and the public will have an additional opportunity for comment. Following County approval, the plan will be submitted to FEMA for final approval.

The Committee found it difficult to predict the geographic threat and resulting impact of some natural disasters as compared to others. Tornadoes and related severe weather strike randomly, usually affecting a small, localized area. On the other hand, natural disasters such as coastal storms/hurricanes and drought can blanket the entire county, affecting all businesses, public facilities, and residents.

Recognizing this challenge, the McIntosh County HMPUC identified both general and specific measures to aid in the mitigation of natural hazards most likely to impact McIntosh County. These measures include, but are not limited to, the protection of public facilities and infrastructure, progressive government policies, and the proactive use of codes and regulations. In many instances, the implementation of one mitigation action step will effectively mitigate several hazards at once.

The mission of the McIntosh County Pre-Disaster Mitigation Planning Committee was:
to make our community less vulnerable to the effects of all hazards by identifying risks and community vulnerability, developing wise mitigation strategies and seeking hazard mitigation grant funding to implement chosen strategies to preserve the integrity of the community for future generations.

The Committee feels that this plan, when implemented, will help to make all of McIntosh County a safer place to live and work for all its citizens.

SECTION II – REFERENCES

Numerous sources were utilized to ensure the most complete planning document could be assembled. In an effort to ensure that all data sources consulted are cited, references are listed in the following format: 1) Publications, 2) Web Sites, 3) Other Sources.

Publications:

- FEMA Pre-Disaster Mitigation How-to Guides #1, 2, 3, 4, 5, 6, 7, 8, & 9 (FEMA)
- GEMA Supplements to FEMA Pre-Disaster Mitigation How-to Guides (GEMA)
- 2008 Georgia Hazard Mitigation Strategy Standard and Enhanced
- 2017 Regional Plan of Coastal Georgia
- 2008 McIntosh County Partial Comprehensive Plan Update
- 2013 McIntosh County Short Term Work Plan Update
- 2008 City of Darien Partial Comprehensive Plan Update
- Georgia Coast 2030: Population Projections for the 10-County Coastal Region, 2006
- Land Use Planning for Hazard Mitigation, Community Report for McIntosh County and City of Darien, 2013, Georgia Department of Community Affairs
- 2010 McIntosh County Community Wildfire Protection Plan
- 2014 State of Georgia Hazard Mitigation Strategy
- 2017 McIntosh County Hazard Risk Analyses (HAZUS modeling results), Coastal Regional Commission
- The Georgia County Guide 2009
- USGS Droughts in Georgia
- Georgia Wildfires of 2007 Summary of Facts and Costs of Recovery
- National Assessment of Shoreline Change: Part 2, USGS

Websites:

- FEMA (www.fema.gov)
- GEMA (www.gema.state.ga.us)
- NOAA, National Centers for Environmental Information (NCEI), Storm Event Database (www.ncdc.noaa.gov)
- NOAA, Historical Hurricane Tracks (https://coast.noaa.gov/hurricanes/)
- Georgia Governor's Office of Planning and Budget, Population Projections (https://opb.georgia.gov/population-projections)
- University of Nebraska-Lincoln, U.S. Drought Monitor (http://drought.unl.edu/MonitoringTools/USDroughtMonitor.aspx)

- Tax Digest Consolidated Summaries, Georgia Department of Revenue (https://dor.georgia.gov/tax-digest-consolidated-summaries)
- Georgia Coastal Hazards Portal (http://gchp.skio.uga.edu/)
- Southern Group of State Foresters, Wildfire Risk Assessment Portal (https://www.southernwildfirerisk.com/)

Other Sources:

- McIntosh County Tax Assessor
- Center for Disease Control
- NOAA, National Hurricane Center
- Georgia DNR, Coastal Resources Division
- Georgia DNR, Environmental Protection Division
- Georgia Forestry Commission
- U.S. Census Bureau (& American Community Survey)
- United States Department of Agriculture, Drought Information
- Southeast Regional Climatic Center
- National Drought Mitigation Center, US Drought Impacts
- United States Geological Survey, Office of Surface Water
- NOAA, Office of Hydrology