Augusta-Richmond County Hazard Mitigation Plan

ATKINS

Approved through October 10, 2020

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SECTION 1
INTRODUCTION

This section provides a general introduction to the Augusta-Richmond County Hazard Mitigation Plan. It consists of the following five subsections:

- 1.1 Background
- 1.2 Purpose
- 1.3 Scope
- 1.4 Authority
- 1.5 Summary of Plan Contents

1.1 BACKGROUND

Natural and man-made hazards, such as floods, hurricanes, and nuclear power plant incidents, are a part of the world around us. In some cases, their occurrence is natural and inevitable, and there is little we can do to control their force and intensity. In others, we have more power to control the intensity and probability, but can never truly eliminate the threat entirely. In either case, we must consider these hazards to be legitimate and significant threats to human life, safety, and property.

Augusta-Richmond County is located in the east central section of Georgia. This area is vulnerable to a wide range of natural hazards, such as severe thunderstorms/windstorms, winter storms, floods, and hurricanes/tropical storms. It is also vulnerable to technological and man-made hazards, including chemical hazards, terrorism, and nuclear power plant incidents. These hazards threaten the life and safety of residents in Augusta-Richmond County and have the potential to damage or destroy both public and private property, disrupt the local economy, and impact the overall quality of life of individuals who live, work, and vacation in Augusta-Richmond County.

While the threat from hazardous events may never be fully eliminated, there is much we can do to lessen their potential impact upon our community and our citizens. By minimizing the impact of hazards upon our built environment, we can prevent such events from resulting in disasters. The concept and practice of reducing risks to people and property from known hazards is generally referred to as *hazard mitigation*.

FEMA Definition of Hazard Mitigation:
"Any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards."

Hazard mitigation techniques include both structural measures (such as strengthening or protecting buildings and infrastructure from the destructive forces of potential hazards) and non-structural measures (such as the adoption of sound land use policies and the creation of public awareness programs). It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately

made. A comprehensive mitigation approach addresses hazard vulnerabilities that exist today and in the foreseeable future. Therefore, it is essential that projected patterns of future development are evaluated and considered in terms of how that growth will increase or decrease a community's overall hazard vulnerability.

A key component in the formulation of a comprehensive approach to hazard mitigation is to develop, adopt, and update a local hazard mitigation plan as needed. A hazard mitigation plan establishes the broad community vision and guiding principles for reducing hazard risk, and further proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

Augusta-Richmond County and the two municipalities participating in the Augusta-Richmond County Hazard Mitigation Plan have an existing hazard mitigation plan that has evolved over the years, as described in Section 2: *Planning Process*. This update of the plan draws from the previous plan to document the efforts of each jurisdiction to incorporate hazard mitigation principles and practices into routine government activities and functions. At its core, the Plan recommends specific actions to minimize hazard vulnerability and protect residents from losses to those hazards that pose the greatest risk. These mitigation actions go beyond simply recommending structural solutions to reduce existing vulnerability, such as elevation, retrofitting, and acquisition projects. Local policies on community growth and development, incentives for natural resource protection, and public awareness and outreach activities are examples of other actions considered to reduce Augusta-Richmond County's vulnerability to identified hazards. The Plan remains a living document, with implementation and evaluation procedures established to help achieve meaningful objectives and successful outcomes over time.

1.1.1 The Disaster Mitigation Act and the Flood Insurance Reform Acts

In an effort to reduce the Nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) in order to amend the Robert T. Stafford Disaster Relief and Emergency Assistance Act. Section 322 of DMA 2000 emphasizes the need for state, local, and Tribal government entities to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local or Tribal government applying for federal mitigation grant funds. In short, if a jurisdiction is not covered by an approved mitigation plan, it will not be eligible for mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation (PDM) program, both of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally-approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

Additionally, the Flood Insurance Reform Act of 2004 (P.L. 108-264) created two new grant programs, Severe Repetitive Loss (SRL) and Repetitive Flood Claim (RFC), and modified the existing Flood Mitigation Assistance (FMA) program. One of the requirements of this Act is that a FEMA-approved Hazard Mitigation Plan is now required if communities wish to be eligible for these FEMA mitigation programs. However, as of early 2014, these programs have been folded into a single Flood Mitigation Assistance (FMA) program.

This change was brought on by new, major federal flood insurance legislation that was passed in 2012 under the Biggert-Waters Flood Insurance Reform Act (P.L. 112-141) and the subsequent Homeowner Flood Insurance Affordability Act in 2014 which revised Biggert-Waters. These acts made several

changes to the way the National Flood Insurance Program is to be run, including raises in rates to reflect true flood risk and changes in how Flood Insurance Rate Map (FIRM) updates impact policyholders. These acts further emphasize Congress' focus on mitigating vulnerable structures.

The Augusta-Richmond County Hazard Mitigation Plan has been prepared in coordination with FEMA Region IV and the Georgia Emergency Management Agency (GEMA) to ensure that the Plan meets all applicable FEMA and state requirements for hazard mitigation plans. A *Local Mitigation Plan Review Tool*, found in Appendix C, provides a summary of federal and state minimum standards and notes the location where each requirement is met within the Plan.

1.2 PURPOSE

The purpose of the Augusta-Richmond County Hazard Mitigation Plan is to:

- Reduce risk to people, property, and the critical infrastructure;
- Increase public awareness and education about the plan and the planning process;
- Maintain grant eligibility for participating jurisdictions; and
- Maintain compliance with state and federal legislative requirements for local hazard mitigation plans.

1.3 SCOPE

The focus of the Augusta-Richmond County Hazard Mitigation Plan is on those hazards determined to be "high" or "moderate" risks to Augusta-Richmond County, as determined through a detailed hazard risk assessment. Other hazards that pose a "low" or "negligible" risk will continue to be evaluated during future updates to the Plan, but they may not be fully addressed until they are determined to be of high or moderate risk. This enables the participating jurisdictions to prioritize mitigation actions based on those hazards which are understood to present the greatest risk to lives and property.

The geographic scope (i.e., the planning area) for the Plan includes all of Augusta-Richmond County including all of its incorporated municipalities (see below). Richmond County includes three municipalities: Augusta, Blythe, and Hephzibah. The City of Augusta operates in conjunction with Richmond County as part of a consolidated government and thus, these communities are treated as a single entity in this plan as there are no unincorporated areas within the county. Additionally, Fort Gordon occupies a large section of the southwest part of the county and, although not an incorporated municipality, it is treated as a separate entity for the purposes of this Plan. **Table 1.1** indicates the participating jurisdictions.

TABLE 1.1: JURISDICTIONAL AREAS IN THE AUGUSTA-RICHMOND COUNTY HAZARD MITIGATION PLAN

Augusta-Richmond County	Fort Gordon
Blythe	Hephzibah

1.4 AUTHORITY

The Augusta-Richmond County Hazard Mitigation Plan has been developed in accordance with current state and federal rules and regulations governing local hazard mitigation plans and has been adopted by each participating jurisdiction in accordance with standard local procedures. Copies of the adoption resolutions for each participating jurisdiction are provided in Appendix A. The Plan shall be routinely monitored and revised to maintain compliance with the following provisions, rules, and legislation:

- Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390);
- FEMA's Final Rule published in the Federal Register, at 44 CFR Part 201 (201.6 for local mitigation planning requirements and 201.7 for Tribal planning requirements); and
- Flood Insurance Reform Act of 2004 (P.L. 108-264), Biggert-Waters Flood Insurance Reform Act of 2012 (P.L. 112-141) and the Homeowner Flood Insurance Affordability Act.

1.5 SUMMARY OF PLAN CONTENTS

The contents of this Plan are designed and organized to be as reader-friendly and functional as possible. While significant background information is included on the processes used and studies completed (i.e., risk assessment, capability assessment), this information is separated from the more meaningful planning outcomes or actions (i.e., mitigation strategy, mitigation action plan).

Section 2, ***Planning Process***, provides a complete narrative description of the process used to prepare the Plan. This includes the identification of participants on the planning team and describes how the public and other stakeholders were involved. It also includes a detailed summary for each of the key meetings held, along with any associated outcomes.

The ***Community Profile***, located in Section 3, provides a general overview of Augusta-Richmond County, including prevalent geographic, demographic, and economic characteristics. In addition, building characteristics and land use patterns are discussed. This baseline information provides a snapshot of the planning area and helps local officials recognize those social, environmental, and economic factors that ultimately play a role in determining the county's vulnerability to hazards.

The Risk Assessment is presented in three sections: Section 4, ***Hazard Identification***; Section 5, ***Hazard Profiles***; and Section 6, ***Vulnerability Assessment***. Together, these sections serve to identify, analyze, and assess hazards that pose a threat to Augusta-Richmond County. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of Augusta-Richmond County.

The Risk Assessment begins by identifying hazards that threaten Augusta-Richmond County. Next, detailed profiles are established for each hazard, building on available historical data from past hazard occurrences, spatial extent, and probability of future occurrence. This section culminates in a hazard risk ranking based on conclusions regarding the frequency of occurrence, spatial extent, and potential impact highlighted in each of the hazard profiles. In the vulnerability assessment, FEMA's Hazus®MH loss estimation methodology is used in conjunction with GIS analysis to evaluate known hazard risks by their relative long-term cost in expected damages. In essence, the information generated through the risk assessment serves a critical function as the participating jurisdictions in Augusta-Richmond County seek

to determine the most appropriate mitigation actions to pursue and implement—enabling them to prioritize and focus their efforts on those hazards of greatest concern and those structures or planning areas facing the greatest risk(s).

The ***Capability Assessment***, found in Section 7, provides a comprehensive examination of Augusta-Richmond County's capacity to implement meaningful mitigation strategies and identifies opportunities to increase and enhance that capacity. Specific capabilities addressed in this section include planning and regulatory capability, staff and organizational (administrative) capability, technical capability, fiscal capability, and political capability. Information was obtained through the use of a detailed survey questionnaire and an inventory and analysis of existing plans, ordinances, and relevant documents. The purpose of this assessment is to identify any existing gaps, weaknesses, or conflicts in programs or activities that may hinder mitigation efforts and to identify those activities that should be built upon in establishing a successful and sustainable local hazard mitigation program.

The *Risk Assessment*, and *Capability Assessment* collectively serve as a basis for determining the goals for the Augusta-Richmond County Hazard Mitigation Plan, each contributing to the development, adoption, and implementation of a meaningful and manageable *Mitigation Strategy* that is based on accurate background information.

The ***Mitigation Strategy***, found in Section 8, consists of broad goal statements as well as an analysis of hazard mitigation techniques for the jurisdictions participating in the Augusta-Richmond County Hazard Mitigation Plan to consider in reducing hazard vulnerabilities. The strategy provides the foundation for a detailed ***Mitigation Action Plan***, found in Section 9, which links specific mitigation actions for each jurisdiction to locally-assigned implementation mechanisms and target completion dates. Together, these sections are designed to make the Plan both strategic, through the identification of long-term goals, and functional, through the identification of immediate and short-term actions that will guide day-to-day decision-making and project implementation.

In addition to the identification and prioritization of possible mitigation projects, emphasis is placed on the use of program and policy alternatives to help make Augusta-Richmond County less vulnerable to the damaging forces of hazards while improving the economic, social, and environmental health of the community. The concept of multi-objective planning was emphasized throughout the planning process, particularly in identifying ways to link, where possible, hazard mitigation policies and programs with complimentary community goals related to disaster recovery, housing, economic development, recreational opportunities, transportation improvements, environmental quality, land development, and public health and safety.

Plan Maintenance, found in Section 10, includes the measures that the jurisdictions participating in the plan will take to ensure the Plan's continuous long-term implementation. The procedures also include the manner in which the Plan will be regularly evaluated and updated to remain a current and meaningful planning document.

SECTION 2
PLANNING PROCESS

This section describes the planning process undertaken to develop the Augusta-Richmond County Hazard Mitigation Plan. It consists of the following eight subsections:

- 2.1 Overview of Hazard Mitigation Planning
- 2.2 History of Hazard Mitigation Planning in Augusta-Richmond County
- 2.3 Preparing the 2017 Plan
- 2.4 The Augusta-Richmond County Hazard Mitigation Planning Team
- 2.5 Community Meetings and Workshops
- 2.6 Involving the Public
- 2.7 Involving the Stakeholders
- 2.8 Documentation of Plan Progress

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44 CFR Requirement
44 CFR Part 201.6(c)(1): The plan shall include documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process and how the public was involved.

2.1 OVERVIEW OF HAZARD MITIGATION PLANNING

Local hazard mitigation planning is the process of organizing community resources, identifying and assessing hazard risks, and determining how to best minimize or manage those risks. This process culminates in a hazard mitigation plan that identifies specific mitigation actions, each designed to achieve both short-term planning objectives and a long-term community vision.

To ensure the functionality of a hazard mitigation plan, responsibility is assigned for each proposed mitigation action to a specific individual, department, or agency along with a schedule or target completion date for its implementation (see Section 10: *Plan Maintenance*). Plan maintenance procedures are established for the routine monitoring of implementation progress, as well as the evaluation and enhancement of the mitigation plan itself. These plan maintenance procedures ensure that the Plan remains a current, dynamic, and effective planning document over time that becomes integrated into the routine local decision making process.

Communities that participate in hazard mitigation planning have the potential to accomplish many benefits, including:

- Saving lives and property
- Saving money
- Speeding recovery following disasters
- Reducing future vulnerability through wise development and post-disaster recovery and reconstruction

- Expediting the receipt of pre-disaster and post-disaster grant funding
- Demonstrating a firm commitment to improving community health and safety

Typically, communities that participate in mitigation planning are described as having the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that the investments made before a hazard event will significantly reduce the demand for post-disaster assistance by lessening the need for emergency response, repair, recovery, and reconstruction. Furthermore, mitigation practices will enable local residents, businesses, and industries to re-establish themselves in the wake of a disaster, getting the community economy back on track sooner and with less interruption.

The benefits of mitigation planning go beyond solely reducing hazard vulnerability. Mitigation measures such as the acquisition or regulation of land in known hazard areas can help achieve multiple community goals, such as preserving open space, maintaining environmental health, and enhancing recreational opportunities. Thus, it is vitally important that any local mitigation planning process be integrated with other concurrent local planning efforts, and any proposed mitigation strategies must take into account other existing community goals or initiatives that will help complement or hinder their future implementation.

2.2 HISTORY OF HAZARD MITIGATION PLANNING IN AUGUSTA-RICHMOND COUNTY

Each of the three participating jurisdictions has previously adopted a hazard mitigation plan. The FEMA approval date for this plan is listed below:

- *Augusta-Richmond County and the Cities of Blythe and Hephzibah Multi-Jurisdictional Hazard Mitigation Plan* (6/28/2012)

The plan was developed using the multi-jurisdictional planning process recommended by the Federal Emergency Management Agency (FEMA).

2.3 PREPARING THE 2017 PLAN

Local hazard mitigation plans are required to be updated every five years to remain eligible for federal mitigation funding. To simplify planning efforts, the jurisdictions in Augusta-Richmond County decided to join together to create the *Augusta-Richmond County Hazard Mitigation Plan*. This allows resources to be shared amongst the participating jurisdictions and eases the administrative duties of all of the participants.

To prepare the Plan, a team led by the consulting firm called Atkins was hired to provide professional mitigation planning services. To meet additional planning requirements of the Community Rating System (CRS), the planning process was facilitated under the direction of a professional planner. Ryan Wiedenman from Atkins served as the lead planner for this project and is a member of the American Institute of Certified Planners (AICP). Furthermore, CRS planning requirements from section 510 of the 2013 Coordinator's Manual are addressed throughout this plan. The intent is to try to maximize the number of CRS points for those jurisdictions that may wish to join the CRS Program in the future.

Currently, Augusta-Richmond County has prepared their CRS letter of interest and had a Community Assistance Visit (CAV) with the CRS Coordinator and Floodplain Administrator. The participation of the community in the National Flood Insurance Program (NFIP) was discussed. A review of the Flood Damage Prevention Ordinance, Special Flood Hazard Area (SFHA) permits and the procedures, elevation certificates, and floodproofing certificates, variance actions, review and implementation procedures for substantial damage and substantial improvement, and submit-for-rate flood insurance policy applications was performed and two Flood Damage Prevention Ordinance items were highlighted for updating. Upon an update of the referenced items, a rating will be granted and a future CAV will be scheduled.

Per the contractual scope of work, the consultant team followed the mitigation planning process recommended by FEMA (Publication Series 386 and Local Mitigation Plan Review Guide) and recommendations provided by Georgia Emergency Management Agency (GEMA) mitigation planning staff.[1] The Local Mitigation Plan Review Tool, found in Appendix C, provides a detailed summary of FEMA's current minimum standards of acceptability for compliance with DMA 2000 and notes the location where each requirement is met within this Plan. These standards are based upon FEMA's Final Rule as published in the Federal Register in Part 201 of the Code of Federal Regulations (CFR). The Planning Team used FEMA's Local Mitigation Plan Review Guide (October 2011) for reference as they completed the Plan.

Additionally, the Planning Team determined that it was important to include and analyze technological and man-made hazards in the plan to provide a more comprehensive approach to hazard management within the county. Although this is not a requirement as per regulations regarding hazard mitigation planning at the state or federal level, it is a noteworthy step in the direction of an all-hazards approach to risk analysis and management.

Key elements from the previously approved plan are referenced throughout the document (e.g., existing actions) and required a discussion of changes made. For example, all of the risk assessment elements needed to be updated to include most recent information. It was also necessary to review the goals for the county. The Capability Assessment section includes updated information for all of the participating jurisdictions and the Mitigation Action Plan provides implementation status updates for all of the actions identified in the previous plans.

During plan development, the following planning documents were reviewed and incorporated into the community profile, hazard identification, risk assessment, and capability assessment as appropriate:

- Augusta-Richmond County Comprehensive Plan
- City of Blythe Municipal Comprehensive Plan
- City of Hephzibah Municipal Comprehensive Plan
- Augusta-Richmond County Floodplain Management Plan
- Augusta-Richmond County Flood Insurance Study and Digital Flood Insurance Rate Maps
- Augusta-Richmond County Emergency Operations Plan
- City of Blythe Municipal Emergency Operations Plan

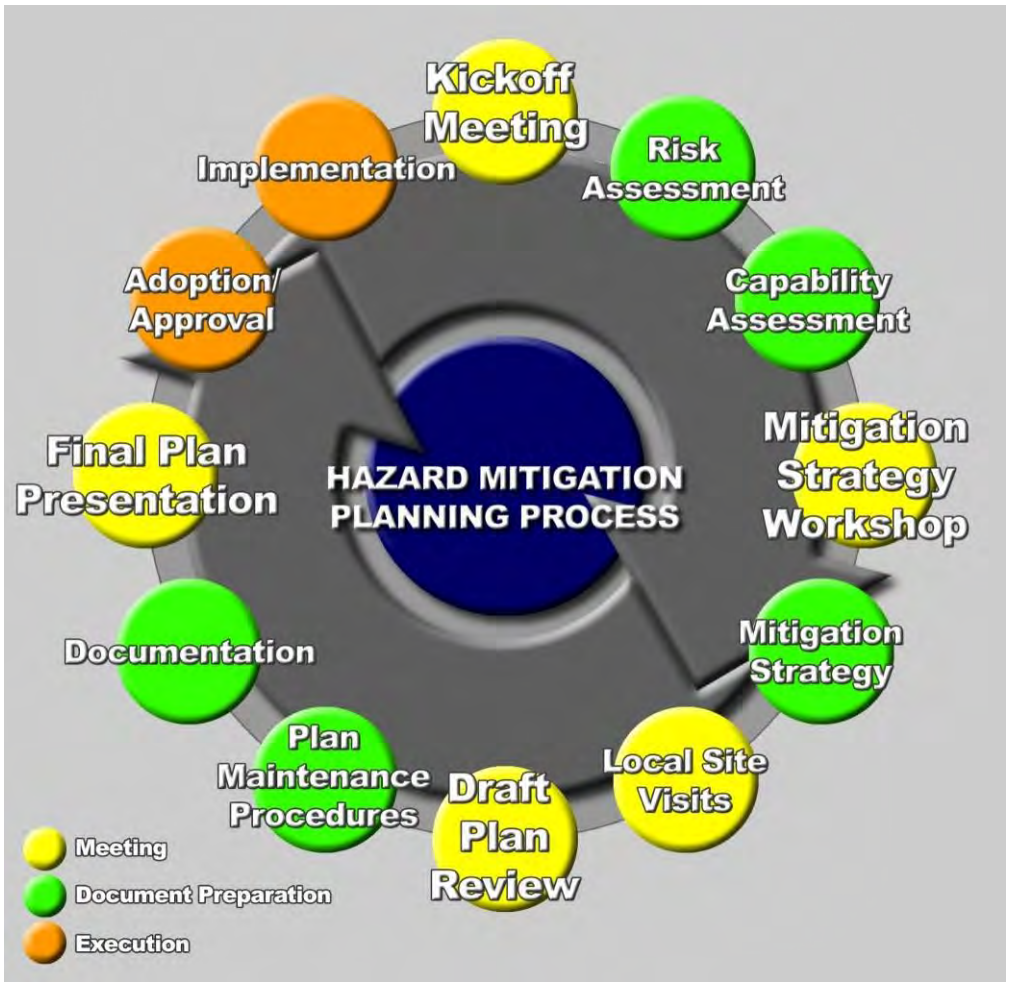
[1] A copy of the negotiated contractual scope of work between Augusta-Richmond County and Atkins is available through Augusta-Richmond County upon request.

- State of Georgia Hazard Mitigation Strategy

The process used to prepare this Plan included twelve major steps that were completed over the course of approximately eleven months beginning in June 2016. Each of these planning steps (illustrated in **Figure 2.1**) resulted in critical work products and outcomes that collectively make up the Plan. Specific plan sections are further described in Section 1: *Introduction*.

Over the past five years, each participating jurisdiction has been actively working to implement the existing plan. This is documented in the Mitigation Action Plan through the implementation status updates for each of the Mitigation Actions. The Capability Assessment also documents changes and improvements in the capabilities of each participating jurisdiction to implement the Mitigation Strategy.

FIGURE 2.1: MITIGATION PLANNING PROCESS FOR AUGUSTA-RICHMOND COUNTY



As is further detailed below, the planning process was conducted through Hazard Mitigation Planning Team meetings comprised primarily of local government staff from each of the participating jurisdictions and advisory stakeholders.

2.4 THE AUGUSTA-RICHMOND COUNTY HAZARD MITIGATION PLANNING TEAM

In order to guide the development of this Plan, Augusta-Richmond County and its jurisdictions created the Augusta-Richmond County Hazard Mitigation Planning Team (Hazard Mitigation Planning Team or Planning Team). The Hazard Mitigation Planning Team represents a community-based planning team made up of representatives from various county and municipal departments and other key stakeholders identified to serve as critical partners in the planning process.

Beginning in June 2016, the Hazard Mitigation Planning Team members engaged in regular discussions as well as local meetings and planning workshops to discuss and complete tasks associated with preparing the Plan. This working group coordinated on all aspects of plan preparation and provided valuable input to the process. In addition to regular meetings, Planning Team members routinely communicated and were kept informed through an e-mail distribution list.

Specifically, the tasks assigned to the Hazard Mitigation Planning Team members included:

- Participate in Hazard Mitigation Planning Team meetings and workshops
- Provide best available data as required for the risk assessment portion of the Plan
- Provide information that will help complete the Capability Assessment section of the plan and provide copies of any mitigation or hazard-related documents for review and incorporation into the Plan
- Support the development of the Mitigation Strategy, including the design and adoption of countywide goal statements
- Help design and propose appropriate mitigation actions for their department/agency for incorporation into the Mitigation Action Plan
- Review and provide timely comments on all study findings and draft plan deliverables
- Support the adoption of the 2017 *Augusta-Richmond County Hazard Mitigation Plan*

Table 2.1 lists the members of the Hazard Mitigation Planning Team who were responsible for participating in the development of the Plan. Planning Team members are listed in alphabetical order by last name.

TABLE 2.1: MEMBERS OF THE AUGUSTA-RICHMOND COUNTY HAZARD MITIGATION PLANNING TEAM

NAME	POSITION	DEPARTMENT/AGENCY
Jonathan Adriano	District Program Manager	East Central Health District
Martha R. Allen	City Clerk	City of Hephzibah
Sharon W. Bennett	Emergency Management Specialist	Augusta Emergency Management Agency
Johnnie Boyd	Captain	Paine College
Sharon Broady	Director	Augusta Animal Services
John Caran	Fire Marshal	Augusta Fire Department
Loriann Chancey	City Clerk	City of Blythe

NAME	POSITION	DEPARTMENT/AGENCY
Jasper Cooke	Director	CEPAR Augusta University
Sheila Fain	Facility Management Coordinator	Electrolux
Larry Felix, Jr.	Chief Ranger	Georgia Forestry
Jerry Germann	--	CERT Team 17
Dee Griffin	Public Information Officer/Fire Safety Educator	Augusta Fire Department
Gerald Hillman	Operation Manager	Richmond County Mosquito Control
Michael Hogue	Director, Emergency Department	Trinity Hospital
Christopher E. James	Fire Chief, Emergency Management Agency Director	Augusta Fire Department/ Emergency Management Agency
Carrie Jones	Events Manager	Golden Harvest Food Bank
Sterling Jones	Interim Dept. Director	Augusta 911
Mie Lucas	Disaster Preparedness Coordinator	Augusta Emergency Management Agency
Rev. Nellie Pearl Merriweather	--	CERT
Shelby Meyers	Hazard Mitigation Planner	Georgia Emergency Management and Homeland Security Agency
John Miller	Disaster Program Manager	Red Cross
Pamela Nestor	--	CERT
Vincent Pacchiana	Emergency Manager	Fort Gordon
Laura Radford	Hazard Mitigation Planner	Georgia Emergency Management and Homeland Security Agency
Paul Reyes	--	CERT Team 2
Jennifer Sosebee	Assistant Director, Plant Ops/ Safety Office	Trinity Hospital
Gail Simpkins	--	CERT
Steven Strickland	Major, Field Ops	Richmond County Sheriff's Office
Byron W. Taylor	Deputy Chief	Augusta Fire Department
Terri L. Turner	Development Services Administrator	Augusta Planning and Development
Rodney Way	Area Engineer	Georgia Department of Transportation
Tom Wiedmeier	Director	Augusta Utilities
Dennis Williams	Commissioner	Augusta-Richmond County Commission District 2
Randy Wishard	Environmental Health Director	Environmental Health, Richmond County Health Department

Additional participation and input from other identified stakeholders and the general public was sought by Augusta-Richmond County during the planning process through phone calls and the distribution of e-mails, advertisements, and public notices aimed at informing people of the development of the Hazard

Mitigation Plan (public and stakeholder involvement is further discussed later in this section). It should be noted that many neighboring communities, businesses, and other interested parties were offered the opportunity to participate in the planning process through email, phone conversations, and in-person discussions. Among those invited to participate were representatives from Columbia County, local representatives from Georgia Department of Public Health, local representatives from the Georgia Department of Environment and Natural Resources, Fort Gordon, the Salvation Army, and a number of local businesses. A full list and documentation of the initial email invitation to participate can be found in Appendix D. During these discussions, comments and suggestions received concerning the plan were integrated into the planning document.

2.4.1 Multi-Jurisdictional Participation

The *Augusta-Richmond County Hazard Mitigation Plan* includes Richmond County and its three incorporated municipalities. The City of Augusta operates in conjunction with Richmond County as part of a consolidated government and thus, these communities are treated as a single entity in this plan as there are no unincorporated areas within the county. To satisfy multi-jurisdictional participation requirements, the participating jurisdictions were required to perform the following tasks:

- Participate in mitigation planning workshops
- Identify completed mitigation projects, if applicable
- Develop and adopt (or update) their local Mitigation Action Plan

Each jurisdiction participated in the planning process and has developed a local Mitigation Action Plan unique to their jurisdiction. Each jurisdiction will adopt the plan which includes the individual Mitigation Action Plan that provides the means for jurisdictions to monitor and update their Plan on a regular basis.

2.5 COMMUNITY MEETINGS AND WORKSHOPS

The preparation of this Plan required a series of meetings and workshops for facilitating discussion, gaining consensus, and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the Plan. The following is a summary of the key meetings and community workshops held during the development of the plan update.[2] In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency, such as the approval of specific mitigation actions for their department or agency to undertake and include in the Mitigation Action Plan.

August 5, 2016
Kick-off Meeting
Augusta Commission Chambers

Chief Christopher James, Fire Chief for Augusta-Richmond County, opened the meeting by introducing himself and the consultant, Atkins. He outlined the process for developing and updating a hazard

[2] Copies of agendas, sign-in sheets, and minutes for all meetings and workshops can be found in Appendix D.

mitigation plan. He stated that the county could potentially receive funding for having a completed hazard mitigation plan.

Margaret Walton, Project Manager from the project consultant Atkins, led the meeting and began by providing an overview of the agenda items and briefly reviewed each of the handouts that were distributed in the meeting packets (agenda and presentation slides). She then asked each of the meeting attendees to introduce themselves. Following introductions, she provided a brief overview of the meeting agenda and the stages of the mitigation planning process that would be addressed through this plan. Ms. Walton emphasized that mitigation refers to actions (projects, policies, plans) to reduce the impacts of future hazard events. The hazard mitigation planning process looks at hazards, capability to conduct mitigation, and specific activities to reduce impacts of hazards. She explained how Federal legislation requires local governments to have a hazard mitigation plan in place to remain eligible for federal mitigation grants such as the Pre-Disaster Mitigation Grant Program, Hazard Mitigation Grant Program, and Flood Mitigation Assistance Program so there is funding to implement some of the actions that this plan may identify.

Ms. Walton then laid out all of the mitigation techniques/categories that mitigation actions fall into. She walked through the PowerPoint presentation to outline various examples of each technique and began a discussion of projects that the county and participating jurisdictions might pursue. Following this discussion, Ms. Walton led an icebreaker exercise.

She provided instructions to attendees on how to complete the exercise. Attendees were given an equal amount of fictitious FEMA money ($20 each) and asked to spend it in the various mitigation categories. Money could be thought of as grant money that communities received towards mitigation or areas that they feel are more of a priority. Given the windfall of financial resources, attendees target their money towards areas of mitigation that are of greatest concern. Ideally, the exercise helps pinpoint areas of mitigation that the community may want to focus on when developing mitigation grants. Ms. Walton explained that the results would be presented at the next Hazard Mitigation Planning Team meeting.

The results were:

- Public Education and Awareness- $97
- Prevention- $82
- Property Protection- $77
- Emergency Services- $72
- Structural Projects- $47
- Natural Resource Protection- $40

Ms. Walton shared the objectives of the plan to include updating the document for Augusta-Richmond County, maintaining funding eligibility for the city-county and its two municipalities, initiating the Community Rating System (CRS) for the jurisdictions, identifying potential projects, increasing public education and awareness, and maintaining State and Federal compliance. Then she spent some time explaining the CRS program and the benefits of it for a community as well as the ways to capitalize on points to gain a better class for the community thereby reducing flood insurance premiums for citizens.

Ms. Walton outlined the municipalities' roles in the processes and what would be needed to assist in developing the plan. The cycle of the project tasks was also shared and each phase was described to include the planning process and risk assessment.

Ms. Walton explained that in the risk assessment portion of the plan development that FEMA requires that plans address natural hazards, but an all-hazards approach is becoming more prevalent. She shared the previous hazards that were identified in the plan and asked the group to possibly decide if there were additional hazards they would like to add to the list. Additional hazards that were suggested were cyberterrorism, utility failure, infectious disease, climate adaptation, and solar EMP. Some manmade/technological hazards were included in the previous hazard identification, but the vulnerability assessment focuses more on the natural hazards since more mitigation funding is available for natural hazards.

Capability Assessment
Ms. Walton explained the community capability assessment and discussed how capability is divided primarily into 3 categories:

- Administrative
- Technical
- Fiscal

Mitigation Strategy
Ms. Walton discussed mitigation strategy and how it is developed. She stated that mitigation goals come from the existing plan and maybe adjusted and objectives may be added if the city-county desires to do that. The current mitigation actions will be updated as well with their status. However, all of the jurisdictions will need to develop new actions as well based on the risk assessment.

She continued the presentation by discussing the necessary documentation for the planning process, the rapid project schedule, and the project team.

Public Involvement
Ms. Walton explained how public comment and participation is a required part of this process. A public survey was developed that the city-county will be placing on their website. The link will be shared electronically following the meeting and local academic institutions were asked to disseminate the survey as well.

Next, Ms. Walton discussed the roles and responsibilities of all the parties involved as well as the expectations on the level of involvement. The Atkins team will provide technical assistance, data collection, facilitation, and plan preparation. The city-county and jurisdictions were asked to be active participants by assisting with data collection, public awareness, hosting planning team meetings, mitigation strategy, plan feedback, and plan adoption.

The next steps are to initiate data collection with the risk assessment and capability assessment. The floor was opened for questions and comments.

Ms. Walton then adjourned the meeting.

November 4, 2016
Risk Assessment and Mitigation Strategy Meeting
Augusta Commission Chambers

Chief Christopher James introduced himself and the project team from Atkins. He explained that this is a large part of our planning effort and appreciated everyone coming. Chief James then turned the meeting

November 4, 2016 Augusta-Richmond County HMPT Meeting

over to Ms. Walton, the project manager for Atkins. She asked who in the audience did not attend the previous meeting and asked them to introduce themselves. Individuals were from Emergency Management, Trinity Hospital, Electrolux, Augusta University, Augusta Utilities, Animal Services, Fire, City of Hephzibah, and Public Health. She mentioned that the meeting and presentation were informal and could be interrupted for any questions. Ms. Walton emphasized the importance of the potential funding for the participating jurisdictions and entities.

Ryan Wiedenman led the next portion of the meeting regarding the risk assessment. He explained that the Planning Team worked together to build a list of potential hazards.

Mr. Wiedenman with Atkins then presented the findings of the risk assessment. He stated that the risk assessment is the base of the mitigation plan and that we now have better data to update the hazard history. Mr. Wiedenman identified the three pieces of the risk assessment and the caveats for the risk assessment. He reviewed the Presidential Disaster Declarations that have impacted the region. He then explained the process for preparing Hazard Profiles and discussed how each hazard falls into one of four basic categories: Atmospheric, Hydrologic, Geologic, and Other. He indicated that each hazard must be evaluated and formally ruled out if it is not applicable to the study area, even where it seems obvious (such as in the case of landslide).

Mr. Wiedenman reviewed the Hazard Profiles and the following bullets summarize the information presented:

- CLIMATE CHANGE. It has been measured to some degree but not near as significantly as future occurrences. Future occurrences are likely.

- DROUGHT. There have been 0 events recorded since 1996 according to NCDC. Future occurrences are highly likely. The previous plan notes 3 severe droughts in 1986, 1998, and 2003.

- EARTHQUAKES. There have been 24 recorded earthquake events since 1812. There were 21 in Augusta and 3 in Hephzibah. The strongest had a recorded magnitude of VIII (MMI). Future occurrences are possible.

- EXTREME HEAT. There have been 0 recorded events since 1996 at the county level. Future occurrences are highly likely.

- FLOOD. There have been 24 flood events since 1996, 23 of them in Augusta and 1 at Ft. Gordon. Future occurrences are highly likely.

- HAIL. There have been 72 recorded events since 1955 at the county level; 55 in Augusta, 11 in Hephzibah, and 6 at Ft. Gordon. $30,716 in property damages were reported. Future occurrences are highly likely.

- HURRICANES AND TROPICAL STORMS. There have been 74 storm tracks that have come within 75 miles of the region since 1850. Future occurrences are likely.

- INFECTIOUS DISEASE OUTBREAK. Highly contagious types of infectious diseases have potential to cause major problems in concentrated areas. Future occurrences are possible.

- LIGHTNING. There has been 1 recorded lightning event in the region since 2012 resulting in $167,703 in reported property damages. 0 deaths and 3 injuries were reported. Future occurrences are highly likely.

- WINTER STORM AND FREEZE. There have been 8 recorded events since 2002. No deaths and 1 injury was reported. Future occurrences are likely.

- SOLAR EMP. There have been no major events recorded. Future occurrences are likely.

- TORNADOES. There have been 10 recorded tornado events reported since 1954. No deaths and 1 injury was reported. Future occurrences are likely.

- THUNDERSTORM / HIGH WINDS. There have been 182 thunderstorm events reported since 1955, 156 in Augusta, 12 in Hephzibah, and 9 at Ft. Gordon. 1 death and 36 injuries were reported. 4 million dollars were reported in property damages. Future occurrences are highly likely.

- WILDFIRE. The average is 38 fires annually. The annual average is 129 acres annually. Future occurrences are likely.

- CHEMICAL HAZARD. 339 reported events since 1971. 21 were reported as serious incidents as well as 27 injuries. Future occurrences are highly likely. $771,913 has been reported in property damage.

- CYBER TERRORISM. No previous cyber-attacks have occurred. Future occurrences are possible.

- DAM AND LEVEE FAILURE. No recorded events in the county. Future occurrences are unlikely.

- NUCLEAR PLANT INCIDENT. No major incidents have been reported. Future occurrences are unlikely.

- TERRORISM. No major events have occurred in the county. Future events are possible.

- UTILITY FAILURE (Power/Water). No events have been recorded. Ice storms or strong wind events are typically the cause. Future occurrences are possible.

During the hazard profile portion, specifics on each hazard were discussed. The initial hazard of discussion was climate change and it was suggested that it is a mix of drought and flooding. There was also some discussion on the number of repetitive loss properties. The group also requested that hail, tornado, and thunderstorm be examined separately. The Director of Public Health also shared that he

had more updated infectious disease statistics that can be included. The Planning Team suggested that more winter storm was available as well. Mr. Wiedenman stated that he tries to look at all of the hazards objectively.

The results of the hazard identification process were used to generate a Priority Risk Index (PRI), which categorizes and prioritizes potential hazards as high, moderate or low risk based on probability, impact, spatial extent, warning time, and duration. The highest PRI was assigned to Flood, Climate Change, Chemical Hazard, Drought, Extreme Heat, and Hurricane/Tropical Storm. It was decided that Hurricane/Tropical Storm and Severe Winter Storm should both be moved to moderate based on justification from the group. The discussion continued with the area experiences more windstorms to straight line winds over hurricane and this provide the rationale to lower the severity of Hurricane/Tropical Storm. Another topic of discussion was the idea of separating chemical hazards into fixed site incidents and transportation incidents and placing both of them in the high range. It was also suggested that climate change could be viewed as the effect from other hazards instead of a separate risk.

Ms. Walton then began the overview of the capability assessment. She stated the mechanism for how the capabilities are measured to include planning and regulatory capability, administrative and technical capability, fiscal capability, and political capability. Capability indicators included:

- National Flood Insurance Program (NFIP) Participation
- Community Rating System (CRS) Participation
- Building Code Effectiveness Grading Schedule (BCEGS)
- Local Capability Assessment Survey
    - Inventory and evaluation of existing plans, policies, programs and ordinances
    - Measures administrative, technical, fiscal and political capability

Ms. Walton stated that the current capabilities overall vary based on the size of the jurisdiction but that initiating the CRS program would provide a significant benefit to the community.

Next, Ms. Walton gave an overview of the public participation survey. She highlighted how the survey was disseminated and that 409 completed surveys were received. The highlights included that 90% of respondents are interested in making the community more resistant to hazards; 43% have already taken action to make their residences/homes/neighborhoods more hazard resistant; and 47% do not know who to contact regarding risk reduction. The variety of responses for each question were shared. The overarching summary shared that the highest importance was placed on emergency services, prevention, and public education and awareness.

The next portion of the meeting was focused on the mitigation strategy. Ms. Walton explained that the mitigation strategy stems from the findings of the risk assessment and public survey along with the capability assessment that will be completed and that the main purpose is to develop an action plan which is the most important part of the plan. Additional handouts of the mitigation action worksheet and potential mitigation goals were distributed. It was shared that the general idea of protecting life, health, and the safety of all citizens should be the focus. Information on exactly how to update the existing was detailed and examples were given. The steps to developing new mitigation actions were outlined as well and examples were given that might pertain to Augusta-Richmond County. Ms. Walton also reminded the group about the repetitive loss properties in the area as a reminder that actions for

mitigating flooding should be included. She also connected back to the capability assessment to encourage actions related to areas of weakness for the city-county.

Lastly, Ms. Walton stated that she would send the mitigation strategy documents out electronically and that she needed all feedback by December 2. Finally, the next steps of completing the mitigation strategy, drafting the plan, and submitting it were shared. She stated that she would be available to assist with mitigation action development and then asked if there were any questions. She then thanked the Planning Team for taking the time to attend and the meeting was adjourned.

2.6 INVOLVING THE PUBLIC

44 CFR Requirement
44 CFR Part 201.6(b)(1): The planning process shall include an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval.

An important component of the mitigation planning process involved public participation. Individual citizen and community-based input provides the entire Planning Team with a greater understanding of local concerns and increases the likelihood of successfully implementing mitigation actions by developing community "buy-in" from those directly affected by the decisions of public officials. As citizens become more involved in decisions that affect their safety, they are more likely to gain a greater appreciation of the hazards present in their community and take the steps necessary to reduce their impact. Public awareness is a key component of any community's overall mitigation strategy aimed at making a home, neighborhood, school, business or entire city safer from the potential effects of hazards.

Public involvement in the development of the Augusta-Richmond County Hazard Mitigation Plan was sought using three methods: (1) public meetings were held and were advertised in local media; (2) public survey instruments were made available in hard copy and online; and (3) the draft Plan deliverables were made available on the City website along with contact information for providing input.

The general public was provided three opportunities to be involved in the development of the Plan: (1) twice during the drafting stage of the Plan; and (2) upon completion of a final draft Plan, but prior to official Plan approval and adoption. During the drafting stage, open public meetings were held on August 5, 2016 and November 4, 2016. Additional information on these meetings can be found in Appendix D. In addition, a public participation survey (discussed in greater detail in Section 2.6.1) was made available during the planning process at various locations throughout the county and on the city website.

A final public meeting was held in conjunction with the Public Safety Committee meeting of the County Commission was held on February 28, 2017 at 1:00pm. The purpose of the meeting was to present the final plan and its findings and recommendations and so that the Public Safety Committee and public could ask questions and submit any final comments for review, consideration, and potential modification of the plan. No additional public comments for the plan were provided at this meeting. A draft of the plan as approved by the Public Safety Committee was then posted on the County website for public comment as well for 15 days to receive any additional feedback. The comments were directed to the project contractor, Atkins, and no comments or concerns were received.

2.6.1 Public Survey

The Hazard Mitigation Planning Team was successful in getting citizens to provide input to the mitigation planning process through the use of the *Public Participation Survey*. The *Public Participation Survey* was designed to capture data and information from residents of Augusta-Richmond County that might not be able to attend public meetings or participate through other means in the mitigation planning process.

Copies of the *Public Participation Survey* were distributed to the Hazard Mitigation Planning Team to be made available for residents to complete at local public offices. A link to an electronic version of the survey was also posted on the city website. A total of 409 survey responses were received, which provided valuable input for the Hazard Mitigation Planning Team to consider in the development of the plan update. Selected survey results are presented below.

- Approximately 49 percent of survey respondents had been impacted by a disaster, mainly winter/ice storms, tornadoes, hurricanes/tropical storms, floods, and severe storms/high wind.
- Respondents ranked Severe Winter Storm as the highest threat to their neighborhood (50 percent), followed by Nuclear Plant Incident (40 percent), Tornado (35 percent), Chemical Hazard (32 percent), and Extreme Heat (32 percent).
- Approximately 43 percent of respondents have taken actions to make their homes more resistant to hazards and 90 percent are interested in making their homes more resistant to hazards.
- 47 percent of respondents do not know what office to contact regarding reducing their risks to hazards.
- Emergency Services, Prevention, and Public Education and Awareness were ranked as the most important activities for communities to pursue in reducing risks.

A copy of the survey is provided in Appendix B and a detailed summary of the survey results are provided in Appendix D.

2.7 INVOLVING THE STAKEHOLDERS

44 CFR Requirement
44 CFR Part 201.6(b)(2): The planning process shall include an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other non-profit interests to be involved in the planning process.

At the beginning of the planning process for the development of this plan, the project consultant worked with the City Emergency Management Coordinator to initiate outreach to stakeholders to be involved in the planning process. The project consultant sent out a list of recommended stakeholders provided from FEMA Publication 386-1 titled **Getting Started: Building Support for Mitigation Planning**. The list of recommended stakeholders is found in Appendix C of that publication (Worksheet #1: Build the Planning Team) and has been included in Appendix B of this plan to demonstrate the wide range of stakeholders that were considered to participate in the development of this plan. The City Emergency

Management Coordinator used that list for reference as they invited stakeholders to participate in the planning process.

In addition to the efforts described above, Augusta-Richmond County went above and beyond the minimum requirements for stakeholder outreach by designing and distributing the *Public Participation Survey* described earlier in this section. In addition to collecting public input for the plan, the survey was generated to allow the stakeholders that could not attend Hazard Mitigation Planning Team Meetings the opportunity to provide input to the plan and the planning process. All survey results were shared with the Hazard Mitigation Planning Team and represented input from citizens, local officials, businesses, academia, and other private interests in the county and neighboring communities.

2.8 DOCUMENTATION OF PLAN PROGRESS

Progress in hazard mitigation planning for the participating jurisdictions in Augusta-Richmond County is documented in this plan update. Since hazard mitigation planning efforts officially began in the participating jurisdictions with the development of the initial Hazard Mitigation Plans in the late 1990s and early 2000s, many mitigation actions have been completed and implemented in the participating jurisdictions. These actions will help reduce the overall risk to natural hazards for the people and property in Augusta-Richmond County. The actions that have been completed are documented in the Mitigation Action Plan found in Section 9.

In addition, community capability continues to improve with the implementation of new plans, policies, and programs that help to promote hazard mitigation at the local level. The current state of local capabilities for the participating jurisdictions is captured in Section 7: *Capability Assessment*. The participating jurisdictions continue to demonstrate their commitment to hazard mitigation and hazard mitigation planning and have proven this by developing the Hazard Mitigation Planning Team to update the Plan and by continuing to involve the public in the hazard mitigation planning process.

SECTION 3
COMMUNITY PROFILE

This section of the Plan provides a general overview of Augusta-Richmond County and its participating municipalities. It consists of the following four subsections:

- 3.1 Geography and the Environment
- 3.2 Population and Demographics
- 3.3 Housing, Infrastructure, and Land Use
- 3.4 Employment and Industry

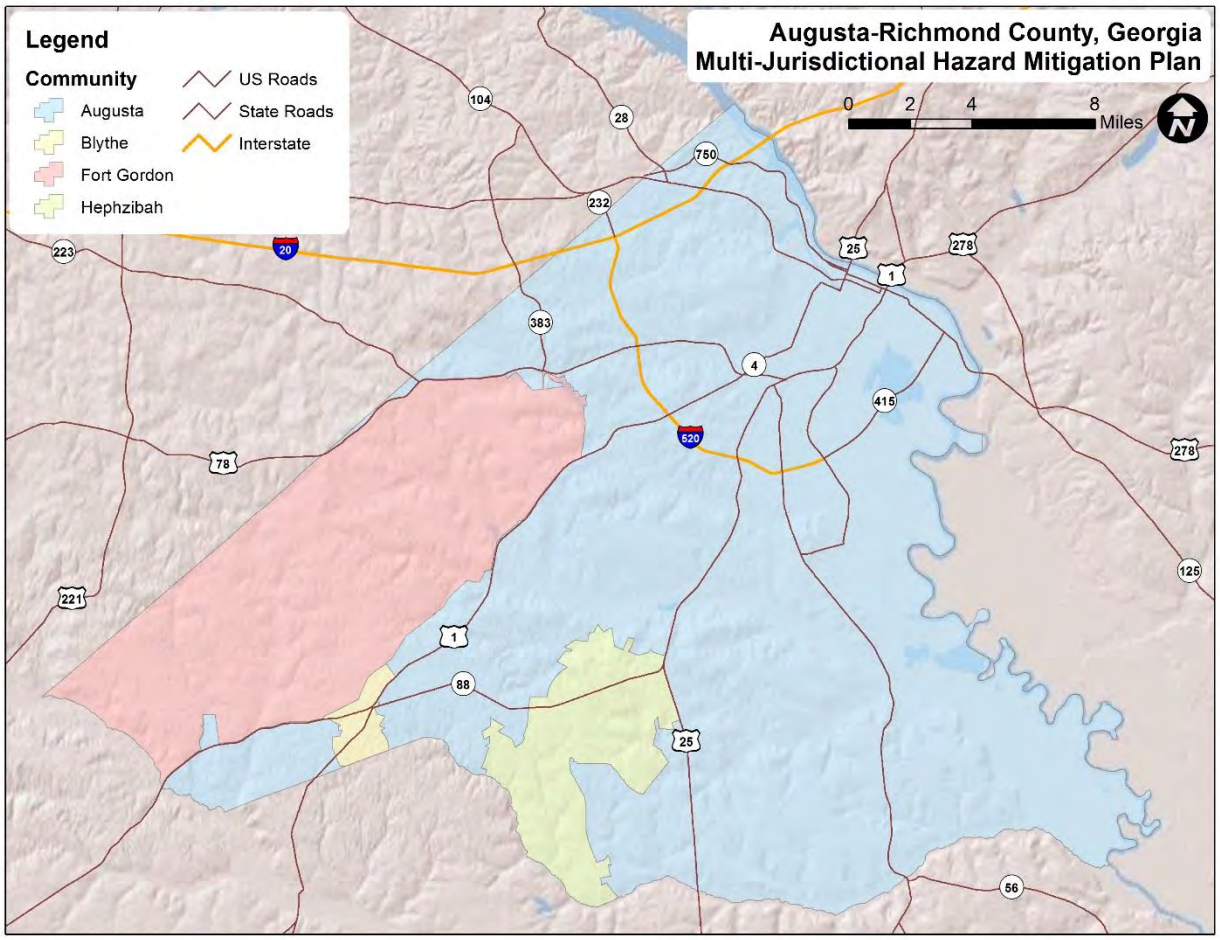
3.1 GEOGRAPHY AND THE ENVIRONMENT

Augusta-Richmond County is located in the east central section of Georgia, approximately 150 miles east of Atlanta on Interstate 20. In 1996, the City of Augusta consolidated with Richmond County to form Augusta-Richmond County. The cities of Blythe and Hephzibah are separate municipalities charted by the State of Georgia which are also included in this Plan. Additionally, Fort Gordon occupies a large section of the southwest part of the county and, although it is not an incorporated municipality, it is treated as a separate entity for the purposes of this Plan. An orientation map is provided as **Figure 3.1**.

Augusta-Richmond County is situated in three major land resource areas: the Southern Piedmont, the Carolina and Georgia Sand Hills, and the Southern Coastal Plain. The Southern Piedmont covers the extreme northern part of the county and consists of broad to narrow ridgetops and long irregular hillsides bisected by numerous small winding drainageways. The Carolina and Georgia Sand Hills are located in the northern and western parts of the county and separate the Southern Piedmont from the Southern Coastal Plain. The Southern Coastal Plain covers the southern and southeastern parts of the county and is characterized by broad ridgetops and hillsides extending to drainageways. Nearly level floodplains of the Savannah River are located in the eastern and northern parts of the county and on the narrower basins of its tributaries.

Elevations range between 100 and 140 feet along the Savannah River and 500 feet or more on high ridges on Fort Gordon. More than half of the total land area has a slope of less than 5 percent, and more than 85 percent of the land has less than 10 percent slope. Less than 2 percent of the land area has slope greater than 15 percent. The steepest slopes are found along Butler, Spirit, and Little Spirit Creeks. The majority of areas with steep slopes are either within floodplains, which are regulated by local ordinance, or are located on Fort Gordon.

FIGURE 3.1: AUGUSTA-RICHMOND COUNTY ORIENTATION MAP



The total land area of each of the participating jurisdictions is presented in **Table 3.1**.

TABLE 3.1: TOTAL LAND AREAS OF PARTICIPATING JURISDICTIONS

Jurisdiction	Total Land Area
Augusta-Richmond County	229.39 square miles
Blythe	2.56 square miles
Fort Gordon	69.43 square miles
Hephzibah	19.51 square miles

Source: Augusta GIS

Augusta-Richmond County has a humid subtropical climate. It experiences mild winters and a humid summer. The average high temperature for the summer months is 90.6 degrees Fahrenheit. Summer daytime temperatures can soar to 100 degrees Fahrenheit or above. The average low temperature is 67.8 degrees Fahrenheit. The average high temperature for the winter months is 58.9 degrees Fahrenheit; the average low temperature is 34.4 degrees Fahrenheit.

Snowfall is not nearly as common as in Atlanta, due largely to the Augusta-Richmond County's elevation, with downtown Augusta being about 900 feet lower than downtown Atlanta. Still, snow flurries are typically seen annually. Freezing rain is also a threat in wintertime.

Augusta-Richmond County has a relatively mild climate characterized by long hot summers and short cool winters. Prevailing winds are from the southeast and southwest, bringing in moist tropical air from the Atlantic Ocean and the Gulf of Mexico. In summer, the average temperature is 79 degrees Fahrenheit, and the average daily high exceeds 90 degrees Fahrenheit in June, July, and August. In winter, the average temperature is 47 degrees Fahrenheit, and the average daily minimum temperature is 35 degrees Fahrenheit. Total annual precipitation is 46 inches, with 23 inches falling in April through September. Annual precipitation amounts have been below normal for the last 50 years. The average relative humidity in mid-afternoon is about 50 percent. Humidity is higher at night, and the average at dawn is about 90 percent.

3.2 POPULATION AND DEMOGRAPHICS

Between 2000 and 2010, the county experienced minimal population growth. However, Fort Gordon had a higher rate of growth compared to the rest of the county. Population counts from the U.S. Census Bureau for 1990, 2000, and 2010 for each of the participating jurisdictions are presented in **Table 3.2**.

TABLE 3.2: POPULATION COUNTS FOR PARTICIPATING JURISDICTIONS

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	% Change 2000-2010
Richmond County	**189,719**	**199,775**	**200,549**	**0.4%**
Augusta-Richmond County (balance)*	177,816	187,428	186,852	-0.3%
Blythe†	300	718	721	0.4%
Fort Gordon CCD‡	9,140	7,754	8,992	16.0%
Hephzibah	2,466	3,880	4,011	3.4%

*1990 Census data for unincorporated Richmond County excluding Fort Gordon (133,177) and the City of Augusta (44,639) were combined to provide a better comparison with 2000 and 2010 data after the city and county were consolidated.
†The population counts for the City of Blythe include population residing in neighboring Burke County (3 in 1990, 5 in 2000, and 27 in 2010). Note: these populations are not included in the Richmond County total.
‡A Census County Division (CCD) is a subdivision of a county that is a relatively permanent statistical area. The population counts for Fort Gordon CCD were subtracted from the Augusta-Richmond County balance counts (195,182 in 2000 and 195,844 in 2010) to prevent duplication.
Source: United States Census Bureau, 1990, 2000, and 2010 Census

Based on the 2010 Census, the median age of residents in Augusta-Richmond County is 33.2. The racial characteristics of the participating jurisdictions are presented in **Table 3.3**. Generally, African Americans make up the majority of the population in the county accounting for over 54 percent of the population overall. However, the cities of Blythe and Hephzibah as well as Fort Gordon have majority populations that are Caucasian.

TABLE 3.3: DEMOGRAPHICS OF PARTICIPATING JURISDICTIONS

Jurisdiction	White, Percent (2010)	Black or African American, Percent (2010)	American Indian or Alaska Native, Percent (2010)	Asian, Percent (2010)	Native Hawaiian or Other Pacific Islander, Percent (2010)	Other Race, Percent (2010)	Two or More Races, percent (2010)	Persons of Hispanic Origin, Percent (2010)*
Richmond County	**39.7%**	**54.2%**	**0.3%**	**1.7%**	**0.2%**	**1.3%**	**2.6%**	**4.1%**
Augusta-Richmond County (balance)	38.1%	56.1%	0.3%	1.6%	0.2%	1.2%	2.4%	3.6%
Blythe	81.1%	14.0%	0.4%	0.6%	0.0%	1.1%	2.8%	4.3%
Fort Gordon CCD‡	59.7%	26.9%	0.7%	2.6%	0.6%	3.5%	5.9%	14.1%
Hephzibah	62.1%	33.7%	0.2%	0.4%	0.1%	0.6%	2.9%	3.1%

*Hispanics may be of any race, so also are included in applicable race categories
‡A Census County Division (CCD) is a subdivision of a county that is a relatively permanent statistical area. The demographic counts for Fort Gordon CCD were removed from the Augusta-Richmond County balance counts to prevent duplication.
Source: United States Census Bureau, 2010 Census

3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

3.3.1 Housing

According to the 2010 U.S. Census, there were 86,331 housing units in Augusta-Richmond County, the majority of which are single family homes. Housing information for each of the participating jurisdictions is presented in **Table 3.4**. As shown in the table, Augusta-Richmond County has a very low percentage of seasonal housing across the jurisdictions; however, the City of Blythe has a slightly higher rate compared to the rest of the county.

TABLE 3.4: HOUSING CHARACTERISTICS OF PARTICIPATING JURISDICTIONS

Jurisdiction	Housing Units (2000)	Housing Units (2010)	Seasonal Units, Percent (2010)	Median Home Value (2011-2015)
Richmond County	**82,312**	**86,331**	**0.5%**	**$101,900**
Augusta-Richmond County (balance)	79,590	83,265	0.5%	$101,900
Blythe†	262	305	2.0%	$82,900
Fort Gordon CCD‡	891	1,162	0.0%	--
Hephzibah	1,570	1,613	0.5%	$117,000

†The housing unit counts for the City of Blythe include units located in neighboring Burke County (1 in 2000 and 14 in 2010). Note: these housing units are not included in the Richmond County total.
‡A Census County Division (CCD) is a subdivision of a county that is a relatively permanent statistical area. The housing counts for Fort Gordon CCD were subtracted from the Augusta-Richmond County balance counts (80,481 in 2000 and 84,427 in 2010) to prevent duplication.
Source: United States Census Bureau, 2000 and 2010 Census, 2011-2015 American Community Survey 5-Year Estimates

3.3.2 Infrastructure

Transportation

Augusta-Richmond County is served by a road network that includes a mix of interstate highways, federal highways, and state routes as well as numerous local roads. The county is well connected to the surrounding areas in Georgia and South Carolina. Interstate 20 runs east to west crossing the northwestern corner of the county and linking Atlanta, Georgia and Columbia, South Carolina. Interstate 520 (known as Bobby Jones Expressway in Georgia and as Palmetto Parkway in South Carolina) is an auxiliary circumferential interstate that begins in the northern part of Augusta-Richmond County, encircles Augusta, and converges with Interstate 20 in North Augusta, South Carolina. U.S. 1 runs north to south through Georgia linking Charlton County in southern Georgia with Augusta-Richmond County and also connecting it with the Sandhills region of South Carolina. U.S. 25 connects Brunswick, Georgia to Augusta-Richmond County before crossing the Savannah River into South Carolina. U.S. 78 connects Haralson County, Georgia with Augusta-Richmond County and continues on to Charleston, South Carolina. U.S. 278 is an east-west highway that connects Augusta-Richmond County with Cedartown, Georgia on the Georgia/Alabama state line and with Hilton Head Island in South Carolina.

The Augusta Regional Airport [at Bush Field] serves Augusta-Richmond County. The airport is a city-owned and operated, public use airport. Currently, two primary commercial airlines operate daily services to Atlanta, Georgia and Charlotte, North Carolina. A second smaller airport, Daniel Field, also operates in Augusta-Richmond County. This airport is publicly-owned and operated by the General Aviation Commission and it is primarily used by corporate and private clients for business and recreational purposes.

Passenger rail service is not available in Augusta-Richmond County at this time. However, freight service is provided by two railroads, Norfolk Southern and CSX Transportation, Inc.

Augusta-Richmond County also provides comprehensive public transportation services through Augusta Public Transit. These include the fixed route bus service that operates 9 fixed routes, access to ADA (Para transit) service, and the Richmond Rural Transit service.

Utilities

Electrical power in Augusta-Richmond County is provided by Georgia Power and Jefferson Energy Cooperative. Georgia Power is a major provider across the state of Georgia. Jefferson Energy Cooperative is an electric cooperative that supplies electric services to 11 counties within Georgia, including a portion of Augusta-Richmond County.

Natural gas deregulation in Georgia allows Atlanta Gaslight Company to store and distribute natural gas in its facilities (pipelines, storage facilities, and other supporting services) and marketers to sell this natural gas to consumers. As a result, consumers are able to choose their natural gas supplier and there are a number of certified independent gas suppliers that serve Augusta-Richmond County.

The Augusta Utilities Department is responsible for the operation and maintenance of the water and sewerage systems in Augusta-Richmond County. Generally, the service area can be characterized as having complete water service coverage for potential customers who wish to connect to the system. An agreement was signed by Augusta-Richmond County and Fort Gordon to provide water and wastewater services on Fort Gordon for 50 years starting in 2008. The cities of Blythe and Hephzibah provide water

service within their respective jurisdictions. Fort Gordon and the cities of Blythe and Hephzibah have separate sewer systems.

Community Facilities

There are a number of public buildings and community facilities located throughout Augusta-Richmond County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 3 emergency management facilities, 24 fire stations, 27 government facilities, 13 law enforcement facilities, 25 medical facilities, 6 private sector facilities, 81 schools, 7 transportation facilities, 12 universities, and 33 utility facilities located within the study area.

Augusta-Richmond County has a long history of service in the field of medicine. There are several major medical hospitals in Augusta-Richmond County. These facilities include acute care hospitals, psychiatric facilities, and extended care centers, such as University Hospital, Charlie Norwood Veterans Administration Medical Center, Trinity Hospital of Augusta (formerly St. Joseph Hospital), Walton Rehabilitation Hospital, Doctors Hospital, East Central Regional Hospital at Augusta, Dwight David Eisenhower Army Medical Center, Medical College of Georgia (MCG) and Hospitals, and Select Specialty Hospital.

Augusta-Richmond County also offers many cultural amenities including six library branches, multiple museums, a civic center, auditoriums, and performing arts facilities as well as other attractions such as the Riverwalk Augusta, Augusta Botanical Gardens, Springfield Village Park, Augusta Common, Lake Olmstead Stadium, Phinizy Swamp Nature Park, and Augusta Canal National Heritage Area.

3.3.3 Land Use

Augusta-Richmond County is characterized by land uses reflecting an older city combined with newer suburbs and semi-rural areas. Land use within the old city limits (prior to consolidation) includes neighborhoods of varying ages, a central business district, concentrations of public/institutional uses commercial uses in shopping centers and on individual sites, and industrial uses on scattered sites. These uses are connected by a series of streets and highways, most of which are laid out on a grid pattern. In many cases, residential, commercial, and industrial uses are in close proximity to one another, reflecting development that occurred prior to enactment of the local zoning ordinance. In contrast, the land that was formerly in unincorporated Richmond County is characterized by a land use pattern more like a community that developed after World War II. Major urban land uses (residential, commercial, industrial, and institutional) are separated from one another. Strip commercial development is prevalent along all of the major arterial highways and consists of shopping centers, office complexes, and businesses on individual sites. Major manufacturing plants are situated in industrial parks or on individual sites in close proximity to highways and railroad lines. At the fringe of the urbanized area, development becomes sparse and gives way to more open space, the occasional farm, residences on larger lots, and woodlands. Local land use and associated regulations are further discussed in *Section 7: Capability Assessment.*

3.4 EMPLOYMENT AND INDUSTRY

Augusta-Richmond County has a diversified economy. Employment is highest in the service, retail trade, and manufacturing sectors. Manufacturing facilities in the city produce textiles, paper products, chemicals, transportation equipment, and food products. Retail trade establishments are located in the

downtown, in shopping centers on major roads, and on individual sites and provide for the daily needs of area residents. Large facilities such as Augusta Mall and Augusta Exchange draw customers from throughout the region.

Major employers in the service sector include health care and related facilities, educational institutions, and business service establishments. Nine hospitals are the most visible component of the health care industry. Additional health care jobs are provided at clinics, nursing homes, laboratories, and the offices of doctors, dentists, and other health care practitioners. Major educational institutions providing employment include the Medical College of Georgia, Paine College, Augusta State University, Augusta Technical College, and the Richmond County Board of Education.

According to the 2011 to 2015 American Community Survey (ACS) 5-year estimates, in 2015, Augusta-Richmond County had an average annual employment of 85,027 workers and an average unemployment rate of 12.0 percent (compared to 9.7 percent for the state). In 2015, the Educational Services, and Health Care and Social Assistance industry employed 26.1 percent of the workforce followed by Retail Trade (13.1%); Arts, Entertainment, and Recreation, and Accommodation and Food Services (11.2%); Professional, Scientific, and Management, and Administrative and Waste Management Services (10.3%); and Manufacturing (9.4%). In 2015, the average annual median household income in Augusta-Richmond County was $37,337 compared to $49,620 in the state of Georgia.

SECTION 4
HAZARD IDENTIFICATION

This section describes how the Planning Team identified the hazards to be included in this Plan. It consists of the following five subsections:

- 4.1 Overview
- 4.2 Description of Full Range of Hazards
- 4.3 Disaster Declarations
- 4.4 Hazard Evaluation
- 4.5 Hazard Identification Results

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

4.1 OVERVIEW

Augusta-Richmond County is vulnerable to a wide range of natural and human-caused hazards that threaten life and property. Current FEMA regulations and guidance under the Disaster Mitigation Act of 2000 (DMA 2000) require, at a minimum, an evaluation of a full range of natural hazards. An evaluation of human-caused hazards (i.e., technological hazards, terrorism, etc.) is encouraged, though not required, for plan approval. Augusta-Richmond County has included an assessment of both types of hazards.

Upon a review of the full range of natural hazards suggested under FEMA planning guidance, the participating jurisdictions in the Augusta-Richmond County planning area (Augusta-Richmond County, City of Blythe, and City of Hephzibah) have identified a number of hazards that are to be addressed in their Multi-Jurisdictional Hazard Mitigation Plan. These hazards were identified through an extensive process that utilized input from Augusta-Richmond County Hazard Mitigation Planning Team members, research of past disaster declarations in the county,[1] and review of the Georgia State Hazard Mitigation Plan. Readily available information from reputable sources (such as federal and state agencies) was also evaluated to supplement information from these key sources.

Table 4.1 lists the full range of hazards initially identified for inclusion in the Plan and provides a brief description for each. This table includes 29 individual hazards. Some of these hazards are considered to be interrelated or cascading, but for preliminary hazard identification purposes these individual hazards are broken out separately.

Next, **Table 4.2** lists the disaster declarations in Augusta-Richmond County.

[1] A complete list of disaster declarations for Augusta-Richmond County can be found below in Section 4.3.

Next, **Table 4.3** documents the evaluation process used for determining which of the initially identified hazards are considered significant enough to warrant further evaluation in the risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table works to summarize not only those hazards that *were* identified (and why) but also those that *were not* identified (and why not). Hazard events not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the Hazard Mitigation Planning Team during the plan update process.

Lastly, **Table 4.4** provides a summary of the hazard identification and evaluation process noting that 19 of the 29 initially identified hazards are considered significant enough for further evaluation through this Plan's risk assessment (marked with a "☑").

It should also be noted that in addition to the hazards listed below, this plan also considers the impacts of climate change on Augusta-Richmond County. Since climate change will have the greatest effect in terms of how it exacerbates other hazards already identified in this plan, it was not identified as its own hazard in this section of the plan, but its impacts will be discussed further in Sections 5 and 6 of the plan.

4.2 DESCRIPTION OF FULL RANGE OF HAZARDS

TABLE 4.1: DESCRIPTIONS OF THE FULL RANGE OF INITIALLY IDENTIFIED HAZARDS

Hazard	Description
NATURAL HAZARDS	
Avalanche	A rapid fall or slide of a large mass of snow down a mountainside.
Drought	A prolonged period of less than normal precipitation such that the lack of water causes a serious hydrologic imbalance. Common effects of drought include crop failure, water supply shortages, and fish and wildlife mortality. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. Human demands and actions have the ability to hasten or mitigate drought-related impacts on local communities.
Earthquake	A sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the surface. This movement forces the gradual building and accumulation of energy. Eventually, strain becomes so great that the energy is abruptly released, causing the shaking at the earth's surface which we know as an earthquake. Roughly 90 percent of all earthquakes occur at the boundaries where plates meet, although it is possible for earthquakes to occur entirely within plates. Earthquakes can affect hundreds of thousands of square miles; cause damage to property measured in the tens of billions of dollars; result in loss of life and injury to hundreds of thousands of persons; and disrupt the social and economic functioning of the affected area.
Erosion	Erosion is the gradual breakdown and movement of land due to both physical and chemical processes of water, wind, and general meteorological conditions. Natural, or geologic, erosion has occurred since the Earth's formation and continues at a very slow and uniform rate each year.

Expansive Soils	Soils that will exhibit some degree of volume change with variations in moisture conditions. The most important properties affecting degree of volume change in a soil are clay mineralogy and the aqueous environment. Expansive soils will exhibit expansion caused by the intake of water and, conversely, will exhibit contraction when moisture is removed by drying. Generally speaking, they often appear sticky when wet, and are characterized by surface cracks when dry. Expansive soils become a problem when structures are built upon them without taking proper design precautions into account with regard to soil type. Cracking in walls and floors can be minor, or can be severe enough for the home to be structurally unsafe.
Extreme Cold	Extreme cold is generally considered to occur when the temperature is at or below freezing for a period of time. Often these events are associated with winter storms and other winter weather, but extreme cold events can occur on their own. Dangers associated with extreme cold events include frostbite and hypothermia among other impacts to people and these events can often last for several days or weeks in a row.
Extreme Heat	A heat wave may occur when temperatures hover 10 degrees or more above the average high temperature for the region and last for several weeks. Humid or muggy conditions, which add to the discomfort of high temperatures, occur when a "dome" of high atmospheric pressure traps hazy, damp air near the ground. Excessively dry and hot conditions can provoke dust storms and low visibility. A heat wave combined with a drought can be very dangerous and have severe economic consequences on a community.
Flooding	The accumulation of water within a water body which results in the overflow of excess water onto adjacent lands, usually floodplains. The floodplain is the land adjoining the channel of a river, stream ocean, lake or other watercourse or water body that is susceptible to flooding. Most floods fall into the following three categories: riverine flooding, coastal flooding, or shallow flooding (where shallow flooding refers to sheet flow, ponding and urban drainage).
Hail	Any storm that produces hailstones that fall to the ground; usually used when the amount or size of the hail is considered significant. Hail is formed when updrafts in thunderstorms carry raindrops into parts of the atmosphere where the temperatures are below freezing.
Hurricane/Tropical Storm	Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and with a diameter averaging 10 to 30 miles across. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves and tidal flooding which can be more destructive than cyclone wind. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea and Gulf of Mexico during the official Atlantic hurricane season, which extends from June through November.

Infectious Disease	Public health threats are often defined by a biological agent/disease that may result in mass casualties or an outbreak of symptoms in those affected. Often emerging diseases are the greatest threat because they are new or varied iterations of existing threats and the population may not have built up a collective immunity to the disease.
Landslide	The movements of a mass of rock, debris, or earth down a slope when the force of gravity pulling down the slope exceeds the strength of the earth materials that comprise to hold it in place. Slopes greater than 10 degrees are more likely to slide, as are slopes where the height from the top of the slope to its toe is greater than 40 feet. Slopes are also more likely to fail if vegetative cover is low and/or soil water content is high.
Land Subsidence/Sinkhole	The gradual settling or sudden sinking of the Earth's surface due to the subsurface movement of earth materials. Causes of land subsidence include groundwater pumpage, aquifer system compaction, drainage of organic soils, underground mining, hydrocompaction, natural compaction, sinkholes, and thawing permafrost.
Lightning	Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes, but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 73 people are killed each year by lightning strikes in the United States.
Nor'easter	Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful. Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding.
Severe Winter Storm	Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Blizzards, the most dangerous of all winter storms, combine low temperatures, heavy snowfall, and winds of at least 35 miles per hour, reducing visibility to only a few yards. Ice storms occur when moisture falls and freezes immediately upon impact on trees, power lines, communication towers, structures, roads and other hard surfaces. Winter storms and ice storms can down trees, cause widespread power outages, damage property, and cause fatalities and injuries to human life.
Solar Flare/EMP	According to NOAA, solar flares are large outbursts of electromagnetic radiation from the Sun lasting from minutes to hours. They are caused by magnetic reconnection associated with large-scale eruptions of magnetic flux called "coronal mass ejections" (CMEs). Solar flares occur in a large range of strengths and are classified on a logarithmic scale based on their intensity in the 1-minute averaged NOAA/GOES XRS instrument's 0.1 -- 0.8 nm spectral band, with the smallest flares being labeled "A" flares, the next (10 times) larger called "B" flares, the next larger "C" flares, followed by the fairly large "M" flares, and finally the largest "X" flares.

Storm Surge	A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to more than 30 feet in a Category 5 storm. Storm surge heights and associated waves are also dependent upon the shape of the offshore continental shelf (narrow or wide) and the depth of the ocean bottom (bathymetry). A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. Storm surge arrives ahead of a storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Storm surge can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast. Further, water rise caused by storm surge can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas.
Tornado	A tornado is a violently rotating column of air that has contact with the ground and is often visible as a funnel cloud. Its vortex rotates cyclonically with wind speeds ranging from as low as 40 mph to as high as 300 mph. Tornadoes are most often generated by thunderstorm activity when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size and duration of the storm.
Tsunami	A series of waves generated by an undersea disturbance such as an earthquake. The speed of a tsunami traveling away from its source can range from up to 500 miles per hour in deep water to approximately 20 to 30 miles per hour in shallower areas near coastlines. Tsunamis differ from regular ocean waves in that their currents travel from the water surface all the way down to the sea floor. Wave amplitudes in deep water are typically less than one meter; they are often barely detectable to the human eye. However, as they approach shore, they slow in shallower water, basically causing the waves from behind to effectively "pile up", and wave heights to increase dramatically. As opposed to typical waves which crash at the shoreline, tsunamis bring with them a continuously flowing 'wall of water' with the potential to cause devastating damage in coastal areas located immediately along the shore.
Volcano	A mountain that opens downward to a reservoir of molten rock below the surface of the earth. While most mountains are created by forces pushing up the earth from below, volcanoes are different in that they are built up over time by an accumulation of their own eruptive products: lava, ash flows, and airborne ash and dust. Volcanoes erupt when pressure from gases and the molten rock beneath becomes strong enough to cause an explosion.
Wildfire	An uncontrolled fire burning in an area of vegetative fuels such as grasslands, brush, or woodlands. Heavier fuels with high continuity, steep slopes, high temperatures, low humidity, low rainfall, and high winds all work to increase risk for people and property located within wildfire hazard areas or along the urban/wildland interface. Wildfires are part of the natural management of forest ecosystems, but most are caused by human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

Windstorm/Thunderstorm	Windstorms/thunderstorms are caused by air masses of varying temperatures meeting in the atmosphere. Rapidly rising warm moist air fuels the formation of thunderstorms. Thunderstorms may occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours. Thunderstorms may result in hail, tornadoes, or straight-line winds. Windstorms pose a threat to lives, property, and vital utilities primarily due to the effects of flying debris and can down trees and power lines.
TECHNOLOGICAL/MAN-MADE HAZARDS	
Chemical Hazard	Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the nation's highways and on the water. HAZMAT incidents consist of solid, liquid and/or gaseous contaminants that are released from fixed or mobile containers, whether by accident or by design as with an intentional terrorist attack. A HAZMAT incident can last hours to days, while some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind and possibly wildlife as well.
Cyberterrorism	Cyberterrorism is a deliberate attack on an individual or group using the internet. In the past few decades, society has become dependent on computers and internet connections for much of daily life. This dependence has opened up the avenue for crime to be committed from afar, often from a different country. Some common examples of cyberterrorism include a hacker accessing bank accounts by hacking into a bank's website, infecting a computer system with a virus, Trojan horse, or worm to inflict damage to the information in the system, or disseminating incorrect or otherwise flawed information, also called "misinformation." Also, denial-of-service attacks could occur against prominent websites, which prevent legitimate users from accessing information or services
Dam/ Levee Failure	Dam failure is the collapse, breach, or other failure of a dam structure resulting in downstream flooding. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and severe property damage if development exists downstream of the dam. Dam failure can result from natural events, human-induced events, or a combination of the two. The most common cause of dam failure is prolonged rainfall that produces flooding. Failures due to other natural events such as hurricanes, earthquakes or landslides are significant because there is generally little or no advance warning.
Nuclear Power Plant Incident	A nuclear and radiation accident is defined by the International Atomic Energy Agency as "an event that has led to significant consequences to people, the environment or the facility. Often, this type of incident results from damage to the reactor core of a nuclear power plant which can release radioactivity into the environment. The degree of exposure from nuclear accidents has varied from serious to catastrophic.
Terrorism	Terrorism is defined by FEMA as, "the use of force or violence against persons or property in violation of the criminal laws of the United States for purposes of intimidation, coercion, or ransom." Terrorist acts may include assassinations, kidnappings, hijackings, bomb scares and bombings, and the use of chemical, biological, nuclear and radiological weapons.

Utility Failure	Power/water utility failures often occur hand in hand with other hazards. For example, they can be caused by rising flood waters or high winds. These events most commonly occur when wind events knock down power lines or water treatment plants are flooded by rising waters, thereby shutting down these utilities. The impacts from these failures are often widespread and can affect thousands of people even when small parts of this infrastructure are affected.

4.3 DISASTER DECLARATIONS

Disaster declarations provide initial insight into the hazards that may impact the Augusta-Richmond County planning area. Since 1953, 3 presidential disaster declarations have been reported in Augusta-Richmond County. This includes two events related to severe storms and flooding, as well as one severe winter storm event.

TABLE 4.2: AUGUSTA-RICHMOND COUNTY DISASTER DECLARATIONS

Year	Disaster Number	Description
1990	880	SEVERE STORMS AND FLOODING
1998	1209	SEVERE STORMS AND FLOODING
2014	4165	SEVERE WINTER STORM

4.4 HAZARD EVALUATION

TABLE 4.3: DOCUMENTATION OF THE HAZARD EVALUATION PROCESS

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
NATURAL HAZARDS			
Avalanche	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of US Forest Service National Avalanche Center website	• The United States avalanche hazard is limited to mountainous western states including Alaska, as well as some areas of low risk in New England. • Avalanche hazard was not included in the Georgia State Hazard Mitigation Plan after determining the mountain elevations in Georgia did not have enough snow to produce this hazard. • Avalanche is not included in the previous Augusta-Richmond County Hazard Mitigation Plan. • There is no risk of avalanche events in Georgia.
Drought	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of U.S. Drought Monitor data	• Drought is a normal part of virtually all climatic regimes, including areas with high and low average rainfall. • Droughts are discussed in the Georgia State Hazard Mitigation Plan. • The Georgia State Hazard Mitigation Plan lists drought as a medium-high hazard for the state. • Drought is included in the previous Augusta-Richmond County Hazard Mitigation Plan. • There are reports of severe to exceptional drought conditions in 9 of the last 17 years in Augusta-Richmond County, according to the U.S. Drought Monitor.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Earthquake	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of National Centers for Environmental Information (formerly National Geophysical Data Center) • USGS Earthquake Hazards Program website	• Although the zone of greatest seismic activity in the United States is along the Pacific Coast, eastern regions have experienced significant earthquakes. • Earthquake events are discussed in the Georgia State Hazard Mitigation Plan and the state is considered to be at low risk to an earthquake event. • Earthquake was included in the previous Augusta-Richmond County Hazard Mitigation Plan. • Earthquakes have occurred in and around the State of Georgia in the past. The state is affected by the Charleston and the Eastern Tennessee seismic zones, and the former has generated a magnitude 8.0 earthquake in the last 200 years. • 24 events are known to have occurred in the county according to the National Centers for Environmental Information. The greatest MMI reported was a VIII. • According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 2% probability of exceedance in 50 years for Augusta-Richmond County is approximately 8 to 14%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Erosion	NO	• Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan	• Erosion is discussed in the Georgia State Hazard Mitigation Plan but only for coastal areas (there is no significant discussion of riverine erosion). • Erosion is not included as a hazard in the previous Augusta-Richmond County Hazard Mitigation Plan. • Riverine erosion remains a natural, dynamic, and continuous process that unlikely to have a major impact on Augusta-Richmond County other than in a very localized sense.
Expansive Soils	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of USGS Swelling Clays Map	• The effects of expansive soils are most prevalent in parts of the Southern, Central, and Western U.S. • Expansive soils are not identified in the Georgia State Hazard Mitigation Plan. • Augusta-Richmond County is located in an area that has relatively low clay swelling potential. • The previous Augusta-Richmond County Hazard Mitigation Plan did not identify expansive soils as a potential hazard.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Extreme Cold	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• Many areas of the United States are susceptible to extreme cold. • Extreme cold was not included in the previous Augusta-Richmond County Hazard Mitigation Plan. • As a community in the southeastern United States, the county is much more susceptible to extreme heat than extreme cold.
Extreme Heat	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Georgia Automated Environmental Monitoring Network	• Many areas of the United States are susceptible to extreme heat and heat waves, including Georgia. • The Georgia State Hazard Mitigation Plan reports the entire state has some vulnerability. • Extreme heat was included in the previous Augusta-Richmond County Hazard Mitigation Plan. • Although NCDC reports no extreme heat events for Augusta-Richmond County, several nearby weather stations have reported temperatures in the upper 90s and low 100s every year for the past 10 years.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Flooding	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Review of historical disaster declarations • Review of FEMA DFIRM data • Review of FEMA's NFIP Community Status Book and Community Rating System (CRS)	• Floods occur in all 50 states and in the U.S. territories. • The flood hazard is thoroughly discussed in the Georgia State Hazard Mitigation Plan. The state was found to have high vulnerability to flooding. • The previous Augusta-Richmond County Hazard Mitigation Plan addresses flood hazard. • NCDC reports that Augusta-Richmond County has been affected by 24 flood events since 1996. In total, these events caused nearly $1 million (2016 dollars) in property damages. • Two of the county's Presidential Disaster Declarations were flood-related. • 18.7% of Augusta-Richmond County is located in an identified floodplain (100- or 500-year). • All jurisdictions in the county participate in the NFIP and Augusta-Richmond County also participates in the CRS.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Hail	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• Although hailstorms occur primarily in the Midwestern states, they do occur in every state on the mainland U.S. Most inland regions experience hailstorms at least two or more days each year. • Hailstorm events are discussed in the Georgia State Hazard Mitigation Plan under the Severe Weather hazard. • Hail is included in the previous Augusta-Richmond County Hazard Mitigation Plan. • NCDC reports 72 hailstorm events (0.75 to 1.75 inch size hail) for Augusta-Richmond County since 1955.
Hurricane and Tropical Storm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website • FEMA Hazus-MH storm return periods	• The Atlantic and Gulf regions are most prone to landfall by hurricanes and tropical storms. • Hurricane and tropical storm events are discussed in the Georgia State Hazard Mitigation Plan and are listed as the medium hazard in the state. • Hurricanes and tropical weather were addressed in the previous Augusta-Richmond County Hazard Mitigation Plan. • NOAA historical records indicate 74 storm tracks have come within 75 miles of Augusta-Richmond County since 1850. • The 50-year return period peak gust for hurricane and tropical storm events in Augusta-Richmond County is around 68 mph.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Infectious Disease	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Discussions with local officials	• The previous Augusta-Richmond County Hazard Mitigation Plan did not include infectious disease; however, it is a hazard that local officials were concerned with and wanted to evaluate. • Public health emergencies are often unpredictable and can ramp up quickly depending on how quickly they are recognized. These threats will potentially impact the county in the future.
Landslide	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of USGS Landslide Incidence and Susceptibility Hazard Map	• Landslides occur in every state in the U.S., and they are most common in the coastal ranges of California, the Colorado Plateau, the Rocky Mountains, and the Appalachian Mountains. • Landslide/debris flow events are discussed in the Georgia State Hazard Mitigation Plan, but vulnerability tends to be higher in the Appalachian region of the state. • The previous Augusta-Richmond County Hazard Mitigation Plan did not address landslides. • USGS landslide hazard maps indicate that a low risk is found through most of the county.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Land Subsidence/Sinkhole	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan	• Land subsidence affects at least 45 states, including Georgia. However, because of the broad range of causes and impacts, there has been limited national focus on this hazard. • The Georgia State Hazard Mitigation Plan delineates certain areas that are susceptible to land subsidence hazards in Georgia; with the southern part of the state being much more susceptible. • The previous Augusta-Richmond County Hazard Mitigation Plan did not identify land subsidence as a potential hazard.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Lightning	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Review of Vaisala's NLDN Lightning Flash Density Map	• The central region of the Florida has the highest density of lightning strikes in the mainland U.S.; however, lightning events are experienced in nearly every region. • Lightning events are discussed in the Georgia State Hazard Mitigation Plan as part of the severe weather hazard. • Lightning events were not addressed on their own in the previous Augusta-Richmond County Hazard Mitigation Plan, but the Planning Team determined that it might be useful to separate lightning out as a hazard in this update. • NCDC reports only 1 lightning event in Augusta-Richmond County since 1996, but it resulted in 3 injuries. • According to Vaisala's U.S. National Lightning Detection Network, Augusta-Richmond County is located in an area that experienced an average of 2 to 8 lightning flashes per square kilometer per year between 2006 and 2014.
Nor'easter	NO	• Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• Nor'easters are not discussed in the Georgia State Hazard Mitigation Plan. • Nor'easters were not identified in the previous Augusta-Richmond County Hazard Mitigation Plan. • NCDC does not report any nor'easter activity for Augusta-Richmond County.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Severe Winter Storm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database • Review of historical presidential disaster declarations	• Winter storms affect every state in the continental U.S. and Alaska. • Severe winter storms, including snow storms and ice storms, are discussed in the Georgia State Hazard Mitigation Plan. They are listed as a medium-high hazard in the state. • Winter snow and ice storm events were addressed in the previous Augusta-Richmond County Hazard Mitigation Plan. • NCDC reports that Augusta-Richmond County has been affected by at least 8 snow and ice events since 1996. • One of the county's disaster declarations was directly related to winter storm events.
Solar Flare/EMP	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA Space Weather scales • Discussions with local officials	• The previous Augusta-Richmond County Hazard Mitigation Plan did not include solar flares; however, it was discussed as a potential threat at meetings of the Planning Team. • Solar flares are a threat that can occur without regard to specific location, so it was evaluated in this plan.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Storm Surge	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• Given the inland location of Augusta-Richmond County, storm surge would not affect the area. • Storm surge is discussed in the Georgia State Hazard Mitigation Plan, but vulnerability to storm surge is confined coastal areas. • The previous Augusta-Richmond County Hazard Mitigation Plan did not address storm surge. • No historical events were reported by NCDC.
Tornado	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• Tornado events are discussed in the Georgia State Hazard Mitigation Plan and ranked as a high risk hazard in the state. • Tornado events were addressed in the previous Augusta-Richmond County Hazard Mitigation Plan. • NCDC reports 10 tornado events in Augusta-Richmond County since 1950. These events have resulted 26 injuries and $16.4 million (2016 dollars) in property damage with the most severe being an EF3.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Tsunami	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of FEMA "How-to" mitigation planning guidance (Publication 386-2, "Understanding Your Risks – Identifying Hazards and Estimating Losses).	• No record exists of a catastrophic Atlantic basin tsunami impacting the Atlantic coast of the United States. • Tsunami inundation zone maps are not available for communities located along the U.S. East Coast. • Tsunamis are not discussed in the Georgia State Hazard Mitigation Plan. • The previous Augusta-Richmond County Hazard Mitigation Plan did not address tsunamis. • FEMA mitigation planning guidance suggests that locations along the U.S. East Coast have a relatively low tsunami risk and need not conduct a tsunami risk assessment at this time.
Volcano	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of USGS Volcano Hazards Program website	• More than 65 potentially active volcanoes exist in the United States and most are located in Alaska. The Western states and Hawaii are also potentially affected by volcanic hazards. • There are no active volcanoes in Georgia. • There has not been a volcanic eruption in Georgia in over 1 million years. • No volcanoes are located near Augusta-Richmond County.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Wildfire	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of GA Forestry Commission data	• Wildfires occur in virtually all parts of the United States. Wildfire hazard risks will increase as low-density development along the urban/wildland interface increases. • Wildfires are discussed in the Georgia State Hazard Mitigation Plan as a medium hazard of concern in the state. • The previous Augusta-Richmond County Hazard Mitigation Plan addressed wildfire. • A review of SWRA data indicates that there are some areas of elevated concern in Augusta-Richmond County. • According to the Georgia Forestry Commission, Augusta-Richmond County experiences an average of 38 fires each year which burn a combined 129 acres.
Windstorm/Thunderstorm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of NOAA NCDC Storm Events Database	• The Georgia State Hazard Mitigation Plan addresses windstorms and thunderstorms as severe weather which is considered a high to very high risk hazard in the state. • Severe thunderstorm events were addressed in the previous Augusta-Richmond County Hazard Mitigation Plan. • NCDC reports 182 thunderstorm/high wind events in Augusta-Richmond County since 1950. These events have resulted in 1 death, 36 injuries, and $4.0 million (2016 dollars) in property damage.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
TECHNOLOGICAL/MAN-MADE HAZARDS			
Chemical Hazard	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review EPA Toxic Release Inventory (TRI) • Review of USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) incident database	• Cities, counties, and towns where hazardous materials fabrication, processing, and storage sites are located, and those where hazardous waste treatment, storage or disposal facilities operate are at risk for hazardous materials events. • The previous Augusta-Richmond County Hazard Mitigation Plan included hazardous materials incidents. • 29 TRI facilities are located in Augusta-Richmond County. • 21 of the 339 PHMSA-reported HAZMAT incidents in the county were classified as "serious" incidents. In total, these incidents have resulted in 27 injuries, and over $700,000 (2016 dollars) in property damages.
Cyberterrorism	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Discussions with local officials	• The previous Augusta-Richmond County Hazard Mitigation Plan did not include cyberterrorism; however, it was discussed as a possible threat in Planning Team meetings. • Cyberterrorism is a threat that can occur without regard to specific location, so it was evaluated in this plan.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Dam/Levee Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of GA State Hazard Mitigation Plan • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Review of Georgia Safe Dams Program data	• The National Inventory of Dams shows dams are located in every state. • Dam failure is discussed in the Georgia State Hazard Mitigation Plan and is listed a low risk hazard for the state. • The previous Augusta-Richmond County Hazard Mitigation Plan addressed dam failure. • Of the 27 dams reported by the Georgia Safe Dams Program, 6 are high hazard (high hazard is defined as "where failure or mis-operation will probably cause loss of human life").
Nuclear Power Plant Incident	YES	• Review of IAEA data on the location of nuclear reactors • Review of Augusta-Richmond County HIRA • Discussions with local officials	• The Vogtle Nuclear Power Plant is located within 10 miles of the southeastern corner of Augusta-Richmond County. • The previous Augusta-Richmond County Hazard Mitigation Plan included nuclear power plant incident as a hazard. • A nuclear accident is unlikely to occur, but could cause severe damage in the event of a major incident.
Terrorism	YES	• Review of previous Augusta-Richmond County Hazard Mitigation Plan • Discussions with local officials	• The previous Augusta-Richmond County Hazard Mitigation Plan included terrorism. • There are several high profiles targets in the area that caused the Planning Team to determine that the hazard should be evaluated further.

Natural Hazards Considered	Was this hazard identified as a significant hazard to be addressed in the plan at this time? (Yes or No)	How was this determination made?	Why was this determination made?
Utility Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of previous Augusta-Richmond County Hazard Mitigation Plan • Discussions with local officials	• The previous Augusta-Richmond County Hazard Mitigation Plan did not include utility failure; however, discussion during Planning Team meetings indicated the hazard warranted further discussion. • Utility failures occur frequently in the county, especially during winter storms or high wind events. These will continue to impact the county going forward.

4.5 HAZARD IDENTIFICATION RESULTS

TABLE 4.4: SUMMARY RESULTS OF THE HAZARD IDENTIFICATION AND EVALUATION PROCESS

NATURAL HAZARDS	
☐ Avalanche	☑ Severe Winter Storm
☑ Drought	☑ Solar Flare/EMP
☑ Earthquake	☐ Storm Surge
☐ Erosion	☑ Tornado
☐ Expansive Soils	☐ Tsunami
☐ Extreme Cold	☐ Volcano
☑ Extreme Heat	☑ Wildfire
☑ Flooding	☑ Windstorm/Thunderstorm
☑ Hail	**TECHNOLOGICAL/MAN-MADE HAZARDS**
☑ Hurricane/Tropical Storm	☑ Chemical Hazard
☑ Infectious Disease	☑ Cyberterrorism
☐ Landslide	☑ Dam/Levee Failure
☐ Land Subsidence/Sinkhole	☑ Nuclear Power Plant Incident
☑ Lightning	☑ Terrorism
☐ Nor'easter	☑ Utility Failure

☑ = Hazard considered significant enough for further evaluation in the Augusta-Richmond County hazard risk assessment.

SECTION 5
HAZARD PROFILES

This section includes detailed hazard profiles for each of the hazards identified in the previous section (*Hazard Identification*) as significant enough for further evaluation in the Augusta-Richmond County Hazard Mitigation Plan. It contains the following subsections:

Overview

- 5.1 Overview
- 5.2 Study Area
- 5.3 Climate Change/Adaptation

Natural Hazards

- 5.4 Drought
- 5.5 Earthquake
- 5.6 Extreme Heat
- 5.7 Flooding
- 5.8 Hail
- 5.9 Hurricane/Tropical Storm
- 5.10 Infectious Disease
- 5.11 Lightning
- 5.12 Severe Winter Storm
- 5.13 Solar Flare/EMP
- 5.14 Tornado
- 5.15 Wildfire
- 5.16 Windstorm/Thunderstorm

Technological/Man-Made Hazards

- 5.17 Chemical Hazard
- 5.18 Cyberterrorism
- 5.19 Dam/Levee Failure
- 5.20 Nuclear Power Plant Incident
- 5.21 Terrorism
- 5.22 Utility Failure

Conclusion

- 5.23 Conclusions on Hazard Risk
- 5.24 Final Determinations

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

Overview

5.1 OVERVIEW

This section includes detailed hazard profiles for each of the hazards identified in the previous section (*Hazard Identification*) as significant enough for further evaluation in the Augusta-Richmond County hazard risk assessment by creating a hazard profile. Each hazard profile includes a general description of the hazard, its location and extent, notable historical occurrences, and the probability of future occurrences. Each profile also includes specific items noted by members of the Augusta-Richmond County Hazard Mitigation Planning Team as it relates to unique historical or anecdotal hazard information for Augusta-Richmond County or a participating municipality within it.

The following hazards were identified:

- **Natural**
  - Drought
  - Earthquake
  - Extreme Heat
  - Flooding
  - Hail
  - Hurricane/Tropical Storm
  - Infectious Disease
  - Lightning
  - Severe Winter Storm
  - Solar Flare/EMP
  - Tornado
  - Windstorm/Thunderstorm
  - Wildfire
- **Technological/Man-Made**
  - Chemical Hazard
  - Cyberterrorism
  - Dam/Levee Failure
  - Nuclear Power Plant Incident
  - Terrorism
  - Utility Failure

5.2 STUDY AREA

Richmond County includes three municipalities: Augusta, Blythe, and Hephzibah. The City of Augusta operates in conjunction with Richmond County as part of a consolidated government and thus, these communities are treated as a single entity in this plan as there are no unincorporated areas within the county. Additionally, Fort Gordon occupies a large section of the southwest part of the county and, although it is not an incorporated municipality, it is treated as a separate entity for the purposes of this plan. **Table 5.1** provides a summary table of the participating communities. In addition, **Figure 5.1** provides a base map, for reference, of Augusta-Richmond County.

TABLE 5.1: JURISDICTIONAL AREAS IN THE AUGUSTA-RICHMOND COUNTY HAZARD MITIGATION PLAN

Augusta-Richmond County	Fort Gordon
Blythe	Hephzibah

FIGURE 5.1: AUGUSTA-RICHMOND COUNTY BASE MAP

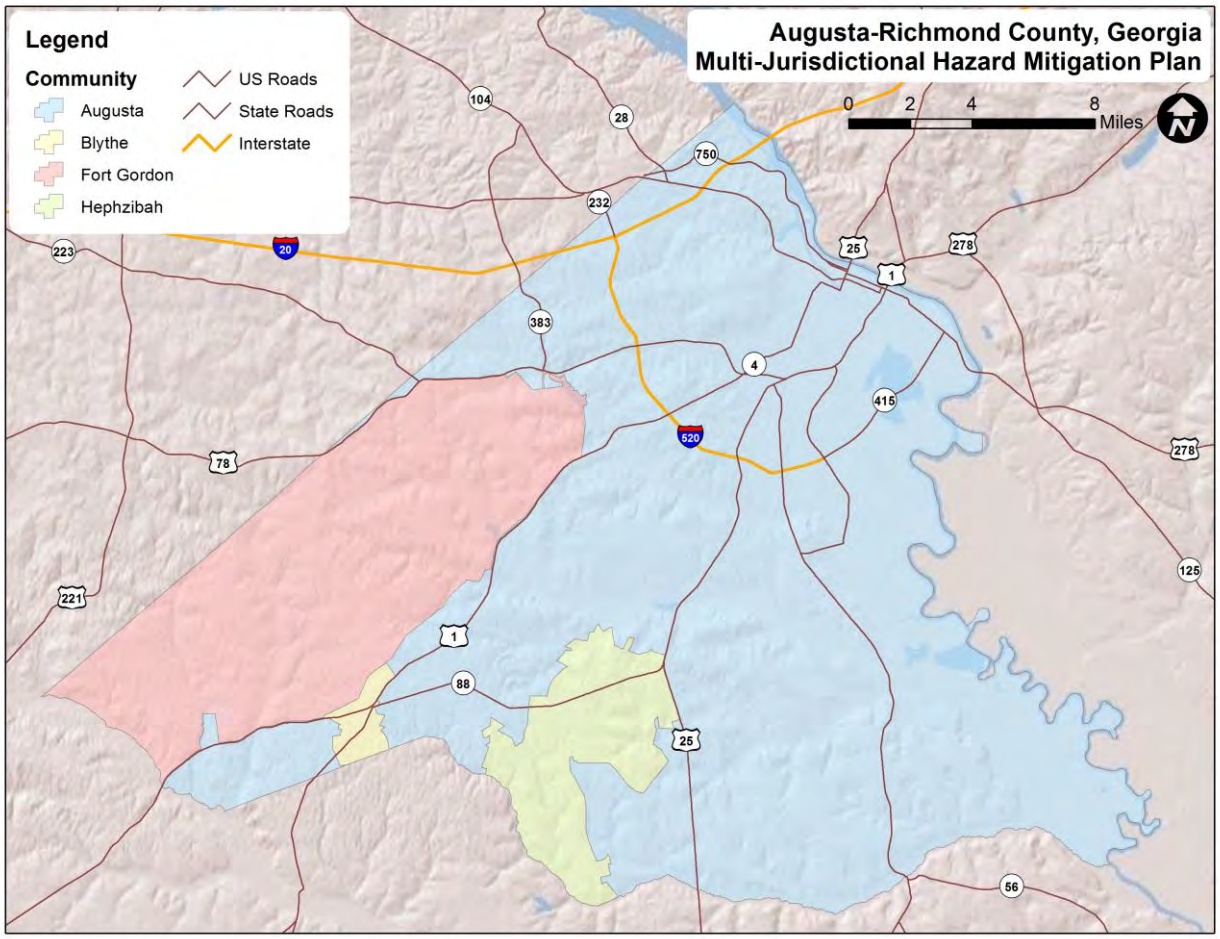


Table 5.2 lists each significant hazard for Augusta-Richmond County and identifies whether or not it has been determined to be a specific hazard of concern for the 3 communities and the Fort Gordon area. This is the based on the best available data and information from the Augusta-Richmond County Hazard Mitigation Planning Team. (● = hazard of concern)

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN AUGUSTA-RICHMOND COUNTY

Jurisdiction	NATURAL												
	Drought	Earthquake	Extreme Heat	Flooding	Hail	Hurricane/ Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Windstorm/ Thunderstorm	Wildfire
Augusta-Richmond County													
Augusta-Richmond County	●	●	●	●	●	●	●	●	●	●	●	●	●
Blythe	●	●	●	●	●	●	●	●	●	●	●	●	●
Fort Gordon	●	●	●	●	●	●	●	●	●	●	●	●	●
Hephzibah	●	●	●	●	●	●	●	●	●	●	●	●	●

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN AUGUSTA-RICHMOND COUNTY (CONTINUED)

Jurisdiction	TECHNOLOGICAL/MAN-MADE					
	Chemical Hazard	Cyberterrorism	Dam/Levee Failure	Nuclear Power Plant Incident	Terrorism	Utility Failure
Augusta-Richmond County						
Augusta-Richmond County	●	●	●	●	●	●
Blythe	●	●	●	●	●	●
Fort Gordon	●	●	●	●	●	●
Hephzibah	●	●	●	●	●	●

5.3 CLIMATE CHANGE/ADAPTATION

The *National Climate Assessment (2014)* is a report on climate change in the United States that has been developed to increase understanding of the impacts of climate change throughout the country, with specific focus on regional effects and outcomes. The report is based on a wealth of information and data analysis, evaluating both past trends and future projections related to changes in our climate.[1] Much of the data indicates that the primary factor in altering the global climate is greenhouse gas emissions from human activities.

Augusta-Richmond County appears to be fundamentally changing due to climate change which has resulted in more violent storms, higher temperatures, and changes in precipitation leading to increased drought and/or flood risk. These changes are expected to continue in the foreseeable future for both the county and the region at-large. Primary public health concerns as a result of climate change impacts in the Southeast include a number of potential impacts such as the urban heat island effect upon city residents and outdoor workers, heat-related issues for rural workers (primarily farmworkers), increased health risks to the elderly and other vulnerable populations in both rural and urban communities, and impacts to local ecosystems that can have widespread effects on human health.

Due to its inland location, the impacts of climate change on Augusta-Richmond County may less dramatically alter lifestyles and the environment from today's "normal" when compared to other areas of the nation and world. Nevertheless, there will be fundamental changes to the communities covered by this plan and the impacts of climate change on the hazards discussed in this plan will be significant. Climate change is likely to exacerbate the effects of many hazards and this is discussed (where applicable) in the hazard profiles found in this section.

[1] http://nca2014.globalchange.gov/

Natural Hazards

5.4 DROUGHT

5.4.1 Background

Drought is a normal part of virtually all climatic regions, including areas with high and low average rainfall. Drought is the consequence of a natural reduction in the amount of precipitation expected over an extended period of time, usually a season or more in length. High temperatures, high winds, and low humidity can exacerbate drought conditions. In addition, human actions and demands for water resources can hasten drought-related impacts. Drought may also lead to more severe wildfires.

Droughts are typically classified into one of four types: 1) meteorological, 2) hydrologic, 3) agricultural, or 4) socioeconomic. **Table 5.3** presents definitions for these types of drought.

TABLE 5.3 DROUGHT CLASSIFICATION DEFINITIONS

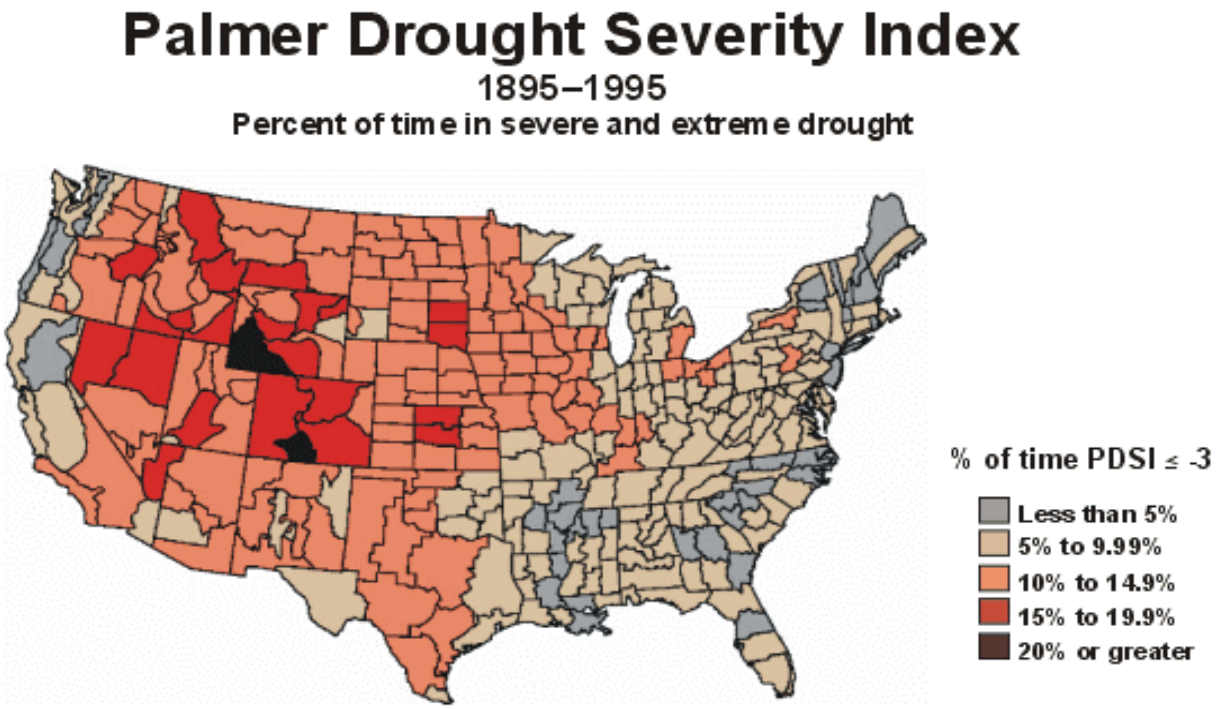
Meteorological Drought	The degree of dryness or departure of actual precipitation from an expected average or normal amount based on monthly, seasonal, or annual time scales.
Hydrologic Drought	The effects of precipitation shortfalls on stream flows and reservoir, lake, and groundwater levels.
Agricultural Drought	Soil moisture deficiencies relative to water demands of plant life, usually crops.
Socioeconomic Drought	The effect of demands for water exceeding the supply as a result of a weather-related supply shortfall.

Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

Droughts are slow-onset hazards, but over time, can have very damaging effects on crops, municipal water supplies, recreational uses, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impact can be significant.

The Palmer Drought Severity Index (PDSI) is based on observed drought conditions and range from -0.5 (incipient dry spell) to -4.0 (extreme drought). Evident in **Figure 5.2**, the Palmer Drought Severity Index Summary Map for the United States, drought affects most areas of the United States, but tends to be less severe in the Eastern United States.

FIGURE 5.2: PALMER DROUGHT SEVERITY INDEX SUMMARY MAP FOR THE UNITED STATES



Source: National Drought Mitigation Center

5.4.2 Location and Spatial Extent

Drought typically covers a large area and cannot be confined to any geographic or political boundaries. According to the Palmer Drought Severity Index, Central Eastern Georgia has a relatively low risk for drought hazard, spending between 5.00% and 9.99% of the time in severe to extreme drought conditions over the last 100 years. However, local areas may experience much more severe and/or frequent drought events than what is represented on the Palmer Drought Severity Index map. It is assumed that Augusta-Richmond County would be uniformly exposed to drought, making the spatial extent potentially widespread. It is also notable that drought conditions typically do not cause significant damage to the built environment.

5.4.3 Historical Occurrences

The United States Drought Monitor was used to ascertain historical drought events in Augusta-Richmond County. The U.S. Drought Monitor records information on historical drought occurrence and categorizes drought on a D0-D4 scale. **Table 5.4** presents definitions for these classifications.

TABLE 5.4 U.S. DROUGHT MONITOR DROUGHT CLASSIFICATIONS

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
D1	Moderate Drought	Some damage to crops, pastures; streams, reservoirs, or wells low, some water shortages developing or imminent; voluntary water-use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; widespread water shortages or restrictions
D4	Exceptional Drought	Exceptional and widespread crop/pasture losses; shortages of water in reservoirs, streams, and wells creating water emergencies

Source: United States Drought Monitor, http://droughtmonitor.unl.edu/classify.htm

According to the U.S. Drought Monitor, Augusta-Richmond County experienced severe to exceptional drought occurrences in 9 of the last 17 years (2000-2016). **Table 5.5** shows the most severe drought condition reported for each year in Augusta-Richmond County, according to U.S. Drought Monitor classifications.

TABLE 5.5: HISTORICAL DROUGHT OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Year	Severity
2000	EXCEPTIONAL
2001	EXTREME
2002	EXCEPTIONAL
2003	ABNORMAL
2004	SEVERE
2005	ABNORMAL
2006	MODERATE
2007	EXCEPTIONAL
2008	EXTREME
2009	MODERATE
2010	MODERATE
2011	EXTREME
2012	EXCEPTIONAL
2013	EXTREME
2014	MODERATE
2015	MODERATE
2016	ABNORMAL

Source: U.S. Drought Monitor

In addition, local officials have identified several drought events of note that have affected Augusta-Richmond County over the past 30 years. The most severe of these was in 1986 when a drought contributed to 3 deaths in the county and over $300,000 in crop damage. In 1998, a drought caused a reduction in normal flows of the Savannah River so much that tourism was reduced and water quality was negatively impacted. Finally, in 2003, a major drought occurred in the region that was a -4.0 on the Palmer Drought Severity Index.

Data from the State of Georgia's Climatologist was also reviewed to obtain additional information on historical drought events that may have been larger in scale or more regional in nature. These events are identified in **Table 5.6**.

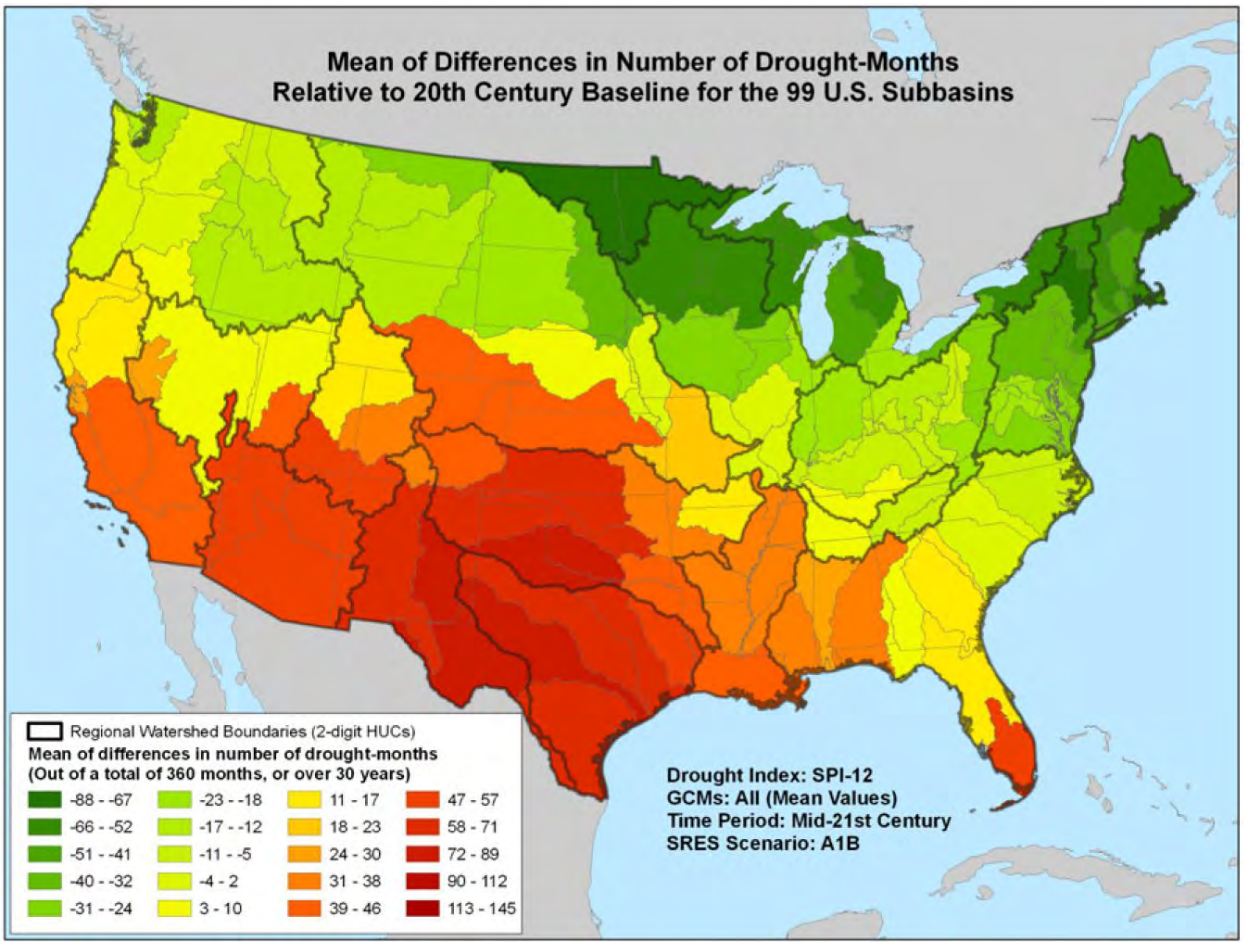
TABLE 5.6: NOTABLE HISTORICAL DROUGHT OCCURRENCES IN THE STATE OF GEORGIA

Year	Area Affected	Notes
1903-1905	Statewide	Severe
1924-1927	North Central Georgia	One of most severe of century
1930-1935	Mostly Statewide	Affected most of US
1938-1944	Statewide	Regional drought
1950-1957	Statewide	Regional drought
1968-1971	Southern and Central Georgia	Variable severity
1985-1990	North and Central Georgia	Regional drought
1999-2009	Statewide	Severe

Source: USGS, GA State Climatologist

It should also be noted that climate change will likely have a significant impact on the frequency and intensity of drought events across the United States. Indeed, short-term droughts are expected to intensify throughout the United States and long term drought will likely become much more prevalent in the western United States. As can be seen in **Figure 5.3** much of the southern United States can expect a substantial increase in the number of months that will be spent in drought conditions when compared to the 20th century baseline. Although the southwest is expected to see a much larger increase in the number of months in drought conditions, most of Georgia (including Augusta-Richmond County) can expect an average increase of between 11 and 17 months in drought conditions over a 30 year period going forward.

FIGURE 5.3: MEAN OF DIFFERENCES IN NUMBER OF DROUGHT MONTHS RELATIVE TO 20TH CENTURY BASELINE



Source: Strzepek et al., 2010

5.4.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Augusta-Richmond County has a probability level of highly likely (near 100 percent annual probability) for future drought events. This is especially true given the potential effects of climate change to exacerbate drought and increase the frequency of drought events going forward, which will ultimately result in greater agricultural losses and more water supply shortages in the county.

5.4.5 Consequence Analysis

People (The Public and Public Confidence)

Drought can have a detrimental effect on the livelihood of farmers and agricultural producers in Augusta-Richmond County. Efforts to mitigate against drought, such as using irrigation equipment, have a high initial cost, including the need for an increase in management requirements, cost of operation and maintenance, and the lack of good quality water resources—which during times of drought would be severely affected. Public confidence would likely not be impacted severely.

Responders

Although drought would have many of the same impacts on responders as it would on the public, the overall effects on responders would be relatively limited when compared to other hazards.

Continuity of Operations

Drought would have minimal impacts on continuity of operations due to the relatively long warning time that would allow for plans to be made to maintain continuity of operations.

Built Environment (Property, Facilities, and Infrastructure)

Water Use

Drought has the potential to affect Augusta-Richmond County's water supply for residential, commercial, institutional, industrial, and government-owned areas. Drought can reduce water supply in wells and reservoirs. When drought conditions persist with no relief, local or state governments often institute water restrictions which can impact many aspects of the built environment.

Irrigation

Drought would affect irrigation and outdoor landscaping efforts around residential, commercial, institutional, industrial, and government-owned land. Water conservation strategies can limit the amount of water used to maintain the aesthetic environment around buildings, businesses, and areas such as golf courses (perhaps most prominently, Augusta National Golf Club). This would include automatic and non-automatic spray irrigation systems, hose-end sprinklers, handheld hoses, bucket watering, drip irrigation, athletic field irrigation, swimming pools, car washing, pressure washing, and reuse water.

Economy

Extreme drought has the potential to depress local businesses and industries such as landscaping, recreation and tourism, and public utilities. Nursery and landscape businesses can also face significant losses from a drought. Losses include reduction of output and sales of nursery crops, reduction in plant sales, and an increase in watering costs. This can lead to the closing of many business locations, lay-off of employees, and increases in bankruptcy filing.

In Augusta-Richmond County, events at Augusta National Golf Club are recognized nationwide and contribute substantially to the economy. Irrigating golf courses of this caliber is critical in order to maintain the course at an acceptable level to play. In a drought scenario, it is possible that reduced availability of water resources may hinder the ability of course managers to maintain the course to the proper level, thereby having a negative impact on the course, future events, and thus, the economy at-large.

Environment

Agriculture

The agriculture sector of Augusta-Richmond County is particularly susceptible to drought damage. **Table 5.7** shows the number of farms, acres of total land area being farmed, and average farm size for the county.[2] Agricultural drought has the potential to directly affect much of the land in the county. Agricultural areas at particular risk are cropland and pastures.

[2] Augusta-Richmond County*: Census of agriculture—2012*. Retrieved January 3, 2017, from https://www.agcensus.usda.gov/Publications/2012/Online_Resources/County_Profiles/Georgia/cp13245.pdf

TABLE 5.7: AUGUSTA-RICHMOND COUNTY FARMLAND OVERVIEW

Census of Agriculture	
Number of Farms	123
Total Land in Farms, Acres	13,908
Average Farm Size, Acres	113

Source: Census of Agriculture, 2012

Crops

Prolonged periods of dry weather are the most difficult and damaging problem faced by crop growers and agricultural suppliers. Short- or long-term moisture deficits—even with the use of irrigation methods—during critical stages of crop development can severely reduce yields, with the amount of yield lost depending on when the drought occurs (see **Table 5.8** for a list of Richmond County crop specific information), the growth stage of the crop, the severity of dry conditions, and the amount of available water that the soil can hold.

TABLE 5.8: AUGUSTA-RICHMOND COUNTY CROP INFORMATION

Crops	Acres Harvested	Rank[3]
Forage-land used for all hay and haylage, grass silage, and greenchop	1,768	113
Wheat for grain, all	144	103
Winter wheat for grain	144	103
Pecans, all	77	82
Rye for grain	65	65

Source: Census of Agriculture, 2012

Livestock

Table 5.9 shows the type of livestock in Richmond County, including the quantity of livestock and the county's rank compared to other counties in the state. These are at risk for being affected by drought conditions in the county.

Livestock losses from drought will most likely be confined to forage-based production systems. Losses in beef and dairy systems will potentially be of a single-season or multiyear variety. Single-season losses will include lost forage production (on both hay and grazing land), reduced weaning weights, reduced milk production, and increased mortality.

Multiyear losses could include the cost of reestablishing pastures and reduced meat or milk production in subsequent years due to forced sales in the drought year. In addition, drought conditions could result in poor pasture conditions, reduced drinking water supplies, and a critical hay shortage that directly affects livestock and poultry health.

TABLE 5.9: AUGUSTA-RICHMOND COUNTY LIVESTOCK (2012)

Livestock	Number	Rank[4]
Cattle and calves	1,854	122
Layers	477	101

[3] Rank in production among Georgia counties
[4] Rank in production among Georgia counties

Livestock	Number	Rank[4]
Horses and ponies	307	79
Pullets for laying flock replacement	220	57
Goats, all	111	133

Source: Census of Agriculture, 2012

Environmental Degradation
Drought may also lead to pollution of water sources as a result of lack of rain water to dilute industrial and agricultural chemical runoff. This poses a risk to plants and animals and makes it difficult to maintain a clean drinking water supply.

Lack of water reaching the soil may also cause the ground to become dry and unstable. Erosion can increase and loss of topsoil can be severe if a high-intensity rain falls on ground lacking a ground cover of plants. As a result of these environmental impacts, habitats may be degraded through a loss of wetlands, lake capacity, and vegetation.

5.5 EARTHQUAKE

5.5.1 Background

An earthquake is movement or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured in the tens of billions of dollars, result in loss of life and injury to hundreds of thousands of persons, and disrupt the social and economic functioning of the affected area.

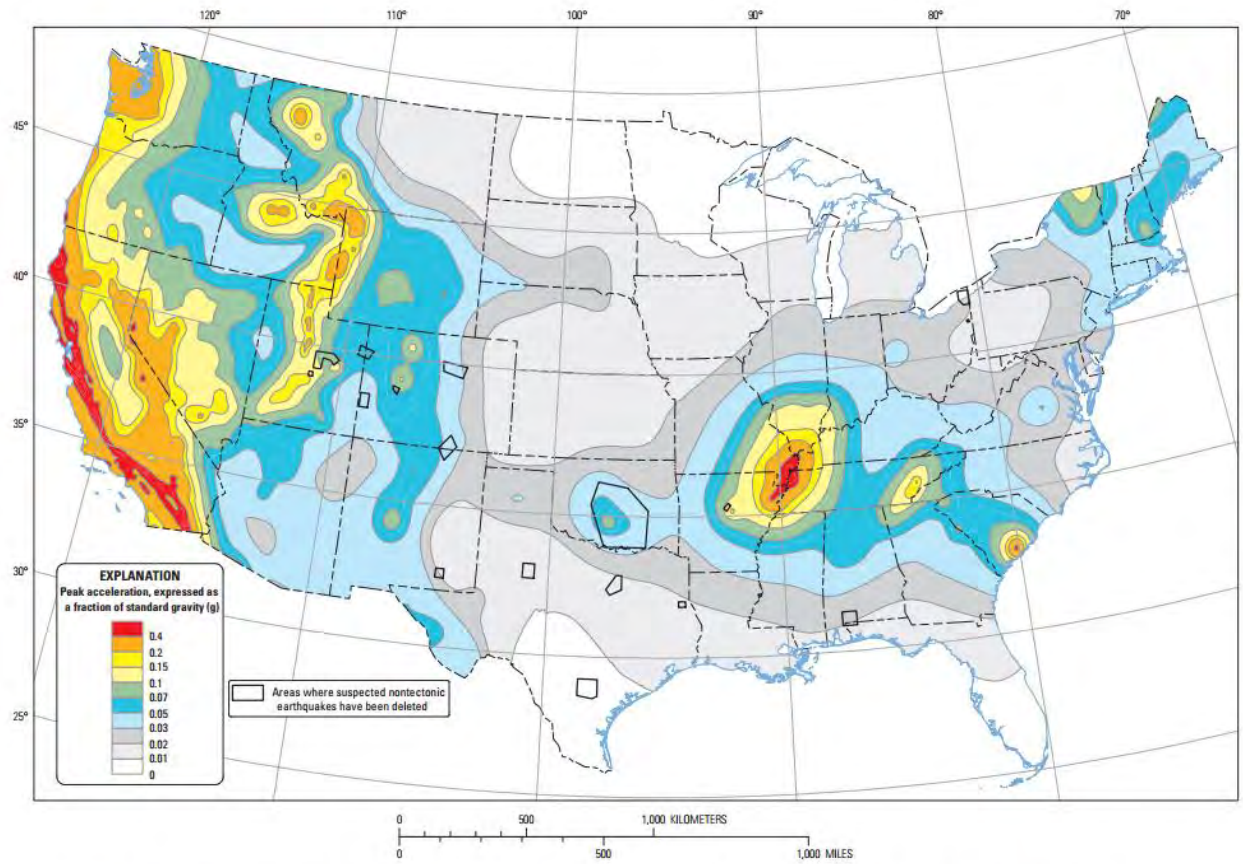
Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, site, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quick sand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth’s outer crust. These fault planes are typically found along borders of the Earth's 10 tectonic plates. The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

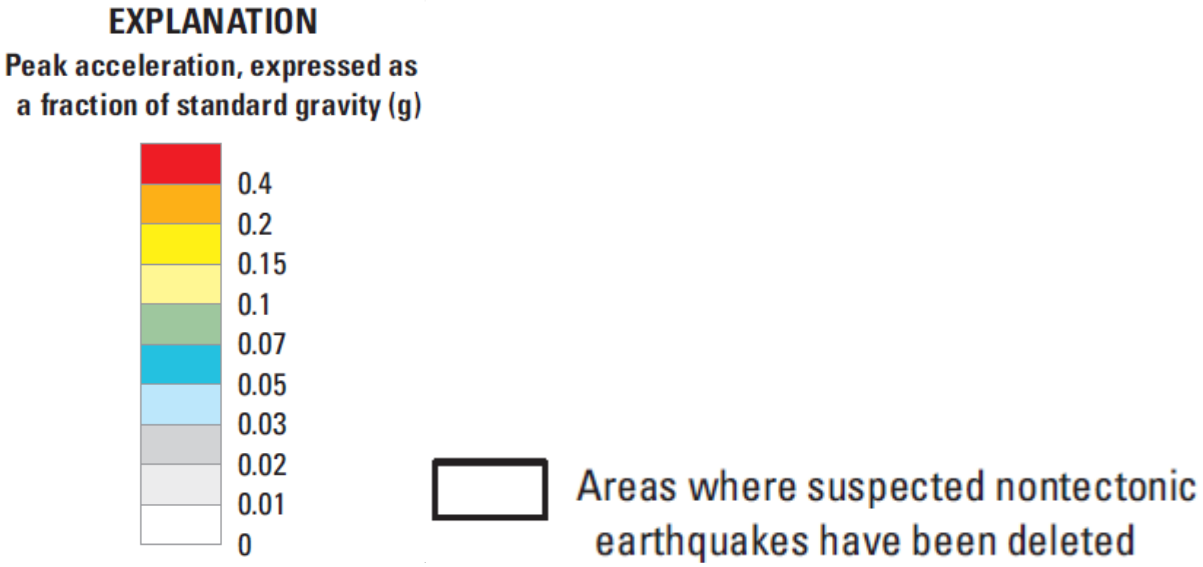
The greatest earthquake threat in the United States is along tectonic plate boundaries and seismic fault lines located in the central and western states; however, the Eastern United States does face moderate risk to less frequent, less intense earthquake events. **Figure 5.4** shows relative seismic risk in the United

States based on United States Geological Survey mapping of peak ground acceleration at the national level.

FIGURE 5.4: PEAK ACCELERATION WITH 10 PERCENT PROBABILITY OF EXCEEDANCE IN 50 YEARS



Ten-percent probability of exceedance in 50 years map of peak ground acceleration



Source: United States Geological Survey, 2014

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (**Table 5.10**). Each unit increase in magnitude on the Richter Scale corresponds to a 10-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using roman numerals, ranging from "I" corresponding to imperceptible (instrumental) events to "XII" for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in **Table 5.11**.

TABLE 5.10: RICHTER SCALE

RICHTER MAGNITUDES	EARTHQUAKE EFFECTS
< 3.5	Generally not felt, but recorded.
3.5 - 5.4	Often felt, but rarely causes damage.
5.4 - 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 - 6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0 - 7.9	Major earthquake. Can cause serious damage over larger areas.
8 or >	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: Federal Emergency Management Agency

TABLE 5.11: MODIFIED MERCALLI INTENSITY SCALE FOR EARTHQUAKES

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
I	INSTRUMENTAL	Detected only on seismographs.	
II	FEEBLE	Some people feel it.	< 4.2
III	SLIGHT	Felt by people resting; like a truck rumbling by.	
IV	MODERATE	Felt by people walking.	
V	SLIGHTLY STRONG	Sleepers awake; church bells ring.	< 4.8
VI	STRONG	Trees sway; suspended objects swing, objects fall off shelves.	< 5.4
VII	VERY STRONG	Mild alarm; walls crack; plaster falls.	< 6.1
VIII	DESTRUCTIVE	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged.	
IX	RUINOUS	Some houses collapse; ground cracks; pipes break open.	< 6.9
X	DISASTROUS	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread.	< 7.3
XI	VERY DISASTROUS	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards.	< 8.1

SCALE	INTENSITY	DESCRIPTION OF EFFECTS	CORRESPONDING RICHTER SCALE MAGNITUDE
XII	CATASTROPHIC	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

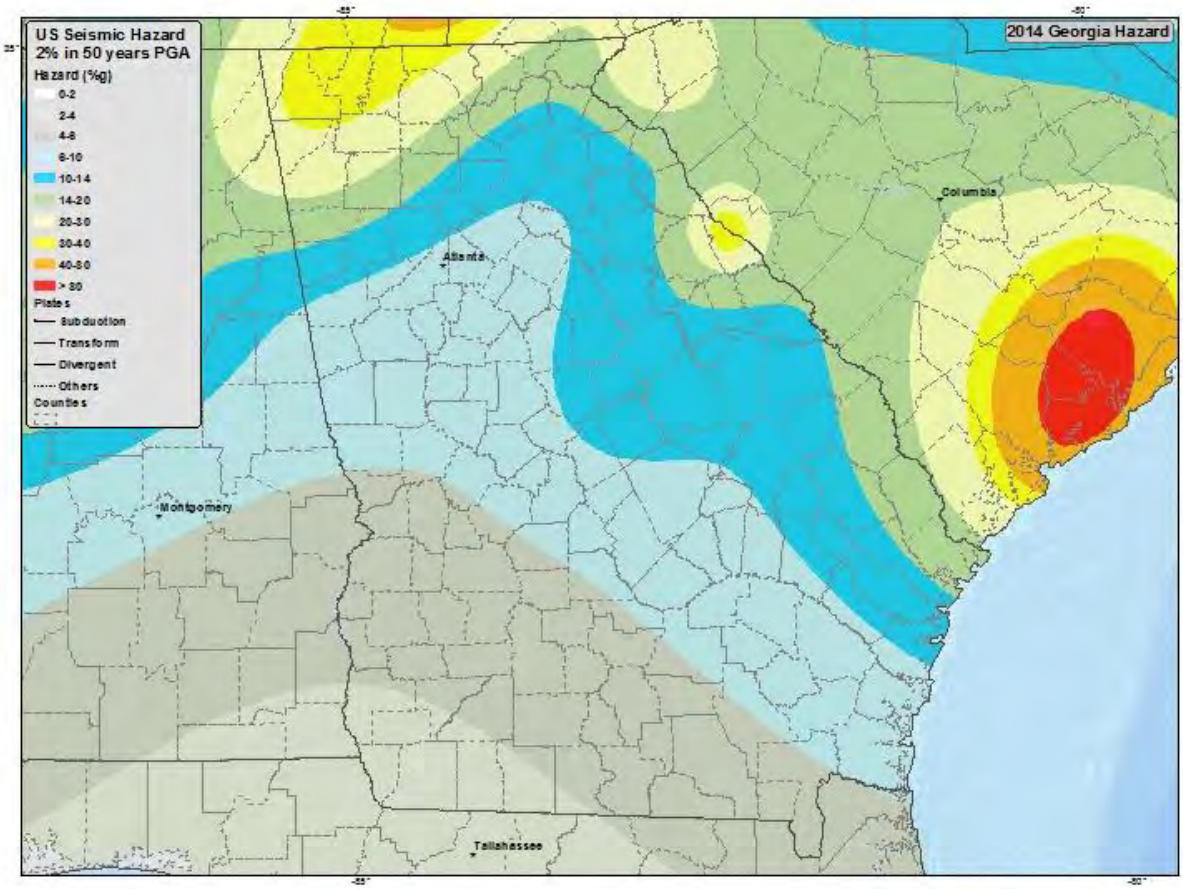
Source: Federal Emergency Management Agency

5.5.2 Location and Spatial Extent

The eastern and northern parts of Georgia are subject to the most significant earthquake risk in the state, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and the Eastern Tennessee Fault in Tennessee. The Charleston Fault has generated earthquakes measuring greater than 8 on the Richter Scale during the last 200 years, and this is the fault that is most likely to impact Augusta-Richmond County.

Figure 5.5 shows the intensity level associated with Augusta-Richmond County, based on the national USGS map of peak acceleration with 2 percent probability of exceedance in 50 years. This is the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 2 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards. According to this map, Augusta-Richmond County lies within an approximate zone of 10 to 20%g peak ground acceleration. This indicates that the county as a whole exists within an area of moderate seismic risk.

FIGURE 5.5: UNITED STATES EARTHQUAKE HAZARD MAP



Source: United States Geological Survey, 2014

5.5.3 Historical Occurrences

At least twenty-four earthquakes are known to have affected Augusta-Richmond County since 1800. The strongest of these measured a VIII on the Modified Mercalli Intensity (MMI) scale. **Table 5.12** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985 and **Figure 5.6** presents a map showing earthquakes whose epicenters have occurred near the county between 1985 and 2015 (no earthquakes occurred within the county boundaries during this period). **Table 5.13** shows a detailed occurrence of each event including the date, distance from the epicenter, magnitude, and Modified Mercalli Intensity (if known).[5]

TABLE 5.12: SUMMARY OF SEISMIC ACTIVITY IN AUGUSTA-RICHMOND COUNTY

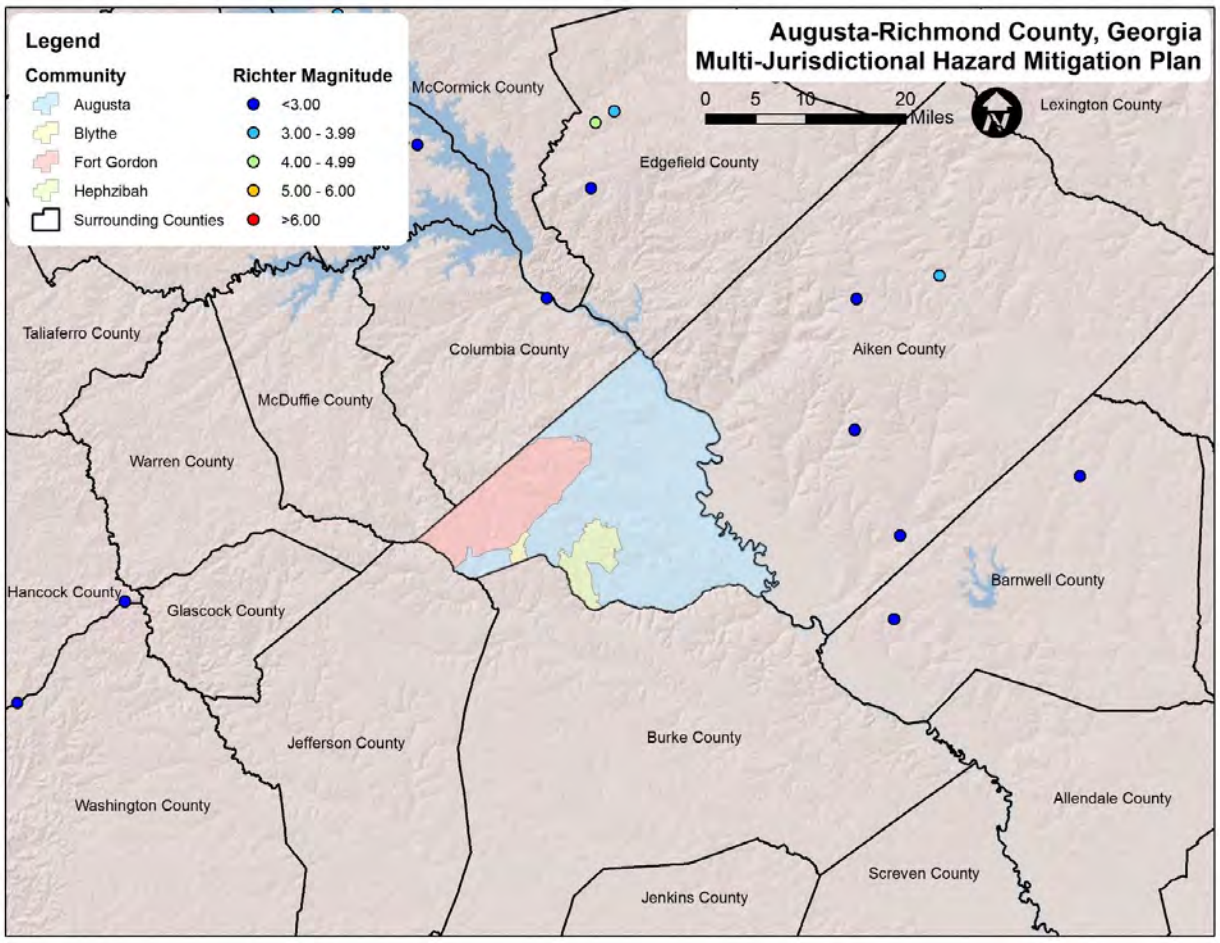
Location	Number of Occurrences	Greatest MMI Reported	Description of Greatest MMI Impacts
Augusta-Richmond County	21	VIII	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged
Blythe	0	--	--

[5] Due to reporting mechanisms, not all earthquakes events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of "unknown" is reported.

Location	Number of Occurrences	Greatest MMI Reported	Description of Greatest MMI Impacts
Fort Gordon	3	VI	Trees sway; suspended objects swing, objects fall off shelves
Hephzibah	0	--	--
AUGUSTA-RICHMOND COUNTY TOTAL	**24**	**VIII**	**--**

Source: National Geophysical Data Center

FIGURE 5.6: HISTORIC EARTHQUAKES WITH EPICENTERS NEAR AUGUSTA-RICHMOND COUNTY (1985-2015)



Source: United States Geological Survey, 2016

TABLE 5.13: SIGNIFICANT SEISMIC EVENTS IN AUGUSTA-RICHMOND COUNTY (1638-1985)

Location	Date	Epicentral Distance (km)	Magnitude	MMI
Augusta-Richmond County				
Augusta-Richmond County	2/7/1812	777	7.4	5
Augusta-Richmond County	1/5/1843	762	*Not Available*	4
Augusta-Richmond County	11/2/1875	61	*Not Available*	6
Augusta-Richmond County	9/1/1886	193	*Not Available*	8

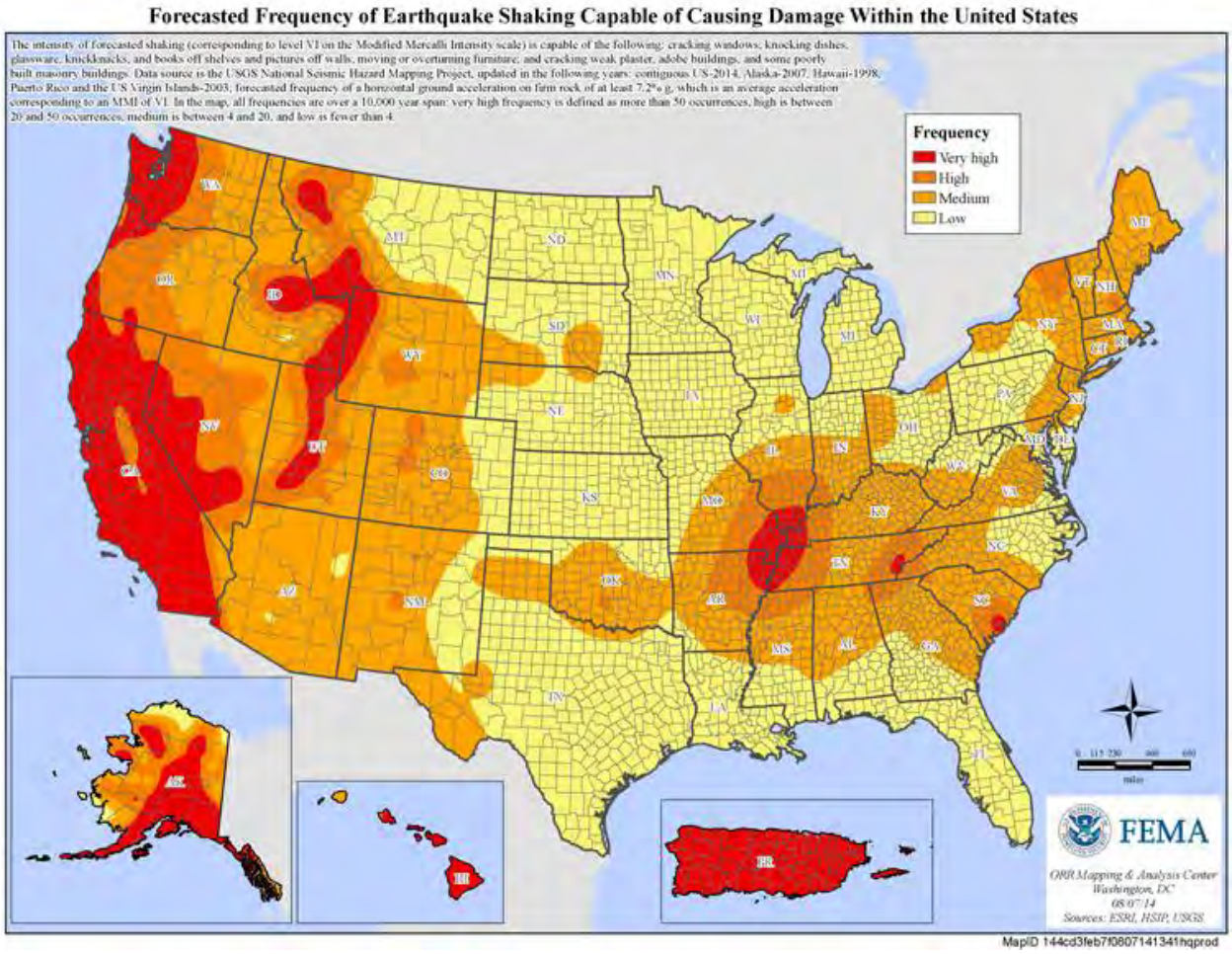
Location	Date	Epicentral Distance (km)	Magnitude	MMI
Augusta-Richmond County	10/22/1886	193	*Not Available*	6
Augusta-Richmond County	1/24/1903	*Not Available*	*Not Available*	3
Augusta-Richmond County	4/19/1907	193	*Not Available*	5
Augusta-Richmond County	9/22/1914	171	*Not Available*	2
Augusta-Richmond County	2/21/1916	231	*Not Available*	4
Augusta-Richmond County	10/18/1916	393	*Not Available*	2
Augusta-Richmond County	10/20/1924	179	*Not Available*	2
Augusta-Richmond County	7/29/1943	*Not Available*	*Not Available*	3
Augusta-Richmond County	7/26/1945	122	5.6	3
Augusta-Richmond County	8/3/1959	234	*Not Available*	5
Augusta-Richmond County	3/12/1960	280	*Not Available*	4
Augusta-Richmond County	11/9/1968	775	5.3	4
Augusta-Richmond County	11/20/1969	445	4.3	4
Augusta-Richmond County	5/19/1971	127	3.4	4
Augusta-Richmond County	2/3/1972	144	4.5	5
Augusta-Richmond County	8/2/1974	66	4.9	4
Augusta-Richmond County	11/6/1983	181	3.3	2
Blythe				
None Reported	--	--	--	--
Fort Gordon				
None Reported	--	--	--	--
Hephzibah				
Hephzibah	9/1/1886	200	*Not Available*	6
Hephzibah	2/3/1972	159	4.5	4
Hephzibah	8/2/1974	71	4.9	3

Source: National Geophysical Data Center

5.5.4 Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Augusta-Richmond County is likely as indicated by **Figure 5.7** which shows the forecasted frequency of an earthquake that would result in shaking capable of causing damage. It is possible that future earthquakes resulting in moderate to strong perceived shaking and damages that are substantial will affect the county. The annual probability level for the county is estimated between 10 and 100 percent (likely).

FIGURE 5.7: FORECASTED FREQUENCY OF EARTHQUAKE SHAKING CAPABLE OF CAUSING DAMAGE WITHIN THE UNITED STATES



Source: National Geophysical Data Center

5.5.5 Consequence Analysis

People (The Public and Public Confidence)

Earthquakes in Augusta-Richmond County generally are not high impact events that cause injury or death as most are moderate. The public typically experiences some shaking in these events and the greatest threat to health and well-being is often from objects falling from shelves. Public confidence would likely not be affected drastically in the event of an earthquake.

Responders

There would be little impact on responders in the event of an earthquake, again, because Augusta-Richmond County is only likely to experience a moderate earthquake magnitude. Since there would be likely only minor damage to infrastructure, responders would likely not be impacted in their ability to respond to an earthquake.

Continuity of Operations

During and after an earthquake, continuity of operations could relatively easily be maintained and there would likely be little disruption to services or operations.

Built Environment (Property, Facilities, and Infrastructure)

Ground shaking is the primary cause of damage to the built environment during an earthquake. There are three important variables that determine the amount of damage: the intensity of the quake, local soil characteristics, and the quality of the impacted structures. The amount of damage caused by an earthquake is strongly influenced by soil characteristics. The velocity at which the rock or soil transmits shear waves is the main contributor to ground shaking. Shaking is increased by soft, thick, or wet soil types.

Certain building types are particularly vulnerable to earthquake damage: wood-frame multi-unit buildings, single-family homes, mobile homes, and unreinforced masonry buildings.[6] The most susceptible structures are wood-frame, multi-story, mixed-use buildings that have large openings on the first floor for garages or commercial space and housing on the upper floors. During an earthquake, these types of structures could sway or even collapse. HAZUS-MH estimates that approximately 76 percent of the total building stock within the county is built of wood.

Single-family homes built prior to the 1970s are often not bolted to their foundations, and walls surrounding crawl spaces are not braced (i.e., cripple walls). Typical earthquake damage to these structures include cracked foundations, chimneys breaking at the roof line, wood frames coming off their foundations, and racking of cripple walls.

Mobile homes that are built of light-weight metal or a combination of steel frame and wood are easily damaged by a quake. Mobile homes installed prior to 1995 were often not attached to their foundations and could shift off their supports. Based on data from HAZUS-MH, manufactured homes make up approximately 9 percent of the county's building stock.

The last type of susceptible building material is unreinforced masonry—masonry walls that have not been reinforced with steel. These buildings were often built before 1960 in an era when reinforcing was not generally used, anchorage to floors and roofs was missing, and use of low-strength lime mortar was common. Earthquake damage to these buildings can be severe. A lack of reinforcement and tie-downs can result in substantial damage in the form of cracked or leaning walls. Damage may also occur between the walls, and separation between the framing and walls could lead to full collapse due to a lack of vertical support. HAZUS-MH reports that around 8 percent of the buildings within the county are unreinforced masonry buildings.

Critical Infrastructure and Key Resources

Critical infrastructure and key resources within Augusta-Richmond County include assets, systems, and networks that are vital to the continued operation of government services. The incapacitation or destruction of these resources would have a debilitating effect on the county's security, economy, and/or public health. There are a handful of key resource categories that could be impacted by an earthquake including transportation systems, communication systems, and utility systems. Historically, the county has not been impacted by an earthquake with more than a moderate intensity so damage to

[6] Association of Bay Area Governments. (2012). *Guide to housing vulnerable resources*. Retrieved January 3, 2017, from http://quake.abag.ca.gov/housing/

these resources would be very minor; however, an inspection of certain features after a strongly felt earthquake may be necessary.

Economy

There are three primary sources of economic loss associated with an earthquake in Richmond County: property damage and business interruption costs; cost to repair public transportation, communication, or utility systems; and debris removal costs. Historically, there have been no major economic losses from earthquakes felt within the county.

Environment

There would be no substantial impacts to the environment following a large earthquake that is felt in Augusta-Richmond County with a moderate intensity. Secondary effects from the damage of the key resources mentioned above (e.g., utility systems) could impact the environment, but the probability of this type of situation is very small. Damage to a facility that houses chemicals or hazardous materials may release these dangerous materials cause damage to the surrounding environment.

5.6 EXTREME HEAT

5.6.1 Background

Extreme heat, like drought, poses little risk to property. However, extreme heat can have devastating effects on health. Extreme heat is often referred to as a "heat wave." According to the National Weather Service, there is no universal definition for a heat wave, but the standard U.S. definition is any event lasting at least three days where temperatures reach ninety degrees Fahrenheit or higher. However, it may also be defined as an event at least three days long where temperatures are ten degrees greater than the normal temperature for the affected area. Heat waves are typically accompanied by humidity but may also be very dry. These conditions can pose serious health threats causing an average of 1,500 deaths each summer in the United States.[7]

According to the National Oceanic and Atmospheric Administration, heat is the number one weather-related killer among natural hazards, followed by frigid winter temperatures. The National Weather Service devised the Heat Index as a mechanism to better inform the public of heat dangers. The Heat Index Chart, shown in **Figure 5.8**, uses air temperature and humidity to determine the heat index or apparent temperature. **Table 5.14** shows the dangers associated with different heat index temperatures. Some populations, such as the elderly and young, are more susceptible to heat danger than other segments of the population.

[7] http://www.noaawatch.gov/themes/heat.php

FIGURE 5.8: HEAT INDEX CHART

Air Temp (in F)	Relative Humidity (in percent)																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
140	125																				
135	120	128																			
130	117	122	131																		
125	111	116	123	131	141																
120	107	111	116	123	130	139	148														
115	103	107	111	115	120	127	135	143	151												
110	99	102	105	108	112	117	123	130	137	143	150										
105	95	97	100	102	105	109	113	118	123	129	135	142	149								
100	91	93	95	97	99	101	104	107	110	115	120	126	132	138	144						
95	87	88	90	91	93	94	96	98	101	104	107	110	114	119	124	130	136				
90	83	84	85	86	87	88	90	91	93	95	96	98	100	102	106	109	113	117	122		
85	78	79	80	81	82	83	84	85	86	87	88	89	90	91	93	95	97	99	102	105	108
80	73	74	75	76	77	77	78	79	79	80	81	81	82	83	85	86	86	87	88	89	91
75	69	69	70	71	72	72	73	73	74	74	75	75	76	76	77	77	78	78	79	79	80
70	64	64	65	65	66	66	67	67	68	68	69	69	70	70	70	70	71	71	71	71	72

Source: National Oceanic and Atmospheric Administration

TABLE 5.14: HEAT DISORDERS ASSOCIATED WITH HEAT INDEX TEMPERATURE

Heat Index Temperature (Fahrenheit)	Description of Risks
80°- 90°	Fatigue possible with prolonged exposure and/or physical activity
90°- 105°	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105°- 130°	Sunstroke, heat cramps, and heat exhaustion likely, and heatstroke possible with prolonged exposure and/or physical activity
130° or higher	Heatstroke or sunstroke is highly likely with continued exposure

Source: National Weather Service, National Oceanic and Atmospheric Administration

In addition, the National Weather Service issues a number of heat-related cautions in order to better inform and warn the public of heat dangers. These are outlined below in **Table 5.15.**

TABLE 5.15: NATIONAL WEATHER SERVICE HEAT-RELATED ALERTS

Alert Type	Description of Alert
Excessive Heat Warning	An Excessive Heat Warning is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Warning is when the maximum heat index temperature is expected to be 105°F or higher for at least 2 days and night time air temperatures will not drop below 75°F.
Excessive Heat Watch	Heat watches are issued when conditions are favorable for an excessive heat event in the next 24 to 72 hours. A Watch is used when the risk of a heat wave has increased but its occurrence and timing is still uncertain.
Heat Advisory	A Heat Advisory is issued within 12 hours of the onset of extremely dangerous heat conditions. The general rule of thumb for this Advisory is when the maximum heat index temperature is expected to be 100°F or higher for at least 2 days, and night time air temperatures will not drop below 75°F.
Excessive Heat Outlook	Excessive Heat Outlooks are issued when the potential exists for an excessive heat event in the next 3-7 days. An Outlook provides information to those who need considerable lead-time to prepare for the event.

Source: National Weather Service, National Oceanic and Atmospheric Administration

People living in urban areas are often most vulnerable to heat events because stagnant atmospheric conditions trap pollutants, thus adding unhealthy air to excessively hot temperatures. In addition, the "urban heat island effect" can produce significantly higher nighttime temperatures because asphalt and concrete (which store heat longer) gradually release heat at night. Finally, it should be noted that elderly and aging populations—one of the fastest growing age demographics nationally—are highly vulnerable to heat-related illnesses.

5.6.2 Location and Spatial Extent

Excessive heat typically impacts a large area and cannot be confined to any geographic or political boundaries, so the entire county is susceptible to extreme heat conditions.

5.6.3 Historical Occurrences

According to the *Piedmont Together Climate Adaptation Report*, the 10 warmest years in recorded history have occurred since 1997. Although data from the National Climatic Data Center was evaluated to determine historical extreme heat and heat wave events in Augusta-Richmond County, it did not report any events. As such, the planning team collected data from the Georgia Automated Environmental Monitoring Network's weather stations website.

This site includes high and low temperatures for each day of the year at several weather stations across Georgia. Even though no stations are located directly in Augusta, there are several nearby stations that can provide information that is likely comparable to temperatures within the county. Stations at Clarks-Hill, South Carolina and Dearing, Georgia were used to collect historic high temperatures from the last ten years. **Table 5.16** includes the data collected from these stations and shows that many years, the highest recorded temperature was well above 95°F.

TABLE 5.16: HIGHEST RECORDED ANNUAL TEMPERATURES AT SELECTED WEATHER STATIONS

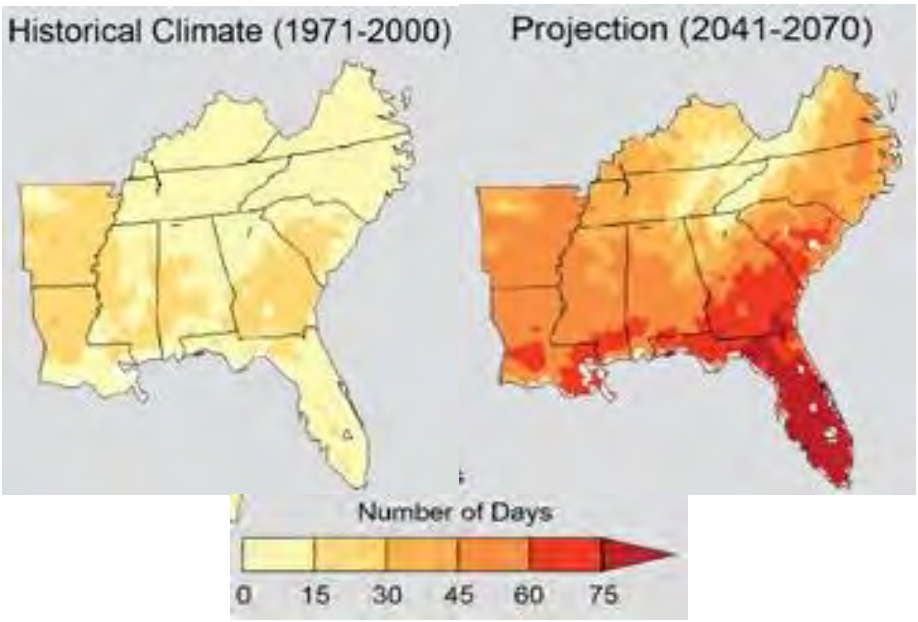
Year	Clarks-Hill, SC	Dearing, GA
2007	105.4°F	105.2°F
2008	101.7°F	101.8°F
2009	99.9°F	98.8°F
2010	101.5°F	101.5°F
2011	102.4°F	103.1°F
2012	106.2°F	110.4°F
2013	95.3°F	95.4°F
2014	98.9°F	99.7°F
2015	101.2°F	100.3°F
2016	100.6°F	99.2°F

Source: Georgia Automated Environmental Monitoring Network

5.6.4 Probability of Future Occurrences

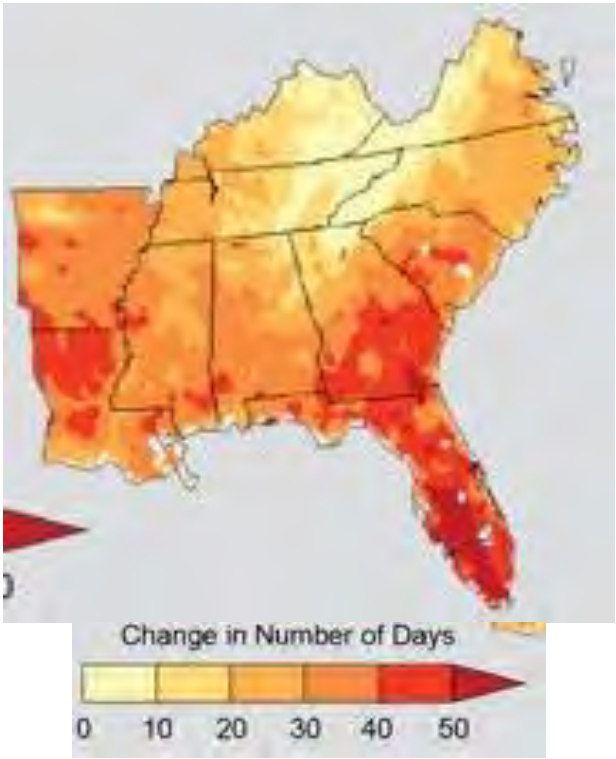
Based on historical occurrence information, it is assumed that all of Augusta-Richmond County has a probability level of highly likely (near 100 percent annual probability) for future extreme heat events to impact the county. Additionally, according to the National Climate Assessment, the increase in the number of days over 95°F is likely to increase over the 30 to 50 years when compared to a baseline over the last 30 years of the 20th century. **Figure 5.9** shows both the baseline, historical number of days over 95°F from 1971 to 2000 and the projection for the 2041 to 2070 period. **Figure 5.10** shows the projected change in number of days between the historic data and the projected data. This increase in days of extreme heat due to climate change will likely result in a higher number of rolling brown/blackouts and decreased air quality in the county.

FIGURE 5.9: NUMBER OF DAYS OVER 95 DEGREES FAHRENHEIT



Source: National Climate Assessment

FIGURE 5.10: PROJECTED CHANGE IN NUMBER OF DAYS OVER 95 DEGREES FAHRENHEIT



Source: National Climate Assessment

5.6.5 Consequence Analysis

People (The Public and Public Confidence)

Extreme heat can affect many people and to varying degrees. Often the elderly and very young are susceptible to the most detrimental impacts, but heat stroke and exhaustion can plague anyone. A heat wave or extreme heat event would have minimal effects on public confidence as these events are frequent and the public likely understands the potential impacts.

Responders

Extreme heat can also affect responders who are often more susceptible to heat stroke and exhaustion due to the nature of their work which often forces police and emergency medical providers to be exposed to the elements. In these cases, responders could be negatively impacted by extreme heat and will need to protect themselves by preparing accordingly.

Continuity of Operations

Extreme heat would likely have few impacts on continuity of operations as the warning time for these events is usually long and direct impacts to large numbers of personnel or other resources necessary to maintain operations are unlikely. If air conditioning systems in operations centers break down due to overuse, operations could be interrupted or forced to move to secondary facilities.

Built Environment (Property, Facilities, and Infrastructure)

Extreme heat would likely have a minor effect on the built environment, although high temperatures could potentially put a strain on infrastructure such as power generation and water systems due to higher demand.

Economy

An extreme heat event could potentially have a negative impact on the economy in the short term as the public may be advised to stay inside, causing them to reduce overall spending and negatively impact businesses in the community. Extended periods of extreme heat may also disrupt the local economy if agricultural, dairy, and livestock production declines, resulting in income loss for famers and others affected.

Environment

The environment would be impacted by extreme heat as many plants and animals that are not able to withstand the heat may die off and crops and livestock may be impacted by unusually high temperatures, resulting in death or illness.

5.7 FLOODING

5.7.1 Background

Flooding is the most frequent and costly natural hazard in the United States and is a hazard that has caused more than 10,000 deaths since 1900. Nearly 90 percent of presidential disaster declarations result from natural events where flooding was a major component.

Floods generally result from excessive precipitation and can be classified under two categories: general floods, which are defined by precipitation over a given river basin for a long period of time along with storm-induced wave action, and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is typically determined by a combination of several major factors, including stream and river basin topography and physiography, precipitation and weather patterns, recent soil moisture conditions, and the degree of vegetative clearing and impervious surface.

General floods are usually long-term events that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, and other large coastal storms. Urban flooding occurs where manmade development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. However, flash flooding events may also occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall or from a sudden release of water held by a retention basin or other stormwater control facility. Although flash flooding occurs most often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as a floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains are designated by the frequency of the flood that is large enough to cover them. For example, the 10-year floodplain will be covered by the 10-year flood and the 100-year floodplain by the 100-year flood. Flood frequencies, such as the 100-year flood, are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. Another way of expressing the flood frequency is the chance of occurrence in a given year, which is the percentage of the probability of flooding each year. For example, the 100-year flood has a 1 percent chance of occurring in any given year and the 500-year flood has a 0.2 percent chance of occurring in any given year.

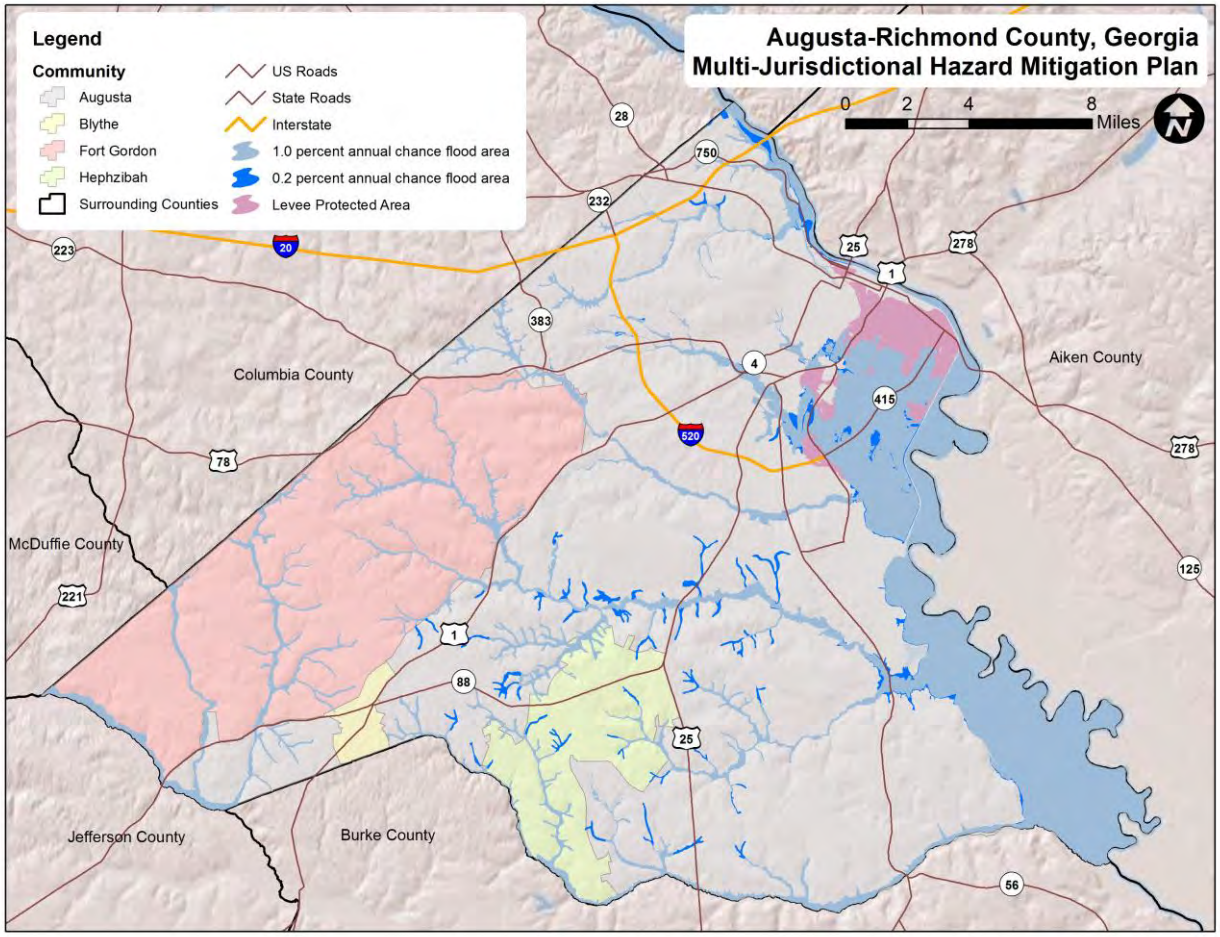
5.7.2 Location and Spatial Extent

There are areas in Augusta-Richmond County that are susceptible to flood events. Special flood hazard areas in Augusta-Richmond County were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).[8] This includes Zone A (1-percent annual chance floodplain), Zone AE (1-percent annual chance floodplain with elevation) and Zone X500 (0.2-percent annual chance floodplain). There are also some areas within the county that are designated as levee protected areas. According to GIS analysis, of the 320.9 square miles of land that make up Augusta-Richmond County, there are 82.6 square miles of land in zone A and AE (1-percent annual chance floodplain/100-year floodplain) and 5.8 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). These flood zone values account for 19.7 percent of the total land area in Augusta-Richmond County.

It is important to note that while FEMA digital flood data is recognized as best available data for planning purposes, it does not always reflect the most accurate and up-to-date flood risk. Flooding and flood-related losses often do occur outside of delineated special flood hazard areas. **Figure 5.11**, **Figure 5.12**, **Figure 5.13**, and **Figure 5.14** illustrate the location and extent of currently mapped special flood hazard areas for Augusta-Richmond County and its municipalities based on best available FEMA DFIRM data.

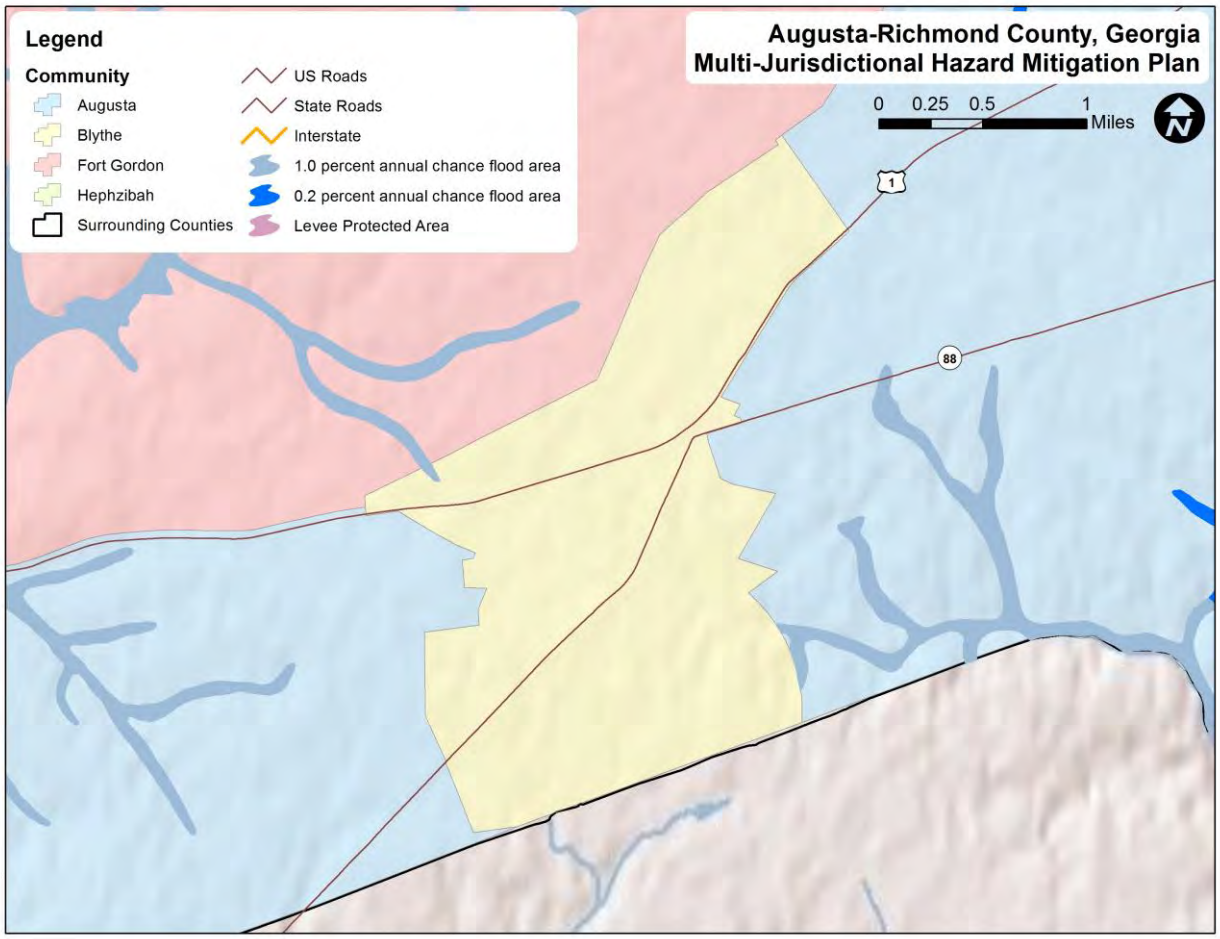
[8] The county-level DFIRM used for Augusta-Richmond County was updated in 2011.

FIGURE 5.11: SPECIAL FLOOD HAZARD AREAS IN AUGUSTA-RICHMOND COUNTY



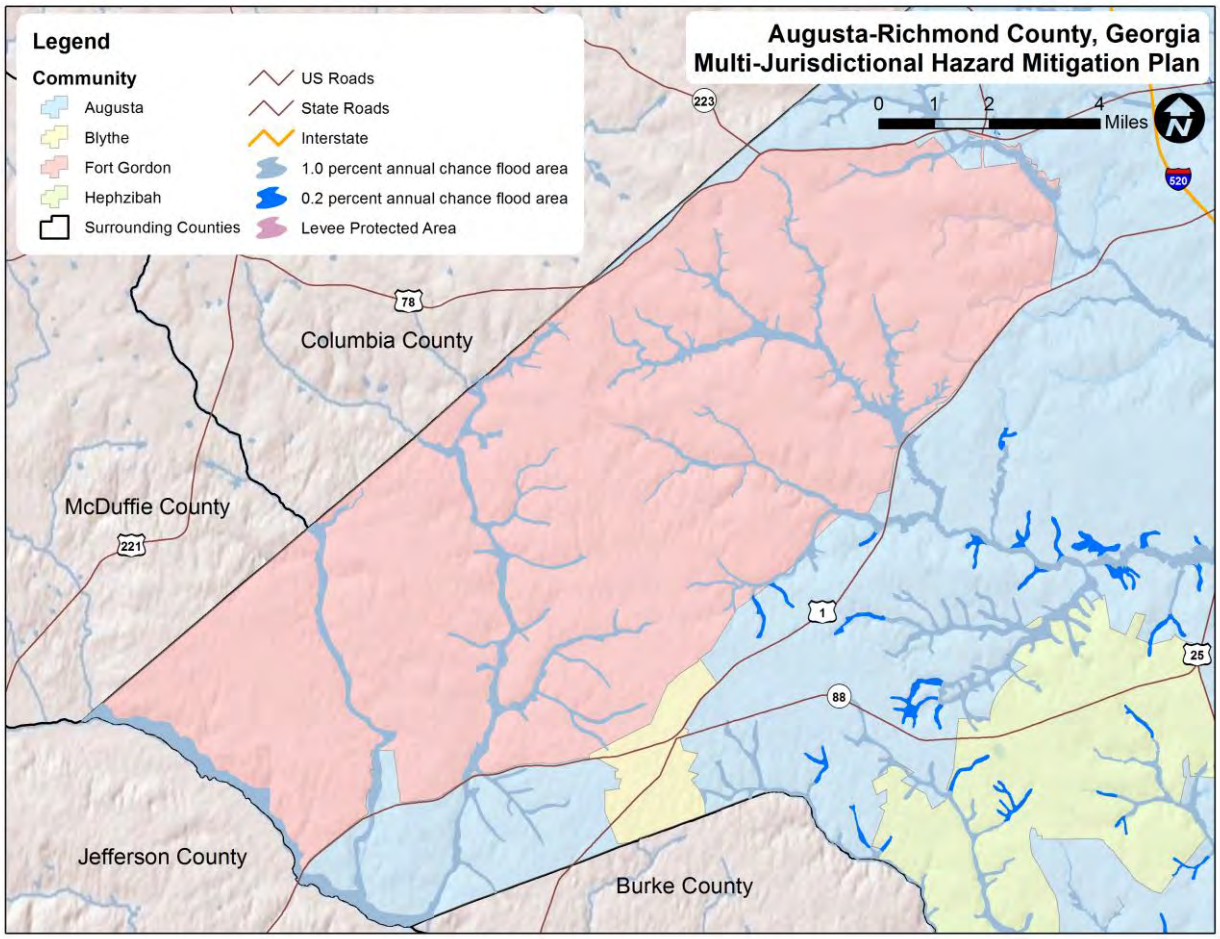
Source: Federal Emergency Management Agency

FIGURE 5.12: SPECIAL FLOOD HAZARD AREAS IN BLYTHE



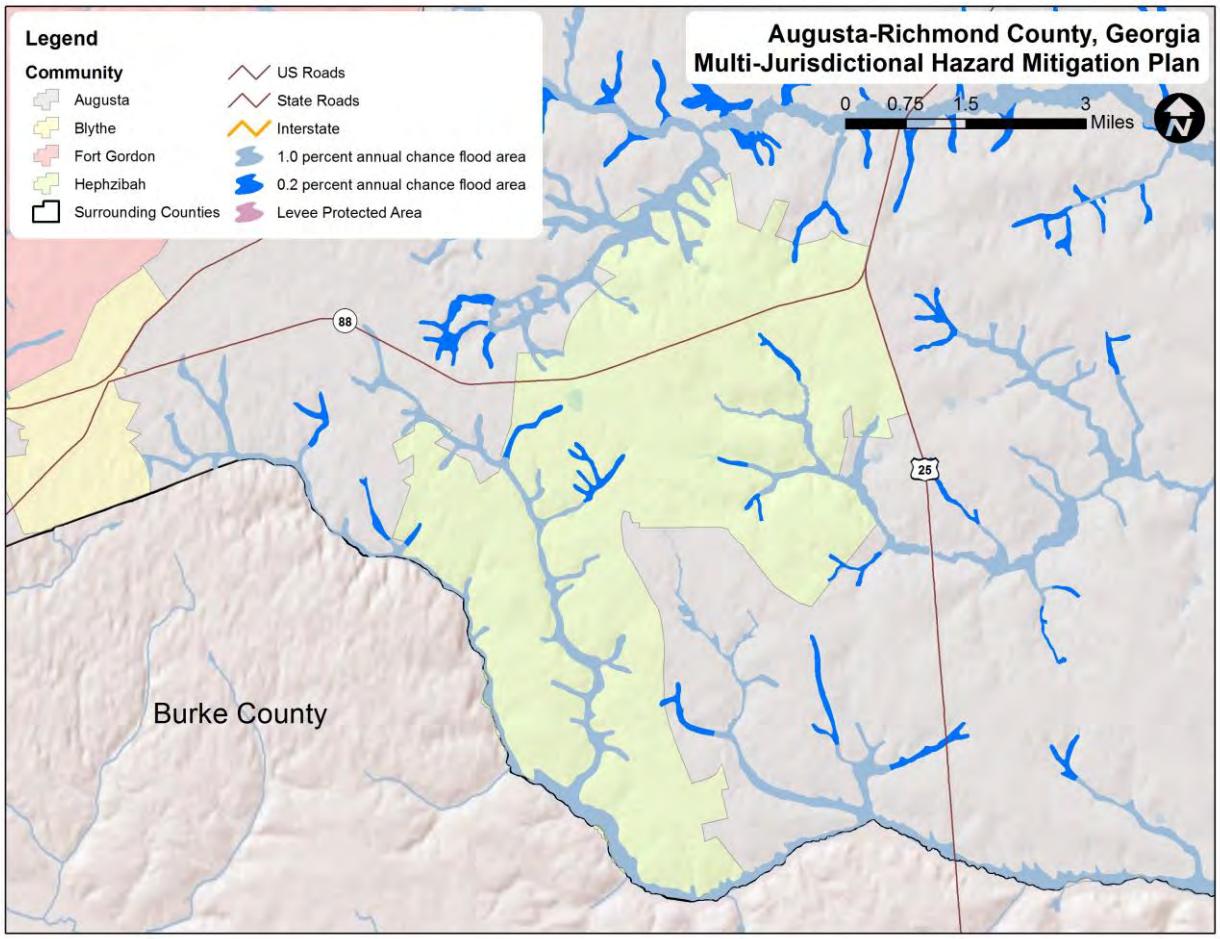
Source: Federal Emergency Management Agency

FIGURE 5.13: SPECIAL FLOOD HAZARD AREAS IN FORT GORDON



Source: Federal Emergency Management Agency

FIGURE 5.14: SPECIAL FLOOD HAZARD AREAS IN HEPHZIBAH



Source: Federal Emergency Management Agency

5.7.3 Historical Occurrences

Information from the National Climatic Data Center was used to ascertain historical flood events. The National Climatic Data Center reported a total of 24 events throughout Augusta-Richmond County since 1996.[9] A summary of these events is presented in **Table 5.17**. These events accounted for over $800,000 (2016 dollars) in property damage throughout the county.[10] Specific information on flood events for each jurisdiction, including date, type of flooding, and deaths and injuries, can be found in **Table 5.18**.

TABLE 5.17: SUMMARY OF FLOOD OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	23	0/0	$845,826

[9] These flood events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through 2016. It is likely that additional occurrences have occurred and have gone unreported in Augusta-Richmond County.
[10] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Blythe	0	0/0	$0
Fort Gordon	1	0/0	$2,066
Hephzibah	0	0/0	$0
AUGUSTA-RICHMOND COUNTY TOTAL	**24**	**0/0**	**$847,892**

Source: National Climatic Data Center

TABLE 5.18: HISTORICAL FLOOD OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

	Date	Type	Deaths / Injuries	Property Damage*
Augusta-Richmond County				
NORTHERN HALF	3/7/1996	Flash Flood	0/0	$613,504
AUGUSTA	12/24/1997	Flash Flood	0/0	$2,999
AUGUSTA	3/8/1998	Flash Flood	0/0	$0
AUGUSTA	9/3/1998	Flash Flood	0/0	$0
COUNTYWIDE	6/20/2000	Flash Flood	0/0	$0
COUNTYWIDE	5/30/2002	Flash Flood	0/0	$0
AUGUSTA	5/18/2003	Flash Flood	0/0	$0
AUGUSTA	8/8/2003	Flash Flood	0/0	$0
(AGS) BUSH FLD AUGUSTA	1/25/2010	Flash Flood	0/0	$22,072
AVONDALE	8/7/2012	Flash Flood	0/0	$10,481
LAKEMONT	8/7/2012	Flash Flood	0/0	$83,851
LAKEMONT	8/7/2012	Flash Flood	0/0	$16,770
NATIONAL HILLS	8/7/2012	Flash Flood	0/0	$62,888
PEACH ORCHARD	8/7/2012	Flash Flood	0/0	$10,481
DE BRUCE	8/11/2012	Flash Flood	0/0	$4,193
DE BRUCE	8/11/2012	Flash Flood	0/0	$4,193
DE BRUCE	8/11/2012	Flash Flood	0/0	$2,096
NATIONAL HILLS	7/10/2013	Flash Flood	0/0	$4,132
NATIONAL HILLS	7/11/2013	Flash Flood	0/0	$2,066
AUGUSTA	6/24/2014	Flash Flood	0/0	$1,017
AUGUSTA DANIEL ARPT	6/24/2014	Flash Flood	0/0	$2,033
SOUTH NELLIEVILLE	6/24/2014	Flash Flood	0/0	$2,033
AUGUSTA DANIEL ARPT	6/4/2015	Flash Flood	0/0	$1,015
Blythe				
None Reported	--	--	--	--
Fort Gordon				
FORT GORDON	7/12/2013	Flash Flood	0/0	$2,066
Hephzibah				
None Reported	--	--	--	--

*Property damage is reported in 2016 dollars; All damage may not have been reported.
Source: National Climatic Data Center

5.7.4 Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of October 2016, there have been 1,064 flood losses reported in Augusta-Richmond County through the National Flood Insurance Program (NFIP) since 1978, totaling over $3.2 million in claims payments. A summary of these figures for each community is provided in **Table 5.19**. It should be emphasized that these numbers include only those losses to structures that were insured through the NFIP policies, and for losses in which claims were sought and received. It is likely that many additional instances of flood loss in Augusta-Richmond County were either uninsured, denied claims payment, or not reported.

TABLE 5.19: SUMMARY OF INSURED FLOOD LOSSES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Policies	Number of Claims	Claims Payments
Augusta†	0	72	$717,751
Blythe*	--	--	--
Hephzibah	2	0	$0
Augusta-Richmond County	1,062	270	$2,574,566
AUGUSTA-RICHMOND COUNTY TOTAL	**1,064**	**342**	**$3,292,317**

†This claims data pre-dates the consolidation of the city-county
**Community does not participate in the NFIP.*
Source: Federal Emergency Management Agency, National Flood Insurance Program

5.7.5 Repetitive and Severe Repetitive Loss Properties

FEMA defines a repetitive loss property as any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling 10-year period, since 1978. A repetitive loss property may or may not be currently insured by the NFIP. Currently there are over 140,000 repetitive loss properties nationwide.

As of October 2016, there are 36 non-mitigated repetitive loss properties located in Augusta-Richmond County, which accounted for 91 losses and over $740,000 in claims payments under the NFIP. Nearly all of the properties are single-family residential buildings (26). Ten (10) of the remaining are other types of residential and the last (1) is non-residential (commercial). Without mitigation these properties will likely continue to experience flood loses. **Table 5.20** presents a summary these figures for Augusta-Richmond County.

TABLE 5.20: SUMMARY OF REPETITIVE LOSS PROPERTIES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Average Payment
Augusta-Richmond County	35	26 single-family residential; 9 other residential; 1 non-residential	89	$730,275	$8,205
Blythe*	--	--	--	--	--
Hephzibah	1	1 other residential	2	$10,564	$5,282
AUGUSTA-RICHMOND COUNTY TOTAL	**36**	**--**	**91**	**$740,839**	**$8,141**

Source: Federal Emergency Management Agency, Georgia Emergency Management Agency

5.7.6 Probability of Future Occurrences

Flood events will remain a threat in Augusta-Richmond County, and the probability of future occurrences will remain highly likely (100 percent annual probability). The probability of future flood events based on magnitude and according to best available data is illustrated in the figure above, which indicates those areas susceptible to the 1-percent annual chance flood (100-year floodplain) and the 0.2-percent annual chance flood (500-year floodplain).

It can be inferred from the floodplain location maps, previous occurrences, and repetitive loss properties that risk varies throughout Augusta-Richmond County. For example, Blythe likely has much lower risk of flood than the other communities.

Additionally, according to the National Climate Assessment, the increased likelihood of extreme participation events due to climate change will result in greater risks of flash flooding and impacts from stormwater runoff in the county. Indeed, even though there may be less precipitation overall in the long term (leading to more frequent drought events), the rainfall that does occur will be more likely to occur during consolidated periods, causing heavy rainfall events that may lead to flash flooding. That is to say, that while overall precipitation may decline, flooding impacts may actually intensify as a result of climate change. This is especially true in the southeastern United States which is located in a sort of middle ground between the southwestern states (which will likely be experiencing significant declines in precipitation) and northeastern states (which will likely be experiencing significant increases in precipitation). The result will be that there are likely to be periods of both drought and substantial precipitation in the southeast going forward.

5.7.7 Consequence Analysis

People (The Public and Public Confidence)

During flood events, people are often stranded and have to be rescued by first responders. Often lives are lost or people are injured. Public confidence is often impacted by flood events, especially when impacted people do not have flood insurance and are not covered by their home insurance policy. This can create public relations issues for government entities.

Responders

Responders are often affected by flooding because floods can trap people in their homes or in other locations, forcing responders to put their lives at risk to return members of the public to safety. Often responders in flood situations face blocked roads and have difficulty safely protecting citizens.

Continuity of Operations

Flooding can impact continuity of operations by knocking out power sources and preventing emergency management personnel from being able to do their jobs properly. Floods typically have some impact on continuity of operations as they can cause severe disruption to normal operations and have done so in the past in Augusta-Richmond County.

Built Environment (Property, Facilities, and Infrastructure)

Many buildings and structures could be impacted by a flood event. For a more detailed analysis of flood prone properties, see *Section 6: Hazard Vulnerability.*

Critical Infrastructure and Key Resources

Critical infrastructure and key resources (CIKR) within Augusta-Richmond County include assets, systems, and networks that are vital to the continued operation of government services. The incapacitation or destruction of these resources would have a debilitating effect on the county's security, economy, and/or public health.

Economy

There are a variety of economic impacts that could result from a large-scale flood event. Perhaps the biggest impact would be that many businesses that are flooded would have to shut down at least temporarily in the wake of a flood event to repair and rebuild the structures in which they are located. Of more concern may be that, according to the National Flood Insurance Program, almost 40 percent of small businesses that are impacted by a flood never reopen their doors following the disaster. This demonstrates that the economic impact of flooding events is ongoing even after the flood waters have receded and that the long-term health of the local economy will likely be slow to recover.

Environment

The fluctuation of water levels in a wetland, especially flood waters, supports the biological diversity of low-lying areas by releasing nutrients into the soil and germinating wetland flora. Flooding also offers some control of invasive water weeds.

Another impact is on soil that is covered by flood waters, causing the rapid depletion of oxygen which is essential for plant growth and development. Flooding may modify nutrients within the soil either by leaching or changing their availability to the plant. Impact from submersion will vary with duration and temperature, but it is notable that ongoing food supplies and other plants The full extent of injury to seedlings would be determined by the current stage of development at the time of flooding, duration of the flood event, air and soil temperatures, and the presence of axillary buds.

5.8 HAIL

5.8.1 Background

Hailstorms are a potentially damaging outgrowth of severe thunderstorms (thunderstorms are discussed in a separate sub-section). Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until they develop to a sufficient weight and fall as precipitation. Hail typically takes the form of spheres or irregularly-shaped masses greater than 0.75 inches in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size. **Table 5.21** shows the TORRO Hailstorm Intensity Scale which is a way of measuring hail severity.

TABLE 5.21: TORRO HAILSTORM INTENSITY SCALE

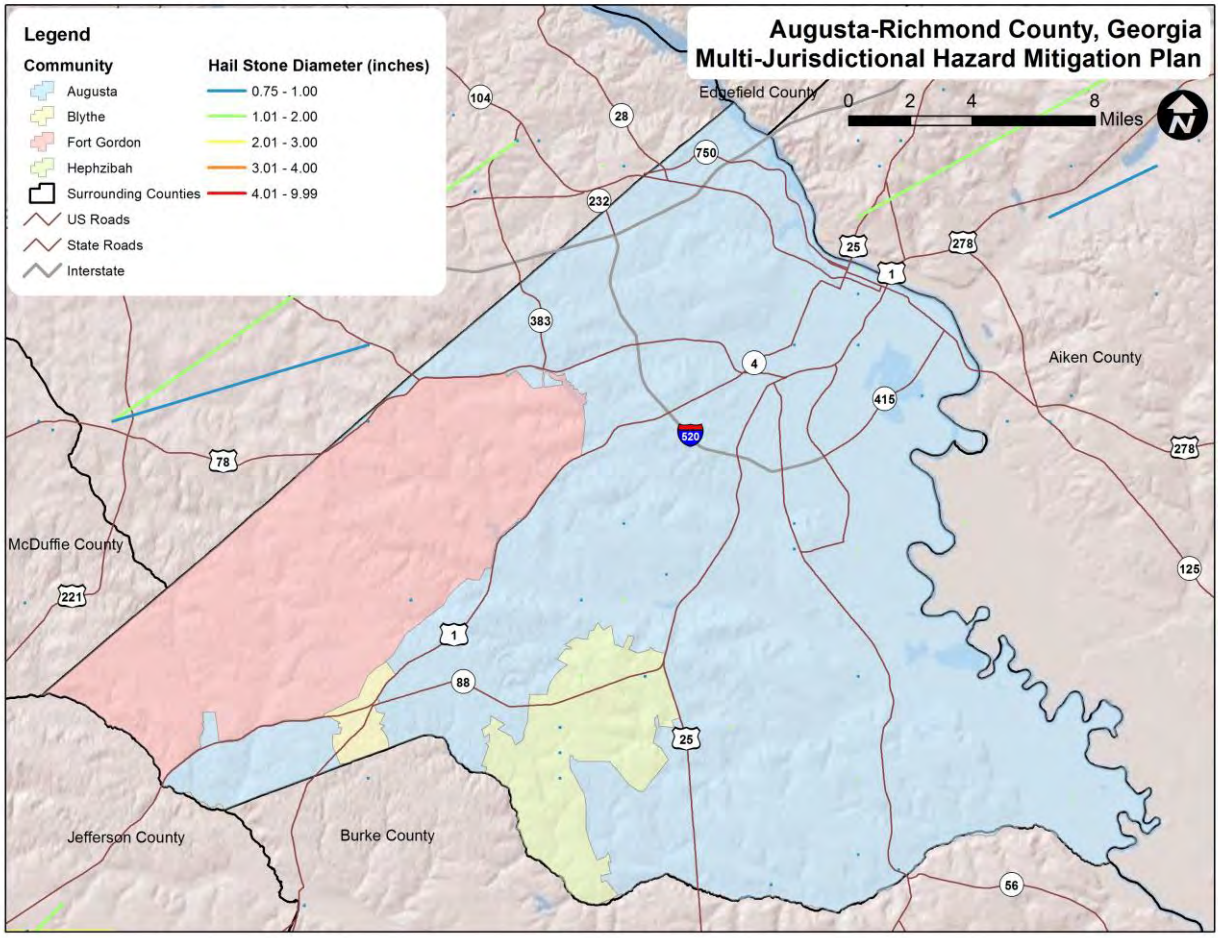
	Intensity Category	Typical Hail Diameter (mm)*	Typical Hail Diameter (in)*	Probable Kinetic Energy, J-m^2	Typical Damage Impacts
H0	Hard Hail	5	0 - 0.2	0-20	No damage
H1	Potentially Damaging	5-**15**	0.2 - 0.6	>20	Slight general damage to plants, crops
H2	Significant	10-**20**	0.4 - 0.8	>100	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	0.8 - 1.2	>300	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	1.0 - 1.6	>500	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	1.2 - 2.0	>800	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
H6	Destructive	40-**60**	1.6 - 2.4		Bodywork of grounded aircraft dented, brick walls pitted
H7	Destructive	50-**75**	2.0 - 3.0		Severe roof damage, risk of serious injuries
H8	Destructive	60-**90**	1.6 - 3.5		(Severest recorded in the British Isles) Severe damage to aircraft bodywork
H9	Super Hailstorms	75-**100**	3.0 - 3.9		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
H10	Super Hailstorms	>100	>4.0		Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

**Approximate range (typical maximum size in bold), since other factors (e.g. number and density of hailstones, hail fall speed and surface wind speeds) affect severity.*
Source: Torro Hailstorm Intensity Scale (http://www.torro.org.uk/hscale.php)

5.8.2 Location and Spatial Extent

Hailstorms frequently accompany thunderstorms, so their locations and spatial extents coincide. It is assumed that Augusta-Richmond County is uniformly exposed to severe thunderstorms; therefore, all areas of the county are equally exposed to hail which may be produced by such storms. The location of historic hail events that occurred in Augusta-Richmond County can be found in **Figure 5.15**.

FIGURE 5.15: HISTORIC HAIL TRACKS



Source: Federal Emergency Management Agency

5.8.3 Historical Occurrences

According to the National Climatic Data Center, 72 recorded hailstorm events have affected Augusta-Richmond County since 1950.[11] **Table 5.22** is a summary of the hail events in Augusta-Richmond County. **Table 5.23** provides detailed information about each event that occurred in the county. Records from

[11] These hail events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1950 through October 2016. It is likely that additional hail events have affected Augusta-Richmond County. In addition to NCDC, the North Carolina Department of Insurance office was contacted for information. As additional local data becomes available, this hazard profile will be amended.

NCDC report hail occurrences resulted in over $30,000 (2016 dollars) in property damages.[12] Hail ranged in diameter from 0.75 inches to 1.75 inches. It should be noted that hail is notorious for causing substantial damage to roofs, gutters, siding, and other areas of the built environment that may not be reported to the National Climatic Data Center. Therefore, it is likely that damages are greater than the reported value. The location of historic hail events that occurred in Augusta-Richmond County can be found in **Figure 5.16**.

TABLE 5.22: SUMMARY OF HAIL OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	55	0/0	$30,716
Blythe	0	0/0	$0
Fort Gordon	6	0/0	$0
Hephzibah	11	0/0	$0
AUGUSTA-RICHMOND COUNTY TOTAL	**72**	**0/0**	**$30,716**

Source: National Climatic Data Center

TABLE 5.23: HISTORICAL HAIL OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

	Date	Magnitude	Deaths / Injuries	Property Damage*
Augusta-Richmond County				
RICHMOND CO.	5/12/1955	0.75 in.	0/0	$0
RICHMOND CO.	5/28/1962	1.00 in.	0/0	$0
RICHMOND CO.	5/21/1967	1.75 in.	0/0	$0
RICHMOND CO.	5/12/1971	0.75 in.	0/0	$0
RICHMOND CO.	6/28/1972	0.75 in.	0/0	$0
RICHMOND CO.	10/4/1979	1.75 in.	0/0	$0
RICHMOND CO.	2/16/1982	1.00 in.	0/0	$0
RICHMOND CO.	2/16/1982	0.75 in.	0/0	$0
RICHMOND CO.	6/10/1982	1.00 in.	0/0	$0
RICHMOND CO.	7/15/1983	1.00 in.	0/0	$0
RICHMOND CO.	4/14/1984	1.75 in.	0/0	$0
RICHMOND CO.	4/14/1984	1.25 in.	0/0	$0
RICHMOND CO.	4/14/1984	1.75 in.	0/0	$0
RICHMOND CO.	4/14/1984	1.75 in.	0/0	$0
RICHMOND CO.	4/14/1984	1.75 in.	0/0	$0
RICHMOND CO.	4/17/1984	1.75 in.	0/0	$0
RICHMOND CO.	6/2/1985	1.50 in.	0/0	$0
RICHMOND CO.	6/2/1985	1.00 in.	0/0	$0
RICHMOND CO.	6/26/1986	1.50 in.	0/0	$0
RICHMOND CO.	7/30/1988	0.75 in.	0/0	$0
RICHMOND CO.	1/29/1990	0.75 in.	0/0	$0
Augusta	3/31/1993	1.00 in.	0/0	$0
AUGUSTA	1/2/1996	1.75 in.	0/0	$0

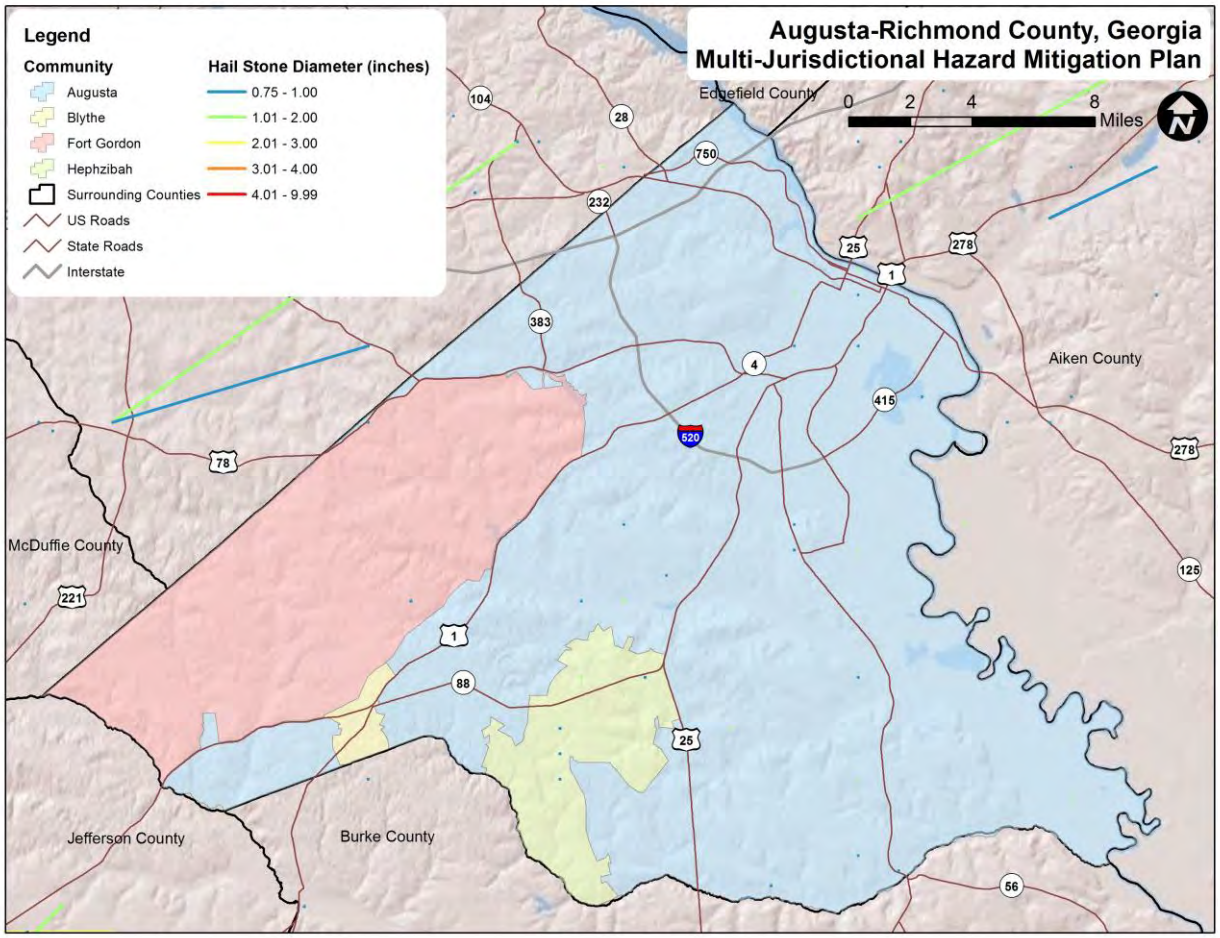
[12] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

	Date	Magnitude	Deaths / Injuries	Property Damage*
AUGUSTA AIRPORT	1/2/1996	1.00 in.	0/0	$0
AUGUSTA	3/15/1996	0.75 in.	0/0	$0
AUGUSTA	5/7/1996	0.75 in.	0/0	$0
AUGUSTA	4/22/1997	1.75 in.	0/0	$14,994
AUGUSTA	4/3/1998	0.75 in.	0/0	$0
AUGUSTA	4/8/1998	1.00 in.	0/0	$0
AUGUSTA	4/22/1998	0.75 in.	0/0	$0
AUGUSTA	6/10/1998	0.75 in.	0/0	$0
AUGUSTA	6/16/1998	1.75 in.	0/0	$0
AUGUSTA	6/19/1998	0.88 in.	0/0	$0
AUGUSTA	6/19/1998	0.88 in.	0/0	$0
AUGUSTA	3/31/2002	0.75 in.	0/0	$0
AUGUSTA	3/31/2002	1.75 in.	0/0	$0
AUGUSTA	3/31/2002	0.75 in.	0/0	$0
AUGUSTA	5/3/2002	1.75 in.	0/0	$0
AUGUSTA	6/3/2002	1.75 in.	0/0	$0
AUGUSTA	5/6/2003	1.00 in.	0/0	$0
AUGUSTA	2/21/2005	0.88 in.	0/0	$0
AUGUSTA	4/22/2005	0.75 in.	0/0	$0
AUGUSTA	2/13/2007	0.88 in.	0/0	$0
AUGUSTA	6/12/2007	1.00 in.	0/0	$0
MC BEAN	3/15/2008	0.88 in.	0/0	$0
AUGUSTA	5/20/2008	1.25 in.	0/0	$0
MC BEAN	8/16/2008	0.88 in.	0/0	$0
AUGUSTA	8/11/2009	0.75 in.	0/0	$0
AUGUSTA	7/31/2010	0.88 in.	0/0	$0
GRACEWOOD	6/21/2011	0.88 in.	0/0	$0
(AGS)BUSH FLD AUGUSTA	8/13/2011	1.00 in.	0/0	$0
AUGUSTA	2/24/2012	1.75 in.	0/0	$15,772
BEL AIR	4/3/2012	0.88 in.	0/0	$0
MC BEAN	7/5/2012	0.88 in.	0/0	$0
MC BEAN	9/17/2014	1.75 in.	0/0	$0
Blythe				
None Reported	--	--	--	--
Fort Gordon				
FT GORDON	2/21/2005	1.75 in.	0/0	$0
FT GORDON	2/21/2005	0.75 in.	0/0	$0
FT GORDON	5/10/2005	0.75 in.	0/0	$0
FT GORDON	5/20/2005	0.88 in.	0/0	$0
FT GORDON	12/4/2005	0.88 in.	0/0	$0
FT GORDON	7/5/2012	1.00 in.	0/0	$0
Hephzibah				
HEPHZEBAH	3/17/1996	1.75 in.	0/0	$0
HEPHZIBAH	6/10/1998	0.75 in.	0/0	$0
HEPHZIBAH	5/3/2002	1.75 in.	0/0	$0
HEPHZIBAH	5/10/2005	0.75 in.	0/0	$0

	Date	Magnitude	Deaths / Injuries	Property Damage*
HEPHZIBAH	7/29/2005	0.75 in.	0/0	$0
HEPHZIBAH	12/28/2005	0.88 in.	0/0	$0
HEPHZIBAH	2/13/2007	1.75 in.	0/0	$0
HEPHZIBAH	5/20/2008	1.75 in.	0/0	$0
HEPHZIBAH	5/26/2011	1.00 in.	0/0	$0
HEPHZIBAH	5/26/2011	1.00 in.	0/0	$0
HEPHZIBAH	6/21/2011	1.00 in.	0/0	$0

*Property damage is reported in 2016 dollars; All damage may not have been reported.
Source: National Climatic Data Center

FIGURE 5.16: HISTORIC HAIL TRACKS



Source: NOAA

5.8.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that the probability of future hail occurrences is highly likely (100 percent annual probability). Since hail is an atmospheric hazard (coinciding with thunderstorms), it is expected that future hail events will frequently continue to cause minor damage to homes and other personal property throughout the county.

5.8.5 Consequence Analysis

People (The Public and Public Confidence)

Hail can have a negative impact on the public as it can often cause injury if people are struck by hail stones. Often the impoverished or homeless are detrimentally impacted if they cannot find shelter, but hail can impact anyone. There would be little negative impact on public confidence as hail events are frequent and generally do not engender distrust in the local community's governing ability.

Responders

Hail can also affect responders who are often more susceptible to hail events due to the nature of their work which often forces police and emergency medical providers to be exposed to the elements. In these cases, responders could be negatively impacted by hail.

Continuity of Operations

Hail would likely have some impacts on continuity of operations as the warning time for these events is usually shorter and hail stones could potentially knock out power supplies or other critical resources which would affect operations temporarily.

Built Environment (Property, Facilities, and Infrastructure)

Hail can often have a significant effect on the built environment, depending on the size of the hail stones. Often these can damage roofs or other parts of homes and businesses as they are essentially rocks that are being propelled at high speeds. Hail can affect most any type of facility or infrastructure as well, causing damage to the structure.

Economy

A hailstorm could negatively impact the economy to some degree if the damage from the storm is large enough. Often hail causes a great deal of damage to personal property such as cars and homes, and these impacts would hurt the overall economy due to recovery efforts.

Environment

Hail often has a serious effect on crops and other plants and has been known to cause millions of dollars' worth of damage to farmers. It can also negatively impact livestock, as well as any flora or fauna that is not properly sheltered. However, overall impacts to the environment would be relatively small.

5.9 HURRICANE/TROPICAL STORM

5.9.1 Background

Hurricanes and tropical storms are classified as cyclones and defined as any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward

latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes.

The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in the Atlantic basin is about six.

As an incipient hurricane develops, barometric pressure (measured in millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale (**Table 5.24**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

TABLE 5.24: SAFFIR-SIMPSON SCALE

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)
1	74–95	Greater than 980
2	96–110	979–965
3	111–129	964–945
4	130–156	944–920
5	157 +	Less than 920

Source: National Hurricane Center (2012)

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as “major” hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. **Table 5.25** describes the damage that could be expected for each category of hurricane. Damage during hurricanes may also result from spawned tornadoes, storm surge, and inland flooding associated with heavy rainfall that usually accompanies these storms.

TABLE 5.25: HURRICANE DAMAGE CLASSIFICATIONS

Storm Category	Damage Level	Description of Damages	Photo Example
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain may be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.	

Source: National Hurricane Center; Federal Emergency Management Agency

5.9.2 Location and Spatial Extent

Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboard of the United States. While coastal areas are most directly exposed to the brunt of landfalling storms, their impact is often felt hundreds of miles inland and they can affect Augusta-Richmond County. All areas in Augusta-Richmond County are equally susceptible to hurricane and tropical storms.

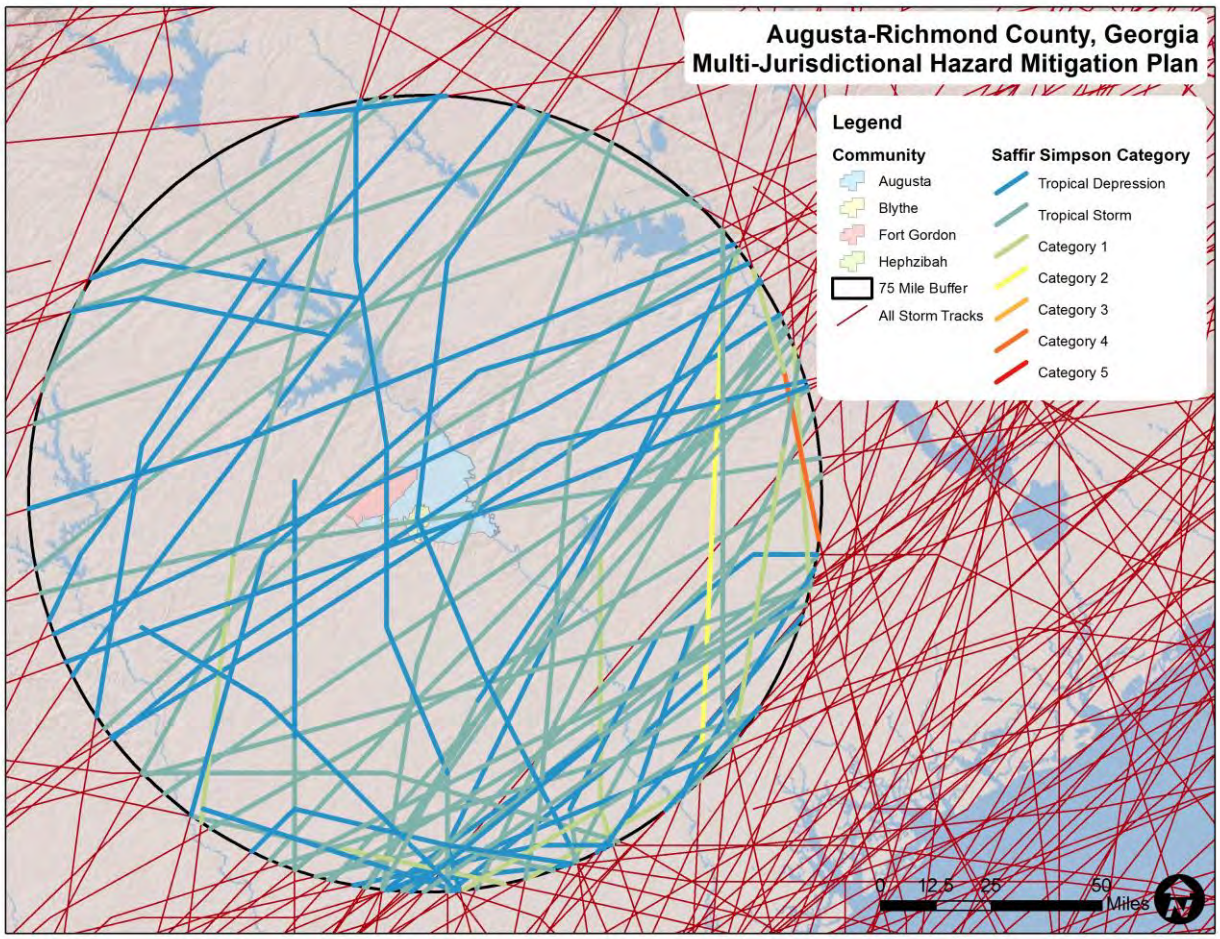
5.9.3 Historical Occurrences

According to the National Hurricane Center's historical storm track records, 74 hurricane/tropical storm tracks have passed within 75 miles of Augusta-Richmond County since 1850.[13] This includes 20 hurricanes, 21 tropical storms, and 33 tropical depressions.

Of the recorded storm events, 11 have traversed directly through Augusta-Richmond County as shown in **Figure 5.17**. **Table 5.26** provides the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of Augusta-Richmond County), and Category of the storm based on the Saffir-Simpson Scale for each event.

[13] These storm track statistics do not include extra-tropical storms. Though these related hazard events are less severe in intensity, they may cause significant local impact in terms of rainfall and high winds.

FIGURE 5.17: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES OF AUGUSTA-RICHMOND COUNTY



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

TABLE 5.26: HISTORICAL STORM TRACKS WITHIN 75 MILES OF AUGUSTA-RICHMOND COUNTY (1850–2016)

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
8/24/1851	UNNAMED	69.67	Category 1
8/27/1852	UNNAMED	42.69	Tropical Storm
10/10/1852	UNNAMED	69.67	Category 1
9/9/1854	UNNAMED	85.03	Category 2
8/31/1856	UNNAMED	69.67	Category 1
9/16/1859	UNNAMED	42.69	Tropical Storm
9/27/1861	NOT NAMED	Not Available	Tropical Depression
11/2/1861	NOT NAMED	Not Available	Tropical Depression
9/17/1863	NOT NAMED	Not Available	Tropical Depression
8/14/1867	NOT NAMED	Not Available	Tropical Depression
8/28/1871	UNNAMED	17.56	Tropical Depression
10/3/1877	UNNAMED	58.60	Tropical Storm

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
9/10/1882	UNNAMED	42.69	Tropical Storm
9/11/1884	UNNAMED	42.69	Tropical Storm
9/23/1885	UNNAMED	69.67	Category 1
10/12/1885	UNNAMED	58.60	Tropical Storm
6/22/1886	UNNAMED	50.35	Tropical Storm
7/1/1886	UNNAMED	64.34	Category 1
10/20/1887	UNNAMED	17.56	Tropical Depression
9/9/1888	UNNAMED	42.69	Tropical Storm
9/24/1889	UNNAMED	50.35	Tropical Storm
8/28/1893	UNNAMED	89.03	Category 2
10/3/1893	UNNAMED	50.35	Tropical Storm
10/9/1894	UNNAMED	78.78	Category 1
7/8/1896	UNNAMED	32.60	Tropical Depression
8/31/1898	UNNAMED	69.67	Category 1
9/18/1901	UNNAMED	32.60	Tropical Depression
6/15/1902	UNNAMED	32.60	Tropical Depression
9/16/1903	UNNAMED	17.56	Tropical Depression
11/4/1904	UNNAMED	17.56	Tropical Depression
9/18/1906	UNNAMED	69.67	Category 1
7/2/1909	UNNAMED	4.99	Tropical Depression
8/28/1911	UNNAMED	58.60	Tropical Storm
6/14/1912	UNNAMED	32.60	Tropical Depression
8/3/1915	UNNAMED	42.69	Tropical Storm
9/30/1924	UNNAMED	64.34	Category 1
8/10/1928	UNNAMED	17.56	Tropical Depression
10/1/1929	UNNAMED	58.60	Tropical Storm
9/6/1933	UNNAMED	42.69	Tropical Storm
9/7/1933	UNNAMED	17.56	Tropical Depression
9/5/1935	UNNAMED	64.34	Category 1
8/12/1940	UNNAMED	73.83	Category 1
10/8/1941	UNNAMED	50.35	Tropical Storm
10/8/1946	UNNAMED	64.34	Category 1
10/8/1947	UNNAMED	0.87	Tropical Depression
8/28/1949	UNNAMED	73.83	Category 1
10/22/1950	LOVE	17.56	Tropical Depression
8/31/1952	ABLE	73.83	Category 1
9/1/1953	UNNAMED	17.56	Tropical Depression
9/26/1956	FLOSSY	42.69	Tropical Storm
6/2/1959	ARLENE	0.87	Tropical Depression
9/29/1959	GRACIE	96.54	Category 3
8/29/1964	CLEO	32.6	Tropical Depression
9/13/1964	DORA	42.69	Tropical Storm
6/15/1965	UNNAMED	42.69	Tropical Storm
6/7/1968	ABBY	50.35	Tropical Storm
5/25/1970	ALMA	4.99	Tropical Depression
6/20/1972	AGNES	17.56	Tropical Depression

Date of Occurrence	Storm Name	Maximum Wind Speed (knots)	Storm Category
9/5/1979	DAVID	73.83	Category 1
11/22/1985	KATE	73.83	Category 1
8/14/1986	CHARLEY	0.00	Tropical Depression
8/28/1988	CHRIS	42.69	Tropical Storm
10/12/1990	MARCO	0.87	Tropical Depression
6/6/1995	ALLISON	32.60	Tropical Depression
8/27/1995	JERRY	0.87	Tropical Depression
7/23/1997	DANNY	0.87	Tropical Depression
9/3/1998	EARL	50.35	Tropical Storm
9/18/2000	GORDON	4.99	Tropical Depression
9/23/2000	HELENE	4.99	Tropical Depression
6/13/2001	ALLISON	4.99	Tropical Depression
7/26/2003	UNNAMED	4.99	Tropical Depression
9/27/2004	JEANNE	17.56	Tropical Depression
6/14/2006	ALBERTO	32.60	Tropical Depression
10/8/2016†	MATTHEW	95.00	Category 2

†At the time this plan was developed, a storm track for Hurricane Matthew was not available digitally, but was definitively within 75 miles of Augusta-Richmond County
Source: National Hurricane Center

Hurricane Matthew (2016) had a major impact on many communities in the southeastern United States, affecting people and property from Florida to Virginia, as well as some areas in the northeast. Some additional information on this major storm is available below:

Hurricane Matthew – October 8-9, 2016
Hurricane Matthew was the strongest storm on record in the Atlantic Basin during the 2016 season with peak wind speeds of around 160 miles per hour (while in the Caribbean). The storm caused more than 1,700 fatalities and 11.6 billion dollars in damages. As the storm approached Georgia, mandatory evacuation orders were issued for all areas of the state east of Interstate 95 and traffic lanes had to be reversed to support the evacuation. Over 250,000 people lost power across the state and at least 3 deaths were a result of the storm, leading to a disaster declaration for many counties. In the end, the storm was one of the most devastating to impact Georgia in many years and recovery efforts were still under way as of the writing of this plan.

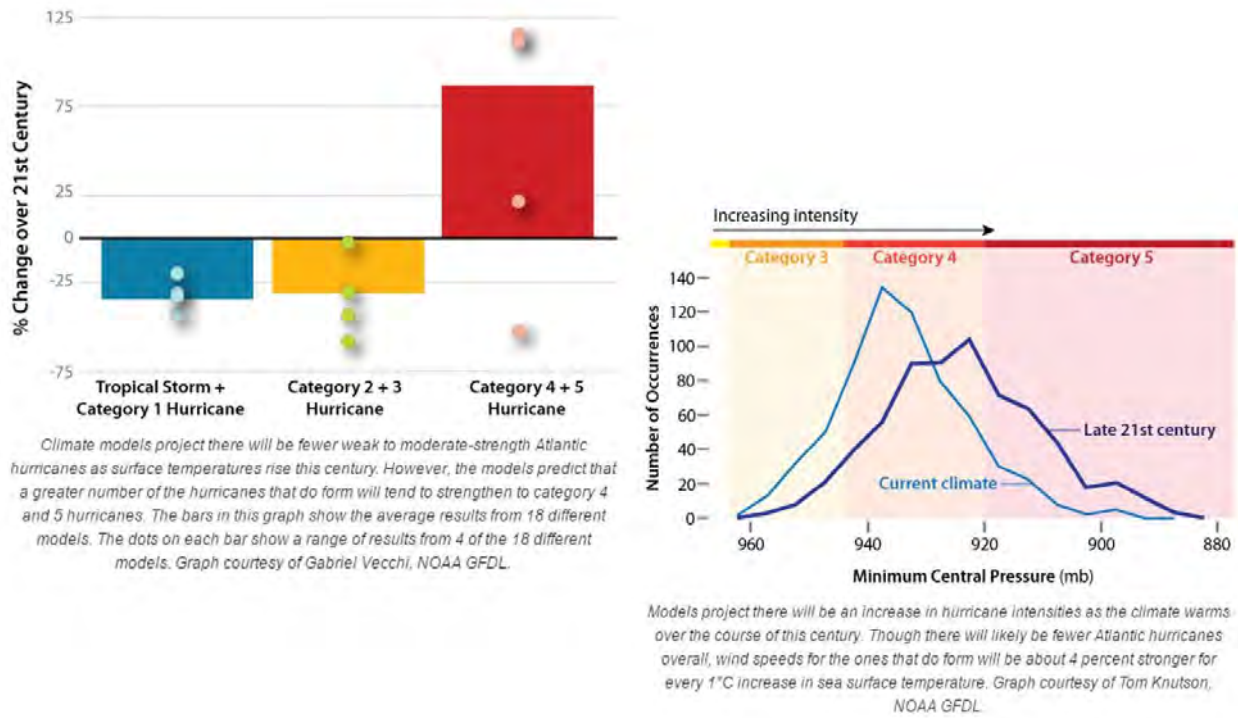
5.9.4 Probability of Future Occurrences

Given the inland location of the county, it is not likely to be affected by storm surge or many of the other problems that coastal counties may face when it comes to hurricanes. However, the county will still be impacted by flooding and high winds. Thus, the probability of being impacted is less than coastal areas, but still remains a real threat to Augusta-Richmond County due to induced events like flooding. Based on historical evidence, the probability level of future occurrence is likely (between 10 and 100 percent annual probability).

However, when the county is impacted, the damage could be large-scale, threatening lives and property throughout the planning area. Additionally, as NOAA reports in **Figure 5.18**, climate change will likely cause more frequent, stronger storms in the future due to rising surface temperatures. That is to say,

NOAA models predict that while there may be less frequent, low-category storm events (Tropical Storms, Category 1 Hurricanes), there will be more, high-category storm events (Category 4 and 5 Hurricanes) in the future. This means that there may be fewer hurricanes overall in any given year, but when hurricanes do form, it is more likely that they will become large storms that can create massive damage. Therefore, the increased likelihood of large hurricanes due to climate change will result in greater wind damage and increased flooding in the county.

FIGURE 5.18: NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION CLIMATE MODELS PROJECTION FOR FUTURE HURRICANES



Source: National Oceanic and Atmospheric Administration GFDL

5.9.5 Consequence Analysis

People (The Public and Public Confidence)

It is reasonable to assume that a number of people would be displaced from their homes and will require accommodations in temporary public shelters due to a hurricane. This hazard could potentially have a negative effect on public confidence due to the possibility of a high magnitude event and the difficulties that might arise for governments in terms of response and recovery.

Responders

The impacts on responders from this type of storm could potentially be very high as responders may be physically injured or killed during a storm event by flooding or high winds. In addition, their homes and personal effects could also be impacted which would limit their response capability.

In terms of on-the-ground response capacity, downed trees in the wake of a hurricane often block roads and make ingress and egress difficult, thereby causing issues with response time. This is also often true

of the resulting floodwaters. Moreover, due to the large scale spatial impact of hurricanes and the number of citizens affected by the storm, response time will be reduced because of the number of incidents that require emergency responders.

Continuity of Operations

Continuity of operations in a hurricane event can be severely affected if power is lost or if critical facilities or infrastructure are damaged during an event. Although Augusta-Richmond County has a plan in place to maintain continuity of operations in the event of a storm, a hurricane with a high magnitude would likely disrupt operations to some degree due to the impacts it would have on personnel.

Built Environment (Property, Facilities, and Infrastructure)

Many buildings and structures could be impacted by a hurricane or tropical storm event. For a detailed analysis of dollar damage to properties, see *Section 6: Hazard Vulnerability.*

Economy

In general, the economy would be severely impacted by a hurricane or tropical storm event. Due to the massive scale of these events and multiple types of impacts from flooding and high winds, commerce would definitively slow down as efforts to rebuild are undertaken after the storm.

Debris Generation

HAZUS-MH estimates the amount of debris that will be generated by the 100 year hurricane scenario event. The model breaks the debris into four general categories: brick/wood, reinforced concrete/steel, eligible tree debris, and other tree debris. This distinction is made because of the different types of material-handling equipment required to handle the debris. The model estimates that a total of 39,002 tons of debris will be generated. Of the total amount, brick/wood comprises 4.92 percent of the total, reinforced concrete/steel comprises 0.00 percent of the total, eligible tree debris comprises 16.72, and other tree debris is 78.36 percent of the total.

Environment

Flooding and wind damage are the main impacts that would be felt by a hurricane in Augusta-Richmond County. Please refer to the Flood Hazard Profile for a discussion on flood-related impacts and the Tornado Hazard Profile for a discussion on relevant wind-related impacts.

5.10 INFECTIOUS DISEASE

5.10.1 Background

Communicable, or infectious, diseases are conditions that result in clinically evident illness which are transmissible directly from one person to another or indirectly through vectors such as insects, air, water, blood, or other objects. The impact of communicable disease can range from the mild effects of the common cold to the extreme lethality of pneumonic plague or anthrax. The public health system in the United States was developed in large part as a response to the often urgent need to respond to or prevent outbreaks of communicable diseases. Through public health methods of disease reporting, vaccinations, vector control, and effective treatments, most communicable diseases are well controlled in the United States and Augusta-Richmond County. However, control systems can fail and when people come together from locations outside of the county, state, and the country, outbreaks can occur, even

in the most modern of communities. In this section, some of the more significant potential communicable disease concerns are described.

The threats discussed in this section usually do not occur on a regular basis, though some are more frequent. The diseases described herein do not originate from intentional exposure (such as through terrorist actions) but do present significant issues and concerns for the public health community. There are numerous infectious diseases that rarely, if ever, occur in Augusta-Richmond County, such as botulism or bubonic plague. Some highly dangerous diseases which could potentially be used as biological weapons, such as anthrax, pneumonic plague, and smallpox, are safely housed and controlled in laboratory settings such as at the Center for Disease Control and Prevention (CDC). Other diseases have not (yet) mutated into a form that can infect humans, or otherwise lie dormant in nature.

There have been several significant viral outbreaks from emerging diseases in recent years of both national and international importance. The Zika virus and West Nile virus are viruses that are typically passed to humans or animals by mosquitoes and made major news as emergent disease threats. Meanwhile, diseases that are spread directly between human beings such as Severe Acute Respiratory Syndrome (SARS) and Ebola have also been identified as serious threats. While each of these conditions caused a great deal of public health concern when they were first identified, SARS has virtually disappeared, West Nile virus occurs with low frequency and causes serious disease in only a very small percentage of cases, Ebola has been more or less contained and a vaccine is in development, and many people infected with Zika will not experience symptoms from the disease.

Other communicable diseases pose a much more frequent threat to the residents of Augusta-Richmond County. Some of the infectious diseases of greatest concern include influenza, particularly in a pandemic form, as well as norovirus, and multiple antibiotic-resistant tuberculosis. Even in one of its normal year-to-year variants, influenza (commonly referred to as “flu”) can result in serious illness and even death in young children, the elderly and immune-compromised persons. But there is always the potential risk of the emergence of influenza in one of the pandemic H1N1 forms, such as in the “Spanish Flu” outbreak of 1918-19, which killed over 50 million people worldwide. Every year, Augusta-Richmond County sees hundreds of cases of influenza, leading to hundreds of hours of lost productivity in businesses due to sick employees. Of note, a vaccine for influenza is produced every year and, according to the CDC, is highly effective in preventing the disease.

Norovirus is recognized as the leading cause of foodborne-disease outbreaks in the United States. The virus can cause diarrhea, vomiting, and stomach pain, and is easily spread from person to person through contaminated food or water and by surface to surface contact. Especially vulnerable populations to this virus include those living or staying in nursing homes and assisted living facilities and other healthcare facilities such as hospitals. Norovirus could also be a threat in the event of large public gatherings such as sporting events, concerts, festivals, and so forth. Augusta-Richmond County and the State of Georgia often experience norovirus outbreaks on an annual basis. No vaccine or treatment exists for the Norovirus, making it especially dangerous for the public in the event of an outbreak.

Public health threats can occur at any time and can have varying impacts. Discussions between public health professionals, planning officials, and first response agencies are essential in order to facilitate safe, effective, and collaborative efforts toward outbreaks.

5.10.2 Location and Spatial Extent

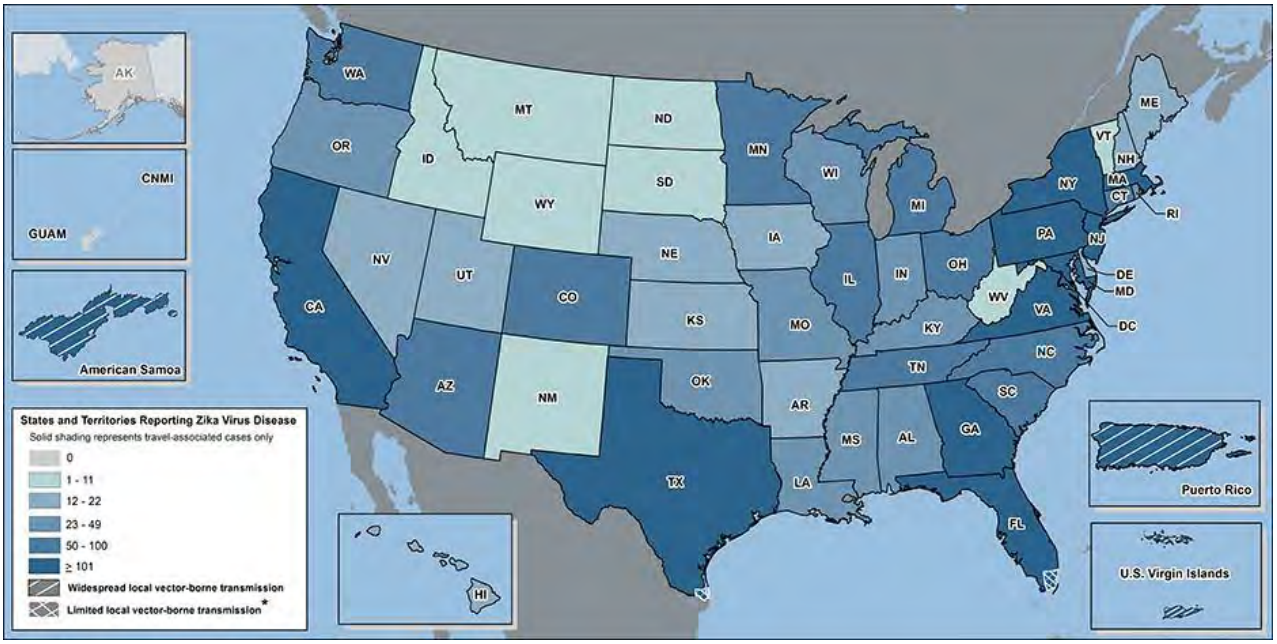
Due to the nature of a public health/emerging disease threat, it is difficult to identify a precise location where this type of event would occur. Moreover, a large-scale event would have impacts that spread throughout the county. Therefore, all areas in Augusta-Richmond County are considered equally susceptible to infectious diseases.

5.10.3 Historical Occurrences

In 2003, the SARS outbreak that began in Southeast Asia began showing up in the United States. There were three confirmed case of SARS in Georgia in 2003. Since that time there have not been any reported cases of SARS.[14] An outbreak of the West Nile Virus began showing up in the United States in 1999, with Georgia reporting 388 cases from that time through the end of 2016. No cases of Ebola were reported in the State of Georgia, though several locations in the United States did experience cases.

A map showing the number of Zika cases reported in each state in 2016 can be found in **Figure 5.19.** According to the Centers for Disease Control, there were over 100 cases of Zika in the State of Georgia during this time. Although none of those cases were reported in Augusta-Richmond County, it is certainly possible that in the future, cases will be contracted within the county given that many neighboring areas have been impacted.

FIGURE 5.19: NUMBER OF ZIKA CASES REPORTED IN 2016 BY STATE



Source: Centers for Disease Control

As stated previously, diseases like influenza and norovirus are regularly occurring health issues in Augusta-Richmond County. These conditions are not legally reportable to county or state public health agencies, so data on disease incidence is not readily available, although there were at least 2 cases of norovirus reported in the county, with one in 2011 and one in 2012. These diseases are monitored

[14] https://www.cdc.gov/media/presskits/sars/cases.htm

through local epidemiological surveillance systems in hospitals and health departments and any potential outbreaks are investigated promptly.

Finally, the Richmond County epidemiologist provided cumulative information on notifiable diseases reported over roughly the last 5 years (January 1, 2012 to November 8, 2016). This information shows that a majority of the notifiable diseases that impact the county are related to Hepaitits C or Salmonellosis. A full list of the notifiable diseases, the number of occurrences of each, and the percentage of total can be found in **Figure 5.20.**

FIGURE 5.20: INCIDENCE OF NOTIFIABLE DISEASES IN AUGUSTA-RICHMOND COUNTY

Incidence of Notifiable Disease Reported from
Augusta (6-0)
Occurring During the Period of:
01-Jan-2012 and 08-Nov-2016

Disease	Incident Count	% of Total
Hepatitis C	1429	24.21
Hepatitis C (Chronic)	1178	19.96
Salmonellosis	1034	17.52
Campylobacteriosis	311	5.27
Hepatitis B (Chronic)	310	5.25
Streptococcal Disease, Group B (Invasive)	288	4.88
Streptococcus Pneumoniae (Invasive)	285	4.83
Shigellosis	259	4.39
Hepatitis B	256	4.34
Streptococcal Disease, Group A (Invasive)	99	1.68
Pertussis	74	1.25
Cryptosporidiosis	72	1.22
Giardiasis	67	1.14
Hepatitis A (Acute)	56	.95
Varicella (Chicken Pox)	47	.8
Haemophilus Influenzae (Invasive)	45	.76
Shiga Toxin Producing E.Coli (Stec)	43	.73
Rocky Mountain Spotted Fever	27	.46
Lyme Disease	17	.29
Zika	5	.08
Total Incidents Reported: **5902**		

% of Total Incidents Reported

* Rates reflect only those cases with the admin status(es) of:
(Confirmed,Deleted,Not Confirmed,Out Of State,Pending,Probable,Suspect,Unknown,)

Source: Richmond County Health Department

During events involving outbreaks, as stated in Ga. Code § 31-2-1, the Department of Community Health and local County Board of Health are empowered to exercise quarantine and isolation authority. Quarantine and isolation authority shall be exercised with the understanding that those ordered into quarantine shall have access to legal representation and can challenge the order.

5.10.4 Probability of Future Occurrences

Due to some recent incidents that have been recorded across the State of Georgia and in Augusta-Richmond County, future occurrences are considered possible (between 1 and 10 percent annual probability).

5.10.5 Consequence Analysis

People (The Public and Public Confidence)

The general public can be exposed to emerging diseases through different means based on the particular threat and its potential transmission routes. Vaccinations, when available, are the best means of preventing transmission and infection. Public Health information messages will be disseminated via the media in order to provide preventive measures to limit or avoid exposure.

Public confidence in government and nongovernmental organizations may be impacted by public health outbreaks. The level of confidence the public possesses is based upon societal expectations, media influence, and past experience following other outbreaks. An effective response to the outbreak can help to guide public confidence toward a favorable level. Collaboration with media outlets can also assist in keeping the public informed and helping to protect them from exposure.

Responders

During a disease outbreak, responders can expect an increase in workload and should practice a higher level of precaution toward exposure than they would normally. Plans exist for first response and health care to address the needs of such situations. Communication between these agencies regarding plans and procedures maximizes the efficiency and effectiveness of these combined efforts.

Continuity of Operations

Continuity of operations may be impacted if those in governmental or other key roles are impacted by the disease or public health threat and cannot perform their normal duties. Although plans are in place to ensure continuity of operations, a large-scale event or one that has significant impacts on operational-level staff could negatively affect continuity of operations.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – There are no expected impacts.
Commercial – There are no expected impacts.
Industrial – There are no expected impacts.
Hazardous Materials Facilities – There are no expected impacts.

Critical Facilities and Personnel

Hospitals – The primary impacts for hospitals during disease outbreaks are an increase in patients and the spread of disease within the hospitals.
Emergency Services – Workload may be increased for emergency services as individuals infected with disease may require transport to a hospital facility or other forms of care.

Emergency Shelters – There are no expected impacts, though officials monitoring and managing these facilities should be on higher guard against the spread of disease due to a concentrated aggregation of people in one location.

Transportation Systems
There are no expected impacts to Interstates/Airports/Rail Lines.

Critical Utilities
There are no expected impacts to High Voltage Distribution Lines, Power Lines, or Natural Gas Systems.

Communication Systems and Networks
There are no expected impacts to Telephone Systems, Cell Phone Towers, or Internet Capabilities.

Economy
Small/Local Employers – One of the more significant economic impacts that could be seen in Augusta-Richmond County involves absenteeism at local businesses which could have a significant impact as the absence of several employees at a small business could force temporary shutdowns or reduced hours of availability. There would also likely be an impact on the local government budget as officials try to respond to the disease and assist those impacted.
Large Employers – If employees are affected, there may be some loss in productivity.

Special Consideration Areas
City Centers – There are no expected impacts, although city centers tend to be areas where large masses of people congregate and thus may be areas where the likelihood of disease spread is more prominent.
Large Event Arenas – Events may have to be cancelled if the outbreak is large enough or has the potential to be spread easily and quickly.
Historical and Cultural Landmarks – There are no expected impacts.

Environment
The environmental impact is dependent on the particular biological substance being transmittable to animal or plant life, or if it can be distributed through the water supply.

5.11 LIGHTNING

5.11.1 Background

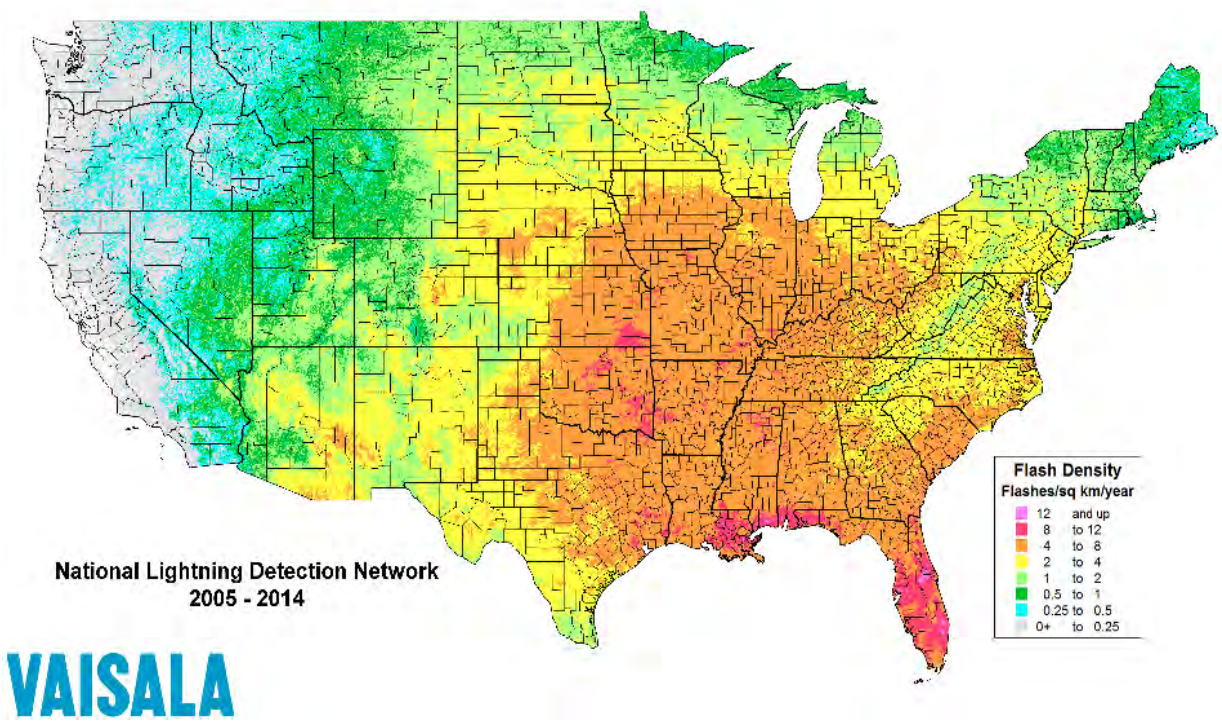
Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a “bolt” when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes the thunder which often accompanies lightning strikes. While most often affiliated with severe thunderstorms, lightning may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall.

Lightning strikes occur in very small, localized areas. For example, they may strike a building, electrical transformer, or even a person. According to FEMA, lightning injures an average of 300 people and kills

80 people each year in the United States. Direct lightning strikes also have the ability to cause significant damage to buildings, critical facilities, and infrastructure largely by igniting a fire. Lightning is also responsible for igniting wildfires that can result in widespread damages to property.

Figure 5.21 shows a lightning flash density map for the years 2005-2014 based upon data provided by Vaisala's U.S. National Lightning Detection Network (NLDN®).

FIGURE 5.21: LIGHTNING FLASH DENSITY IN THE UNITED STATES



Source: Vaisala United States National Lightning Detection Network

5.11.2 Location and Spatial Extent

Lightning occurs randomly, therefore it is impossible to predict where and with what frequency it will strike. It is assumed that all of Augusta-Richmond County is uniformly exposed to lightning.

5.11.3 Historical Occurrences

According to the National Climatic Data Center, there has only been 1 recorded lightning event in Augusta-Richmond County since 1996.[15] This event resulted in 3 injuries and almost $170,000 (2016 dollars) in damages.[16] Detailed information on historical lightning events can be found in **Table 5.27**.

[15] These lightning events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through October 2016. It is certain that additional lightning events have occurred in Augusta-Richmond County. The State Fire Marshall's office was also contacted for additional information but none could be provided. As additional local data becomes available, this hazard profile will be amended.

[16] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

It is certain that more than one lightning event has impacted the county. Many of the reported events are those that caused damage, and it should be expected that damages are likely much higher for this hazard than what is reported.

TABLE 5.27: HISTORICAL OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

	Date	Deaths / Injuries	Property Damage (2016)*	Details
Augusta-Richmond County				
AUGUSTA	7/17/2012	0/3	$167,703	Lightning struck the roof of SunBelt Auto Center in Augusta. The lightning rippled through the interior of the facility injuring a few people. Then the wind blew out the cracked windows. Ken Harris, the general manager, was blead out of his arm and a little bit on his head. Harris said he couldn't believe the devastation.
Blythe				
None Reported	--	--	--	--
Fort Gordon				
None Reported	--	--	--	--
Hephzibah				
None Reported	--	--	--	--

*Property damage is reported in 2016 dollars; all damage may not have been reported.
Source: National Climatic Data Center

There have been several recent events reported by local media that were deemed to be important enough to include in the plan and these are described below. As mentioned above, this likely does not include all lightning events that have impacted the county.

August 17, 2010: Two separate lightning strikes injured a 14-year-old girl (in Hephzibah) and 19-year-old boy (in Augusta).

July 17, 2013: Lightning struck a transformer at South Richmond County substation, resulting in a power outage for 650 customers in southern Richmond County and northern Burke County.

June 4, 2015: Lightning started a house fire in Augusta, no injuries and minor damage to house were reported.

5.11.4 Probability of Future Occurrences

Although there was not a large number of historical lightning events reported throughout Augusta-Richmond County via NCDC data, it is considered a regular occurrence, especially accompanied by thunderstorms. In fact, lightning events will assuredly happen on an annual basis, though not all events will cause damage. According to Vaisala's U.S. National Lightning Detection Network (NLDN®), Augusta-

Richmond County is located in an area of the country that experienced an average of 2 to 8 lightning flashes per square kilometer per year between 2005 and 2014. Therefore, the probability of future events is highly likely (100 percent annual probability). It can be expected that future lightning events will continue to threaten life and cause minor property damages throughout the county.

5.11.5 Consequence Analysis

People (The Public and Public Confidence)

Although relatively rare when compared to other hazards, the impacts of lightning on people can be severe, resulting in death or severe injury if a person is struck. Fatalities and injuries from lightning events most often occur when a person is exposed and in outdoor conditions during a thunderstorm. Exposure to water and open areas also increases the likelihood that a person will be struck. Lightning generally has a low probability of impacting public confidence.

Responders

Although responders are generally aware of the effects of lightning and take precautions to avoid being impacted by a lightning strike, it is possible that they could be struck. Moreover, taking the necessary precautions to avoid a lightning strike can often reduce response times as staying inside and away from lightning is the best way to avoid injury from the hazard.

Continuity of Operations

Lightning

Most critical facilities and infrastructure are protected against lightning via surge protectors and lightning rods. However, if lightning were to shut down large parts of the power grid due to blowing a transformer, operations would be detrimentally impacted. In general, however, continuity of operations during a lightning event would not be affected as most critical operations centers have backup power systems.

Built Environment (Property, Facilities, and Infrastructure)

Lightning generally does not have a major impact on property, facilities, or infrastructure. However, it has been known to affect power and energy sources through strikes which can shut down power for hours and sometimes days. Lightning is also responsible for igniting wildfires that can result in widespread damage to property.

Economy

Since lightning events generally pass through the area quickly and cause relatively little property damage when compared to other hazards, effects on the economy will likely be minimal. Nevertheless, if power-related infrastructure is damaged, this could cause some economic strain to replace and get the system back to full capacity.

Environment

The environmental effects of lightning are relatively minimal, although lightning has been known to cause wildfires which can lead to widespread damage to ecosystems. For more details on these impacts, please see this section of the wildfire hazard.

5.12 SEVERE WINTER STORM

5.12.1 Background

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Events may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Some winter storms might be large enough to affect several states, while others might affect only localized areas. Occasionally, heavy snow might also cause significant property damages, such as roof collapses on older buildings. All winter storm events have the potential to present dangerous conditions to the affected area.

Snow Storms
Larger snowfalls pose a great risk, reducing visibility due to blowing snow and making driving conditions treacherous. A heavy snow event is defined by the National Weather Service as an accumulation of 4 or more inches in 12 hours or less. A blizzard is the most severe form of winter storm. It combines low temperatures, heavy snow, and winds of 35 miles per hour or more, which reduces visibility to a quarter mile or less for at least 3 hours. Snow storms are often accompanied by sleet, freezing rain, or an ice storm. These combined events are particularly hazardous as they create treacherous surfaces.

Ice Storms
Ice storms, which are much more common in Augusta-Richmond County than snow storms, are defined as storms with significant amounts of freezing rain and are a result of cold air damming (CAD). CAD is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes. In the former case, super-cooled droplets can freeze on impact (freezing rain), while in the latter case, the re-frozen water particles are ice pellets (or sleet). Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces.

All of the winter storm elements – snow, sleet, ice, etcetera – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and tree limbs and create hazardous driving conditions. Furthermore, communication and power may be disrupted for days.

5.12.2 Location and Spatial Extent

Nearly the entire continental United States is susceptible to winter storm events. Some ice and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

5.12.3 Historical Occurrences

Winter weather has resulted in one disaster declarations in Augusta-Richmond County (in 2014.)[17] The National Climatic Data Center does not report winter storm events at the municipal level, however, there have been a total of 8 recorded winter storm events and in Augusta-Richmond County since 1996 (**Table 5.28**).[18] Although NCDC did not record any damages from these events, there were certainly dollar losses that occurred that were not recorded.[19] Detailed information on the recorded winter storm events can be found in **Table 5.29**.

TABLE 5.28: SUMMARY OF WINTER STORM EVENTS IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	8	0/1	$0

Source: National Climatic Data Center

TABLE 5.29: HISTORICAL WINTER STORM EVENTS IN AUGUSTA-RICHMOND COUNTY

	Date	Type of Storm	Deaths / Injuries	Property Damage*
Augusta-Richmond County				
RICHMOND (ZONE)	1/2/2002	Winter Storm	0/0	$0
RICHMOND (ZONE)	1/26/2004	Ice Storm	0/0	$0
RICHMOND (ZONE)	12/26/2004	Ice Storm	0/0	$0
RICHMOND (ZONE)	1/29/2005	Ice Storm	0/0	$0
RICHMOND (ZONE)	2/12/2010	Winter Storm	0/0	$0
RICHMOND (ZONE)	1/10/2011	Winter Storm	0/0	$0
RICHMOND (ZONE)	1/28/2014	Heavy Snow	0/0	$0
RICHMOND (ZONE)	2/12/2014	Ice Storm	0/0	$0

*Property damage is reported in 2016 dollars; All damage may not have been reported.
Source: National Climatic Data Center

There have been several severe winter weather events in Augusta-Richmond County. The text below describes two of the major events (one snow and one ice event) and associated impacts on the county. Similar impacts can be expected with most severe winter weather.

January 2011 Winter Storm – January 10, 2011
A low pressure system moved through the Gulf of Mexico and across northern Florida producing snow, sleet and freezing rain across the southeast U.S. Heavy snow fell across the CSRA and lower Midlands of South Carolina with accumulations of 1 to 6 inches.

[17] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Identification*.
[18] These ice and winter storm events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1996 through October 2016. It is likely that additional winter storm conditions have affected Augusta-Richmond County.
[19] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

February 2014 Ice Storm – February 12, 2014
A major Ice Storm produced 3/4 to 1 inch of ice and 1 to 2 inches of snow and sleet across Richmond County taking down numerous trees and powerlines. Power outages were widespread across the county affecting most of the population. I-535 and other highways were closed due to the ice accumulations.

Winter storms throughout the planning area have several negative externalities including hypothermia, cost of snow and debris cleanup, business and government service interruption, traffic accidents, and power outages. Furthermore, citizens may resort to using inappropriate heating devices that could to fire or an accumulation of toxic fumes.

5.12.4 Probability of Future Occurrences

Winter storm events will likely remain a fairly regular occurrence in Augusta-Richmond County. According to historical information, Augusta-Richmond County generally experiences some type of winter weather during many winters. Therefore, the annual probability is likely (between 10 and 100 percent).

5.12.5 Consequence Analysis

People (The Public and Public Confidence)
Winter storms most often impact people indirectly. Winter storms can create dangerous driving conditions by limiting visibility for drivers or creating slick conditions that make maneuverability difficult. Loss of power can create very cold conditions for residents, making it difficult to stay warm. Residents may try to heat their home using alternative means, which runs the risk of carbon monoxide poisoning caused by improperly ventilated heating sources. In addition, dangerously cold temperatures increase the risk of wind chill, frostbite, and hypothermia. Winter storms generally do not have a large impact on public confidence, but it could be impacted if road clearing or response operations are slow.

Responders
Responders in winter storm and freeze events face a variety of hazards themselves including slick or icy roads that could cause harm if they are attempting to quickly respond to an emergency as is often the case. Crashed emergency vehicles and injuries to responders are always a possibility, but their chances increase during a winter storm event. Winter storms can also make it difficult to access more rural areas if roads are snowed/iced over and vehicles cannot pass through.

Continuity of Operations
Generally, continuity of operations can be maintained during a winter storm event in Augusta-Richmond County. However, winter storms do have the potential to affect power transmission and can make it difficult for emergency management employees to arrive to work. As a result, there may be some disruption of operations during a winter storm event.

Built Environment (Property, Facilities, and Infrastructure)
Schools
Winter storms have the potential to impact public and private school schedules through closings and delays. Poor driving conditions, lack of power and heat, and mechanical problems with school buses and equipment due to cold weather conditions are potential concerns.

School closures and delays can lead to logistical problems for teachers and school administrators, especially in the event of end-of-term exams and standardized testing schedules. It can also result in logistical problems for making up school days.

Critical Infrastructure and Key Resources
Winter storms have the potential to create hazardous driving conditions leading to accidents on roadways. The Federal Highway Administration reports that 24 percent of weather–related vehicle crashes occur on snowy, slushy, or icy pavement.[20] Accidents can cause highways to become the equivalent of large parking lots which may cause motorists to strand their vehicles, making it difficult for emergency workers to reach those who need assistance. In general, major and local roadways become severely impacted when temperatures drop, making pre-treatment solutions ineffective. Transportation impacts can be minimized during early- and late-season events when paved surfaces are able to warm sufficiently to prevent winter precipitation accumulation. Winter storms can also result in delays and cancellations of flights at airports in Augusta-Richmond County due to slick conditions on runways. There is also the potential of a loss of power that can close the airport.

Utilities
One of the primary identified impacts of winter storms on Augusta-Richmond County is the disruption of utilities. Utilities that are at risk of being affected include telephone, internet, cable, and water. Newspaper reports typically cite trees falling on electrical wires—as well as trees that have already been damaged from previous incidents that fall during a winter storm—or the stress caused by ice accumulation as main causes for power outages.

Economy
In the event of a winter storm, there is a high potential of business and office closures, modified business and office hours, and cancellation or postponement of sporting and other planned events in the county. This can be contributed to poor road conditions (including icy and slick conditions) that result in fewer people using the roads to get to their destination or a loss of power and heat that result in a loss of operations at specific facilities.

Environment
Winter storms have an impact on the environment through the clearing of roadways. Snow on the roads can pick up contaminants from chemicals and oil products in traffic as well as the salt mixture that is used to de-ice the roads. These contaminants can be carried to nearby waterways which contaminates water sources and is absorbed by groundwater.

In addition, vegetation can be damaged by these storm types. Vegetation destruction reduces available habitats, and threatens wildlife.

[20] Federal Highway Administration. *Snow and Ice*. Retrieved January 3, 2017, from http://ops.fhwa.dot.gov/weather/weather_events/snow_ice.htm

5.13 SOLAR FLARE/EMP

5.13.1 Background

According to NOAA, a solar flare is a large outburst of electromagnetic radiation from the Sun that can last from mere minutes to several hours. They are caused by large scale eruptions of magnetic flux known as coronal mass ejections (CMEs). These CMEs cause X-rays and extreme ultraviolet light to ionize in the Earth's atmosphere and impact the day-side of the planet by enhancing the absorption power of the ionosphere. In normal conditions, the ionosphere reflects radio waves, which allows for long distance radio communication without having a clear line-of-sight between the transmitter and the receiver.

However, when the absorption power of the ionosphere is enhanced by the activities of a solar flare, nearly all radio waves are absorbed and radio communication is reduced or impossible. These types of events are often referred to as radio blackouts and can have a drastic impact on communications, especially for emergency services officials who rely on radio communication. In addition, these events can disrupt GPS navigation systems, airline communications, military and environmental satellites, and electrical power grids.[21]

Solar flares are classified physically on a logarithmic scale that increases in intensity by 10 times at each new level. The scale is based on the intensity of the flare in a 1 minute averaged NOAA/GOES XRS instrument's 0.1-0.8 nm spectral band. The scale measures five levels of intensity with "A" flares as the least intense, followed by "B" flares, "C" flares, "M" flares, and "X" flares as the largest. The naming scale corresponds with descriptors for each event: "C" flares are considered to be "Common," "M" flares are "Medium," and "X" flares are "Extreme."

In addition to the physical classification of the solar flare itself, NOAA has also developed a five-level scale to classify the radio blackout itself. **Table 5.30** shows the radio blackout scale and provides descriptions of the typical solar flare intensity that is associated with each scale of radio blackout.

TABLE 5.30: NOAA RADIO BLACKOUT SCALE

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
R 5	Extreme	**HF Radio:** Complete HF (high frequency) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. **Navigation:** Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 (2×10^{-3})	Less than 1 per cycle

[21] NOAA. The Serendipitous Discovery of Solar Flares. http://www.noaa.gov/features/02_monitoring/1859solarstorm.html

Scale	Description	Effect	Physical measure	Average Frequency (1 cycle = 11 years)
R 4	Severe	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. **Navigation:** Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R 3	Strong	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. **Navigation:** Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R 2	Moderate	**HF Radio:** Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. **Navigation:** Degradation of low-frequency navigation signals for tens of minutes.	M5 (5×10^{-5})	350 per cycle (300 days per cycle)
R 1	Minor	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. **Navigation:** Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

Source: NOAA

5.13.2 Location and Spatial Extent

Because these events occur on a global scale and could have wide-ranging impacts on the entire dayside of the planet simultaneously, all areas of the county are considered to be equally susceptible to a solar flare.

5.13.3 Historical Occurrences

There is a relatively extensive history of solar flares being observed in the United States, but the first observation of a solar flare was in England in 1859 when Richard Carrington observed what is still considered the largest solar flare in recorded history. This event, now known as the Carrington event, was a critical discovery as it connected solar flares with many of the impacts that we recognize they cause today. In the direct aftermath of Carrington's discovery, the Earth was engulfed in a magnetic storm that created auroras all over the sky, caused compass needles to spin uncontrollably, and prevented telegraph operators from sending messages. These early observations of impacts from solar flares would lay the groundwork for recognizing future impacts from solar flare events such as the disruption of communications systems and electrical power.

Although there has not been another solar flare on the magnitude of the Carrington event in the last 150 years, there have been a number of large events that have impacted various areas of the country and the world. Several of these events are described below and it should be noted that since solar flares could have effects anywhere in the world, similar impacts could be expected in Randolph County.

August 4, 1972: A major solar storm reportedly caused a voltage surge on telephone lines in Illinois as reported by AT&T. This resulted in a temporary shutdown of communications lines for around 30

minutes. This was one of the first storms that scientists were able to predict with some degree of accuracy.

March 13, 1989: Known as the Quebec Blackout Storm, this event knocked out power to the electric grid of the Hydro-Quebec Power Authority. Roughly six million people were impacted as they lost electricity and thus, in many cases, their source of heat. Power companies restored power within about 9 hours, but the event was considered very close to a large-scale disaster.

July 14, 2000: The Bastille Day Flare was an X5.7 class flare that was the largest on record since the 1989 event. This event was considered probably the most well-observed solar flare event on record and helped astronomers better understand the causes of solar flares and the sun's cycle of activity.

5.13.4 Probability of Future Occurrences

Based on historic observations of major events and the knowledge of the Sun's roughly eleven year cycle of activity, a major solar flare event that has impacts on Earth is considered likely (between 10 and 100 percent annual probability).

5.13.5 Consequence Analysis

People (The Public and Public Confidence)

The entire Augusta-Richmond County population is vulnerable to the impacts of a solar flare/EMP regardless of the measured magnitude, although most low-classification events will not have any noticeable impact on the daily lives of people. If a large event were to occur and cause widespread power outages or communications systems disruptions, there may be a panic and people may temporarily be unable to undertake normal activities such as cooking or using mobile devices. Tornadoes often have some significant likelihood of affecting public confidence due to their highly visible impacts and the fact that most members of the public are unaware of the hazard and may be confused about the cause of loss of power/communications systems.

Responders

Responders could be critically affected by a solar flare/EMP event as response personnel rely heavily on communications equipment to carry out their normal operations. If a large event were to occur that knocked out communications equipment for several hours or possibly more than a day, this would be significantly hinder responders' abilities to perform their duties.

Continuity of Operations

Continuity of operations would potentially be impacted in many ways by a major solar flare/EMP. As mentioned above, if communications equipment were disrupted, it would be challenging for government officials to coordinate with one another and respond to the citizen needs such as emergency medical care. Additionally, if power were lost, there would be a disruption to normal operations, though there are generally plans in place to maintain continuity of operations in this case as several operations centers have backup power systems.

Built Environment (Property, Facilities, and Infrastructure)

Critical Infrastructure

The primary impact on the built environment from a solar flare/EMP would be on communications and power infrastructure. Most of the built environment (e.g. homes, buildings, roadways) would not be impacted in any way by this type of event. However, if power or communications systems are damaged or temporarily shut down, some aspects of the built environment will be impacted such as traffic lights, street lights, cell phone towers.

Economy

A solar flare/EMP can impact any area of Augusta-Richmond County at any time and may bring with it an interruption of service for local businesses as well as government that lose power or cannot utilize communications systems. As a result, there will be significant disruption of the local economy as long as the effects (such as power or communications loss) of the solar flare/EMP remain in place.

Environment

There will likely be relatively minimal impacts on the environment from a solar flare/EMP.

5.14 TORNADO

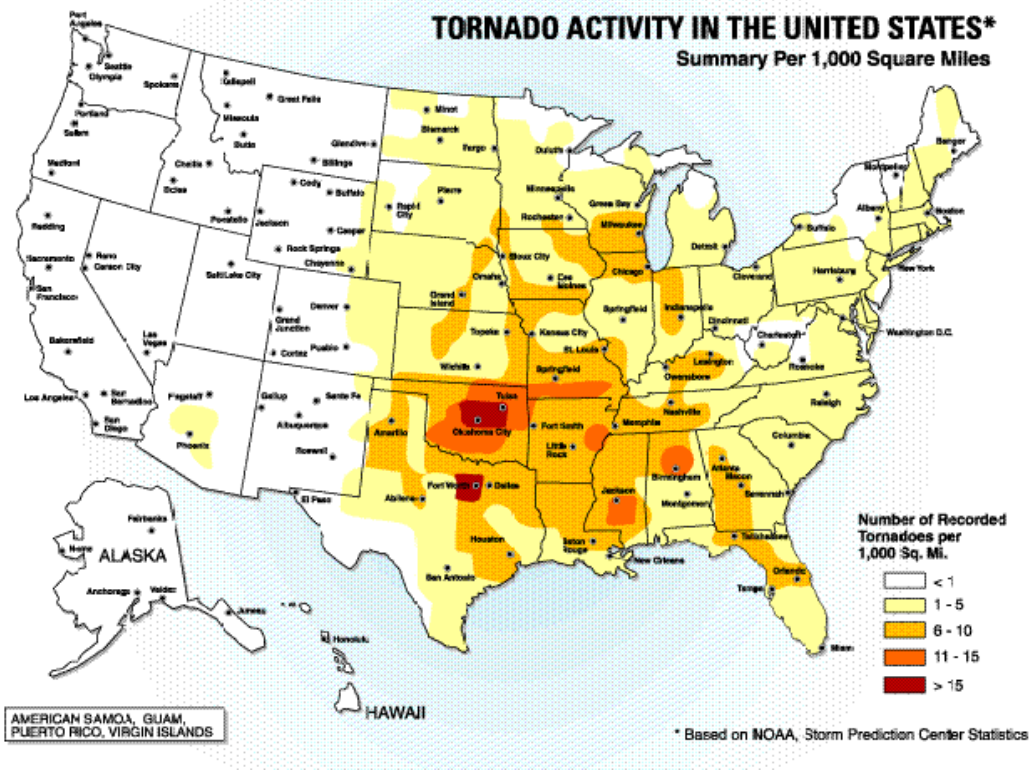
5.14.1 Background

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other tropical storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 miles per hour to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries.[22] According to the NOAA Storm Prediction Center (SPC), the highest concentration of tornadoes in the United States has been in Oklahoma, Texas, Kansas, and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of "tornado alley"), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). **Figure 5.22** shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

[22] NOAA, 2009.

FIGURE 5.22: TORNADO ACTIVITY IN THE UNITED STATES



Source: Federal Emergency Management Agency

Tornadoes are more likely to occur during the months of March through May and are most likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

The destruction caused by tornadoes ranges from light to inconceivable depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings (particularly mobile homes). Tornadic magnitude is reported according to the Fujita and Enhanced Fujita Scales. Tornado magnitudes prior to 2005 were determined using the traditional version of the Fujita Scale (**Table 5.31**). Tornado magnitudes that were determined in 2005 and later were determined using the Enhanced Fujita Scale (**Table 5.32**).

TABLE 5.31: THE FUJITA SCALE (EFFECTIVE PRIOR TO 2005)

F-SCALE NUMBER	INTENSITY	WIND SPEED	TYPE OF DAMAGE DONE
F0	GALE TORNADO	40–72 MPH	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
F1	MODERATE TORNADO	73–112 MPH	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
F2	SIGNIFICANT TORNADO	113–157 MPH	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
F3	SEVERE TORNADO	158–206 MPH	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
F4	DEVASTATING TORNADO	207–260 MPH	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
F5	INCREDIBLE TORNADO	261–318 MPH	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.
F6	INCONCEIVABLE TORNADO	319–379 MPH	These winds are very unlikely. The small area of damage they might produce would probably not be recognizable along with the mess produced by F4 and F5 wind that would surround the F6 winds. Missiles, such as cars and refrigerators would do serious secondary damage that could not be directly identified as F6 damage. If this level is ever achieved, evidence for it might only be found in some manner of ground swirl pattern, for it may never be identifiable through engineering studies.

Source: National Weather Service

TABLE 5.32: THE ENHANCED FUJITA SCALE (EFFECTIVE 2005 AND LATER)

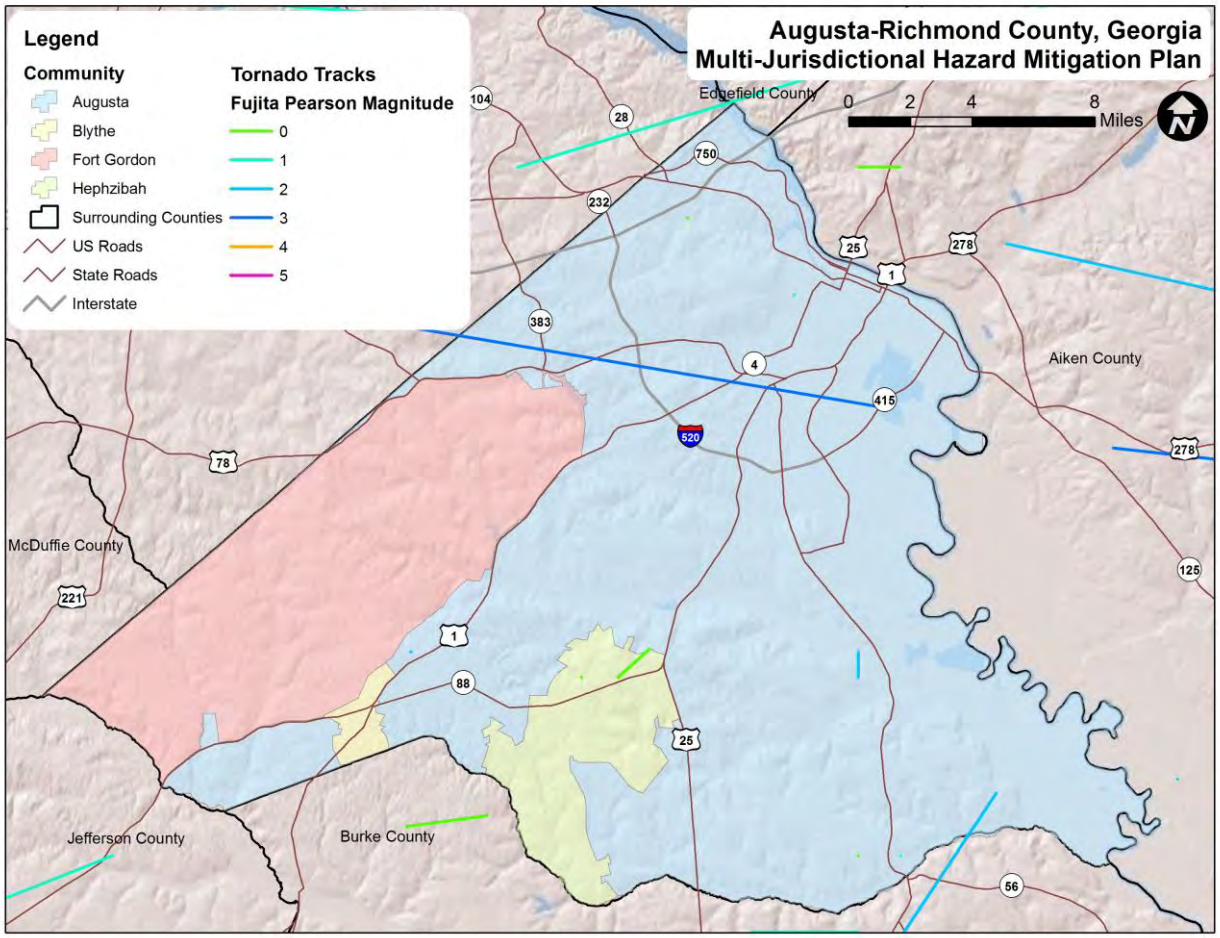
EF-SCALE NUMBER	INTENSITY PHRASE	3 SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF0	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads; attached garages may be destroyed.
EF2	SIGNIFICANT	111–135	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light object missiles generated.
EF3	SEVERE	136–165	Roof and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted.
EF4	DEVASTATING	166–200	Well-constructed houses leveled; structures with weak foundations blown off some distance; cars thrown and large missiles generated.
EF5	INCREDIBLE	Over 200	Strong frame houses lifted off foundations and carried considerable distances to disintegrate; automobile sized missiles fly through the air in excess of 100 meters; trees debarked; steel re-enforced concrete structures badly damaged.

Source: National Weather Service

5.14.2 Location and Spatial Extent

Tornadoes occur throughout the State of Georgia, and thus in Augusta-Richmond County. Tornadoes typically impact a relatively small area, but damage may be extensive. Event locations are completely random and it is not possible to predict specific areas that are more susceptible to tornado strikes over time. Therefore, it is assumed that Augusta-Richmond County is uniformly exposed to this hazard. With that in mind, **Figure 5.23** shows tornado track data for many of the major tornado events that have impacted the county. While no definitive pattern emerges from this data, some areas that have been impacted in the past may be potentially more susceptible in the future.

FIGURE 5.23: HISTORICAL TORNADO TRACKS IN AUGUSTA-RICHMOND COUNTY



Source: NOAA

5.14.3 Historical Occurrences

According to the National Climatic Data Center, there have been a total of 10 recorded tornado events in Augusta-Richmond County since 1950 (**Table 5.33**), resulting in $16.4 million (2016 dollars) in property damages.[23] [24] In addition, one death and five injuries were reported (**Table 5.34)**. The magnitude of these tornadoes ranges from EF0 to EF3 in intensity, although an EF4 or EF5 event is possible. It is important to note that only tornadoes that have been reported are factored into this risk assessment. It is likely that a high number of occurrences have gone unreported over the past 65 years.

[23] These tornado events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1950 through October 2016. It is likely that additional tornadoes have occurred in Augusta-Richmond County. As additional local data becomes available, this hazard profile will be amended.

[24] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

TABLE 5.33: SUMMARY OF TORNADO OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	7	0/14	$10,799,728
Blythe	0	0/0	$0
Fort Gordon	1	0/12	$5,608,520
Hephzibah	2	0/0	$10,698
AUGUSTA-RICHMOND COUNTY TOTAL	**10**	**0/26**	**$16,418,946**

Source: National Climatic Data Center

TABLE 5.34: HISTORICAL TORNADO OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Augusta-Richmond County					
RICHMOND CO.	8/17/1954	F1	0/0	$223,650	--
RICHMOND CO.	2/24/1961	F1	0/0	$201,210	--
RICHMOND CO.	5/8/1978	F1	0/0	$9,227,262	--
RICHMOND CO.	4/23/1983	F0	0/0	$604,034	--
RICHMOND CO.	1/29/1990	F2	0/6	$460,304	A tornado blew down trees from Oak Ridge to Stokesdale.
AUGUSTA	5/19/1993	F0	0/0	$83,269	A short lived tornado touched down on old trail road along the Richmond-Columbia county line. One home and two cars were damaged by toppled trees.
AUGUSTA	12/17/2000	F2	0/8	$0	An F2 tornado intermittently touched down along a 2 mile path. Extensive damage was done to the Timberidge subdivision and to other homes and mobile homes along its path. Eight people were injurred, one seriously. There were no deaths.
Blythe					
None Reported	--	--	--	--	--
Fort Gordon					
FT GORDON	4/10/2009	EF3	0/12	$5,608,520	A supercell tornado continued out of Columbia county and tracked across the Augusta area severely damaging many homes and business and taking down numerous trees and powerlines. One hundred and fifty people had to be evacuated from a nursing home that was damaged and there were around a dozen minor injuries.
Hephzibah					
HEPHZIBAH	6/12/2001	F0	0/0	$0	WAGT TV and others reported a small tornado touchdown at Point South golf course taking down several trees.

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
HEPHZIBAH	11/16/2011	EF0	0/0	$10,698	WRDW reported a tornado touchdown near Hephzibah taking down trees in rural areas east of Hephzibah. Photo attached.

*Property damage is reported in 2016 dollars; All damage may not have been reported.
Source: National Climatic Data Center

5.14.4 Probability of Future Occurrences

According to historical information, tornado events are not an annual occurrence for the county. However, given the county's location in the southeastern United States and history of tornadoes, an occurrence is possible every few years. While the majority of the reported tornado events are small in terms of size, intensity, and duration, they do pose a significant threat should Augusta-Richmond County experience a direct tornado strike. Tornado events are likely to increase in frequency as a result of climate change for reasons similar to those explained in the sub-section of this plan on the thunderstorm/windstorm hazard. The probability of future tornado occurrences affecting Augusta-Richmond County is likely (between 10 and 100 percent annual probability).

5.14.5 Consequence Analysis

People (The Public and Public Confidence)

The entire Augusta-Richmond County population is vulnerable to the impacts of a tornado regardless of the measured magnitude. Because it cannot be predicted where a tornado will touch down, it cannot be said which areas of the population within the county are most vulnerable. However, injuries as well as deaths resulting from tornadoes are the most significant impacts. Tornadoes often have a high likelihood of affecting public confidence due to their destructive and highly visible impacts.

Responders

Responders could be critically affected by tornado events as the onset is often very rapid and unpredictable, thereby putting response personnel potentially in harm's way. Due to the unpredictability of such events, response may also be hindered as responders may be unable to access those that have been affected if storm conditions persist and they are unable to safely enter affected areas.

Continuity of Operations

Continuity of operations could be greatly impacted by a tornado as personnel may be harmed and critical resources damaged or destroyed during a tornado. In many ways, since the impacts of a tornado are unpredictable, it is also difficult to predict and plan for the appropriate ways to ensure a continuity of operations. Although Augusta-Richmond County is prepared for such an event, disruption of operations will likely take place to some degree.

Built Environment (Property, Facilities, and Infrastructure)

Building Inventory

Augusta-Richmond County has been impacted by tornadoes ranging in intensity from EF0 through EF3 based on the Enhanced-Fujita scale. Because it cannot be predicted where a tornado may touch down,

all buildings, facilities, and infrastructure within the county are considered exposed to the hazard and at risk for being impacted.

Wind
Building materials play a role in how well a structure can withstand tornado force winds. Buildings that use structural steel, reinforced concrete, or load-bearing masonry have the best chance of withstanding a tornado event in the county. Homes constructed of wood or manufactured material are most at risk. Non-engineered structures in the county are far more vulnerable than engineered buildings to damage from tornado winds.

Critical Facilities and Key Resources
All critical facilities and key resources are equally vulnerable to the impacts of a tornado. The magnitude of the tornado will determine the extent of damage and impacts that are felt throughout the county. These impacts can include structural failure, debris damage, and loss of facility functionality.

Critical Infrastructure
The county's infrastructure system is equally vulnerable to the impacts of a tornado. This includes critical infrastructure such as roads, railroads, bridges, utilities (power and gas), and pipelines. Any number of these infrastructure systems could be damaged in the event of a tornado, although often power lines are the most common assets that are affected during a tornado. Impacts could include structural damage, impassable or blocked roadways, failed utility lines, railway failure, and impassable bridges.

Key Resources
The county's key resources are equally vulnerable to the impacts of a tornado. Any number of key resources could be damaged or lost in the event of a tornado. Impacts could include structural damage, and loss of power and utilities.

Economy
A tornado can impact any area of Augusta-Richmond County at any time and brings with it significant property damage costs to individual citizens and the regular functioning of the local economy. After past events, there has been a substantial halt to many economic activities and losses to businesses have often been high.

Environment
Downed trees and other forms of vegetation are often one of the most visible impacts to the environment from a tornado. Additionally, building material or other debris can be carried or thrown great distances by the force of wind and end up spread out in unexpected places such as natural areas. Coordinated countywide cleanup efforts after a tornado can include removal of debris, but much debris ends up remaining in the local habitats. Finally, if hazardous materials facilities are impacted by the tornado, these may release dangerous chemicals into the environment that can cause long-term harm.

5.15 WILDFIRE

5.15.1 Background

A wildfire is any outdoor fire (i.e. grassland, forest, brush land) that is not under control, supervised, or prescribed.[25] Wildfires are part of the natural management of forest ecosystems, but may also be caused by human factors.

Nationally, over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning. In Georgia, a majority of fires are caused by debris burning such as burning yard leaf piles.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildfires are usually signaled by dense smoke that fills the area for miles around.

Wildfire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural hazards (such as tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings.

Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high wildfire hazard areas. Furthermore, the increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for wildfire events that can sweep through the brush and timber and destroy property within minutes.

Wildfires can result in severe economic losses as well. Businesses that depend on timber, such as paper mills and lumber companies, experience losses that are often passed along to consumers through higher prices and sometimes jobs are lost. The high cost of responding to and recovering from wildfires can deplete state resources and increase insurance rates. The economic impact of wildfires can also be felt in the tourism industry if roads and tourist attractions are closed due to health and safety concerns.

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks, and fuel management can be designed as part of an overall fire defense system to aid in fire control. Fuel management, prescribed burning, and cooperative land management planning can also be encouraged to reduce fire hazards.

[25] Prescription burning, or "controlled burn," undertaken by land management agencies is the process of igniting fires under selected conditions, in accordance with strict parameters.

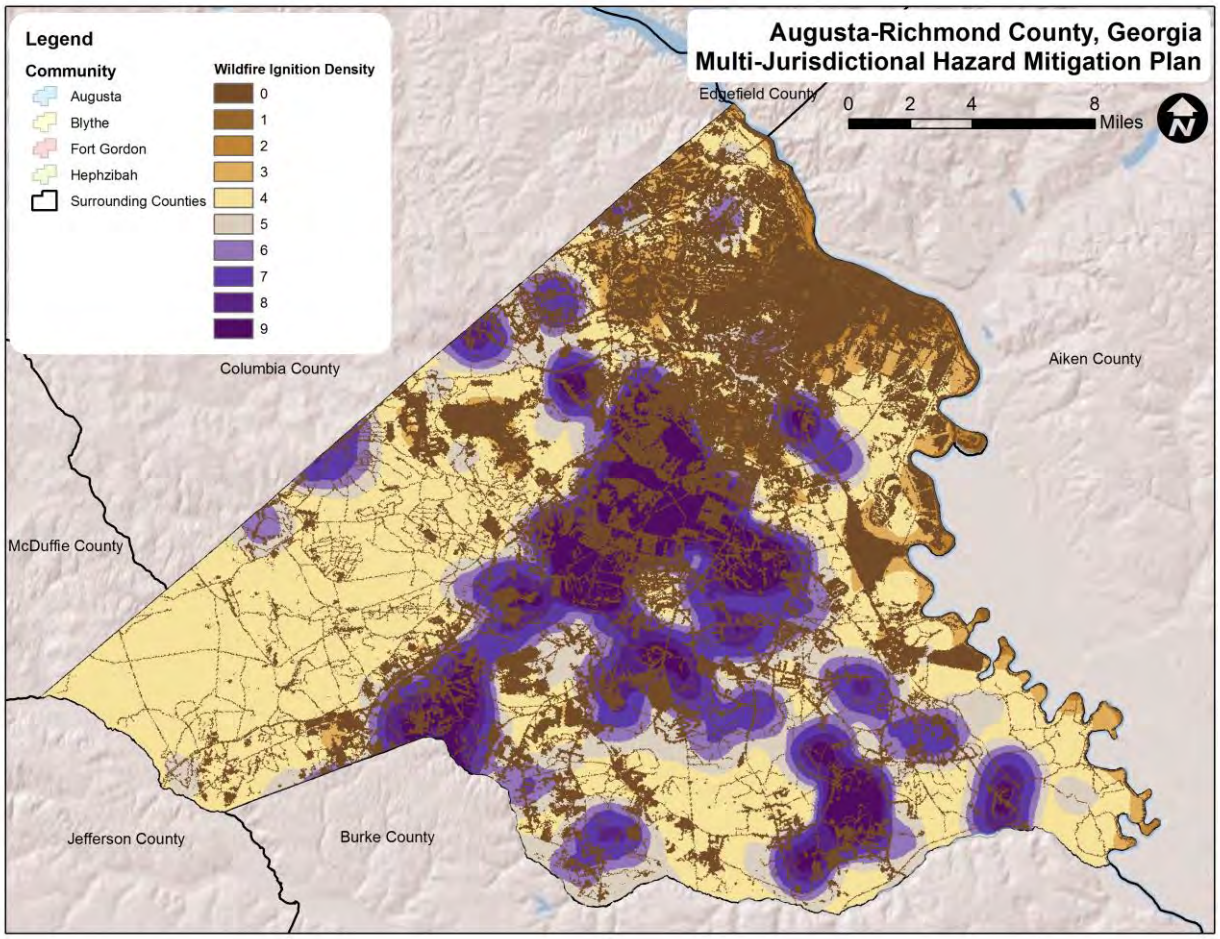
5.15.2 Location and Spatial Extent

The entire county is at risk to a wildfire occurrence. However, several factors such as drought conditions or high levels of fuel on the forest floor, may make a wildfire more likely. Furthermore, areas in the urban-wildland interface are particularly susceptible to fire hazard as populations abut formerly undeveloped areas. The Wildfire Ignition Density data shown in the figure below gives an indication of historic location in Augusta-Richmond County.

5.15.3 Historical Occurrences

Figure 5.24 shows the Wildfire Ignition Density in Augusta-Richmond County based on data from the Southern Wildfire Risk Assessment. This data is based on historical fire ignitions and the likelihood of a wildfire igniting in an area. Occurrence is derived by modeling historic wildfire ignition locations to create an average ignition rate map. This is measured in the number of fires per year per 1,000 acres.[26]

FIGURE 5.24: WILDFIRE IGNITION DENSITY IN AUGUSTA-RICHMOND COUNTY



Source: Southern Wildfire Risk Assessment

[26] Southern Wildfire Risk Assessment, 2016.

Based on data from the Georgia Forestry Commission (GFC) from 2007 to 2016, Augusta-Richmond County experienced an average of 34.6 wildfires annually which burn a combined average of 118.6 acres per year. The data indicates that most of these fires are small, averaging 3.4 acres per fire. **Table 5.35** lists the number of reported wildfire occurrences in the county between the years 2007 and 2016.

TABLE 5.35: HISTORICAL WILDFIRE OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016*
Augusta-Richmond County										
Number of Fires	42	47	37	23	51	36	27	30	32	21
Number of Acres	109	328	55	46	177	100	54	194	65	58

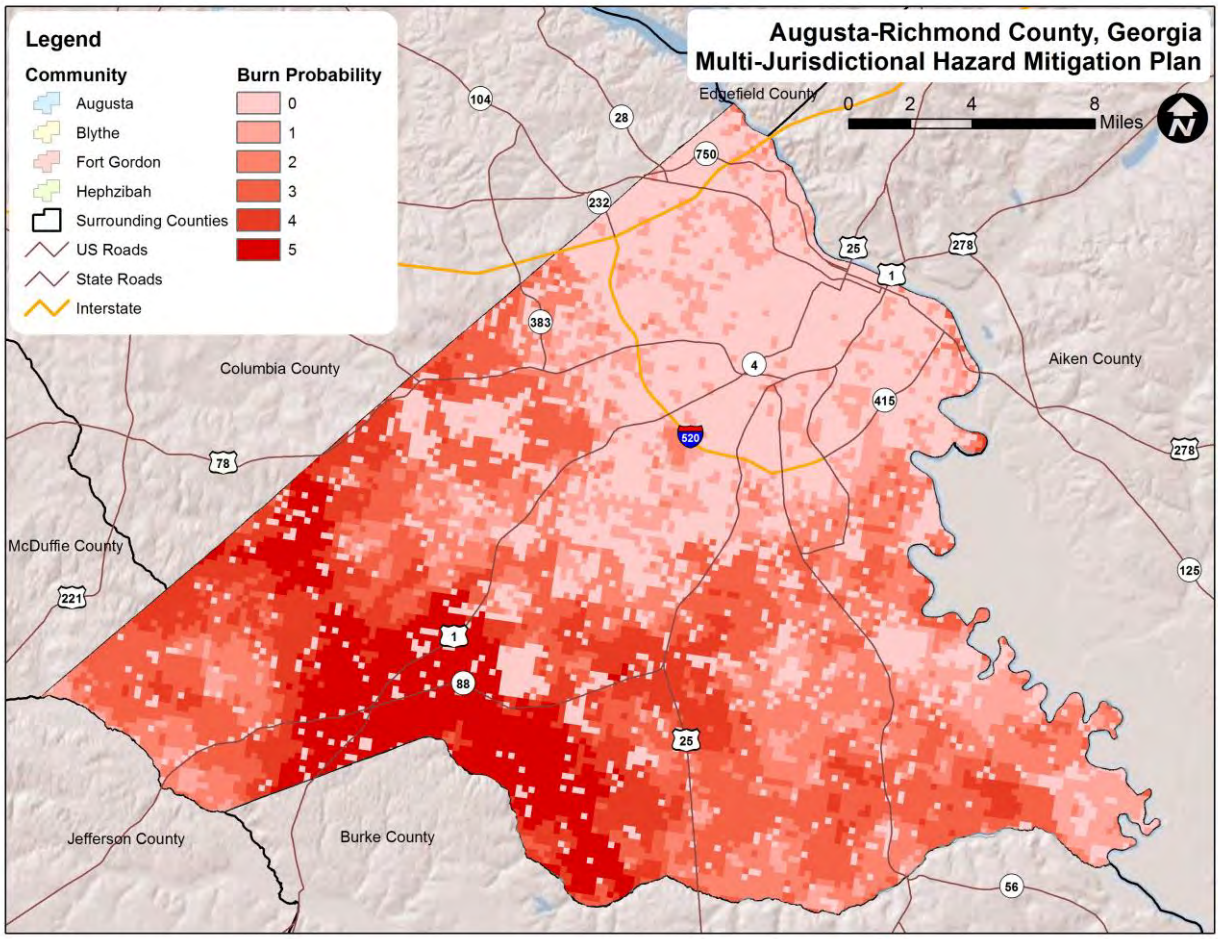
**Data collected only through October 11, 2016*
Source: Georgia Forestry Commission

5.15.4 Probability of Future Occurrence

Wildfire events will be an ongoing occurrence in Augusta-Richmond County. **Figure 5.25** shows that there is some probability a wildfire will occur throughout the county. However, the likelihood of wildfires increases during drought cycles and abnormally dry conditions. Fires are likely to stay small in size but could increase due local climate and ground conditions. Dry, windy conditions with an accumulation of forest floor fuel (potentially due to ice storms or lack of fire) could create conditions for a large fire that spreads quickly.

It should also be noted that some areas do vary somewhat in risk. For example, highly developed areas are less susceptible unless they are located near the urban-wildland boundary. The risk will also vary due to assets. Areas in the urban-wildland interface will have much more property at risk, resulting in increased vulnerability and need to mitigate compared to rural, mainly forested areas. The probability assigned to Augusta-Richmond County for future wildfire events is likely (between 10 and 100 percent annual probability). Additionally, as explained in the sub-section concerning drought, the increased likelihood of drought due to climate change will result in drier conditions that are more conducive to wildfires and, therefore, to greater structural/property damage and decreased air quality in the county.

FIGURE 5.25: BURN PROBABILITY IN AUGUSTA-RICHMOND COUNTY



Source: Southern Wildfire Risk Assessment

5.15.5 Consequence Analysis

People (The Public and Public Confidence)

There are a number of losses related to people from a wildfire in Augusta-Richmond County. Potential losses include human life, structures, and natural resources. Health hazards from smoke caused by wildland fires within or outside the county include breathing difficulties and worsening of chronic breathing and/or cardiovascular disease. Smoke and air pollution pose a risk for children, the elderly, and those with respiratory and cardiovascular problems. Wildfire tends to create some issues with public confidence because of the very visible impacts that the fire has on the community.

Responders

Responders are often at great risk when addressing fires or wildfire, especially firefighters who are responsible for putting out the blaze. First responders are also at risk for exposure to dangers from the initial incident and after-effects such as smoke inhalation and/or heat stroke. All response personnel are potentially at risk when dealing with a wildfire and often-changing winds and a number of other factors can cause a fire to spread rapidly. Although much of Augusta-Richmond County has been urbanized and

is not at a high risk to wildfire, the more rural areas that are located in the wildland urban interface may require response personnel to be ready to act.

Continuity of Operations

Since wildfire often moves quickly and can affect infrastructure that is important to maintaining continuity of operations, there is some level of concern for maintaining continuity. However, operations in Augusta-Richmond County, which are generally run from urbanized areas, will probably not be impacted in a major way.

Built Environment (Property, Facilities, and Infrastructure)

Wildland fires have the potential to substantially burn forested areas as well as private residences. Damage and destruction to state, county, private, and municipal structures and facilities are major losses that are attributed to wildland fires. Private residences and communities that are located within the Wildland Urban Interface (WUI) are particularly susceptible to the threat. Population increases in the county's WUI areas, for example, can create significant challenges for firefighters and residents.

Many new homes are constructed without considering community wildland fire planning. This creates neighborhoods with limited accessibility and flammable building construction and landscaping. A lack of Firewise planning can also greatly increase the probability of a wildland fire occurrence with more homes and emergency personnel being threatened.

Impacts to agricultural crops are another form of direct property losses that Augusta-Richmond County could face in the event of a wildland fire. Some structural losses might cause damage to private property including business properties and homes, vehicles, and livestock. Damage to capital goods and equipment as well as evacuation expenses and other losses are directly related to fire and smoke damage. Additional potential losses include building and landscape maintenance expenses, firefighting equipment purchases, and fire-related business closures. Post-fire losses include cleanup, rehabilitation and repair expenses, equipment and capital goods replacement, drinking water pollution, smoke damage, deflated real estate values, and an increase in fire insurance premiums.

Economy

Given the fact that some homes, businesses, and infrastructure are located in areas that could be impacted by wildfire, there could be some significant economic impacts of a wildfire in Augusta-Richmond County. If homes or businesses are burned, the cost of rebuilding could be substantial and loss of revenue as businesses rebuild would also impact the local economy.

Environment

Wildland fires have the potential to damage or destroy forage on grazing lands, secondary forest products destruction, and/or degradation and loss of wildlife habitat on public lands. On private lands, vegetation losses could include agricultural crops that are either burned or impacted by wildland fire smoke. Another potential loss includes damage and destruction to a wide variety of common or protected habitats in Augusta-Richmond County.

5.16 WINDSTORM/THUNDERSTORM

5.16.1 Background

Thunderstorms can produce a variety of accompanying hazards including wind (discussed here), hail, and lightning (discussed in separate sub-sections). Although thunderstorms generally affect a small area, they are very dangerous and may cause substantial property damage.

Three conditions need to occur for a thunderstorm to form. First, it needs moisture to form clouds and rain. Second, it needs unstable air, such as warm air that can rise rapidly (this often referred to as the "engine" of the storm). Third, thunderstorms need lift, which comes in the form of cold or warm fronts, sea breezes, mountains, or the sun's heat. When these conditions occur simultaneously, air masses of varying temperatures meet, and a thunderstorm is formed. These storm events can occur singularly, in lines, or in clusters. Furthermore, they can move through an area very quickly or linger for several hours.

According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as "severe." A *severe* thunderstorm occurs when the storm produces at least one of these three elements: 1) hail at least one inch in diameter, 2) a tornado, or 3) winds of at least 58 miles per hour.

Thunderstorm events have the capability of producing straight-line winds that can cause severe destruction to communities and threaten the safety of a population. Such wind events, sometimes separate from a thunderstorm event, are common throughout Augusta-Richmond County. Therefore, high winds are also reported in this section.

High winds can form due to pressure of the Northeast coast of the United States that combines with strong pressure moving through the Ohio Valley. This creates a tight pressure gradient across the region, resulting in high winds which increase with elevation.

Downbursts are also possible with thunderstorm events. Such events are an excessive burst of wind in excess of 125 miles per hour. They are often confused with tornadoes. Downbursts are caused by down drafts from the base of a convective thunderstorm cloud. It occurs when rain-cooled air within the cloud becomes heavier than its surroundings. Thus, air rushes towards the ground in a destructive yet isolated manner. There are two types of downbursts. Downbursts less than 2.5 miles wide, duration less than 5 minutes, and winds up to 168 miles per hour are called "microbursts." Larger events greater than 2.5 miles at the surface and longer than 5 minutes with winds up to 130 miles per hour are referred to as "macrobursts."

5.16.2 Location and Spatial Extent

A wind event is an atmospheric hazard, and thus has no geographic boundaries. It is typically a widespread event that can occur in all regions of the United States. However, thunderstorms are most common in the central and southern states because atmospheric conditions in those regions are favorable for generating these powerful storms. Also, Augusta-Richmond County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is assumed that Augusta-Richmond County has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

5.16.3 Historical Occurrences

According to NCDC, there have been 182 reported thunderstorm wind and high wind events since 1950 in Augusta-Richmond County.[27] These events caused almost $4.0 million (2016 dollars) in damages.[28] There were also reports of one fatality and thirty-six injuries. **Table 5.36** summarizes this information. **Table 5.37** provides detailed thunderstorm wind and high wind event reports, including date, magnitude, and associated damages for each event.

TABLE 5.36: SUMMARY OF THUNDERSTORM / HIGH WIND OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	156	1/34	$3,789,359
Blythe	5	0/2	$22,998
Fort Gordon	9	0/0	$52,755
Hephzibah	12	0/0	$0
AUGUSTA-RICHMOND COUNTY TOTAL	**182**	**1/36**	**$3,977,975**

Source: National Climatic Data Center

TABLE 5.37: HISTORICAL THUNDERSTORM / HIGH WIND OCCURRENCES IN AUGUSTA-RICHMOND COUNTY

	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
Augusta-Richmond County					
RICHMOND CO.	5/22/1955	Thunderstorm Wind	58 kts.	0/0	$0
RICHMOND CO.	5/24/1955	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	8/6/1955	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	6/29/1956	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/15/1956	Thunderstorm Wind	58 kts.	0/0	$0
RICHMOND CO.	7/27/1956	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	6/11/1961	Thunderstorm Wind	65 kts.	0/0	$0
RICHMOND CO.	7/3/1966	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	5/8/1967	Thunderstorm Wind	65 kts.	0/0	$0
RICHMOND CO.	5/25/1968	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/8/1969	Thunderstorm Wind	50 kts.	0/0	$0
RICHMOND CO.	7/3/1970	Thunderstorm Wind	50 kts.	0/0	$0
RICHMOND CO.	7/16/1970	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/16/1970	Thunderstorm Wind	53 kts.	0/0	$0

[27] These thunderstorm events are only inclusive of those reported by the National Climatic Data Center (NCDC) from 1950 through October 2016 and these high wind events are only inclusive of those reported by NCDC from 1996 through October 2016. It is likely that additional thunderstorm and high wind events have occurred in Augusta-Richmond County. As additional local data becomes available, this hazard profile will be amended.

[28] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
RICHMOND CO.	3/2/1972	Thunderstorm Wind	53 kts.	0/0	$0
RICHMOND CO.	3/16/1972	Thunderstorm Wind	75 kts.	0/0	$0
RICHMOND CO.	7/5/1972	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	3/21/1974	Thunderstorm Wind	58 kts.	0/0	$0
RICHMOND CO.	8/7/1974	Thunderstorm Wind	57 kts.	0/0	$0
RICHMOND CO.	5/16/1975	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/22/1977	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	10/2/1977	Thunderstorm Wind	54 kts.	0/0	$0
RICHMOND CO.	8/19/1978	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	8/29/1978	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	8/29/1978	Thunderstorm Wind	54 kts.	0/0	$0
RICHMOND CO.	10/4/1979	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/9/1980	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/26/1980	Thunderstorm Wind	60 kts.	0/0	$0
RICHMOND CO.	8/7/1980	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	3/16/1981	Thunderstorm Wind	50 kts.	0/0	$0
RICHMOND CO.	8/10/1981	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	8/12/1981	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	2/16/1982	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	4/26/1982	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	6/10/1982	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	4/23/1983	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	6/5/1983	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/5/1983	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/15/1983	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	8/24/1983	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	4/14/1984	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	4/14/1984	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	5/3/1984	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/22/1985	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	5/24/1988	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/30/1988	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	4/4/1989	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	5/5/1989	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	5/5/1989	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	2/10/1990	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	2/22/1990	Thunderstorm Wind	0 kts.	0/1	$0
RICHMOND CO.	6/9/1990	Thunderstorm Wind	52 kts.	0/0	$0
RICHMOND CO.	3/1/1991	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	7/12/1992	Thunderstorm Wind	0 kts.	0/0	$0
RICHMOND CO.	9/3/1992	Thunderstorm Wind	0 kts.	0/0	$0
Augusta	5/13/1993	Thunderstorm Wind	0 kts.	0/0	$8,327
Augusta	5/19/1993	Thunderstorm Wind	0 kts.	0/0	$8,327
Augusta	5/19/1993	Thunderstorm Wind	0 kts.	0/0	$83,269
McBean	6/26/1994	Thunderstorm Wind	0 kts.	0/0	$812
Augusta	6/28/1994	Thunderstorm Wind	0 kts.	0/0	$8,119

	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
Augusta	6/28/1994	Thunderstorm Wind	0 kts.	0/0	$8,119
Augusta	5/14/1995	Thunderstorm Wind	0 kts.	0/4	$3,158
Richmond	6/9/1995	Thunderstorm Wind	0 kts.	0/0	$0
Augusta	6/12/1995	Thunderstorm Wind	0 kts.	0/0	$790
South Augusta	6/12/1995	Thunderstorm Wind	0 kts.	0/0	$28,423
Augusta	7/24/1995	Thunderstorm Wind	0 kts.	0/0	$790
Augusta	11/7/1995	Thunderstorm Wind	0 kts.	0/0	$0
Augusta	11/11/1995	Thunderstorm Wind	0 kts.	0/0	$0
WEST AUGUSTA	1/24/1996	Thunderstorm Wind	50 kts.	0/0	$0
GOESHEN	3/7/1996	Thunderstorm Wind	75 kts.	0/0	$3,067,521
AUGUSTA	5/28/1996	Thunderstorm Wind	50 kts.	0/0	$0
GRACEWOOD	4/22/1997	Thunderstorm Wind	60 kts.	0/0	$10,496
AUGUSTA	5/3/1997	Thunderstorm Wind	50 kts.	0/0	$0
AUGUSTA	6/19/1998	Thunderstorm Wind	55 kts.	0/0	$0
AUGUSTA	4/15/1999	Thunderstorm Wind	50 kts.	0/0	$0
AUGUSTA	8/23/1999	Thunderstorm Wind	50 kts.	0/0	$0
AUGUSTA	8/18/2000	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	6/3/2001	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	6/3/2001	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	6/22/2001	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	7/8/2001	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	5/3/2002	Thunderstorm Wind	70 kts. M	0/0	$0
AUGUSTA	5/3/2002	Thunderstorm Wind	70 kts. M	0/0	$0
AUGUSTA	5/3/2002	Thunderstorm Wind	50 kts. E	0/0	$0
COUNTYWIDE	5/13/2002	Thunderstorm Wind	60 kts. E	0/0	$0
AUGUSTA	5/29/2002	Thunderstorm Wind	55 kts. E	0/1	$24,078
AUGUSTA	7/30/2002	Thunderstorm Wind	55 kts. E	0/0	$0
AUGUSTA	8/18/2002	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	9/18/2002	Thunderstorm Wind	50 kts. E	0/0	$0
COUNTYWIDE	12/24/2002	Thunderstorm Wind	50 kts. E	0/0	$0
AUGUSTA	2/22/2003	Thunderstorm Wind	55 kts. E	0/0	$0
CENTRAL PORTION	5/2/2003	Thunderstorm Wind	60 kts. EG	0/0	$0
AUGUSTA	5/18/2003	Thunderstorm Wind	50 kts. EG	0/0	$0
AUGUSTA	7/11/2003	Thunderstorm Wind	55 kts. EG	0/0	$0
AUGUSTA	11/19/2003	Thunderstorm Wind	50 kts. EG	0/0	$0
AUGUSTA	5/2/2004	Thunderstorm Wind	55 kts. EG	0/0	$0
AUGUSTA BUSH ARPT	5/2/2004	Thunderstorm Wind	64 kts. MG	0/0	$0
AUGUSTA	4/22/2005	Thunderstorm Wind	60 kts. EG	0/0	$0
AUGUSTA	5/20/2005	Thunderstorm Wind	60 kts. EG	0/0	$0
AUGUSTA	8/4/2005	Thunderstorm Wind	50 kts. EG	0/0	$0
AUGUSTA	7/15/2006	Thunderstorm Wind	60 kts. EG	0/0	$0
AUGUSTA	7/20/2006	Thunderstorm Wind	55 kts. EG	0/0	$0
(AGS)BUSH FLD AUGUST	6/18/2007	Thunderstorm Wind	58 kts. EG	0/0	$0
AUGUSTA	7/11/2007	Thunderstorm Wind	60 kts. EG	1/4	$0

	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
AUGUSTA	3/4/2008	Thunderstorm Wind	70 kts. EG	0/0	$0
NATIONAL HILLS	3/15/2008	Thunderstorm Wind	61 kts. EG	0/0	$0
(AGS)BUSH FLD AUGUST	5/20/2008	Thunderstorm Wind	58 kts. MG	0/0	$0
AUGUSTA	5/20/2008	Thunderstorm Wind	65 kts. EG	0/0	$0
AUGUSTA	6/22/2008	Thunderstorm Wind	60 kts. EG	0/0	$0
RICHMOND (ZONE)	1/7/2009	Strong Wind	43 kts. EG	0/0	$16,826
SOUTH NELLIEVILLE	6/12/2009	Thunderstorm Wind	55 kts. EG	0/0	$0
AUGUSTA	6/18/2009	Thunderstorm Wind	55 kts. EG	0/0	$6,730
(AGS)BUSH FLD AUGUST	7/30/2009	Thunderstorm Wind	50 kts. MG	0/0	$0
AUGUSTA	8/11/2009	Thunderstorm Wind	50 kts. EG	0/0	$2,243
AUGUSTA	12/9/2009	Thunderstorm Wind	50 kts. EG	0/0	$4,487
AUGUSTA DANIEL ARPT	1/24/2010	Thunderstorm Wind	50 kts. EG	0/0	$5,518
AUGUSTA	6/15/2010	Thunderstorm Wind	60 kts. EG	0/0	$44,144
SOUTH NELLIEVILLE	6/25/2010	Thunderstorm Wind	55 kts. EG	0/0	$6,622
(AGS)BUSH FLD AUGUST	7/27/2010	Thunderstorm Wind	60 kts. MG	0/0	$0
AUGUSTA	7/31/2010	Thunderstorm Wind	55 kts. EG	0/0	$4,414
AUGUSTA	10/25/2010	Thunderstorm Wind	50 kts. EG	0/0	$0
AUGUSTA DANIEL ARPT	3/9/2011	Thunderstorm Wind	50 kts. EG	0/0	$535
SOUTH NELLIEVILLE	4/5/2011	Thunderstorm Wind	65 kts. EG	0/0	$72,749
SOUTH NELLIEVILLE	4/5/2011	Thunderstorm Wind	50 kts. EG	0/0	$1,070
BATH	4/28/2011	Thunderstorm Wind	55 kts. EG	0/0	$19,257
SOUTH NELLIEVILLE	4/28/2011	Thunderstorm Wind	55 kts. EG	0/0	$40,654
(AGS)BUSH FLD AUGUST	6/15/2011	Thunderstorm Wind	58 kts. MG	0/24	$0
AUGUSTA	6/15/2011	Thunderstorm Wind	60 kts. EG	0/0	$12,838
(AGS)BUSH FLD AUGUST	6/21/2011	Thunderstorm Wind	52 kts. EG	0/0	$0
ELWOOD	6/21/2011	Thunderstorm Wind	50 kts. EG	0/0	$535
SOUTH NELLIEVILLE	6/21/2011	Thunderstorm Wind	55 kts. EG	0/0	$8,559
ARAGON PARK	6/28/2011	Thunderstorm Wind	50 kts. EG	0/0	$4,279
ARAGON PARK	6/28/2011	Thunderstorm Wind	55 kts. EG	0/0	$0
(AGS)BUSH FLD AUGUST	8/13/2011	Thunderstorm Wind	55 kts. MG	0/0	$0
(AGS)BUSH FLD AUGUST	8/13/2011	Thunderstorm Wind	50 kts. EG	0/0	$3,210
(AGS)BUSH FLD AUGUST	9/15/2011	Thunderstorm Wind	59 kts. MG	0/0	$0
AUGUSTA DANIEL ARPT	10/13/2011	Thunderstorm Wind	55 kts. EG	0/0	$0
NATIONAL HILLS	10/13/2011	Thunderstorm Wind	55 kts. EG	0/0	$0
AUGUSTA	2/24/2012	Thunderstorm Wind	70 kts. EG	0/0	$125,777
NATIONAL HILLS	4/3/2012	Thunderstorm Wind	60 kts. EG	0/0	$0
NATIONAL HILLS	4/3/2012	Thunderstorm Wind	60 kts. EG	0/0	$0

	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
NATIONAL HILLS	4/3/2012	Thunderstorm Wind	60 kts. EG	0/0	$0
NATIONAL HILLS	4/3/2012	Thunderstorm Wind	60 kts. EG	0/0	$0
NATIONAL HILLS	7/5/2012	Thunderstorm Wind	50 kts. EG	0/0	$4,193
SOUTH NELLIEVILLE	7/5/2012	Thunderstorm Wind	50 kts. EG	0/0	$6,289
NATIONAL HILLS	8/9/2012	Thunderstorm Wind	50 kts. EG	0/0	$0
SOUTH NELLIEVILLE	8/9/2012	Thunderstorm Wind	50 kts. EG	0/0	$524
SOUTH NELLIEVILLE	8/17/2012	Thunderstorm Wind	60 kts. EG	0/0	$31,444
(AGS)BUSH FLD AUGUST	3/18/2013	Thunderstorm Wind	50 kts. MG	0/0	$0
DE BRUCE	1/11/2014	Thunderstorm Wind	50 kts. EG	0/0	$4,066
AUGUSTA DANIEL ARPT	11/23/2014	Thunderstorm Wind	55 kts. EG	0/0	$8,132
NIXON	6/22/2015	Thunderstorm Wind	60 kts. EG	0/0	$48,735
NATIONAL HILLS	6/27/2015	Thunderstorm Wind	50 kts. EG	0/0	$508
NATIONAL HILLS	7/2/2015	Thunderstorm Wind	55 kts. EG	0/0	$28,429
AUGUSTA	7/20/2015	Thunderstorm Wind	50 kts. EG	0/0	$24,368
AUGUSTA DANIEL ARPT	2/24/2016	Thunderstorm Wind	55 kts. EG	0/0	$0
Blythe					
BLYTHE	4/22/1997	Thunderstorm Wind	60 kts.	0/2	$22,490
BLYTHE	7/27/1997	Thunderstorm Wind	50 kts.	0/0	$0
BLYTHE	4/14/2007	Thunderstorm Wind	55 kts. EG	0/0	$0
BLYTHE	8/7/2008	Thunderstorm Wind	55 kts. EG	0/0	$0
BLYTHE	6/9/2015	Thunderstorm Wind	55 kts. EG	0/0	$508
Fort Gordon					
FT GORDON	12/17/2001	Thunderstorm Wind	50 kts. E	0/0	$0
FT GORDON	7/22/2006	Thunderstorm Wind	55 kts. EG	0/0	$0
FT GORDON	3/1/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
FT GORDON	6/18/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
FT GORDON	7/31/2008	Thunderstorm Wind	50 kts. EG	0/0	$0
FT GORDON	6/18/2009	Thunderstorm Wind	50 kts. EG	0/0	$39,260
FT GORDON	7/3/2012	Thunderstorm Wind	60 kts. EG	0/0	$5,241
FT GORDON	7/5/2012	Thunderstorm Wind	50 kts. EG	0/0	$4,193
FT GORDON	6/27/2015	Thunderstorm Wind	55 kts. EG	0/0	$4,061
Hephzibah					
Hephzibah	6/17/1994	Thunderstorm Wind	0 kts.	0/0	$8,119
Hephzibah	7/16/1995	Thunderstorm Wind	0 kts.	0/0	$947
HEPHZIBAH	4/22/1997	Thunderstorm Wind	55 kts.	0/0	$4,498
HEPHZIBAH	6/10/1998	Thunderstorm Wind	50 kts.	0/0	$0
HEPHZIBAH	9/8/1998	Thunderstorm Wind	50 kts.	0/0	$0
HEPHZIBAH	6/22/2000	Thunderstorm Wind	50 kts. E	0/0	$5,444
HEPHZIBAH	2/13/2007	Thunderstorm Wind	50 kts. EG	0/0	$0
HEPHZIBAH	3/2/2007	Thunderstorm Wind	55 kts. EG	0/0	$0
HEPHZIBAH	4/5/2011	Thunderstorm Wind	65 kts. EG	0/0	$89,866
HEPHZIBAH	6/21/2011	Thunderstorm Wind	55 kts. EG	0/0	$3,210
HEPHZIBAH	7/5/2012	Thunderstorm Wind	50 kts. EG	0/0	$4,193

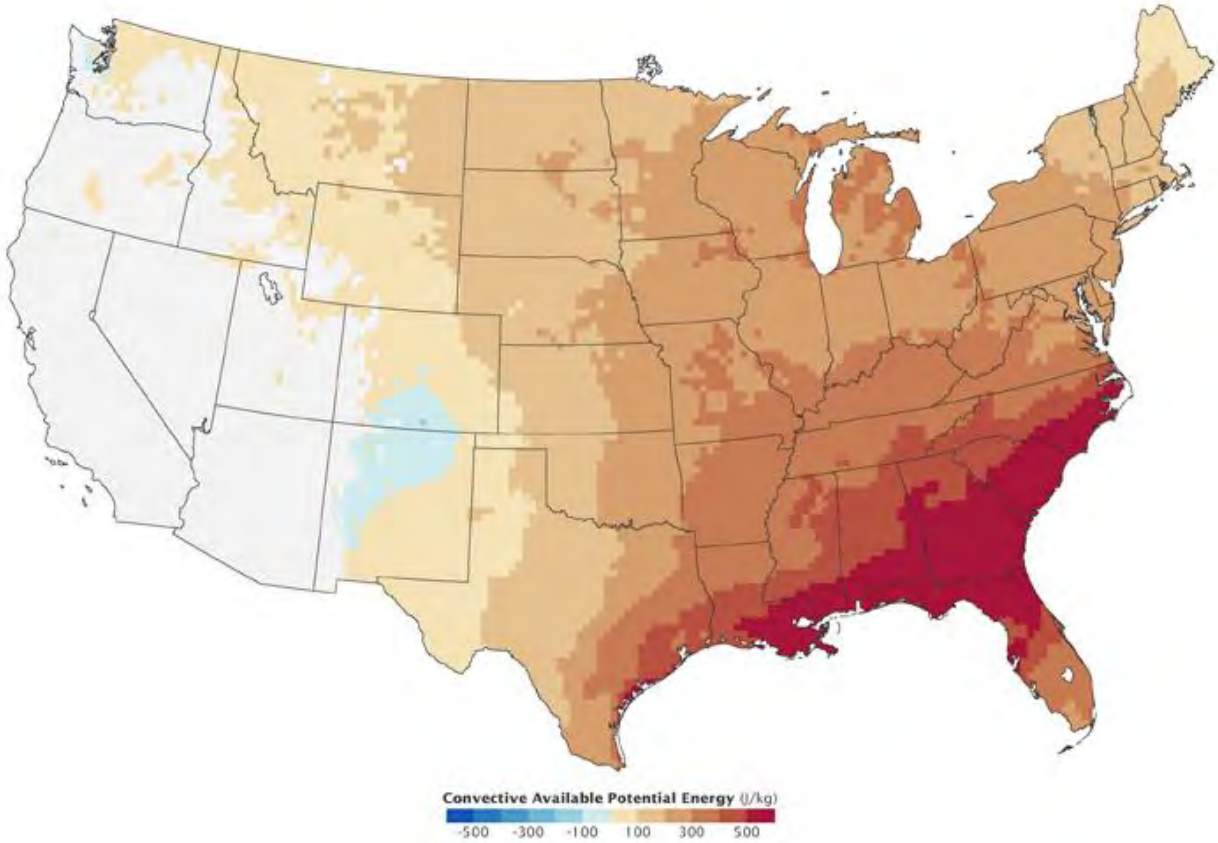
	Date	Type	Magnitude†	Deaths / Injuries	Property Damage*
HEPHZIBAH	4/19/2015	Thunderstorm Wind	55 kts. EG	0/0	$2,031

*Property damage is reported in 2016 dollars; All damage may not have been reported.
†E = estimated; EG = estimated gust; ES = estimated sustained ;MG = measured gust ;MS = measured sustained
Source: National Climatic Data Center

5.16.4 Probability of Future Occurrence

Given the high number of previous events, it is certain that wind events, including straight-line wind and thunderstorm wind, will occur in the future. This results in a probability level of highly likely (100 percent annual probability) for future thunderstorm/wind events for the entire county. Additionally, according to the National Aeronautics and Space Administration (NASA), thunderstorm events in the future are likely to become more frequent in the southeast as a result of climate change. Thunderstorm potential is measured by an index that NASA. Created that is called the Convective Available Potential Energy (CAPE) index. This measures how warm and moist the air is, which is a major contributing factor in thunderstorm formation. NASA projects that by the period of 2072-2099, the CAPE the southeastern United States will increase dramatically. Indeed, as **Figure 5.26** shows, Augusta-Richmond County is in an area that will likely experience the greatest increase in CAPE in the United States. This indicates that there will potentially be even more frequent thunderstorms in the county going forward.

FIGURE 5.26: CONVECTIVE AVAILABLE POTENTIAL ENERGY PROJECTED INCREASE BY 2072-2099



Source: National Aeronautics and Space Administration

5.16.5 Consequence Analysis

People (The Public and Public Confidence)

Windstorms/thunderstorms are generally associated with several other hazards such as high wind and flooding, the latter of which is caused by torrential rain. As such, the public could be impacted in a number of ways by a thunderstorm event. High wind can cause trees to fall and potentially result in injuries or death and rising floodwaters can lead to drowning or other serious injury. Although often not as severe as hurricanes or tornadoes, the impacts on the public from thunderstorms can be significant, especially in the long-term. However, the public confidence is usually not affected to a large degree as a result of thunderstorms.

Responders

Responders are not generally affected to any great degree by thunderstorm events, although it should be noted that they could be impacted in many of the same ways as the public. Otherwise, responders could be affected by road blockages caused by downed trees or floodwaters, which would ultimately reduce their response time.

Continuity of Operations

In general, continuity of operations during a thunderstorm event can be maintained. Thunderstorm events often affect power in much the same way as tornadoes and hurricanes, which ultimately may impact operations. However, thunderstorm events are typically not large enough to severely affect normal operations and their impacts are not wide enough to disrupt continuity of operations in Augusta-Richmond County.

Built Environment (Property, Facilities, and Infrastructure)

Thunderstorms often have their greatest impact on the built environment as they can cause damage to homes via strong winds or flooding and will often impact facilities and infrastructure in the same way. Power losses often occur due to damage to power lines and roads can flood and cause damage as well. In fact, thunderstorms are often considered one of the greater hazards of concern for local communities even though any given event will cause relatively little damage, because damaging events occur so frequently.

Economy

Economic impacts from thunderstorm events can often be far reaching as the damage from these events are often widespread, affecting both homes and businesses. This damage can result in business and economic disruption through the recovery process.

Environment

Thunderstorms can impact crops via high wind and flooding and can also impact the natural environment through these elements. Flooding can kill plants and animals as well as contaminate drinking water supplies for human populations. High wind can harm forests by bringing down trees and cause fires from downed power lines that impact the environment.

Technological/Man-Made Hazards

5.17 CHEMICAL HAZARD

5.17.1 Background

Hazardous materials can be found in many forms and quantities that can potentially cause death; serious injury; long-lasting health effects; and damage to buildings, homes, and other property in varying degrees. Such materials are routinely used and stored in many homes and businesses and are also shipped daily on the nation's highways, railroads, waterways, and pipelines. This subsection on the hazardous material hazard is intended to provide a general overview of the hazard. The threshold for identifying fixed and mobile sources of hazardous materials is limited to general information on rail, highway, and FEMA-identified fixed HAZMAT sites determined to be of greatest significance as appropriate for the purposes of this plan.

Hazardous material (HAZMAT) incidents can apply to fixed facilities as well as mobile, transportation-related accidents in the air, by rail, on the nation's highways, and on the water. These incidents can be further classified based on the state of the hazardous material; whether they consist of solid, liquid, and/or gaseous contaminants that are released from fixed or mobile containers. A HAZMAT incident can last hours to days and some chemicals can be corrosive or otherwise damaging over longer periods of time. In addition to the primary release, explosions and/or fires can result from a release, and contaminants can be extended beyond the initial area by persons, vehicles, water, wind, and possibly wildlife as well.

HAZMAT incidents can also occur as a result of or in tandem with natural hazard events, such as floods, hurricanes, tornadoes, and earthquakes which, in addition to causing incidents, can also hinder response efforts. For example, flooding and hurricane events can lead to hazardous spills by causing flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills, and a variety of other environmental pollutants that are of widespread toxological concern.

Hazardous material incidents can include the spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of a hazardous material, but exclude: (1) any release which results in exposure to poisons solely within the workplace with respect to claims which such persons may assert against the employer of such persons; (2) emissions from the engine exhaust of a motor vehicle, rolling stock, aircraft, vessel or pipeline pumping station engine; (3) release of source, byproduct, or special nuclear material from a nuclear incident; and (4) the normal application of fertilizer.

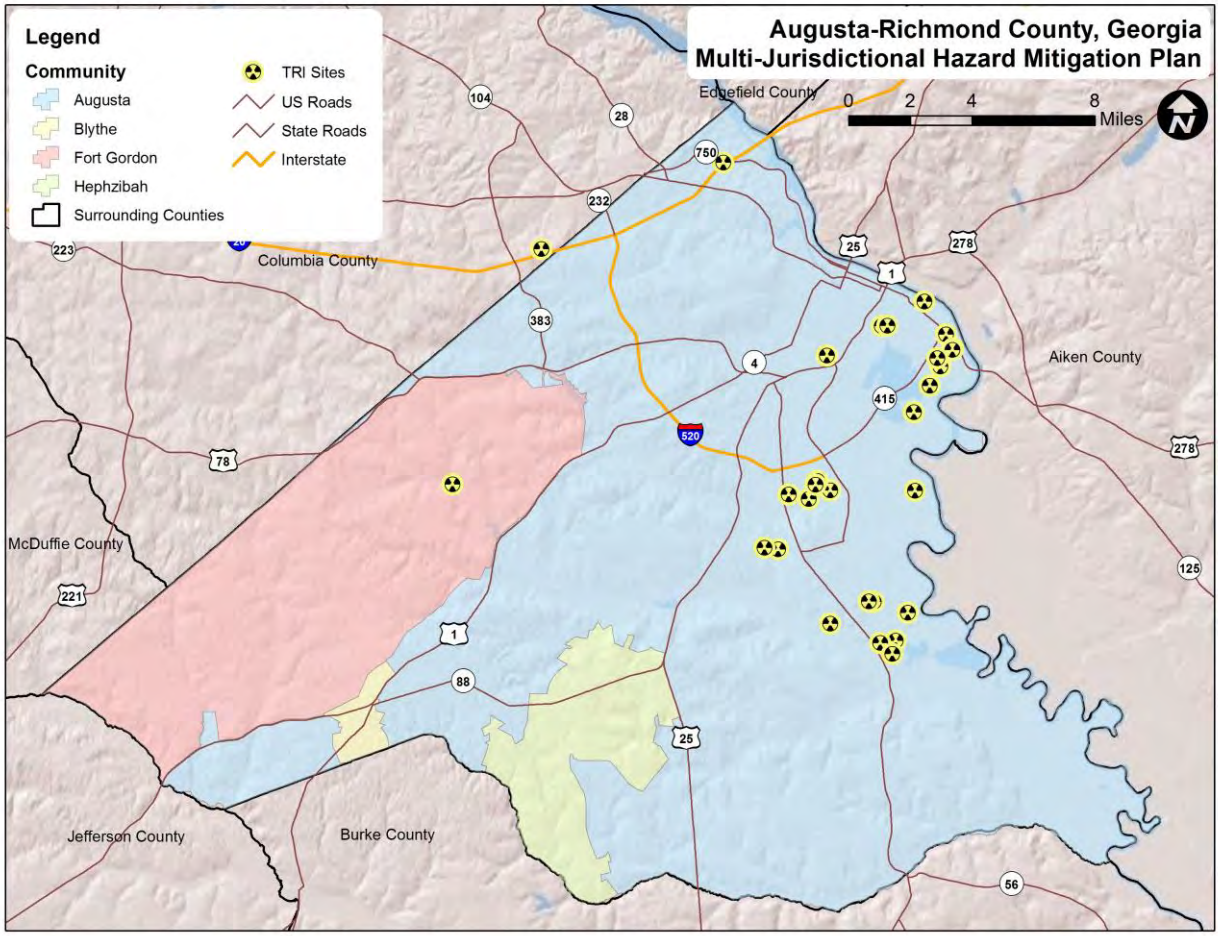
5.17.2 Location and Spatial Extent

As a result of the 1986 Emergency Planning and Community Right to Know Act (EPCRA), the Environmental Protection Agency (EPA) provides public information on hazardous materials. One facet of this program is to collect information from industrial facilities on the releases and transfers of certain toxic agents. This information is then reported in the Toxic Release Inventory (TRI). TRI sites indicate where such activity is occurring. Augusta-Richmond County has 29 TRI sites. These fixed sites are summarized in **Table 5.38** and shown in **Figure 5.27.**

TABLE 5.38: SUMMARY OF TOXIC RELEASE INVENTORY SITES IN AUGUSTA-RICHMOND COUNTY

Location	TRI Facilities
Augusta-Richmond County	28
Blythe	0
Fort Gordon	0
Hephzibah	1
AUGUSTA-RICHMOND COUNTY TOTAL	**29**

FIGURE 5.27: TOXIC RELEASE INVENTORY SITES IN AUGUSTA-RICHMOND COUNTY



Source: Environmental Protection Agency

In addition to "fixed" hazardous materials locations, hazardous materials may also impact the county via roadways and rail. Many roads and rails in the county are subject to hazardous materials transport and all roads and rails that permit hazardous material transport are considered potentially at risk to an incident.

5.17.3 Historical Occurrences

The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA) lists historical occurrences throughout the nation. A "serious incident" is a hazardous materials incident that involves:

- a fatality or major injury caused by the release of a hazardous material,
- the evacuation of 25 or more persons as a result of release of a hazardous material or exposure to fire,
- a release or exposure to fire which results in the closure of a major transportation artery,
- the alteration of an aircraft flight plan or operation,
- the release of radioactive materials from Type B packaging,
- the release of over 11.9 gallons or 88.2 pounds of a severe marine pollutant, or
- the release of a bulk quantity (over 199 gallons or 882 pounds) of a hazardous material.

However, prior to 2002, a hazardous materials "serious incident" was defined as follows:

- a fatality or major injury due to a hazardous material,
- closure of a major transportation artery or facility or evacuation of six or more person due to the presence of hazardous material, or
- a vehicle accident or derailment resulting in the release of a hazardous material.

There have been a total of 339 recorded HAZMAT incidents in Augusta-Richmond County since 1971 (**Table 5.39**). These events resulted in nearly $800,000 (2016 dollars) of property damage as well as 27 injuries.[29] **Table 5.40** presents detailed information on historical HAZMAT incidents in Augusta-Richmond County as reported by the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA). However, due to the high number of reported incidents, detailed information is only provided for those incidents that are classified as serious incidents.

TABLE 5.39: SUMMARY OF HAZMAT INCIDENTS IN AUGUSTA-RICHMOND COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2016)
Augusta-Richmond County	339	0/27	$771,913
Blythe	0	0/0	$0
Fort Gordon	0	0/0	$0
Hephzibah	0	0/0	$0
AUGUSTA-RICHMOND COUNTY TOTAL	**339**	**0/27**	**$771,913**

Source: United States Department of Transportation Pipeline and Hazardous Materials Safety Administration

[29] Adjusted dollar values were calculated based on the average Consumer Price Index for a given calendar year. This index value has been calculated every year since 1913. For 2016, the October 2016 monthly index was used.

TABLE 5.40: HAZMAT INCIDENTS IN AUGUSTA-RICHMOND COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)*	Quantity Released
Augusta-Richmond County							
I-1971050086	4/13/1971	AUGUSTA	Highway	No	0/1	$0	0
I-1971120114	11/1/1971	AUGUSTA	Highway	No	0/0	$0	0
I-1971110181	11/16/1971	AUGUSTA	Rail	No	0/0	$0	0
I-1971120151	12/9/1971	AUGUSTA	Highway	No	0/0	$0	0
I-1972030123	3/9/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1972060154	5/19/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1972070315	5/30/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1972100050	7/10/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1972110005	7/25/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1972100320	9/11/1972	AUGUSTA	Highway	No	0/0	$0	0
I-1973020318	2/5/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973050019	4/3/1973	AUGUSTA	Rail	No	0/1	$0	0
I-1973050264	4/12/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973060085	5/19/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973070083	5/21/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973070479	7/3/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973080348	7/26/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973120078	10/19/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973120027	11/26/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973120183	11/30/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973120241	12/4/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1973120343	12/27/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1974010198	12/28/1973	AUGUSTA	Highway	No	0/0	$0	0
I-1974010328	1/17/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974020238	1/28/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974060643	6/9/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974080280	6/13/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974080740	7/26/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974090703	8/13/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974100530	10/8/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1974120108	11/11/1974	AUGUSTA	Highway	No	0/0	$0	0
I-1975040071	3/18/1975	AUGUSTA	Highway	No	0/0	$0	0
I-1975040732	4/17/1975	AUGUSTA	Highway	No	0/0	$0	0
I-1975060952	6/17/1975	AUGUSTA	Highway	No	0/0	$0	0
I-1975100981	10/17/1975	AUGUSTA	Highway	No	0/0	$0	0
I-1975120079	10/21/1975	AUGUSTA	Highway	No	0/1	$0	0
I-1975110751	11/12/1975	AUGUSTA	Highway	No	0/0	$0	0
I-1976010760	1/12/1976	AUGUSTA	Highway	Yes	0/0	$0	150 LGA
I-1976010604	1/16/1976	AUGUSTA	Highway	No	0/0	$0	40 LGA
I-1976020291	1/26/1976	AUGUSTA	Highway	No	0/0	$0	0
I-1976040805	3/30/1976	AUGUSTA	Highway	No	0/0	$0	10 LGA
I-1976040612	4/1/1976	AUGUSTA	Highway	No	0/0	$0	0
I-1976080401	7/9/1976	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1976090786	9/14/1976	AUGUSTA	Highway	No	0/0	$0	1 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)*	Quantity Released
I-1976100493	9/29/1976	AUGUSTA	Highway	No	0/0	$0	3 LGA
I-1976120180	11/2/1976	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1977010239	12/21/1976	AUGUSTA	Highway	No	0/0	$0	2 LGA
I-1977020194	1/26/1977	AUGUSTA	Highway	Yes	0/0	$0	2500 LGA
I-1977060355	5/17/1977	AUGUSTA	Highway	No	0/0	$0	2 LGA
I-1977061223	6/8/1977	AUGUSTA	Highway	No	0/0	$0	0
I-1977061226	6/21/1977	AUGUSTA	Highway	No	0/0	$0	0
I-1977100041	7/2/1977	AUGUSTA	Rail	No	0/0	$0	55 LGA
I-1977080468	7/25/1977	AUGUSTA	Highway	No	0/0	$0	550 SLB
I-1977090932	8/30/1977	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1977110852	11/3/1977	AUGUSTA	Highway	No	0/0	$0	0
I-1978010308	12/30/1977	AUGUSTA	Highway	No	0/0	$0	0
I-1978020105	1/8/1978	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1978020526	2/3/1978	AUGUSTA	Highway	Yes	0/0	$0	286 LGA
I-1978041269	4/14/1978	AUGUSTA	Highway	No	0/0	$0	0
I-1978051189	4/16/1978	AUGUSTA	Rail	No	0/0	$0	0
I-1978051538	5/17/1978	AUGUSTA	Highway	No	0/0	$0	125 SLB
I-1978080459	7/18/1978	AUGUSTA	Highway	No	0/0	$0	0
I-1978100062	9/19/1978	AUGUSTA	Highway	No	0/0	$0	0
I-1978110965	11/7/1978	AUGUSTA	Highway	No	0/0	$0	0
I-1978120608	11/16/1978	AUGUSTA	Highway	Yes	0/0	$0	147 LGA
I-1978120065	11/17/1978	AUGUSTA	Highway	No	0/0	$0	40 SLB
I-1979040921	3/13/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979050306	4/23/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979050816	4/30/1979	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1979120230	4/30/1979	AUGUSTA	Highway	No	0/0	$0	530 SLB
I-1979051361	5/17/1979	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1979090663	8/14/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979090574	8/20/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979092002	9/7/1979	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1979101071	10/2/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979111102	10/23/1979	AUGUSTA	Highway	No	0/0	$0	0
I-1979111019	10/23/1979	AUGUSTA	Highway	No	0/0	$0	2 LGA
I-1979120938	11/10/1979	AUGUSTA	Rail	Yes	0/12	$0	10216 LGA
I-1980010733	12/18/1979	AUGUSTA	Highway	Yes	0/0	$0	4500 LGA
I-1980020147	1/22/1980	AUGUSTA	Highway	Yes	0/1	$0	0
I-1980041559	3/31/1980	AUGUSTA	Highway	No	0/0	$0	0
I-1980050839	4/30/1980	AUGUSTA	Highway	Yes	0/0	$0	1660 LGA
I-1980090152	5/5/1980	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1980061192	5/15/1980	AUGUSTA	Highway	No	0/0	$0	50 SLB
I-1980081138	7/25/1980	AUGUSTA	Highway	Yes	0/0	$0	2600 LGA
I-1980100882	9/5/1980	AUGUSTA	Highway	No	0/0	$0	10 LGA
I-1981020093	1/15/1981	AUGUSTA	Highway	No	0/0	$0	0
I-1981070123	6/16/1981	AUGUSTA	Highway	No	0/0	$0	0
I-1981100286	9/30/1981	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1981110260	10/29/1981	AUGUSTA	Highway	No	0/0	$0	2 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)*	Quantity Released
I-1981120176	11/18/1981	AUGUSTA	Highway	No	0/0	$0	3 SLB
I-1982030376	2/24/1982	AUGUSTA	Highway	No	0/0	$0	460 SLB
I-1982040634	4/16/1982	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-1982080049	7/16/1982	AUGUSTA	Highway	No	0/0	$0	0
I-1983010130	12/28/1982	AUGUSTA	Highway	No	0/0	$0	5 SLB
I-1983090329	9/1/1983	AUGUSTA	Highway	Yes	0/0	$0	329 LGA
I-1983090642	9/13/1983	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1984070089	6/11/1984	AUGUSTA	Rail	No	0/0	$0	0.12 LGA
I-1985030274	2/19/1985	AUGUSTA	Rail	No	0/0	$0	0.25 LGA
I-1985060295	6/11/1985	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1985120234	11/16/1985	AUGUSTA	Rail	No	0/0	$0	0.12 LGA
I-1985110321	11/21/1985	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1986010113	11/26/1985	AUGUSTA	Highway	No	0/0	$0	1 SLB
I-1986010292	1/9/1986	AUGUSTA	Highway	No	0/0	$0	0.5 LGA
I-1986040463	3/18/1986	AUGUSTA	Highway	No	0/0	$0	10 LGA
I-1986090595	9/9/1986	AUGUSTA	Highway	No	0/0	$0	1.5 LGA
I-1988050056	3/15/1988	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1988060186	5/9/1988	AUGUSTA	Rail	No	0/0	$0	0
I-1988060174	5/9/1988	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1988060175	5/10/1988	AUGUSTA	Rail	No	0/0	$0	0.12 LGA
I-1988070588	5/10/1988	AUGUSTA	Rail	No	0/0	$0	0
I-1988060175	5/10/1988	AUGUSTA	Rail	No	0/0	$0	0.25 LGA
I-1988090451	9/2/1988	AUGUSTA	Rail	No	0/0	$0	0.25 LGA
I-1989010387	12/24/1988	AUGUSTA	Highway	No	0/0	$0	20 LGA
I-1989040536	4/15/1989	AUGUSTA	Rail	No	0/0	$0	2 LGA
I-1989050242	4/18/1989	AUGUSTA	Rail	No	0/0	$0	0
I-1989050355	4/27/1989	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-1989110463	10/16/1989	AUGUSTA	Highway	No	0/0	$136,352	0
I-1989110057	10/17/1989	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1989110127	11/3/1989	AUGUSTA	Rail	No	0/0	$0	0
I-1990060775	11/3/1989	AUGUSTA	Highway	No	0/0	$6,870	40 LGA
I-1989120012	11/9/1989	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1990020218	1/31/1990	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1990050075	4/4/1990	AUGUSTA	Rail	No	0/0	$0	30 LGA
I-1990060181	5/25/1990	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1990100590	9/12/1990	AUGUSTA	Rail	No	0/0	$110	55 LGA
I-1990090627	9/13/1990	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1991040562	4/14/1991	AUGUSTA	Highway	No	0/0	$27	10 LGA
I-1991060673	5/30/1991	AUGUSTA	Highway	No	0/0	$0	15 LGA
I-1991070747	7/19/1991	AUGUSTA	Rail	No	0/0	$2	0.125 LGA
I-1991070746	7/19/1991	AUGUSTA	Rail	No	0/0	$0	0.125 LGA
I-1992020211	2/10/1992	AUGUSTA	Rail	No	0/0	$943	100 LGA
I-1992040558	3/16/1992	AUGUSTA	Highway	No	0/0	$0	0.0625 LGA
I-1992060113	5/25/1992	AUGUSTA	Rail	No	0/0	$0	0.375 LGA
I-1992060406	5/26/1992	AUGUSTA	Highway	No	0/0	$0	50 LGA
I-1992070583	7/16/1992	AUGUSTA	Rail	No	0/0	$9	1 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)*	Quantity Released
I-1992080147	7/20/1992	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-1992080148	7/20/1992	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-1992080672	7/28/1992	AUGUSTA	Rail	No	0/0	$34	0.125 LGA
I-1992100705	9/22/1992	AUGUSTA	Rail	No	0/0	$0	0.25 LGA
I-1992100608	9/29/1992	AUGUSTA	Rail	No	0/0	$3	1 LGA
I-1992110520	10/25/1992	AUGUSTA	Rail	No	0/0	$86	0.125 LGA
I-1992110519	10/25/1992	AUGUSTA	Rail	No	0/0	$86	0.125 LGA
I-1992110518	10/25/1992	AUGUSTA	Rail	No	0/0	$86	0.125 LGA
I-1993060977	5/14/1993	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-1993060923	5/27/1993	AUGUSTA	Highway	No	0/0	$250	0.5 LGA
I-1993100138	9/7/1993	AUGUSTA	Highway	No	0/0	$2,270	55 LGA
I-1993100130	9/16/1993	AUGUSTA	Highway	No	0/0	$50	40 LGA
I-1993110942	10/6/1993	AUGUSTA	Highway	No	0/0	$804	1.056688 LGA
I-1993110325	10/23/1993	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1994050375	4/1/1994	AUGUSTA	Rail	No	0/0	$0	20 LGA
I-1994051341	4/11/1994	AUGUSTA	Rail	Yes	0/0	$17,212	500 LGA
I-1994051470	4/28/1994	AUGUSTA	Highway	No	0/0	$203	4 LGA
I-1994051216	5/8/1994	AUGUSTA	Rail	Yes	0/2	$0	1 LGA
I-1994051216	5/8/1994	AUGUSTA	Rail	Yes	0/2	$0	1 LGA
I-1994060684	5/9/1994	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1994060996	5/31/1994	AUGUSTA	Highway	No	0/0	$4,888	10 LGA
I-1994091182	8/16/1994	AUGUSTA	Highway	No	0/0	$63	0.25 LGA
I-1995010637	11/28/1994	AUGUSTA	Highway	No	0/0	$0	0.264172 LGA
I-1995010636	12/5/1994	AUGUSTA	Highway	No	0/0	$0	4 LGA
I-1995010232	12/20/1994	AUGUSTA	Highway	No	0/0	$487	31 LGA
I-1995020729	1/10/1995	AUGUSTA	Rail	No	0/0	$0	2 LGA
I-1995020726	1/24/1995	AUGUSTA	Rail	No	0/0	$0	3 LGA
I-1995040434	3/29/1995	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1995050161	4/7/1995	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-1995060242	5/9/1995	AUGUSTA	Highway	No	0/0	$0	0.125 LGA
I-1995080029	7/13/1995	AUGUSTA	Rail	No	0/0	$790	2 LGA
I-1995080029	7/13/1995	AUGUSTA	Rail	No	0/0	$790	2 LGA
I-1995111072	11/8/1995	AUGUSTA	Highway	Yes	0/0	$5,527	1965 LGA
I-1995121060	11/20/1995	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1996020123	1/4/1996	AUGUSTA	Highway	Yes	0/0	$230,064	5355 LGA
I-1996030549	2/20/1996	AUGUSTA	Highway	No	0/0	$4,578	0.195313 LGA
I-1996050229	4/5/1996	AUGUSTA	Rail	No	0/0	$0	0
I-1996050936	4/19/1996	AUGUSTA	Highway	No	0/0	$460	10 LGA
I-1996050700	4/26/1996	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1996060338	5/8/1996	AUGUSTA	Rail	No	0/0	$0	0.5 LGA
I-1996080336	7/18/1996	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1996080336	7/18/1996	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1996090839	9/6/1996	AUGUSTA	Rail	Yes	0/0	$38,344	100000 SLB
I-1996091322	9/12/1996	AUGUSTA	Rail	No	0/0	$0	0.25 LGA

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I-1996090670	9/17/1996	AUGUSTA	Highway	Yes	0/0	$902	330 LGA
I-1997110332	1/3/1997	AUGUSTA	Highway	Yes	0/0	$75	0.007813 LGA
I-1997020138	1/24/1997	AUGUSTA	Rail	No	0/0	$0	8 SLB
I-1997020139	1/29/1997	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1997110333	2/14/1997	AUGUSTA	Highway	No	0/0	$75	0.09375 LGA
I-1997110334	4/18/1997	AUGUSTA	Highway	No	0/0	$0	0.015625 LGA
I-1997060720	5/14/1997	AUGUSTA	Highway	No	0/0	$3,576	40 LGA
I-1997060332	5/17/1997	AUGUSTA	Highway	No	0/0	$225	10 LGA
I-1997070020	5/23/1997	AUGUSTA	Highway	Yes	0/0	$225	4000 LGA
I-1997080708	6/4/1997	AUGUSTA	Highway	No	0/0	$300	5 LGA
I-1997070220	6/6/1997	AUGUSTA	Rail	No	0/0	$0	3 LGA
I-1997101161	9/11/1997	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1997091435	9/13/1997	AUGUSTA	Highway	No	0/1	$0	5 LGA
I-1997101147	9/21/1997	AUGUSTA	Highway	No	0/0	$0	0.023438 LGA
I-1997101140	9/28/1997	AUGUSTA	Highway	No	0/0	$0	0.007809 LGA
I-1998040756	3/23/1998	AUGUSTA	Highway	No	0/0	$576	10 LGA
I-1998050006	4/8/1998	AUGUSTA	Highway	No	0/0	$4,872	5 LGA
I-1998050003	4/20/1998	AUGUSTA	Highway	No	0/0	$443	8 LGA
I-1998051393	5/11/1998	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-1998061071	6/9/1998	AUGUSTA	Highway	No	0/0	$0	10 LGA
I-1998080048	7/10/1998	AUGUSTA	Highway	No	0/0	$295	0.5 LGA
I-1998091500	9/11/1998	AUGUSTA	Highway	No	0/0	$4,577	30 LGA
I-1998091535	9/15/1998	AUGUSTA	Highway	No	0/0	$258	0.0625 LGA
I-1998111179	10/5/1998	AUGUSTA	Highway	No	0/0	$1,462	3 LGA
I-1998110702	11/13/1998	AUGUSTA	Highway	No	0/0	$0	0.5 LGA
I-1999030868	2/22/1999	AUGUSTA	Highway	No	0/0	$0	40 SLB
I-1999050623	4/14/1999	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1999060018	5/22/1999	AUGUSTA	Highway	No	0/0	$744	2 LGA
I-1999110106	9/21/1999	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-1999110805	10/29/1999	AUGUSTA	Highway	No	0/0	$1,238	40 LGA
I-1999121244	12/5/1999	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-2001051487	12/10/1999	AUGUSTA	Highway	Yes	0/0	$16,178	250 LGA
I-1999121425	12/17/1999	AUGUSTA	Rail	No	0/0	$0	10 LGA
I-2000010656	1/11/2000	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-2000020604	2/2/2000	AUGUSTA	Rail	No	0/0	$0	50 LGA
I-2000041053	4/14/2000	AUGUSTA	Highway	No	0/0	$3,756	75 LGA
I-2000051648	5/11/2000	AUGUSTA	Highway	No	0/0	$419	5 SLB
I-2000080506	7/18/2000	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-2000081322	7/22/2000	AUGUSTA	Rail	No	0/0	$0	0.8375 LGA
I-2000090275	7/28/2000	AUGUSTA	Highway	No	0/0	$252	1.5 LGA
I-2000080495	7/30/2000	AUGUSTA	Highway	No	0/0	$28	20 LGA
I-2000090923	8/16/2000	AUGUSTA	Rail	No	0/0	$0	0.25 LGA
I-2000120384	8/30/2000	AUGUSTA	Highway	No	0/0	$2,795	50 LGA

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I-2000100184	9/10/2000	AUGUSTA	Rail	No	0/0	$0	40 LGA
I-2000120101	10/23/2000	AUGUSTA	Highway	No	0/0	$1,048	5 SLB
I-2001030287	1/18/2001	AUGUSTA	Highway	No	0/0	$340	0.000065 SLB
I-2001070596	6/20/2001	AUGUSTA	Highway	No	0/0	$0	15 LGA
I-2001070599	6/25/2001	AUGUSTA	Highway	No	0/0	$0	15 LGA
I-2001071521	6/27/2001	AUGUSTA	Rail	No	0/0	$0	5 LGA
I-2001070509	7/5/2001	AUGUSTA	Highway	No	0/0	$272	0.125 LGA
I-2001080495	7/21/2001	AUGUSTA	Rail	No	0/0	$0	0.125 LGA
I-2001110044	10/26/2001	AUGUSTA	Highway	No	0/0	$272	2 SLB
I-2002010100	10/30/2001	AUGUSTA	Highway	No	0/0	$0	0.25 LGA
I-2002060257	5/8/2002	AUGUSTA	Highway	No	0/0	$0	0.125 LGA
I-2002071160	7/10/2002	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-2002090356	7/23/2002	AUGUSTA	Highway	No	0/0	$268	0
I-2002100745	8/27/2002	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-2002090696	8/29/2002	AUGUSTA	Highway	No	0/0	$20	15 LGA
I-2002100283	9/4/2002	AUGUSTA	Highway	No	0/0	$1,471	16 LGA
I-2002101094	10/14/2002	AUGUSTA	Highway	No	0/0	$13	5 LGA
I-2002120628	12/5/2002	AUGUSTA	Highway	Yes	0/0	$201	150 LGA
I-2003030330	2/14/2003	AUGUSTA	Highway	No	0/0	$0	3 LGA
I-2003040247	3/13/2003	AUGUSTA	Highway	No	0/0	$0	0.001057 LGA
I-2003050062	4/11/2003	AUGUSTA	Rail	No	0/0	$13	1 LGA
I-2003051205	4/25/2003	AUGUSTA	Highway	No	0/3	$392	20 LGA
I-2003060385	5/8/2003	AUGUSTA	Highway	No	0/0	$5,395	40 LGA
I-2003070400	5/28/2003	AUGUSTA	Highway	No	0/0	$0	0.264172 LGA
I-2003060888	6/4/2003	AUGUSTA	Highway	No	0/0	$177	0.5 LGA
I-2003060884	6/5/2003	AUGUSTA	Highway	No	0/0	$1,112	0.023438 LGA
I-2003080102	6/24/2003	AUGUSTA	Highway	No	0/0	$327	15 LGA
I-2003080457	6/26/2003	AUGUSTA	Highway	No	0/0	$39	0.125 LGA
I-2003080322	7/14/2003	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-2003101106	9/24/2003	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-2003101416	10/2/2003	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-2003120701	11/17/2003	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-2004030306	2/27/2004	AUGUSTA	Highway	No	0/0	$255	3 LGA
I-2004040357	4/1/2004	AUGUSTA	Highway	No	0/0	$185	2 LGA
I-2004071171	7/8/2004	AUGUSTA	Highway	No	0/0	$13	10 LGA
I-2004080379	7/22/2004	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-2004080097	7/29/2004	AUGUSTA	Air	No	0/0	$0	0.000066 SLB
I-2004090424	8/14/2004	AUGUSTA	Highway	No	0/0	$127	2 LGA
I-2004110038	10/25/2004	AUGUSTA	Highway	Yes	0/1	$0	33085 LGA
I-2004110296	10/26/2004	AUGUSTA	Highway	No	0/0	$0	0.015625 LGA
I-2005010065	12/21/2004	AUGUSTA	Highway	No	0/0	$0	5 LGA
I-2005020956	2/1/2005	AUGUSTA	Highway	No	0/0	$0	0
E-2005040157	3/15/2005	AUGUSTA	Highway	No	0/0	$55,504	900 GCF

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E-2005040157	3/15/2005	AUGUSTA	Highway	No	0/0	$55,504	900 GCF
E-2005040157	3/15/2005	AUGUSTA	Highway	No	0/0	$55,504	900 GCF
I-2005050010	3/19/2005	AUGUSTA	Rail	No	0/0	$801	75 LGA
I-2005050305	4/2/2005	AUGUSTA	Rail	No	0/0	$10,782	5 LGA
I-2005050744	4/22/2005	AUGUSTA	Rail	No	0/0	$4,350	3 LGA
E-2005080090	7/21/2005	AUGUSTA	Highway	No	0/0	$4,621	50 LGA
I-2005081778	7/25/2005	AUGUSTA	Highway	No	0/0	$0	0.5 LGA
I-2005090002	8/4/2005	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-2005091140	9/12/2005	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-2006020313	1/20/2006	AUGUSTA	Rail	No	0/0	$0	1 LGA
I-2006020420	1/27/2006	AUGUSTA	Highway	No	0/0	$3,024	12.6125 LGA
I-2006030266	2/15/2006	AUGUSTA	Rail	No	0/0	$1,802	1 LGA
I-2006060155	5/23/2006	AUGUSTA	Highway	No	0/0	$0	2 LGA
I-2006070723	6/26/2006	AUGUSTA	Highway	No	0/0	$0	1 LGA
E-2006100093	8/25/2006	AUGUSTA	Highway	No	0/0	$0	3 LGA
E-2006110138	8/29/2006	AUGUSTA	Highway	No	0/0	$0	20 LGA
X-2006120114	11/9/2006	AUGUSTA	Highway	No	0/0	$0	1 LGA
I-2006120394	11/22/2006	AUGUSTA	Highway	No	0/0	$0	0.25 LGA
X-2007010028	12/8/2006	AUGUSTA	Highway	No	0/0	$0	32 SLB
I-2007020606	2/7/2007	AUGUSTA	Rail	No	0/0	$0	0.0625 LGA
X-2007030081	2/9/2007	AUGUSTA	Highway	No	0/0	$0	0.52836 LGA
I-2007040129	3/24/2007	AUGUSTA	Rail	Yes	0/0	$41,202	4000 SLB
X-2007040079	3/27/2007	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2007050336	5/5/2007	AUGUSTA	Rail	No	0/0	$1,741	1 LGA
X-2007070073	6/27/2007	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
E-2007070412	7/19/2007	AUGUSTA	Highway	No	0/0	$0	0.007812 LGA
X-2007100336	10/5/2007	AUGUSTA	Highway	No	0/0	$0	0.79254 LGA
X-2007100400	10/11/2007	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2008020089	2/4/2008	AUGUSTA	Rail	No	0/0	$3,353	0.01671 GCF
E-2008030214	2/21/2008	AUGUSTA	Highway	No	0/0	$0	0.0625 LGA
X-2008050015	4/11/2008	AUGUSTA	Rail	No	0/0	$0	0.1 LGA
X-2008060142	5/22/2008	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2008060122	5/27/2008	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2008070279	7/3/2008	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2008080252	8/12/2008	AUGUSTA	Rail	No	0/0	$5,589	5 LGA
X-2008090120	8/28/2008	AUGUSTA	Highway	No	0/0	$0	2.204623 SLB
E-2008100074	9/5/2008	AUGUSTA	Highway	No	0/0	$0	0.039062 LGA
X-2008090286	9/10/2008	AUGUSTA	Rail	No	0/0	$1,688	1 LGA
E-2008090278	9/15/2008	AUGUSTA	Highway	No	0/0	$0	0.09375 LGA
E-2008100346	10/3/2008	AUGUSTA	Highway	No	0/0	$5,589	40 LGA
X-2008120005	11/15/2008	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2008120205	12/5/2008	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2009050154	4/18/2009	AUGUSTA	Rail	No	0/0	$0	1 LGA
E-2009050247	4/20/2009	AUGUSTA	Highway	No	0/0	$0	0.046875 LGA

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X-2009060333	6/10/2009	AUGUSTA	Rail	No	0/0	$0	0
E-2009070201	6/15/2009	AUGUSTA	Highway	No	0/0	$0	0.1875 LGA
X-2009070007	6/23/2009	AUGUSTA	Rail	No	0/0	$0	0.125 LGA
X-2009070008	6/27/2009	AUGUSTA	Rail	No	0/0	$1,688	0.25 LGA
X-2009100167	9/18/2009	AUGUSTA	Highway	No	0/0	$0	1 LGA
X-2009110173	10/27/2009	AUGUSTA	Highway	No	0/0	$0	0.0625 LGA
X-2010070262	7/6/2010	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2011050487	5/11/2011	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
X-2011070461	7/8/2011	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
E-2011090438	8/30/2011	AUGUSTA	Rail	No	0/0	$0	12 LGA
X-2012080475	7/25/2012	AUGUSTA	Highway	No	0/0	$0	0.26418 LGA
E-2012100311	10/1/2012	AUGUSTA	Highway	No	0/0	$0	20 LGA
I-2013010443	11/28/2012	AUGUSTA	Highway	No	0/0	$0	0.125 LGA
E-2012120319	12/3/2012	AUGUSTA	Highway	No	0/0	$0	0.03125 SLB
E-2013040069	3/19/2013	AUGUSTA	Highway	No	0/0	$0	1 LGA
E-2013040071	3/19/2013	AUGUSTA	Highway	No	0/0	$0	1 LGA
E-2014090674	6/3/2014	AUGUSTA	Highway	No	0/0	$0	0.2 LGA
E-2014060223	6/9/2014	AUGUSTA	Highway	No	0/0	$0	0.000011 SLB
E-2014080273	8/15/2014	AUGUSTA	Highway	No	0/0	$0	2 SLB
I-2014100047	9/9/2014	AUGUSTA	Highway	No	0/0	$0	2 LGA
E-2014120328	12/16/2014	AUGUSTA	Highway	No	0/0	$0	0.0625 LGA
E-2015020506	1/30/2015	AUGUSTA	Highway	No	0/0	$0	0.5 LGA
E-2015071286	7/28/2015	AUGUSTA	Highway	No	0/0	$0	1 SLB
E-2015120470	11/30/2015	AUGUSTA	Highway	No	0/0	$0	0.25 LGA
X-2016010159	12/14/2015	AUGUSTA	Highway	No	0/0	$0	0.007812 LGA
E-2016010325	12/26/2015	AUGUSTA	Highway	No	0/1	$5,077	1 LGA
I-2016030041	2/23/2016	AUGUSTA	Highway	No	0/0	$0	0.015625 LGA
I-2016030250	3/18/2016	AUGUSTA	Highway	No	0/0	$0	0.25 LGA
E-2016070779	7/27/2016	AUGUSTA	Highway	No	0/0	$7,500	15 LGA
Blythe							
None Reported	--	--	--	--	--	--	--
Fort Gordon							
None Reported	--	--	--	--	--	--	--
Hephzibah							
None Reported	--	--	--	--	--	--	--

*Property damage is reported in 2016 dollars.

Source: United States Department of Transportation Pipeline and Hazardous Materials Safety Administration

In addition, the county recently experienced a hazardous materials incident on February 5, 2017 at a fixed site where there was a release of liquid nitrogen on site that caused one death and 4 hospitalizations. This incident is currently being investigated, as of mid-February 2017.

5.17.4 Probability of Future Occurrence

Given the location of numerous TRI facilities in Augusta-Richmond County as well as prior roadway, railway, air, and other incidents it is highly likely (100 percent annual probability) that a hazardous material incident may occur in the county. County and municipal officials are mindful of this possibility and take precautions to prevent such an event from occurring. Additionally, there are detailed plans in place to respond to an occurrence.

5.17.5 Consequence Analysis

People (The Public and Public Confidence)

The accidental or intentional release of a hazardous material could have both immediate and long lasting effects on the health of the public. Any release needs to be quickly identified and the proper response guidelines followed to reduce the possible impact on the public. Evacuation is always a consideration when dealing with harmful substances. The public should be aware that hazards exist from the presence of hazardous materials, and should take preparedness actions at home and in the workplace to act should a release of materials occur.

Chemical hazards can have a significant effect on public confidence in government as incidents often cause serious harm to people via long-term health impacts, contamination of soil or drinking water, and even death. Because of the dangers associated with many chemicals and the level of control that humans have over chemical incidents compared to natural hazards, public confidence could be damaged severely in the event of an incident.

Responders

First responders must be vigilant when chemical/hazardous materials are suspected to be involved. The proper protective apparel must be worn and protocols must be followed to ensure that contaminated individuals and objects go through appropriate decontamination procedures prior to being moved away from the incident, regardless of the situation. Contamination of other responders or citizens must be avoided. The appropriate personnel, such as Hazardous Materials teams, must be notified to ensure that the proper measures are taken to prevent further harm and other related impacts.

Continuity of Operations

During a hazardous materials incident, normal operations are likely be maintained with only moderate stress on daily operations. In the event of a larger scale hazardous materials spill, there could be some loss of continuity of operations as a result of strain on personnel and equipment, but typically this will not be the case.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – Residential structures have numerous hazardous materials sitting around that are generally contained, but can become hazards when spilled, used incorrectly, mixed with other chemicals, or come in contact with fire. Cleaning products, fertilizers, and pesticides are common examples of household supplies that are considered hazardous materials. Fires, explosions, leaks, or releases into the air or water supply are the incidents most likely to occur from residential buildings.

Commercial – Commercial buildings may have hazardous materials contained within them that could present a hazard. These materials are regulated and reported to appropriate entities. Proper containers and labeling can prevent inappropriate use, but accidents can still cause workers to be exposed.
Industrial – Many industrial facilities have some types of hazardous materials onsite that could, if handled improperly, become a health and/or environmental risk.
Hazardous Materials Facilities – A hazardous materials event is most likely to take place where the material is created or stored. Hazardous materials facilities have their own highly-trained personnel for handling and cleaning up the particular substances stored onsite. The facility's plans are highly specific to the materials stored there, thus providing for effective responses to incidents that involve these materials. Some facilities contain hazardous materials that can spread or leak quickly, or are held in extremely dangerous concentrations. There can still be significant effects on workers and others in close proximity despite having good planning in place.

Critical Facilities and Personnel
Hospitals – Hospitals utilize and store some hazardous materials on site. Biological materials and radioactive wastes are the primary concerns in a hospital setting. Plans are in place to manage these concerns in both routine and emergency situations. An external hazardous materials event that occurs near the hospital or directly impacts a hospital could create service disruptions such as patient care. Decisions about sheltering-in-place or evacuation could be complex, and may require outside resources if evacuations are deemed necessary in a situation.
Emergency Services – Some emergency services facilities store hazardous materials onsite, including cleaning agents and fuel. These must be appropriately contained and labeled.
Emergency Shelters – Emergency shelters may be opened if homes have been exposed to hazardous materials and evacuations occur. Hazardous materials could also impact emergency shelters themselves. If this occurs, inhabitants would be moved to alternative facilities.

Transportation Systems
Interstates – Hazardous materials can have an impact on interstate transportation if a release occurs on or in the vicinity of the roadway. Significant traffic disruptions may occur, slowing commerce or forcing alternative routing and further congestion of other areas.
Airports – Airports facilities may have to cease operations if hazardous materials are released nearby or discovered onsite.
Rail Lines – Rail lines are one of the more prominent places that hazardous materials are transported. A hazardous materials event on the rail system can impact rail traffic and the overall system. Cleanup efforts wherever the event occurred could be costly and go on for extended periods, shutting down that part of the rail system for that time.

Critical Utilities
Power Lines – It is possible for power lines to be impacted by hazardous materials if fire or other physical hazards to the network are involved. Long-term outages may occur if there are many downed or corrupted lines or technicians are unable to repair issues due to the presence of hazardous materials.
Natural Gas – Natural gas distribution lines can be problematic with some hazardous materials if contact is made with the natural gas supply. Most of the natural gas infrastructure is located underground, making exposure highly unlikely. However, natural gas itself can be the hazardous material involved in the incident. A utility or other work crew member may strike a line and cause a leak. Also, degradation of the line can cause a release. Explosions and fires would be significant concerns for the immediate vicinity.

Communication Systems and Networks

Telephone Systems/Cell Phone Towers – It is possible for telephone lines or cell phone towers to be impacted by hazardous materials if fire or other physical hazards to these networks are involved. Long-term outages may occur if there are many downed or corrupted lines/towers or technicians are unable to repair issues due to the presence of hazardous materials.

Internet Capabilities – Internet connections are not likely to be impacted by hazardous materials unless cable-based connections are impacted. Wireless sites that are hit directly may cause local or regional connectivity problems.

Economy

Small/Local Employers – The economic impact of a hazardous materials-related incident can be significant locally. Directly affected commerce is the greatest concern, as spills and releases can force businesses such as shopping centers, markets, and financial centers to be shut down for indeterminate periods of time. Contaminated water can be especially problematic as it can cause extensive shutdowns and put many people in danger. The overall costs depend on the chemical(s) involved, how much is released, the processes and time used to manage the spill or release, who or what is contaminated, whether a fire takes place, etc. Cleanup is a less significant cost and is typically handled by the party responsible for the spill or release.

Large Employers – Large employers can be significantly impacted by hazardous materials, especially if the hazardous material is located on-site of the business. Cleanup processes may be costly after the incident depending on the product involved and the severity of the exposure, spill, or release.

Financial Centers – Hazardous materials incidents could have a significant impact on financial centers, especially during business hours. Cleanup processes may be costly after the incident depending on the product involved and the severity of the exposure, spill, or release.

Special Consideration Areas

City Centers – Hazardous materials incidents would likely have a significant impact on city centers, especially during hours when there are many people present. Cleanup processes could be very costly after the incident depending on the product involved and the severity of the exposure, spill, or release.

Large Event Arenas – A hazardous materials incident could occur at any large gathering if it was the target of a terrorism event. Also, a large event arena could be forced to deal with a hazardous materials incident if it is located in close proximity to them. Arenas and other major event venues may also be situated along transportation routes where vehicles transporting such materials could become involved in an accident.

Historical and Cultural Landmarks – Hazardous materials are unlikely to impact parks or its visitors unless it was specifically targeted or affected by a person, vehicle, or other carrier, or if the substance's leak or release were to spread from an incident into the park(s).

Environment

The environmental impact is highly dependent on the location and the severity of the event. Some of the materials involved in these incidents can be cleaned up or do not have lasting impacts on the areas affected. Others may cause crops and other vegetation to be destroyed, sometimes beyond the ability to grow back and animal populations may become displaced. Some areas may be deemed uninhabitable or not fit for development. Water sources may also be impacted by hazardous materials releases or spills, which can affect fish, animal, and plant populations as well as humans that come in contact with contaminated water.

5.18 CYBERTERRORISM

5.18.1 Background

Cyber attacks represent a broad category of incidents that relate to deliberate attacks on information technology systems that the world has come to rely on more and more in recent years. Unlike traditional forms of physical attack, cyber attacks are often difficult to identify and recognize. Among the potential threats encompassed under the categorization of a cyber threat are viruses erasing systems, intruders breaking into systems and altering files or using a device to attack others, and stealing confidential information.[30]

Cyberterrorism is a deliberate attack on an individual or group using the internet. In the past few decades, society has become dependent on computers and internet connections for much of daily life. This dependence has opened up the avenue for crime to be committed from afar, often from a different country. Some common examples of cyberterrorism include a hacker accessing bank accounts by hacking into a bank's website, infecting a computer system with a virus, Trojan horse, or worm to inflict damage to the information in the system, or disseminating incorrect or otherwise flawed information, also called "misinformation." Also, denial-of-service attacks could occur against prominent websites, which prevent legitimate users from accessing information or services.

One of the most challenging aspects of mitigating and preparing for cyber attacks is that they can be carried out by many disparate sources to achieve different ends. Some attacks are carried out by individuals, while others are orchestrated as part of state-sponsored activities. Moreover, some attacks are intended to steal information or money, while others are intended to purposefully disrupt daily operations.

5.18.2 Location and Spatial Extent

Cyber attacks could occur anywhere within the county and because of the pervasiveness of information technology systems, the impacts could be widespread throughout the community and difficult to predict.

5.18.3 Historical Occurrences

In Augusta-Richmond County, large-scale cyberterrorism attempts or attacks have not been reported, though there was a breach of the Division of Aging Services at the state level that affected some citizens of Augusta. Additionally, the State of Georgia was the victim of a breach in 2015 that compromised roughly 6 million social security numbers.

In addition, in the recently published 2016 Data Breach Investigation Report[31] shows that most the major breaches that take place across the country are in the Finance sector and the Accommodation sector. A full breakdown of the number of breach incidents by industry sector can be found in **Figure 5.28.**

[30] https://www.ready.gov/cyber-attack
[31] Data Breach Investigations Report. Verizon. 2016. Retrieved on January 3, 2017 from http://www.verizonenterprise.com/verizon-insights-lab/dbir/2016/

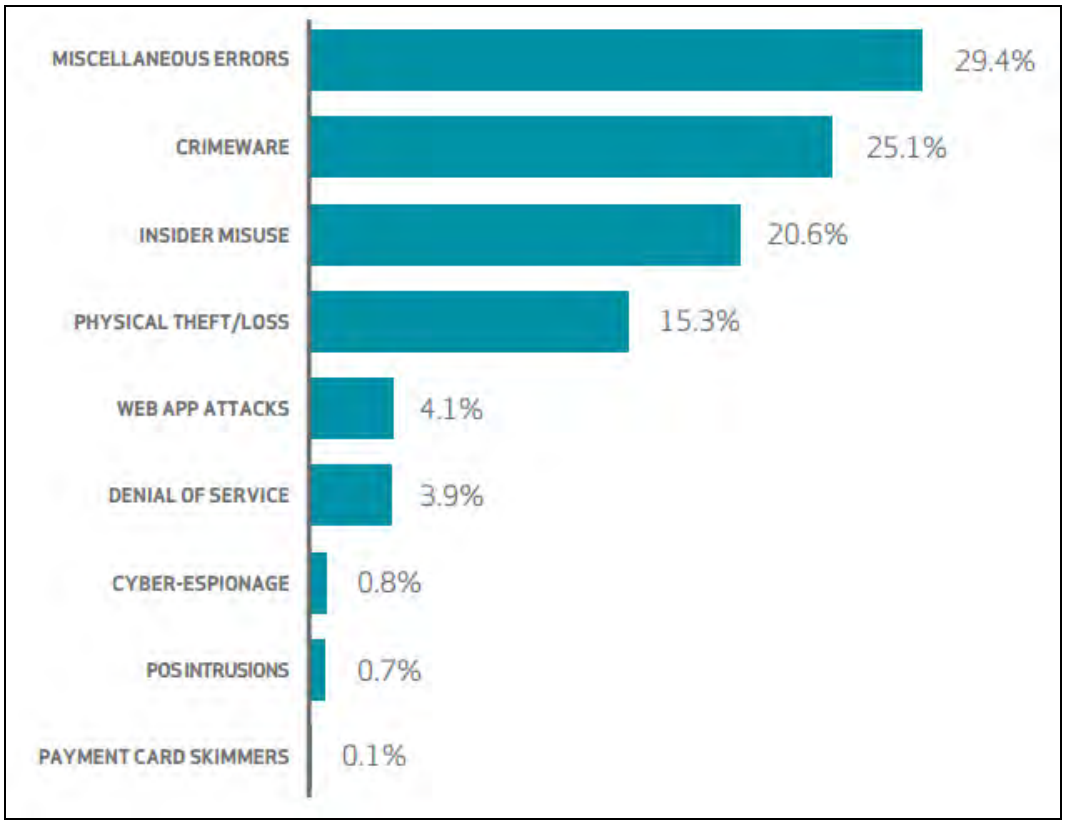
FIGURE 5.28: NATIONWIDE CYBER-BREACHES BY INDUSTRY SECTOR

Industry	Total	Small	Large	Unknown
Accommodation (72)	282	136	10	136
Administrative (56)	18	6	2	10
Agriculture (11)	1	0	0	1
Construction (23)	4	0	1	3
Educational (61)	29	3	8	18
Entertainment (71)	38	18	1	19
Finance (52)	795	14	94	687
Healthcare (62)	115	18	20	77
Information (51)	194	12	12	170
Management (55)	0	0	0	0
Manufacturing (31-33)	37	5	11	21
Mining (21)	7	0	6	1
Other Services (81)	11	5	2	4
Professional (54)	53	10	4	39
Public (92)	193	4	122	67
Real Estate (53)	5	3	0	2
Retail (44-45)	182	101	14	67
Trade (42)	4	2	2	0
Transportation (48-49)	15	1	3	11
Utilities (22)	7	0	0	7
Unknown	270	109	0	161
Total	2,260	447	312	1501

Source: Data Breach Investigations Report, 2016

As can be seen in **Figure 5.29**, Crimeware and Miscellaneous Errors together account for more than 50 percent of the data breaches. According to the Verizon report, crimeware represents malware infections that defy exact classification and are less likely to receive an intense investigation or involve law enforcement. These attacks tend to be motivated by financial gain and are opportunistic in nature. Miscellaneous Errors are basically an error on the part of a user that results in a breach of data. Examples of this include sensitive information reaching the wrong recipient, publishing nonpublic data to public servers, and insecure disposal of personal data (such as medical records).

FIGURE 5.29: BREAKDOWN OF BREACHES BY TYPE



Source: Data Breach Investigations Report, 2016

5.18.4 Probability of Future Occurrence

Although there have been no previous cyber threats in the county of significant impact, it is possible (between 1 and 10 percent annual probability) that the county could be impacted in the future.

5.18.5 Consequence Analysis

People (The Public and Public Confidence)

The aim of a cyberterrorist is typically to corrupt or exploit protected information. Depending on the target of the ploy, a significant number of people can be victims of identity theft, fraud, or other forms of technology-based crime. Anyone with an account, membership, or other relationship with an entity that requires the storage of information is vulnerable. An individual/user must rely on the entity of affiliation to create and maintain safeguards against the intrusion of computerized systems. However, even the strongest of safeguards can be corrupted or evaded. Continual monitoring of attempted or successful attempts at cyberterrorism is warranted to lessen the potential impacts.

The public confidence in government and nongovernmental organizations response may be impacted by a disaster based upon societal expectations and media influence with respect to cyberterrorism. Public confidence can be gained when the public's expectations of response and recovery services are met or exceeded. Public confidence may be impacted by media interpretation and reporting of the event, whether positively or negatively.

Responders

Cyberterrorists may try to intrude into electronic safety equipment or systems. This may increase call volume, block systems, or otherwise hinder emergency operations.

Continuity of Operations

In the event of a cyber-attack, continuity of operations could be impacted if many of the services (such as internet or other IT programs) that are required to maintain daily operations are shut down by the attack. This could cause considerable detriment to normal operations in the county.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – There are no expected impacts other than individual users at a localized level that would not pertain to this plan.
Commercial – Some commercial technologies may be targeted and exploited by cyberterrorists.
Industrial – Some industrial technologies may be targeted and exploited by cyberterrorists.
Hazardous Materials Facilities – Cyberterrorists may target and exploit or manipulate processes which in turn cause the release of hazardous materials.

Critical Facilities and Personnel

Hospitals – Cyberterrorists may target life sustaining equipment or systems, or cause other technological disruptions.
Emergency Services – Cyberterrorists may target and sabotage information networks and communications equipment that could disrupt services.
Emergency Shelters – Emergency shelters are unlikely to be targets of cyberterrrorism.

Transportation Systems

Interstates – There are no expected impacts.
Airports – Numerous systems utilized by airports can be compromised by cyberterrorists.
Rail Lines – Numerous systems utilized by rail lines can be compromised by cyberterrorists.

Critical Utilities

High Voltage Distribution Lines – Cyberterrorists could target and sabotage power distribution systems.
Power Lines – Cyberterrorists could target and sabotage power distribution systems.
Natural Gas – Natural gas distribution technologies could be targeted by cyberterrorism.

Communications Systems and Networks

Telephone Systems – The telephone system could be compromised by cyberterrorists, either by disrupting the ability to use it or exploiting the information that can be obtained from those using it.
Cell Phone Towers – Operations could be disrupted by cyberterrorists exploiting systems and equipment.
Internet Capabilities – Cyberterrorists can compromise the systems that provide internet accessibility.

Economy

Small/Local Employers – Freezing, redirecting, or stealing financial assets can have drastic impacts on a small business. Banking and credit institutions are commonly affected or targeted by fraudulent

activities and often store a great deal of information on small businesses, so large-scale intrusions can have significant impacts on the local economy.
Large Employers – Large employers are more likely to be targeted by cyberterrorists than individuals or small businesses. Larger businesses generally have greater assets to exploit and store more personal information on private individuals or employees.
Financial Centers – As stated previously, banking and credit institutions are commonly affected or targeted by fraudulent activities. Large-scale intrusions can have significant economic impact.

Special Consideration Areas
City Centers – There are no expected impacts.
Large Event Arenas – Electronically ticketed events may require purchasers to provide personal information that could be compromised.
Historical and Cultural Landmarks – There are no expected impacts.

Environment
There are no expected impacts.

5.19 DAM/LEVEE FAILURE

5.19.1 Background

Worldwide interest in dam and levee safety has risen significantly in recent years. Aging infrastructure, new hydrologic information, and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation, and maintenance.

There are approximately 80,000 dams in the United States today, the majority of which are privately owned. Other owners include state and local authorities, public utilities, and federal agencies. The benefits of dams are numerous: they provide water for drinking, navigation, and agricultural irrigation. Dams also provide hydroelectric power, create lakes for fishing and recreation, and save lives by preventing or reducing floods.

Though dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if development exists downstream. If a levee breaks, scores of properties may become submerged in floodwaters and residents may become trapped by rapidly rising water. The failure of dams and levees has the potential to place large numbers of people and great amounts of property in harm's way.

5.19.2 Location and Spatial Extent

Dam extent can be determined using the Georgia Safe Dams Program dam classification system which uses a high (category I), significant (category II), exempt, and breached classifications. The hazard classification system is based on the consequences of failure, not the condition of the dam. According to the "Georgia Safe Dams Act of 1978":

- **Category I dams** are those for which improper operation or dam failure would result in probable loss of human life. Situations constituting 'probable loss of life' are those situations involving

frequently occupied structures or facilities, including but not limited to, residences, commercial and manufacturing facilities, schools, and churches.

- **Category II dams** are those for which improper operation or dam failure would not be expected to result in probable loss of human life.

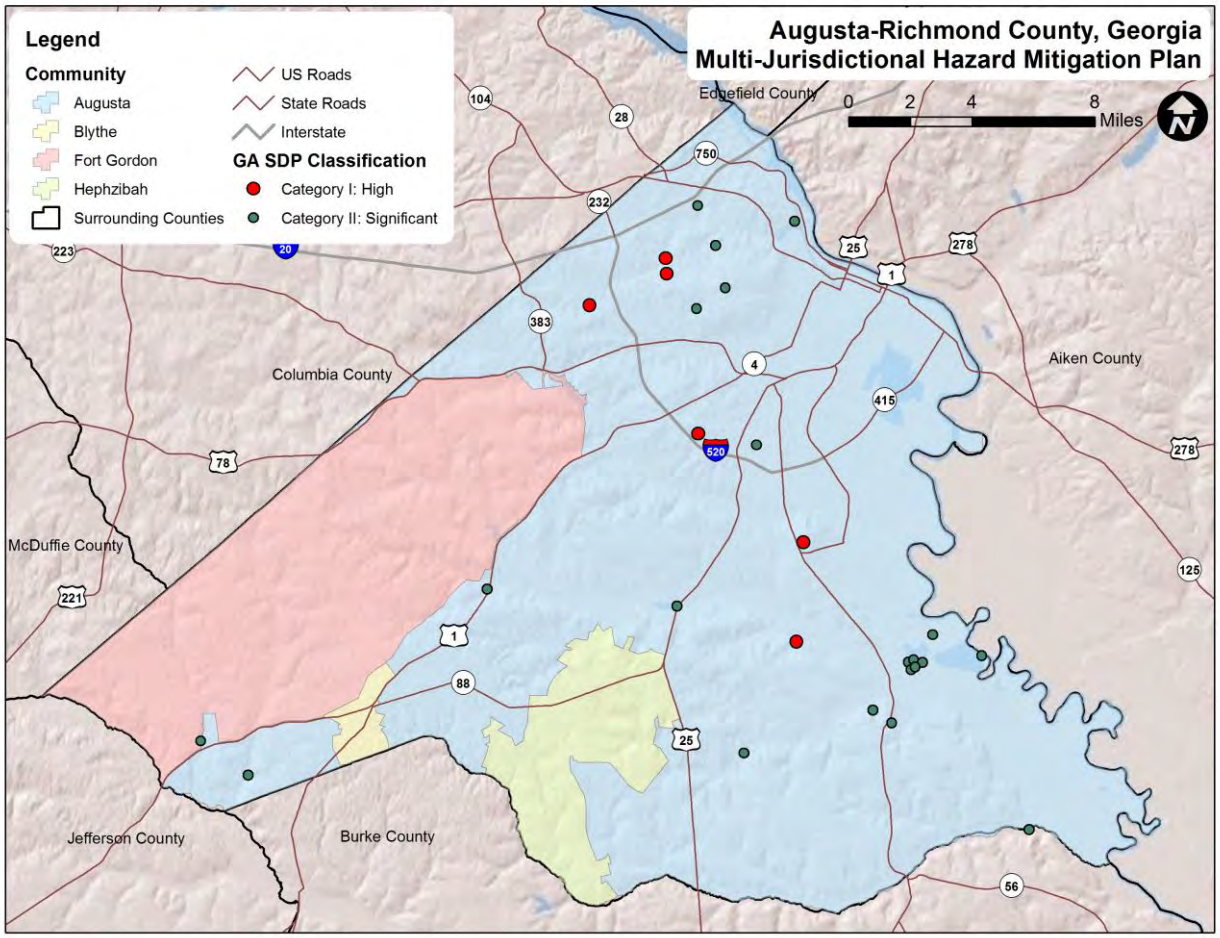
As of 2016, there were 27 identified dams in the county and 6 were classified as Category II hazard dams. These dams are listed in the **Table 5.41** below and **Figure 5.30** shows the location of inventoried dams in the County.

TABLE 5.41: SUMMARY OF DAM LOCATIONS AND BREACHES

Location	Number of Dams	Number of High Hazard Dams	Number of Breaches
Augusta-Richmond County	27	6	0
Blythe	0	0	0
Fort Gordon	0	0	0
Hephzibah	0	0	0
AUGUSTA-RICHMOND COUNTY TOTAL	**27**	**6**	**0**

Source: Georgia Safe Dams Program

FIGURE 5.30: AUGUSTA-RICHMOND COUNTY DAM LOCATION AND HAZARD RANKING



Source: Georgia Safe Dams Program, 2016

It should be noted that dam regulations for classifying dams was recently changed. As a result, generally more dams are classified as high hazard.

5.19.3 Historical Occurrences

There have been no dam breaches reported in Augusta-Richmond County according to the Georgia Safe Dams Program.

5.19.4 Probability of Future Occurrence

Given the current dam inventory and historic data, a dam breach is unlikely (less than 1 percent annual probability) in the future. However, as has been demonstrated in the past, regular monitoring is necessary to prevent these events.

5.19.5 Consequence Analysis

People (The Public and Public Confidence)

Many of the impacts associated with a dam/levee failure are the same as those that would be associated with a flood event. However, the primary difference for members of the public in the case of a dam/levee failure is that often citizens who might be impacted by a dam/levee failure may believe themselves to be protected from flood events as a result of the dam/levee and therefore, may not be anticipating the event. This may have a severe impact on public confidence in the long run as citizens may view this as a failure of government institutions to properly regulate and control the dam/levee. That is to say, they may ultimately view the incident as preventable, unlike a flood that occurs purely from natural causes.

Responders

Similar to the issues associated with the flood hazard, responders would be impacted by a dam/levee failure as they may be forced to attempt to assist citizens who have become trapped in their homes or in flood waters. Responders may have difficulty accessing homes or other structures where they need to provide support.

Continuity of Operations

A dam/levee failure would be unlikely to impact continuity of operations as the event would likely be confined to a specific area of the county and most operations facilities in the county are not at risk of being impacted by a dam/levee failure.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – Any residential properties located downstream of a dam/levee and located in the inundation zone may be impacted.

Commercial – Commercial properties may be impacted in a way that is similar to the impacts from a flood event.

Industrial – Any industrial facilities that are located within a dam/levee failure inundation zone may be impacted by the event.

Hazardous Materials – Similar to flood events, if a facility that houses hazardous materials is impacted by flooding from a dam/levee failure, there may be contamination of the stream/river and ultimately the water supply.

Critical Facilities and Personnel

Hospitals – Hospitals tend to not be located in dam/levee failure inundation zones, but could be impacted in terms of providing care if certain roads are flooded and patients cannot reach the hospital to receive care.

Emergency Services – Like hospitals, most emergency services facilities are not located in high risk areas to a dam/levee failure, however they may be impacted in terms of accessibility.

Emergency Shelters – Emergency shelters are typically selected in locations that are safe from dam/levee failure. However, if shelters were impacted, they would likely experience similar impacts as those from a flood event.

Transportation Systems
Interstates – Interstate highways are typically built in areas where they will not be flooded by a dam/levee failure, though other important roadways may become flooded causing accessibility and travel issues.
Airports – Airport facilities are rarely located in dam/levee failure inundation areas, so airports would not likely be impacted.
Rail Lines – Rail lines tend to be built well above flood levels, though it is possible that some lines may be impacted by flooding as a result of a dam/levee failure. This could cause disruptions in service and some economic loss.

Critical Utilities
Power Lines – Like a flood, a dam/levee failure may cause localized power outages as floodwaters inundate critical power infrastructure and down power lines.
Natural Gas – Natural gas distribution networks may be damaged from flooding and create additional hazards from damaged pipes or other gas infrastructure.

Communication Systems and Networks
Telephone Systems– As with the flooding hazard, dam/levee failures may damage telephone systems and cause disruption of service, especially in areas impacted by the floodwaters.
Cell Phone Towers – Cellular telephone towers are generally built high enough to not be impacted by a dam/levee failure.
Internet Capabilities – Internet connections could be impacted on a local scale if infrastructure is damaged.

Economy
Small/Local Employers – Flooding from a dam/levee failure could cause damage to local businesses and have significant financial impacts depending on the location and type of business.
Large Employers – Large employers may also be impacted by a dam/levee failure if they are located in a high risk area.

Environment
The impacts on the environment from a dam/levee failure might be that ecosystems and habitats that existed while a dam was in place on a stream/river could be destroyed as floodwaters destabilize areas by inundating areas that had not previously been under water or causing higher flow rates downstream.

5.20 NUCLEAR POWER PLANT INCIDENT

5.20.1 Background

A nuclear and radiation accident is defined by the International Atomic Energy Agency as “an event that has led to significant consequences to people, the environment or the facility. Often, this type of incident results from damage to the reactor core of a nuclear power plant which can release radioactivity into the environment. The degree of exposure from nuclear accidents has varied historically from serious to catastrophic.

By some estimates, over 50 percent of nuclear accidents that have ever occurred were in the United States.[32] However, it is also important to note that generally, nuclear accidents are a rare occurrence. Many incidents are extremely well known due to their large-scale impact and serious effects on people and the environment, but incidents are generally not common

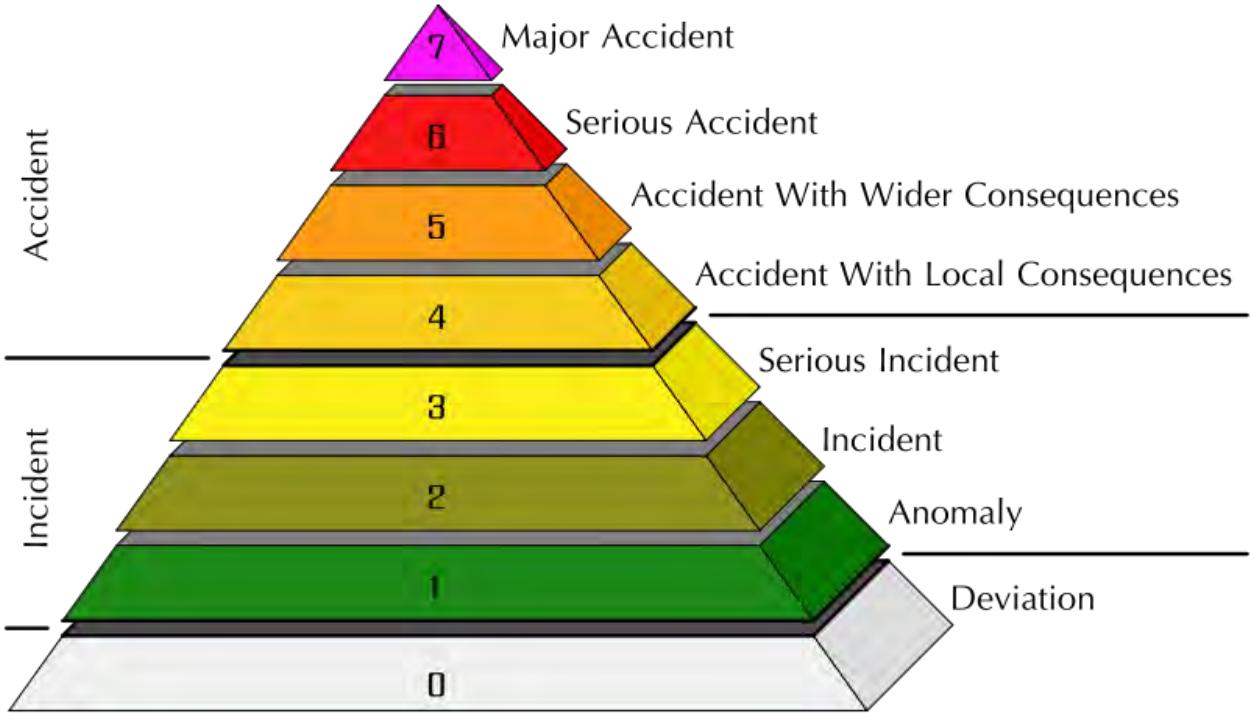
One of the most notorious accidents in the United States was the Three Mile Island accident which occurred in 1979 and released small amounts of radioactive gases and iodine into the environment. Although no deaths have been directly attributed to the accident, it invoked a strong public reaction and demonstrated the potential dangers associated with nuclear power generation.

Vogtle Nuclear Power Plant, which is the plant located closest to Augusta-Richmond County, is a 3,626 megawatt power plant that began commercial operation in 1987. It has pressurized water reactors and operates with a very high level of security.

5.20.2 Location and Spatial Extent

The southeastern portion of the county is at highest risk to a nuclear incident. Areas in this part of the county are susceptible due to their relative proximity to the Vogtle Power Plant. The International Atomic Energy Association has developed a scale called the International Nuclear and Radiological Event Scale (INES) which provides a quantitative means of assessing the extent of a nuclear event. This scale, like the MMI used for earthquakes, is logarithmic which means that each increasing level on the scale represents an event 10 times more severe than the previous level (**Figure 5.31**).

FIGURE 5.31: INTERNATIONAL NUCLEAR EVENT SCALE

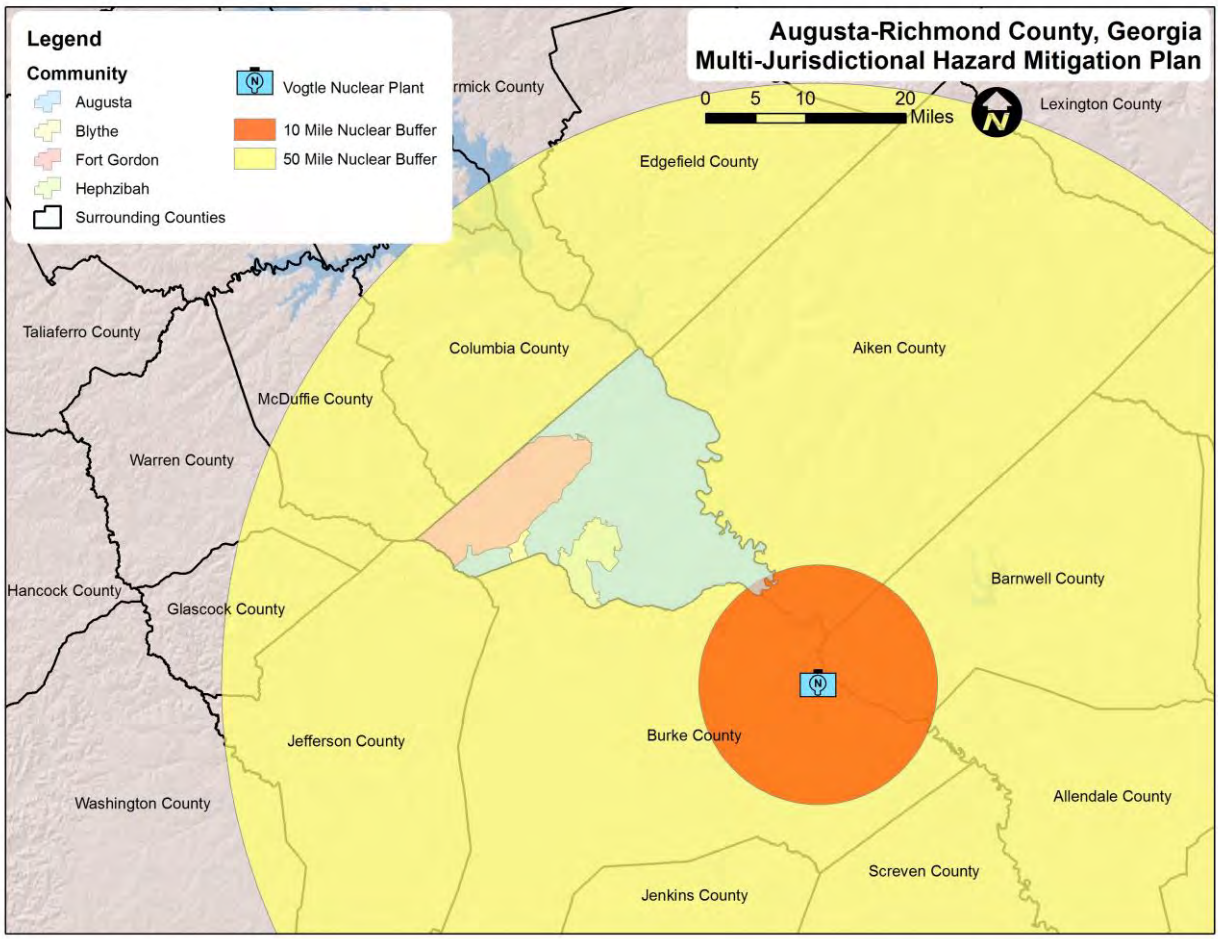


Source: International Atomic Energy Agency

[32] Benjamin K. Sovacool. A Critical Evaluation of Nuclear Power and Renewable Electricity in Asia *Journal of Contemporary Asia*, Vol. 40, No. 3, August 2010, pp. 393–400.

The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants. Areas located within 10 miles of the station are considered to be within the zone of highest risk to a nuclear incident and this radius is the designated evacuation radius recommended by the Nuclear Regulatory Commission. Within the 10-mile zone, the primary concern is exposure to and inhalation of radioactive contamination. Only a very small area of the county is located within the 10-mile radius of the power plant. The most concerning effects in the secondary 50-mile zone are related to ingestion of food and liquids that may have been contaminated. The remainder of the county is located within this 50-mile radius which is still considered to be at risk from a nuclear incident (**Figure 5.32**).

FIGURE 5.32: NUCLEAR POWER PLANT INCIDENT HAZARD ZONES IN AUGUSTA-RICHMOND COUNTY



Source: International Atomic Energy Agency

5.20.3 Historical Occurrences

Although there have been no major nuclear events at the Vogtle Nuclear Power Plant, there is some possibility that one could occur as there have been incidents in the past in the United States at other facilities and at facilities around the world. Additionally, a list of minor events/notifications was acquired from reports collected by the Nuclear Regulatory Commission (NRC). The NRC classifies events using the

scale found in **Table 5.42**. A list of events at Vogtle Nuclear Plant can be found in **Table 5.43**. It is noteworthy that all of the events were minor in magnitude and many were insignificant enough that they did not register on the classification scale.

TABLE 5.42: NUCLEAR REGULATORY COMMISSION EMERGENCY CLASSIFICATION SCALE FOR EVENTS OCCURRING AT NUCLEAR POWER PLANTS

Classification	Description
Notification of Unusual Event (NOUE)	Events are in progress or have occurred which indicate a potential degradation of the level of safety of the plant or indicate a security threat to facility protection has been initiated. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs. [Note: This term is sometimes shortened to Unusual Event (UE). The terms Notification of Unusual Event, NOUE and Unusual Event are used interchangeably.]
Alert	Events are in progress or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant or a security event that involves probable life threatening risk to site personnel or damage to site equipment because of HOSTILE ACTION. Any releases are expected to be limited to small fractions of the Environmental Protection Agency (EPA) protective action guides (PAGs)
Site Area Emergency	Site Area Emergency (SAE) – Events are in progress or have occurred which involve actual or likely major failures of plant functions needed for protection of the public or hostile action that results in intentional damage or malicious acts; 1) toward site personnel or equipment that could lead to the likely failure of or; 2) that prevent effective access to, equipment needed for the protection of the public. Any releases are not expected to result in exposure levels which exceed EPA PAG exposure levels beyond the site boundary.
General Emergency	Events are in progress or have occurred which involve actual or imminent substantial core degradation or melting with potential for loss of containment integrity or hostile action that results in an actual loss of physical control of the facility. Releases can be reasonably expected to exceed EPA PAG exposure levels offsite for more than the immediate site area.

Source: Nuclear Regulatory Commission

TABLE 5.43: HISTORICAL OCCURRENCES OF NOTIFIABLE EVENTS AT VOGTLE NUCLEAR POWER PLANT

Date	Retrieved From*	Classification	Plant	Description
1/19/1989	Licensee Event Report	Notification of Unusual Event	Vogtle Unit 1	REACTOR COOLANT PRESSURE BOUNDARY LEAKAGE LEADS TO UNIT SHUTDOWN
3/9/1989	Licensee Event Report	Notification of Unusual Event	Vogtle Unit 2	REACTOR COOLANT SYSTEM LEAKEAGE DURING CHECK VALVE TESTING
3/20/1990	Licensee Event Report	Site Area Emergency	Vogtle Unit 1	LOSS OF OFFSITE POWER LEADS TO SITE AREA EMERGENCY
5/14/1992	Licensee Event Report	Notification of Unusual Event	Vogtle Unit 1	REACTOR SHUTDOWN DUE TO EXCESSIVE UNIDENTIFIED LEAKAGE
4/18/1993	Licensee Event Report	Notification of Unusual Event	Vogtle Unit 1	SAFETY INJECTION INITIATED DURING SLAVE RELAY TESTING

Date	Retrieved From*	Classification	Plant	Description
8/8/2003	Preliminary Notification Reports	Not Applicable	Vogtle Unit 2	Unit 2 Shutdown to Investigate and Repair Mechanical Seal Leak on Reactor Vessel Head:
5/24/2005	Preliminary Notification Reports	Not Applicable	Vogtle Unit 2	Unit 2 Shutdown to Repair Condenser Tube(s) Leak
12/12/2005	Preliminary Notification Reports	Not Applicable	Vogtle Unit 2	Unit 2 Shutdown to Repair RHR Pipe Leak
12/19/2005	Preliminary Notification Reports	Not Applicable	Vogtle Unit 2	Shutdown to Repair Residual Heat Removal Pipe Leak
3/9/2007	Preliminary Notification Reports	Notification of Unusual Event	Vogtle Unit 2	Reactor Coolant System Leakage in Excess of 10 Gallons Per Minute
4/25/2007	Preliminary Notification Reports	Not Applicable	Vogtle Unit 2	Automatic Reactor Trip/Plant Shutdown Greater than 72 Hours

Source: Nuclear Regulatory Commission
**Preliminary Notification Reports (http://www.nrc.gov/reading-rm/doc-collections/event-status/prelim-notice/): These are brief descriptions, generated by NRC regions when needed, of matters that are of significant safety or safeguards concern or have high public interest. PNs are used to promptly inform the Commissioners and others in NRC and Agreement States with new and current information.*
Licensee Event Reports (https://lersearch.inl.gov/Entry.aspx): Commercial nuclear reactor licensees are required to report certain event information per 10 CFR 50.73. Search was for- "Notification of Unusual Event" "Alert" "Site Area Emergency" "General Emergency"

In addition, county officials were recently made aware of an event that caused a shutdown of the Vogtle Plant's Unit 1, as one of the components of the unit's steam line contained a failed o-ring component.[33] This incident occurred on February 3, 2017 and according to a company spokesman, the site technicians were able to keep the situation under control and prevent risk to the public.

5.20.4 Probability of Future Occurrence

A nuclear event is a very rare occurrence in the United States due to the intense regulation of the industry. There have been incidents in the past, but it is considered unlikely (less than 1 percent annual probability).

5.20.5 Consequence Analysis

People (The Public and Public Confidence)

The majority of the public in Augusta-Richmond County would be most impacted if they were to ingest impacted home grown crops, drink milk produced from livestock which have fed on contaminated grasses, or consume contaminated surface water. Ingestion of radiological materials may result in internal contamination if ionizing radiation is released in the body. This can cause serious health risks, especially if critical organs are affected. Some organs such as the thyroid take in certain isotopes and it is extremely difficult to purge the material from the body. The population of Augusta-Richmond located in the southeast corner of the county would potentially be impacted directly by radiation exposure which can cause both acute and chronic effects in the body.

[33] Equipment Failure Shuts Down Vogtle Reactor. The Augusta Chronicle. February 6, 2017. Retrieved on February 14, 2017 from: http://chronicle.augusta.com/news/2017-02-06/equipment-failure-shuts-down-vogtle-reactor#

The public will be extremely concerned about their health and safety during and after a nuclear incident. Confidence will be dependent upon the availability of information and perceived quality of response by government and nongovernment service providers.

Responders

First responders are vulnerable to the same impacts as the general public but also may be at greater risk due to their need to function outdoors, operating in contaminated environments. These responders will likely need to operate in personal protective equipment and limit their outdoor exposure. Proper decontamination is likely to be necessary to reduce the spread of contamination.

Continuity of Operations

In the wake of a nuclear accident, continuity of operations in Augusta-Richmond County would likely be maintained relatively well since the county is only impacted in most areas by the 50 mile buffer area. Generally operations could proceed from their normal location, with personnel and equipment remaining more or less unharmed.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – In general, most residential buildings in the county would not be impacted by an incident. Though in a highly impactful event, it is possible that homes may become contaminated by a radiation release.

Commercial – Some businesses within the IPZ, mainly agricultural or any of those related to food/beverage production, may be affected by an incident at the Vogtle facility.

Industrial – Similar to residential buildings, most industrial buildings would not be impacted.

Critical Facilities and Personnel

Hospitals – Hospitals are likely to experience an increase in patients. Hospitals are likely to also require more advanced support in obtaining water and food for continuing operations. Prior to entry into the hospitals, decontamination processes for patients, visitors, vendors, and employees may be necessary.

Emergency Services – Emergency services agencies and facilities may experience increased call volumes, though it is unlikely any would be exposed directly.

Emergency Shelters – Emergency shelters may be opened for this event for those persons not having access to protective structures.

Transportation Systems

Interstates – Checkpoints and decontamination stations may be set up along routes that enter/leave the IPZ resulting in increased travel times.

Airports – Similar to interstates, there may be some form of checkpoint set up to monitor contamination areas.

Rail Lines – Similar to interstates, there may be some form of checkpoint set up to monitor contamination areas.

Critical Utilities

High Voltage Distribution Lines/ Power Lines – There are no expected impacts to the distribution system itself, although it is possible some residents may lose power due to the loss of electricity generation from a plant incident.

Natural Gas – There are no expected impacts.

Communication Systems and Networks
Telephone Systems/Cell Towers/Internet Capabilities – There are no expected impacts.

Economy
Small/Local Employers – Economies within the IPZ and the area surrounding it are likely to see decreased discretionary spending. Travel and tourism may be limited for an extended period of time. Interstate commerce may be impacted as decontamination stations may need to be established and some drivers may elect to attempt to circumnavigate the affected area extending travel times and increasing the time to market for products.
Large Employers – Large employers may see increased absenteeism and requests to work from home. Some employees may self-evacuate resulting in a loss of productivity.
Financial Centers – In-person financial transactions are likely to be more limited, electronic transactions may increase due to the public electing not to go outside.

Special Consideration Areas
City Centers – Travel within the IPZ may be limited to prevent spread of contaminants. Buildings within the IPZ, may require decontamination stations for those that wish to enter the buildings.
Large Event Arenas –Some events may be cancelled or rescheduled even if these arenas or zones are deemed safe.
Historical and Cultural Landmarks – While no structural damage to the landmarks is likely, visitation and attendance may decrease temporarily within the IPZ, affecting some tourism and local commerce.

Environment
Contaminants may impact the land and water for many years. Wildlife may experience increased likelihood of cancer and other health problems.

5.21 TERRORISM

5.21.1 Background

Terrorism is defined in the United States by the Code of Federal Regulations as: "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives."[34] Academic literature identifies some overarching political goals that terrorism seeks to achieve, including spreading anxiety and alarm among immediate victims, families, and the general public; eliminating opponents and destroying symbolic targets; and generating direct damage on society, such as affecting business confidence. In the following sections, some general background information about terrorism is presented prior to the county's hazard identification and risk assessment findings.

There are two general types of terrorist groups: network and hierarchical. The type of organization a group adopts largely depends on how long the group has existed. More recently developed groups tend to organize or adapt to the possibilities of the network model. Older, more established groups lean toward the hierarchical structure and are often more associated with violence of a political nature.[35] Terrorist acts can be committed by large, formally organized groups with terrorist cells in different parts

[34] U.S. Code of Federal Regulations. 23 C.F.R. Section 0.85
[35] Terrorism Research. *Terrorist groups*. Retrieved December 27, 2011, from http://www.terrorism-research.com/groups/

of the world, or they can originate from smaller groups or individuals from a small city or domestic "homegrown" location. In the United States, terrorists that are "homegrown" do not belong to a defined group, may operate very effectively "under the radar," and may pose the biggest threat initially at the local level.[36]

5.21.2 Location and Spatial Extent

A terror threat could potentially occur at any location in the county. However, the very definition of a terrorist event indicates that it is most likely to be targeted at a critical or symbolic resource/location/event. Ensuring and protecting the continuity of critical infrastructure and key resources (CIKR) of the United States is essential to the Nation's security, public health and safety, economic vitality, and way of life. CIKR includes physical and/or virtual systems or assets that, if damaged, would have a detrimental impact on national security, including large-scale human casualties, property destruction, economic disruption, and significant damage to morale and public confidence. **Table 5.44** lists the U.S. Department of Homeland Security's (DHS) identified main critical infrastructure sectors.

TABLE 5.44: U.S. DEPARTMENT OF HOMELAND SECURITY CRITICAL INFRASTRUCTURE SECTORS

▪ Agriculture and Food	▪ Government Facilities
▪ Banking and Finance	▪ Healthcare and Public Health
▪ Chemical	▪ Information Technology
▪ Commercial Facilities	▪ National Monuments and Icons
▪ Communications	▪ Nuclear Reactors, Materials, and Waste
▪ Critical Manufacturing	▪ Postal and Shipping
▪ Dams	▪ Transportation Systems
▪ Defense Industrial Base	▪ Water
▪ Emergency Services	
▪ Energy	

Although all critical facilities (see Section 6: *Vulnerability Assessment*) are at a heightened level of risk in Augusta-Richmond County, there are several facilities and events in the county that have been identified as the likely primary targets. Augusta-Richmond County Emergency Management maintains a list of facilities and events at elevated risk of terror threat.

5.21.3 Historical Occurrences

Although there have been no major terror events in Augusta-Richmond County, there is some possibility that one could occur in the future as there have been incidents in Georgia in the past and there are several facilities/events that could be potential targets.

[36] *Ibid.*

5.21.4 Probability of Future Occurrences

Augusta-Richmond County has had no recorded terrorist events. Due to no recorded incidents against the county, the probability of future occurrences of a terrorist attack is possible (between 1 and 10 percent annual probability).

5.21.5 Consequence Analysis

People (The Public and Public Confidence)

As seen after the attacks on September 11, 2001 in New York City and Washington, D.C., there can be significant impacts far away from the site of the incident. Fear and worry about additional attacks or for loved ones in areas affected are just a couple examples of impacts that could occur. Other impacts include discrimination or changed interactions between people of differing nationalities depending on the nature and intent of the attack(s) and who perpetrated the attack(s).

During and after a terrorism event, the public will be expecting services to be provided despite the uncertainty of any existing hazards or further impacts. The partnership and involvement of the media is crucial not just for public guidance information, but also for keeping the public informed of the efforts underway or of any obstacles or concerns hindering response efforts. Effective planning and partnerships developed prior to the incident will provide for smoother operations, even during times of chaos like a major terrorism incident. Agencies and organizations working together in an efficient and effective way will provide for the best chance of positive public perception in these government and nongovernmental organizations.

Responders

The danger to human life in a terrorist event is dependent on the form of attack utilized, as well as its location, severity, and scope. In any terror incident, responders must conduct a scene size up to determine hazards to themselves and then others. Decisions must be made about how to handle victims and those in close proximity that may have been victimized or exposed. If hazardous materials are present, it could change the strategy completely. Fear and panic will be significant in the case of a terrorist act, whether it occurs in Augusta-Richmond County or elsewhere in the state or nation.

Depending on the location, the scope, and the nature of the event(s), the impacts can vary greatly and could be felt nationwide, as seen with the September 11, 2001 attacks. Response efforts could last hours, days, or potentially longer. The length of time for recovery efforts could vary as well. Collaboration at all levels can provide for the most stable, effective, and efficient effort in returning to normal activities and operations. Identification of further threats and open communication lines can prevent further harm or detriment to response and recovery operations.

Continuity of Operations

A terrorist event would likely have a high impact on continuity of operations, especially due to the disorder that would result and the unpredictability of this kind of event. Emergency personnel may be directly affected or targeted, which would cause definitive harm to maintaining continuity of operations.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – Single-family dwellings are not likely to be targets for terrorism. However, any areas that have specifically targeted populations could be vulnerable to an attack. These populations may relate to a person or group's ethnicity, religion, and socioeconomic status. Dwellings in close proximity to a target may experience indirect impacts as well. Depending on the method of attack, impacts could include stray bullets or debris from explosions. These could affect people, pets, electrical systems, or water systems, to name a few; other hazards to homes include structural collapse or fires. Lastly, the presence of chemical agents can create health hazards through dangerous reactions with water sources or building materials.

Commercial – Commercial structures may be vulnerable to terrorist attacks, especially those that house companies of international or national significance.

Industrial – Industrial sites are exposed to the same hazards as residential and commercial structures. However, depending on the type of industry it can have a different level of impact. Many industrial sites contain hazardous materials as well as dangerous machines or products that would pose a significant hazard to the public in a terrorism event.

Hazardous Materials Facilities – Terrorism is a significant concern with any kind of hazardous material, whether the materials exist on the targeted site or if hazardous materials were introduced as the instrument of the attack. Hazardous materials and facilities require significant planning for evacuation, containment, and cleanup, and require significant resources for response operations to spills or other releases.

Critical Facilities

Hospitals – The primary concern with a terrorism event is the influx of patients requiring care. Terrorism may pose a specific hazard to a hospital structure itself, but it is more likely to be impacted when in close proximity to a target. Many patients could be injured or their medical condition worsened by the impacts of the terrorism event.

Emergency Services – Emergency services buildings are not considered high probability targets for location terrorists to strike. In other countries, ambulance services and 9-1-1 centers have been targets; however, that pattern has not been seen here in the United States. Alternate locations should be set up so that emergency operations can continue if an emergency services facility was affected or targeted by a terrorism event. If one or more towers tied to the 9-1-1 center's communication systems were disrupted, it could have a detrimental impact to the center's communications to responders, leading to detrimental impacts on response operations as well.

Emergency Shelters – Shelters may need to be activated in a terrorism event to house and care for displaced individuals. These shelters are unlikely to be the target of an attack. However, planning for the evacuation and migration of shelter occupants in any emergency situation can alleviate issues if a shelter is directly affected by a terrorist event.

Transportation Systems

Interstates – Bridges found throughout the interstate system can be targeted by terrorism. Not only would the actual structural failure affect those on, under, or near the bridge, but also the loss of its functionality would significantly hinder travel and commerce.

Airports – Past experiences with terrorists using airplanes for terrorist activity suggest a need for planning and collaboration with all parties of interest including local, state, and federal agencies. Due to its proximity to the Augusta National Golf Club which is home the Masters and Augusta Regional Airport is a significant airport, offering easy access to the many events and amenities.

Rail Lines – The most likely means of disrupting rail lines would be the derailing of a train, primarily by sabotage of the rail or the switching control system. Using explosives would be the simplest means because hacking into systems to cause collisions and other undesired actions to moving rail cars would be more complex operations. In addition to disrupting rail traffic, a derailing can impact other means of travel such as a nearby road or airport. The rail cars involved in an incident could contain hazardous materials, valuable goods, or passengers. Any of these would have some form of significant impact, including monetary and social costs, as well as injury, illness, or death. The response and cleanup could be lengthy as well, tying up resources and adding more costs to the overall incident.

Critical Utilities

High Voltage Distribution Lines/Power Lines – Damage to high voltage distribution lines could disrupt power distribution for a large area, affecting emergency response and other facets of government and business. The economic impacts may also be significant as extended outages can be especially costly and inconvenient. While there is a low likelihood of power lines being directly targeted by terrorism, they are vulnerable to being affected indirectly from other targeted buildings or objects. Power lines are prominent in most parts of Augusta-Richmond County.

Natural Gas – Natural gas lines are a concern as a target for terrorists, but natural gas itself must be exposed to oxygen before it could cause an explosion. Most natural gas explosions are small and rarely deadly. The real concern is in shutting off natural gas to end consumers. Sabotage of a pipeline could disconnect a significant number of homes and businesses for considerable periods of time.

Communication Systems and Networks

Telephone Systems – Due to their location (generally along power distribution lines) these networks face the same hazards as power lines themselves. Targeting of phone lines would temporarily disrupt communications and slow the notification of the terrorist event and its impacts, making it a desirable option for coordinated or multifaceted attacks. These lines can be shut down or damaged with relative ease. The lines themselves can be cut, ripped down, or destroyed. Any disruption in service can be costly to the affected.

Cell Phone Towers – Like telephone systems above, cell phone towers would be an effective target for disrupting communications. In order to significantly impact cell phone communications, numerous towers would need to be targeted as cell phones will simply pick up the next closest tower in the event of one being affected.

Internet Capabilities – Cyberterrorism is a major concern as society continues to depend on the internet more and more as discussed in the cyberterrorism section of this plan.

Economy

Small/Local Employers – The economic impact of a terrorist attack can vary from minimal to severe. If the incident occurs in Augusta-Richmond County, it could hinder the local economy but may not have an impact at the national level.

Tourism and some commerce could decline significantly if people, events, or businesses are hesitant to come to the area following an incident. An incident in a major city or a financial hub could affect the entire country. The events of September 11, 2001 had an immediate impact on the local and national economies. However, this event and other large scale attacks like it could drastically alter economies for generations.

Large Employers – There are several large businesses that are at risk for terrorism, mainly because of their international profiles. Any of the universities located within Augusta-Richmond County could be targeted and cause significant impacts, especially if shut down for a period of time.

Financial Centers – Damage to these facilities could have long-lasting impacts on the community. The loss of equipment and systems within these structures could have detrimental impacts on financial transactions.

Special Consideration Areas
City Centers – Terrorism would most likely occur in city centers during large public gatherings or during business hours to cause the most harm and promote the most fear. Political gatherings would be high priority targets as well.
Large Event Arenas – Arenas can be targeted by terrorism, particularly during events that may have some form of political, cultural, or historical value, or simply any event with a large number of people in attendance.
Historical and Cultural Landmarks – Like the other special consideration areas described above, a politically significant event or other large gathering could make a landmark more attractive to terrorists, however, there is a low likelihood of Augusta-Richmond County's landmarks being targeted by acts of terrorism.

Environment
Impacts on the environment depend on the type of attack utilized by terrorists. A biological, chemical, or other hazardous material can have impacts on human, animal, and plant populations alike. The impacts can vary depending on the particular hazard(s) at play.

5.22 UTILITY FAILURE

5.22.1 Background

There are a number of different types of utility failure that can cause an interruption to the daily lives of citizens and normal government operations. Among these are failures of water systems and electricity/power systems. A long-term outage of either of these systems would present significant challenges, though each would have different impacts on the public and may be the result of different precipitating events. Utility failure is defined in this plan by an interference with the availability of a power supply and/or water supply resulting in a loss of these services.

Power Supply Failure
A failure in the power distribution network can happen for varying reasons. Some possible examples include the physical failure of power lines due to hazards as discussed in the Critical Utilities sections throughout this document, as well as problems within the network itself including faults at a power station, shorts or overloading in a circuit(s), or physical damages at a substation.

There are three different types of power outages - transient faults, brownouts, and blackouts. A transient fault is a brief outage caused by a fault in a power line. The issue is corrected when the power flow clears the faulty part of the circuit, and power is returned. A brownout occurs when voltage falls to an inadequate level. A blackout occurs when there is a complete loss in the power supply. Blackouts are generally longer lasting outages than the previous two examples and may involve significant repairs. These outages can range from minutes to weeks or more depending on the significance of the failure in the network.

Water System Failure

A water failure may also happen for a number of reasons. In some cases it may be caused by flooding of water system infrastructure or may be caused by the contamination of water supplies by hazardous materials spills or farming byproducts.

While most of the Earth's surface is covered by water (70%), a mere 3% of that water is freshwater. More than 68% of this freshwater is found in glaciers and ice caps, while only .3% is found in rivers, lakes, etc. Fresh, potable water is in very limited supply, estimated to be only .08% of the Earth's water.[37] In the case of a water shortage or failure, rationing or elimination of nonessential activities or events could become viable options to limit unnecessary consumption of water during times of concern.

5.22.2 Location and Spatial Extent

Due to the unpredictable nature of where exactly a power or water utility outage will occur, the entire county is considered to be equally susceptible to this hazard. However it should be noted that in more urbanized areas, the effects of an outage at a single location or facility would likely impact larger numbers of people.

5.22.3 Historical Occurrences

Most of the lengthy power outages that have occurred in Augusta-Richmond County have been due to severe wind events or winter storms with ice accumulation. The area frequently experiences this type of weather throughout the year. Winter snow or ice accumulation can make travel dangerous and also cause branches, trees, and power lines to break or fall, causing power disruptions or outages in the affected area. Power outages can vary depending on the amount of precipitation, wind speed, its location on the grid, and its cause.

Many of the events described under natural hazards were the cause of utility failure events. As mentioned, winter storms, thunderstorms, and hurricanes all frequently cause power or water supply failures. Therefore, in general, the history of utility failure events in the county is directly connected to these other hazards.

Still, these outages do not occur only during weather-related events. For example, in 2003, the Northeast Blackout showed how vulnerable large networks are to widespread outage. An estimated 55 million people were without power after a critical failure in the system, as many power plants in Ontario, Canada and the Northeast went offline. A single cause could not be attributed to this incident, but several issues led to a cascading failure. Overload protection was unable to keep a small problem in the system from affecting other parts of the system, which led to the power outage affecting a larger area.

5.22.4 Probability of Future Occurrence

Based on the number of outages that have occurred in past years, the probability of a power or water utility failure is considered possible (between 1 and 10 percent annual probability).

[37] United States Geological Survey, *Earth's Water Distribution,* http://ga.water.usgs.gov/edu/waterdistribution.html

5.22.5 Consequence Analysis

People (The Public and Public Confidence)

Some issues that need to be considered during a power outage include transportation tie-ups and accidents, medical emergencies, and communications disruptions. The transportation problems would likely be related to traffic lights and signals not working or from decreased visibility during the night. Medical emergencies could stem from homes not having power to operate heating and air conditioning systems, particularly during conditions of extreme temperatures. Also medical equipment that relies on power could shut off, no longer providing a patient with treatment he or she requires. Medical emergencies would also be exacerbated if there was a water utility failure. The communications issues could prevent the public from being able to call emergency services. Business disruptions could also impact services that the public wants or needs. Lastly, well pumps would not function without power unless on backup generator power.

Public perception during any incident involving public utility systems depends on the impacts that are presented and how government and nongovernmental entities act. Extended, widespread outages could have the potential for pressure from the public. The media's reporting of the incident and the response could significantly influence public expectations and perception. Passing information to the public about ongoing efforts and when service restoration can be expected could assist in maximizing the confidence and satisfaction of the public.

Responders

As mentioned in the General Public section, there may be issues relating to transportation, medical equipment, extreme weather temperatures, and communications issues in the event of a power/water utility outage. Any of these issues could impact the call volume for emergency responders. If communications disruptions are present, it could affect notification processes and increase response times. Until power is restored, some critical facilities may need generators to provide backup power. Lack of water availability will also pose a challenge for response officials who often need consistent sources of freshwater to perform their duties. Law enforcement may become strained if additional personnel are needed to deal with unusual circumstances such as unrest, looting, or traffic control if signals are not operating appropriately.

Continuity of Operations

Generally, continuity of operations can be maintained during a power or water utility outage event in Augusta-Richmond County. However, when power transmission lines go down, it can make it difficult for emergency management employees to arrive to work. Also alternative sources of water will need to be relied upon. As a result, there will likely be some disruption of operations during an outage.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

Residential – Many residential structures do not have backup generators in place. If power fails, the residents of these homes may not be able to refrigerate their food, regulate medical equipment properly (such as oxygen), etc. until power is restored. Residents who are not on well water may be forced to find alternative sources of water to use for drinking, cooking, cleaning, etc.

Commercial – Unless businesses are prepared and have generators or water backups, many business processes may be hindered or stopped.

Industrial – Unless businesses are prepared and have generators or water backups, many business processes may be hindered or stopped.
Hazardous Materials – In the event of power or water outage, hazardous materials facilities typically have backup systems to continue critical operations and to maintain the hazardous materials on site. However, uncontrolled processes and spills are more likely to occur if backup systems do not operate correctly during these outages. There could be tremendous economic impact to businesses or the community as a whole with extended outages; many of these facilities require a significant amount of energy to operate at normal capacity.

Critical Facilities and Personnel
Hospitals – Hospitals are required to have generators and sources of water backup that provide these resources during outages. Additionally, other facilities can often take in patients if needed when a particular facility is unable to provide care due to a power or water outage.
Emergency Services – Like hospitals, many emergency services facilities are equipped with generators to keep power supplied for continued operations during a power outage. Some of these facilities also have backup sources of water, though these are not typically for the long-term. Mutual aid agreements are put in place to handle situations where there is not an adequate supply of operational resources.
Emergency Shelters – Emergency shelters may be activated if power or water outages are widespread and prolonged. Some shelters may be located in affected areas and alternative locations may need to be considered.

Transportation Systems
Interstates – Power/water outages are unlikely to impact interstates significantly.
Airports – Airport facilities are required to have backup power to keep key operations going during power outages. Other airports have experienced grounded flights and suspended operations as a result of a power outage until power was able to be restored. Extended outages may cause more significant impacts on flight patterns. Water outages would likely not have a major impact on airports.
Rail Lines – Rail lines can be impacted by power outages if backup power sources fail. Signals at railroad crossings may not work appropriately and in more severe cases, networks may be stopped until power is restored to prevent incidents. Water supply issues will likely not have major impacts on rail lines.

Critical Utilities
High Voltage Distribution Lines/Power Lines – High Voltage Distribution and Power lines are directly tied to power outages.
Natural Gas – The distribution of natural gas may be affected by power outages; however, the delivery of natural gas to customers is not usually dependent on external power sources.

Communication Systems and Networks
Telephone Systems – Telephone systems may or may not be impacted by energy/power outage. Typically, weather hazards could cause many of the outages to power, which could affect landline phones at the same time. Water outages will not impact these systems.
Cell Phone Towers – Cellular telephone towers generally have backup power to function during power outages. However, depending on the presence of other hazards or lengthy outages, cell phone reception may be impacted. Water outages will not impact these systems.
Internet Capabilities – Internet connections that originate from or are linked to energy sources in affected areas will likely see effects from a power outage. Water outages will not impact these systems.

Economy

Small/Local Employers – Extended outages could shut down businesses and have significant financial impacts depending on the area of the outage, the period of time the outage occurs, and the nature of the businesses that are affected.

Large Employers – The impact that an outage would have on large employers depends on if the outage occurred during business hours. The impacts are also dependent on how long the outage lasts and if backup power/water systems are in place. Backup systems may not cover all of the business's operations, only the critical functions, so there may still be some impact even with a backup system.

Financial Centers – The impact that an outage would have on the financial centers depend on if the outage occurs during business hours. The impacts are also dependent on how long the outage lasts, though in general financial centers will not be impacted long-term.

Special Consideration Areas

City Centers – Power/water outages would likely tend to prevent people from visiting city centers, though there would likely not be any major long-term impacts.

Large Event Arenas – Power/water outages could have a significant impact on these kinds of facilities if an event is taking place.

Historical and Cultural and Landmarks – Power/water outages may impact the operation of landmarks since many of these facilities rely on electricity and water. Extended outages could provoke closings.

Environment

There are no expected impacts.

Conclusions

5.23 CONCLUSIONS ON HAZARD RISK

The hazard profiles presented in this section were developed using best available data and result in what may be considered principally a qualitative assessment as recommended by FEMA in its "How-to" guidance document titled *Understanding Your Risks: Identifying Hazards and Estimating Losses* (FEMA Publication 386-2). It relies heavily on historical and anecdotal data, stakeholder input, and professional, experienced judgment regarding observed and/or anticipated hazard impacts. It also carefully considers the findings in other relevant plans, studies, and technical reports.

5.23.1 Hazard Extent

Table 5.45 describes the extent of each natural hazard identified for Augusta-Richmond County. The extent of a hazard is defined as its severity or magnitude, as it relates to the planning area.

TABLE 5.45:EXTENT OF AUGUSTA-RICHMOND COUNTY HAZARDS

Natural Hazards	
Drought	Drought extent is defined by U.S. Drought Monitor classifications which include Abnormal, Moderate, Severe, Extreme, and Exceptional Drought classifications. According to these classifications, the most severe drought condition is Exceptional. Augusta-Richmond County has received this ranking 4 times over the 17-year reporting period.

Earthquake	Earthquake extent can be measured by the Richter Scale and the Modified Mercalli Intensity (MMI) scale (both identified above) and the distance of the epicenter from Augusta-Richmond County. According to data provided by the National Geophysical Data Center, the greatest MMI to be recorded for the county was VIII (severe) with a correlating Richter Scale measurement of approximately 6.1-6.9 (last reported on September 1, 1886). The epicenter of this earthquake was located 193.0 km away.
Extreme Heat	The extent of extreme heat can be defined by the maximum temperature reached. The highest temperature recorded in Augusta-Richmond County was 110.4 degrees Fahrenheit (reported in 2012).
Flooding	Flood extent can be measured by the amount of land and property in the floodplain as well as flood height and velocity. The amount of land in the floodplain accounts for 19.7 percent of the total land area in Augusta-Richmond County. Flood depth and velocity are recorded via United States Geological Survey stream gages throughout the county. While a gage does not exist for each participating jurisdiction, there is one at or near many areas. The greatest peak discharge recorded for the county was reported on October 2, 1929. Water reached a discharge of 350,000 cubic feet per second. The greatest gage height in the county was recorded on July 13, 2013 at 117.62 feet. Additional peak discharge readings and gage heights are in the table below. It is also important to include flood stage data, where available, as a reference point for historic gage heights. Although this information is not readily available for all gages that have been identified, information that was available was included in the paragraph below. Additional flood stage information will be collected as it becomes more pervasive. At gage 02197000 on the Savannah River, flood stage is set at 115.50 feet. Furthermore, the USGS Water Supply paper titled "Summary of Floods in the United States During 1990 and 1991" reported that the major flood that occurred on October 12, 1990 recorded a gage height of 139.10 feet which was 9.60 feet over the flood stage for that gage (129.50 feet). This report goes on to explain that, record high flood stages were recorded at 14 sites in east-central Georgia during this event, including several sites near Augusta. Among these were: Rocky Creek at Augusta (9.60 feet), Butler Creek at Fort Gordon (13.30 feet), and McBean Creek near McBean (7.52 feet).

Location/Jurisdiction	Date	Peak Discharge (cfs)	Gage Height (ft)
Richmond County			
Augusta			
USGS 02196605 RAES CREEK TRIB#1 AT BOY SCOUT RD AT AUGUSTA, GA	Oct. 12, 1990	3,690	10.78
USGS 02196725 OATES CREEK AT WHITE ROAD, AT AUGUSTA, GA	Nov. 30, 1982	219	5.88

USGS 02196730 OATES CR AT OLD SAVANNAH ROAD, AT AUGUSTA, GA	Sep. 13, 1983	339	7.57
USGS 02196760 ROCKY CREEK TRIB AT US 78&278 AT AUGUSTA, GA	Oct. 12, 1990	1,110	9.60
USGS 02196850 BUTLER CR TRIB AT MEADOWBROOK DR, AT AUGUSTA, GA	May 10, 1979	178	13.80
USGS 02197020 SPIRIT CREEK AT US 1, NEAR AUGUSTA, GA	Jul. 19, 2005	4,070	8.27 (Aug. 18, 2013)
USGS 02197000 SAVANNAH RIVER AT AUGUSTA, GA	Oct. 02, 1929	350,000	117.62 (Jul. 13, 2013)
USGS 02197190 MCBEAN CREEK AT US 25, NEAR MCBEAN, GA	Oct. 12, 1990	3,160	7.52
USGS 02197200 MCBEAN CREEK AT GA 56, AT MCBEAN, GA	Sep. 29, 1929	9,300	11.50
Blythe			
N/A	--	--	--
Fort Gordon			
USGS 02196820 BUTLER CREEK AT US 78, AT FORT GORDON, GA	Oct. 12, 1990	4,700	13.30
USGS 02196835 BUTLER CREEK BELOW 7TH AVENUE, AT FT. GORDON, GA	May 31, 2002	510	6.00 (Feb. 08, 2013)
USGS 021970161 SPIRIT CK .35 mi DS OF McCOYS CRK AT FT GORDON,GA	Apr. 28, 2011	118	5.24 (Aug. 11, 2012)
Hephzibah			
N/A	--	--	--

Hail	Hail extent can be defined by the size of the hail stone. The largest hail stone reported in Augusta-Richmond County was 1.75 inches (reported most recently on September 17, 2014). It should be noted that future events may exceed this.
Hurricane and Tropical Storm	Hurricane extent is defined by the Saffir-Simpson Scale which classifies hurricanes into Category 1 through Category 5 (see table above). The greatest classification of hurricane to traverse within 75 miles of Augusta-Richmond County was Hurricane Gracie in 1959 which reached a maximum wind speed of 96.54 knots within the 75 mile buffer area.

Infectious Disease	An infectious disease threat could have large–scale effects throughout the county and may cause illness in many people. Possible impacts from a disease threat depend largely on the impacted population, but might include anything from absenteeism and loss of productivity in the workplace to death or serious illness to humans or livestock. A serious disease threat could affect many thousands of people.
Lightning	According to the Vaisala flash density map (see figure above), Augusta-Richmond County is located in an area that experiences 2 to 8 lightning flashes per square kilometer per year. It should be noted that future lightning occurrences may exceed these figures.
Severe Winter Storm	The extent of winter storms can be measured by the amount of snowfall or ice received (in inches). The greatest 24-hour snowfall reported in the county was 8.0 inches in 1973. Due to unpredictable variations in snowfall throughout the county, extent totals will vary for each participating jurisdiction and reliable data on snowfall totals is not abundantly available.
Solar Flare/EMP	Although there is not an extensive history of solar flares occurring and specifically impacting Augusta-Richmond County, reports from historic events outside of the county are useful and can indicate roughly the extent that might be anticipated. Based on these historic events, it is possible that the county could be impacted by an "X" class solar flare that would rate as an R5 on the radio blackout scale and would disrupt radio contact, communications equipment, and power supply for several hours.
Tornado	Tornado hazard extent is measured by tornado occurrences in the US provided by FEMA as well as the Fujita/Enhanced Fujita Scale (see tables above). The greatest magnitude reported in Augusta-Richmond County was an EF3 (reported on April 10, 2009). It should be noted that an EF5 tornado is possible.
Wildfire	Wildfire data was provided by the Georgia Forestry Commission and is reported annually by county from 2007-2016. Analyzing the data indicates the following wildfire hazard extent for the county. • The greatest number of fires to occur in any year was 51 in 2011. • The greatest number of acres to burn in a single year occurred in 2008 when 328 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.
Windstorm/Thunderstorm	Thunderstorm extent is defined by the number of thunder events and wind speeds reported. The strongest recorded wind event in Augusta-Richmond County was reported on March 16, 1972 and March 7, 1996 at 75 knots (approximately 86 mph). It should be noted that future events may exceed these historical occurrences.
Technological/Man-Made Hazards	
Chemical Hazard	According to USDOT PHMSA, the largest hazardous materials incident reported in the county was 100,000 SLB released as a railway incident on September 6, 1996. It should be noted that larger events are possible.

Cyberterrorism	While there is seldom physical damage inflicted from a cyberterrorism event, the effects of such an event are often damaging in other ways. For example, theft, denial of service attacks, and dissemination of misinformation can all result from a cyberterror event. Moreover, these events are often aimed at shutting down IT systems which can result in loss of productivity and damage to IT infrastructure.
Dam/Levee Failure	Dam failure extent is defined using the State of Georgia Safe Dams Program criteria. Of the 27 dams in Augusta-Richmond County, 6 are classified as high hazard.
Nuclear Power Plant Emergency	Although there is no history of a nuclear accident at the Vogtle Power Plant, other events across the globe and in the United States in particular indicate that an event is possible. Since several national and international events were Level 7 events on the INES, the potential for a Level 7 event at Vogtle is possible.
Terrorism	There is no history of major terrorist events in Augusta-Richmond County; however, it is possible that one of these events could occur. If this were to take place, the magnitude of the event could range on the scale of critical damage with many fatalities and injuries to the population.
Utility Failure	There are many impacts that would occur as a result of a utility failure. Among other impacts, traffic lights could be down, residents might lose heat or air conditioning, medical equipment may be non-operational, and well pumps could be shut down limiting access to clean water. These failures could potentially be widespread, leaving tens of thousands of homes and businesses without power or water utilities.

5.23.2 Priority Risk Index

In order to draw some meaningful planning conclusions on hazard risk for Augusta-Richmond County, the results of the hazard profiling process were used to generate countywide hazard classifications according to a “Priority Risk Index” (PRI). The purpose of the PRI is to categorize and prioritize all potential hazards for Augusta-Richmond County as high, moderate, or low risk. Combined with the asset inventory and quantitative vulnerability assessment provided in the next section, the summary hazard classifications generated through the use of the PRI allows for the prioritization of those high hazard risks for mitigation planning purposes, and more specifically, the identification of hazard mitigation opportunities for the jurisdictions in Augusta-Richmond County to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for Augusta-Richmond County is based principally on the PRI, a tool used to measure the degree of risk for identified hazards in a particular planning area. The PRI is used to assist the Augusta-Richmond County Hazard Mitigation Planning Team in gaining consensus on the determination of those hazards that pose the most significant threat to the county based on a variety of factors. The PRI is not scientifically based, but is rather meant to be utilized as an objective planning tool for classifying and prioritizing hazard risks in Augusta-Richmond County based on standardized criteria.

The application of the PRI results in numerical values that allow identified hazards to be ranked against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk has been assigned a value (1 to 4) and an agreed upon

weighting factor,[38] as summarized in **Table 5.46**. To calculate the PRI value for a given hazard, the assigned risk value for each category is multiplied by the weighting factor. The sum of all five categories equals the final PRI value, as demonstrated in the example equation below:

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

According to the weighting scheme and point system applied, the highest possible value for any hazard is 4.0. When the scheme is applied for Augusta-Richmond County, the highest PRI value is 3.3 (flooding). Prior to being finalized, PRI values for each identified hazard were reviewed and evaluated by the members of the Hazard Mitigation Planning Team.

[38] The Hazard Mitigation Planning Team, based upon any unique concerns or factors for the planning area, may adjust the PRI weighting scheme during future plan updates.

TABLE 5.46: PRIORITY RISK INDEX FOR AUGUSTA-RICHMOND COUNTY

PRI Category	Degree of Risk			Assigned Weighting Factor
	Level	Criteria	Index Value	
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
	Highly Likely	100% annual probability	4	
Impact	Minor	Very few injuries, if any. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1	30%
	Limited	Minor injuries only. More than 10% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one day.	2	
	Critical	Multiple deaths/injuries possible. More than 25% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for more than one week.	3	
	Catastrophic	High number of deaths/injuries possible. More than 50% of property in affected area damaged or destroyed. Complete shutdown of critical facilities for 30 days or more.	4	
Spatial Extent	Negligible	Less than 1% of area affected	1	20%
	Small	Between 1 and 10% of area affected	2	
	Moderate	Between 10 and 50% of area affected	3	
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self explanatory	1	10%
	12 to 24 hours	Self explanatory	2	
	6 to 12 hours	Self explanatory	3	
	Less than 6 hours	Self explanatory	4	
Duration	Less than 6 hours	Self explanatory	1	10%
	Less than 24 hours	Self explanatory	2	
	Less than one week	Self explanatory	3	
	More than one week	Self explanatory	4	

5.23.3 Priority Risk Index Results

Table 5.47 summarizes the degree of risk assigned to each category for all initially identified hazards based on the application of the PRI. Assigned risk levels were based on the detailed hazard profiles developed for this section, as well as input from the Hazard Mitigation Planning Team. The results were then used in calculating PRI values and making final determinations for the risk assessment.

TABLE 5.47: SUMMARY OF PRI RESULTS FOR AUGUSTA-RICHMOND COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Natural Hazards						
Drought	Highly Likely	Limited	Large	More than 24 hours	More than 1 week	**3.1**
Earthquake	Possible	Limited	Moderate	Less than 6 hours	Less than 6 hours	**2.3**
Extreme Heat	Highly Likely	Limited	Large	More than 24 hours	Less than 1 week	**3.0**
Flooding	Highly Likely	Critical	Moderate	6 to 12 hours	Less than 1 week	**3.3**
Hail	Highly Likely	Limited	Small	Less than 6 hours	Less than 6 hours	**2.7**
Hurricane/Tropical Storm	Likely	Critical	Moderate	More than 24 hours	Less than 1 week	**2.8**
Infectious Disease	Possible	Critical	Large	Less than 24 hours	More than 1 week	**2.7**
Lightning	Highly Likely	Limited	Small	Less than 6 hours	Less than 6 hours	**2.7**
Severe Winter Storm	Likely	Limited	Large	More than 24 hours	Less than 24 hours	**2.6**
Solar Flare/EMP	Likely	Minor	Large	More than 24 hours	Less than 24 hours	**2.3**
Tornado	Likely	Critical	Moderate	Less than 6 hours	Less than 6 hours	**2.9**
Wildfire	Highly Likely	Limited	Moderate	Less than 6 hours	Less than 6 hours	**2.9**
Windstorm/Thunderstorm	Likely	Limited	Small	Less than 6 hours	Less than 1 week	**2.6**
Technological/Man-Made Hazards						
Chemical Hazard	Highly Likely	Critical	Small	Less than 6 hours	Less than 24 hours	**3.1**
Cyberterrorism	Possible	Critical	Small	Less than 6 hours	Less than 24 hours	**2.5**
Dam/Levee Failure	Unlikely	Critical	Small	Less than 6 hours	Less than 24 hours	**2.2**
Nuclear Power Plant Incident	Unlikely	Critical	Moderate	6 to 12 hours	Less than 1 week	**2.4**
Terrorism	Possible	Critical	Small	Less than 6 hours	Less than 24 hours	**2.5**
Utility Failure	Possible	Limited	Moderate	More than 24 hours	Less than 1 week	**2.2**

5.24 FINAL DETERMINATIONS

The conclusions drawn from the hazard profiling process for Augusta-Richmond County, including the PRI results and input from the Hazard Mitigation Planning Team, resulted in the classification of risk for each identified hazard according to three categories: High Risk, Moderate Risk, and Low Risk (**Table 5.48**). For purposes of these classifications, risk is expressed in relative terms according to the estimated impact that a hazard will have on human life and property throughout all of Augusta-Richmond County.

A more quantitative analysis to estimate potential dollar losses for each hazard has been performed separately, and is described in Section 6: *Vulnerability Assessment*. It should be noted that although some hazards are classified below as posing low risk, their occurrence of varying or unprecedented magnitudes is still possible in some cases and their assigned classification will continue to be evaluated during future plan updates.

TABLE 5.48: CONCLUSIONS ON HAZARD RISK FOR AUGUSTA-RICHMOND COUNTY

HIGH RISK	Flooding Chemical Hazard Drought Extreme Heat
MODERATE RISK	Tornado Windstorm/Thunderstorm Hurricane/Tropical Storm Hail Lightning Infectious Disease Severe Winter Storm Wildfire Cyberterrorism Terrorism
LOW RISK	Nuclear Power Plant Incident Solar Flare/EMP Earthquake Utility Failure Dam/Levee Failure

SECTION 6
VULNERABILITY ASSESSMENT

This section identifies and quantifies the vulnerability of the communities within Augusta-Richmond County to the significant hazards identified in the previous sections (*Hazard Identification and Profiles*). It consists of the following subsections:

- 6.1 Overview
- 6.2 Methodology
- 6.3 Explanation of Data Sources
- 6.4 Asset Inventory
- 6.5 Vulnerability Assessment Results
- 6.6 Conclusions on Hazard Vulnerability

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44 CFR Requirement
44 CFR Part 201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. The description shall include an overall summary of each hazard and its impact on the community. The plan should describe vulnerability in terms of: (A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; (B) An estimate of the potential losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; (C) Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

6.1 OVERVIEW

This section builds upon the information provided in Section 4: *Hazard Identification and* Section 5*: Hazard Profiles* by identifying and characterizing an inventory of assets in Augusta-Richmond County. In addition, the potential impact and expected amount of damages caused to these assets by each identified hazard event is assessed. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard. In doing so, Augusta-Richmond County and participating communities may better understand their unique risks to identified hazards and be better prepared to evaluate and prioritize specific hazard mitigation actions.

This section begins with an explanation of the methodology applied to complete the vulnerability assessment, followed by a summary description of the asset inventory as compiled for communities involved in this planning process. The remainder of this section focuses on the results of the assessment conducted.

6.2 METHODOLOGY

This vulnerability assessment was conducted using three distinct methodologies: (1) A stochastic risk assessment; (2) a geographic information system (GIS)-based analysis; and (3) a risk modeling software

analysis. Each approach provides estimates for the potential impact of hazards by using a common, systematic framework for evaluation, including historical occurrence information provided in the *Hazard Identification* and *Hazard Profiles* sections. A brief description of the three different approaches is provided on the following pages.

6.2.1 Stochastic Risk Assessment

The stochastic risk assessment methodology was applied to analyze hazards of concern that were outside the scope of hazard risk models and the GIS-based risk assessment. This involves the consideration of annualized loss estimates and impacts of current and future buildings and populations. Annualized loss is the estimated long-term weighted average value of losses to property in any single year in a specified geographic area (i.e., municipal jurisdiction or county). This methodology is applied primarily to hazards that do not have geographically-definable boundaries and are therefore excluded from spatial analysis through GIS. A stochastic risk methodology was used for the following hazards:

- Cyberterrorism
- Drought
- Extreme Heat
- Dam/Levee Failure
- Hail
- Infectious Disease
- Lightning
- Severe Winter Storm
- Solar Flare/EMP
- Tornado
- Terrorism
- Windstorm/Thunderstorm
- Utility Failure

All of the natural hazards listed above are considered atmospheric and have the potential to affect all current and future buildings and all populations. Likewise, because technological/man-made hazards are often unpredictable and do not have a defined area in which they are more likely to occur, all current and future buildings and populations are considered at risk. **Table 6.1** provides information about all improved property in Augusta-Richmond County that is vulnerable to these hazards. Annualized loss estimates were determined using the best available data on historical losses from sources including NOAA's National Climatic Data Center records, county and municipal hazard mitigation plans, and local knowledge. Annualized loss estimates were generated by totaling the amount of property damage over the period of time for which records were available, and calculating the average annual loss. Given the standard weighting analysis, losses can be readily compared across hazards providing an objective approach for evaluating mitigation alternatives.

For a number of the technological/man-made hazards, no data with historical property damages was available. Therefore, a detailed vulnerability assessment could not be completed for these hazards at this time.

The results for these hazards are found at the end of this section in **Table 6.18**.

6.2.2 GIS-Based Analysis

Other hazards have specified geographic boundaries that permit additional analysis using Geographic Information Systems (GIS). These hazards include:

- Chemical Hazard
- Flooding
- Nuclear Power Plant Incident
- Wildfire

The objective of the GIS-based analysis was to determine the estimated vulnerability of structures, critical facilities, and populations for the identified hazards in Augusta-Richmond County using best available geospatial data. Digital data was collected from local, regional, state, and national sources for hazards and buildings. This included local tax assessor records for individual parcels and buildings and geo-referenced point locations for identified assets (critical facilities and infrastructure, special populations, etc.) when available. ESRI® ArcGIS™ 10.3 was used to assess hazard vulnerability utilizing digital hazard data, as well as local building data. Using these data layers, hazard vulnerability can be quantified by estimating the assessed building value for parcels and/or buildings determined to be located in identified hazard areas. The results of the analysis provided an estimate of the number of parcels, buildings, and critical facilities, as well as the estimated value of those buildings determined to be potentially at risk to the hazards with delineable geographic hazard boundaries.

6.2.3 Risk Modeling Software Analysis

A risk modeling software was used for the following hazards:

- Earthquake
- Hurricane/Tropical Storm

There are several models that exist to model hazards. Hazus-MH was used in this vulnerability assessment to address the aforementioned hazards.

Hazus-MH

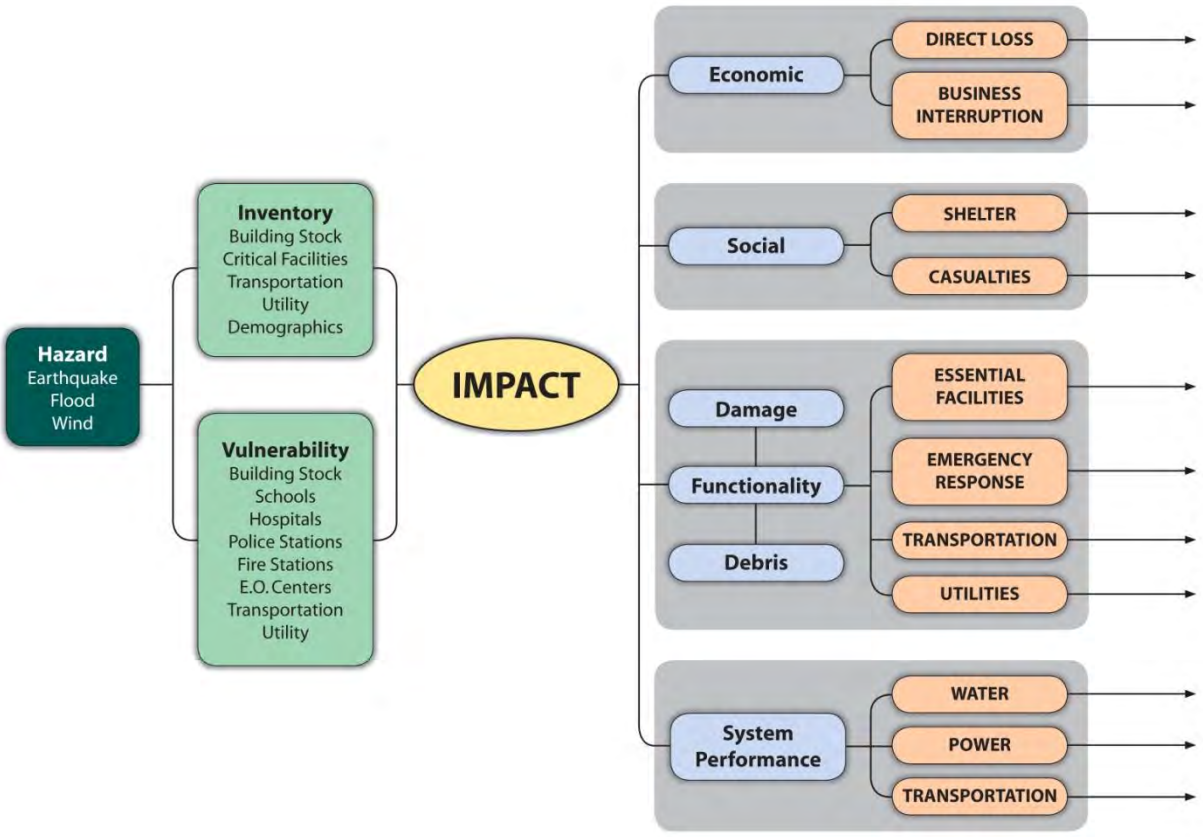
Hazus-MH ("Hazus") is a standardized loss estimation software program developed by FEMA. It is built upon an integrated GIS platform to conduct analysis at a regional level (i.e., not on a structure-by-structure basis). The Hazus risk assessment methodology is parametric, in that distinct hazard and inventory parameters (e.g., wind speed and building types) can be modeled using the software to determine the impact (i.e., damages and losses) on the built environment.

The Augusta-Richmond County Risk Assessment utilized Hazus-MH to produce hazard damage loss estimations for hazards for the planning area. At the time this analysis was completed, Hazus-MH 4.0

was used to estimate potential damages from hurricane winds earthquake hazards using Hazus-MH methodology. Although the program can also model losses for flood, it was not used in this Risk Assessment.

Figure 6.1 illustrates the conceptual model of the Hazus-MH methodology.

FIGURE 6.1: CONCEPTUAL MODEL OF HAZUS-MH METHODOLOGY



Hazus-MH is capable of providing a variety of loss estimation results. In order to be consistent with other hazard assessments, annualized losses are presented when possible. Some additional results based on location-specific scenarios may also be presented to provide a complete picture of hazard vulnerability.

Loss estimates provided in this vulnerability assessment are based on best available data and methodologies. The results are an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (e.g., incomplete inventories, non-specific locations, demographics, or economic parameters).

All conclusions are presented in “Conclusions on Hazard Vulnerability” at the end of this section.

6.3 EXPLANATION OF DATA SOURCES

Earthquake

Hazus-MH 4.0 (as described above) was used to assess earthquake vulnerability. A level 1, probabilistic scenario to estimate annualized loss was utilized. In this scenario, several return periods (events of varying intensities) are run to determine annualized loss. Default Hazus earthquake damage functions and methodology were used to determine the probability of damage. Results are calculated at the 2010 U.S. Census tract level in Hazus and presented at the county level.

Flood

FEMA Digital Flood Insurance Rate Maps (DFIRMs) were used to determine flood vulnerability. DFIRM data can be used in ArcGIS for mapping purposes and they identify several features including floodplain boundaries and base flood elevations. Identified areas on the DFIRM represent some features of Flood Insurance Rate Maps including the 100-year flood areas (1.0-percent annual chance flood), and the 500-year flood areas (0.2-percent annual chance flood). For the vulnerability assessment, local parcel data and critical facilities were overlaid on the 100-year floodplain areas and 500-year floodplain areas. It should be noted that such an analysis does not account for building elevation. Additional analysis using a Hazus report provided by the Georgia Department of Community Affairs in conjunction with the Polis Center was also utilized. The full report can be found in Appendix E.

Hurricane and Tropical Storm Wind

Hazus-MH 4.0 (as described above) was used to assess wind vulnerability. For the hurricane wind analysis, a probabilistic scenario was created to estimate the annualized loss damage and probable peak wind speeds in Augusta-Richmond County. Default Hazus wind speed data, damage functions, and methodology were used in to determine the probability of damage for 50-, 100-, 500-, and 1,000-year frequency events (also known as return periods) in the scenario. Results are calculated in Hazus at the 2010 U.S. Census tract level and presented at the county and municipal level. Additional analysis using a Hazus report provided by the Georgia Department of Community Affairs in conjunction with the Polis Center was also utilized. The full report can be found in Appendix E.

Chemical Hazard

For the fixed chemical hazard analysis, Toxic Release Inventory data was used. The Toxic Release Inventory (TRI) is a publicly available database from the federal Environmental Protection Agency (EPA) that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. This inventory was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and expanded by the Pollution Prevention Act of 1990. Each year, facilities that meet certain activity thresholds must report their releases and other waste management activities for listed toxic chemicals to EPA and to their state or tribal entity. A facility must report if it meets the following three criteria:

- The facility falls within one of the following industrial categories: manufacturing; metal mining; coal mining; electric generating facilities that combust coal and/or oil; chemical wholesale distributors; petroleum terminals and bulk storage facilities; RCRA Subtitle C treatment, storage, and disposal (TSD) facilities; and solvent recovery services;
- Has 10 or more full-time employee equivalents; and
- Manufactures or processes more than 25,000 pounds or otherwise uses more than 10,000 pounds of any listed chemical during the calendar year. Persistent, bioaccumulative, and toxic

(PBT) chemicals are subject to different thresholds of 10 pounds, 100 pounds, or 0.1 grams depending on the chemical.

For the mobile hazardous materials incident analysis, transportation data including major highways and railroads were obtained from the Georgia Department of Transportation. This data is ArcGIS compatible, lending itself to buffer analysis to determine risk.

Nuclear Accident

The data used to determine vulnerability to a nuclear accident in Augusta-Richmond County is based on the location of the Vogtle Nuclear Power Plant and buffer radii recommended by the Nuclear Regulatory Commission for emergency management planning in the event of a nuclear accident.

Wildfire

The data used to determine vulnerability to wildfire in Augusta-Richmond County is based on GIS data called the Southern Wildfire Risk Assessment (SWRA). This data is available on the Southern Wildfire Risk Assessment website and can be downloaded and imported into ArcGIS. A specific layer, known as "Wildland Urban Interface Risk Index" (WUIRI) was used to determine vulnerability of people and property. The WUIRI is presented on a scale of 0 to -9. It combines data on housing density with the data on the impact and likelihood of a wildfire occurring in a specific area. The primary purpose of the data is to highlight areas of concern that may be conducive to mitigation actions. Due to the assumptions made, it is not a true probability. However, it does provide a comparison of risk throughout the region.

6.4 ASSET INVENTORY

An inventory of geo-referenced assets within Augusta-Richmond County was compiled in order to identify and characterize those properties potentially at risk to the identified hazards.[1] By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Under this assessment, two categories of physical assets were created and then further assessed through GIS analysis. These are presented below in Section 6.4.1.

6.4.1 Physical and Improved Assets

The two categories of physical assets consist of:

1. Improved Property: Includes all improved properties in Augusta-Richmond County according to local parcel and building footprint data provided by the county. The information has been expressed in terms of the number of parcels and total value that may be exposed to the identified hazards. In addition, building footprint data was available for the county and it was used to improve the overall assessment by providing a more accurate assessment of how many buildings are located in hazard areas. However, it should be noted that building footprint data has not been updated since 2007, so it likely underestimates building counts.

[1] While potentially not all-inclusive for the jurisdictions in Augusta-Richmond County, "georeferenced" assets include those assets for which specific location data is readily available for connecting the asset to a specific geographic location for purposes of GIS analysis.

2. Critical Facilities: Critical facilities vary by community and the critical facilities provided by Augusta-Richmond County are used in this section. It should be noted that this listing is not inclusive of every important asset located in the county, but is focused on the most critical and it is anticipated that it may be expanded or adjusted during future plan updates.

The following tables provide a detailed listing of the geo-referenced assets that have been identified for inclusion in the vulnerability assessment for Augusta-Richmond County.

Table 6.1 lists the number of buildings, number of parcels, and total value of parcels for participating areas of Augusta-Richmond County.[2]

TABLE 6.1: IMPROVED PROPERTY IN AUGUSTA-RICHMOND COUNTY

Location	Number of Buildings	Number of Parcels	Total Assessed Value of Parcels
Augusta-Richmond County	120,998	78,483	$11,647,282,467
Blythe	733	462	$26612825
Fort Gordon*	*Not Available*	1	$307,196,200
Hephzibah	3,950	2,017	$201,121,136
AUGUSTA-RICHMOND COUNTY TOTAL	**125,681**	**80,963**	**$12,182,212,628**

**Building footprint data was not available for the Fort Gordon area and the Fort Gordon area is designated by only a single parcel in the county records.*
Source: Augusta-Richmond County GIS Department

Table 6.2 lists the emergency management facilities, fire stations, government buildings, law enforcement facilities, medical facilities, key private sector structures, schools, transportation facilities, universities, and utilities located in Augusta-Richmond County. These facilities were identified as primary critical facilities in that they are necessary to maintain government functions and protect the life, health, safety, and welfare of citizens. These facilities were geospatially mapped and used as the basis for further geographic analysis of the hazards that could potentially affect critical facilities. Critical facility information was provided by the Augusta-Richmond County GIS department and additional contributions were made by other departments.

In addition, **Figure 6.2** shows the locations of the primary critical facilities in Augusta-Richmond County. **Table 6.19**, near the end of this section, shows a complete list of the critical facilities by name, as well as the hazards that affect each facility. As noted previously, this list may not be inclusive of every important facility in the county, but attempts to include facilities that have been determined to be most important in the wake of a disaster by local government officials.

TABLE 6.2: CRITICAL FACILITY INVENTORY IN AUGUSTA-RICHMOND COUNTY

Location	Emergency Management	Fire Station	Government	Law Enforcement	Medical
Augusta-Richmond County	3	19	19	10	16
Blythe	0	1	1	1	0
Fort Gordon	0	2	0	0	1
Hephzibah	0	1	1	0	0

[2] Total value for improvements is based on tax assessor records as joined to digital parcel data.. Parcel values are updated for 2016.

Location	Emergency Management	Fire Station	Government	Law Enforcement	Medical
AUGUSTA-RICHMOND COUNTY TOTAL	3	23	21	11	17

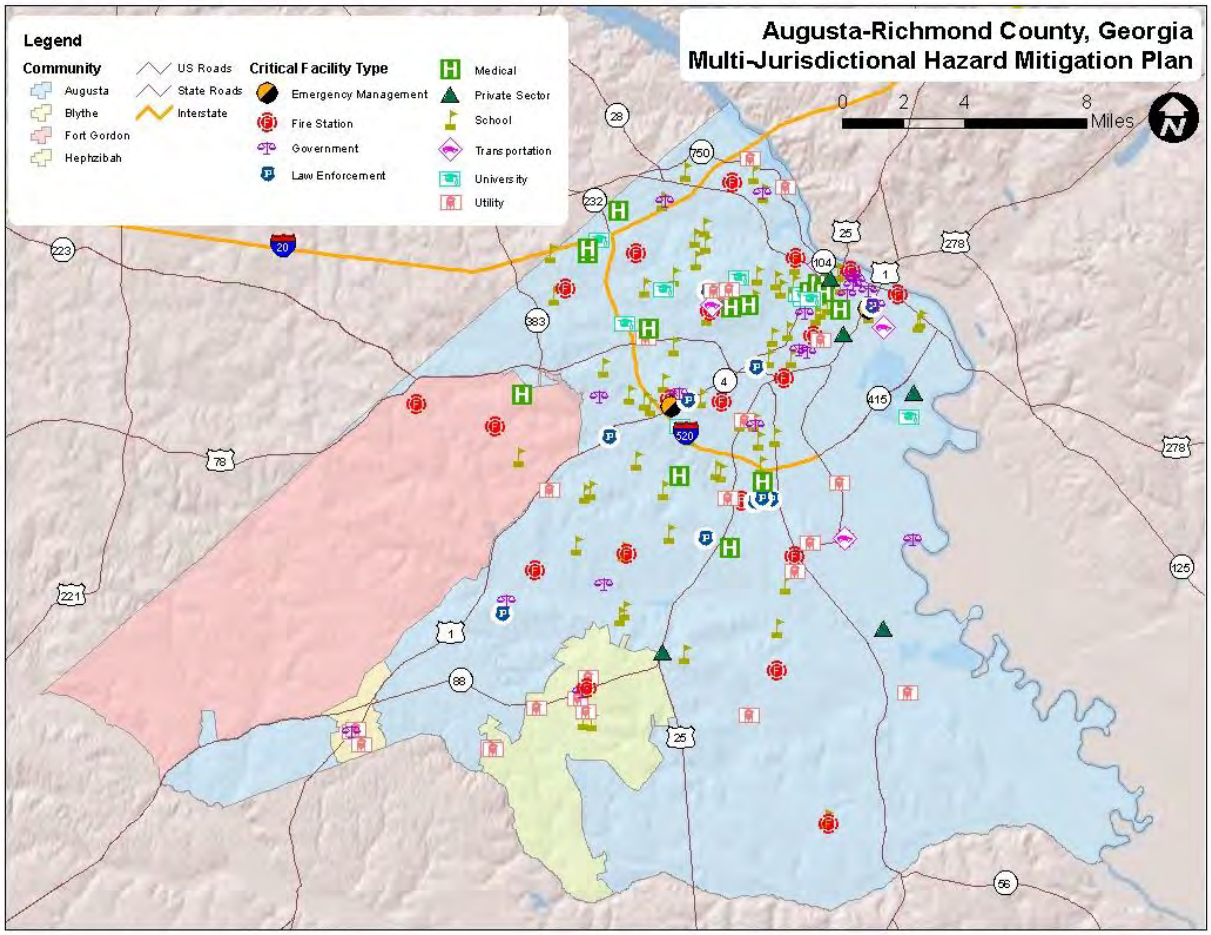
Source: Local Governments

TABLE 6.2: CRITICAL FACILITY INVENTORY IN AUGUSTA-RICHMOND COUNTY (CONTINUED)

Location	Private Sector	School	Transportation	University	Utility
Augusta-Richmond County	5	65	4	10	17
Blythe	0	1	0	0	3
Fort Gordon	0	1	0	0	0
Hephzibah	0	3	0	0	6
AUGUSTA-RICHMOND COUNTY TOTAL	5	70	4	10	26

Source: Local Governments

FIGURE 6.2: CRITICAL FACILITY LOCATIONS IN AUGUSTA-RICHMOND COUNTY



Source: Augusta-Richmond County

6.4.2 Social Vulnerability

In addition to identifying those assets potentially at risk to identified hazards, it is important to identify and assess those particular segments of the resident population in Augusta-Richmond County that are potentially at risk to these hazards.

Table 6.3 lists the population by jurisdiction according to 2015 American Community Survey population estimates. The total population in Augusta-Richmond County according to Census data is 201,313 persons. Additional population estimates are presented in Section 3: *Community Profile*.

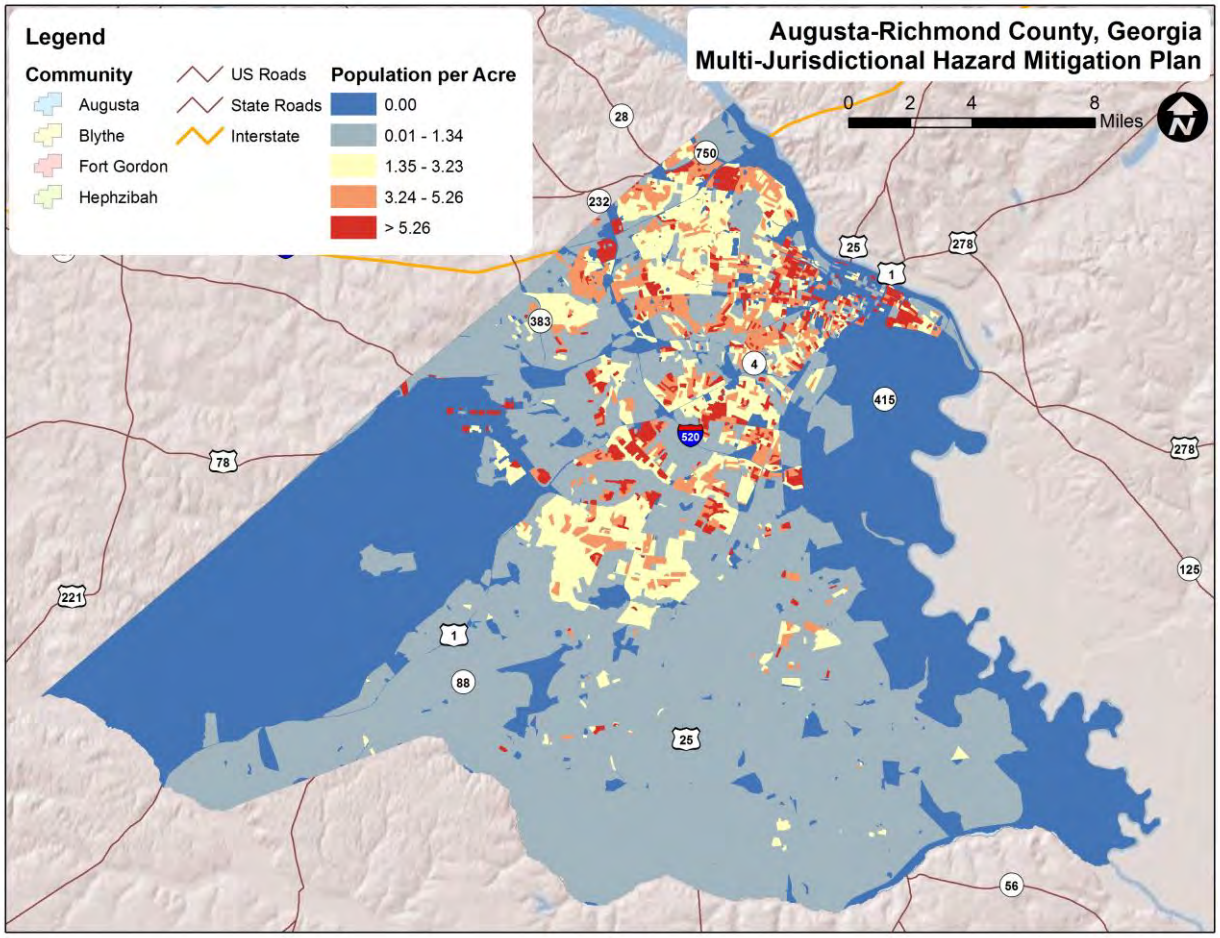
TABLE 6.3: TOTAL POPULATION IN AUGUSTA-RICHMOND COUNTY

Location	Total 2010 Population
Augusta-Richmond County*	196,635
Blythe	728
Hephzibah	3,950
AUGUSTA-RICHMOND COUNTY TOTAL	**201,313**

*The population count for Fort Gordon is included as part of the Augusta-Richmond County total.
Source: United States Census Bureau

In addition, **Figure 6.3** illustrates the population density by census block as it was reported by the U.S. Census Bureau in 2010.

FIGURE 6.3: POPULATION DENSITY IN AUGUSTA-RICHMOND COUNTY



Source: U.S. Census Bureau, 2010

6.4.3 Development Trends and Changes in Vulnerability

Since the previous hazard mitigation plan update, Augusta-Richmond County has experienced limited growth and development. **Table 6.4** shows the number of building units constructed since 2010 according to the U.S. Census American Community Survey.

TABLE 6.4: HOUSING UNIT COUNTS FOR AUGUSTA-RICHMOND COUNTY

Jurisdiction	2010	2011	2012	2013	2014	2015	% Building Stock Built Post-2010
Augusta-Richmond County	84,348	84,575	84,601	84,649	84,925	85,103	0.9%
Blythe	258	294	302	304	313	319	23.6%
Hephzibah	1,492	1,440	1,551	1,466	1,481	1,532	2.7%
AUGUSTA-RICHMOND COUNTY TOTAL	**86,098**	**86,309**	**86,454**	**86,419**	**86,719**	**86,954**	**1.0%**

*The housing unit count for Fort Gordon is included as part of the Augusta-Richmond County total.

Source: United States Census Bureau

Table 6.5 shows population growth estimates for the county and municipalities from 2010 to 2015 based on the American Community Survey's Annual Estimates of Resident Population.

TABLE 6.5: POPULATION GROWTH FOR AUGUSTA-RICHMOND COUNTY

Jurisdiction	Population Estimates (as of July 1)						% Change 2010-2015
	2010	2011	2012	2013	2014	2015	
Augusta-Richmond County*	193,532	194,440	195,646	196,395	196,551	196,635	1.6%
Blythe	635	675	657	641	691	728	14.7%
Hephzibah	4,003	3,997	4,055	4,053	4,026	3,950	-1.3%
AUGUSTA-RICHMOND COUNTY TOTAL	**198,170**	**199,112**	**200,358**	**199,086**	**199,326**	**201,313**	**1.6%**

*The population count for Fort Gordon is included as part of the Augusta-Richmond County total.
Note: July 1 population estimates from the American Community Survey were used in this table to allow comparison of annual population counts. April 1, 2010 Census estimates may have been used for other population counts throughout the plan which is why counts may differ somewhat.
Source: United States Census Bureau

Based on the data above, there has been a low rate of residential development in the county since 2010. That is to say, the county as a whole has been growing at a steady, even rate overall. Although Blythe has seen a substantially higher relative change in housing units and population, it should be noted that the size of the community makes annual projections difficult and the percent change statistic may exaggerate the absolute growth.

There has been some population growth across Augusta-Richmond County since 2010. Since the population has increased across the county, there is now a greater number of people exposed to the identified hazards. Therefore, population growth has impacted the county's vulnerability since the previous local hazard mitigation plan was approved and there has been a slight increase in the overall vulnerability.

It is also important to note that as development increases in the future, greater populations and more structures and infrastructure will be exposed to potential hazards if development occurs in the floodplains or other high risk areas identified in this plan.

6.5 VULNERABILITY ASSESSMENT RESULTS

As noted earlier, only hazards with a specific geographic boundary, modeling tool, or sufficient historical data allow for further analysis. Those results are presented here. All other hazards are assumed to impact the entire planning region (e.g. drought) or, due to lack of data, analysis would not lead to credible results (e.g. terrorism). The total county exposure, and thus risk, was presented in **Table 6.1**.

The annualized loss estimate for all hazards is presented at the end of this section in **Table 6.18.**

The hazards presented in this subsection include: hurricane and tropical storm winds, earthquake, flood, chemical hazard, nuclear accident, and wildfire.

6.5.1 Hurricane and Tropical Storm

Historical evidence indicates that Augusta-Richmond County has fairly significant risk to the hurricane and tropical storm hazard. Many hurricane tracks have come near or traversed through Augusta-Richmond County, as shown and discussed in Section 5: *Hazard Profiles*.

Hurricanes and tropical storms can cause damage through numerous additional hazards such as flooding, erosion, tornadoes, high winds, and precipitation, thus it is difficult to estimate total potential losses from these cumulative effects. The current Hazus-MH hurricane model only analyzes hurricane winds and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes; therefore, only hurricane winds are analyzed in this section. It can be assumed that all existing and future buildings and populations are at risk to the hurricane and tropical storm hazard. Hazus-MH 4.0 was used to determine annualized losses for the county as shown below in **Table 6.6.** In the comparative annualized loss analysis at the end of this section, only losses to buildings are reported in order to best match annualized losses reported for other hazards.

TABLE 6.6: ANNUALIZED LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD

Location	Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Augusta-Richmond County	$1,840,000	$509,000	$5,000	$2,354,000

Source: Hazus-MH 4.0

In addition, probable peak wind speeds were calculated in Hazus. These are shown below in **Table 6.7.**

TABLE 6.7: PROBABLE PEAK HURRICANE/TROPICAL STORM WIND SPEEDS (MPH)

Location	50-year event	100-year event	500-year event	1,000-year event
Augusta-Richmond County	68.1	77.8	97.3	103.6
Blythe	66.6	75.9	95.3	100.8
Fort Gordon	66.6	75.9	95.3	100.8
Hephzibah	67.2	76.6	96.4	102.3
MAXIMUM WIND SPEED REPORTED	**68.1**	**77.8**	**97.3**	**103.6**

Source: Hazus-MH 4.0

In addition to localized analysis that was performed at the county level, a state-generated Hazus report also provided useful information on hurricane risk using a probabilistic scenario. This report included information on a Category 1 hurricane and the estimated number of buildings damaged as well as the amount of debris that would be generated from hurricane wind. These can be found in **Table 6.8** and **Table 6.9**.

TABLE 6.8: CATEGORY 1 STORM DAMAGE FROM HURRICANE WIND

Location	Number of Buildings Damaged	Total Building Damage	Total Economic Loss	Loss Ratio
Augusta-Richmond County	951	$26,148,000	$37,195,000	0.24%

Source: The Polis Center, Georgia Department of Community Affairs, Hazus-MH 2.1

TABLE 6.9: CATEGORY 1 STORM DEBRIS GENERATED FROM HURRICANE WIND (TONS)

Location	Brick, Wood, and Other	Reinforced Concrete and Steel	Eligible Tree Debris	Other Tree Debris
Augusta-Richmond County	4,335	0	11,988	44,562

Source: The Polis Center, Georgia Department of Community Affairs, Hazus-MH 2.1

Social Vulnerability

Given equal susceptibility across Augusta-Richmond County, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Augusta-Richmond County, all critical facilities are considered to be at risk. Some buildings may perform better than others in the face of such an event due to construction and age, among other factors. Determining individual building response is beyond the scope of this plan. However, this plan will consider mitigation actions for vulnerable structures, including critical facilities, to reduce the impacts of the hurricane wind hazard. A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

In conclusion, a hurricane event has the potential to impact many existing and future buildings, critical facilities, and populations in Augusta-Richmond County. Hurricane events can cause substantial damage in their wake including fatalities, extensive debris clean-up, and extended power outages.

6.5.2 Earthquake

For the earthquake hazard vulnerability assessment, a probabilistic scenario was created to estimate the annualized loss for the county. Since the scenario is annualized, no building counts are provided. Losses reported included losses due to building damage (structural and non-structural), contents, and inventory. However, like the analysis for hurricanes, the comparative annualized loss figures at the end of this section only utilize building losses in order to provide consistency with other hazards. **Table 6.10** summarizes the findings.

TABLE 6.10: ANNUALIZED LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Structural Building Loss	Non-Structural Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Augusta-Richmond County	$250,000	$750,000	$287,000	$9,000	$1,296,000

Source: Hazus-MH 4.0

Social Vulnerability

It can be assumed that all existing and future populations are at risk to the earthquake hazard.

Critical Facilities

The Hazus probabilistic analysis indicated that no critical facilities would sustain measurable damage in an earthquake event. However, all critical facilities should be considered at-risk to minor to moderate damage, should an event occur. A list of individual critical facilities and their risk can be found in **Table 6.19**.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Augusta-Richmond County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes may result in structural damage. Impacts of earthquakes include debris clean-up, service disruption and, in severe cases, fatalities due to building collapse. Specific vulnerabilities for assets will be greatly dependent on their individual design and the mitigation measures in place, where appropriate. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates if data becomes available. Furthermore, mitigation actions to address earthquake vulnerability will be considered.

6.5.3 Flood

Historical evidence indicates that Augusta-Richmond County is susceptible to flood events. A total of 24 flood events have been reported by the National Climatic Data Center, resulting in over $800,000 (2016 dollars) in property damage. Additionally, there have been over $3.3 million in claims paid to residents via the National Flood Insurance Program.

In order to assess flood risk, a GIS-based analysis was used to estimate exposure to flood events using Digital Flood Insurance Rate Map (DFIRM) data in combination with local building footprints and parcel/tax assessor records for Augusta-Richmond County and each of the municipalities in this plan. The determination of value at-risk (exposure) was calculated using GIS analysis by summing the 2016 values for only those properties that were confirmed to be located within an identified floodplain. **Table 6.11** presents the potential at-risk property. Both the number of buildings, parcels, and the approximate value are presented.

TABLE 6.11: ESTIMATED EXPOSURE OF PARCELS/BUILDINGS TO THE FLOOD HAZARD

Location	1.0-percent ACF			0.2-percent ACF		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	4,599	4,689	$1,128,165,630	712	1,016	$371,111,787
Blythe	0	5	$1,292,352	0	0	$0
Fort Gordon*	--	--	--	--	--	--
Hephzibah	131	277	$31,207,022	40	110	$17,919,255
AUGUSTA-RICHMOND COUNTY TOTAL	**4,730**	**4,971**	**$1,160,665,004**	**752**	**1,126**	**$389,031,042**

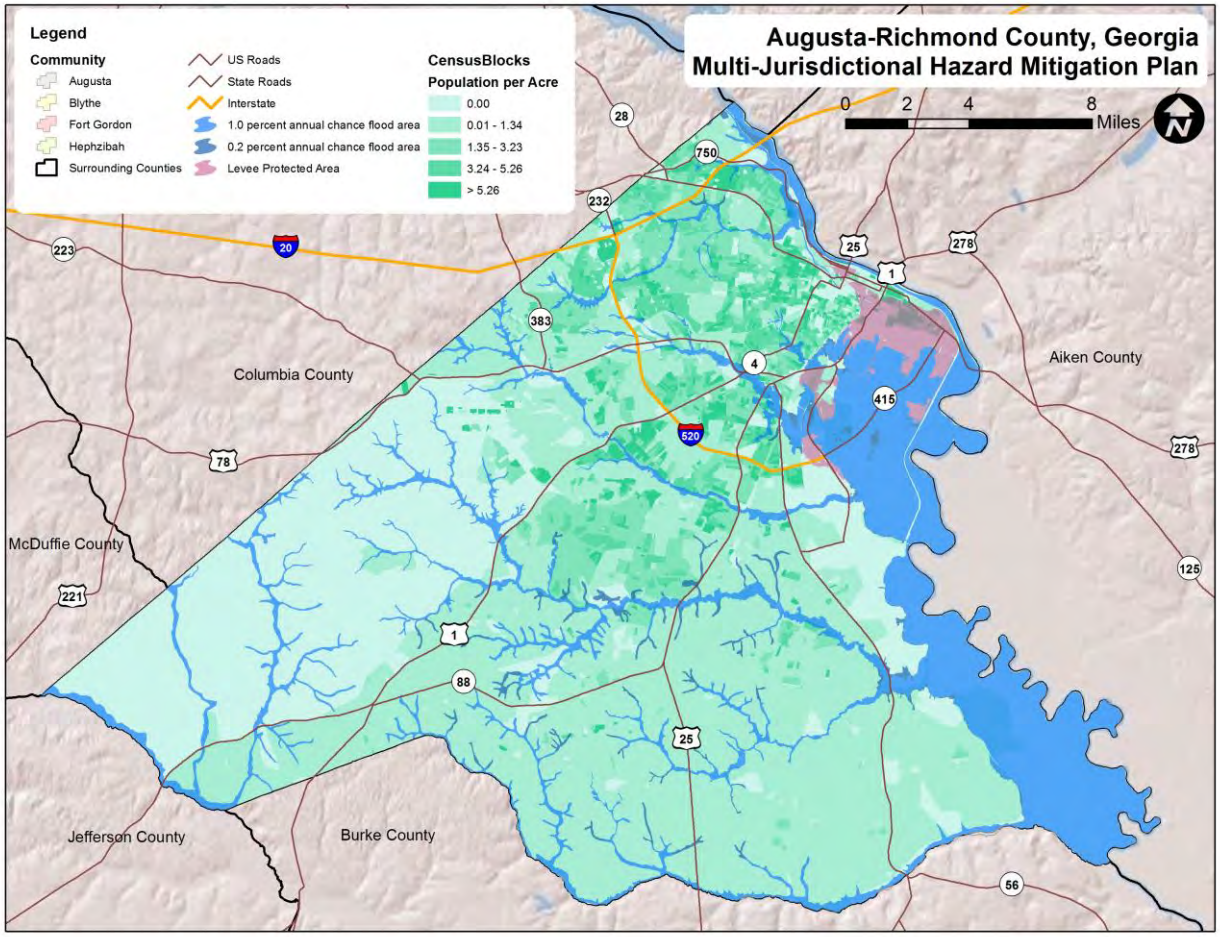
**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in both the 1.0 percent and 0.2 percent ACF areas.*
Source: Federal Emergency Management Agency DFIRM

In addition to localized analysis that was performed at the county level, a state-generated Hazus report also provided useful information on flood risk using a probabilistic scenario. This report included information on a 1 percent annual chance flood and the estimated number of households displaced as well as the amount of debris that would be generated from this level of flood event. According to this analysis from the Polis Center, 2,921 households would be displaced due to a 1 percent annual chance flood event. This represents an estimated 8,762 individuals, 6,419 of which will require short term public sheltering. In terms of flood debris, there would be an estimated 78,154 tons of debris, which breaks down into the following categories: Finishes- 25,026 tons, Structures- 31,025 tons, Foundations- 22,103 tons.

Social Vulnerability

U.S. Census 2010 population at the tract level was used for analysis to determine where areas of high population concentration intersect with flood prone areas in the county. **Figure 6.4** is presented to gain a better understanding of the at-risk population.

FIGURE 6.4 : POPULATION DENSITY NEAR FLOODPLAINS



Source: FEMA DFIRM, United States Census 2010

Critical Facilities

The critical facility analysis revealed that there are 4 critical facilities located in the either the 1.0-percent annual chance or 0.2 percent annual chance floodplain. One of these facilities is a water pump station which in some cases are necessarily located within the floodplain. The remaining three facilities are a recycling center, a government recreation facility, and a private sector business (as previously noted, this analysis does not consider building elevation, which may negate risk.) A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

In conclusion, a flood has the potential to impact many existing and future buildings, facilities, and populations in Augusta-Richmond County, though some areas are at a higher risk than others. All types of structures in a floodplain are at-risk, though elevated structures will have a reduced risk. As noted, the floodplains used in this analysis include the 100-year and 500-year FEMA regulated floodplain boundaries. It is certainly possible that more severe events could occur beyond these boundaries and urban (flash) flooding could certainly impact additional structures. Such site-specific vulnerability determinations are outside the scope of this assessment but will be considered during future plan updates. Furthermore, areas subject to repetitive flooding should be analyzed for potential mitigation actions.

6.5.4 Hazardous Materials Incident

Historical evidence indicates that Augusta-Richmond County is susceptible to chemical hazard events. A total of 339 HAZMAT incidents have been reported by the Pipeline and Hazardous Materials Safety Administration since 1971, resulting in over $700,000 (2016 dollars) in property damage and 27 injuries.

Most hazardous materials incidents that occur are contained and suppressed before destroying any property or threatening lives. However, they can have a significant negative impact. Such events can cause deaths, completely shut down facilities, and cause affected properties to be destroyed or suffer major damage.

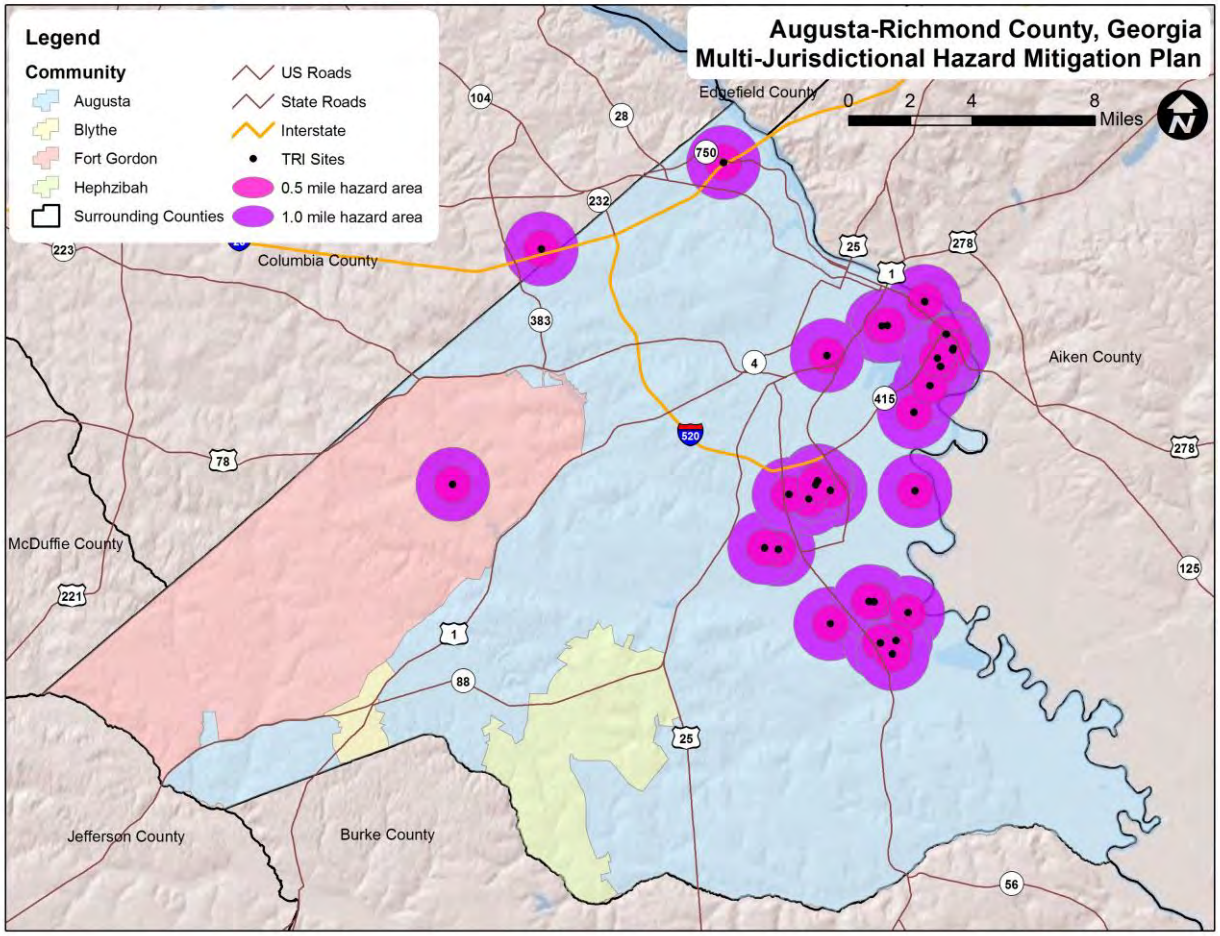
In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Weather conditions will directly affect how the hazard develops. Certain chemicals may travel through the air or water, affecting a much larger area than the point of the incidence itself. Non-compliance with fire and building codes, as well as failure to maintain existing fire and containment features, can substantially increase the damage from a hazardous materials release. The duration of a hazardous materials incident can range from hours to days. Warning time is minimal to none.

In order to conduct the vulnerability assessment for this hazard, GIS analysis was used to determine overlap areas for fixed and mobile areas with building footprints/parcels.[3] In both the fixed and mobile scenarios, two sizes of buffers—0.5-mile and 1.0-mile—were used. These areas are assumed to respect the different levels of effect: immediate (primary) and secondary. Primary and secondary impact sites were selected based on guidance from the PHMSA Emergency Response Guidebook, but it should be noted that specific chemical buffer areas were not determined for each fixed site. Since many fixed sites contain multiple hazardous chemicals and also because, in the event of a mobile incident, it would be impossible to determine ahead of time what chemical was going to be released, the aforementioned standard buffer distances were universally used to determine risk areas.

For the fixed site analysis, geo-referenced TRI and Tier II listed toxic sites in Augusta-Richmond County, along with buffers, were used for analysis as shown in **Figure 6.5** and **Figure 6.6.** For the mobile analysis, the major roads (Interstate highway, U.S. highway, and State highway) and railroads, where hazardous materials are primarily transported were used for the GIS buffer analysis. **Figure 6.7** and **Figure 6.8** show the areas used for mobile toxic release buffer analysis. The results indicate the approximate number of parcels/buildings and improved value, as shown in **Table 6.12** (TRI fixed sites), **Table 6.13** (Tier II fixed sites), **Table 6.14** (mobile road sites) and **Table 6.15** (mobile railroad sites).[4]

[3] This type of analysis will likely yield inflated results (generally higher than what is actually reported after an actual event).
[4] Note that parcels included in the 1.0-mile analysis are also included in the 0.5-mile analysis.

FIGURE 6.5: FIXED FACILITY TOXIC RELEASE INVENTORY SITES WITH BUFFERS IN AUGUSTA-RICHMOND COUNTY



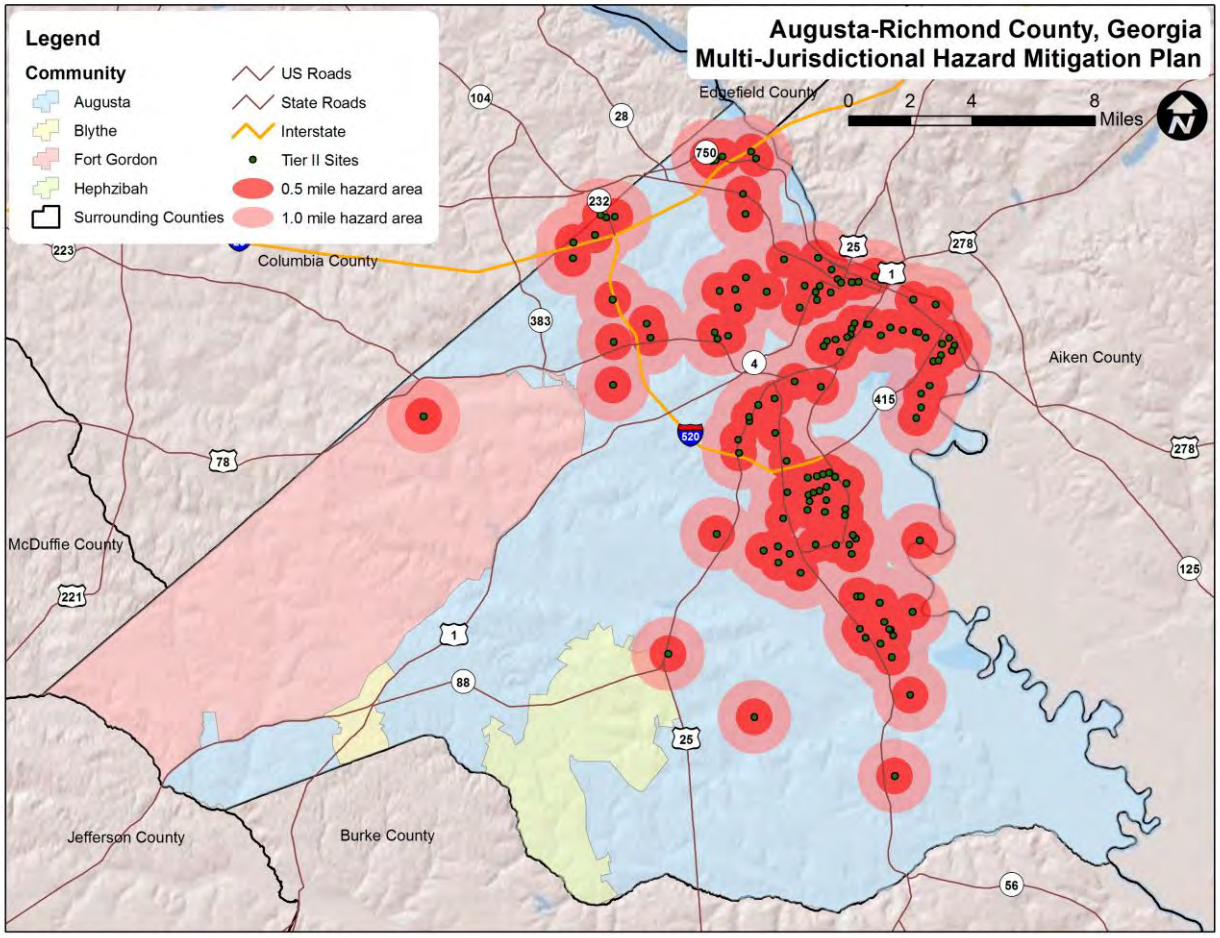
Source: Environmental Protection Agency

TABLE 6.12: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (TRI FIXED SITES)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	5,892	3,070	$713,203,483	16,560	11,173	$1,769,358,216
Blythe	0	0	$0	0	0	$0
Fort Gordon*	--	--	--	--	--	--
Hephzibah	0	0	$0	0	0	$0
AUGUSTA-RICHMOND COUNTY TOTAL	**5,892**	**3,070**	**$713,203,483**	**16,560**	**11,173**	**$1,769,358,216**

**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in both the 0.5 mile and 1.0 mile hazard areas.*

FIGURE 6.6: FIXED FACILITY TIER II SITES WITH BUFFERS IN AUGUSTA-RICHMOND COUNTY



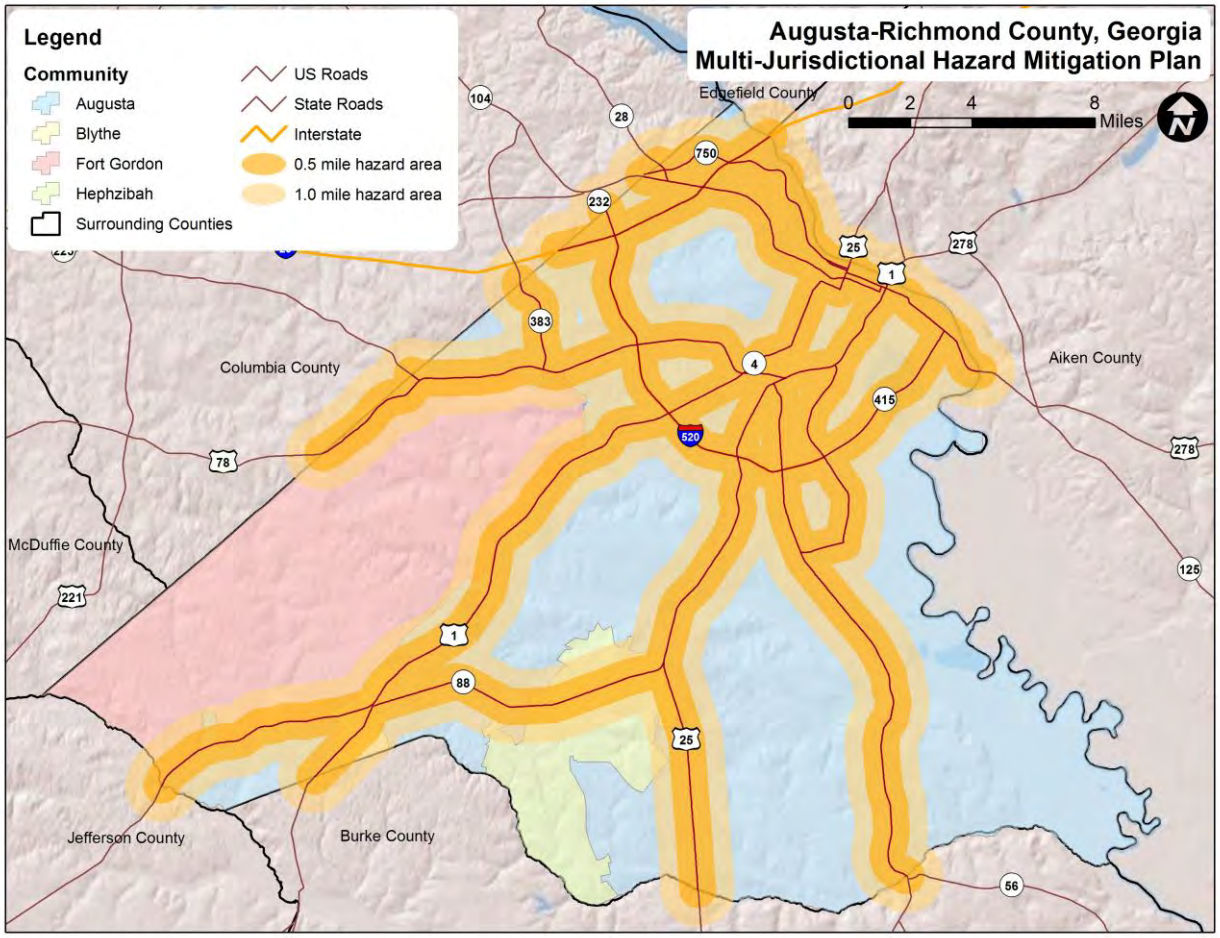
Source: Environmental Protection Agency

TABLE 6.13: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS (TIER II FIXED SITES)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	38,354	26,055	$5,082,314,606	68,930	46,022	$7,696,872,527
Blythe	0	0	$0	0	0	$0
Fort Gordon*	--	--	--	--	--	--
Hephzibah	87	51	$7,361,428	216	92	$11,521,958
AUGUSTA-RICHMOND COUNTY TOTAL	**38,441**	**26,106**	**$5,089,676,034**	**69,146**	**46,114**	**$7,708,394,485**

**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in both the 0.5 mile and 1.0 mile hazard areas.*

FIGURE 6.7: MOBILE HAZMAT BUFFERS FOR ROADS IN AUGUSTA-RICHMOND COUNTY



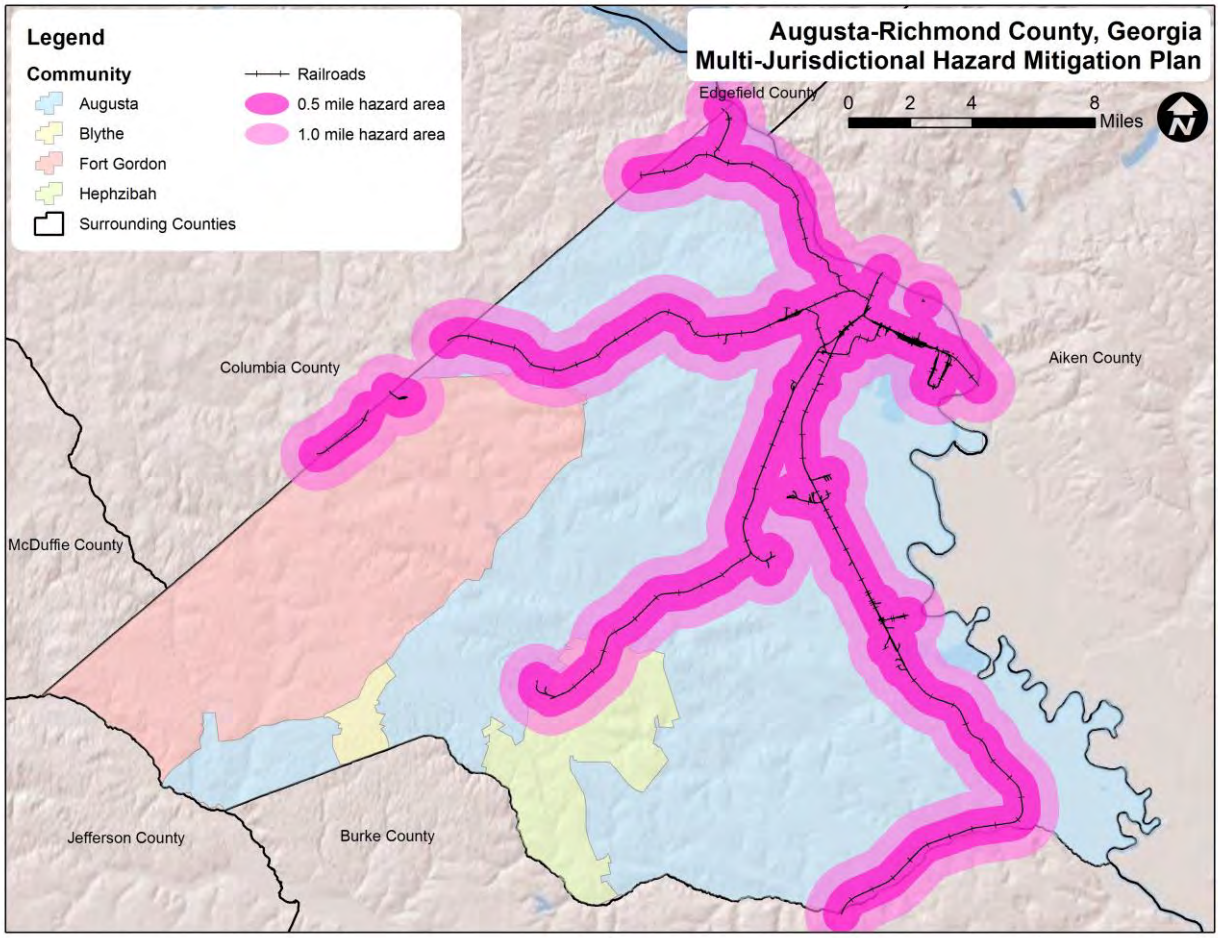
Source: United States Department of Transportation

TABLE 6.14: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - ROAD)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	62,886	41,732	$6,554,380,151	92,984	61,338	$8,827,413,010
Blythe	670	440	$334,823,236	735	478	$336,660,070
Fort Gordon*	--	--	--	--	--	--
Hephzibah	1,219	656	$69,381,547	1,934	1,105	$132,357,178
AUGUSTA-RICHMOND COUNTY TOTAL	**64,775**	**42,828**	**$6,958,584,934**	**95,653**	**62,921**	**$9,296,430,258**

**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in both the 0.5 mile and 1.0 mile hazard areas.*

FIGURE 6.8: MOBILE HAZMAT BUFFERS FOR RAILROADS IN AUGUSTA-RICHMOND COUNTY



Source: United States Department of Transportation

TABLE 6.15: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - RAILROAD)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	38,817	26,570	$4,158,890,954	64,744	42,527	$6,366,051,365
Blythe	0	0	$0	0	0	$0
Fort Gordon*	--	--	--	--	--	--
Hephzibah	851	488	$47,345,791	1,230	721	$84,593,990
AUGUSTA-RICHMOND COUNTY TOTAL	**39,668**	**27,058**	**$4,206,236,745**	**65,974**	**43,248**	**$6,450,645,355**

**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in both the 0.5 mile and 1.0 mile hazard areas.*

Social Vulnerability

Given high susceptibility across Augusta-Richmond County, it is assumed that the total population is at risk to hazardous materials incidents. It should be noted that areas of population concentration may be at an elevated risk due to a greater burden to evacuate population quickly.

Critical Facilities

Fixed Site Analysis:

The critical facility analysis for fixed TRI sites revealed that there are 35 facilities located in a hazard risk zone. The primary impact zone includes 12 facilities of the following types: one government, one law enforcement, two private sector, three schools, one transportation, one university, and three utility. The remaining facilities are in the secondary, 1.0-mile, zone.

The critical facility analysis for fixed Tier II sites revealed that there are 123 facilities located in a hazard risk zone. The primary impact zone includes 95 facilities. The remaining facilities are in the secondary, 1.0-mile, zone. A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

Mobile Analysis:

The critical facility analysis for road and railroad transportation corridors revealed that there are 153 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 119 critical facilities located in the railroad HAZMAT buffer areas. The primary impact zone for roads includes 120 facilities and the primary impact zone for railroads includes 85 facilities. It should be noted that many of the facilities located in the buffer areas for railroad are also located in the buffer areas for road. A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in Augusta-Richmond County. Those areas in a primary buffer are at the highest risk, though all areas carry some vulnerability due to variations in conditions that could alter the impact area such direction and speed of wind, volume of release, etc.

6.5.5 Nuclear Accident

The location of Vogtle Nuclear Power Plant southeast of Augusta-Richmond County demonstrates that the county is at some risk to the effects of a nuclear accident. Although there have not been any major events at this plant in the past, there have been major events at other nuclear stations around the country. Additionally, smaller scale incidents at Vogtle Nuclear Power Plant have occurred.

In order to assess nuclear risk, a GIS-based analysis was used to estimate exposure during a nuclear event within each of the risk zones described in *Section 5: Hazard Profiles*. The determination of assessed value at-risk (exposure) was calculated using GIS analysis by summing the total values for those properties that were confirmed to be located within one of the risk zones. **Table 6.16** presents potential at-risk properties in the 10-mile and 50-mile buffer zones. The number of buildings, parcels, and the approximate value are presented.

TABLE 6.16: ESTIMATED EXPOSURE OF PARCELS/BUILDINGS TO A NUCLEAR ACCIDENT

Location	10-mile buffer			50-mile buffer		
	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels	Approx. Number Buildings	Approx. Number of Parcels	Approx. Value of Parcels
Augusta-Richmond County	0	3	$2,716,529	120,990	78,420	$11,018,916,286
Blythe	0	0	$0	735	478	$336,660,070
Fort Gordon*	--	--	--	--	--	--
Hephzibah	0	0	$0	3,956	2,063	$212,243,872
AUGUSTA-RICHMOND COUNTY TOTAL	**0**	**3**	**$2,716,529**	**125,681**	**80,961**	**$11,567,820,228**

Source: International Atomic Energy Agency

Social Vulnerability

Since a small area in the southeast part of the county is within the 10-mile buffer area, this segment of the population is considered to be at highest risk to a nuclear accident. However, other populations in the county may also be at some risk.

Critical Facilities

The critical facility analysis revealed that all of 190 critical facilities are located in the 50-mile nuclear buffer area. None are located in the 10-mile buffer area. A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

In conclusion, a nuclear accident has the potential to impact many existing and future buildings, facilities, and populations in the Augusta-Richmond County, though areas in the southeast of the county are at a higher risk than others.

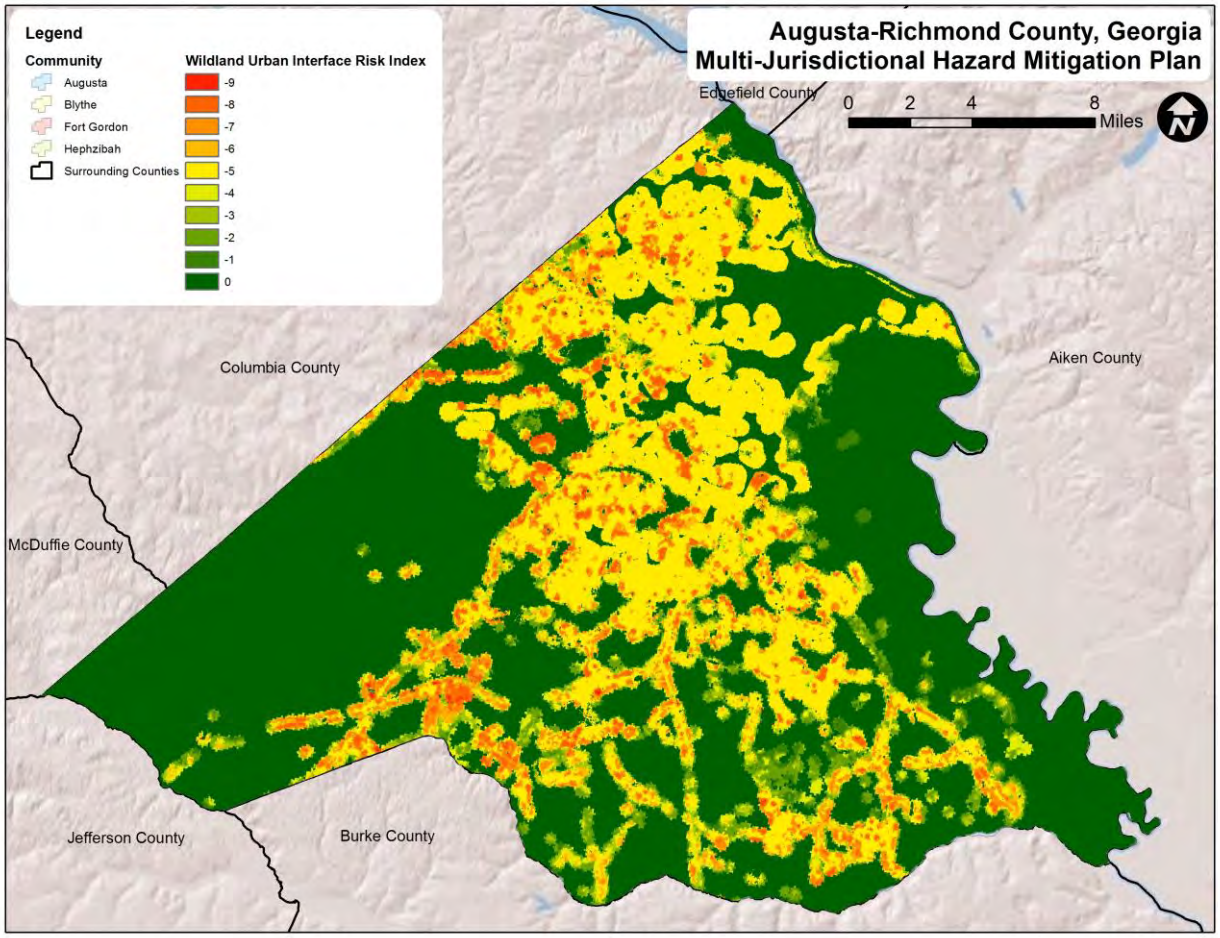
6.5.6 Wildfire

Historical evidence indicates that Augusta-Richmond County is susceptible to wildfire events. An annual average of 38 wildfires were reported by the Georgia Forestry Commission from 2007 to 2016.

To estimate exposure to wildfire, the approximate number of parcels and their associated improved value was determined using GIS analysis. For the critical facility analysis, areas of risk were intersected with critical facility locations. **Figure 6.9** shows the Wildland Urban Interface Risk Index (WUIRI) data, which is a data layer that shows a rating of the potential impact of a wildfire on people and their homes. The key input, Wildland Urban Interface (WUI), reflects housing density (houses per acre) consistent with Federal Register National standards. The location of people living in the WUI and rural areas is key information for defining potential wildfire impacts to people and homes. Initially provided as raster data, it was converted to a polygon to allow for analysis. The Wildland Urban Interface Risk Index data ranges from 0 to -9 with lower values being most severe (as noted previously, this is only a measure of relative risk). **Figure 6.10** shows the areas of analysis where any grid cell is less than -5. Areas with a value below -5 were chosen to be displayed as areas of risk because this showed the upper echelon of the scale and the areas at highest risk.

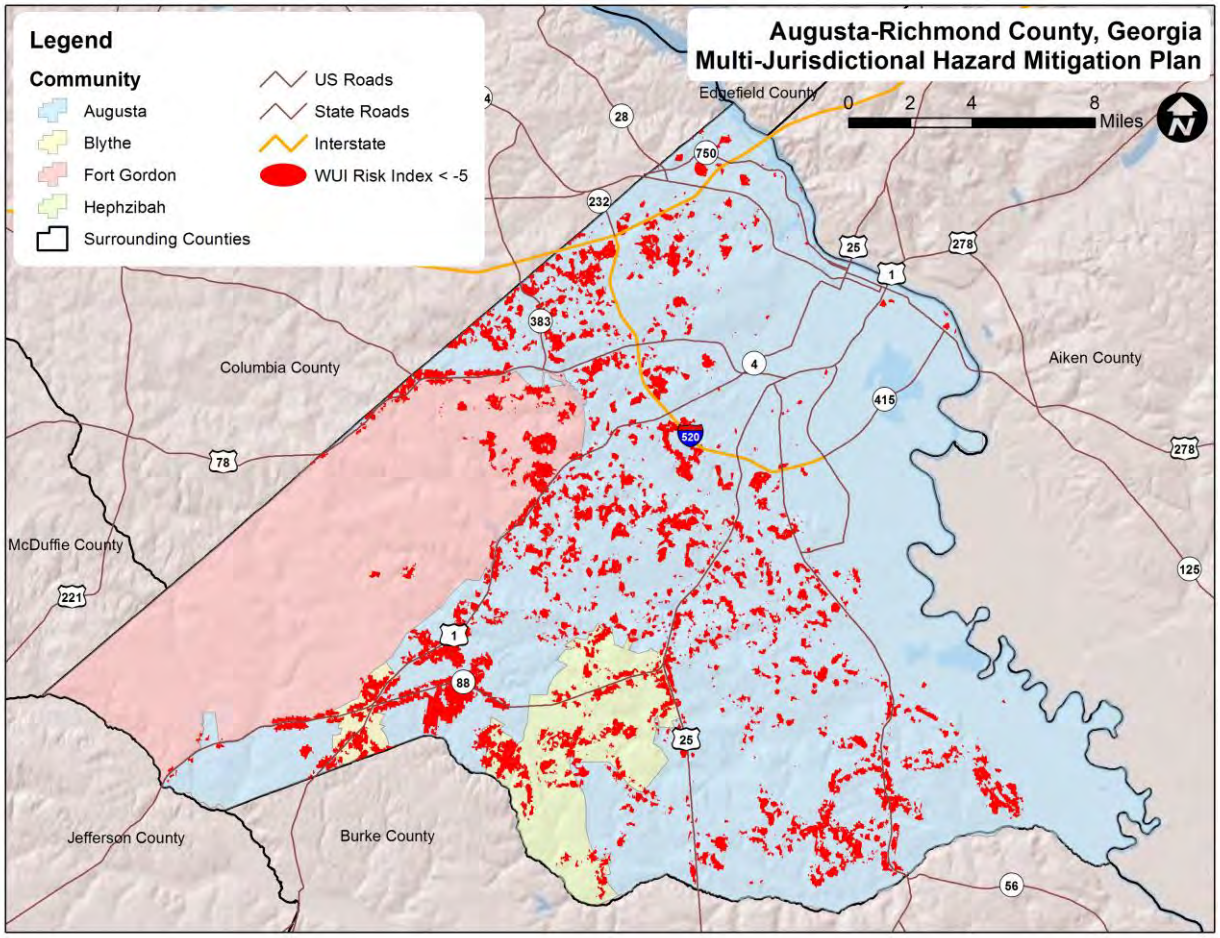
Table 6.17 shows the results of the analysis.

FIGURE 6.9: WUI RISK INDEX AREAS IN AUGUSTA-RICHMOND COUNTY



Source: Southern Wildfire Risk Assessment Data

FIGURE 6.10: WILDFIRE RISK AREAS IN AUGUSTA-RICHMOND COUNTY



Source: Southern Wildfire Risk Assessment Data

TABLE 6.17: EXPOSURE OF IMPROVED PROPERTY TO WILDFIRE RISK AREAS

	HIGH WILDFIRE RISK AREA		
Location	**Approx. Number Buildings**	**Approx. Number of Parcels**	**Approx. Value of Parcels**
Augusta-Richmond County	13,868	14,300	$2,433,152,640
Blythe	452	364	$332,086,685
Fort Gordon*	--	--	--
Hephzibah	1,379	1,193	$132,925,088
AUGUSTA-RICHMOND COUNTY TOTAL	**15,699**	**15,857**	**$2,898,164,413**

**Since spatial data on Fort Gordon is limited to a single parcel and associated dollar value, assessing vulnerability based on this information would either lead to an overestimate or an underestimate of countywide risk. Therefore, the Fort Gordon numbers are not included, though it should be noted that areas of Fort Gordon are located in the wildfire risk area.*

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. According to Census block analysis, there are around 105,952 people located in blocks that are in the aforementioned wildfire risk zone. However, it is assumed that the population is at relatively low risk to

the wildfire hazard compared to many areas of the country due to the high density of development in the county.

Critical Facilities

The critical facility analysis revealed that there are 16 critical facilities located in the wildfire risk area (areas where the WUIRI is less than -5): one fire station, two government, three law enforcement, three medical, one private sector, three schools, one university, and two utility. However, it should also be noted, that several factors could impact the spread of a wildfire putting all facilities at some risk. A list of specific critical facilities and their associated risk can be found in **Table 6.19** at the end of this section.

In conclusion, a wildfire event has the potential to impact some existing and future buildings, critical facilities, and populations in Augusta-Richmond County.

6.6 CONCLUSIONS ON HAZARD VULNERABILITY

The results of this vulnerability assessment are useful in at least three ways:

- Improving our understanding of the risk associated with the hazards in Augusta-Richmond County through better understanding of the complexities and dynamics of risk, how levels of risk can be measured and compared, and the myriad of factors that influence risk. An understanding of these relationships is critical in making balanced and informed decisions on managing the risk.
- Providing a baseline for policy development and comparison of mitigation alternatives. The data used for this analysis presents a current picture of risk in Augusta-Richmond County. Updating this risk "snapshot" with future data will enable comparison of the changes in risk with time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in the region.
- Comparing the risk among the hazards addressed. The ability to quantify the risk to all these hazards relative to one another helps in a balanced, multi-hazard approach to risk management at each level of governing authority. This ranking provides a systematic framework to compare and prioritize the very disparate hazards that are present in Augusta-Richmond County. This final step in the risk assessment provides the necessary information for local officials to craft a mitigation strategy to focus resources on only those hazards that pose the most threat to Augusta-Richmond County and its municipalities.

Exposure to hazards can be an indicator of vulnerability. Economic exposure can be identified through locally assessed values for improvements (buildings), and social exposure can be identified by estimating the population exposed to each hazard. This information is especially important for decision-makers to use in planning for evacuation or other public safety related needs.

The types of assets included in these analyses include all building types in the participating jurisdictions. Specific information about the types of assets that are vulnerable to the identified hazards is included in each hazard subsection (for example all building types are considered at risk to the winter storm hazard and primarily residential buildings are at risk to repetitive flooding, etc.).

Table 6.18 presents a summary of annualized loss for each hazard in Augusta-Richmond County. Due to the reporting of hazard damages primarily at the county level and the fact that Blythe and Hephzibah

are relatively small municipalities, it was determined that a specified annualized loss estimate for each municipality would be redundant. Therefore, annualized loss was determined using the damage reported from historical occurrences at the county level. These values should be used as an additional planning tool or measure risk for determining hazard mitigation strategies throughout the county.

TABLE 6.18: ANNUALIZED LOSS FOR AUGUSTA-RICHMOND COUNTY*

Event	Augusta-Richmond County
Natural Hazards	
Drought	Not Available
Earthquake	$250,000
Extreme Heat	Not Available
Flooding	$42,980
Hail	$504
Hurricane/Tropical Storm	$1,816,000
Infectious Disease	Not Available
Lightning	$41,926
Severe Winter Storm	Not Available
Solar Flare/EMP	Not Available
Tornado	$976,120
Wildfire	Not Available
Windstorm/Thunderstorm	$71,978
Technological/Man-Made Hazards	
Chemical Hazard	$17,154
Cyberterrorism	Not Available
Dam/Levee Failure	Not Available
Nuclear Power Plant Incident	Not Available
Terrorism	Not Available
Utility Failure	Not Available

*In this table, the term "Not Available" is used to indicate that no property damage for the particular hazard was recorded. This could be the case either because there were no events that caused dollar damage or because documentation of that particular type of event is not well-kept or readily available.

As noted previously, all existing and future buildings and populations (including critical facilities) are vulnerable to atmospheric hazards including drought, extreme heat, hail, hurricane and tropical storm, lightning, severe winter storm, tornado, and windstorm/thunderstorm. All existing and future buildings are also vulnerable to many of the technological/man-made hazards including cyberterrorism, terrorism, and utility failure. Some buildings may be more vulnerable to these hazards based on construction and building type. **Table 6.19** shows the critical facilities vulnerable to hazards analyzed in this section. The table lists those assets that are determined to be exposed to each of the identified hazards (marked with an "**X**").

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TABLE 6.19: AT-RISK CRITICAL FACILITIES IN AUGUSTA-RICHMOND COUNTY

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Augusta-Richmond County																												
Richmond County E9-1-1 Dispatch	Emergency Management	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Richmond County Emergency Management	Emergency Management	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Richmond County Emergency Operations Center	Emergency Management	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Augusta Regional Airport Fire Department	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Fire Station #1	Fire Station	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Fire Station #10	Fire Station	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X		X	X		X	X	X
Fire Station #11	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Fire Station #12	Fire Station	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Fire Station #13	Fire Station	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Fire Station #15	Fire Station	X	X	X			X	X	X	X	X	X	X		X				X		X			X		X	X	X
Fire Station #16	Fire Station	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Fire Station #17	Fire Station	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X		X	X		X	X	X
Fire Station #18	Fire Station	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Fire Station #19	Fire Station	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Fire Station #2	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE													
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Fire Station #3	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Fire Station #4	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Fire Station #5	Fire Station	X	X	X			X	X	X	X	X	X	X		X		X	X	X		X	X	X	X		X	X	X
Fire Station #6	Fire Station	X	X	X			X	X	X	X	X	X	X		X				X	X	X			X		X	X	X
Fire Station #7	Fire Station	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Fire Station #8	Fire Station	X	X	X			X	X	X	X	X	X	X		X				X		X		X	X		X	X	X
Fire Station #9	Fire Station	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
Augusta Fire Department Administration Building	Government	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Augusta Information Technology Building	Government	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Augusta Judicial Center	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta Municipal Building	Government	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Augusta Public Defenders Office	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta Solid Waste	Government	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
Bernie Ward Center	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Brigham Community Center	Government	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Carrie J. Mays Parks	Government	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Diamond Lakes Community Center	Government	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Garrett Gymnasium	Government	X	X	X			X	X	X	X	X	X	X		X				X	X	X	X	X	X		X	X	X
May Park	Government	X	X	X			X	X	X	X	X	X	X	X	X		X		X	X	X	X	X	X		X	X	X
McDuffie Woods Park	Government	X	X	X			X	X	X	X	X	X	X		X			X	X		X			X		X	X	X
New Savannah Bluff Lock & Dam Park/Boat Ramp	Government	X	X	X	X		X	X	X	X	X	X	X		X			X	X					X		X	X	X
Richmond County Coroner	Government	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
Richmond County Juvenile Court	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Richmond County School System Central Office	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
W. T. Johnson Center	Government	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Warren Road Park	Government	X	X	X			X	X	X	X	X	X	X		X					X	X		X	X		X	X	X
Charles B. Webster Detention Center	Law Enforcement	X	X	X			X	X	X	X	X	X	X	X	X		X		X		X	X	X	X		X	X	X
City of Hephzibah - Police Department	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Georgia Regional Youth Detention Center	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
Georgia Regional Youth Development Center	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Richmond County Correctional Institution	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Richmond County Marshal's Office	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Richmond County Sheriff's Office	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Richmond County Sheriff's Office Training Center	Law Enforcement	X	X	X			X	X	X	X	X	X	X	X	X						X			X		X	X	X
Richmond County Sheriff's Office, Daniel Village Substation	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Richmond County Sheriff's Office, Southgate Plaza Substation	Law Enforcement	X	X	X			X	X	X	X	X	X	X		X				X	X	X		X	X		X	X	X
Augusta University - Children's Hospital	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta University Medical Center	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Charlie Norwood VA Medical Center Downtown	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Charlie Norwood VA Medical Center Uptown	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X				X	X		X	X	X
Doctor's Hospital	Medical	X	X	X			X	X	X	X	X	X	X	X	X			X	X	X	X			X		X	X	X
Environmental Health - Clinic	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Georgia Regional Hospital - Augusta Campus	Medical	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Gracewood State School & Hospital	Medical	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Harrington Park Health & Rehab- Skilled Nursing Facility (58 beds)	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X			X		X	X	X
JMS Burn Center	Medical	X	X	X			X	X	X	X	X	X	X	X	X			X	X	X	X			X		X	X	X
Richmond County Clinic - South Augusta	Medical	X	X	X			X	X	X	X	X	X	X	X	X						X			X		X	X	X
Richmond County Health Department - Laney Walker	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X		X	X	X	X		X	X	X
Richmond County Health Department - North Leg	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Ronald McDonald House	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Trinity Hospital	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X				X	X		X	X	X
University Hospital	Medical	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Machine and Welding Supply Company dba Arc3 Gases South - AG	Private Sector	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Nelson Brothers, LLC	Private Sector	X	X	X	X		X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
New Cingular Wireless PCS	Private Sector	X	X	X			X	X	X	X	X	X	X	X	X			X	X	X	X			X		X	X	X
Potters Industries, LLC	Private Sector	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X	X	X
Westrock Augusta Recycle	Private Sector	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
A. Brian Merry Elementary	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
A. Dorothy Hains Elementary	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE													
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
A. R. Johnson Health Science and Engineering Magnet	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Academy of Richmond County High	School	X	X	X			X	X	X	X	X	X	X		X				X		X		X	X		X	X	X
Alleluia Community	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Alternative Education Center at Lamar	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X	X	X	X		X	X	X
Aquinas High	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X		X	X		X	X	X
Augusta Preparatory Day	School	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X			X		X	X	X
Barton Chapel Elementary	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Bayvale Elementary	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X		X	X		X	X	X
Butler High	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
C. T. Walker Magnet	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X	X	X	X		X	X	X
Copeland Elementary	School	X	X	X			X	X	X	X	X	X	X		X				X		X		X	X		X	X	X
Craig-Houghton Elementary	School	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
Cross Creek High	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X		X	X		X	X	X
Curtis Baptist School	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Davidson Fine Arts Magnet	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Deer Chase Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Diamond Lakes Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
East Augusta Middle	School	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Ebenezer Seventh Day Adventist Junior Academy	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X	X	X	X		X	X	X
Episcopal Day	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X			X		X	X	X
Garrett Elementary	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X	X	X	X		X	X	X
Glenn Hills Elementary	School	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Glenn Hills High	School	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Glenn Hills Middle	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X			X		X	X	X
Goshen Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Gracewood Elementary	School	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Hillcrest Baptist	School	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Immaculate Conception	School	X	X	X			X	X	X	X	X	X	X		X			X	X		X	X	X	X		X	X	X
Jamestown Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Jenkins-White Elementary	School	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Lake Forest Hills Elementary	School	X	X	X			X	X	X	X	X	X	X		X								X	X		X	X	X
Lamar-Milledge Elementary	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Langford Middle	School	X	X	X			X	X	X	X	X	X	X		X				X					X		X	X	X
Lucy C. Laney High	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
McBean Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE													
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Meadowbrook Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Monte Sano Elementary	School	X	X	X			X	X	X	X	X	X	X		X			X	X				X	X		X	X	X
Morgan Road Middle	School	X	X	X			X	X	X	X	X	X	X	X	X									X		X	X	X
National Hills Elementary	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Pine Hill Middle	School	X	X	X			X	X	X	X	X	X	X	X	X				X		X			X		X	X	X
Reaching Potential Through Manufacturing (RPM)	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Richmond County Technical Career Magnet	School	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X
Rollins Elementary	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X		X	X		X	X	X
Sands Hills Center	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
Sego Middle	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X		X	X		X	X	X
Southside Elementary	School	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Spirit Creek Middle	School	X	X	X			X	X	X	X	X	X	X		X							X	X	X		X	X	X
St. Mary's on the Hill (St. Joseph Academy)	School	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Sue Reynolds Elementary	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
T. W. Josey High	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X	X	X	X		X	X	X
Terrace Manor Elementary	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
Terrell Academy	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE													
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Tobacco Road Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Tubman Performance Learning Center	School	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Tutt Middle	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
W. S. Hornsby K-8 School	School	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
Warren Road Elementary	School	X	X	X			X	X	X	X	X	X	X		X					X	X		X	X		X	X	X
Westminister Schools of Augusta	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Westside High	School	X	X	X			X	X	X	X	X	X	X		X		X		X	X	X	X	X	X		X	X	X
Wheeless Road Elementary	School	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Wilkinson Gardens Elementary	School	X	X	X			X	X	X	X	X	X	X		X				X	X	X		X	X		X	X	X
Willis Foreman Elementary	School	X	X	X			X	X	X	X	X	X	X		X							X	X	X		X	X	X
Windsor Spring Elementary	School	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Augusta Public Transit (Bus Service)	Transportation	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta Regional Airport	Transportation	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
CSXT Augusta Shops	Transportation	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X	X	X
Daniel Field	Transportation	X	X	X			X	X	X	X	X	X	X		X			X	X				X	X		X	X	X
Augusta University Student Housing	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta Technical College	University	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Augusta University - Health Sciences Campus	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta University - Summerville Campus	University	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Augusta University Christenberry Fieldhouse	University	X	X	X			X	X	X	X	X	X	X		X								X	X		X	X	X
Elanco Augusta Technology Center	University	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X		X		X	X		X	X	X
Paine College	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Paine College- 220 Bed Dormitory	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
University of Phoenix - Augusta Campus	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X			X		X	X	X
Virginia College Augusta	University	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Augusta-Richmond County Utilities	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X		X	X		X	X	X
Augusta-Richmond Utilities Plant 1	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Augusta-Richmond Utilities Plant 2	Utility	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X		X	X		X	X	X
Augusta-Richmond Utilities Spirit Creek Plant 3	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Augusta Solid Waste Natural Gas Fuel Station	Utility	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Augusta Wastewater Treatment Plant	Utility	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
Augusta Water Pump Station	Utility	X	X	X	X		X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Augusta Water Treatment	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Augusta Water Treatment Plant	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Augusta Water Works	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
CMC Recycling Augusta	Utility	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X		X	X	X	X		X	X	X
Comcast of Georgia/South Carolina, LLC	Utility	X	X	X			X	X	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X	X	X
Comcast of Georgia/South Carolina, LLC	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X					X		X	X	X
Georgia Power Company - Augusta North Leg Operating Headquarters	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
James Messerly Water	Utility	X	X	X			X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X		X	X	X
N. Max Hicks Water Treatment Plant	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X		X	X		X	X	X
Spirit Creek Waste Water Pumping Station	Utility	X	X	X			X	X	X	X	X	X	X		X			X	X		X	X	X	X		X	X	X
Blythe																												
Fire Station #14	Fire Station	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X
Blythe City Hall	Government	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE													
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
Blythe Police Department	Law Enforcement	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X
Blythe Elementary	School	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
City of Blythe Treatment Plant #2 (Old Well)	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
City of Blythe Water System	Utility	X	X	X			X	X	X	X	X	X	X	X	X					X	X			X		X	X	X
City of Blythe Water Tower	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X			X		X	X	X
Fort Gordon																													
Fort Gordon Fire Station 1	Fire Station	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Fort Gordon Fire Station 2	Fire Station	X	X	X			X	X	X	X	X	X	X		X			X	X	X	X	X	X	X		X	X	X
Dwight D. Eisenhower Army Medical Center	Medical	X	X	X			X	X	X	X	X	X	X		X						X		X	X		X	X	X
Freedom Park Elementary School	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X
Hephzibah																													
Hephzibah City Hall	Government	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Hephzibah Fire Department	Fire Station	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Hephzibah Comprehensive High	School	X	X	X			X	X	X	X	X	X	X		X						X		X	X		X	X	X
Hephzibah Elementary	School	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Hephzibah Middle	School	X	X	X			X	X	X	X	X	X	X		X						X			X		X	X	X

FACILITY NAME	FACILITY TYPE	NATURAL														TECHNOLOGICAL/MAN-MADE												
		Drought	Earthquake	Extreme Heat	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane/Tropical Storm	Infectious Disease	Lightning	Severe Winter Storm	Solar Flare/EMP	Tornado	Wildfire	Windstorm/Thunderstorm	Fixed TRI Site 0.5-mile	Fixed TRI Site 1.0-mile	Fixed Tier II Site 0.5 mile	Fixed Tier II Site 1.0 mile	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Cyberterrorism	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Terrorism	Utility Failure
City of Hephzibah Water System	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Hephzibah-Oakridge - Water Tower	Utility	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Water Tank	Utility	X	X	X			X	X	X	X	X	X	X		X						X		X	X		X	X	X
Water Tank & 2 Wells	Utility	X	X	X			X	X	X	X	X	X	X		X									X		X	X	X
Water Tank and Well	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X
Well Water	Utility	X	X	X			X	X	X	X	X	X	X		X					X	X	X	X	X		X	X	X

SECTION 7
CAPABILITY ASSESSMENT

This section of the Plan discusses the capability of the jurisdictions in Augusta-Richmond County to implement hazard mitigation activities. It consists of the following four subsections:

- 7.1 What is a Capability Assessment?
- 7.2 Conducting the Capability Assessment
- 7.3 Capability Assessment Findings
- 7.4 Conclusions on Local Capability

7.1 WHAT IS A CAPABILITY ASSESSMENT?

The purpose of conducting a capability assessment is 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.[1] 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 completed for Augusta-Richmond County and its municipalities serves as a critical planning step and an integral part of the foundation for designing an effective hazard mitigation strategy. Coupled with the Risk Assessment, the Capability Assessment helps identify and target meaningful mitigation actions for incorporation in the Mitigation Strategy portion of the Hazard Mitigation Plan. It not only helps establish the goals and objectives for Augusta-Richmond County to pursue under this Plan, but it also ensures that those goals and objectives are realistically achievable under given local conditions.

[1] While the Final Rule for implementing the Disaster Mitigation Act of 2000 does not require a local capability assessment to be completed for local hazard mitigation plans, it is a critical step in developing a mitigation strategy that meets the needs of the region while taking into account their own unique abilities. The Rule does state that a community's mitigation strategy should be "based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools" (44 CFR, Part 201.6(c)(3)).

7.2 CONDUCTING THE CAPABILITY ASSESSMENT

In order to facilitate the inventory and analysis of local government capabilities for Augusta-Richmond County and its municipalities, a detailed Capability Assessment Survey was distributed to local government officials of each participating jurisdiction.[2] The survey questionnaire compiled information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the jurisdictions' ability to implement hazard mitigation actions. Other indicators included information related to the communities' fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes. The current political climate, an important consideration for any local planning or decision making process, was also evaluated with respect to hazard mitigation.

At a minimum, survey results provide an extensive inventory of existing local plans, ordinances, programs, and resources that are in place or under development in addition to their overall effect on hazard loss reduction. However, the survey instrument can also serve to identify gaps, weaknesses, or conflicts that the local jurisdictions can recast as opportunities for specific actions to be proposed as part of the hazard mitigation strategy.

The information provided in response to the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify each jurisdiction's overall capability.[3] According to the scoring system, each capability indicator was assigned a point value based on its relevance to hazard mitigation.

Using this scoring methodology, a total score and an overall capability rating of "high," "moderate," or "limited" could be determined according to the total number of points received. These classifications are designed to provide nothing more than a general assessment of local government capability. The results of this capability assessment provide critical information for developing an effective and meaningful mitigation strategy.

7.3 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this Plan to provide insight into the relevant capacity of the jurisdictions in Augusta-Richmond County to implement hazard mitigation activities. All information is based upon the input provided by local government officials through the Capability Assessment Survey and during meetings of the Augusta-Richmond County Hazard Mitigation Planning Team. Since the City of Augusta operates in conjunction with Richmond County as part of a consolidated government, these communities were treated as a single entity for this assessment. Additionally, Fort Gordon was not included in this assessment since it is not an incorporated municipality.

7.3.1 Planning and Regulatory Capability

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible manner while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and

[2] The Capability Assessment Survey instrument is available in Appendix B.
[3] The scoring methodology used to quantify and rank the jurisdictions' capability can be found in Appendix B.

transportation planning; the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built; as well as protecting environmental, historic, and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision making process.

This assessment is designed to provide a general overview of the key planning and regulatory tools and programs that are in place or under development for the jurisdictions in Augusta-Richmond County along with their potential effect on loss reduction. This information will help identify opportunities to address existing gaps, weaknesses, or conflicts with other initiatives in addition to integrating the implementation of this Plan with existing planning mechanisms where appropriate.

Table 7.1 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the jurisdictions in Augusta-Richmond County. A checkmark (✓) indicates that the given item is currently in place and being implemented. An asterisk (*) indicates that the given item is currently being developed for future implementation. A dagger (†) indicates that the given item is administered for that municipality by Augusta-Richmond County. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Augusta-Richmond County Hazard Mitigation Plan.

TABLE 7.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning/Regulatory Tool	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Hazard Mitigation Plan	✓	†	†
Threat and Hazard Identification and Risk Assessment (THIRA)	✓	*	*
Comprehensive Land Use Plan	✓	✓	✓
Floodplain Management Plan/Flood Mitigation Plan	✓		*
Open Space Management Plan (Parks & Rec/Greenway Plan)	✓		✓
Stormwater Management Plan/Ordinance	✓	✓	✓
Natural Resource Protection Plan	✓		*
Flood Response Plan	✓		*
Emergency Operations Plan	✓	✓	*
Emergency Management Accreditation Program (EMAP Accreditation)	*	*	*

Planning/Regulatory Tool	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Continuity of Operations Plan	*		
Evacuation Plan	*		
Disaster Recovery Plan	✓		
Capital Improvements Plan	✓		✓
Economic Development Plan	✓		
Historic Preservation Plan		✓	
Flood Damage Prevention Ordinance	✓		✓
Zoning Ordinance	✓	✓	✓
Subdivision Ordinance	✓	✓	✓
Unified Development Ordinance	✓		
Post-Disaster Redevelopment/Reconstruction Plan/Ordinance			
Building Code	✓	✓	✓
Fire Code	✓	✓	✓
National Flood Insurance Program (NFIP)	✓		✓
NFIP Community Rating System (CRS Program)	*		

A more detailed discussion on the jurisdictions' planning and regulatory capability follows.

7.3.2 Emergency Management

Hazard mitigation is widely recognized as one of the five mission areas of emergency management. The other four phases include prevention, protection, response, and recovery. In reality, each phase is interconnected with hazard mitigation, as **Figure 7.1** suggests. Opportunities to reduce potential losses through mitigation practices are most often implemented before disaster strikes, such as the elevation of flood prone structures or the continuous enforcement of policies that prevent and regulate development that is vulnerable to hazards due to its location, design, or other characteristics. Mitigation opportunities will also be presented during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane, and certainly during the long-term recovery and redevelopment process following a hazard event.

FIGURE 7.1: THE FIVE MISSION AREAS OF EMERGENCY MANAGEMENT

Source: Federal Emergency Management Agency

Planning for each mission area is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions. As a result, the Capability Assessment Survey asked several questions across a range of emergency management plans in order to assess the participating jurisdictions' willingness to plan and their level of technical planning proficiency.

Hazard Mitigation Plan: A hazard mitigation plan represents a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation strategy.

- Augusta-Richmond County has previously adopted a hazard mitigation plan. Both participating municipalities were included in this plan.

Threat and Hazard Identification and Risk Assessment (THIRA): A THIRA is a comprehensive risk assessment process that helps a community understand its risks and estimate capability requirements. Outputs of the THIRA process can inform a variety of disaster preparedness and emergency management efforts, including emergency operations planning, mutual aid agreements, and hazard mitigation planning.

- Augusta-Richmond County has completed a THIRA process. Both participating municipalities are in the process of conducting a THIRA process to improve their understanding of risks and the resources required to prepare for those risks.

Disaster Recovery Plan: A disaster recovery plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.

- Augusta-Richmond County has a disaster recovery plan in place.

Emergency Operations Plan: An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.

- Augusta-Richmond County maintains an emergency operations plan through the city-county Emergency Management Agency.
- The City of Blythe has also adopted a municipal-level emergency operations plan and the City of Hephzibah is in the process of developing one.

Continuity of Operations Plan: A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event.

- Augusta-Richmond County is in the process of adopting a continuity of operations plan.

Flood Response Plan: A flood response plan establishes procedures for responding to a flood emergency including coordinating and facilitating resources to minimize the impacts of flood.

- Augusta-Richmond County maintains a flood response plan which includes "flood fight" procedures.
- The City of Hephzibah is in the process of developing a municipal-level flood response plan.

Emergency Management Accreditation Program (EMAP): EMAP is the voluntary standards, assessment, and accreditation program for disaster preparedness programs. It provides emergency management programs the opportunity to be recognized for compliance with industry standards, to demonstrate accountability, and to focus attention on areas and issues where resources are needed.

- None of the counties or municipalities participating in this multi-jurisdictional plan has earned EMAP accreditation. However, they are all currently working toward becoming accredited.

7.3.3 General Planning

The implementation of hazard mitigation activities often involves agencies and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists, and others. In many instances, concurrent local planning efforts will help to achieve or complement hazard mitigation goals, even though they are not designed as such. Therefore, the Capability Assessment Survey also asked questions regarding general planning capabilities and the degree to which hazard mitigation is integrated into other on-going planning efforts in Augusta-Richmond County.

Comprehensive Land Use Plan: A comprehensive land use plan establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically a comprehensive plan contains sections on demographic conditions, land use, transportation elements, and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions.

- Augusta-Richmond County has adopted a county comprehensive plan.
- The City of Blythe and City of Hephzibah have each adopted a municipal comprehensive plan.

Capital Improvements Plan: A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

- The Augusta-Richmond County Utilities Department maintains a capital improvement plan. The Augusta Regional Airport also has a capital improvement plan.
- The City of Hephzibah has a capital improvement plan in place.

Historic Preservation Plan: A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way.

- Although Augusta-Richmond County does not have a historic preservation plan in place, it has adopted a historic preservation ordinance and maintains a historic preservation commission.
- The City of Blythe has a historic preservation plan.

Zoning Ordinance: Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas.

- Augusta-Richmond County includes zoning regulations as part of its local comprehensive development ordinance.
- The City of Blythe and the City of Hephzibah have each adopted a standalone zoning ordinance.

Subdivision Ordinance: A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

- Augusta-Richmond County includes subdivision regulations as part of its local comprehensive development ordinance.
- The City of Blythe and the City of Hephzibah have each adopted a standalone subdivision ordinance.

Building Codes, Permitting, and Inspections: Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

- The Georgia Department of Community Affairs states that local jurisdictions may adopt their own local codes; however, in order to enforce it, the proposed amendment must have been submitted to the Department of Community Affairs for review. All of the participating jurisdictions have adopted a building code.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program developed by the Insurance Services Office, Inc. (ISO).[4] In George, the Department of Community Affairs assesses the building codes and provides the minimum requirements.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education as well as the number of inspections performed per day. This type of information combined with local building codes is used to determine a grade for that jurisdiction. The grades range from 1 to 10 with a BCEGS grade of 1 representing exemplary commitment to building code enforcement and a grade of 10 indicating less than minimum recognized protection.

Specific BCEGS rating for the participating jurisdictions can be obtained by contacting the department for building inspections within that jurisdiction.

7.3.4 Floodplain Management

Flooding represents the greatest natural hazard facing the nation. At the same time, the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the *National Flood Insurance Program* (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this assessment as a key indicator for measuring local capability.

In order for a county or municipality to participate in the NFIP, they must adopt a local flood damage prevention ordinance that requires jurisdictions to follow established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings will be protected from damage by a 100-year flood event and that new development in the floodplain will not exacerbate existing flood problems or increase damage to other properties.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Once completed, the Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices,

[4] Participation in BCEGS is voluntary and may be declined by local governments if they do not wish to have their local building codes evaluated.

and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community.

Table 7.2 provides NFIP policy and claim information for each participating jurisdiction in Augusta-Richmond County.

TABLE 7.2: NFIP POLICY AND CLAIM INFORMATION

Jurisdiction	Date Joined NFIP	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Closed Claims	Total Payments to Date
AUGUSTA-RICHMOND COUNTY	03/04/80	07/18/11	1,041	$219,641,200	343	$3,305,029
Blythe*	--	--	--	--	--	--
Hephzibah	06/25/76	09/25/09(M)	2	$392,000	0	$0

*Community does not participate in the NFIP
(M) – No Elevation Determined – All Zone A, C, and X
Source: NFIP Community Status information as of 12/19/16; NFIP claims and policy information as of 10/31/16

All jurisdictions listed above that are participants in the NFIP will continue to comply with all required provisions of the program and will work to adequately comply in the future utilizing a number of strategies. For example, the jurisdictions will coordinate with GEMA and FEMA to develop maps and regulations related to special flood hazard areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management program in a way that reduces the risk of flooding to people and property.

As noted above, one jurisdiction is not a participant in the NFIP. The City of Blythe does not participate because it currently does not have any identified flood hazard areas within its jurisdiction, so many residents would be unlikely to purchase flood insurance.

Community Rating System: An additional indicator of floodplain management capability is the active participation of local jurisdictions in the Community Rating System (CRS). The CRS is an incentive-based program that encourages counties and municipalities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP by adding extra local measures to provide protection from flooding. All of the 18 creditable CRS mitigation activities are assigned a range of point values. As points are accumulated and reach identified thresholds, communities can apply for an improved CRS class rating. Class ratings, which range from 10 to 1, are tied to flood insurance premium reductions as shown in **Table 7.3**. As class rating improves (the lower the number the better), the percent reduction in flood insurance premiums for NFIP policyholders in that community increases.

TABLE 7.3: CRS PREMIUM DISCOUNTS, BY CLASS

CRS Class	Premium Reduction
1	45%
2	40%
3	35%
4	30%

CRS Class	Premium Reduction
5	25%
6	20%
7	15%
8	10%
9	5%
10	0

Source: *Federal Emergency Management Agency*

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years based on community comments. Changes were made with the intent to make the CRS more user-friendly and make extensive technical assistance available for communities who request it.

- Augusta-Richmond County is currently in the process of joining the CRS. The program will be beneficial since there are 1,041 NFIP policies in force.

Flood Damage Prevention Ordinance: A flood damage prevention ordinance establishes minimum building standards in the floodplain with the intent to minimize public and private losses due to flood conditions.

- All communities participating in the NFIP are required to adopt a local flood damage prevention ordinance. Augusta-Richmond County and the City of Hephzibah participate in the NFIP and they both have adopted flood damage prevention regulations.

Floodplain Management Plan: A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts.

- Augusta-Richmond County has adopted a floodplain management plan.
- The City of Hephzibah is in the process of developing a floodplain management plan.

Open Space Management Plan*:* An open space management plan is designed to preserve, protect, and restore largely undeveloped lands in their natural state and to expand or connect areas in the public domain such as parks, greenways, and other outdoor recreation areas. In many instances, open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity.

- Augusta-Richmond County includes an open space management plan as part of its Recreation Master Plan.
- The City of Hephzibah has an open space management plan in place.

Stormwater Management Plan: A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and

construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- Augusta-Richmond County has adopted a stormwater management ordinance.
- The City of Blythe and the City of Hephzibah have both also adopted a stormwater management ordinance.

7.3.5 Administrative and Technical Capability

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using Geographic Information Systems (GIS) to analyze and assess community hazard vulnerability. The Capability Assessment Survey was used to capture information on administrative and technical capability through the identification of available staff and personnel resources.

Table 7.4 provides a summary of the capability assessment results for Augusta-Richmond County with regard to relevant staff and personnel resources. A checkmark (✓) indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill. A dagger (†) indicates a county-level staff member(s) provides the specified knowledge or skill to that municipality.

TABLE 7.4: RELEVANT STAFF / PERSONNEL RESOURCES

Staff/Personnel Resource	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Planners with knowledge of land development/land management practices	✓		✓
Engineers or professionals trained in construction practices related to buildings and/or infrastructure	✓		✓
Planners or engineers with an understanding of natural and/or human-caused hazards	✓		✓
Emergency Manager	✓		✓
Floodplain Manager	✓		✓

Staff/Personnel Resource	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Land Surveyors	✓		
Scientists familiar with the hazards of the community	✓		
Staff with education or expertise to assess the community's vulnerability to hazards	✓		✓
Personnel skilled in GIS and/or Hazus	✓		✓
Resource development staff or grant writers	✓		

7.3.6 Fiscal Capability

The ability of a local government to take action is often closely associated with the amount of money available to implement policies and projects. This may take the form of outside grant funding awards or locally-based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project, such as the acquisition of flood-prone homes, which can require a substantial commitment from local, state, and federal funding sources.

The Capability Assessment Survey was used to capture information on the jurisdictions' fiscal capability through the identification of locally available financial resources.

Table 7.5 provides a summary of the results for Augusta-Richmond County with regard to relevant fiscal resources. A checkmark (✓) indicates that the given fiscal resource has previously been used to implement hazard mitigation actions. A dagger (†) indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds).

TABLE 7.5: RELEVANT FISCAL RESOURCES

Fiscal Tool/Resource	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Capital Improvement Programming	✓		†

Fiscal Tool/Resource	AUGUSTA-RICHMOND COUNTY	Blythe	Hephzibah
Community Development Block Grants (CDBG)	†	†	†
Special Purpose Taxes (or taxing districts)	✓	†	
Gas/Electric Utility Fees			
Water/Sewer Fees	†	†	†
Stormwater Utility Fees	✓		
Development Impact Fees	†		
General Obligation, Revenue, and/or Special Tax Bonds	†	†	
Partnering Arrangements or Intergovernmental Agreements	✓	†	†
Other: General fund revenue	✓		

7.3.7 Political Capability

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority or may conflict with or be seen as an impediment to other goals of the community, such as growth and economic development. Therefore, the local political climate must be considered in designing mitigation strategies as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

The Capability Assessment Survey was used to capture information on political capability of Augusta-Richmond County. Survey respondents were asked to evaluate the level of local political support for hazard mitigation and to identify general examples of local political capability, such as guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (i.e., building codes, floodplain management, etc.).

- The current and future political climate for supporting and advancing future hazard mitigation strategies is moderate in Augusta-Richmond County, the City of Blythe, and the City of Hephzibah.
- There are several existing ordinances that address natural hazards or are related to hazard mitigation such as flood damage prevention, soil erosion and sediment control, stormwater management, zoning, and subdivision.

7.4 CONCLUSIONS ON LOCAL CAPABILITY

In order to form meaningful conclusions on the assessment of local capability, a quantitative scoring methodology was designed and applied to the results of the Capability Assessment Survey. The maximum number of points possible (one, two, or three) was assigned to each plan, ordinance, program, or resource based on its relevance to hazard mitigation. If a plan, ordinance, program, or resource was under development or administered for a municipality by Augusta-Richmond County, one point became the highest score possible. The maximum total number of points possible under the scoring methodology is 86, and three categories were established to classify capability level as limited (0-24 points), moderate (25-49 points), or high (50-86 points). This methodology, further described in Appendix B, attempts to assess the overall level of capability of Augusta-Richmond County to implement hazard mitigation actions.

The overall capability to implement hazard mitigation actions varies among the participating jurisdictions. For planning and regulatory capability, the jurisdictions range from limited to moderate to high. There is also some variation in the administrative and technical capability among the jurisdictions with the larger jurisdictions having greater staff and technical resources. Both municipalities are in the limited range for fiscal capability while Augusta-Richmond County has more funding resources available.

Table 7.6 shows the results of the capability assessment using the designed scoring methodology. The capability score is based solely on the information provided by local officials in response to the Capability Assessment Survey. According to the assessment, the average local capability score for all jurisdictions is 45.0, which falls into the moderate capability ranking.

TABLE 7.6: CAPABILITY ASSESSMENT RESULTS

Jurisdiction	Overall Capability Score	Overall Capability Rating
AUGUSTA-RICHMOND COUNTY	71	High
Blythe	22	Limited
Hephzibah	42	Moderate

As previously discussed, one of the reasons for conducting a Capability Assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified for each jurisdiction in the tables found throughout this section. The participating jurisdictions used the Capability Assessment as part of the basis for the Mitigation Actions that are identified in Section 9; therefore, each jurisdiction addresses their ability to expand on and improve their existing capabilities through the identification of their Mitigation Actions.

7.4.1 Linking the Capability Assessment with the Risk Assessment and the Mitigation Strategy

The conclusions of the Risk Assessment and Capability Assessment serve as the foundation for the development of a meaningful hazard mitigation strategy. During the process of identifying specific mitigation actions to pursue, the Hazard Mitigation Planning Team considered not only each jurisdiction's level of hazard risk, but also their existing capability to minimize or eliminate that risk.

SECTION 8
MITIGATION STRATEGY

This section of the Plan provides the blueprint for the participating jurisdictions in Augusta-Richmond County to follow in order to become less vulnerable to its identified hazards. It is based on general consensus of the Augusta-Richmond County Hazard Mitigation Planning Team and the findings and conclusions of the *Capability Assessment* and *Risk Assessment*. It consists of the following five subsections:

- 8.1 Introduction
- 8.2 Mitigation Goals
- 8.3 Identification and Analysis of Mitigation Techniques
- 8.4 Selection of Mitigation Techniques for Augusta-Richmond County
- 8.5 Plan Update Requirement

8.1 INTRODUCTION

The intent of the Mitigation Strategy is to provide Augusta-Richmond County with the goals that will serve as guiding principles for future mitigation policy and project administration, along with an analysis of mitigation techniques available to meet those goals and reduce the impact of identified hazards. It is designed to be comprehensive, strategic, and functional in nature:

- In being *comprehensive*, the development of the strategy includes a thorough review of all hazards and identifies extensive mitigation measures intended to not only reduce the future impacts of high risk hazards, but also to help the region achieve compatible economic, environmental, and social goals.
- In being *strategic*, the development of the strategy ensures that all policies and projects proposed for implementation are consistent with pre-identified, long-term planning goals.
- In being *functional,* each proposed mitigation action is linked to established priorities and assigned to specific departments or individuals responsible for their implementation with target completion deadlines. When necessary, funding sources are identified that can be used to assist in project implementation.

The first step in designing the Mitigation Strategy includes the identification of mitigation goals. Mitigation goals represent broad statements that are achieved through the implementation of more specific mitigation actions. These actions include both hazard mitigation policies (such as the regulation of land in known hazard areas through a local ordinance) and hazard mitigation projects that seek to address specifically targeted hazard risks (such as the acquisition and relocation of a repetitive loss structure).

The second step involves the identification, consideration, and analysis of available mitigation measures to help achieve the identified mitigation goals. This is a long-term, continuous process sustained through the development and maintenance of this Plan. Alternative mitigation measures will continue to be

considered as future mitigation opportunities are identified, as data and technology improve, as mitigation funding becomes available, and as this Plan is maintained over time.

The third and last step in designing the Mitigation Strategy is the selection and prioritization of specific mitigation actions for Augusta-Richmond County and its municipalities (provided separately in Section 9: *Mitigation Action Plan*). Each participating jurisdiction has its own Mitigation Action Plan (MAP) that reflects the needs and concerns of that jurisdiction. The MAP represents an unambiguous and functional plan for action and is considered to be the most essential outcome of the mitigation planning process.

The MAP includes a prioritized listing of proposed hazard mitigation actions (policies and projects) for Augusta-Richmond County and its municipalities to complete. Each action has accompanying information, such as those departments or individuals assigned responsibility for implementation, potential funding sources, and an estimated target date for completion. The MAP provides those departments or individuals responsible for implementing mitigation actions with a clear roadmap that also serves as an important tool for monitoring success or progress over time. The cohesive collection of actions listed in the MAP can also serve as an easily understood menu of mitigation policies and projects for those local decision makers who want to quickly review the recommendations and proposed actions of the Hazard Mitigation Plan.

In preparing each Mitigation Action Plan for Augusta-Richmond County, officials considered the overall hazard risk and capability to mitigate the effects of hazards as recorded through the risk and capability assessment process, in addition to meeting the adopted mitigation goals and unique needs of the community.

8.1.1 Mitigation Action Prioritization

Prioritization of the proposed mitigation actions was based on the following six factors:

- Effect on overall risk to life and property
- Ease of implementation
- Political and community support
- A general economic cost/benefit review[1]
- Funding availability
- Continued compliance with the NFIP

The point of contact for each jurisdiction helped coordinate the prioritization process by reviewing each action and working with the lead agency/department responsible to determine a priority for each action using the six factors listed above.

[1] Only a general economic cost/benefit review was considered by the Hazard Mitigation Planning Team through the process of selecting and prioritizing mitigation actions. Mitigation actions with "high" priority were determined to be the most cost effective and most compatible with the participating jurisdictions' unique needs. Actions with a "moderate" priority were determined to be cost-effective and compatible with jurisdictional needs, but may be more challenging to complete administratively or fiscally than "high" priority actions. Actions with a "low" priority were determined to be important community needs, but the community likely identified several potential challenges in terms of implementation (e.g. lack of funding, technical obstacles). A more detailed cost/benefit analysis will be applied to particular projects prior to the application for or obligation of funding, as appropriate.

Using these criteria, actions were classified as high, moderate, or low priority by the participating jurisdiction officials.

8.2 MITIGATION GOALS

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

The primary goal of all local governments is to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Augusta-Richmond County has developed five goal statements for local hazard mitigation planning. In developing these goals, the previous hazard mitigation plan was reviewed to determine if the goals remained applicable. The project consultant reviewed the goals and objectives from the existing plan. Many of the goals and objectives were similar and, therefore, revised goals were formulated based on commonalities found between them. **Table 8.1** provides a listing of the existing mitigation goals from the previous hazard mitigation plan.

TABLE 8.1: EXISTING MITIGATION GOALS

	Goal
Goal 1	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to tornado/windstorms/hail.
Goal 2	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to the riverine and localized flooding.
Goal 3	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to the effects of drought and extreme heat.
Goal 4	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to effects of severe winter storms.
Goal 5	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to effects of wildfire.
Goal 6	To minimize losses of life and property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to effects of earthquakes.
Goal 7	Analyze the impacts of current policies, ordinances, and plans in Augusta-Richmond County and the Cities of Blythe and Hephzibah on community safety from natural hazard risks due to growth decisions.

As a result of reviewing the existing goals and objectives, five proposed revised goals were presented to the Hazard Mitigation Planning Team for their consideration. The proposed goals were presented, reviewed, voted on, and accepted by the Hazard Mitigation Planning Team at their second meeting. Each goal, purposefully broad in nature, serves to establish parameters that were used in developing mitigation actions. The Augusta-Richmond County Mitigation Goals are presented in **Table 8.2**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE 8.2: AUGUSTA-RICHMOND COUNTY MITIGATION GOALS

	Goal
Goal 1	Minimize losses of life, property, and other economic losses in Augusta-Richmond County and the Cities of Blythe and Hephzibah due to natural and technological hazards.
Goal 2	Increase resilience of building stock, critical infrastructure, and essential facilities (including shelters) to the effects of natural and technological hazards.
Goal 3	Increase level of protection to local population and economy from the effects of natural and technological hazards.
Goal 4	Increase public awareness of the effects of natural and technological hazards.
Goal 5	Ensure local policies, ordinances, and plans support community safety and minimize hazard risks due to growth decisions.

8.3 IDENTIFICATION AND ANALYSIS OF MITIGATION TECHNIQUES

44 CFR Requirement
44 CFR Part 201.6(c)(3)(ii): The mitigation strategy shall include a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effect of each hazard, with particular emphasis on new and existing buildings and infrastructure.

In formulating the Mitigation Strategy for Augusta-Richmond County, a wide range of activities were considered in order to help achieve the established mitigation goals, in addition to addressing any specific hazard concerns. These activities were discussed during the Augusta-Richmond County Hazard Mitigation Planning Team meetings. In general, all activities considered by the Hazard Mitigation Planning Team can be classified under one of the following six broad categories of mitigation techniques: Prevention, Property Protection, Natural Resource Protection, Structural Projects, Emergency Services, and Public Awareness and Education. These are discussed in detail below.

8.3.1 Prevention

Preventative activities are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning
- Building codes
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvements programming
- Riverine/fault zone setbacks

8.3.2 Property Protection

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Retrofitting (e.g., windproofing, floodproofing, seismic design techniques, etc.)
- Safe rooms, shutters, shatter-resistant glass
- Insurance

8.3.3 Natural Resource Protection

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their protective functions. Such areas include floodplains, wetlands, steep slopes, and sand dunes. Parks, recreation, or conservation agencies and organizations often implement these protective measures. Examples include:

- Floodplain protection
- Watershed management
- Riparian buffers
- Forest and vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- Erosion and sediment control
- Wetland preservation and restoration
- Habitat preservation
- Slope stabilization

8.3.4 Structural Projects

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event through construction. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Reservoirs
- Dams/levees/dikes/floodwalls
- Diversions/detention/retention
- Channel modification
- Storm sewers

8.3.5 Emergency Services

Although not typically considered a "mitigation" technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems
- Evacuation planning and management
- Emergency response training and exercises
- Sandbagging for flood protection
- Installing temporary shutters for wind protection

8.3.6 Public Education and Awareness

Public education and awareness activities are used to advise residents, elected officials, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects
- Speaker series/demonstration events
- Hazard map information
- Real estate disclosure
- Library materials
- School children educational programs
- Hazard expositions

8.4 SELECTION OF MITIGATION TECHNIQUES FOR AUGUSTA-RICHMOND COUNTY

In order to determine the most appropriate mitigation techniques for the communities in Augusta-Richmond County, the Hazard Mitigation Planning Team thoroughly reviewed and considered the findings of the *Capability Assessment* and *Risk Assessment* to determine the best activities for their respective communities. Other considerations included the effect of each mitigation action on overall risk to life and property, its ease of implementation, its degree of political and community support, its general cost-effectiveness, and funding availability (if necessary).

8.5 PLAN UPDATE REQUIREMENT

In keeping with FEMA requirements for plan updates, the Mitigation Actions identified in the previous plan were evaluated to determine their 2017 implementation status. Updates on the implementation status of each action are provided. The mitigation actions provided in Section 9: *Mitigation Action Plan* include the mitigation actions from the previous plans as well as any new mitigation actions proposed through the 2017 planning process.

SECTION 9
MITIGATION ACTION PLAN

This section includes the listing of the mitigation actions proposed by the participating jurisdictions in Augusta-Richmond County. It consists of the following two subsections:

- 9.1 Overview
- 9.2 Mitigation Action Plans

44 CFR Requirement
44 CFR Part 201.6(c)(3)(iii): The mitigation strategy shall include an action plan describing how the actions identified in paragraph (c)(2)(ii) of this section will be prioritized, implemented, and administered by the local jurisdiction.

9.1 OVERVIEW

As described in the previous section, the Mitigation Action Plan, or MAP, provides a functional plan of action for each jurisdiction. It is designed to achieve the mitigation goals established in Section 8: *Mitigation Strategy* and will be maintained on a regular basis according to the plan maintenance procedures established in Section 10: *Plan Maintenance*.

Each proposed mitigation action has been identified as an effective measure (policy or project) to reduce hazard risk for Augusta-Richmond County. Each action is listed in the MAP in conjunction with background information such as hazard(s) addressed and relative priority. Other information provided in the MAP includes potential funding sources to implement the action should funding be required (not all proposed actions are contingent upon funding). Most importantly, implementation mechanisms are provided for each action, including the designation of a lead agency or department responsible for carrying the action out as well as a timeframe for its completion. These implementation mechanisms ensure that the Augusta-Richmond County Hazard Mitigation Plan remains a functional document that can be monitored for progress over time. The proposed actions are not listed in priority order, though each has been assigned a priority level of “high,” “moderate,” or “low” as described below and in Section 8 (page 8.2).

The Mitigation Action Plan is organized by mitigation strategy category (Prevention, Property Protection, Natural Resource Protection, Structural Projects, Emergency Services, or Public Education and Awareness). The following are the key elements described in the Mitigation Action Plan:

- Hazard(s) Addressed—Hazard which the action addresses.
- Relative Priority—High, moderate, or low priority as assigned by the jurisdiction.
- Lead Agency/Department—Department responsible for undertaking the action.
- Potential Funding Sources—Local, State, or Federal sources of funds are noted here, where applicable.
- Implementation Schedule—Date by which the action the action should be completed. More information is provided when possible.

- Implementation Status (2017)—Indication of completion, progress, deferment, or no change since the previous plan. If the action is new, that will be noted here.

9.2 MITIGATION ACTION PLANS

The mitigation actions proposed by each of the participating jurisdictions are listed in 11 individual MAPs on the following pages. **Table 9.1** shows the location of each jurisdiction's MAP within this section as well as the number of mitigation actions proposed by each jurisdiction.

TABLE 9.1: INDIVIDUAL MAP LOCATIONS

Location	Page	Number of Mitigation Actions
Augusta-Richmond County	**9:3**	**29**
Blythe	9:13	12
Hephzibah	9:17	12

Augusta-Richmond County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention							
P-1	**Public Tree Maintenance** – Continue tree maintenance on city streets and city-owned property (reduce debris, impacts of falling).	Tornado/ Windstorm/ Hail; Severe Winter Storm	Moderate	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	Georgia Forestry Commission Urban and Community Forestry Grant, Operational Budget	2021	Deferred; Tree maintenance is an ongoing project.
P-2	**Drainage and Stormwater Management**. Implement central database for staff to record drainage and flooding problems (build on existing software). Train staff of all departments that receive citizen calls to use the database to register appropriate information to ensure quality data. Develop method to consider the database contents in setting priorities for drainage projects and to support identification of flood mitigation opportunities. Formalize inventory of detention basin maintenance procedures system to prioritize maintenance.	Flood	Low	Engineering Services with support of Planning and Zoning	Stormwater Utility of the City of Augusta	2021	Deferred; Implementation has just started in 2016.
P-3	**Soil Erosion and Sediment Control**. Request GDOT's continued attention to exemplary sediment and erosion control practices. Communicate with City crews and contractors that City projects are to be undertaken with exemplary sediment and erosion control practices. Examine the feasibility of offering training for local contractors to reinforce proper installation and maintenance of sediment control measures; seek cooperative partners, including the	Flood	Low	Augusta Engineering Services, License and Inspections, supported by Soil and Conservation and Planning and Zoning	Additional staff and funding needed	2021	Deferred; Building an ongoing relationship with GDOT to facilitate sediment control.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
	District Soil Conservation Office, Georgia DOT, and GA Department of Natural Resources. Increase frequency of inspections of sediment control measures and work with project owner/contractor to maintain effective measures throughout construction. Continue cooperative efforts with Columbia County regarding installation and maintenance of sediment and erosion control measures on active construction sites in the upper portions of waterways that drain into Augusta, with particular attention to Crane Creek, Rae's Creek, and Butler Creek.						
P-4	**Flood Hazard Map Revisions and Updates**. Continue pursuit of City-wide revision of the Flood Insurance Rate Maps, building on the City's new digital topography and work underway by the U.S. Army Corps of Engineers to prepare flood studies as part of the *Flood Reduction Study* and including other studies and identified watersheds. Communicate to the Georgia DNR and FEMA Region IV the importance of conducting new engineering studies to produce revised maps in the Digital Flood Insurance Rate Map format for incorporation into the City's existing GIS DFIRMs. Annotate digital map with the "lower floodway fringe" delineation to facilitate awareness of and application of the Flood Damage Prevention Ordinance and to more clearly identify areas targeted for greenspace purposes. Develop a database of property owners for use in public awareness activities.	Flood	High	Planning and Zoning, support Engineering, IT	Operational Budget	2021	Deferred; Preliminary Updated Maps due to the Community in Dec 2016 or early 2017, which will start the community appeal process and the necessary steps to adoption of the maps by the community.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	**Economic Analysis related to Flood Hazard and Critical Facilities**. Perform economic analysis related to identifying the most effective flood mitigation projects. Utilize newly developed FEMA DFIRMs and new topography to ascertain economic impact of flooding at various frequencies. Develop several scenarios and identify the most cost-beneficial mitigation measures. Map critical facilities information using the city GIS platform.	Flood	Moderate	Planning and Zoning/EMA/ Engineering, with support from IT	ESRI Government Grant Program, Federal Grants	2020	Deferred; Action cannot be started until after new flood maps are adopted by the community which is due to happen in 2017.
P-6	**Policies & Procedures for Flood Mitigation Projects**. Develop Flood Mitigation Project Policies and Procedures Manual. Establish systematic method for using and prioritizing funds, including a mechanism to account for changes in priorities as a function of several variables. Continue to gather data on buildings in FEMA-mapped floodways and repetitive loss areas to have available in the post-flood period; use to target efforts for recovery, permitting, and grant application development. Obtain FEMA's Residential Substantial Damage Estimator software and maintain ability to use it to facilitate damage estimates and substantial damage determinations. Develop policy on abandoned homes in SFHA. Examine the Corps' database of buildings in the SFHA and pre-identify those most likely to sustain significant damage if floods equivalent to the SFHA or greater occur, i.e., those predicted to have more than 2-feet of water above the	Flood	Moderate	Planning and Zoning, other Departments/ Committee	Additional funds and additional staff required, FEMA Planning Grant, GDOT ISTEA Grants	2021	Deferred; Due to staff constraints this action has not been completed.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
	lowest floor. Coordinate with EMA and GIS Departments to determine and map areas likely to experience flooding and target post-flood inspections. Maintain awareness of different sources of mitigation funding and seek mitigation grant funds to implement mitigation in high priority actions. Explore with GDOT if funding could support additional buyouts areas where the frequency of flooding indicates that hydrology would support allowing areas to return to wetland functions. Include consideration of flood mitigation opportunities in the City's identification of projects for which ISTEA applications will be prepared.						
P-7	**NFIP CRS**. NFIP flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: 1) Reduce flood losses; 2) Facilitate accurate insurance rating; and 3) Promote the awareness of flood insurance. Work to improve Augusta' CRS rating.	Flood	High	Emergency Management; support Planning and Zoning, Engineering, IT	Operational Budget	2017	Augusta, GA has started the process in 2016 to join the CRS program; CAV completed and passed 11/28/2016.
P-8	**Dam Safety**. For State-designated Category I dams that are located in the City or on waterways that drain through the City, estimate potential impacts and determine if the downstream risks are sufficient to contact owners to encourage their development of limited emergency action plan procedures, and period inspections, that are coordinated with the City.	Flood	Moderate	Emergency Management with support of Engineering Department, Planning and Development, and GA DNR Dam Safety Program	Operational Budget, Federal and State Grants	2021	Deferred; Funding was not available.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-9	**Flood Mitigation Staffing**. Seek new staff position to coordinate the City's floodplain management and mitigation efforts. Administer mitigation grants; coordinate the City's CRS program.	Flood	High	Augusta Emergency Services, Planning and Zoning	Federal and State Grants	2021	Deferred; Currently, funding is not available to increase staffing; however, many of the mitigation actions in this Plan aimed at reducing the impacts from flood events and flooding are dependent on funding to fill this very needed void in the government's personnel.
P-10	**Pre-suppression planning for city-owned lands**. Request assistance from the GA Forestry Commission to evaluate fire risks on City-owned parks and greenspace to develop prevention plans to improve forest health.	Wildfire	High	Augusta and Hephzibah Fire Departments with support from EMA and Georgia Forestry Commission	Georgia Forestry Urban & Community Forestry Grant, Southern Wildfire Risk Assessment Project, Operational Budget	2021	Deferred; Working on building a strong relationship with the GA Forestry Commission to support this effort.
P-11	**Subdivisions & driveway access for fire vehicles**. Request that the Quarterly Subdivision Regulations Review Committee consider new standards for widths of subdivision roads and shoulders, and for common driveways for multiple flagpole lots to provide safer access by larger fire trucks.	Wildfire	High	Planning Divisions with Augusta Fire Department	Operational Budget	Complete	This is in place and is reviewed on every site plan received by the Fire Department.
P-12	**Outreach and seismic inspection**. Request that building inspectors conduct field verification of the building structural soundness and field operator seismic inspection of residential structures.	Earthquake	High	Planning and Development Department	Operational Budget	2021	Deferred; Removed EMA as a responsible agency. The action has been moved to the Planning and Development Department as it is their function.
P-13	**Conduct safe communities' audit**. Request that the Planning and Development Department create a safe growth steering committee to develop vision for the community, conduct workshops, and post analysis information and reports on local	All	High	Planning and Development with EMA, Engineering, and HMPC Members	Operational Budget	2019	Deferred; This effort has been started but has not reached completion.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
	government websites. Develop potential safe growth regulations, policies, and processes to revise existing community documents, regulations, and plans.						
P-14	**Assess Vulnerability to Drought Risk**. Gathering and analyze water and climate data to gain a better understanding of local climate and drought history. Determine how the community and its water sources have been impacted by droughts in the past.	Drought	Low	Augusta-Richmond County Emergency Management/ Water Utilities	Departmental budget	2019	New
Property Protection							
PP-1	**Promote enhanced anchoring of manufactured homes** – making them less susceptible to tornado damages and detachment from the pad.	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	FEMA PA	2021	Deferred; Need to create a campaign to support home owners in working through the process.
Structural Projects							
SP-1	**Sewer Line Infiltration and Inflow**. Continue to undertake projects to identify and resolve infiltration and inflow.	Flood	Low	Augusta Utilities	City of Augusta CIP	2021	Deferred; This is an ongoing effort that the City is continuously working on.
Emergency Services							
ES-1	**Review capacity of the existing tornado shelters, construct new ones if needed.**	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	HMGP, PDM	2021	Deferred; Existing tornado shelters do not exist in Richmond County. Funding for construction was requested in 2014 but it was not a funded project.
ES-2	**Debris Management Plan** – Work with the cities, GEMA, FEMA, power companies, and other entities to revise and gain approval, support, and funding of existing Debris Management Plan.	Tornado/ Windstorm/ Hail; Severe Winter Storm	High	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	GEFA Grants for Communities and Solid Waste Authorities, FEMA PA, HMPG, Operational Budget	Complete	FEMA has approved Augusta's Debris Management Plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
ES-3	**Flood Warning** –Use GIS and flood maps to identify buildings within flood hazard areas and develop phone groups for automated, generalized flood warning announcements through 911 Messages; exercise the announcement system periodically. Explore if automated rain gages installed by Augusta Utilities as part of watershed assessments can be used to augment the City's preparations. Improve the list of flood-prone roads; evaluate whether the most frequently flooded areas warrant warning signs to alert the traveling public.	Flood	Moderate	Emergency Management with support of Engineering, IT, Utilities	NOAA Integrated Flood Observing and Warning System (IFLOWS – 11.450 Grant), exploring grant funds to support gages, implantation within existing budget	2021	Deferred; It is partially completed as an updated list of flood prone areas is maintained by EMA, GIS, and Planning and Development. The emergency notification system is used to alert the public of possible flooding and emergency actions if it happens. Rain gauges have not been purchased for these areas. Vulnerable populations need to be assessed as well as notification and potential evacuation of those vulnerable populations.
ES-4	**Plan for Drought.** Develop a drought emergency plan, criteria or triggers for drought-related actions and a drought communication plan and early warning system to facilitate timely communication of relevant information to officials, decision makers, emergency managers, and the general public.	Drought	Low	Augusta-Richmond County Emergency Management/ Water Utilities	Departmental budget	2019	New
ES-5	**Assist Vulnerable Populations**. Organize an outreach plan to vulnerable populations, including establishing and promoting accessible heating or cooling centers in the community. Create a database to track those individuals at high risk of death, such as the elderly, homeless, etc.	Extreme Temperature	Moderate	Augusta-Richmond County Emergency Management	Departmental budget	2020	New
ES-6	**Assist Vulnerable Populations**. Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages. Organize outreach to vulnerable populations, including establishing and promoting accessible heating centers in the community.	Severe Winter Weather	Moderate	Augusta-Richmond County Emergency Management	Departmental budget	2020	New

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness							
PEA-1	**Severe Storm Awareness** – Continue public outreach on severe storm and tornado risks; encourage families to prepare Disaster Supply Kits and people with special medial needs to notify Augusta EM. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including nonprofit and neighborhood organizations and others, to look at outreach efforts and materials provided by the NWS, FEMA, ARC, and others and determine whether changes are appropriate. Expand use of Augusta's website to make information readily available to the public.	Tornado/ Windstorm/ Hail	High	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	State Farm Safety Grant, Operational Budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including: a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.
PEA-2	**Public Awareness Initiative**. Convene a work group to prepare and implement a multi-year plan for public awareness. Prepare articles for publication on what property owners can do to plan and prepare for floods and to reduce losses. Coordinate with campaigns undertaken by the State. Develop web-based materials and link to other sites. Co-op with stormwater management initiative to distribute periodic mailing to property owners along waterways to inform them of their responsibility to keep drainage ways clear. Develop materials for the Planning Commission and License and Inspections to hand out with permits or mailings. Establish a hotline for citizen reports of flooding and drainage problems. Create a database to record citizens and local government personnel reports of drainage issues and to document	Flood	High	Emergency Management with support	Additional staff and training funds needed	2019	Deferred; Emergency management currently provides readiness information to the community through various outlets, including a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
	mitigation actions. Request and sponsor periodic NFIP workshops provided by others (GADNR, FEMA) for lenders, insurance agents, real estate professionals and others. Post database of elevation benchmarks and reference marks on the City's webpage and notify local surveyors and engineers of its availability. Conduct training to developers, contractors, citizens, and others on the preparation of Elevation Certificates. Research options to improve disclosure of flood hazards as part of the property transfer process.						
PEA-3	**Savannah River Flood Protection and Awareness**. Convene a City workgroup to review and revise the Emergency Levee Closure Plan. Examine lease conditions for City-owned property on the riverside of the Levee leased to private entities, for adequate language to protect the City. Consider if lessees should be notified of the flooding risk; the levee closing exercise, and that predicted flood levels by the U.S. Army Corps of Engineers may prompt the City to require evacuation. Notify owners of private property on the river side of the Levee about flooding risk, closing procedures, requirement to evacuate, flood insurance availability, and the requirement to obtain permits. Continue the Emergency Levee Closure Plan exercise every two years.	Flood	Moderate	Engineering with support from EMA and Planning	Implementation of current standards and activities within Operational Budget; State and Federal Grants	2021	Deferred; The lead department was listed as EMA, however that plan is developed, maintained and updated by the Engineering Department so the agency was updated. A plan currently exists for levee closure. A drill is planned for March 2017.
PEA-4	**Water Conservation Awareness**. Augusta Utilities to continue implementation of the Water Conservation Plan; continue to comment on proposed development	Drought and Extreme Heat	High	Augusta Utilities, Blythe, Hephzibah, County Extension Service, Georgia DNR	Implementation within Operational Budget	2021	Deferred; This is an ongoing process for the Cities to work with Augusta Utilities and GADNR to create awareness.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
	site and landscaping plans; continue to report on and encourage conservation and to highlight water conservation tips on its web page. Blythe and Hephzibah will continue to follow and implement the State's water conservation guidelines and well as water use ordinances.						
PEA-5	**Severe Winter Storm Awareness** – Continue public outreach on severe winter storm and ice; encourage families to prepare Disaster Supply Kits; encourage people with special medical needs to notify Augusta Emergency Management Agency. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including non-profit and neighborhood organizations and others, to look at outreach efforts and materials provided by the NWS, FEMA, ARC, and others and determine whether changes are appropriate. Expand use of EMA and Augusta's website to make information readily available to the public.	Severe Winter Storm	Moderate	Augusta-Richmond County EMA and the Cities of Blythe and Hephzibah with support of Recreation and Parks	NOAA Integrated Flood Overserving and Warning System (IFLOWS-11.450 Grant), Operational Budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including a community emergency ready day held every Fall, social media, TV, and radio, the city website, through the emergency notification system text and email, and through small group presentations.
PEA-6	**Increase Awareness of Extreme Temperature Risk and Safety**. Educate citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves.	Extreme Temperature	Moderate	Augusta-Richmond County Emergency Management	Departmental budget	2020	New
PEA-7	**Conduct Lightning Awareness Programs**. Develop a lightning brochure for distribution by the Recreation Department to county sports groups. Post warning signage at local parks. Teach school children about the dangers of lightning and how to take safety precautions.	Lightning	Low	Augusta-Richmond County Emergency Management/ Recreation	Departmental budget	2020	New

City of Blythe Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention							
P-1	**Public Tree Maintenance** – Continue tree maintenance on city streets and city-owned property (reduce debris, impacts of falling).	Tornado/ Windstorm/ Hail; Severe Winter Storm	High	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	Georgia Forestry Commission Urban and Community Forestry Grant, Operational Budget	2020	Deferred; Tree maintenance is an ongoing project.
P-2	**Economic Analysis related to Flood Hazard and Critical Facilities**. Perform economic analysis related to identifying the most effective flood mitigation projects. Utilize newly developed FEMA DFIRMs and new topography to ascertain economic impact of flooding at various frequencies. Develop several scenarios and identify the most cost-beneficial mitigation measures. Map critical facilities information using the city GIS platform.	Flood	Low	Planning and Zoning, IT	ESRI Government Grant Program, Federal Grants	2020	Deferred; Action cannot be started until after new flood maps are adopted by the community which is due to happen in 2017.
P-3	**Dam Safety**. For State-designated Category I dams that are located in the City or on waterways that drain through the City, estimate potential impacts and determine if the downstream risks are sufficient to contact owners to encourage their development of limited emergency action plan procedures, and period inspections, that are coordinated with the City.	Flood	Moderate	Emergency Management with support of Engineering Department and GA DNR Dam Safety Program	Operational Budget, Federal and State Grants	2021	Deferred; Funding was not available.
P-4	**Outreach and seismic inspection**. Request that building inspectors conduct field verification of the building structural soundness and field operator seismic inspection of residential structures.	Earthquake	High	License Inspections Department	Operational Budget	2021	Deferred; Removed EMA as a responsible agency. The action has been moved to the Planning and Development Department as it is their function.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	**Conduct safe communities' audit**. Request that the Planning and Development Department to create a safe growth steering committee to develop vision for the community, conduct workshops, and post analysis information and reports on local government websites. Develop potential safe growth regulations, policies, and processes to revise existing community documents, regulations, and plans.	All	High	Planning and Development	Operational Budget	2019	Deferred; This effort has been started but has not reached completion.
P-6	**Assess Vulnerability to Drought Risk**. Gathering and analyzing water and climate data to gain a better understanding of local climate and drought history. Determine how the community and its water sources have been impacted by droughts in the past.	Drought	Low	Augusta-Richmond County Emergency Management/ Water Utilities	Departmental budget	2019	New
Property Protection							
PP-1	**Promote enhanced anchoring of manufactured homes** – making them less susceptible to tornado damages and detachment from the pad.	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	FEMA PA	2021	Deferred; Need to create a campaign to support home owners in working through the process.
Emergency Services							
ES-1	**Review capacity of the existing tornado shelters, construct new ones if needed.**	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	HMGP, PDM	2021	Deferred; Existing tornado shelters do not exist in Richmond County. Funding for construction was requested in 2014 but it was not a funded project.
ES-2	**Debris Management Plan** – Work with the cities, GEMA, FEMA, power companies, and other entities to revise and gain approval, support, and funding of existing Debris Management Plan.	Tornado/ Windstorm/ Hail; Severe Winter Storm	High	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	GEFA Grants for Communities and Solid Waste Authorities, FEMA PA, HMPG, within existing budget	Complete	FEMA has approved Augusta's Debris Management Plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness							
PEA-1	**Severe Storm Awareness** – Continue public outreach on severe storm and tornado risks; encourage families to prepare Disaster Supply Kits; encourage people with special medial needs to notify Augusta Emergency Management Agency. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including nonprofit and neighborhood organizations and others, to look at outreach efforts and materials provided by the National Weather Service, FEMA, the American Red Cross, and others and determine whether changes are appropriate. Expand use of Augusta's website to make information readily available to the public.	Tornado/ Windstorm/ Hail	High	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	State Farm Safety Grant, within existing budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including: a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.
PEA-2	**Water Conservation Awareness**. Augusta Utilities to continue implementation of the Water Conservation Plan; continue to comment on proposed development site and landscaping plans; continue to report on and encourage conservation and to highlight water conservation tips on its web page. The Cities of Blythe and Hephzibah will continue to follow and implement the State's water conservation guidelines and well as water use ordinances.	Drought and Extreme Heat	High	Augusta Utilities, Blythe, Hephzibah, County Extension Service, Georgia DNR	Implementation within Operational budget	2021	Deferred; This is an ongoing process for the Cities to work with Augusta Utilities and GADNR to create awareness.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	**Severe Winter Storm Awareness** – Continue public outreach on severe winter storm and ice; encourage families to prepare Disaster Supply Kits; encourage people with special medical needs to notify Augusta Emergency Management Agency. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including non-profit and neighborhood organizations and others, to look at outreach efforts and materials provided by the National Weather Service, FEMA, the American Red Cross, and others and determine whether changes are appropriate. Expand use of EMA and Augusta's website to make information readily available to the public.	Severe Winter Storm	High	Augusta-Richmond County EMA and the Cities of Blythe and Hephzibah with support of Recreation and Parks	NOAA Integrated Flood Overserving and Warning System (IFLOWS-11.450 Grant), within Operational budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including: a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.

City of Hephzibah Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Prevention							
P-1	**Public Tree Maintenance** – Continue tree maintenance on city streets and city-owned property (reduce debris, impacts of falling).	Tornado/ Windstorm/ Hail; Severe Winter Storm	High	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	Georgia Forestry Commission Urban and Community Forestry Grant, within Operational budget	2021	Deferred; Tree maintenance is an ongoing project.
P-2	**Economic Analysis related to Flood Hazard and Critical Facilities**. Perform economic analysis related to identifying the most effective flood mitigation projects. Utilize newly developed FEMA DFIRMs and new topography to ascertain economic impact of flooding at various frequencies. Develop several scenarios and identify the most cost-beneficial mitigation measures. Map critical facilities information using the city GIS platform.	Flood	Low	Planning and Zoning, IT	ESRI Government Grant Program, seek various grants	2020	Deferred; Action cannot be started until after new flood maps are adopted by the community which is due to happen in 2017.
P-3	**Dam Safety**. For State-designated Category I dams that are located in the City or on waterways that drain through the City, estimate potential impacts and determine if the downstream risks are sufficient to contact owners to encourage their development of limited emergency action plan procedures, and period inspections, that are coordinated with the City.	Flood	Moderate	Emergency Management with support of Engineering Department and GA DNR Dam Safety Program	Operational Budget, Federal and State Grants	2021	Deferred; Funding was not available.
P-4	**Outreach and seismic inspection**. Request that building inspectors conduct field verification of the building structural soundness and field operator seismic inspection of residential structures.	Earthquake	High	License Inspections Department	Operational Budget	2021	Deferred; Removed EMA as a responsible agency. The action has been moved to the Planning and Development Department as it is their function.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
P-5	**Conduct safe communities' audit**. Request that the Planning and Development Department to create a safe growth steering committee to develop vision for the community, conduct workshops, and post analysis information and reports on local government websites. Develop potential safe growth regulations, policies, and processes to revise existing community documents, regulations, and plans.	All	High	Planning and Development	Operational Budget	2019	Deferred; This effort has been started but has not reached completion.
P-6	**Assess Vulnerability to Drought Risk**. Gathering and analyzing water and climate data to gain a better understanding of local climate and drought history. Determine how the community and its water sources have been impacted by droughts in the past.	Drought	Low	Augusta-Richmond County Emergency Management/ Water Utilities	Department budget	2019	New
Property Protection							
PP-1	**Promote enhanced anchoring of manufactured homes** – making them less susceptible to tornado damages and detachment from the pad.	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	FEMA PA	2021	Deferred; Need to create a campaign to support home owners in working through the process.
Emergency Services							
ES-1	**Review capacity of the existing tornado shelters, construct new ones if needed.**	Tornado/ Windstorm/ Hail	Moderate	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	HMGP, PDM	2021	Deferred; Existing tornado shelters do not exist in Richmond County. Funding for construction was requested in 2014 but it was not a funded project.
ES-2	**Debris Management Plan** – Work with the cities, GEMA, FEMA, power companies, and other entities to revise and gain approval, support, and funding of existing Debris Management Plan.	Tornado/ Windstorm/ Hail; Severe Winter Storm	High	Augusta-Richmond County EMA with support of the Cities of Hephzibah and Blythe	GEFA Grants for Communities and Solid Waste Authorities, FEMA PA, HMPG, within existing budget	Complete	FEMA has approved Augusta's Debris Management Plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
Public Education and Awareness							
PEA-1	**Severe Storm Awareness** – Continue public outreach on severe storm and tornado risks; encourage families to prepare Disaster Supply Kits; encourage people with special medial needs to notify Augusta Emergency Management Agency. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including nonprofit and neighborhood organizations and others, to look at outreach efforts and materials provided by the National Weather Service, FEMA, the American Red Cross, and others and determine whether changes are appropriate. Expand use of Augusta's website to make information readily available to the public.	Tornado/ Windstorm/ Hail	High	Augusta-Richmond County with support of Recreation and Parks and the Cities of Blythe and Hephzibah	State Farm Safety Grant, within existing budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including: a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.
PEA-2	**Water Conservation Awareness**. Augusta Utilities to continue implementation of the Water Conservation Plan; continue to comment on proposed development site and landscaping plans; continue to report on and encourage conservation and to highlight water conservation tips on its web page. The Cities of Blythe and Hephzibah will continue to follow and implement the State's water conservation guidelines and well as water use ordinances.	Drought and Extreme Heat	High	Augusta Utilities, Blythe, Hephzibah, County Extension Service, Georgia DNR	Implementation within Operational budget	2021	Deferred; This is an ongoing process for the Cities to work with Augusta Utilities and GADNR to create awareness.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2017)
PEA-3	**Severe Winter Storm Awareness** – Continue public outreach on severe winter storm and ice; encourage families to prepare Disaster Supply Kits; encourage people with special medical needs to notify Augusta Emergency Management Agency. Convene a working group of representatives from Augusta, Blythe, Hephzibah, and members of the public, including non-profit and neighborhood organizations and others, to look at outreach efforts and materials provided by the National Weather Service, FEMA, the American Red Cross, and others and determine whether changes are appropriate. Expand use of EMA and Augusta's website to make information readily available to the public.	Severe Winter Storm	High	Augusta-Richmond County EMA and the Cities of Blythe and Hephzibah with support of Recreation and Parks	NOAA Integrated Flood Overserving and Warning System (IFLOWS-11.450 Grant), within existing budget	Complete	Emergency management currently provides readiness information to the community through various outlets, including: a community emergency ready day held every Fall, through social media, TV, and radio, on the city website, through the emergency notification system text and email, and through small group presentations.

SECTION 10
PLAN MAINTENANCE

This section discusses how the Augusta-Richmond County Mitigation Strategy and Mitigation Action Plan will be implemented and how the Hazard Mitigation Plan will be evaluated and enhanced over time. This section also discusses how the public will continue to be involved in a sustained hazard mitigation planning process. It consists of the following three subsections:

- 10.1 Monitoring and Evaluating the Previous Plan
- 10.2 Implementation and Integration
- 10.3 Monitoring, Evaluation, and Enhancement
- 10.4 Continued Public Involvement

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44 CFR Requirement
44 CFR Part201.6(c)(4)(i): The plan shall include a plan maintenance process that includes a section describing the method and schedule of monitoring, evaluating and updating the mitigation plan within a five-year cycle. ***44 CFR Part 201.6(c)(4)(ii):*** The plan maintenance process shall include a process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.

10.1 MONITORING AND EVALUATING THE PREVIOUS PLAN

Since the previous plan was adopted, each jurisdiction has worked to ensure that mitigation was integrated into local activities and that the mitigation plan was appropriately implemented. The participants jointly outlined a process in the previous mitigation plan for monitoring and evaluating the plan throughout the interim period between plan updates.

All participants were ultimately successful in implementing the monitoring and evaluation processes that were outlined in previous plan as all participating jurisdictions participated in annual meetings to discuss the mitigation plan and the priorities that were outlined in it. The specific process is outlined below with an explanation of how the monitoring and evaluating process was carried out as well as any changes that were identified that would be useful to implement during the next update.

Augusta-Richmond County

The Augusta-Richmond County and the Cities of Blythe and Hephzibah Multi-Jurisdictional Hazard Mitigation Plan included a review process and progress report on the plan. The Augusta-Richmond County Planning Commission and the Augusta Emergency Management Agency were charged with monitoring the plan and mitigation activities and preparing annual progress reports. Meetings held between the Emergency Management Agency, community stakeholders, and the agencies assigned lead functions reported on the status of implementation, including obstacles to progress and recommended solutions. Reports were compiled into a single document and submitted to the Georgia Emergency Management Agency and all stakeholders.

In addition to the annual report, a meeting was convened after damage-causing natural hazard events to review the effects of the hazard events. These after action reports were incorporated into the community LEOP and supporting response functions. Based on evaluation of those effects, adjustments to the mitigation actions and priorities were made and additional event-specific actions identified for inclusion in the Joint Comprehensive Plan Short Term Work Program, Flood Mitigation Plan, Capital Improvements Plan, and Green Space Program.

Although there were some minor revisions made to the plan during the interim update period, there were few major revisions identified during this time and the HMP planning team generally agreed that the plan was on course and that the monitoring and evaluating process itself was sufficient to ensure implementation of the plan.

The planning team noted that while reporting was done on the progress of the plan through the interim review period on a bi-annual basis. The HMP planning team met following an event that occurred and a noted deficiency was the failure of the team to meet on an annual basis and discuss any needed updates to the plan. The HMP planning team will meet in the future on an annual basis as well as after an emergency event to implement any changes.

10.2 IMPLEMENTATION AND INTEGRATION

Each agency, department, or other partner participating under the Augusta-Richmond County Hazard Mitigation Plan is responsible for implementing specific mitigation actions as prescribed in the Mitigation Action Plan. Every proposed action listed in the Mitigation Action Plan is assigned to a specific "lead" agency or department in order to assign responsibility and accountability and increase the likelihood of subsequent implementation.

In addition to the assignment of a local lead department or agency, an implementation time period or a specific implementation date has been assigned in order to assess whether actions are being implemented in a timely fashion. When applicable, potential funding sources have been identified for proposed actions listed in the Mitigation Action Plan.

The participating jurisdictions will integrate this Hazard Mitigation Plan into relevant government decision-making processes or mechanisms, where feasible. This includes integrating the requirements of the Hazard Mitigation Plan into other local planning documents, processes, or mechanisms, such as comprehensive or capital improvement plans, when appropriate. The members of the Augusta-Richmond County Hazard Mitigation Planning Team will remain charged with ensuring that the goals and mitigation actions of new and updated local planning documents for their agencies or departments are consistent, or do not conflict with, the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in Augusta-Richmond County.

Since the previous plan was adopted, each jurisdiction has worked to integrate the hazard mitigation plan into other planning mechanisms where applicable/feasible. Examples of how this integration has occurred have been documented in the Implementation Status discussion provided for each of the mitigation actions found in Section 9. Specific examples of how integration has occurred include:

- Integrating the mitigation plan into reviews and updates of floodplain management ordinances;

- Integrating the mitigation plan into reviews and updates of emergency operations plans;
- Integrating the mitigation plan into review and updates of building codes; and
- Integrating the mitigation plan into capital improvements plans through the identification of mitigation actions that require local funding

Opportunities to further integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the Hazard Mitigation Planning Team and the review process described herein. Although it is recognized that there are many possible benefits to integrating components of this Plan into other local planning mechanisms, the development and maintenance of this stand-alone Multi-jurisdictional Hazard Mitigation Plan is deemed by the Hazard Mitigation Planning Team to be the most effective and appropriate method to implement local hazard mitigation actions at this time.

10.3 MONITORING, EVALUATION, AND ENHANCEMENT

Periodic revisions and updates of the Hazard Mitigation Plan are required to ensure that the goals of the Plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable federal and state regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to the Mitigation Action Plan.

The Hazard Mitigation Planning Team shall meet once every year to evaluate the progress attained and to revise, where needed, the activities set forth in the Plan. This meeting shall be held in the month upon which final plan approval is attained, however, it may be necessary to schedule in the month prior or after in any given year, depending on the schedules of local officials. The findings and recommendations of the Planning Team will be documented in the form of a report that can be shared with interested cities, the county, and other stakeholders. The Hazard Mitigation Planning Team will also meet following any disaster events warranting a reexamination of the mitigation actions being implemented or proposed for future implementation. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within Augusta-Richmond County. The Augusta-Richmond County Disaster Preparedness Coordinator will be responsible for reconvening the Hazard Mitigation Planning Team for these reviews.

Five Year Plan Review

The Plan will be thoroughly reviewed by the Hazard Mitigation Planning Team every five years to determine whether there have been any significant changes in Augusta-Richmond County that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, an increased exposure to hazards, an increase or decrease in capability to address hazards, and changes to federal or state legislation are examples of factors that may affect the necessary content of the Plan.

The plan review provides Augusta-Richmond County/municipal officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. The Augusta-Richmond County Disaster Preparedness Coordinator will be responsible for reconvening the Hazard Mitigation Planning Team and conducting the five-year review.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- Do the goals address current and expected conditions?
- Has the nature or magnitude of risks changed?
- Are the current resources appropriate for implementing the Plan?
- Are there implementation problems, such as technical, political, legal, or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did city/county departments participate in the plan implementation process as assigned?

Following the five-year review, any revisions deemed necessary will be summarized and implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the Augusta-Richmond County Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the Georgia Emergency Management Agency (GEMA) for final review and approval in coordination with the Federal Emergency Management Agency (FEMA).

Because the plan update process can take several months to complete, and because Federal funding may be needed to update the plan, it is recommended that the five-year review process begin at the beginning of the third year after the plan was last approved. This will allow the participants in the Augusta-Richmond County Hazard Mitigation Plan to organize in order to seek Federal funding if necessary and complete required plan update documentation before the plan expires at the end of the fifth year.

Disaster Declaration

Following a disaster declaration, the Augusta-Richmond County Hazard Mitigation Plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility of the Augusta-Richmond County Disaster Preparedness Coordinator to reconvene the Hazard Mitigation Planning Team and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

Reporting Procedures

The results of the five-year review will be summarized by the Hazard Mitigation Planning Team in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

Plan Amendment Process

Upon the initiation of the amendment process, representatives from Augusta-Richmond County and the participating municipalities will forward information on the proposed change(s) to all interested parties including, but not limited to, all directly affected departments, residents, and businesses. Information will also be forwarded to the Georgia Emergency Management Agency. This information will be

disseminated in order to seek input on the proposed amendment(s) for no less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the Hazard Mitigation Planning Team for final consideration. The Hazard Mitigation Planning Team will review the proposed amendment along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan.

In determining whether to recommend approval or denial of a Plan amendment request, the following factors will be considered by the Hazard Mitigation Planning Team:

- There are errors, inaccuracies, or omissions made in the identification of issues or needs in the Plan.
- New issues or needs have been identified which are not adequately addressed in the Plan.
- There has been a change in information, data, or assumptions from those on which the Plan is based.

Upon receiving the recommendation from the Hazard Mitigation Planning Team, and prior to adoption of the Plan, the participating jurisdictions will hold a public hearing. The governing bodies of each participating jurisdiction will review the recommendation from the Hazard Mitigation Planning Team (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing bodies will take one of the following actions:

- Adopt the proposed amendments as presented;
- Adopt the proposed amendments with modifications;
- Refer the amendments request back to the Hazard Mitigation Planning Team for further revision; or
- Defer the amendment request back to the Hazard Mitigation Planning Team for further consideration and/or additional hearings.

Incorporation into Existing Planning Documents

The Augusta-Richmond County Hazard Mitigation Planning Team intends to make available to all of Augusta-Richmond County and its municipalities a process by which the requirements of this hazard mitigation plan will be incorporated into other plans. During the planning process for new and updated local planning documents, such as a comprehensive plan, capital improvements plan, or emergency management plan to name a few examples, the Emergency Management Agency will provide a copy of the hazard mitigation plan to the advisory committee of each relevant planning document. The Emergency Management Agency will advise the advisory committee members to ensure that all goals and strategies of new and updated local planning documents are consistent with the hazard mitigation plan and will not increase hazards in the jurisdictions.

This process will be carried out for each of the planning documents described in *Section 7: Capability Assessment* of this document. It should also be noted that the jurisdictions within the county are participants in the county-level version of each type of plan and do not have stand-alone jurisdictional plans of their own. Therefore, when the Emergency Management Agency shares and advises on the

hazard mitigation plan, they are acting on behalf of the municipalities. It should be further noted that due to the smaller size of the municipalities, municipal representatives of the Hazard Mitigation Planning Team are often the same person who participates in the update of comprehensive plans, zoning ordinances, and other planning documents. As such, much of the engrained knowledge these officials have gained from participating in the hazard mitigation planning process is transferred to these processes.

Therefore, each municipality's process for integrating the hazard mitigation plan into other planning mechanisms is the same as the county level process because these planning mechanisms are carried out as countywide plans or ordinances and each community's stake in each process is intricately linked.

10.4 CONTINUED PUBLIC INVOLVEMENT

44 CFR Requirement
44 CFR Part 201.6(c)(4)(iii): The plan maintenance process shall include a discussion on how the community will continue public participation in the plan maintenance process.

Public participation is an integral component to the mitigation planning process and will continue to be essential as this Plan evolves over time. As described above, significant changes or amendments to the Plan shall require a public hearing prior to any adoption procedures.

Other efforts to involve the public in the maintenance, evaluation, and revision process will also be made. These efforts include:

- Advertising meetings of the Hazard Mitigation Planning Team in local newspapers, public bulletin boards, and/or city/county and municipal office buildings;
- Designating willing and voluntary citizens and private sector representatives as official members of the Hazard Mitigation Planning Team;
- Utilizing local media to update the public on any maintenance and/or periodic review activities taking place;
- Utilizing the websites of participating jurisdictions to advertise any maintenance and/or periodic review activities taking place; and
- Keeping copies of the Plan in public libraries.

Appendix A
Plan Adoption

This appendix includes the FEMA APA letter and local adoption resolutions for each of the participating jurisdictions.

GEORGIA EMERGENCY MANAGEMENT AGENCY
HOMELAND SECURITY

NATHAN DEAL
GOVERNOR

HOMER BRYSON
DIRECTOR

July 27, 2017

Honorable Hardie Davis, Jr.
Mayor
Augusta-Richmond County
535 Telfair Street
Augusta, Georgia 30901

Dear Mayor Davis:

The Federal Emergency Management Agency (FEMA) has completed its review of the Richmond County Multi-Jurisdictional Hazard Mitigation Plan for compliance with the programmatic requirements of the Federal Hazard Mitigation Planning Standards contained in 44 CFR Section 201.6(b)-(d). FEMA has determined that the Richmond County Hazard Mitigation Plan Update is compliant with Federal standards, subject to formal community adoption.

The county and each municipality must pass individual resolutions adopting the Plan. Please forward the adopted and signed resolutions to Breanna Rogers, Hazard Mitigation Planner, so that we may submit them to FEMA for inclusion in your plan for formal federal review and approval. Upon submittal of a copy of the participating jurisdictions' adoption documentation as well as documentation of the final public meeting, FEMA will issue formal approval of the Richmond County Multi-jurisdictional Mitigation Plan. Should you have any questions or need additional information, please contact Breanna Rogers, Hazard Mitigation Planner, at (404)-635-7245.

Sincerely,

Terry K. Lunn
Hazard Mitigation Division Director

tkl/br
cc: Christopher E. James, Director
Richmond County Emergency Management Agency
Richmond County Municipalities
Collin Hopf, Area Coordinator
Georgia Emergency Management Agency/Homeland Security

RECEIVED
AUG 07 2017
BY:

RESOLUTION TO ADOPT THE
AUGUSTA-RICHMOND COUNTY, GA MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, Augusta-Richmond County is vulnerable to an array of natural hazards that can cause loss of life and damages to public and private property; and

WHEREAS, Augusta-Richmond County desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the development and implementation of a hazard mitigation plan can result in actions that reduce the long-term risk to life and property from natural hazards; and

WHEREAS, it is the intent of the Augusta, GA Board of Commissioners to protect its citizens and property from the effects of natural hazards by preparing and maintaining a local hazard mitigation plan; and

WHEREAS, it is also the intent of the Augusta, GA Board of Commissioners to fulfill its obligation under the Robert T. Stafford Disaster Relief and Emergency Assistance Act and to remain eligible to receive state and federal assistance in the event of a declared disaster affecting Augusta-Richmond County; and

WHEREAS, Augusta, GA , in coordination with the City of Hephzibah, GA and the City of Blythe, GA, has prepared a multi-jurisdictional hazard mitigation plan with input from the appropriate local and state officials;

WHEREAS, the Georgia Emergency Management Agency and the Federal Emergency Management Agency have reviewed the Augusta-Richmond County, GA Hazard Mitigation Plan for legislative compliance and has approved the plan pending the completion of local adoption procedures;

NOW, THEREFORE, BE IT RESOLVED that the Augusta, GA Board of Commissioners hereby:

1. Adopts the Augusta-Richmond County, GA Multi-jurisdictional Hazard Mitigation Plan; and

2. Agrees to take such other official action as may be reasonably necessary to carry out the proposed actions of the Plan.

Adopted on March 7, 2017.

Hardie Davis, Jr, Mayor
Augusta, GA

9/5/17

ATTEST:

Lena Bonner, Clerk

AUGUSTA-RICHMOND COUNTY 1736 GEORGIA

CITY OF BLYTHE
RES NO. 2017-02

RESOLUTION TO ADOPT THE
AUGUSTA-RICHMOND COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, CITY OF BLYTHE is vulnerable to an array of natural hazards that can cause loss of life and damages to public and private property; and

WHEREAS, CITY OF BLYTHE desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the development and implementation of a hazard mitigation plan can result in actions that reduce the long-term risk to life and property from natural hazards; and

WHEREAS, it is the intent of the BLYTHE MAYOR AND CITY COUNCIL is to protect its citizens and property from the effects of natural hazards by preparing and maintaining a local hazard mitigation plan; and

WHEREAS, it is also the intent of the BLYTHE MAYOR AND CITY COUNCIL to fulfill its obligation under the Robert T. Stafford Disaster Relief and Emergency Assistance Act and to remain eligible to receive state and federal assistance in the event of a declared disaster affecting the CITY OF BLYTHE; and

WHEREAS, BLYTHE, GA, in coordination with the AUGUSTA-RICHMOND COUNTY and CITY OF HEPHZIBAH, has prepared a multi-jurisdictional hazard mitigation plan with input from the appropriate local and state officials;

WHEREAS, the Georgia Emergency Management Agency and the Federal Emergency Management Agency have reviewed the AUGUSTA-RICHMOND COUNTY Multi-Jurisdictional Hazard Mitigation Plan for legislative compliance and has approved the plan pending the completion of local adoption procedures;

NOW, THEREFORE, BE IT RESOLVED that the CITY OF BLYTHE MAYOR AND COUNCIL hereby:

1. Adopts the AUGUSTA-RICHMOND COUNTY Multi-jurisdictional Hazard Mitigation Plan; and
2. Agrees to take such other official action as may be reasonably necessary to carry out the proposed actions of the Plan.

Adopted on August 7th, 2017.

Brent Weir, Mayor
Blythe, GA

Absent
Cindy Parham, Councilmember

James G. Adkins, Councilmember

Daisy Price
Daisy Price, Councilmember

Noel Cartagena, Councilmember

CITY OF BLYTHE CORPORATE SEAL 1920 GEORGIA

ATTEST:
Loriann H. Chancey
Loriann H. Chancey, Clerk

RESOLUTION TO ADOPT THE
AUGUSTA-RICHMOND COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

WHEREAS, the CITY OF HEPHZIBAH is vulnerable to an array of natural hazards that can cause loss of life and damages to public and private property; and

WHEREAS, the CITY OF HEPHZIBAH desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the development and implementation of a hazard mitigation plan can result in actions that reduce the long-term risk to life and property from natural hazards; and

WHEREAS, it is the intent of the HEPHZIBAH CITY COMMISSION to protect its citizens and property from the effects of natural hazards by preparing and maintaining a local hazard mitigation plan; and

WHEREAS, it is also the intent of the HEPHZIBAH CITY COMMISSION to fulfill its obligation under the Robert T. Stafford Disaster Relief and Emergency Assistance Act and to remain eligible to receive state and federal assistance in the event of a declared disaster affecting CITY OF HEPHZIBAH; and

WHEREAS, the CITY OF HEPHZIBAH in coordination with the AUGUSTA-RICHMOND COUNTY and the CITY OF BLYTHE, has prepared a multi-jurisdictional hazard mitigation plan with input from the appropriate local and state officials;

WHEREAS, the Georgia Emergency Management Agency and the Federal Emergency Management Agency have reviewed the Augusta-Richmond County Multi-Jurisdictional Hazard Mitigation Plan for legislative compliance and has approved the plan pending the completion of local adoption procedures;

NOW, THEREFORE, BE IT RESOLVED that the Hephzibah City Commission hereby:

1. Adopts the Augusta-Richmond County Multi-Jurisdictional Hazard Mitigation Plan; and
2. Agrees to take such other official action as may be reasonably necessary to carry out the proposed actions of the Plan.

Adopted on August 7, 2017.

Robert J. Buchwitz

Robert Buchwitz
Chairman, Hephzibah City Commission

ATTEST:

Martha R. Allen, City Clerk

Appendix B
Planning Tools

This appendix includes the following:

1. List of Recommended Stakeholders
2. Blank Public Survey
3. GIS Data Inventory Sheet
4. Blank Capability Assessment Survey
5. Scoring Criteria for Capability Assessment
6. Blank Mitigation Action Worksheet
7. Plan Update Evaluation Worksheet

In establishing a planning team, you want to ensure that you have a broad range of backgrounds and experiences represented. Below are some suggestions for agencies to include in a planning team. There are many organizations, both governmental and community-based, that should be included when creating a local team. In addition, state organizations can be included on local teams, when appropriate, to serve as a source of information and to provide guidance and coordination.

Use the checklist as a starting point for forming your team. Check the boxes beside any individuals or organizations that you have in your community/state that you believe should be included on your planning team so you can follow up with them.

Task A. Create the planning team – *Suggestions for team members.* Date:_____

Local/Tribal

- ☐ Administrator/Manager's Office
- ☐ Budget/Finance Office
- ☐ Building Code Enforcement Office
- ☐ City/County Attorney's Office
- ☐ Economic Development Office
- ☐ Emergency Preparedness Office
- ☐ Fire and Rescue Department
- ☐ Hospital Management
- ☐ Local Emergency Planning Committee
- ☐ Planning and Zoning Office
- ☐ Police/Sheriff's Department
- ☐ Public Works Department
- ☐ Sanitation Department
- ☐ School Board
- ☐ Transportation Department
- ☐ Tribal Leaders

Special Districts and Authorities

- ☐ Airport and Seaport Authorities
- ☐ Business Improvement District(s)
- ☐ Fire Control District
- ☐ Flood Control District
- ☐ Redevelopment Agencies
- ☐ Regional/Metropolitan Planning Organization(s)
- ☐ School District(s)
- ☐ Transit/Transportation Agencies

Others

- ☐ Architectural/Engineering/Planning Firms
- ☐ Citizen Corps
- ☐ Colleges/Universities
- ☐ Land Developers
- ☐ Major Employers/Businesses
- ☐ Professional Associations
- ☐ Retired Professionals

State

- ☐ Adjutant General's Office (National Guard)
- ☐ Board of Education
- ☐ Building Code Office
- ☐ Climatologist
- ☐ Earthquake Program Manager
- ☐ Economic Development Office
- ☐ Emergency Management Office/State Hazard Mitigation Officer
- ☐ Environmental Protection Office
- ☐ Fire Marshal's Office
- ☐ Geologist
- ☐ Homeland Security Coordinator's Office
- ☐ Housing Office
- ☐ Hurricane Program Manager
- ☐ Insurance Commissioner's Office
- ☐ National Flood Insurance Program Coordinator
- ☐ Natural Resources Office
- ☐ Planning Agencies
- ☐ Police
- ☐ Public Health Office
- ☐ Public Information Office
- ☐ Tourism Department

Non-Governmental Organizations (NGOs)

- ☐ American Red Cross
- ☐ Chamber of Commerce
- ☐ Community/Faith-Based Organizations
- ☐ Environmental Organizations
- ☐ Homeowners Associations
- ☐ Neighborhood Organizations
- ☐ Private Development Agencies
- ☐ Utility Companies
- ☐ Other Appropriate NGOs

PUBLIC PARTICIPATION SURVEY
FOR HAZARD MITIGATION PLAN UPDATE

We need your help! Please take a few minutes to complete this survey.

The City of Augusta-Richmond County is working together to become less vulnerable to natural hazards, such as winter storms, tornadoes, and floods, as well as man-made hazards, including nuclear plant incidents and terrorism, and your participation is important to us!

The City-County, along with local jurisdictions and other partners, are working to prepare a multi-jurisdictional *Hazard Mitigation Plan Update*. This Plan will identify and assess our community's natural and man-made hazard risks and determine how to best mitigate, or minimize and manage, those risks.

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

Please help us by completing this survey by September 5, 2016 and returning it to:

Margaret Walton, Atkins
1616 E Millbrook Road, Suite 310
Raleigh, NC 27609

Surveys can also be faxed to: (919) 876-6848 c/o Margaret Walton or scanned and emailed to: Margaret Walton at margaret.walton@atkinsglobal.com.

If you have any questions regarding this survey or would like to learn about more ways you can participate in the development of the *City of Augusta-Richmond County Hazard Mitigation Plan Update*, please contact Atkins, the planning consultant for the project. You may reach Margaret Walton (Atkins) at (803) 622-4142 or by email at margaret.walton@atkinsglobal.com.

1. Where do you live?

- ❑ Unincorporated Richmond County
- ❑ City of Augusta
- ❑ City of Blythe
- ❑ City of Hephzibah
- ❑ Other: _____

2. Is your home located in a floodplain?

- ❑ Yes
- ❑ No
- ❑ I don't know

3. **Do you have flood insurance for your home/personal property?**

- ❑ Yes
- ❑ No
- ❑ I don't know

   a. **If "No," why not?**

   - ❑ Not located in floodplain
   - ❑ Too expensive
   - ❑ Not necessary because it never floods
   - ❑ Not necessary because my property is elevated or otherwise protected
   - ❑ Never really considered it
   - ❑ Other (please explain): _____

4. **Have you ever experienced or been impacted by a natural disaster or man-made incident?**

- ❑ Yes
- ❑ No

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

5. **On a scale of 1 to 5, how concerned are you about the possibility of your community being impacted by a natural disaster or man-made incident?**

- ❑ 1 – Not at all
- ❑ 2 – Slightly
- ❑ 3 – Moderately
- ❑ 4 – Very
- ❑ 5 – Extremely

6. **Please select the <u>three</u> hazards you think pose the *greatest concern* to your community:**

- ❑ Chemical Hazard
- ❑ Dam/Levee Failure
- ❑ Drought
- ❑ Earthquake
- ❑ Extreme Heat
- ❑ Flooding
- ❑ Hail
- ❑ Nuclear Plant Incident
- ❑ Severe Winter Storm
- ❑ Terrorism
- ❑ Tornado
- ❑ Windstorm
- ❑ Wildfire

7. **Is there another hazard not listed above that you think is a wide-scale threat to your community?**

   - ❑ Yes (please explain): _____
   - ❑ No

8. **On a scale of 1 to 5, how prepared do you feel if a natural disaster or man-made incident were to occur?**

   - ❑ 1 – Not at all
   - ❑ 2 – Slightly
   - ❑ 3 – Moderately
   - ❑ 4 – Very
   - ❑ 5 – Extremely

9. **Have you taken any actions to make your home, neighborhood, or family safer from hazards?**

   - ❑ Yes
   - ❑ No

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

10. **Are you interested in making your home, neighborhood, or family safer from hazards?**

    - ❑ Yes
    - ❑ No

11. **On a scale of 1 to 5, how informed do you feel about the risks and potential impacts of natural disasters and man-made incidents?**

    - ❑ 1 – Not at all
    - ❑ 2 – Slightly
    - ❑ 3 – Moderately
    - ❑ 4 – Very
    - ❑ 5 – Extremely

12. **Do you know which government department or agency to contact regarding your risks from hazards in your area?**

- ❑ Yes
- ❑ No

13. **Please select the way(s) you prefer to receive information about how to make your home, neighborhood, or family safer from hazards:**

- ❑ Newspaper
- ❑ Television
- ❑ Radio
- ❑ Internet
- ❑ Social media
- ❑ Email
- ❑ Mail
- ❑ Public workshops/meetings
- ❑ School meetings
- ❑ Other (please explain): _____

14. **Please select the way(s) you prefer to receive alerts or warnings about impending hazard events or dangerous conditions:**

- ❑ Television
- ❑ Radio
- ❑ Landline phone
- ❑ Cell phone
- ❑ Text message
- ❑ Facebook
- ❑ Twitter
- ❑ Other (please explain): _____

15. **In your opinion, what are some steps your local government could take to reduce the risk of future hazard damages in your community?**

16. **A number of community-wide activities can reduce vulnerability to hazards. In general, these activities fall into one of the following six broad categories. Please tell us how important you think each category is for your community to consider.**

Category	Very Important	Somewhat Important	Not Important
1. Prevention Administrative or regulatory actions that influence the way land is developed and buildings are built. Examples include planning and zoning, building codes, open space preservation, and floodplain regulations.	❑	❑	❑
2. Property Protection Actions that involve modification of existing buildings to protect them from a hazard or removal from the hazard area. Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.	❑	❑	❑
3. Natural Resource Protection Actions that, in addition to minimizing hazard losses, also preserve or restore the functions of natural systems. Examples include floodplain protection, habitat preservation, slope stabilization, riparian buffers, and forest management.	❑	❑	❑
4. Structural Projects Actions intended to lessen the impact of a hazard by modifying the natural progression of the hazard. Examples include dams, levees, detention/retention basins, channel modification, retaining walls, and storm sewers.	❑	❑	❑
5. Emergency Services Actions that protect people and property during and immediately after a hazard event. Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.	❑	❑	❑
6. Public Education and Awareness Actions to inform citizens about hazards and the techniques they can use to protect themselves and their property. Examples include outreach projects, school education programs, library materials, and demonstration events.	❑	❑	❑

THANK YOU FOR YOUR PARTICIPATION!

GIS Data Request Sheet
Augusta-Richmond County Hazard Mitigation Plan

Data requested	Available?	Received?	Potential Sources
Tax Parcel Data			Tax Assessor
including replacement value			
Building Footprints			Tax Assessor/GIS office
Critical Facilities (in GIS or list form with addresses)			Tax Assessor/GIS office
examples include:			
government buildings			
hospitals			
senior care			
police/fire/EMS/EOC			
locally significant buildings			
schools			
Local hazard studies			public works, natural resources, planning
examples include:			
Flood Studies (HEC-RAS, Risk MAP)			
Local Hazard History Articles			
Areas of Concern Studies			

If you have any questions, please contact:

Ryan Wiedenman
ryan.wiedenman@gmail.com
919-431-5295

Local Capability Assessment Survey

Jurisdiction/Agency: _____ **Phone:** _____

Point of Contact: _____ **E-mail:** _____

1. PLANNING AND REGULATORY CAPABILITY - Please indicate whether the following planning or regulatory tools (plans, ordinances, codes or programs) are currently in place or under development for your jurisdiction by placing an "**X**" in the appropriate box. Then, for each particular item in place, identify the department or agency responsible for its implementation and indicate its estimated or anticipated effect on hazard loss reduction (Strongly Supports or Helps Facilitate) with another "**X**". Finally, please provide additional comments or explanations in the space provided.

Planning/Regulatory Tool	In Place	Under Development	Department/ Agency Responsible	Effect on Loss Reduction		Comments
				Strongly Supports	Helps Facilitate	
Hazard Mitigation Plan						
Threat and Hazard Identification and Risk Assessment (THIRA)						
Comprehensive Land Use Plan (or General, Master or Growth Management Plan)						
Floodplain Management Plan/Flood Mitigation Plan						
Open Space Management Plan (or Parks & Recreation/ Greenways Plan)						
Stormwater Management Plan/Ordinance						
Natural Resource Protection Plan						
Flood Response Plan						
Emergency Operations Plan						
Emergency Management Accreditation Program (EMAP Accreditation)						
Other Plans (please explain under Comments)						

Local Capability Assessment Survey

Planning/Regulatory Tool	In Place	Under Development	Department/ Agency Responsible	Effect on Loss Reduction		Comments
				Strongly Supports	Helps Facilitate	
Continuity of Operations Plan						
Evacuation Plan						
Disaster Recovery Plan						
Capital Improvements Plan						
Economic Development Plan						
Historic Preservation Plan						
Floodplain Ordinance (or Flood Damage Prevention Ordinance)						
Zoning Ordinance						
Subdivision Ordinance						
Unified Development Ordinance						
Post-disaster Redevelopment/ Reconstruction Plan/Ordinance						
Building Code						
Fire Code						
National Flood Insurance Program (NFIP)						
NFIP Community Rating System (CRS Program)						

Local Capability Assessment Survey

2. ADMINISTRATIVE AND TECHNICAL CAPABILITY - Please indicate whether your jurisdiction maintains the following staff members within its current personnel resources by placing an "**X**" in the appropriate box. Then, if YES, please identify the department or agency they work under and provide any other comments you may have in the space provided.

Staff/Personnel Resources	Yes	No	Department/ Agency	Comments
Planners with knowledge of **land development** and land management practices				
Engineers or **professionals** trained in **construction practices** related to buildings and/or infrastructure				
Planners or **engineers** with an **understanding of natural and/or human-caused hazards**				
Emergency manager				
Floodplain manager				
Land surveyors				
Scientists familiar with the hazards of the community				
Staff with education or **expertise to assess** the community's **vulnerability to hazards**				
Personnel skilled in **Geographic Information Systems (GIS)** and/or **FEMA's HAZUS program**				
Resource development staff or grant writers				

3. FISCAL CAPABILITY - Please indicate whether your jurisdiction has previously used or has access to/is eligible to use the following local financial resources ***for hazard mitigation purposes*** (including as match funds for State of Federal mitigation grant funds) by placing an "**X**" in the appropriate box. Then, provide any other comments you may have in the space provided.

Financial Resources	Yes - used to implement mitigation	Yes - available	No	Comments
Capital Improvement Programming				
Community Development Block Grants (CDBG)				
Special Purpose Taxes (or taxing districts)				
Gas/Electric Utility Fees				
Water/Sewer Fees				
Stormwater Utility Fees				
Development Impact Fees				
General Obligation, Revenue and/or Special Tax Bonds				
Partnering arrangements or intergovernmental agreements				
Other: _____				

4. POLITICAL CAPABILITY - Political capability can be generally measured by the degree to which local political leadership is willing to enact policies and programs that reduce hazard vulnerabilities in your community, even if met with some opposition. Examples may include guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum State or Federal requirements (e.g., building codes, floodplain management, etc.). Please indicate if your community has limited, moderate, or high political capability by placing an "**X**" in the appropriate box. Then, identify some general examples of these efforts if available and/or reference where more documentation can be found.

Political Support	Limited	Moderate	High	Comments
Degree of support by local elected officials in terms of adopting/funding mitigation				

Points System for Capability Ranking

0-24 points = Limited overall capability **25-49 points = Moderate overall capability** **50-86 points = High overall capability**

I. Planning and Regulatory Capability
(Up to 48 points)

Yes = 3 points
Under Development = 1 point
Included under county plan/code/ordinance/program = 1 point
No = 0 points

- Hazard Mitigation Plan
- Threat Hazard and Identification and Risk Assessment (THIRA)
- Comprehensive Land Use Plan
- Floodplain Management Plan/Flood Mitigation Plan
- National Flood Insurance Program (NFIP)
- NFIP Community Rating System (CRS Program)

Yes = 2 points
Under Development = 1 point
Included under county plan/code/ordinance/program = 1 point
No = 0 points

- Open Space Management Plan/Parks & Recreation Plan/Greenways Plan
- Stormwater Management Plan/Ordinance
- Natural Resource Protection Plan
- Flood Response Plan
- Emergency Operations Plan
- Emergency Management Accreditation Program (EMAP Accreditation)
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Flood Damage Prevention Ordinance
- Post-disaster Redevelopment/Reconstruction Plan/Ordinance

Yes = 1 point
No = 0 points

- Capital Improvements Plan
- Economic Development Plan
- Historic Preservation Plan
- Zoning Ordinance
- Subdivision Ordinance
- Unified Development Ordinance

- Building Code
- Fire Code

II. Administrative and Technical Capability
(Up to 15 points)

Yes = 2 points
Service provided by county = 1 point
No = 0 points

- Planners with knowledge of land development and land management practices
- Engineers or professionals trained in construction practices related to buildings and/or infrastructure
- Planners or engineers with an understanding of natural and/or human-caused hazards
- Emergency manager
- Floodplain manager

Yes = 1 point
No = 0 points

- Land surveyors
- Scientist familiar with the hazards of the community
- Staff with education or expertise to assess the community's vulnerability to hazards
- Personnel skilled in Geographical Information Systems (GIS) and/or Hazus
- Resource development staff or grant writers

III. Fiscal Capability
(Up to 20 points)

Yes - used to implement mitigation = 2 points
Yes - available = 1 point
No = 0 points

- Capital Improvement Programming
- Community Development Block Grants (CDBG)
- Special Purpose Taxes (or tax districts)
- Gas/Electric Utility Fees
- Water/Sewer Fees
- Stormwater Utility Fees
- Development Impact Fees
- General Obligation/Revenue/Special Tax Bonds
- Partnering arrangements or intergovernmental agreements
- Other

IV. Political Capability
(Up to 3 points)

High = 3 point
Moderate = 2 points
Limited = 1 point

- Degree of support by local elected officials in terms of adopting/funding mitigation

MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in Augusta-Richmond County will consider to reduce the negative effects of identified hazards. The worksheets provide a simple yet effective method of organizing potential actions in a user-friendly manner that can easily be incorporated into the Augusta-Richmond County's Hazard Mitigation Plan Update.

The worksheets are to be used as part of a strategic planning process and are designed to be:

a.) completed electronically (worksheets and instructions will be e-mailed to members of the Hazard Mitigation Planning Team following the Mitigation Strategy Workshop);
b.) reviewed with your department/organization for further consideration; and
c.) returned according to the contact information provided below.

Please return all completed worksheets by December 2, 2016 to:

Margaret M. Walton, Project Manager, Atkins
Electronic copies may be e-mailed to: margaret.walton@atkinsglobal.com
Hard copies may be faxed to: 919.876.6848 (Attn: Ryan Wiedenman)

INSTRUCTIONS

Each mitigation action should be considered to be a separate local project, policy or program and each individual action should be entered into a separate worksheet. By identifying the implementation requirements for each action, the worksheets will help lay the framework for engaging in distinct actions that will help reduce the community's overall vulnerability and risk. Detailed explanations on how to complete the worksheet are provided below.

Proposed Action: Identify a specific action that, if accomplished, will reduce vulnerability and risk in the impact area. Actions may be in the form of local policies (i.e., regulatory or incentive-based measures), programs or structural mitigation projects and should be consistent with any pre-identified mitigation goals and objectives.

Site and Location: Provide details with regard to the physical location or geographic extent of the proposed action, such as the location of a specific structure to be mitigated, whether a program will be citywide, countywide or regional, etc.

History of Damages: Provide a brief history of any known damages as it relates to the proposed action and the hazard(s) being addressed. For example, the proposed elevation of a repetitive loss property should include an overview of the number of times the structure has flooded, total dollar amount of damages if available, etc.

Hazard(s) Addressed: List the hazard(s) the proposed action is designed to mitigate against.

Category: Indicate the most appropriate category for the proposed action as discussed during the Mitigation Strategy Workshop (Prevention; Property Protection; Natural Resource Protection; Structural Projects; Emergency Services; Public Education and Awareness).

Priority: Indicate whether the action is a "high" priority, "moderate" priority or "low" priority based generally on the following criteria:

1. Effect on overall risk to life and property
2. Ease of implementation / technical feasibility
3. Project costs versus benefits
4. Political and community support
5. Funding availability

Estimated Cost: If applicable, indicate what the total cost will be to accomplish this action. This amount will be an estimate until actual final dollar amounts can be determined. Some actions (such as ordinance revisions) may only cost "local staff time" and should be noted so.

Potential Funding Sources: If applicable, indicate how the cost to complete the action will be funded. For example, funds may be provided from existing operating budgets or general funds, a previously established contingency fund, a cost-sharing federal or state grant program, etc.

Lead Agency/Department Responsible: Identify the local agency, department or organization that is best suited to implement the proposed action.

Implementation Schedule: Indicate when the action will begin and when the action is expected to be completed. Remember that some actions will require only a minimal amount of time, while others may require a long-term or continuous effort.

Comments: This space is provided for any additional information or details that may not be captured under the previous headings.

MITIGATION ACTION	
Proposed Action:	
BACKGROUND INFORMATION	
Site and Location:	
History of Damages:	

MITIGATION ACTION DETAILS	
Hazard(s) Addressed:	
Category:	
Priority (High, Moderate, Low):	
Estimated Cost:	
Potential Funding Sources:	
Lead Agency/Department Responsible:	
Implementation Schedule:	

COMMENTS

Mitigation Action Progress Report Form

Progress Report Period	From Date:	To Date:
Action/Project Title		
Responsible Agency		
Contact Name		
Contact Phone/Email		
Project Status	❏ Project completed ❏ Project canceled ❏ Project on schedule ❏ Anticipated completion date:_____ ❏ Project delayed Explain _____	

Summary of Project Progress for this Report Period

1. What was accomplished for this project during this reporting period?

_____

_____

2. What obstacles, problems, or delays did the project encounter?

_____

_____

3. If uncompleted, is the project still relevant? Should the project be changed or revised?

_____

_____

4. Other comments

_____

_____

Plan Update Evaluation Worksheet

Plan Section	Considerations	Explanation
Planning Process	Should new jurisdictions and/or districts be invited to participate in future plan updates?	
	Have any internal or external agencies been invaluable to the mitigation strategy?	
	Can any procedures (e.g., meeting announcements, plan updates) be done differently or more efficiently?	
	Has the Planning Team undertaken any public outreach activities?	
	How can public participation be improved?	
	Have there been any changes in public support and/or decision- maker priorities related to hazard mitigation?	
Capability Assessment	Have jurisdictions adopted new policies, plans, regulations, or reports that could be incorporated into this plan?	
	Are there different or additional administrative, human, technical, and financial resources available for mitigation planning?	
	Are there different or new education and outreach programs and resources available for mitigation activities?	
	Has NFIP participation changed in the participating jurisdictions?	
Risk Assessment	Has a natural and/or technical or human-caused disaster occurred?	
	Should the list of hazards addressed in the plan be modified?	
	Are there new data sources and/or additional maps and studies available? If so, what are they and what have they revealed? Should the information be incorporated into future plan updates?	
	Do any new critical facilities or infrastructure need to be added to the asset lists?	
	Have any changes in development trends occurred that could create additional risks?	
	Are there repetitive losses and/or severe repetitive losses to document?	

Worksheet 7.2

Plan Update Evaluation Worksheet

Plan Section	Considerations	Explanation
Mitigation Strategy	Is the mitigation strategy being implemented as anticipated? Were the cost and timeline estimates accurate?	
	Should new mitigation actions be added to the Action Plan? Should existing mitigation actions be revised or eliminated from the plan?	
	Are there new obstacles that were not anticipated in the plan that will need to be considered in the next plan update?	
	Are there new funding sources to consider?	
	Have elements of the plan been incorporated into other planning mechanisms?	
Plan Maintenance Procedures	Was the plan monitored and evaluated as anticipated?	
	What are needed improvements to the procedures?	

Appendix C
Local Mitigation Plan Review Tool

LOCAL MITIGATION PLAN REVIEW TOOL

The *Local Mitigation Plan Review Tool* demonstrates how the Local Mitigation Plan meets the regulation in 44 CFR §201.6 and offers States and FEMA Mitigation Planners an opportunity to provide feedback to the community.

- The Regulation Checklist provides a summary of FEMA's evaluation of whether the Plan has addressed all requirements.
- The Plan Assessment identifies the plan's strengths as well as documents areas for future improvement.
- The Multi-jurisdiction Summary Sheet is an optional worksheet that can be used to document how each jurisdiction met the requirements of the each Element of the Plan (Planning Process; Hazard Identification and Risk Assessment; Mitigation Strategy; Plan Review, Evaluation, and Implementation; and Plan Adoption).

The FEMA Mitigation Planner must reference this *Local Mitigation Plan Review Guide* when completing the *Local Mitigation Plan Review Tool*.

Jurisdiction: Augusta-Richmond County	**Title of Plan:** Augusta-Richmond County Hazard Mitigation Plan	**Date of Plan:** February 2017
Local Point of Contact: Mie Lucas	**Address:** Augusta Fire/Emergency Management Division 3117 Deans Bridge Rd. Augusta, GA 30906	
Title: Disaster Preparedness Coordinator		
Agency: Augusta Fire/Emergency Management Division		
Phone Number: (706) 821-1157 office/(706)799-9803 cell	**E-Mail:** dlucas@augustaga.gov	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region *(insert #)*		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:
REGULATION CHECKLIST

INSTRUCTIONS: The Regulation Checklist must be completed by FEMA. The purpose of the Checklist is to identify the location of relevant or applicable content in the Plan by Element/sub-element and to determine if each requirement has been 'Met' or 'Not Met.' The 'Required Revisions' summary at the bottom of each Element must be completed by FEMA to provide a clear explanation of the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is 'Not Met.' Sub-elements should be referenced in each summary by using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each Element and sub-element are described in detail in this *Plan Review Guide* in Section 4, Regulation Checklist.

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT A. PLANNING PROCESS			
A1. Does the Plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement §201.6(c)(1))	Section 2; App. D		
A2. Does the Plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, agencies that have the authority to regulate development as well as other interests to be involved in the planning process? (Requirement §201.6(b)(2))	Section 2.4-2.7; App. B; App. D		
A3. Does the Plan document how the public was involved in the planning process during the drafting stage? (Requirement §201.6(b)(1))	Section 2.6-2.7; App. B; App. D		
A4. Does the Plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement §201.6(b)(3))	Section 7.3		
A5. Is there discussion of how the community(ies) will continue public participation in the plan maintenance process? (Requirement §201.6(c)(4)(iii))	Section 10.4		
A6. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a 5-year cycle)? (Requirement §201.6(c)(4)(i))	Section 10.3		
ELEMENT A: REQUIRED REVISIONS			
ELEMENT B. HAZARD IDENTIFICATION AND RISK ASSESSMENT			
B1. Does the Plan include a description of the type, location, and extent of all natural hazards that can affect each jurisdiction(s)? (Requirement §201.6(c)(2)(i))	Section 4; Section 5		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	Location in Plan (section and/or page number)	Met	Not Met
B2. Does the Plan include information on previous occurrences of hazard events and on the probability of future hazard events for each jurisdiction? (Requirement §201.6(c)(2)(i))	Section 5		
B3. Is there a description of each identified hazard's impact on the community as well as an overall summary of the community's vulnerability for each jurisdiction? (Requirement §201.6(c)(2)(ii))	Section 5; Section 6		
B4. Does the Plan address NFIP insured structures within the jurisdiction that have been repetitively damaged by floods? (Requirement §201.6(c)(2)(ii))	Section 5.7.5 (Table 5.20)		
ELEMENT B: REQUIRED REVISIONS **B2: Section 6 Vulnerability Assessment does not reflect or represent Updated Hazus Data. (*Hazus Report Attached*)** Info from the Hazus Report incorporated into Sect. 6 and the report is now included as Appendix E.			
ELEMENT C. MITIGATION STRATEGY			
C1. Does the plan document each jurisdiction's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement §201.6(c)(3))	Section 7		
C2. Does the Plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement §201.6(c)(3)(ii))	Section 5.7.4 (Table 5.19); Section 7.3.4 (Table 7.2)		
C3. Does the Plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement §201.6(c)(3)(i))	Section 8.2		
C4. Does the Plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement §201.6(c)(3)(ii))	Section 8.3-8.4; Section 9.2		
C5. Does the Plan contain an action plan that describes how the actions identified will be prioritized (including cost benefit review), implemented, and administered by each jurisdiction? (Requirement §201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))	Section 8.1.1; Section 9.2		
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))	Section 7.3.1 (Table 7.1); Section 10.1-10.2		
ELEMENT C: REQUIRED REVISIONS **C5: Need to describe how the overall benefits to overall cost help prioritize each mitigation action plan.** A description of the general economic cost/benefit review considered when prioritizing each action is already included as a footnote on page 8.2 (in Section 8).			

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
ELEMENT D. PLAN REVIEW, EVALUATION, AND IMPLEMENTATION (applicable to plan updates only)			
D1. Was the plan revised to reflect changes in development? (Requirement §201.6(d)(3))	Section 6.4.3		
D2. Was the plan revised to reflect progress in local mitigation efforts? (Requirement §201.6(d)(3))	Section 2.8; Section 8.5; Section 9.2		
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 5.24 (Table 5.48); Section 9.2		
ELEMENT D: REQUIRED REVISIONS			
ELEMENT E. PLAN ADOPTION			
E1. Does the Plan include documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval? (Requirement §201.6(c)(5))	App. A		
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	App. A		
ELEMENT E: REQUIRED REVISIONS			
ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1. Does the plan document opportunities for participation by neighboring communities, businesses and other interested parties? (Invitation letters, sign in sheets, etc.)	Section 2.4-2.7; App. B; App. D		
F2. Does the plan document opportunities for public input and participation? (copies of meeting notices, sign in sheets, or other applicable documentation)	Section 2.6-2.7; App. B; App. D		
F3. Does the plan discuss the review of the following planning mechanisms, at a minimum, for incorporation as applicable? • Comprehensive Plan • Flood Mitigation Assistance Plan (if one exists) • Flood Insurance Study (If one exists) • Community Wildfire Protection Plan • Local Emergency Operations Plan • State Hazard Mitigation Strategy	Section 2.3; Section 7.3.1		
F4. Has the Critical Facilities Inventory been completed online?	Yes		
F5. Have the GMIS Critical Facilities reports and maps, or maps from a superior system, been provided?	Yes		

1. REGULATION CHECKLIST **Regulation** (44 CFR 201.6 Local Mitigation Plans)	**Location in Plan** (section and/or page number)	**Met**	**Not Met**
F6. Has the county included/incorporated their state-provided Hazus MH report if available? Has the county added the report to an appendix or have they incorporated the information in to the risk assessment?	Section 6; App. E		

ELEMENT F: REQUIRED REVISIONS

F1: Documentation showing opportunities for participation by neighboring communities, businesses and other interested parties. (invitation letters, sign in sheets etc.)

Request for Feedback notice documentation is already included at the end of Appendix D. Added a paragraph to Section 2.4 indicating other stakeholders/neighboring communities were invited to participate. Also revised 2.7 to better demonstrate this.

F3: Plan must discuss at minimum, for incorporation as applicable?

- **Comprehensive Plan**
- **Flood Mitigation Assistance Plan (If one exist)**
- **Flood Insurance Study (If one exist)**
- **Community Wildfire Protection Plan**
- **Local Emergency Operations**
- **State Hazard Mitigation Strategy**

Added text in Sect. 2.3 listing the required documents reviewed for incorporation into the plan. Additional info is also already included in Sect. 7.3.1 as part of the capability assessment.

F6. Has the county included/incorporated their state-provided Hazus MH report if available.
Has the county added the report to an appendix or have they incorporated the information in to the risk assessment?

Info from the Hazus Report incorporated into Sect. 6 and the report is now included as Appendix E.

SECTION 2:
PLAN ASSESSMENT

INSTRUCTIONS: The purpose of the Plan Assessment is to offer the local community more comprehensive feedback to the community on the quality and utility of the plan in a narrative format. The audience for the Plan Assessment is not only the plan developer/local community planner, but also elected officials, local departments and agencies, and others involved in implementing the Local Mitigation Plan. The Plan Assessment must be completed by FEMA. The Assessment is an opportunity for FEMA to provide feedback and information to the community on: 1) suggested improvements to the Plan; 2) specific sections in the Plan where the community has gone above and beyond minimum requirements; 3) recommendations for plan implementation; and 4) ongoing partnership(s) and information on other FEMA programs, specifically RiskMAP and Hazard Mitigation Assistance programs. The Plan Assessment is divided into two sections:

1. Plan Strengths and Opportunities for Improvement
2. Resources for Implementing Your Approved Plan

Plan Strengths and Opportunities for Improvement is organized according to the plan Elements listed in the Regulation Checklist. Each Element includes a series of italicized bulleted items that are suggested topics for consideration while evaluating plans, but it is not intended to be a comprehensive list. FEMA Mitigation Planners are not required to answer each bullet item, and should use them as a guide to paraphrase their own written assessment (2-3 sentences) of each Element.

The Plan Assessment must not reiterate the required revisions from the Regulation Checklist or be regulatory in nature, and should be open-ended and to provide the community with suggestions for improvements or recommended revisions. The recommended revisions are suggestions for improvement and are not required to be made for the Plan to meet Federal regulatory requirements. The italicized text should be deleted once FEMA has added comments regarding strengths of the plan and potential improvements for future plan revisions. It is recommended that the Plan Assessment be a short synopsis of the overall strengths and weaknesses of the Plan (no longer than two pages), rather than a complete recap section by section.

Resources for Implementing Your Approved Plan provides a place for FEMA to offer information, data sources and general suggestions on the overall plan implementation and maintenance process. Information on other possible sources of assistance including, but not limited to, existing publications, grant funding or training opportunities, can be provided. States may add state and local resources, if available.

A. Plan Strengths and Opportunities for Improvement

This section provides a discussion of the strengths of the plan document and identifies areas where these could be improved beyond minimum requirements.

Element A: Planning Process

How does the Plan go above and beyond minimum requirements to document the planning process with respect to:

- *Involvement of stakeholders (elected officials/decision makers, plan implementers, business owners, academic institutions, utility companies, water/sanitation districts, etc.);*
- *Involvement of Planning, Emergency Management, Public Works Departments or other planning agencies (i.e., regional planning councils);*
- *Diverse methods of participation (meetings, surveys, online, etc.); and*
- *Reflective of an open and inclusive public involvement process.*

Element B: Hazard Identification and Risk Assessment

In addition to the requirements listed in the Regulation Checklist, 44 CFR 201.6 Local Mitigation Plans identifies additional elements that should be included as part of a plan's risk assessment. The plan should describe vulnerability in terms of:

1) *A general description of land uses and future development trends within the community so that mitigation options can be considered in future land use decisions;*
2) *The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas; and*
3) *A description of potential dollar losses to vulnerable structures, and a description of the methodology used to prepare the estimate.*

How does the Plan go above and beyond minimum requirements to document the Hazard Identification and Risk Assessment with respect to:

- *Use of best available data (flood maps, HAZUS, flood studies) to describe significant hazards;*
- *Communication of risk on people, property, and infrastructure to the public (through tables, charts, maps, photos, etc.);*
- *Incorporation of techniques and methodologies to estimate dollar losses to vulnerable structures;*
- *Incorporation of Risk MAP products (i.e., depth grids, Flood Risk Report, Changes Since Last FIRM, Areas of Mitigation Interest, etc.); and*
- *Identification of any data gaps that can be filled as new data became available.*

Element C: Mitigation Strategy

How does the Plan go above and beyond minimum requirements to document the Mitigation Strategy with respect to:

- *Key problems identified in, and linkages to, the vulnerability assessment;*
- *Serving as a blueprint for reducing potential losses identified in the Hazard Identification and Risk Assessment;*
- *Plan content flow from the risk assessment (problem identification) to goal setting to mitigation action development;*
- *An understanding of mitigation principles (diversity of actions that include structural projects, preventative measures, outreach activities, property protection measures, post-disaster actions, etc);*
- *Specific mitigation actions for each participating jurisdictions that reflects their unique risks and capabilities;*
- *Integration of mitigation actions with existing local authorities, policies, programs, and resources; and*
- *Discussion of existing programs (including the NFIP), plans, and policies that could be used to implement mitigation, as well as document past projects.*

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

How does the Plan go above and beyond minimum requirements to document the 5-year Evaluation and Implementation measures with respect to:

- *Status of previously recommended mitigation actions;*
- *Identification of barriers or obstacles to successful implementation or completion of mitigation actions, along with possible solutions for overcoming risk;*
- *Documentation of annual reviews and committee involvement;*
- *Identification of a lead person to take ownership of, and champion the Plan;*
- *Reducing risks from natural hazards and serving as a guide for decisions makers as they commit resources to reducing the effects of natural hazards;*
- *An approach to evaluating future conditions (i.e. socio-economic, environmental, demographic, change in built environment etc.);*
- *Discussion of how changing conditions and opportunities could impact community resilience in the long term; and*
- *Discussion of how the mitigation goals and actions support the long-term community vision for increased resilience.*

B. Resources for Implementing Your Approved Plan

Ideas may be offered on moving the mitigation plan forward and continuing the relationship with key mitigation stakeholders such as the following:

- *What FEMA assistance (funding) programs are available (for example, Hazard Mitigation Assistance (HMA)) to the jurisdiction(s) to assist with implementing the mitigation actions?*
- *What other Federal programs (National Flood Insurance Program (NFIP), Community Rating System (CRS), Risk MAP, etc.) may provide assistance for mitigation activities?*
- *What publications, technical guidance or other resources are available to the jurisdiction(s) relevant to the identified mitigation actions?*
- *Are there upcoming trainings/workshops (Benefit-Cost Analysis (BCA), HMA, etc.) to assist the jurisdictions(s)?*
- *What mitigation actions can be funded by other Federal agencies (for example, U.S. Forest Service, National Oceanic and Atmospheric Administration (NOAA), Environmental Protection Agency (EPA) Smart Growth, Housing and Urban Development (HUD) Sustainable Communities, etc.) and/or state and local agencies?*

SECTION 3:
MULTI-JURISDICTION SUMMARY SHEET (OPTIONAL)

INSTRUCTIONS: For multi-jurisdictional plans, a Multi-jurisdiction Summary Spreadsheet may be completed by listing each participating jurisdiction, which required Elements for each jurisdiction were 'Met' or 'Not Met,' and when the adoption resolutions were received. This Summary Sheet does not imply that a mini-plan be developed for each jurisdiction; it should be used as an optional worksheet to ensure that each jurisdiction participating in the Plan has been documented and has met the requirements for those Elements (A through E).

MULTI-JURISDICTION SUMMARY SHEET													
#	Jurisdiction Name	Jurisdiction Type (city/borough/ township/ village, etc.)	Plan POC	Mailing Address	Email	Phone	Requirements Met (Y/N)					
							A. Planning Process	B. Hazard Identification & Risk Assessment	C. Mitigation Strategy	D. Plan Review, Evaluation & Implementation	E. Plan Adoption	F. State Require-ments
1	Augusta-Richmond County	City-County										
2	City of Blythe	City										
3	City of Hephzibah	City										

Appendix D
Planning Process Documentation

This appendix includes:

1. Meeting Agendas
2. Meeting Minutes
3. Meeting Sign-In Sheets
4. Meeting Notices
5. Public Survey Advertisements
6. Public Survey Results
7. Draft Plan Review/Request for Feedback Notices

AGENDA
City of Augusta-Richmond County Hazard Mitigation Plan Update
August 5, 2016
12:30pm

1) Introductions

2) Overview of Mitigation Planning

3) Project Overview
   - i) Planning Process
   - ii) Hazard Mitigation Planning Committee
   - iii) Project Schedule
   - iv) Data Request

4) Roles and Responsibilities

5) Next Steps

6) Questions/Concerns

AGENDA

City of Augusta-Richmond County Hazard Mitigation Plan Update
Risk Assessment and Mitigation Strategy Meeting
November 4, 2016

1) **Introductions**

2) **Mitigation Refresher**

3) **Project Schedule**

4) **Risk Assessment Findings**
   a) Hazard History and Profiles
   b) Conclusions on Risk: PRI

5) **Capability Assessment Findings**
   i) Indicators
   ii) Results

6) **Public Involvement Activities**

7) **Mitigation Strategy**
   i) Current Goals/Actions
   ii) New Actions
   iii) Discussion

8) **Next Steps**
   i) Mitigation Actions

9) **Questions, Issues, or Concerns**

Public Safety Committee Meeting Commission Chamber- 2/28/2017- 1:20 PM

PUBLIC SAFETY

1. Present the Information Technology 2016 Annual Report. Attachments

2. Motion to approve the minutes of the Public Safety Committee held on February 14, 2017. Attachments

3. Presentation of the Hazard Mitigation Plan Update provided by Atkins North America, Inc. and authorize the Mayor to execute the Updated Hazard Mitigation Plan following the 30-day public review period. Attachments

4. Discuss Probation Services Department. **(Referred from February 21 Commission meeting)** Attachments

Public Safety Committee Meeting
2/28/2017 1:20 PM
Presentation of the Updated Hazard Mitigation Plan

Department: EMA

Presenter: Chief James and Margaret Walton

Caption: Presentation of the Hazard Mitigation Plan Update provided by Atkins North America, Inc. and authorize the Mayor to execute the Updated Hazard Mitigation Plan following the 30-day public review period.

Background: A Contract, dated August 2, 2016, was awarded to Atkins North America, Inc., to prepare an updated Hazard Mitigation Plan, Project Number PDMC-PL-04-GA2015-001/HPD15-0018, for Augusta-Richmond County. State and local governments are required to develop and maintain a hazard mitigation plan as a condition of receiving certain types of hazard mitigation disaster assistance, emergency and non-emergency. Augusta, GA received grant funding from FEMA and GEMA to complete the plan update.

Analysis: The Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. This plan creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters. The requirements and procedures for state and local mitigation plans are found in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44 CFR Part 201).

Financial Impact: Augusta, GA received grant funding from FEMA and GEMA to complete the plan update. Augusta, GA is responsible for a 15% match. This was previously approved on August 2, 2016.

Alternatives: none

Recommendation: Approve the Hazard Mitigation Plan Update and authorize the

	Mayor to execute the appropriate documents at the close of the 30-day public review period.
Funds are Available in the Following Accounts:	No additional fund required. Plan developed through approved Contract.

REVIEWED AND APPROVED BY:

Finance.
Law.
Administrator.
Clerk of Commission

Commission Meeting Agenda

Commission Chamber

3/7/2017
2:00 PM

INVOCATION: Pastor Marty Baker, Lead Pastor Stevens Creek Church .

PLEDGE OF ALLEGIANCE TO THE FLAG OF THE UNITED STATES OF AMERICA.

RECOGNITION(S)

Commissioners Certifications

A. Congratulations! Commissioners **Sean Frantom**, **Ben Hasan** and **Sammie Sias** on completing the required course work to obtain your first level of certification through the Georgia Municipal Association and the University of Georgia Carl Vinson Institute of Government Municipal Training Institute. Attachments

Employee of the Month

B. Congratulations! March 2017 Employee of the Month. Attachments

Five (5) minute time limit per delegation
DELEGATIONS

C. Mr. Bill Lockett RE: Soliciting support for Augusta's Age Friendly Initiative. Presentation will include information on Walk Augusta Audit; City-Wide Cleanup Proposal; and a trip to Macon-Bibb County to review their successful Age Friendly Program. Attachments

CONSENT AGENDA

(Items 1-39)

PLANNING

1. SA-52 – A request for concurrence with the Augusta Planning Attachments

Commission to **approve** a petition to amend Section 400-H – Standard for Streets and Roadway, Street Right-of-Way Widths of the Subdivision Regulations for Augusta, Georgia by updating standards to be consistent with the Augusta Engineering Street and Road Technical Manual. **(Approved by the Commission February 21, 2017-second reading)**

PUBLIC SERVICES

2. Motion to **approve** New Location: A.N. 17-6: request by Barethea Walker for an on premise consumption **Liquor, Beer and Wine** License to be used in connection with Smokin Aces located at 2510-B Peach Orchard Rd. There will be Dance. District 2. Super District 9. **(Approved by Public Services Committee February 28, 2017)** Attachments

3. Motion to **approve** New Application: A.N. 17-7: a request by Ahmed Said Mohammad Ashel for an on premise consumption **Liquor License** to be used in connection with Sharifa's Hookah Bar and Lounge located at 730 Broad Street. **District 1. Super District 9.(Approved by Public Services Committee February 28, 2017)** Attachments

4. Motion to **approve** application A.N. 17-8: request by Gabriel Echevarria for an on premise consumption **Liquor, Beer** and **Wine** License to be used in connection with **Augusta Exchange Stadium 20** & IMAX d/b/a Regal Cinemas located at 1144 Agerton Lane. There will be Sunday Sales. **District 3.** Super District 10.**(Approved by Public Services Committee February 28, 2017)** Attachments

5. Motion to **approve** New Location: A.N. 17-9: a request by Robyn Jarrett for an on premise consumption **Liquor, Beer** and **Wine License** to be used in connection with The Scene located at 1289 Broad Street. There will be Dance. District 1. Super District 9**(Approved by Public Services Committee February 28, 2017)** . Attachments

6. Motion to **approve** an award of contract for Bid Item #17-136, HVAC Automation System Upgrade, for Diamond Lake Community Center to Trane Commercial Systems for **$127,234.00**.**(Approved by Public Services Committee February 28, 2017)** Attachments

ADMINISTRATIVE SERVICES

7. Motion to **approve** a request from the Augusta Fire Chief for the acquisition of one Ford F-150 for an additional Arson Investigator. **(Approved by Administrative Services Committee February 28, 2017)** Attachments

8. Motion to **deny** a request from the Senior Pastor of First United Pentecostal Church of Augusta, Reverend Mark Maddox, for the donation of two paratransit vehicles and one bus for the First United Pentecostal Church of Augusta.**(Approved by Administrative Services Committee February 28, 2017)** Attachments

9. Motion to **approve** a request from the Richmond County Sheriff's Office to replace 34 Road Patrol cars, 2 Traffic cars and 7 Criminal Investigation cars using SPLOST VII – Public Safety Vehicles. **(Approved by Administrative Services Committee February 28, 2017)** Attachments

10. Motion to **approve** five (5) annual bid items. The items require Commission approval due to the fact that purchases on the individual items will exceed $25,000.00. **(Approved by Administrative Services Committee February 28, 2017)** Attachments

11. Motion to **approve** a request from the Head Coach & Director of the Augusta Boxing Club for a donation of one 28-passenger bus in order to transport members of the Augusta Boxing Club to and from competitions. **(Approved by Administrative Services Committee February 28, 2017)** Attachments

12. Motion to **approve** a request from Fleet Management for the replacement of four Marshal's Office vehicles, purchase one new vehicle and to replace one vehicle in the Probation Office using SPLOST Phase VII – Public Safety Vehicles. **(Approved by Administrative Services Committee February 28, 2017)** Attachments

13. Motion to **approve** Resolution of Support - Operation Teammate. **(Approved by Administrative Services Committee February 28,** Attachments

2017)

PUBLIC SAFETY

14. Motion to **approve** the Hazard Mitigation Plan Update provided by Atkins North America, Inc. and authorize the Mayor to execute the Updated Hazard Mitigation Plan following the 30-day public review period. **(Approved by Public Safety Committee February 28, 2017)** Attachments

15. Motion to **provide** a 60-day notice to the Magistrate judges that the City of Augusta plans to change the in-house probation order and request a meeting with the judges within ten days of the approval by the Commission.**(Approved by Public Safety Committee February 28, 2017)** Attachments

FINANCE

16. Motion to accept the 2017 Summer Intern Program $4000 Grant from Civic Affairs Foundation. **(Approved by Finance Committee February 28, 2017)** Attachments

17. Motion to **approve** a request from Mr. Patrick Feistel of the Garden City Rescue Mission for an abatement of taxes for the tax year 2016. **(Approved by Finance Committee February 28, 2017)** Attachments

18. Motion to **approve** agreement with Augusta Coliseum Authority for funding as authorized in SPLOST Phase VII. **(Approved by Finance Committee February 28, 2017)** Attachments

ENGINEERING SERVICES

19. Motion to **approve** supplementing the Augusta Utilities Department contract with Blair Construction, Inc., not to exceed $114,945 to cover the additional costs of water line relocation for the 15th Street Bridge Rehabilitation Project as requested by AED. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

20. Motion to **approve** and authorize the Engineering Department (AED) to Attachments

accept and receive federal financial assistance through Section 319(h) Nonpoint Source Implication Grant Program. Also, grant authorization permitting the Augusta, GA's Mayor to sign all documentation as requested by the AED.**(Approved by Engineering Services Committee February 28, 2017)**

21. Motion to **approve** award of preliminary engineering phase of Design Consultant Services Agreement to Civil Services, Inc., in the amount of $200,916.27 for the 5th Street Bridge over the Savannah River (Bridge Repair and Restoration), subject to receipt of signed Agreement as requested by AED.**(Approved by Engineering Services Committee February 28, 2017)** Attachments

22. Motion to **determine** that the alley between Hogan Street and Adrian Street, as shown on the attached plat has ceased to be used by the public to the extent that no substantial public purpose is served by it or that its removal from the county road system is otherwise in the best public interest, pursuant to O.C.G.A. §32-7-2, with the abandoned property to be quit-claimed to the appropriate party(ies), as provided by law and an easement to be retained over the entire abandoned portion for existing or future utilities as directed by Augusta Engineering Department and Augusta Utilities Department. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

23. Motion to **approve** entering into a Mowing and Maintenance and Indemnity Agreement with the Georgia Department of Transportation. Also, obtain a GDOT Permit for Gordon Hwy at Doug Barnard Entryway Landscape Improvements Project as requested by AED. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

24. Motion to **determine** that 0.06 acres adjacent to 1507 Saint Luke Street, shown as "Tract B" on the attached plat has ceased to be used by the public to the extent that no substantial public purpose is served by it or that its removal from the county road system is otherwise in the best public interest, pursuant to O.C.G.A. §32-7-2, with the abandoned property to be quit-claimed to the appropriate party(ies), as provided by law and an easement to be retained over the entire abandoned portion for existing or future utilities as directed by Augusta Engineering Department and Augusta Utilities Department. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

25. Motion to **approve** Tower Cloud, Inc.'s Formal Registration Application to access the public right of way within the Augusta, Georgia for the provisions of telecommunications services as a State-Certified Utility. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

26. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-2-134-00-0) - 2017 Walnut Street.**(Approved by Engineering Services Committee February 28, 2017)** Attachments

27. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-2-192-00-0) - 167 Aragon Drive. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

28. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-2-193-00-0) - 173 Aragon Drive.**(Approved by Engineering Services Committee February 28, 2017)** Attachments

29. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-4-055-00-0) – 2029 Golden Rod Street. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

30. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-4-056-00-0) - 2033 Golden Rod Street. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

31. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-4-072-00-0) - 2061 Golden Rod Street. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

32. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 087-4-073-00-0) - 2063 Golden Rod Street. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

33. Motion to **authorize** condemnation to acquire property in fee simple interests (Parcel 088-1-032-00-0) - 149 Aragon Drive. **(Approved by Engineering Services Committee February 28, 2017)** Attachments

34. Motion to **determine** that a portion of Heath Street, East of Berckmans Road as shown on the attached plat has ceased to be used by the public to the extent that no substantial public purpose is served by it or that its removal from the county road system is otherwise in the best public interest, pursuant to O.C.G.A. §32-7-2, with the abandoned property to be quit-claimed to the appropriate party(ies), as provided by law and an easement to be retained over the entire abandoned portion for existing or future utilities as directed by Augusta Engineering Department and Augusta Utilities Department.**(Approved by Engineering Services Committee February 28, 2017)** Attachments

35. Motion to **approve** the amount of $7,108.72 to have 17 Streetlights added to Ashton Drive and Ardwick Drive in the Southampton subdivision at a cost of $255.00 per month for a total of $3,060.00 per year thereafter. This is also to approve a new lighting tax district for the 52 lots associated with above roads. Funding is available in the Street Lighting budget account #2760416105312310.**(Approved by Engineering Services Committee February 28, 2017)** Attachments

PETITIONS AND COMMUNICATIONS

36. Motion to **approve** the minutes of the **regular** meeting of the Commission held **February 21, 2017** and Special Called meeting held **February 28, 2017.** Attachments

APPOINTMENT(S)

37. Motion to **approve** the appointment of **Ms. Janmarie Hall** to the Augusta Animal Control Citizens Advisory Board effective April 1, 2017 representing **District 3**. Attachments

38. Motion to **approve** the appointment of **Dr. Charles Larke**- Augusta Aviation Commission; **Ms. Marian T. Brown-**Augusta Public Library Board of Trustees and **Ms. Barbara Gordon**- ARC Zoning & Appeals Attachments

Board representing **District 5**.

39. Motion to **approve the** appointment **of Ms. Monica R. Mack** to the Citizens Small Business Advisory Board representing District 6. Attachments

******END CONSENT AGENDA******
AUGUSTA COMMISSION
3/7/2017

AUGUSTA COMMISSION
REGULAR AGENDA
3/7/2017

(Items 40-47)

PLANNING

40. Z-16-41 – Reconsideration of a request by the Augusta Planning Commission to **approv**e, with the conditions stated below, a petition by Stanley Mack, on behalf of Stanley and Shelley Mack, requesting a **Special Exception** to establish a Family **Personal Care Hom**e per Section 26-1 (h) of the Comprehensive Zoning Ordinance for Augusta, Georgia affecting property containing .31 acres and known as **3603 Richdale Drive.** Tax Map 143-0-277-00-0 **DISTRICT 6** 1. The home shall be staffed in three (3) 8-hour shifts on a 7-day, 24-hour basis with no staff sleeping in the home. 2. A private room shall be provided for staff to conduct business. 3. No more than six (6) clients are permitted to reside in the home based on the number and size of the existing bedrooms. 4. In order to continue to maintain a local business license, the applicant must continue to maintain a license with the State of Georgia, proof of compliance with the minimum requirements of Chapter 111.8-62.01 of the O.C.G.A must be provided, and the applicant must provide updated fire department compliance for six (6) clients. All requirements must be met within six (6) months of approval of this Special Exception request, or the Special Exception is void. 5. If wheelchair bound persons reside in the residence all 2010 ADA Standards for Accessible Design requirements must be met, including but not limited to: · All doorways must be at least 3 feet. wide. · At least one bathroom that permits a wheelchair dependent person to use all bathroom facilities unimpeded. 6. All conditions must be met prior to issuance of a local business license. **(Approved by Commission** Attachments

January 17, 2017)

PUBLIC SERVICES

41. Discuss Jamestown Community Center. **(Requested by Commissioner Marion Williams)** Attachments

ADMINISTRATIVE SERVICES

42. Discuss scheduling a Commission Work Session regarding the establishment of Personal Care Homes in Augusta, GA. **(Requested by Commissioner Ben Hasan)** Attachments

43. Discuss/update from Administration regarding the electrical system at the Augusta Common. **(Requested by Commissioner Marion Williams)** Attachments

44. Discuss a resolution changing the name of the John C. Calhoun Expressway. **(No recommendation from Administrative Services Committee February 28, 2017)** Attachments

APPOINTMENT(S)

45. Motion to **approve** the reappointment of **Mr. Brad Owens** to the Augusta Urban Redevelopment Board. **(Requested by Commissioner Sean Frantom** Attachments

ADMINISTRATOR

46. Update/presentation on Augusta's community awareness efforts e.g. Environmental Services Department's March 25th **"Great Augusta Cleanup and Recycling Block Party"** event. Attachments

LEGAL MEETING

A. Pending and Potential Litigation.

B. Real Estate.

C. Personnel.

47. Motion to **approve** execution by the Mayor of the affidavit of compliance with Georgia's Open Meeting Act.

Upcoming Meetings

www.augustaga.gov

Commission Meeting Agenda
3/7/2017 2:00 PM
Presentation of the Updated Hazard Mitigation Plan

Department: EMA

Department: EMA

Caption: Motion to **approve** the Hazard Mitigation Plan Update provided by Atkins North America, Inc. and authorize the Mayor to execute the Updated Hazard Mitigation Plan following the 30-day public review period. **(Approved by Public Safety Committee February 28, 2017)**

Background: A Contract, dated August 2, 2016, was awarded to Atkins North America, Inc., to prepare an updated Hazard Mitigation Plan, Project Number PDMC-PL-04-GA2015-001/HPD15-0018, for Augusta-Richmond County. State and local governments are required to develop and maintain a hazard mitigation plan as a condition of receiving certain types of hazard mitigation disaster assistance, emergency and non-emergency. Augusta, GA received grant funding from FEMA and GEMA to complete the plan update.

Analysis: The Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. This plan creates a framework for risk-based decision making to reduce damages to lives, property, and the economy from future disasters. The requirements and procedures for state and local mitigation plans are found in the Code of Federal Regulations (CFR) at Title 44, Chapter 1, Part 201 (44 CFR Part 201).

Financial Impact: Augusta, GA received grant funding from FEMA and GEMA to complete the plan update. Augusta, GA is responsible for a 15% match. This was previously approved on August 2, 2016.

Alternatives: none

Recommendation:	Approve the Hazard Mitigation Plan Update and authorize the Mayor to execute the appropriate documents at the close of the 30-day public review period.
Funds are Available in the Following Accounts:	No additional fund required. Plan developed through approved Contract.

REVIEWED AND APPROVED BY:

Finance.
Law.
Administrator.
Clerk of Commission

Meeting Minutes
Augusta-Richmond County Hazard Mitigation Plan Update
Kick-off Meeting
August 5, 2016

Chief Christopher James, Fire Chief for Augusta-Richmond County, opened the meeting by introducing himself and the consultant, Atkins. He outlined the process for developing and updating a hazard mitigation plan. He stated that the county could potentially receive funding for having a completed hazard mitigation plan.

Margaret Walton, Project Manager from the project consultant Atkins, led the meeting and began by providing an overview of the agenda items and briefly reviewed each of the handouts that were distributed in the meeting packets (agenda and presentation slides). She then asked each of the meeting attendees to introduce themselves. Following introductions, she provided a brief overview of the meeting agenda and the stages of the mitigation planning process that would be addressed through this plan. Ms. Walton emphasized that mitigation refers to actions (projects, policies, plans) to reduce the impacts of future hazard events. The hazard mitigation planning process looks at hazards, capability to conduct mitigation, and specific activities to reduce impacts of hazards. She explained how Federal legislation requires local governments to have a hazard mitigation plan in place to remain eligible for federal mitigation grants such as the Pre-Disaster Mitigation Grant Program, Hazard Mitigation Grant Program, and Flood Mitigation Assistance Program so there is funding to implement some of the actions that this plan may identify.

Ms. Walton then laid out all of the mitigation techniques/categories that mitigation actions fall into. She walked through the PowerPoint presentation to outline various examples of each technique and began a discussion of projects that the county and participating jurisdictions might pursue. Following this discussion, Ms. Walton led an icebreaker exercise.

She provided instructions to attendees on how to complete the exercise. Attendees were given an equal amount of fictitious FEMA money ($20 each) and asked to spend it in the various mitigation categories. Money could be thought of as grant money that communities received towards mitigation or areas that they feel are more of a priority. Given the windfall of financial resources, attendees target their money towards areas of mitigation that are of greatest concern. Ideally, the exercise helps pinpoint areas of mitigation that the community may want to focus on when developing mitigation grants. Ms. Walton explained that the results would be presented at the next Hazard Mitigation Planning Team meeting.

The results were:

- Emergency Services - $139
- Prevention - $124
- Public Education and Awareness - $115
- Property Protection - $83
- Structural Projects - $65
- Natural Resource Protection - $39

Ms. Walton shared the objectives of the plan to include updating the document for Augusta-Richmond County, maintaining funding eligibility for city-county and its two municipalities, initiating the Community Rating System (CRS) for the jurisdictions, identifying potential projects, increasing public education and awareness, and maintaining State and Federal compliance. Then she spent some time explaining the CRS program and the benefits of it for a community as well as the ways to capitalize on points to gain a better class for the community thereby reducing flood insurance premiums for citizens.

Ms. Walton outlined the municipalities' roles in the processes and what would be needed to assist in developing the plan. The cycle of the project tasks was also shared and each phase was described to include the planning process and risk assessment.

Ms. Walton explained that in the risk assessment portion of the plan development that FEMA requires that plans address natural hazards, but an all-hazards approach is becoming more prevalent. She shared the previous hazards that were identified in the plan and asked the group to possibly decide if there were additional hazards they would like to add to the list. Additional hazards that were suggested were cyberterrorism, utility failure, infectious disease, climate adaptation, and solar EMP. Some manmade/technological hazards were included in the previous hazard identification, but the vulnerability assessment focuses more on the natural hazards since more mitigation funding is available for natural hazards.

Capability Assessment

Ms. Walton explained the community capability assessment and discussed how capability is divided primarily into 3 categories:

- Administrative
- Technical
- Fiscal

Mitigation Strategy

Ms. Walton discussed mitigation strategy and how it is developed. She stated that mitigation goals come from the existing plan and maybe adjusted and objectives may be added if the city-county desires to do that. The current mitigation actions will be updated as well with their status. However, all of the jurisdictions will need to develop new actions as well based on the risk assessment.

She continued the presentation by discussing the necessary documentation for the planning process, the rapid project schedule, and the project team.

Public Involvement

Ms. Walton explained how public comment and participation is a required part of this process. A public survey was developed that the city-county will be placing on their website. The link will be shared electronically following the meeting and local academic institutions were asked to disseminate the survey as well.

Next, Ms. Walton discussed the roles and responsibilities of all the parties involved as well as the expectations on the level of involvement. The Atkins team will provide technical assistance, data collection, facilitation, and plan preparation. The city-county and jurisdictions were asked to be active participants by assisting with data collection, public awareness, hosting planning team meetings, mitigation strategy, plan feedback, and plan adoption.

The next steps are to initiate data collection with the risk assessment and capability assessment. The floor was opened for questions and comments.

Ms. Walton then adjourned the meeting.

Meeting Minutes
Augusta-Richmond County Hazard Mitigation Plan Update
Risk Assessment and Mitigation Strategy Meeting – Augusta, SC
November 4, 2016

Chief Christopher James introduced himself and the project team from Atkins. He explained that this is a large part of our planning effort and appreciated everyone coming. Chief James then turned the meeting over to Ms. Walton, the project manager for Atkins. She asked who in the audience did not attend the previous meeting and asked them to introduce themselves. Individuals were from Emergency Management, Trinity Hospital, Electrolux, Augusta University, Augusta Utilities, Animal Services, Fire, City of Hephzibah, and Public Health. She mentioned that the meeting and presentation were informal and could be interrupted for any questions. Ms. Walton emphasized the importance of the potential funding for the participating jurisdictions and entities.

Ryan Wiedenman led the next portion of the meeting regarding the risk assessment. He explained that the Planning Team worked together to build a list of potential hazards.

Mr. Wiedenman with Atkins then presented the findings of the risk assessment. He stated that the risk assessment is the base of the mitigation plan and that we now have better data to update the hazard history. Mr. Wiedenman identified the three pieces of the risk assessment and the caveats for the risk assessment. He reviewed the Presidential Disaster Declarations that have impacted the region. He then explained the process for preparing Hazard Profiles and discussed how each hazard falls into one of four basic categories: Atmospheric, Hydrologic, Geologic, and Other. He indicated that each hazard must be evaluated and formally ruled out if it is not applicable to the study area, even where it seems obvious (such as in the case of landslide).

Mr. Wiedenman reviewed the Hazard Profiles and the following bullets summarize the information presented:

- CLIMATE CHANGE. It has been measured to some degree but not near as significantly as future occurrences. Future occurrences are likely.

- DROUGHT. There have been 0 events recorded since 1996 according to NCDC. Future occurrences are highly likely. The previous plan notes 3 severe droughts in 1986, 1998, and 2003.

- EARTHQUAKES. There have been 24 recorded earthquake events since 1812. There were 21 in Augusta and 3 in Hephzibah. The strongest had a recorded magnitude of VIII (MMI). Future occurrences are possible.

- EXTREME HEAT. There have been 0 recorded events since 1996 at the county level. Future occurrences are highly likely.

- FLOOD. There have been 24 flood events since 1996, 23 of them in Augusta and 1 at Ft. Gordon. Future occurrences are highly likely.

- HAIL. There have been 72 recorded events since 1955 at the county level; 55 in Augusta, 11 in Hephzibah, and 6 at Ft. Gordon. $30,716 in property damages were reported. Future occurrences are highly likely.

- HURRICANES AND TROPICAL STORMS. There have been 74 storm tracks that have come within 75 miles of the region since 1850. Future occurrences are likely.

- INFECTIOUS DISEASE OUTBREAK. Highly contagious types of infectious diseases have potential to cause major problems in concentrated areas. Future occurrences are possible.

- LIGHTNING. There has been 1 recorded lightning event in the region since 2012 resulting in $167,703 in reported property damages. 0 deaths and 3 injuries were reported. Future occurrences are highly likely.

- WINTER STORM AND FREEZE. There have been 8 recorded events since 2002. No deaths and 1 injury was reported. Future occurrences are likely.

- SOLAR EMP. There have been no major events recorded. Future occurrences are likely.

- TORNADOES. There have been 10 recorded tornado events reported since 1954. No deaths and 1 injury was reported. Future occurrences are likely.

- THUNDERSTORM / HIGH WINDS. There have been 182 thunderstorm events reported since 1955, 156 in Augusta, 12 in Hephzibah, and 9 at Ft. Gordon. 1 death and 36 injuries were reported. 4 million dollars were reported in property damages. Future occurrences are highly likely.

- WILDFIRE. The average is 38 fires annually. The annual average is 129 acres annually. Future occurrences are likely.

- CHEMICAL HAZARD. 339 reported events since 1971. 21 were reported as serious incidents as well as 27 injuries. Future occurrences are highly likely. $771,913 has been reported in property damage.

- CYBER TERRORISM. No previous cyber-attacks have occurred. Future occurrences are possible.

- DAM AND LEVEE FAILURE. No recorded events in the county. Future occurrences are unlikely.

- NUCLEAR PLANT INCIDENT. No major incidents have been reported. Future occurrences are unlikely.

- TERRORISM. No major events have occurred in the county. Future events are possible.

- UTILITY FAILURE (Power/Water). No events have been recorded. Ice storms or strong wind events are typically the cause. Future occurrences are possible.

During the hazard profile portion, specifics on each hazard were discussed. The initial hazard of discussion was climate change and it was suggested that it is a mix of drought and flooding. There was also some discussion on the number of repetitive loss properties. The group also requested that hail, tornado, and thunderstorm be examined separately. The Director of Public Health also shared that he had more updated infectious disease statistics that can be included. The Planning Team suggested that more winter storm was available as well. Mr. Wiedenman stated that he tries to look at all of the hazards objectively.

The results of the hazard identification process were used to generate a Priority Risk Index (PRI), which categorizes and prioritizes potential hazards as high, moderate or low risk based on probability, impact, spatial extent, warning time, and duration. The highest PRI was assigned to Flood, Climate Change, Chemical Hazard, Drought, Extreme Heat, and Hurricane/Tropical Storm. It was decided that Hurricane/Tropical Storm and Severe Winter Storm should both be moved to moderate based on justification from the group. The discussion continued with the area experiences more windstorms to straight line winds over hurricane and this provide the rationale to lower the severity of Hurricane/Tropical Storm. Another topic of discussion was the idea of separating chemical hazards into fixed site incidents and transportation incidents and placing both of them in the high range. It was also suggested that climate change could be viewed as the effect from other hazards instead of a separate risk.

Ms. Walton then began the overview of the capability assessment. She stated the mechanism for how the capabilities are measured to include planning and regulatory capability, administrative and technical capability, fiscal capability, and political capability. Capability indicators included:

- National Flood Insurance Program (NFIP) Participation
- Community Rating System (CRS) Participation
- Building Code Effectiveness Grading Schedule (BCEGS)
- Local Capability Assessment Survey
    - Inventory and evaluation of existing plans, policies, programs and ordinances
    - Measures administrative, technical, fiscal and political capability

Ms. Walton stated that the current capabilities overall vary based on the size of the jurisdiction but that initiating the CRS program would provide a significant benefit to the community.

Next, Ms. Walton gave an overview of the public participation survey. She highlighted how the survey was disseminated and that 409 completed surveys were received. The highlights included that 90% of respondents are interested in making the community more resistant to hazards; 43% have already taken action to make their residences/homes/neighborhoods more hazard resistant; and 47% do not know who to contact regarding risk reduction. The variety of responses for each question were shared. The overarching summary shared that the highest importance was placed on emergency services, prevention, and public education and awareness.

The next portion of the meeting was focused on the mitigation strategy. Ms. Walton explained that the mitigation strategy stems from the findings of the risk assessment and public survey along with the capability assessment that will be completed and that the main purpose is to develop an action plan which is the most important part of the plan. Additional handouts of the mitigation action worksheet and potential mitigation goals were distributed. It was shared that the general idea of protecting life, health, and the safety of all citizens should be the focus. Information on exactly how to update the existing was detailed and examples were given. The steps to developing new mitigation actions were outlined as well and examples were given that might pertain to Augusta-Richmond County. Ms. Walton also reminded the group about the repetitive loss properties in the area as a reminder that actions for mitigating flooding should be included. She also connected back to the capability assessment to encourage actions related to areas of weakness for the city-county.

Lastly, Ms. Walton stated that she would send the mitigation strategy documents out electronically and that she needed all feedback by December 2. Finally, the next steps of completing the mitigation strategy, drafting the plan, and submitting it were shared. She stated that she would be available to assist with

mitigation action development and then asked if there were any questions. She then thanked the Planning Team for taking the time to attend and the meeting was adjourned.

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Project Kickoff Meeting

August 5, 2016

Name	Organization	Position	Phone Number	E-mail Address
Steven Strickland	RCSO	MAJOR, Field OPS	706 821-1260	SLStrickland@Augustaga.gov
Loriann Chancey	Blythe	Clerk	706 592 6255	cityofblythe@comcast.net
Martha Allen	Hephzibah	Clerk	706592-4423	cityofhephzibah@bellsouth.net
Carrie Jones	Golden Harvest Food Bank	Events Manager	706-736-1199	cjones@goldenharvest.org
Jennis Williams	ARC Coh Dist 2	Commissioner	706 432 8093	williamdiles10330@comcast.net
Jasper Cooke	CEPAR Augusta University	Director	706 667 4207	jcooke@Augusta.edu
Jerry Germann	CERT TEAM 17	—	706 831 1719	jmjgermann@hughes.net
Teri L Turner	Augusta P+D	Development Services Administrator	706 821-1796	tturnere@augustaga.gov

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Project Kickoff Meeting

August 5, 2016

Name	Organization	Position	Phone Number	E-mail Address
Shelby Meyers	GEMHSA	Hazard Mitigation Planner	404-635-7245	shelby.meyers@gema.ga.gov
Jennifer Sosebee	Trinity	Asst. Director Plant Ops / Safety Office	706-481-7500	jsosebee@hhs1.com
Michael Hogue	Trinity	Director Emergency Department	706 481-7513	michael.hogue@trinityofaugusta.com
Sharon W. Bennett	Augusta EMA	Emergency Management Specialist	706-821-1156	swbennett@augustaga.gov
Sharon S. Broady	Animal Services	Director	706 790 6836	sbroady@augustaga.gov
John Miller	Red Cross	Disaster Program Manager	(706) 922-8482	john.miller5@redcross.org
Johnnie Boyd	Paine College	Captain	706-840-0119	Johnnieboydsr@yahoo.com
Mie Lucas	Aug. EMA			dlucas@augustaga.gov

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Project Kickoff Meeting

August 5, 2016

Name	Organization	Position	Phone Number	E-mail Address
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Rev. Nelle Pearl Jenkins	CERZ		706-722-4141	Nepemenger@bellsouth.net
Vincent Pacchiana	Fort Gordon	E.M.	706-791-8921	vincent.a.pacchiana.civ@mail.mil
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JOHN CARAN	AFD	FIRE MARSHAL	706.821.2513	jcaran@augustaga.gov
TOM WIEDMEIER	UTILITIES	DIRECTOR	706-312-4160	tomw@augustaga.gov
Christopher E. James	AFD/EMA	Director	706-821-1640	cjames@augusta.gov

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Project Kickoff Meeting

August 5, 2016

Name	Organization	Position	Phone Number	E-mail Address
Rodney Way	GA Dept. of Transportation	Area Engineer	706. 855. 3464	rway@dot.ga.gov
Randy Wishard	Richmond County Health Dept EH	Environment Health Director	706-667-4234	randy.wishard@dph.ga.gov
Gerald Hillman	Richmond County Mosquito Control	Operation Manager	706-667-4241	Gerald.Hillman@dph.ga.gov

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Project Kickoff Meeting

August 5, 2016

Name	Organization	Position	Phone Number	E-mail Address
Larry Felix Jr	Ga. Forestry	Chief Ranger	706-556-3962	lfelixjr@gfc.state.ga.us

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Risk Assessment and Mitigation Strategy Meeting

November 4, 2016

Name	Organization	Position	Phone Number	E-mail Address
Mike Lucas	Augusta EMA	Disaster Preparedness Coordinator	706-821-1157	dlucas@augustaga.gov
Sharon Bennett	Augusta EMA	Emergency Management Specialist	706-821-1156	Sabennett@augustaga.gov
Sheila Fain	Electrolux	Facility mgmt. Coord.	706-651-1751	sheila.fain@electrolux.com
Gail Simpkins	CERT		706-627-4159	gsimpkins65@gmail.com
Jasper Cooke	AU	Director Emerg mgt	706 667 4207	jcooke@Augusta.edu
Jonathan Adriano	Public Health	District Program Manager	706 667 4931	jonathan.adriano@DPH.GA.GOV
Randy Wishard	Public Health	Environmental Health RCHO	706-667-4234	Randy.Wishard@dph.ga.gov
Jennifer Sosebee	Trinity Hospital	Safety Officer	706-481-7500	Jsosebee@hns1.com

Augusta GEORGIA

ty of Augusta-Richmond County Hazard Mitigation Plan Update
Risk Assessment and Mitigation Strategy Meeting

November 4, 2016

Name	Organization	Position	Phone Number	E-mail Address
Pamela Nestor	CERT		706-790-4900	pamnestor@gmail.com
Tom Wiedmeier	Augusta Utilities	Director	(706)312-4160	tomw@augustaga.gov
SHARON BROADY	Animal Services	DIRECTOR	706 826 1365	Sbroady@augustaga.gov
Byron W. Taylor	Augusta Fire	Deputy Chief	706-821-1645	bstaylor@augustaga.gov
Martha R Allen	City of Hephzibah	City Clerk	706-592-4423 706-825-9102	cityofhephzibah@bellsouth.net
CHRISTOPHER E. JAMES	FIRE / EMA	FIRE Chief EMA DIRECTOR	706-821-1640	cjames@augustaga.gov
Paul Reyes	CERT	Team 2	706-650 7707	PaulReyes5106@comcast.net
Dee Griffin	Augusta Fire Dept.	PIO/Fire Safety Educator	706-821-2489	dgriffin@augustaga.gov
STERLING JONES	911	DIRECTOR	706 821 1209	SJONES@AUGUSTAGA.GOV

Augusta Fire/Emergency Management Division
City of Augusta-Richmond County

Chief Christopher James
Augusta Fire/Emergency Management Division

3117 Deans Bridge Road
Augusta, GA 30906

MEDIA ADVISORY
Public Meeting Scheduled for City of Augusta-Richmond County Hazard Mitigation Plan Update

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August 1, 2016

CONTACT:
Mie Lucas, Disaster Preparedness Coordinator
Augusta Fire/Emergency Management Division
706.821.1157 office
706.799.9803 cell
706.821.1246 fax
dlucas@augustaga.gov

FOR IMMEDIATE RELEASE

(Augusta, GA) – Augusta-Richmond County Emergency Management is in the process of updating our Multi-Jurisdictional Hazard Mitigation Plan and we need your help! The Hazard Mitigation Plan identifies the hazards and risks within the City-County and determines exactly what the City-County can do to mitigate some of the potential damages in the future due to a disaster event whether it be winter weather or a storm. This plan serves as a guide for floodplain management and can help prevent losses in that area as well.

This is a City-County-wide plan, so it is very important that everyone that has a vested interest comes together to provide input and weigh in on the prevention and mitigation. Every 5 years the plan has to be updated in order to maintain our eligibility for disaster assistance funds following any type of Federal Disaster Declaration.

Our kick-off meeting regarding this initiative will take place at the Augusta Municipal Building in the Commission Chambers located at 535 Telfair Street, Augusta, GA on Friday, August 5 starting at 12:00pm.

If you have any questions, please reach out to Augusta Fire/Emergency Management Division at at 706.821.1155.

Hazard Mitigation meeting set for this week

By Staff | Posted: Wed 6:16 PM, Nov 02, 2016

Wednesday, Nov. 2, 2016

AUGUSTA, Ga. (WRDW/WAGT) -- The Augusta-Richmond County Emergency Management Agency is set to host a Hazard Mitigation meeting this week.

The meeting will be on Friday, Nov. 4 at 9 a.m. in the Commission Chambers on the second floor of the Municipal Building. The meeting is being held to review risk assessment information and identify potential hazards as well as what could happen if those situations occur during an emergency.

The public is invited to attend the meeting and provide input on risk assessment. This is part of a 5-year update to Augusta's Hazard Mitigation Plan.

Hazard Mitigation meeting set for this week

TSA says you can bring your pumpkin through security

Tips for trick-or-treaters and people welcoming the ghosts and goblins

US bans Samsung Galaxy Note 7 phones from airliners

AAA offering tips for parents during Teen Driver Safety Week

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Emergency Management

Posted on: August 9, 2016

Community Survey

Be part of the community helping Augusta Emergency Management Update the Hazard Mitigation Plan. Complete the short survey to tell us what hazards you are most worried about and if you are prepared at home for the next emergency. The survey is anonymous

Community Survey

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LEPC Distribution

From: Sharon W. Bennett
Sent: Tuesday, August 09, 2016 1:48 PM
To: Alan Hampton Member <ahampton@genchemcorp.com>; Bill Foster Member <bill@impactsafetysystems.com>; Bill Welsh- Univ <BillWelsh@uh.org>; Charlie Bowles <CharlieB@prayoninc.com>; Chuck Ray (Chuck.Ray@GEMA.GA.GOV) <Chuck.Ray@GEMA.GA.GOV>; Coord. LEPC (russell.bergmann@gema.ga.gov) <russell.bergmann@gema.ga.gov>; David Brown <David.Brown1@Va.gov>; Debra Beazley <dbeazley@augustaga.gov>; Earl Hilson Member <jehilson@olin.com>; Jack Milton, Jr <JMiltonJr@augustaga.gov>; James Reed <reed.jd.2@pg.com>; Jennifer Sosebee- Trinity <jsosebee@hhs1.com>; Jerry Asbach <jasbach@augustatech.edu>; Jimmy Atkins-school board <atkinji@boe.richmond.k12.ga.us>; Joe Webber -CEPAR (jwebber2@augusta.edu) <jwebber2@augusta.edu>; John Horne-PCS <John.Horne@potashcorp.com>; John Ryan - Member (john.f.ryan56.civ@mail.mil) <john.f.ryan56.civ@mail.mil>; Jonathan Adriano Public Health <jdadriano@dhr.state.ga.us>; Joseph Foster <joseph@impactsafetysystems.com>; Joseph Gnann- Georgia Pacfic Co. <jgnann@spglp.com>; Juanita McDaniel <jmcdaniel@uwcsra.org>; Ken U. Erondu <Kerondu@gru.edu>; Kimberly Ledbetter- Ft. Gordon <kimberly.h.ledbetter4.ctr@mail.mil>; Lawrence Beggs Nutrasweet <lawrence.j.beggs@nutrasweet.com>; Commissioner William Lockett <WLockett@augustaga.gov>; Michael Williams DSM <michael.williams@dsm.com>; Michael Willis- Gold Cross <mwillis@goldcrossems.com>; Mie Lucas <DLucas@augustaga.gov>; Mille Graham- Augusta Trans Flo <augustatransflo@kindermorgan.com>; Nicholas Walsh- Olin (NPWalsh@olin.com) <NPWalsh@olin.com>; Nick Almeter (Nick.almeter@solvay.com) <Nick.almeter@solvay.com>; Paul Duckworth <Paul.Duckworth@potashcorp.com>; Randy Barrs Member <rbarrs9@yahoo.com>; Richard Dorman <richard.dorman@morganplc.com>; Scott Gay <sgay@augustaga.gov>; Stuart Stapleton-EQ <stuart.stapleton@eqonline.com>; Tameka Allen <Allen@augustaga.gov>; Terri Turner <tturner@augustaga.gov>; Terrie Bradford <terrie.bradford@hcahealthcare.com>; Troy Temples- Olin <tdtemples@olin.com>; Vince Brogdon <vbrogdon@goldcrossems.com>; Audrey <aef_audrey@yahoo.com>; Chad Parrish - Industrial Chem <Chadparish@industrialchem.com>; Cheri Mcleod- Akzonobel <cheri.mcleod@akzonobel.com>; Chris Pogson- Chem Trade Logistics <cpogson@chemtradelogistics.com>; Dan Gates-Region 6 ESM <dan.gates@dph.ga.gov>; Dan Martin AD Enviro <dmartin@adenviro.com>; Denise Cooper <ecooper1@auguta.edu>; Denise Cooper - Jasper <ecooper1@gru.edu>; Jamey Crosby <JCrosby@GoldCrossEMS.com>; Jasper Cooke <jcooke@augusta.edu>; Joe Webber -CEPAR <JWEBBER2@gru.edu>; John Neel AD Enviro <jneel@adenviro.com>; Kevin Wells- Jasper <kwells@gru.edu>; Laycee Silas <LSilas@augustaga.gov>; Michele Horton- Georgia Pacific <michele.horton@gapac.com>; Miller Birdsong- Doctors Hospital (Milton.birdsong@hcahealthcare.com) <Milton.birdsong@hcahealthcare.com>; Richard Watson <richardwatson@industrialchem.com>; Smith, Charles III CIV USARMY MEDCOM EAMC (US) <charles.smith45.civ@mail.mil>; Tim Weegar <tweegar@augustaga.gov>; Tom Basile Univar USA <Tom.basile@univarusa.com>; Wilford Storey <Wilford.Storey@morganplc.com>
Subject: Information From Sharon

Hello Everyone!

This is a survey link we need everyone to take this survey for us. The survey will help us with the Hazard Mitigation Plan update! Even if you just work and not live in Richmond County we need you to take the survey. Thanks and hope to see you all next Friday. See the links below…any questions please let me know.

Have a great afternoon.

Sharon

This is the link: http://www.surveygizmo.com/s3/2950698/Augusta-Richmond-County-Public-Participation-Survey

It is now on our EMA page under the news center here: http://www.augustaga.gov/462/Emergency-Management

Sharon W. Bennett, GA-PCEM, MM
Emergency Management Specialist
Community Emergency Response Team Program Manager
Augusta Fire Department/Emergency Management Division
3117 Deans Bridge Road
Augusta, Georgia 30906
706-821-1156 Office 706-821-2914 Fax

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City of Augusta-Richmond County Hazard Mitigation Plan Update

Public Participation Survey Results

ATKINS

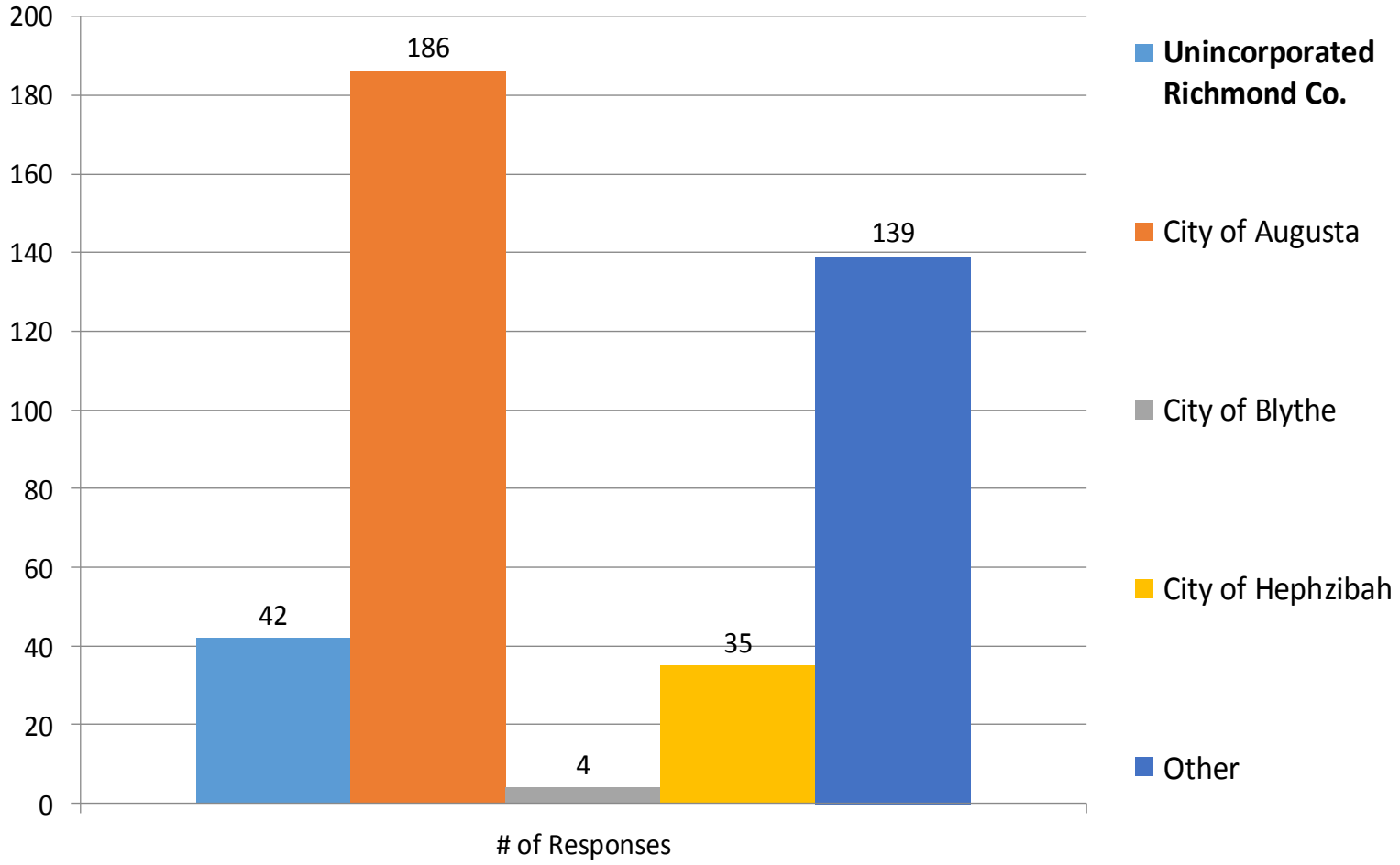
Public Participation Survey

- Provides an opportunity for the public to share opinions and participate in the planning process
- Link to survey posted on city-county website
- 409 completed surveys received

Public Participation Survey Highlights

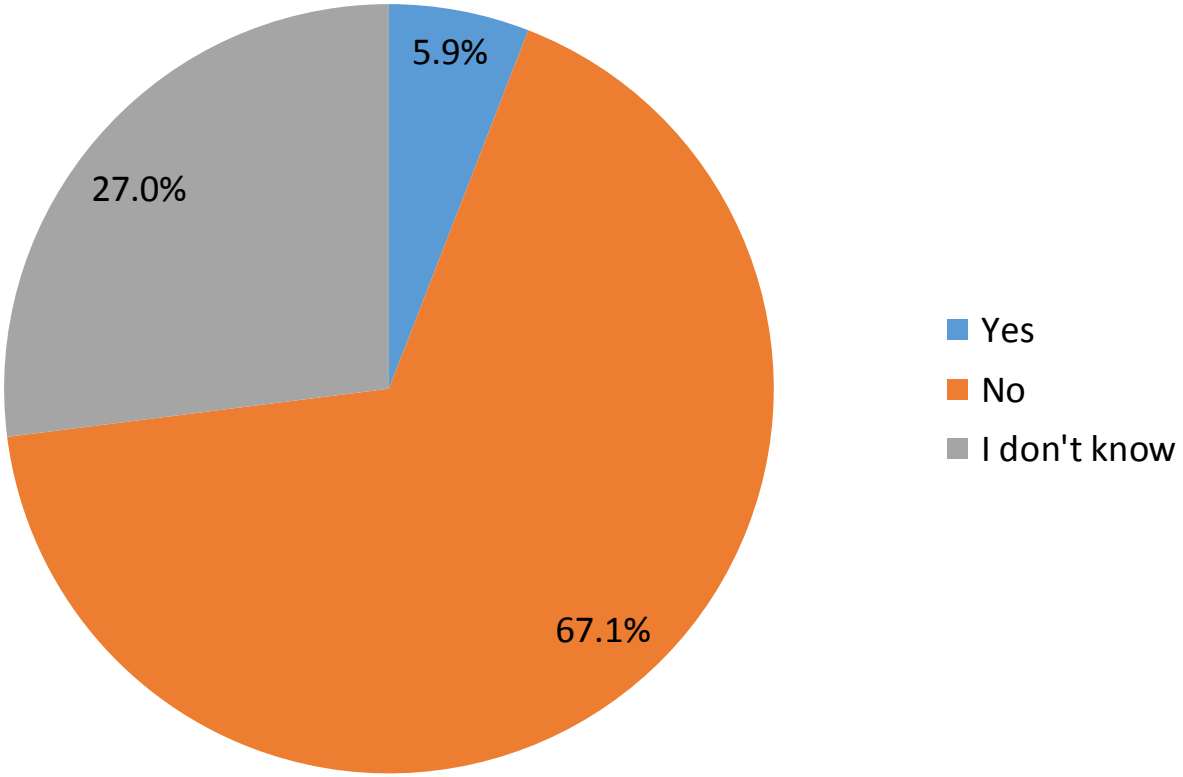
- 90% of respondents are interested in making their homes safer from hazards
- 43% have already taken action to make their homes safer from hazards
- 47% do not who to contact regarding risks from hazards

1. Where do you live?



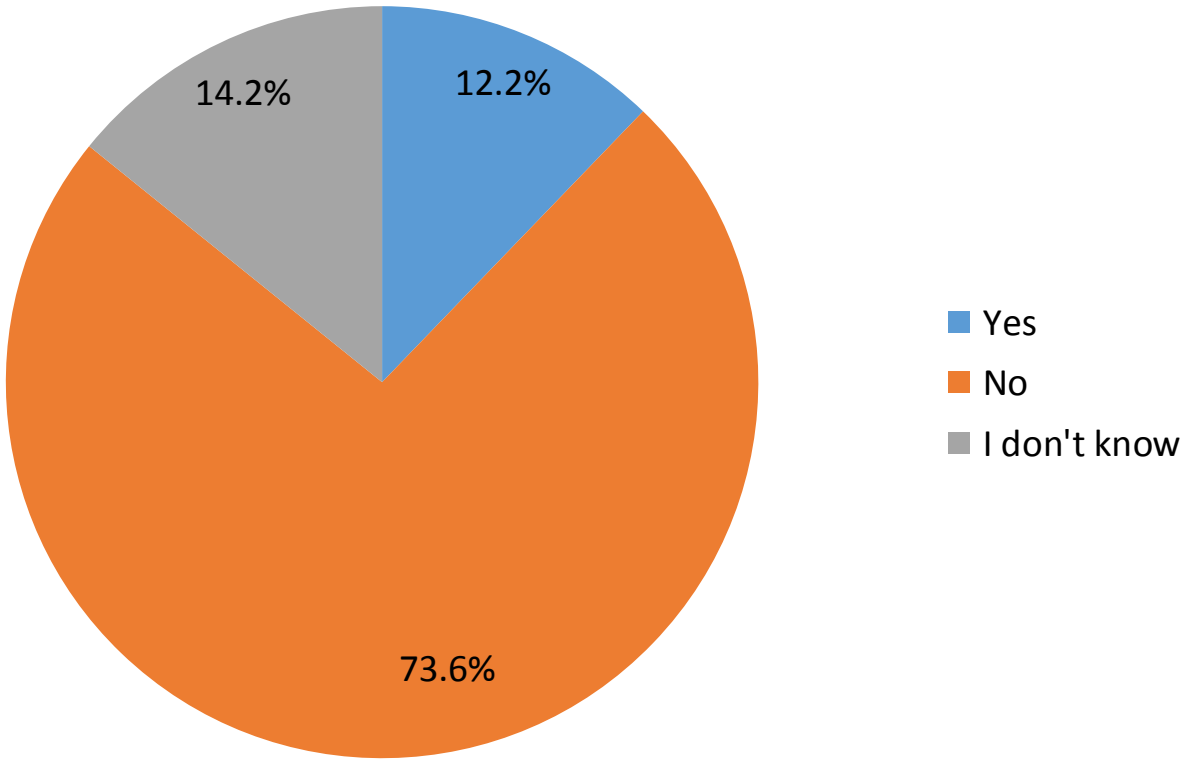
ATKINS

2. Is your home in a floodplain?



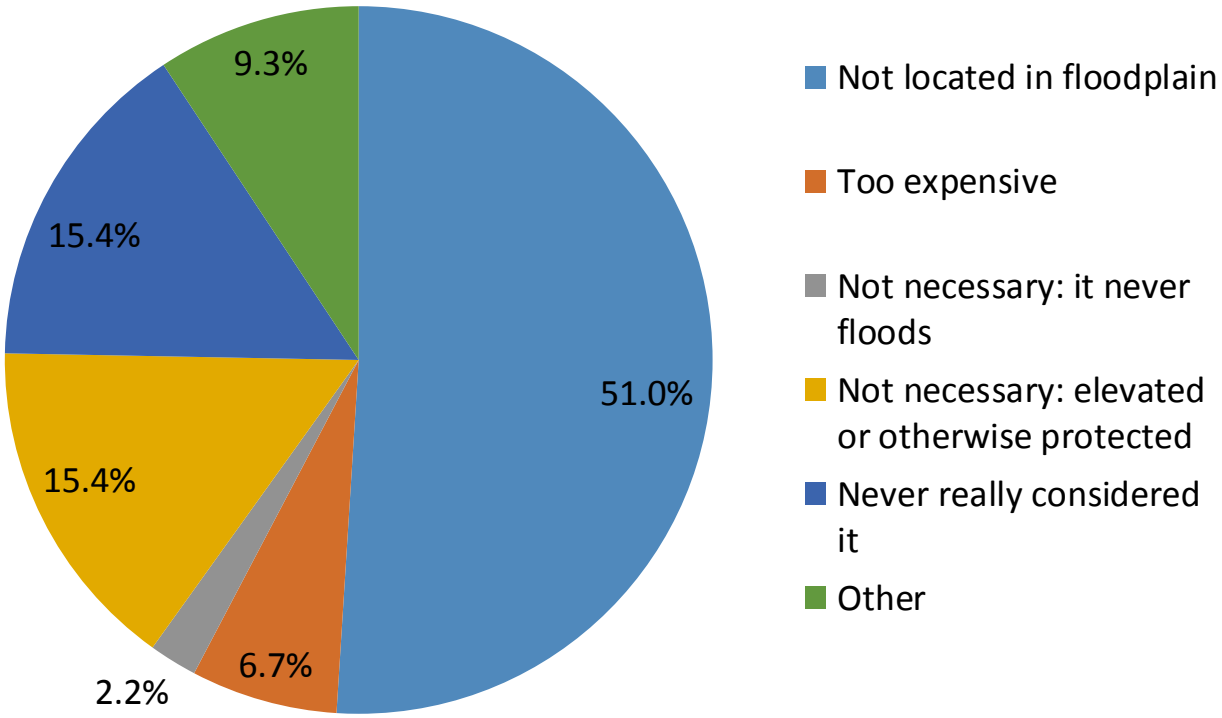
ATKINS

3. Do you have flood insurance?



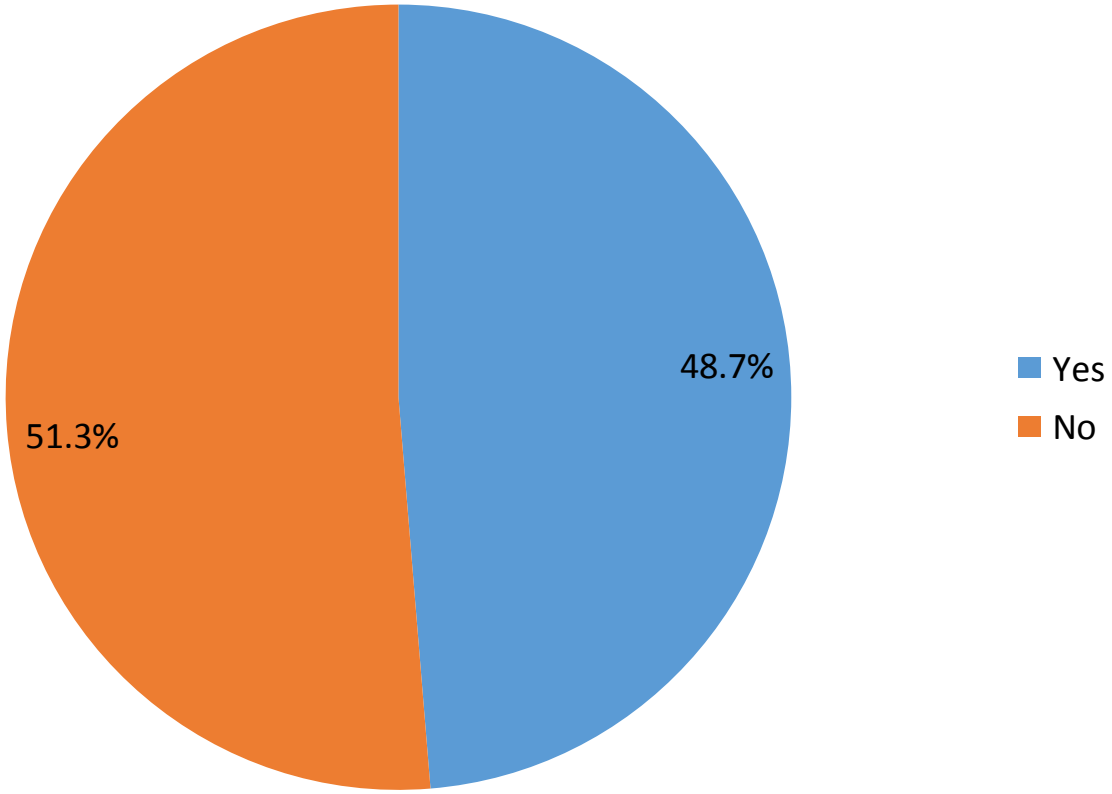
ATKINS

3a. Why no flood insurance?



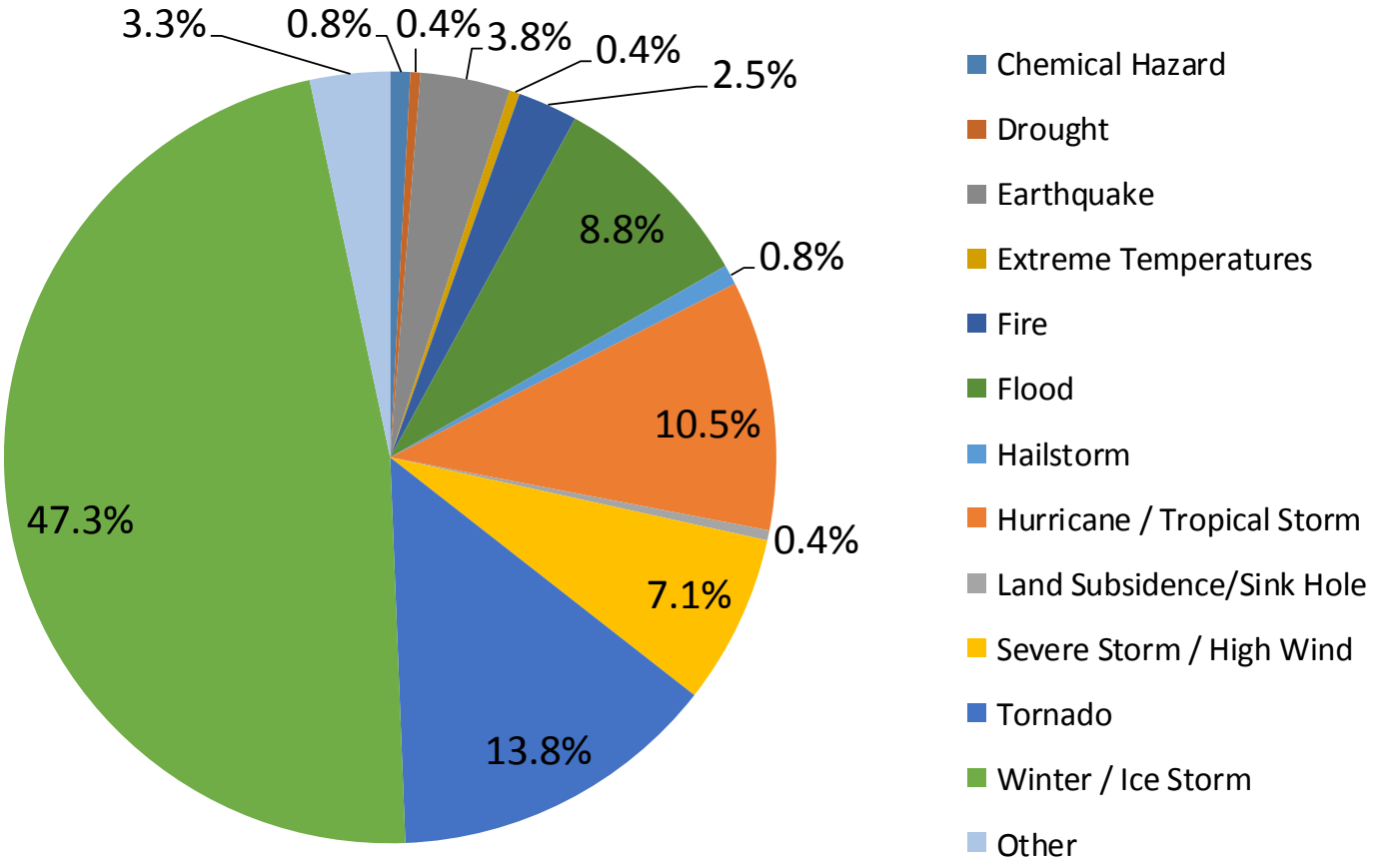
ATKINS

4. Have you experienced a disaster?



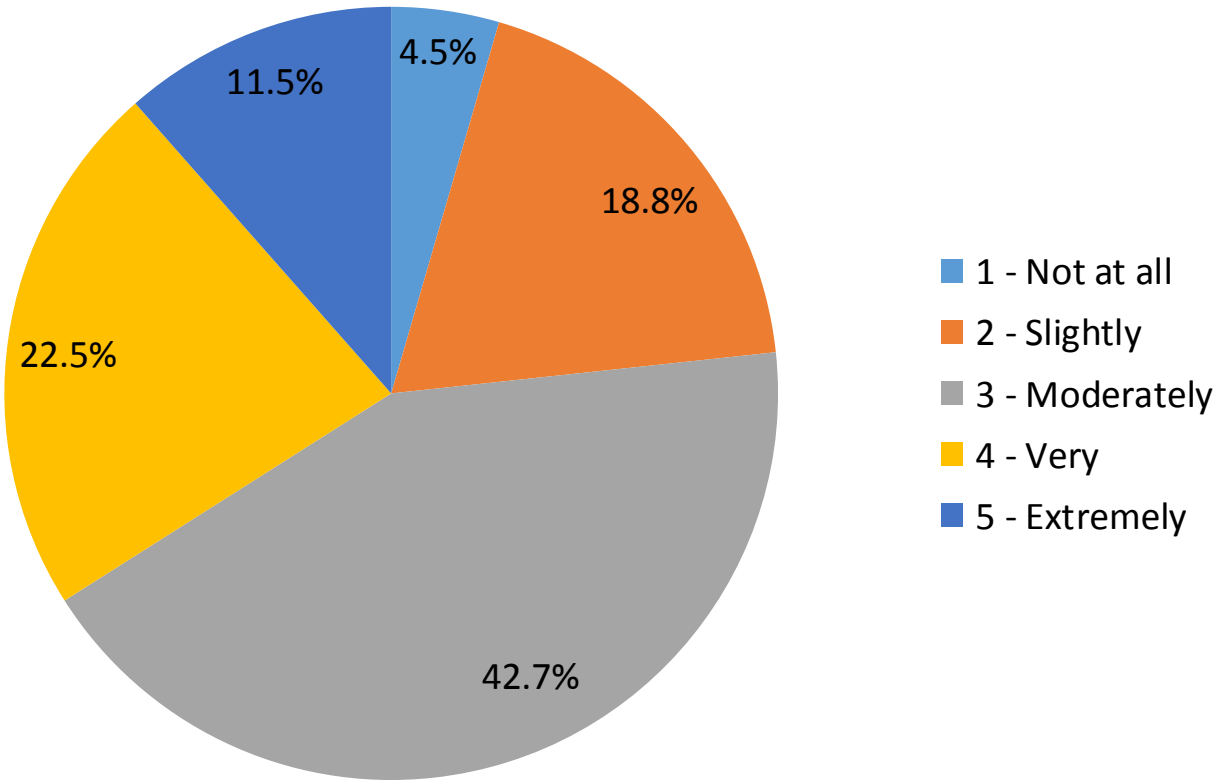
ATKINS

4a. Examples of disasters experienced



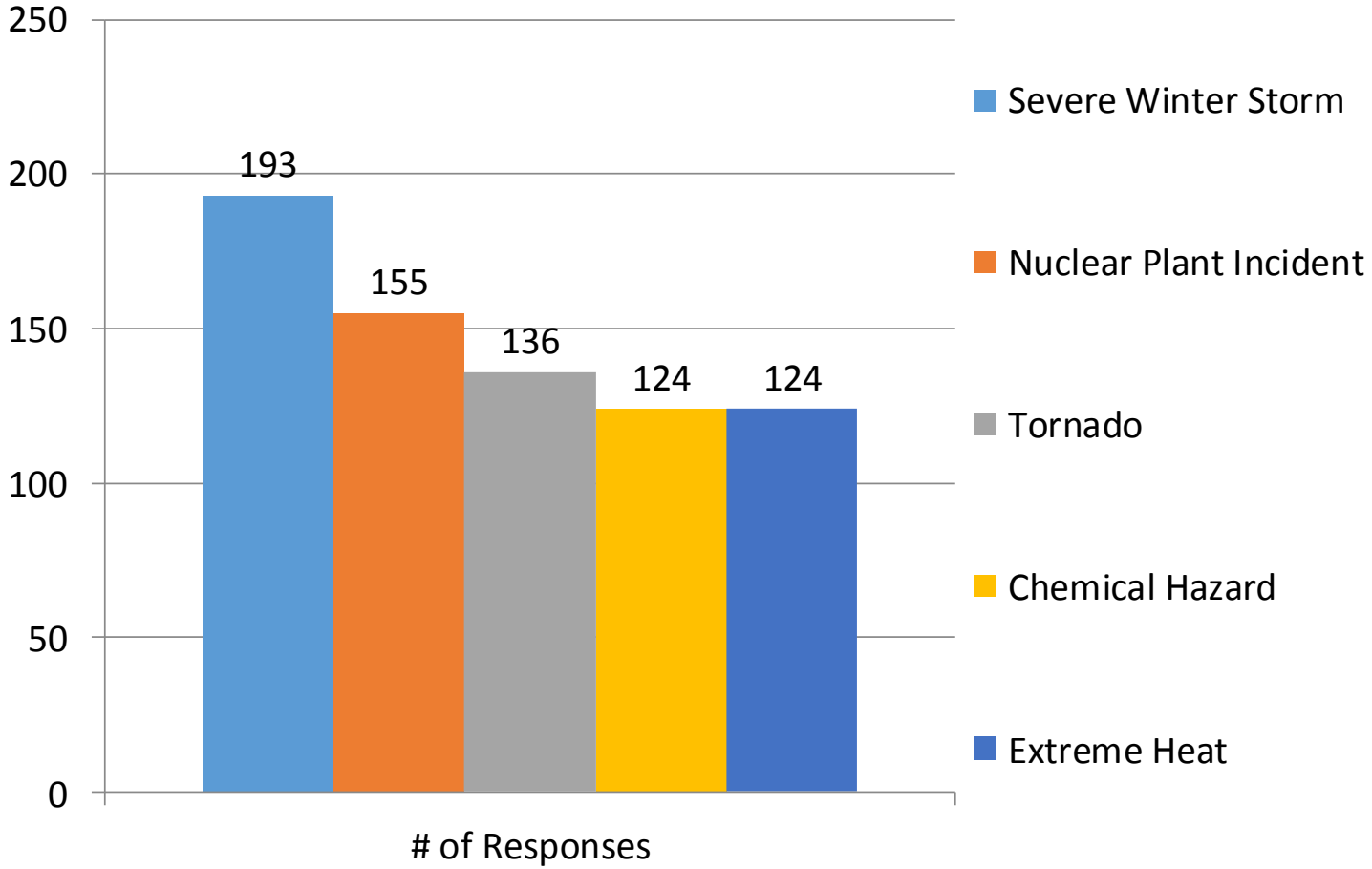
ATKINS

5. How concerned about possibility of being impacted by disaster?



ATKINS

6. Hazards of greatest concern?

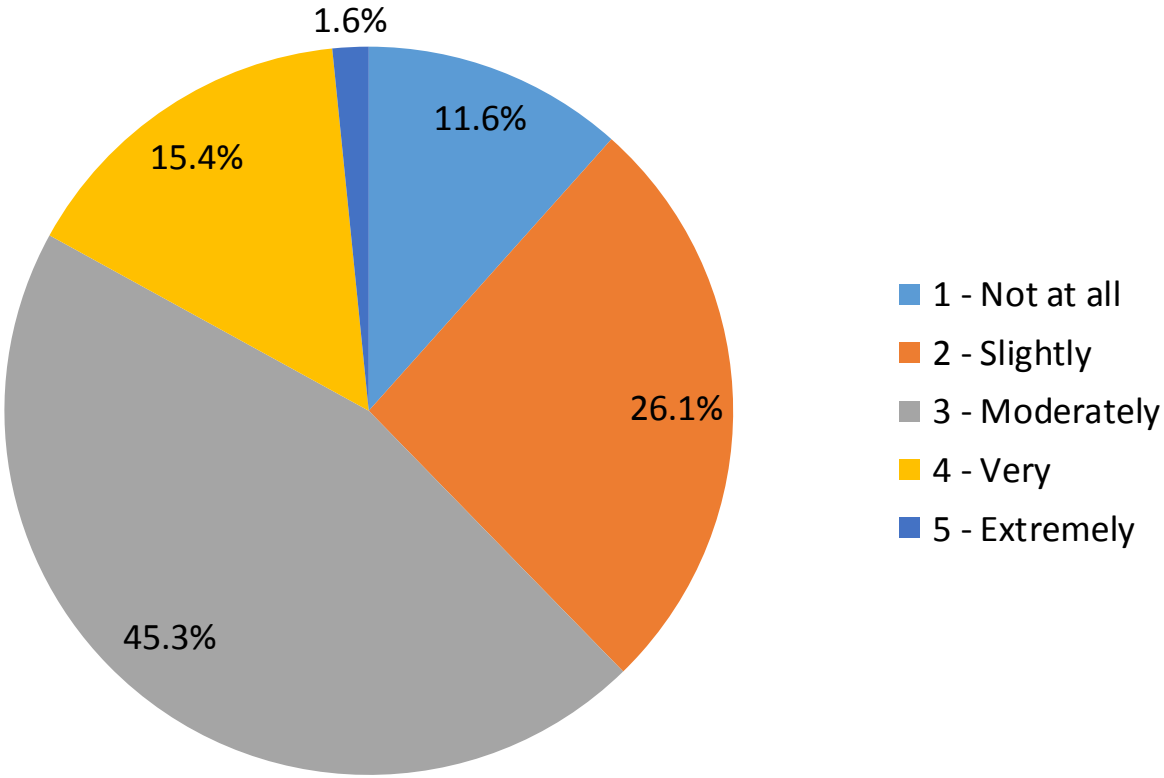


ATKINS

7. Other hazards not listed?

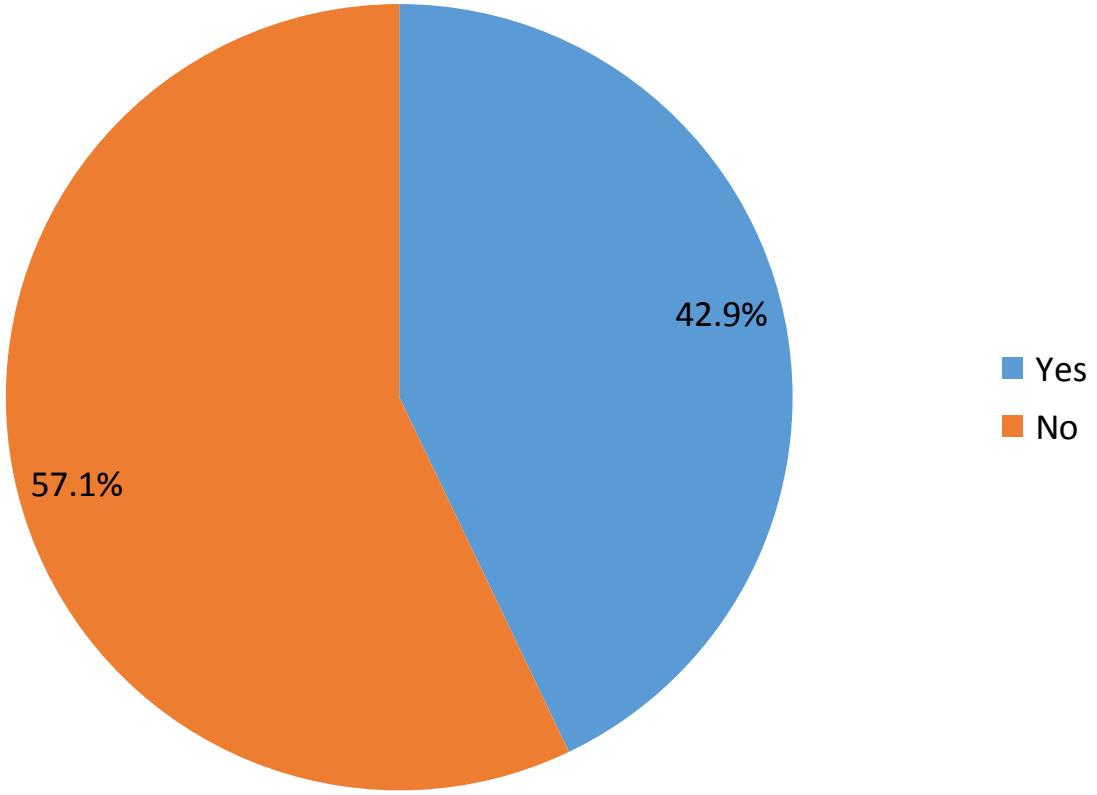
- Hurricane
- Bug infestation
- Water quality (petrol/oil contamination)
- Biomedical hazards
- Biological incident
- Civil unrest/riots
- Economic collapse
- Transportation/rail incident
- Infectious disease/pandemic
- Infrastructure problems/disruption
- Microburst
- Hurricane evacuees seeking refuge
- Trees falling

8. How prepared if disaster occurs?



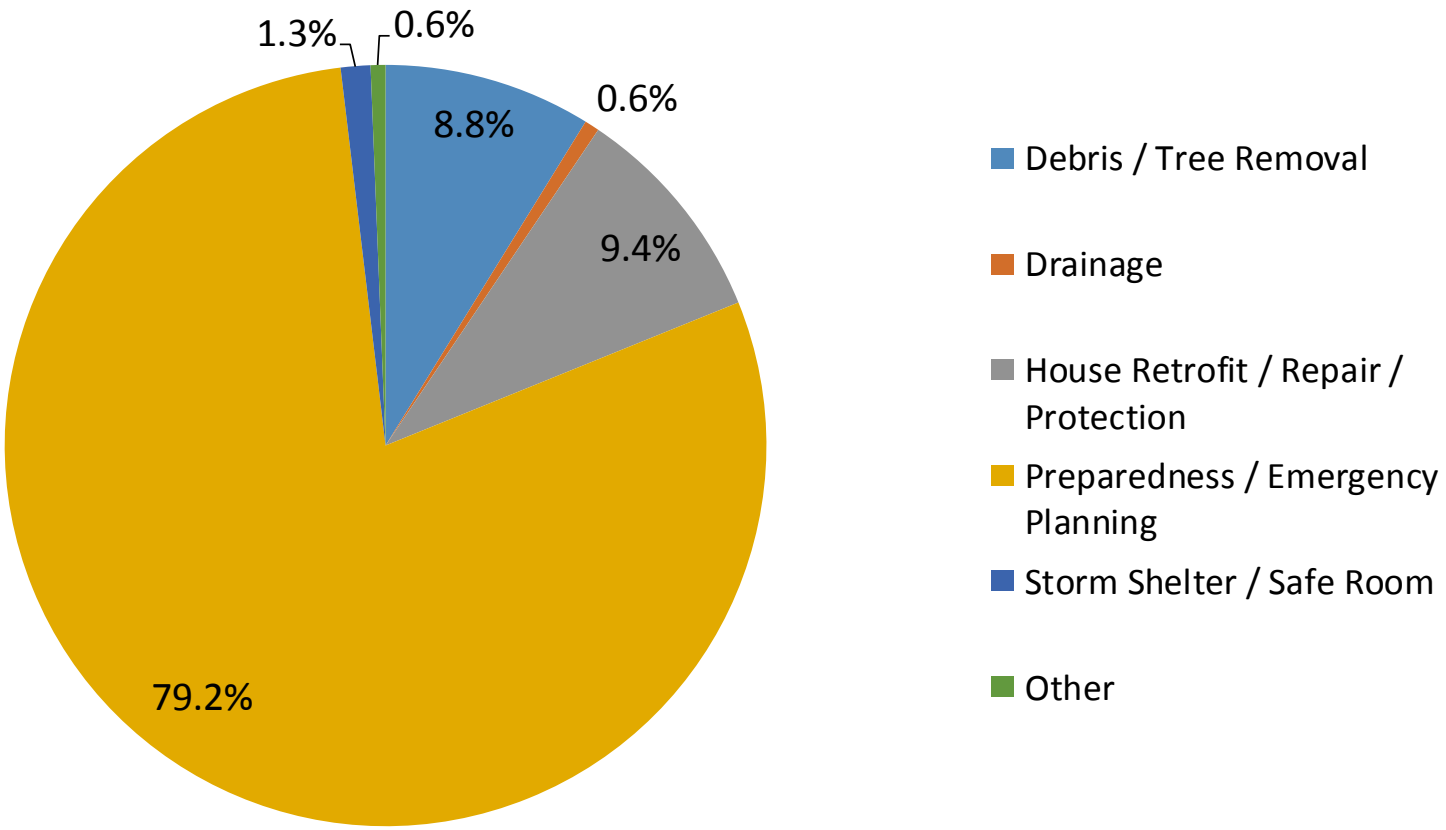
ATKINS

9. Taken action to be safer from hazards?



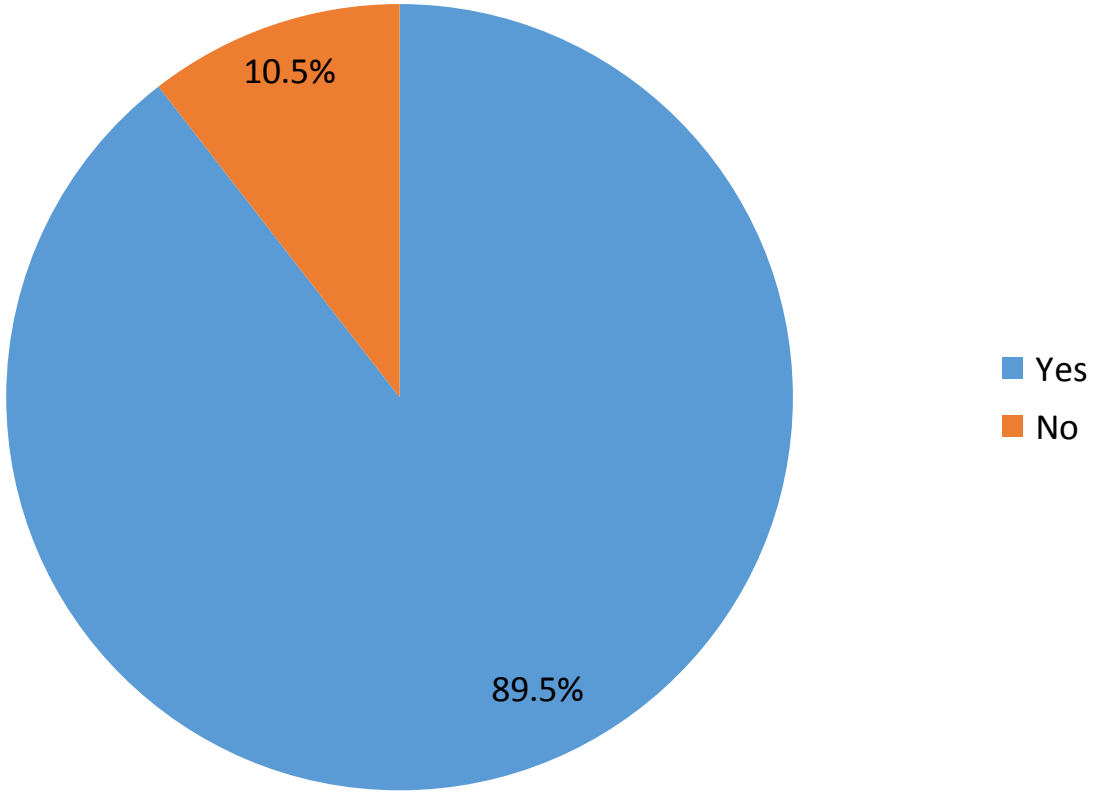
ATKINS

9a. Examples of actions taken



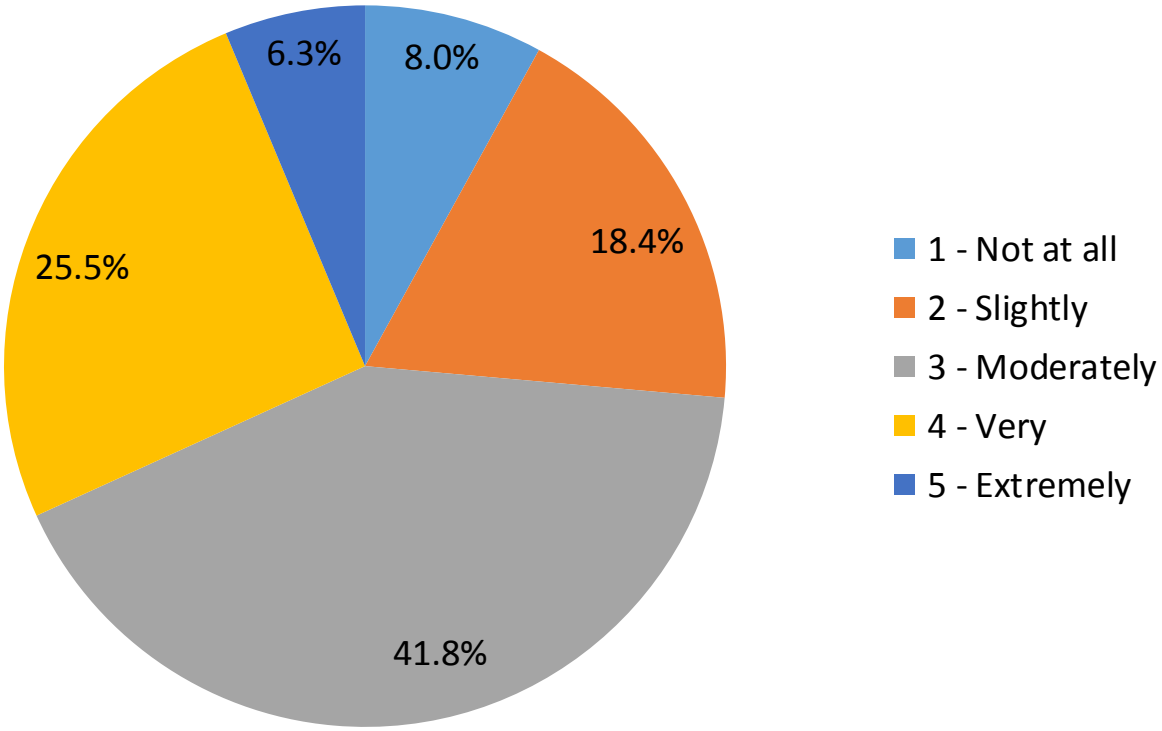
ATKINS

10. Interested in being safer from hazards?



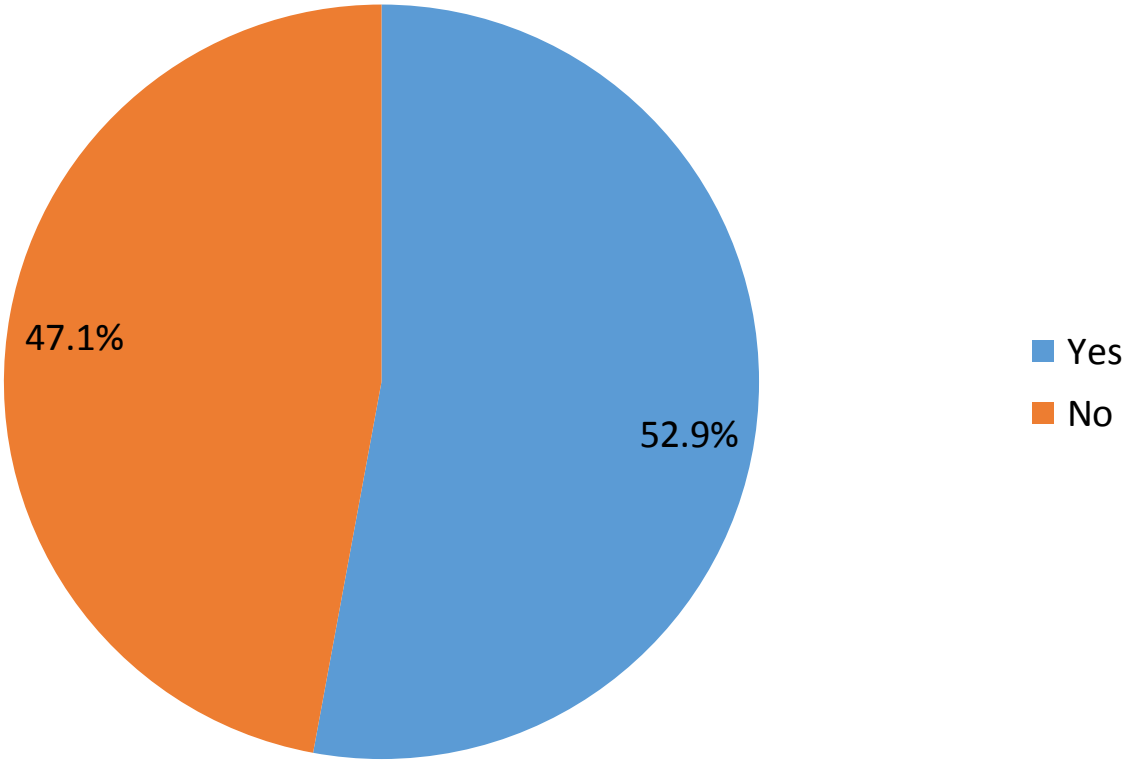
ATKINS

11. How informed about risks and impacts of disasters?



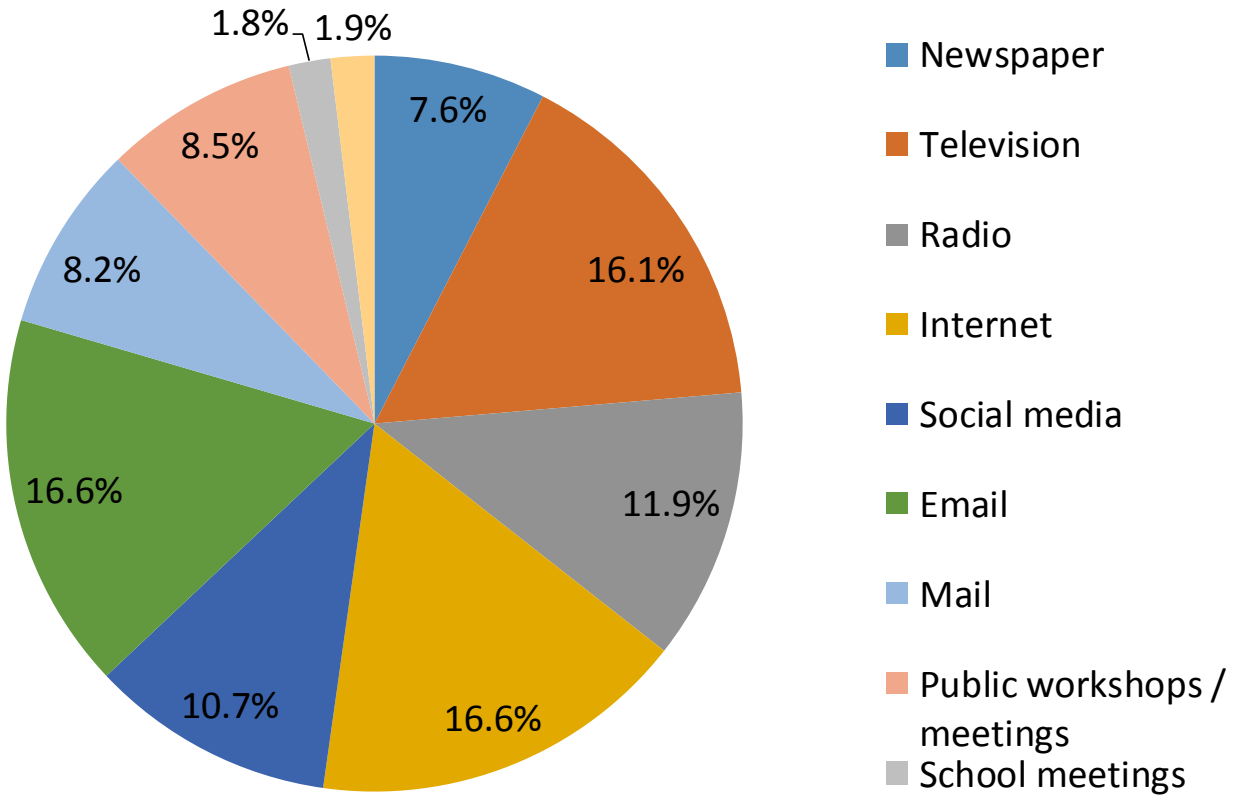
ATKINS

12. Know who to contact regarding risks from hazards?



ATKINS

13. Preferred way to receive info. about being safer from hazards?

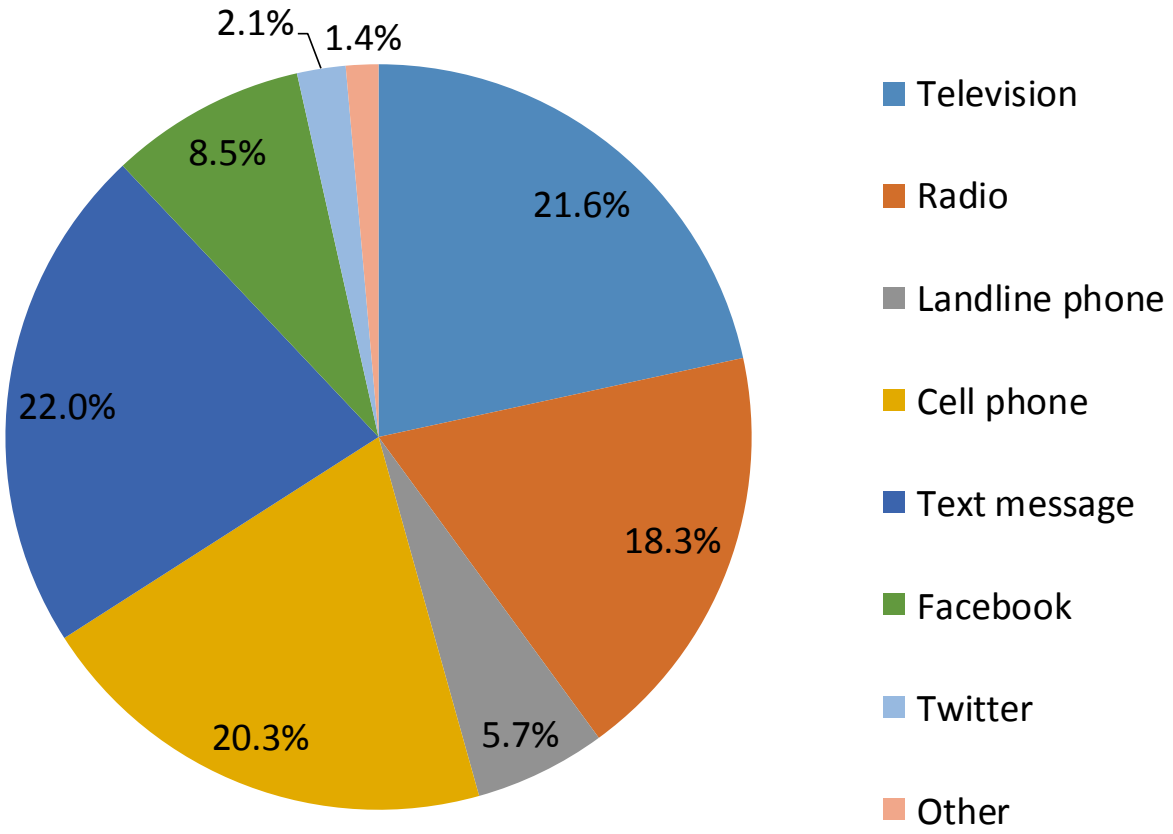


ATKINS

13. Other ways to receive information

- Text message
- Neighborhood association/meetings
- Phone
- Word of mouth
- Federal sources (NOAA, FEMA, USACE)
- Work

14. Preferred way to receive alerts/ warnings about hazard events?

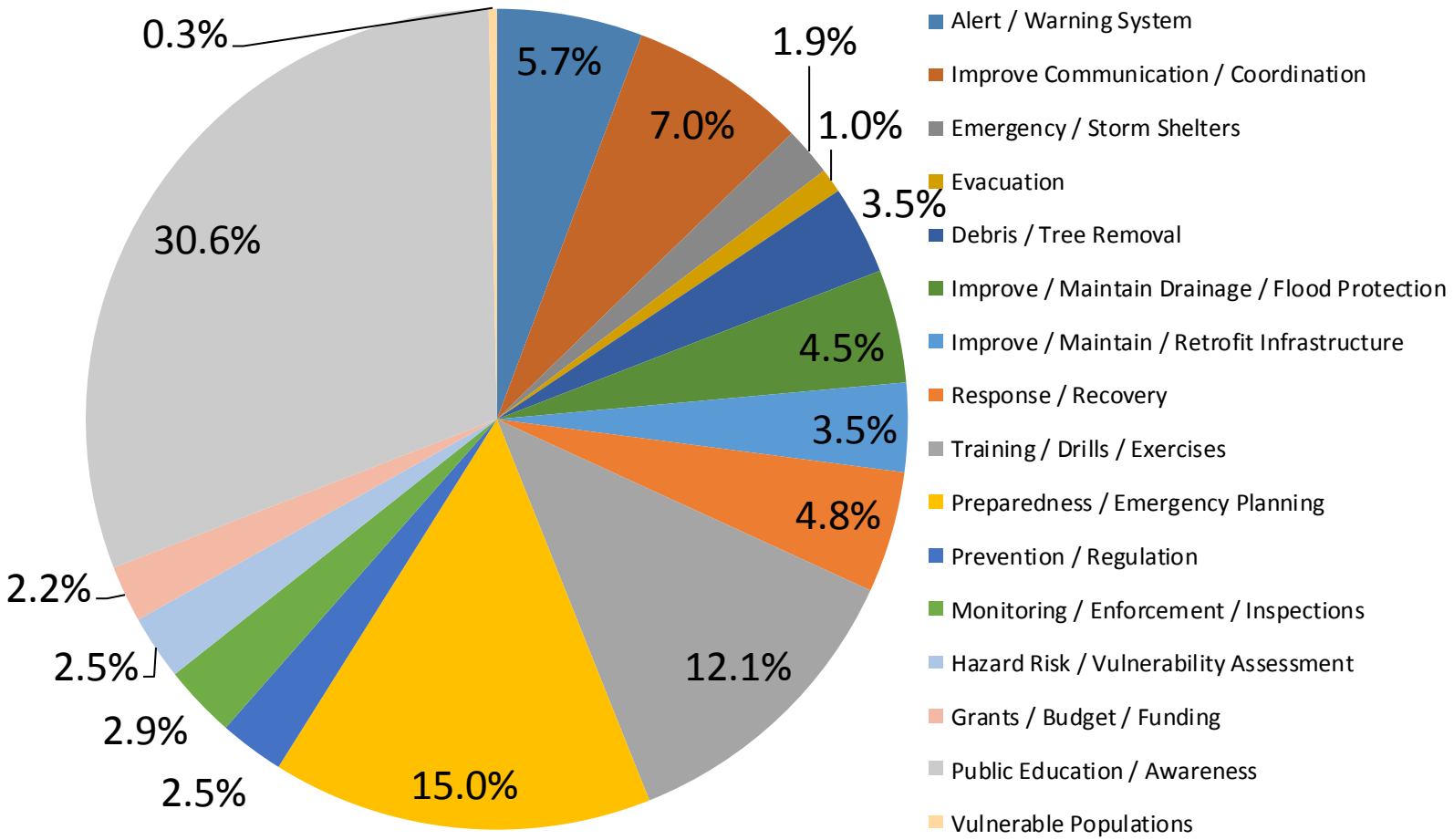


ATKINS

14. Other ways to receive alerts/warnings

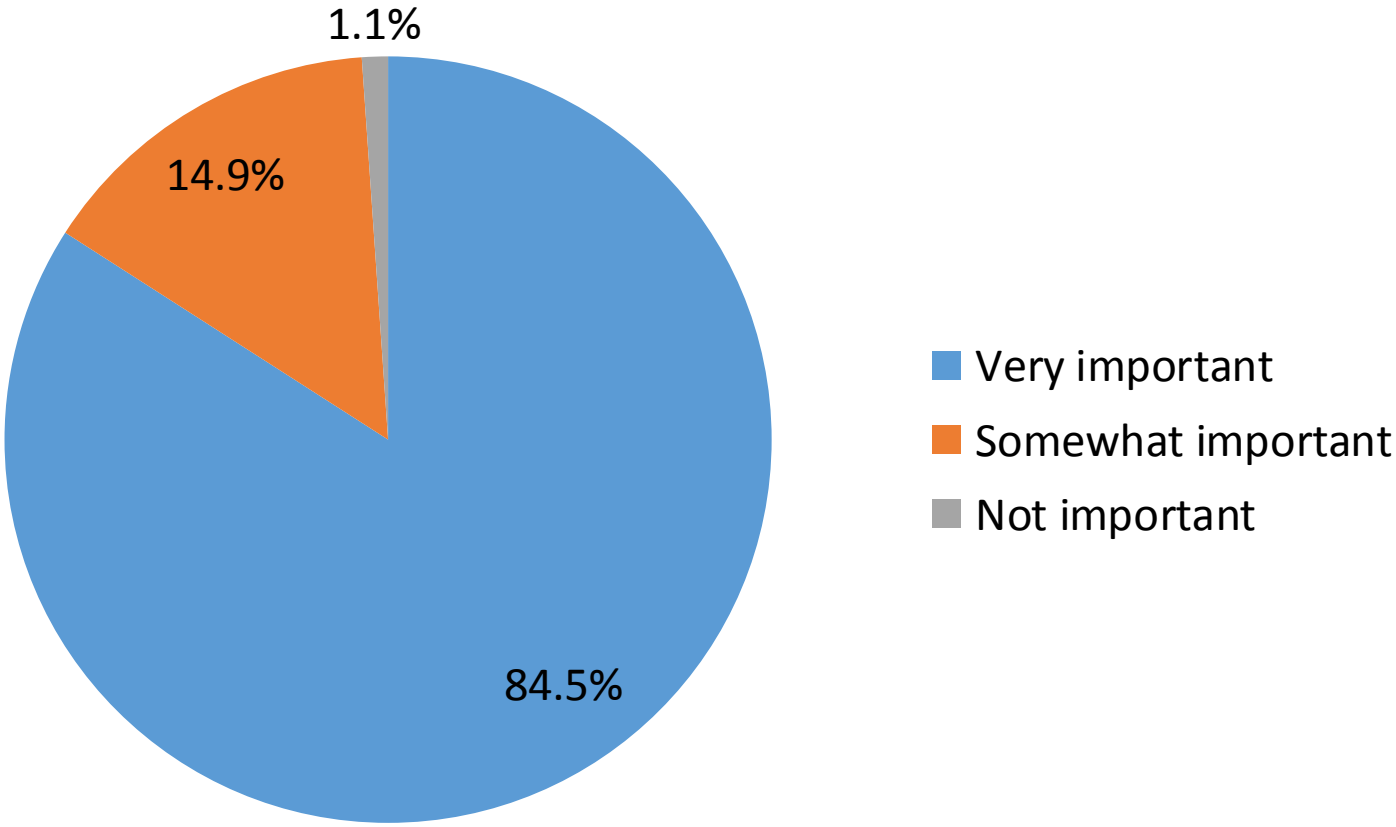
- Email
- Siren/alarms
- Alerts (like amber alert)
- Smartphone app
- Neighborhood association
- Internet

15. Steps local gov't could take to reduce risk



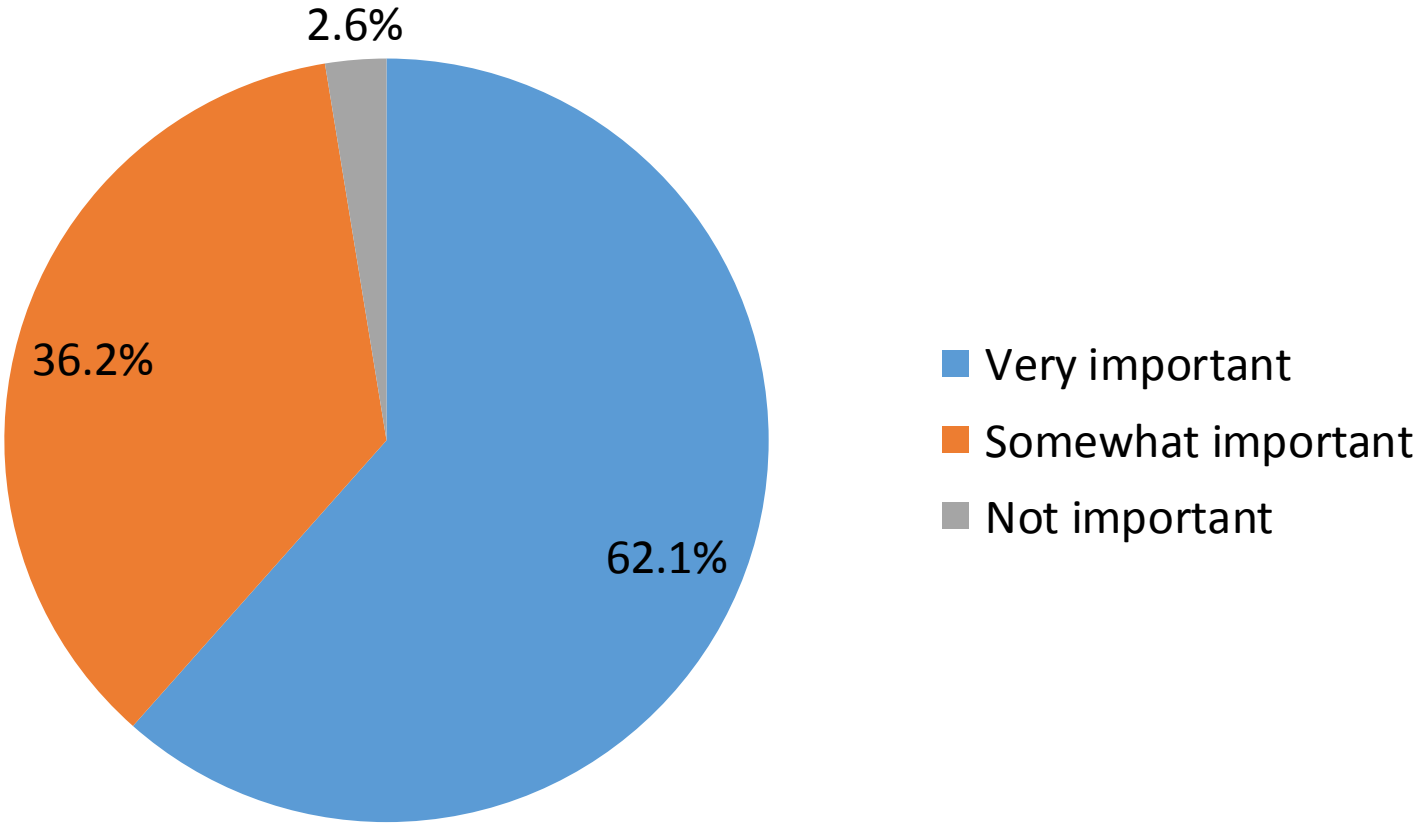
ATKINS

16. Mitigation Actions: Prevention



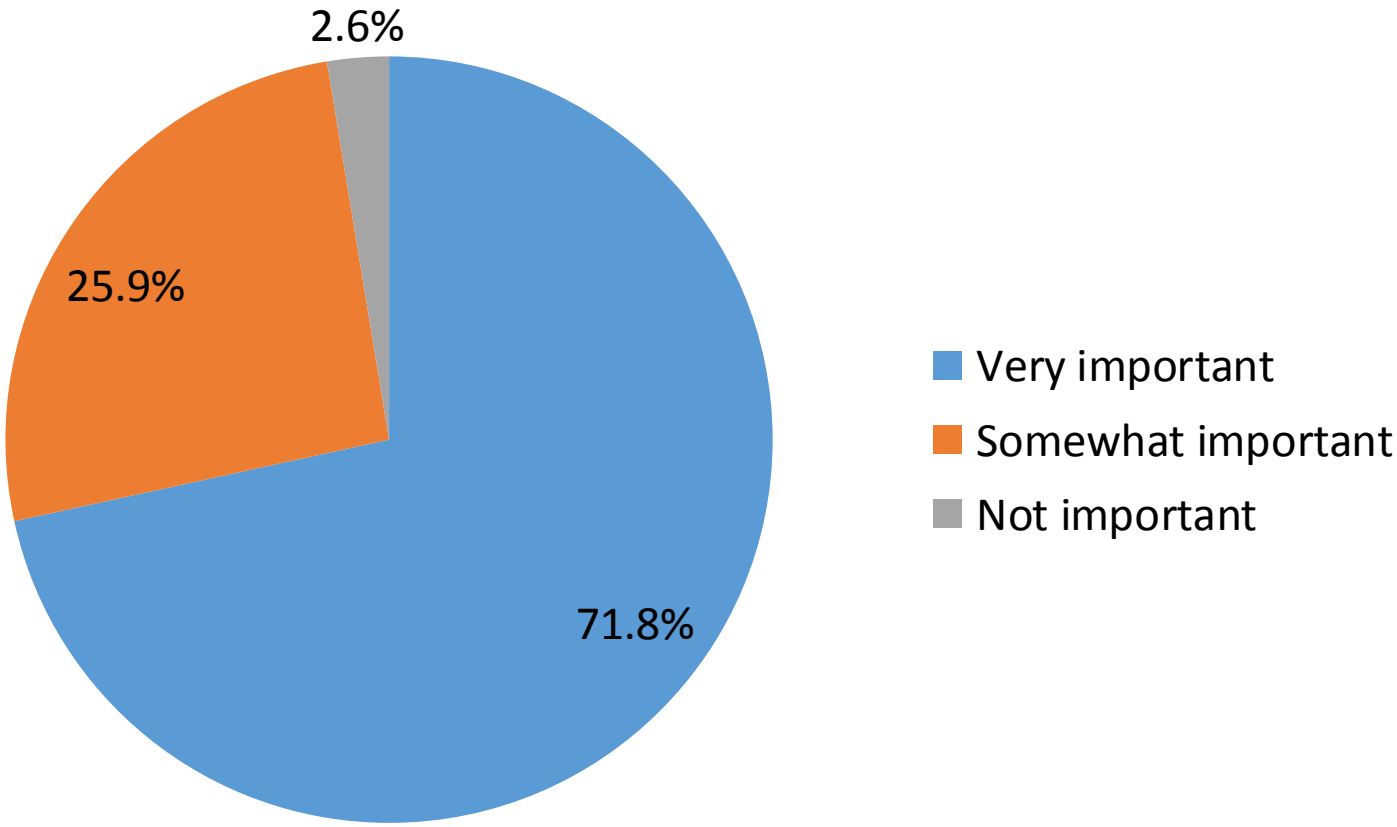
ATKINS

16. Mitigation Actions: Property Protection



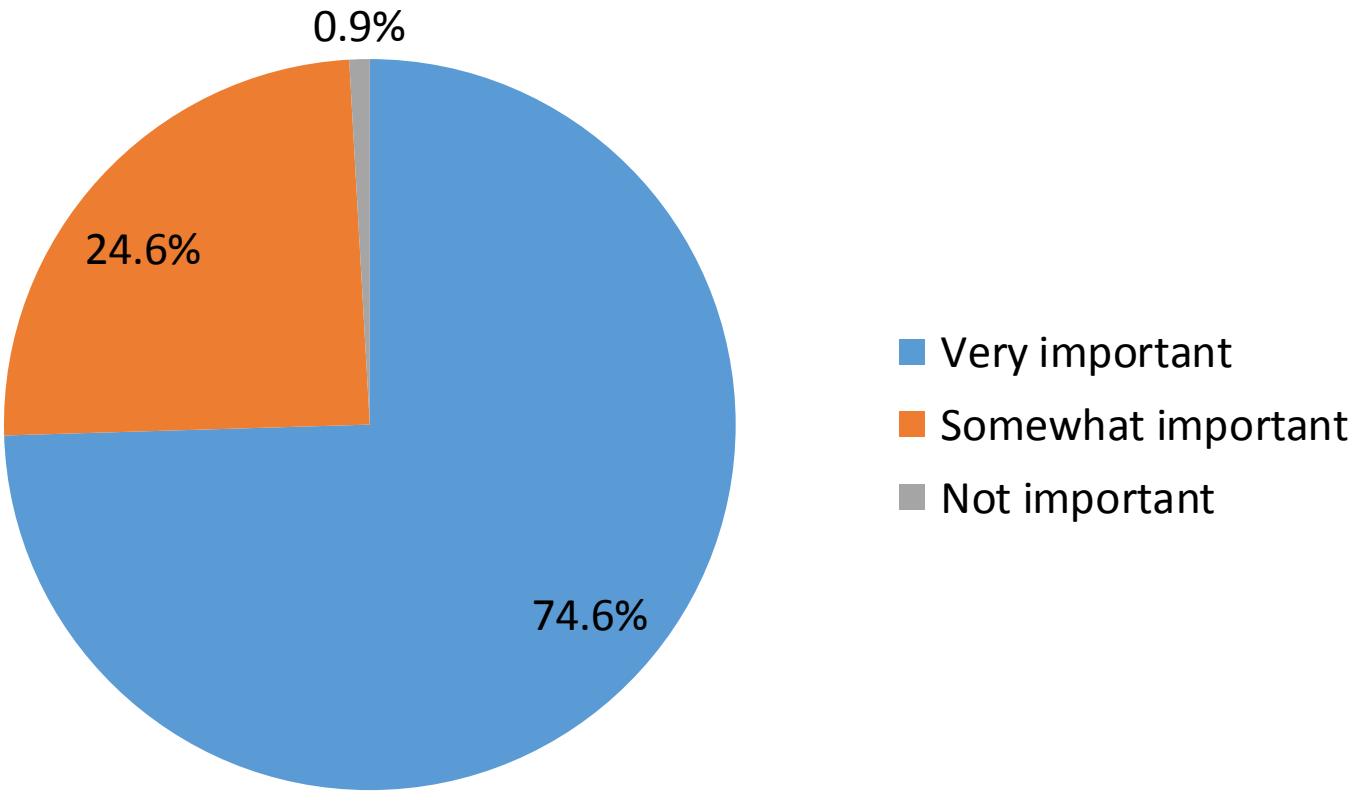
ATKINS

16. Mitigation Actions: Natural Resource Protection



ATKINS

16. Mitigation Actions: Structural Projects



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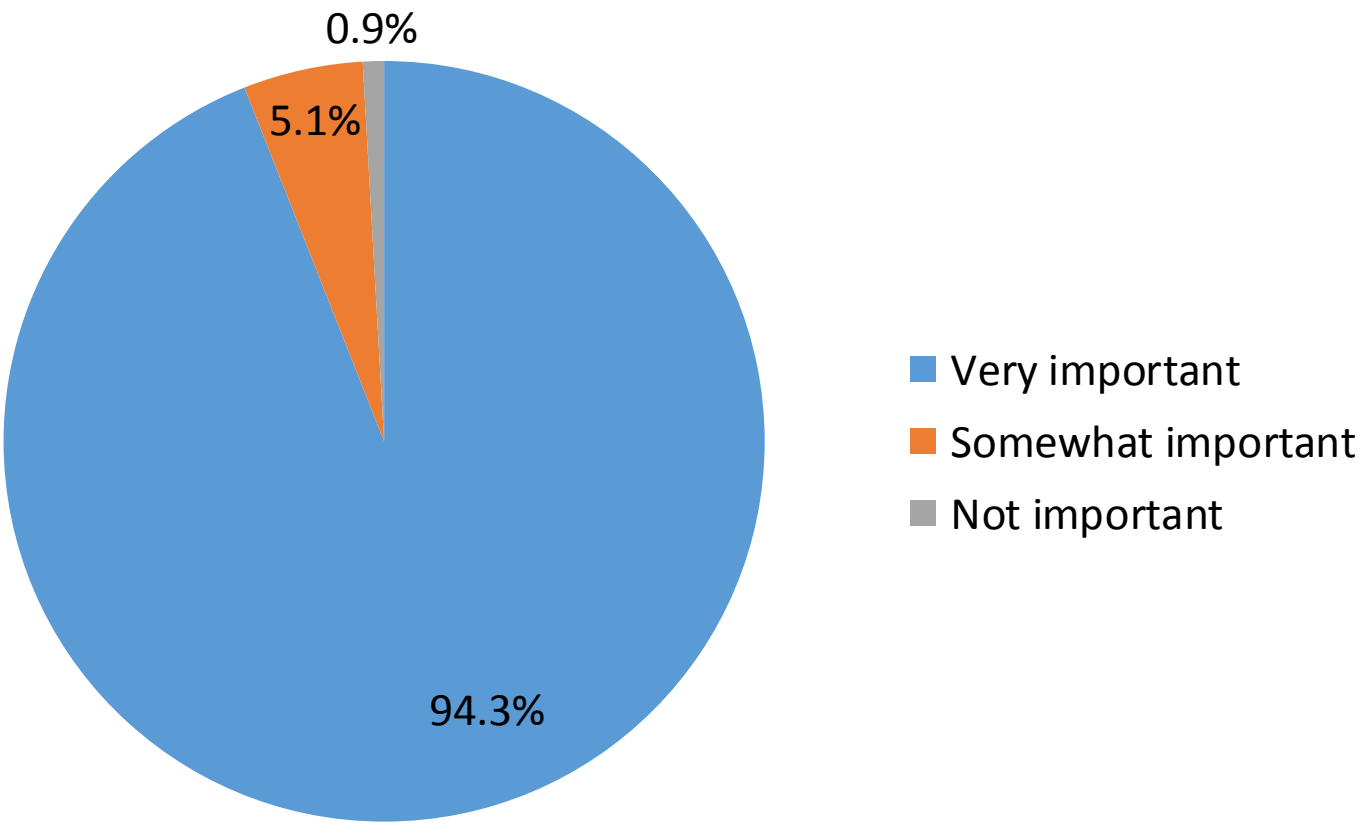
16. Mitigation Actions: Emergency Services



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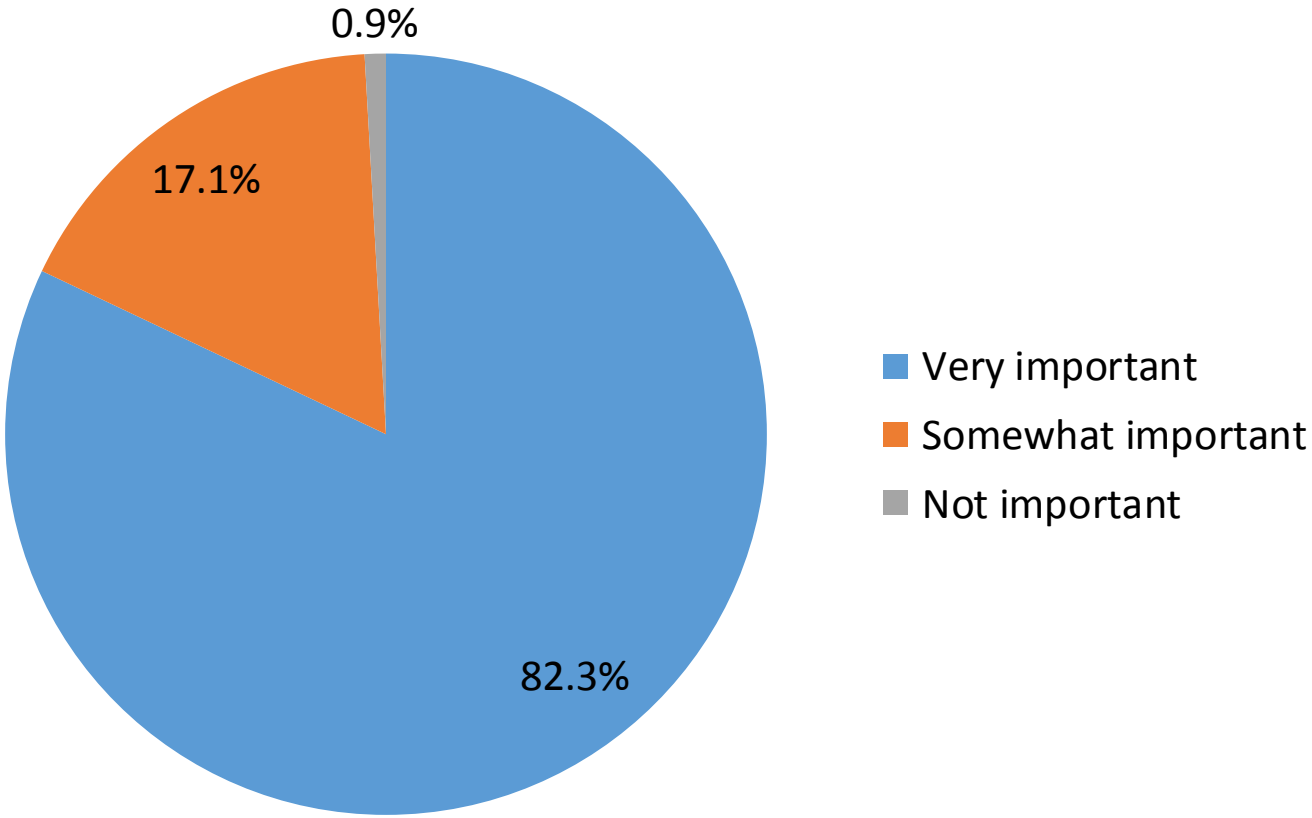
16. Mitigation Actions: Public Education & Awareness



ATKINS

16. Mitigation Actions: Summary

- Highest importance
  - Emergency Services
  - Prevention
  - Public Education & Awareness
- Moderate importance
  - Structural Projects
  - Natural Resource Protection
- Lowest importance
  - Property Protection

City of Augusta-Richmond County Hazard Mitigation Plan Update

Public Participation Survey Results

ATKINS

News Flash to EMA alert subscribers

From: Emergency Management [mailto:listserv@civicplus.com]
Sent: Friday, March 03, 2017 1:16 PM
To: Mie Lucas <DLucas@augustaga.gov>
Subject: New Newsflash Hazard Mitigation Plan Update For www.augustaga.gov

View this in your browser

March 03, 2017

Hazard Mitigation Plan Update

We would like your input on the Augusta-Richmond County Updated Hazard Mitigation Plan draft. Download the plan here:..... Read on

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Draft Plan Notification to Planning Group

From: Mie Lucas [mailto:DLucas@augustaga.gov]
Sent: Monday, March 06, 2017 11:25 AM
Cc: Walton, Margaret M <Margaret.Walton@atkinsglobal.com>
Subject: Hazard Mitigation Plan Posted

Good morning,

The draft of the updated hazard mitigation plan has been posted on the EMA website. The plan can be accessed at: http://www.augustaga.gov/2263/EMA-Response-Plans. If you have any information or feedback you would like to share, please submit it to our project manager, Margaret Walton, at Margaret.Walton@atkinsglobal.com by Friday, March 17.

Thank you for your support during this process!

Mie Lucas, GA CEM
Disaster Preparedness Coordinator
Augusta Fire/Emergency Management Division
3117 Deans Bridge Rd.
Augusta, GA 30906
(706)821-1157 office
(706)799-9803 cell
(706)821-1246 fax
dlucas@augustaga.gov

Find us on & : Augusta, Georgia Fire/EMA

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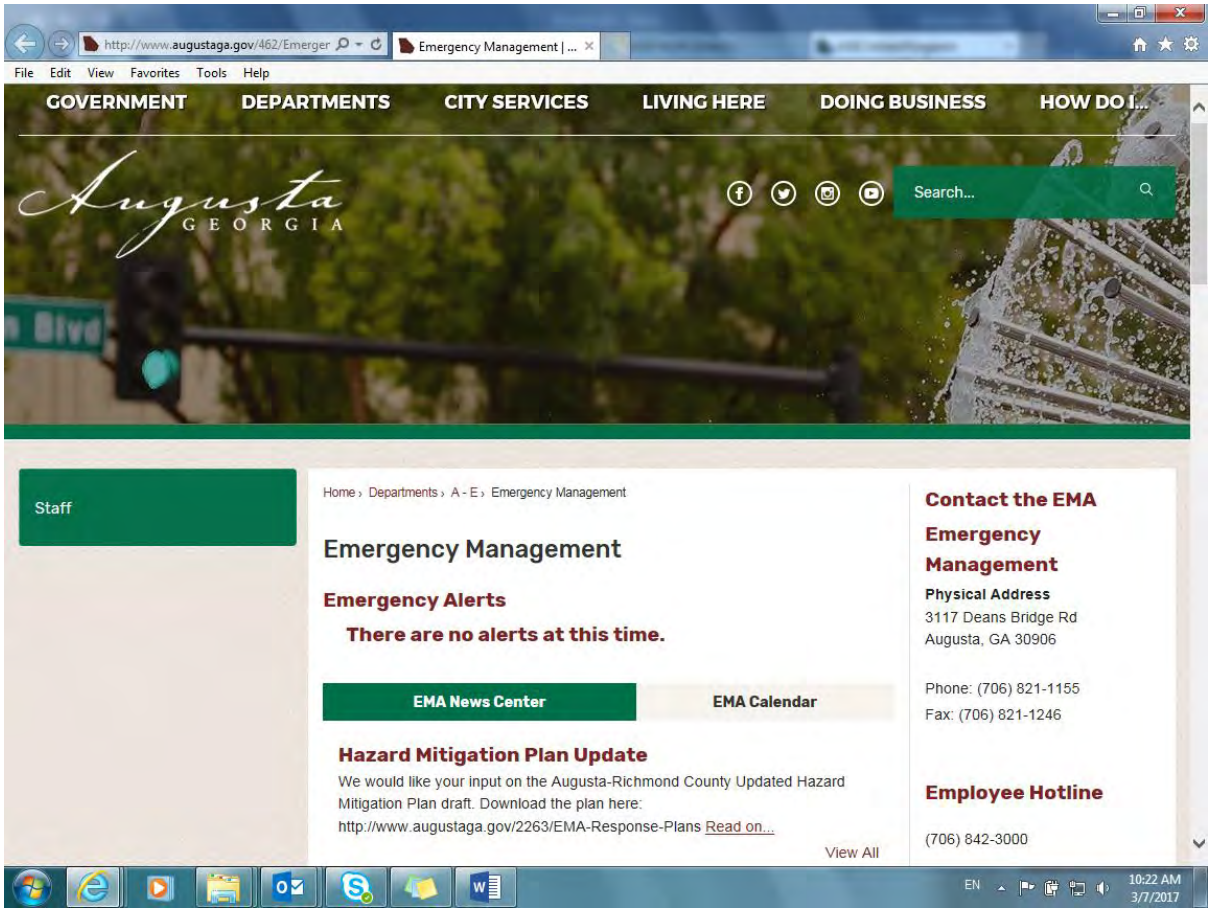
http://www.augustaga.gov/462/Emerger
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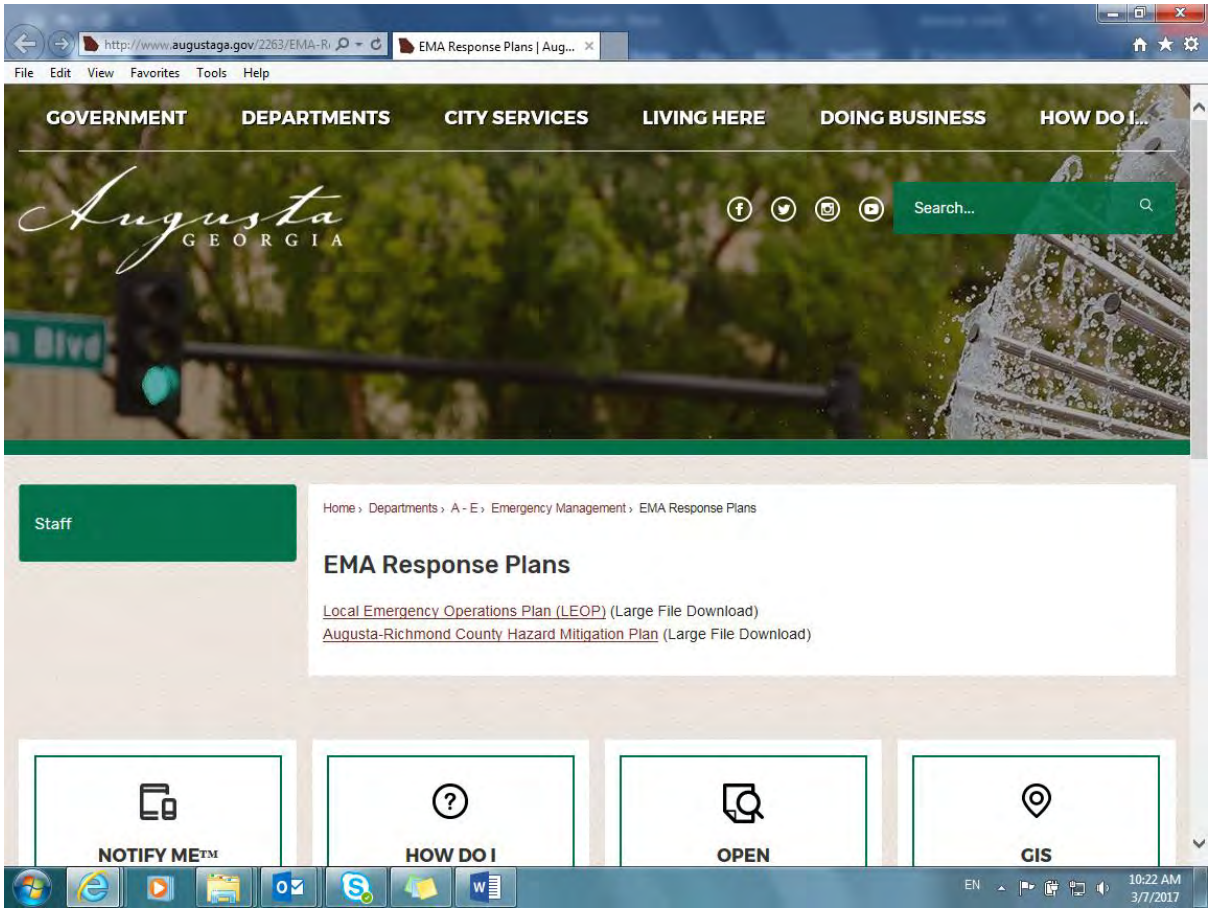
Augusta
GEORGIA
Search...
Staff
Home › Departments › A - E › Emergency Management
Emergency Management
Emergency Alerts
There are no alerts at this time.
EMA News Center
EMA Calendar
Hazard Mitigation Plan Update
We would like your input on the Augusta-Richmond County Updated Hazard Mitigation Plan draft. Download the plan here:
http://www.augustaga.gov/2263/EMA-Response-Plans Read on...
View All
Contact the EMA
Emergency Management
Physical Address
3117 Deans Bridge Rd
Augusta, GA 30906
Phone: (706) 821-1155
Fax: (706) 821-1246
Employee Hotline
(706) 842-3000
EN
10:22 AM
3/7/2017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EMA Response Plans | Aug...
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Augusta
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Staff
Home › Departments › A - E › Emergency Management › EMA Response Plans
EMA Response Plans
Local Emergency Operations Plan (LEOP) (Large File Download)
Augusta-Richmond County Hazard Mitigation Plan (Large File Download)
NOTIFY ME™
HOW DO I
OPEN
GIS
EN
10:22 AM
3/7/2017

Mie Lucas

Subject:	Augusta Richmond County Hazard Mitigation Plan Update
Location:	Augusta Municipal Building Commission Chambers
Start:	Fri 8/5/2016 12:00 PM
End:	Fri 8/5/2016 2:00 PM
Recurrence:	(none)
Meeting Status:	Meeting organizer
Organizer:	Mie Lucas
Required Attendees:	cityofhephzibah@bellsouth.net; Abie L. Ladson; Commissioner Sammie Sias; tmcneal@goldenharvest.org; Hawthorne Welcher; Peterson, David SAS; Bill Welsh; Michele Pearman; lfelixjr@gfc.state.ga.us; jennifer.sosebee@trinityofaugusta.com; Commissioner Ben Hasan; Robert H. Sherman; Commissioner Marion Williams; Collins, Kyle B; Louis C. Brazzell; Jasper Cooke; tjwilliams@paine.edu; pamnestor@gmail.com; Commissioner Mary Davis; William E. Rhinehart; Commissioner Wayne Guilfoyle; Melanie Wilson; Hameed Malik; Chris James; Sharon Broady; Commissioner William Lockett; Steven L. Strickland; Commissioner Grady Smith; john.miller5@redcross.org; Tom Wiedmeier; Sharon W. Bennett (SWBennett@augustaga.gov); Commissioner Sean Frantom; Mayor Hardie Davis, Jr. ; Tonya Bonitatibus; cityofblythe@comcast.net; Commissioner William Fennoy; jmcdaniel@uwcsra.org; Richard Dorman; Sterling Jones; Hyatt, Scott M SAS; nepemenet@bellsouth.net; Alice.Scavullo@uss.salvationarmy.org; sherrouse@augustacanal.com; Jonathan Adriano; milton.birdsong@hcahealthcare.com; John Caran; laura.radford@gema.ga.gov; Walton, Margaret M; Glenn Parker; Commissioner Dennis Williams; Terri Turner; Janice Allen Jackson; tilleje@boe.richmond.k12.ga.us; Jerry Germann
Optional Attendees:	jsosebee@hhs1.com; Carrie Jones; Leroy Morgan Jr.; Gresham, Courtney; Wishard, Randy; Cooke, Jasper; Hogue, Michael A; Vince Pacchiana; Brendon Cunningham; Lynthia Owens; Way, Rodney

This is a reminder about the meeting on Friday. If possible, please let me know by Wednesday afternoon if you will be attending. For those that have already responded, thank you!

The meeting will be from 12pm to 2pm.

See you on Friday!

Good afternoon,

It is time for us to update our Hazard Mitigation Plan! We have received a grant from FEMA/GEMHSA to complete our 5-year update and its due June 2017. The Hazard Mitigation Plan forms the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. This plan ensures the City's eligibility for state and federal support after a disaster.

We will have a kickoff meeting on Friday, August 5, 2016. The meeting will be held at the Augusta Municipal Building in the Commission Chambers.

Please plan to attend this meeting and learn how you can participate and how this plan impacts you. You are a vital partner in this planning process. If you have any questions, please don't hesitate to contact me.

Thank you,

Mie Lucas, GA CEM
Disaster Preparedness Coordinator
Augusta Fire/Emergency Management Division
3117 Deans Bridge Rd.
Augusta, GA 30906
(706)821-1157 office
(706)799-9803 cell
(706)821-1246 fax
dlucas@augustaga.gov

Augusta-Richmond County Hazard Mitigation Plan Update : Message (HTML)

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Delete | Respond | Quick Steps | Move | Tags | Editing | Zoom

Tue 5/16/2017 3:52 PM

Mie Lucas <DLucas@augustaga.gov>

Augusta-Richmond County Hazard Mitigation Plan Update

To Paul Matthews (pmatthews@aikencountysc.gov); rsanders@burkecounty-ga.gov; warrenoes@classicsouth.net; Leanza, Andrew; janderson@jeffersoncountyga.gov; Ssewell@thomson-mcduffie.net

Cc Wiedenman, Ryan E

Bing Maps | Action Items | + Get more add-ins

All,

One of FEMA's requests regarding the development of Hazard Mitigation Plans is that communities that develop a plan give an explicit opportunity to neighboring communities to provide comments/feedback during the drafting stage of the plan. As such, we are interested in any comments/feedback you would like to provide on the Augusta-Richmond County Multi-Jurisdictional Hazard Mitigation Plan Draft, which can be downloaded at the link below.

https://atkins.box.com/s/yo449jy2trczri5e5cc3fbv3a63h20i3

Any comments we receive will be much appreciated and will be brought up for discussion with the members of the Augusta-Richmond County Hazard Mitigation Planning Team. If you have any questions or concerns, please feel free to direct them to myself or Ryan Wiedenman with Atkins (cc'd on this email).

Thanks very much for your time!

Mie Lucas, GA CEM
Disaster Preparedness Coordinator
Augusta Fire/Emergency Management Division
3117 Deans Bridge Rd.
Augusta, GA 30906
(706)821-1157 office
(706)799-9803 cell
(706)821-1246 fax
dlucas@augustaga.gov

Hazard Mitigation Plan Update Public Meeting
August 18,2017

Name	Email
Shawn W. Bennett	sobennett@augustaga.gov
Allen Hillman	Gerald.Hillman@dph.ga.gov
Fred Koehle	August.Koehle@dph.Ga.Gov
Jonathan Adriano	jonathan.adriano@DPH.GA.GOV
James Miller	James.miller56@Va.gov
Kimberly Ledbetter	kimberly.h.ledbetter4.ctr@mail.mil
Randy Barns	rbarns9@yahoo.com
RICH RISTAU	RICH.RISTAU@Solvay.com
Mike Wheeler	JWheeler@goldcrossems.com
TOM BASILE	tbasile@pvschemicals.com
Andy Moats	AMoats at Hepaco.com
Sandra Molina	sandra.molina@dph.ga.gov
Nick Walsh	NWALSH@Olin.com
Frederick Cox MD	Frederick.Cox@VA.GOV
JOHN COBB	john.cobb@pgcorp.com
Debra Bearley	dbearley@augustaga.gov
Nick Almeter	nick.almeter@solvay.com
BILL WELSH	billwelsh@uh.org
Christopher E. James	cjames@augustaga.gov
Byron W. Taylor	btaylor@augustaga.gov
Jennefer Jones	Jennefer.Jones@MorganPLC.com

Hazard Mitigation Plan Update Public Meeting
August 18,2017

Name	Email
Jonny Walker	Jonny.C.Walker@dph.ga.gov
Mark Moots	MMoots@PVS Chemicals.com
Ken Erondu	Kerondu@augusta.edu
Collin Hopf	collin.hopf@gema.ga.gov
Mike Lucas	dlucas@augustaga.gov

Augusta-Richmond County Local Emergency Planning Committee (LEPC) AGENDA

RICHMOND COUNTY
LEPC

Friday August 18 2017 10:00 am
Impact Safety
81 Milledge Road
Lunch Provided by: Tom Basile-PVS Technologies

I. Call to Order & Welcome..... Mie Lucas
II. **Roll Call**..... Sharon Bennett
III Introduction of Guest..... Mie Lucas
IV. Minutes Review & Motion.....Sharon Bennett
V. Treasurer's Report..... Sharon Bennett

- Checking Account Balance $ 22,758.50 ($2339.74 FF Conference)
- **VI. Drill, Exercises & Events**

VII. Sub-Committee Reports:

- Industrial Outreach .....Randy Barrs
- Public Information..... Sharon Bennett
- Training and Exercise ....Vacant

VIII. Old Business

- Membership Applications
- CAER

IX. New Business

Sponsor Spotlight..... **Tom Basile/PVS Technologies**

SPEAKERS:

Introduction Public Health **Jonathan Adriano**
Fred Koehle-Public Health & Sandra Molina

Mie Lucas- Hazard Mitigation Plan

X. Closing: ..... **Next Meeting November 17, 2017**
This will be the 2017 LEPC & ASSE SUMMIT

Chair- Richard Dorman- Safety & Security Manager Morgan Advance Materials Thermal
Co-Chair- Mie Lucas- Disaster Preparedness Coordinator Augusta Fire Department, EMA
Secretary – Sharon W. Bennett- EM Specialist, Augusta Fire Department EMA Division

FW: Richmond County Hazard Mitigation Plan - Message (HTML)

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Fri 8/18/2017 4:35 PM

Mie Lucas <DLucas@augustaga.gov>

FW: Richmond County Hazard Mitigation Plan

To Walton, Margaret M

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You forwarded this message on 8/22/2017 1:49 PM.

From: Mie Lucas
Sent: Monday, August 14, 2017 3:34 PM
To: janderson@jeffersoncountyga.gov; Andy Leanza <ALEANZA@columbiacountyga.gov>; rsanders@burkecounty-ga.gov; 'Ssewell@thomson-mcduffie.net' <Ssewell@thomson-mcduffie.net>; 'warrenoes@classicsouth.net' <warrenoes@classicsouth.net>; 'jaburke930@comcast.net' <jaburke930@comcast.net>; Paul Matthews (pmatthews@aikencountysc.gov) <pmatthews@aikencountysc.gov>; 'Collin Hopf' <collin.hopf@gema.ga.gov>; cbroom@lincolncountyga.com; cityofblythe@comcast.net; cityofhephzibah@bellsouth.net
Subject: Richmond County Hazard Mitigation Plan

Good afternoon,

Richmond County is completing the process to update the Multi-Jurisdictional Hazard Mitigation Plan. FEMA requires the plan be updated every 5 years. One of the requirements is to provide the public an opportunity to give feedback on the plan. On Friday, August 18th, 2017 the Emergency Management Office will hold the final public meeting to take comment on the plan.

You are invited to attend the meeting held at the Julian Smith BBQ Pit (3 Milledge Road Augusta, GA 30904) starting at 10AM. If you are attending, please RSVP to Sharon Bennett (swbennett@augustaga.gov).

A copy of the plan can be downloaded here: https://atkins.box.com/s/s4ea4wsjcvjksy2g0vybp6oawws7adzh

Please contact me if you have any questions.

Thank you,

Mie Lucas, GA CEM
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Augusta Fire/Emergency Management Division
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Appendix E
Additional Hazard Risk Analyses

This appendix includes a report carried out by The Polis Center in conjunction with the Georgia Department of Community Affairs that focuses on defining hurricane, flood, and tornado risk in Augusta-Richmond County, Georgia. It also includes the reports carried out by Atkins in its Hazus runs.

Hazard Risk Analyses

Supplement to the Richmond County Joint Hazard Mitigation Plan

The Polis Center

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INTRODUCTION

The Federal Disaster Mitigation Act of 2000 (DMA2K) requires state, local, and tribal governments to develop and maintain a mitigation plan to be eligible for certain federal disaster assistance and hazard mitigation funding programs.

Mitigation seeks to reduce a hazard's impacts, which may include loss of life, property damage, disruption to local and regional economies, and the expenditure of public and private funds for recovery. Sound mitigation must be based on a sound risk assessment that quantifies the potential losses of a disaster by assessing the vulnerability of buildings, infrastructure, and people.

In recognition of the importance of planning in mitigation activities, FEMA Hazus-MH, a powerful disaster risk assessment tool based on geographic information systems (GIS). This tool enables communities of all sizes to predict estimated losses from floods, hurricanes, earthquakes, and other related phenomena and to measure the impact of various mitigation practices that might help reduce those losses.

In 2012, the Georgia Department of Community Affairs (DCA) partnered with The Polis Center (Polis) at Indiana University Purdue University-Indianapolis (IUPUI) to develop a detailed risk assessment focused on defining hurricane, riverine flood, coastal flood risks and tornado in Richmond County, Georgia. This assessment identifies the characteristics and potential consequences of the disaster, how much of the community could be affected by the disaster, and the impact on community assets.

RISK ASSESSMENT PROCESS OVERVIEW

Hazus Version 2.1 was used to perform the analyses for Richmond County. The Hazus application includes default data for every county in the US. This Hazus data was derived from a variety of national sources and in some cases the data are also several years old. Whenever possible, using local provided data is preferred. Richmond County provided building inventory information from the county's property tax assessment system. This section describes the changes made to the default Hazus inventory and the modeling parameters used for each scenario.

County Inventory Changes

The default Hazus site-specific point inventory was updated using data compiled from the Georgia Emergency Management Agency (GEMA) in coordination with the Georgia Department of Community Affairs (DCA) was also updated prior to running the scenarios. Reported losses reflect the updated data sets.

General Building Stock Updates

General Building Stock (GBS) is an inventory category that consists of aggregated data (grouped by census geography—tract or block). Hazus generates a combination of site-specific and aggregated loss estimates based on the given analysis and user input.

The GBS records for Richmond County were replaced with records provided by Richmond County with help from DCA. Records without improvements were deleted. The parcel boundaries were converted to parcel points located in the centroids of each parcel boundary; then, each parcel point was linked to an assessor record based upon matching parcel numbers. The parcel assessor match-rate for Richmond County is close to 100%. The generated building inventory represents the approximate locations (within a parcel) of structures. The building inventory was aggregated by census block. Both the tract and block tables were updated. Table 1 shows the results of the changes to the GBS tables by occupancy class.

For Richmond County, the updated GBS was used to calculate hurricane wind losses. The flood losses and tornado losses were calculated from building inventory modeled in Hazus as User-Defined Facility (UDF)[1], or site-specific points.

Table 1: GBS Building Exposure Updates by Occupancy Class*

General Occupancy	Default Count	Default Exposure	Updated Count	Updated Exposure
Agricultural	196	$26,011,000	248	$36,953,000
Commercial	4202	$2,707,355,000	4,027	$2,513,155,000
Education	145	$137,831,000	73	$241,758,000
Government	129	$96,570,000	51	$72,662,000
Industrial	961	$495,189,000	65	$89,832,000
Religious	515	$312,465,000	393	$239,650,000
Residential	71,769	$8,967,798,000	66,492	$7,836,548,000
Total	**77,917**	**$12,743,219,000**	**71,349**	**$11,030,558,000**

*The exposure values represent the total number and replacement cost for all Richmond County County Buildings

Essential Facility Updates

The default Hazus essential facility data was updated to reflect improved information available in the Georgia Mitigation Information System (GMIS), which is current as of August 30, 2012. For these risk analyses, only GMIS data for the Essential Facilities was integrated into Hazus-MH because the

Essential facilities include:

- Care facilities
- EOCs
- Fire stations
- Police stations
- Schools

[1] The UDF inventory category in Hazus allows the user to enter site-specific data in place of GBS data.

application provides specialized reports for these five facilities. Essential Facility inventory was updated for the analysis conducted for this report. The following table summarizes the counts by Essential Facility classification of the updated data.

Table 2: Updated Essential Facilities

Classification	Updated Count	Updated Exposure
Hephzibah City		
EOC	0	0
Care	0	0
Fire	1	$228,000
Police	1	$210,000
School	4	$846,785,000
Total	6	$847,223,000
Blythe City		
EOC	0	0
Care	0	0
Fire	1	$482,000
Police	1	$386,000
School	1	$85,422,000
Total	**3**	$86,290,000
Others Facilities in Richmond County but outside of city jurisdiction boundaries		
EOC	1	$880,000
Care	17	$1,389,094,000
Fire	23	$836,333,000
Police	7	$96,818,000
School	177	$28,581,175,000
Total	225	$30,904,300,000

Assumptions and Exceptions

Hazus loss estimates may be impacted by certain assumptions and process variances made in this risk assessment.

- The Richmond County analysis used Hazus Version 2.1, which was released by FEMA in February 2012.

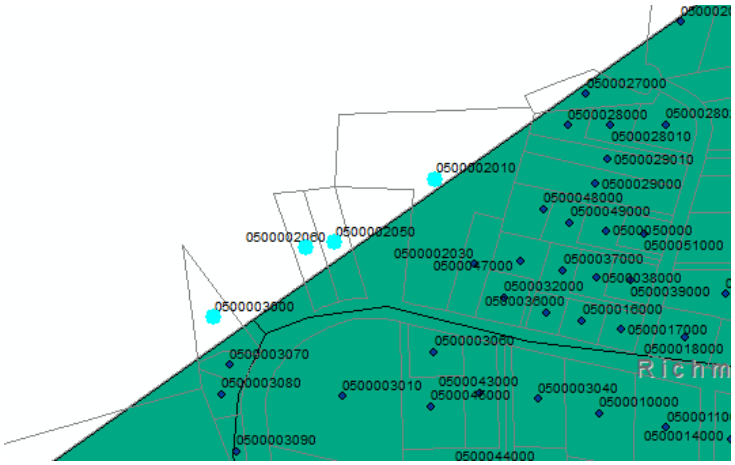
- The population counts from the 2010 census were applied to the Hazus demographics table. Not all population counts were available, so there will be inconsistencies. For example, the sum of female and male populations (not updated) will not equal the total population (updated).

The hazard models included in this risk assessment included:

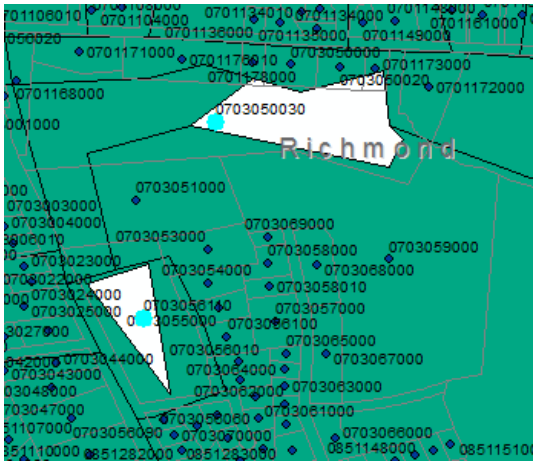
- Hurricane assessment comprised of a wind only damage assessment
- Flood assessment based on the 1% annual chance riverine flood event
- Tornado assessment based on GIS modeling

User Defined Facility and General Building Stock updates and subsequent analysis were conducted with the following assumptions:

- Assessor records are often not maintained when the parcels are not taxable. In such instances, the building replacement costs for government, religious/non-profit and education occupancy classes may be underestimated. Records for Religious, Government and/or Education occupancy classes were available in the Richmond County assessor's data and therefore this was not an issue.
- GBS updates from assessor data will skew loss calculations (see Table 2). The following attributes were defaulted or calculated:
  Foundation Type was set from Occupancy Class
  First Floor Height was set from Foundation Type
  Content Cost was calculated from Replacement Cost
- It was assumed that the buildings are located at the centroid of the parcel.
- 153 out of 80,711 points fell outside of the county boundary. Some of the points belonged to parcels that did not intersect the county boundary as shown in the example below.

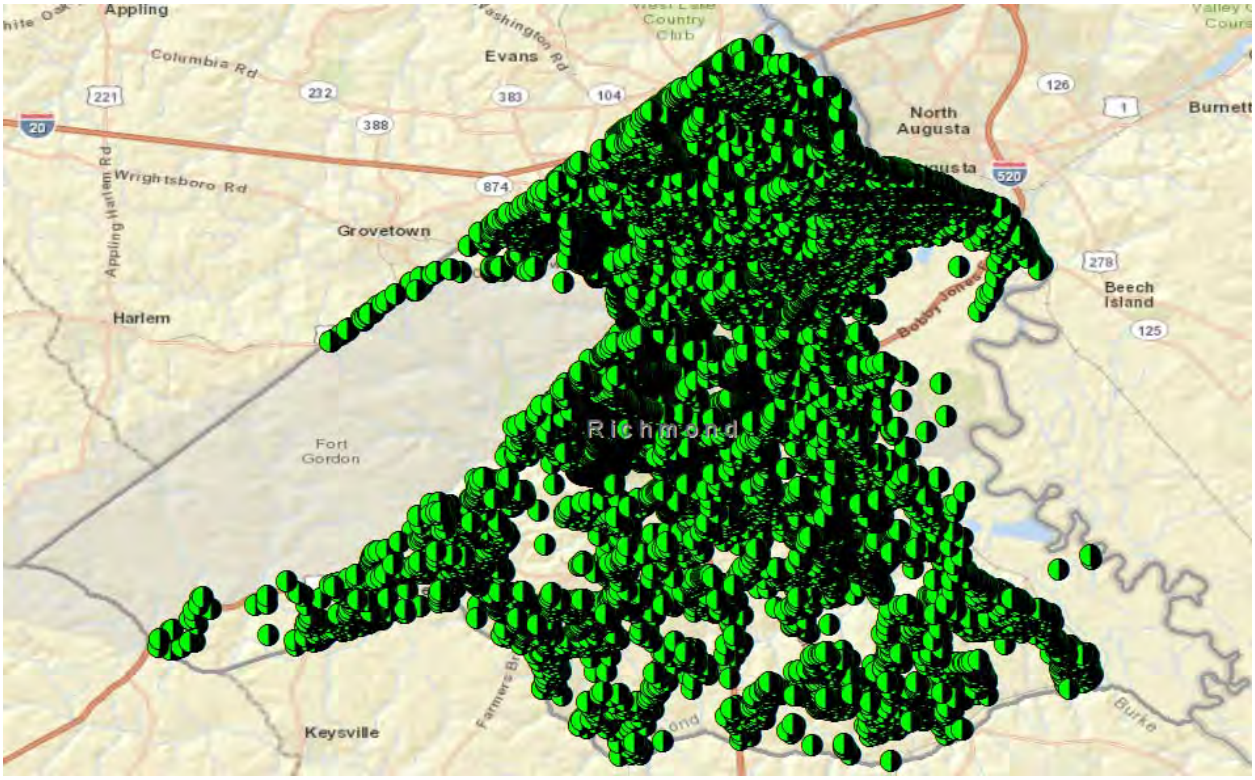


Some points appear to fall within the county boundary but there was not overlapping census blocks (possibly correct and possibly due to an error in the Hazus census block data) as shown in the following example.



All points were manually moved to the closest adjacent block.

- Based on a frequency analysis of the COMPNO field in the acBuildings_Failed feature class there are no structures in the acBuildings table that should be processed in Hazus-MH.
- It was determined that the county BI data does not include the land that covers Fort Gordon as shown below.

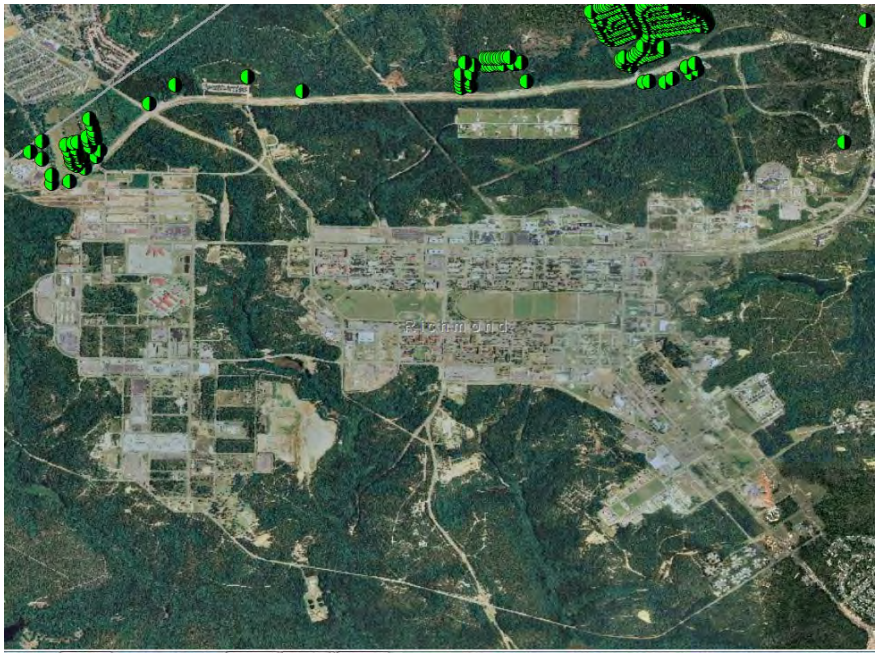


Fort Gordon is the home of US Army Signal Corps and does contain a number of buildings. The two graphics shown below show the area where these are located as well as a table with the default Hazus counts for those areas. These buildings are not represented in the updated Hazus inventory.

Table

absv_InvGbsBldgCountOccupGen

OBJECTID *	SHAPE *	CensusBlock	SHAPE_Length	SHAPE_Area	CensusBlock *	Total	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education
2918	Polygon	132450107041038	0.042446	0.000007	132450107041038	7	6	1	0	0	0	0	0
3101	Polygon	132450108009000	0.136748	0.001014	132450108009000	514	499	10	0	1	1	2	1
3102	Polygon	132450108009001	0.130994	0.000651	132450108009001	119	110	5	2	0	0	0	2
3103	Polygon	132450108009002	0.027949	0.000004	132450108009002	0	0	0	0	0	0	0	0
3104	Polygon	132450108009003	0.021548	0.000021	132450108009003	5	4	1	0	0	0	0	0
3105	Polygon	132450108009004	0.03429	0.000039	132450108009004	15	15	0	0	0	0	0	0
3106	Polygon	132450108009005	0.281872	0.002225	132450108009005	122	105	8	1	0	1	7	0
3107	Polygon	132450108009006	0.389168	0.005289	132450108009006	1	0	1	0	0	0	0	0
3108	Polygon	132450108009007	0.002931	0	132450108009007	0	0	0	0	0	0	0	0
3109	Polygon	132450108009008	0.552577	0.008047	132450108009008	5	5	0	0	0	0	0	0
3110	Polygon	132450108009009	0.001971	0	132450108009009	0	0	0	0	0	0	0	0
3111	Polygon	132450108009010	0.003254	0	132450108009010	0	0	0	0	0	0	0	0
3112	Polygon	132450108009011	0.02075	0.000003	132450108009011	0	0	0	0	0	0	0	0
3113	Polygon	132450108009012	0.01316	0.000002	132450108009012	0	0	0	0	0	0	0	0
3114	Polygon	132450108009013	0.004972	0.000001	132450108009013	2	1	1	0	0	0	0	0
3115	Polygon	132450108009014	0.003433	0.000001	132450108009014	0	0	0	0	0	0	0	0
3204	Polygon	132450109014036	0.025051	0.000002	132450109014036	0	0	0	0	0	0	0	0
3206	Polygon	132450109014038	0.014158	0.000001	132450109014038	0	0	0	0	0	0	0	0
3213	Polygon	132450109014045	0.040607	0.000015	132450109014045	0	0	0	0	0	0	0	0



HURRICANE RISK ASSESSMENT

Hazard Definition

The National Hurricane Center describes a hurricane as a tropical cyclone in which the maximum sustained wind is, at minimum, 74 miles per hour (mph)[2]. The term hurricane is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term typhoon is used for Pacific tropical cyclones north of the Equator west of the International Dateline. Hurricanes in the Atlantic Ocean, Gulf of Mexico, and Caribbean form between June and November with the peak of hurricane season occurring in the middle of September. Hurricane intensities are measured using the Saffir-Simpson Hurricane Wind Scale (Table 3). This scale is a 1 to 5 categorization based on the hurricane's intensity at the indicated time.

Hurricanes bring a complex set of impacts. The winds from a hurricane produce a rise in the water level at landfall called storm surge. Storm surges produce coastal flooding effects that can be as damaging as the hurricane's winds. Hurricanes bring very intense inland riverine flooding. Hurricanes can also produce tornadoes that can add to the wind damages inland. In this risk assessment, only hurricane winds, and coastal storm surge are considered.

Table 3: Saffir-Simpson Hurricane Wind Scale

Category	Wind Speed (mph)	Damage
1	74 - 95	Very dangerous winds will produce some damage
2	96 - 110	Extremely dangerous winds will cause extensive damage
3	111 - 130	Devastating damage will occur
4	131 -155	Catastrophic damage will occur
5	> 155	Catastrophic damage will occur

The National Oceanic and Atmospheric Administration's National Hurricane Center created the HURDAT database, which contains all of the tracks of tropical systems since the mid-1800s. This database was used to document the number of tropical systems that have affected Richmond County by creating a 20-mile buffer around the county to include storms that didn't make direct landfall in Richmond County but impacted the county. Since 1863, Richmond County has had 21 tropical systems within 20 miles of its county borders (Table 4).

[2] National Hurricane Center (2011). "Glossary of NHC Terms." National Oceanic and Atmospheric Administration. http://www.nhc.noaa.gov/aboutgloss.shtml#h. Retrieved 2012-23-02.

Table 4: Tropical Systems affecting Richmond County[3]

YEAR	MONTH	DAY	NAME	LAT	LONG	WIND KTS	PRESSURE	CAT
1851	8	24	NOTNAMED	32.5	-83	60	0	TS
1852	8	27	NOTNAMED	33.2	-82.8	40	0	TS
1877	10	4	NOTNAMED	32.8	-82.1	40	0	TS
1886	6	22	NOTNAMED	32.3	-83.2	45	0	TS
1887	10	20	NOTNAMED	33	-82.5	30	0	TD
1902	6	15	NOTNAMED	33	-81.7	35	0	TS
1915	8	3	NOTNAMED	32.9	-82.1	40	0	TS
1929	10	1	NOTNAMED	32.3	-82.9	40	0	TS
1934	5	31	NOTNAMED	33.6	-82.9	20	0	TD
1935	9	5	NOTNAMED	33	-81.7	55	0	TS
1946	10	8	NOTNAMED	31.9	-82.1	35	0	TS
1947	10	8	NOTNAMED	32.1	-82.6	20	0	TD
1949	8	28	NOTNAMED	33	-82.7	40	996	TS
1964	8	30	CLEO	32.9	-81.9	30	0	TD
1965	6	15	NOTNAMED	31.9	-84.2	40	0	TS
1968	6	7	ABBY	32.6	-82	30	0	TD
1972	6	20	AGNES	32.9	-82.8	30	992	TD
1990	10	12	MARCO	32	-83	20	1005	E
2000	9	23	HELENE	32.9	-83.5	25	1011	TD
2001	6	13	ALLISON	33.4	-81.6	25	1004	SD
2006	6	14	ALBERTO	32.8	-81.9	30	1003	TD

Category Definitions:

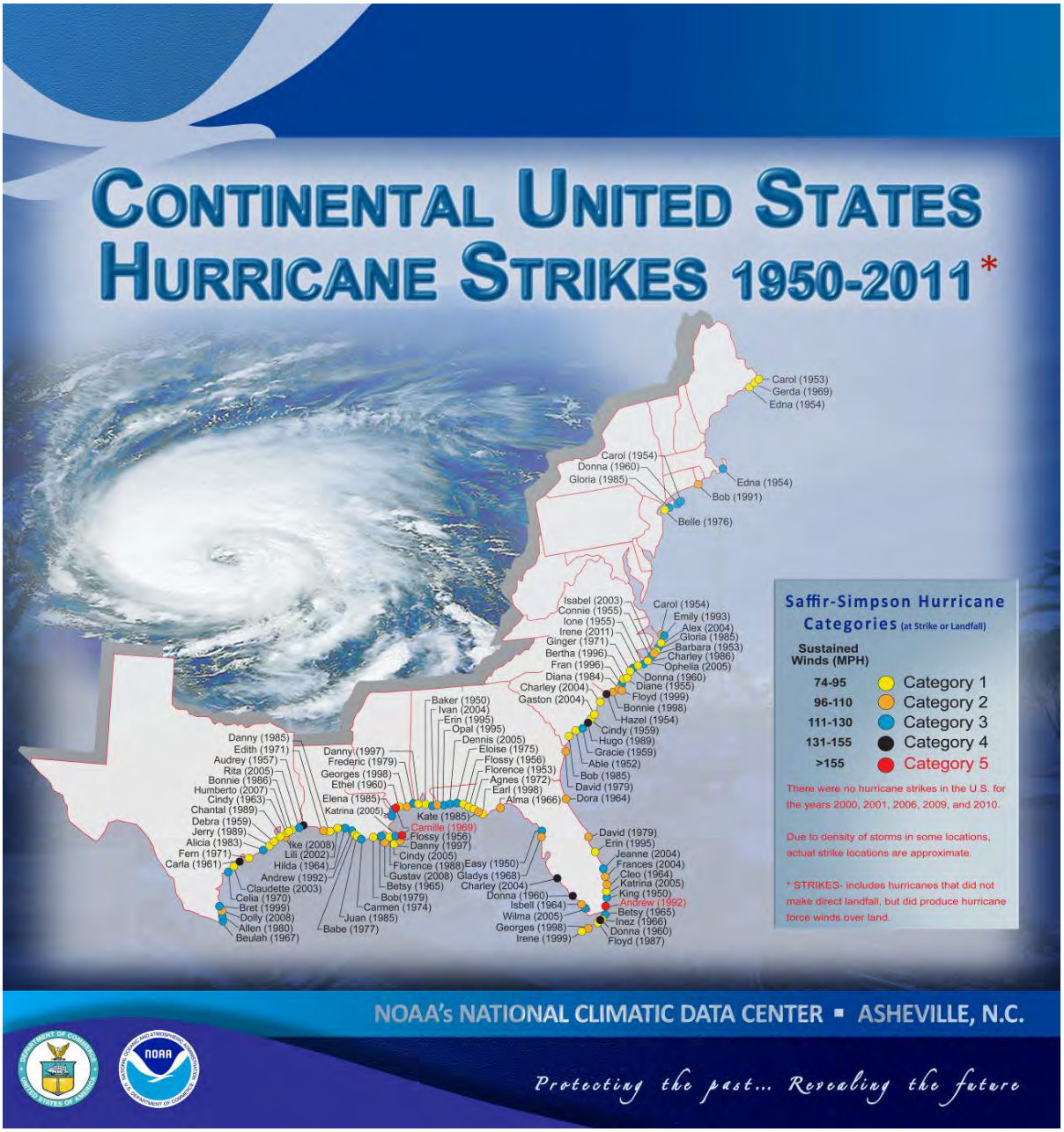
TS – Tropical storm

TD – Tropical depression

H1 – Category 1 (same format for H2, H3, and H4)

E – Extra-tropical cyclone

[3] Atlantic Oceanic and Meteorological Laboratory (2012). "Data Center." National Oceanic and Atmospheric Administration. http://www.aoml.noaa.gov/hrd/data_sub/re_anal.html. Retrieved 2012-03-01.


CONTINENTAL UNITED STATES
HURRICANE STRIKES 1950-2011*
Carol (1953)
Gerda (1969)
Edna (1954)
Carol (1954)
Donna (1960)
Gloria (1985)
Edna (1954)
Bob (1991)
Belle (1976)
Isabel (2003)
Connie (1955)
Ione (1955)
Irene (2011)
Ginger (1971)
Bertha (1996)
Fran (1996)
Diana (1984)
Charley (2004)
Gaston (2004)
Carol (1954)
Emily (1993)
Alex (2004)
Gloria (1985)
Barbara (1953)
Charley (1986)
Ophelia (2005)
Donna (1960)
Diane (1955)
Floyd (1999)
Bonnie (1998)
Hazel (1954)
Cindy (1959)
Hugo (1989)
Gracie (1959)
Able (1952)
Bob (1985)
David (1979)
Dora (1964)
Baker (1950)
Ivan (2004)
Erin (1995)
Opal (1995)
Dennis (2005)
Eloise (1975)
Flossy (1956)
Florence (1953)
Agnes (1972)
Earl (1998)
Alma (1966)
Danny (1985)
Edith (1971)
Audrey (1957)
Rita (2005)
Bonnie (1986)
Humberto (2007)
Cindy (1963)
Chantal (1989)
Debra (1959)
Jerry (1989)
Alicia (1983)
Fern (1971)
Carla (1961)
Danny (1997)
Frederic (1979)
Georges (1998)
Ethel (1960)
Elena (1985)
Katrina (2005)
Kate (1985)
Camille (1969)
Flossy (1956)
Danny (1997)
Cindy (2005)
Florence (1988)
Gustav (2008)
Betsy (1965)
Bob(1979)
Carmen (1974)
Juan (1985)
Babe (1977)
Ike (2008)
Lili (2002)
Hilda (1964)
Andrew (1992)
Claudette (2003)
Celia (1970)
Bret (1999)
Dolly (2008)
Allen (1980)
Beulah (1967)
Easy (1950)
Gladys (1968)
Charley (2004)
Donna (1960)
Isbell (1964)
Wilma (2005)
Georges (1998)
Irene (1999)
David (1979)
Erin (1995)
Jeanne (2004)
Frances (2004)
Cleo (1964)
Katrina (2005)
King (1950)
Andrew (1992)
Betsy (1965)
Inez (1966)
Donna (1960)
Floyd (1987)
Saffir-Simpson Hurricane Categories (at Strike or Landfall)
Sustained Winds (MPH)
74-95 Category 1
96-110 Category 2
111-130 Category 3
131-155 Category 4
>155 Category 5
There were no hurricane strikes in the U.S. for the years 2000, 2001, 2006, 2009, and 2010.
Due to density of storms in some locations, actual strike locations are approximate.
* STRIKES- includes hurricanes that did not make direct landfall, but did produce hurricane force winds over land.
NOAA's NATIONAL CLIMATIC DATA CENTER ▪ ASHEVILLE, N.C.
Protecting the past... Revealing the future

PROBABILISTIC HURRICANE SCENARIO

Storm surge in this risk assessment is modeled using outputs from the SLOSH (Sea, Lake and Overland Surges from Hurricanes) Maximum of Maximums (MOMs) data that is calculated for each hurricane wind category. This analysis modeled a Category 1 Hurricane. This data has been revised to flood depths using the flood water elevations and elevation data from the National Elevation Dataset (NED). Each depth grid was put into Hazus-MH and damages and losses were calculated. Although the amount of rainfall from each storm can vary greatly, riverine flooding from hurricanes can have an impact inland. For this risk assessment, the damages and losses from the storm surge provide a flood risk due to hurricane landfalls.

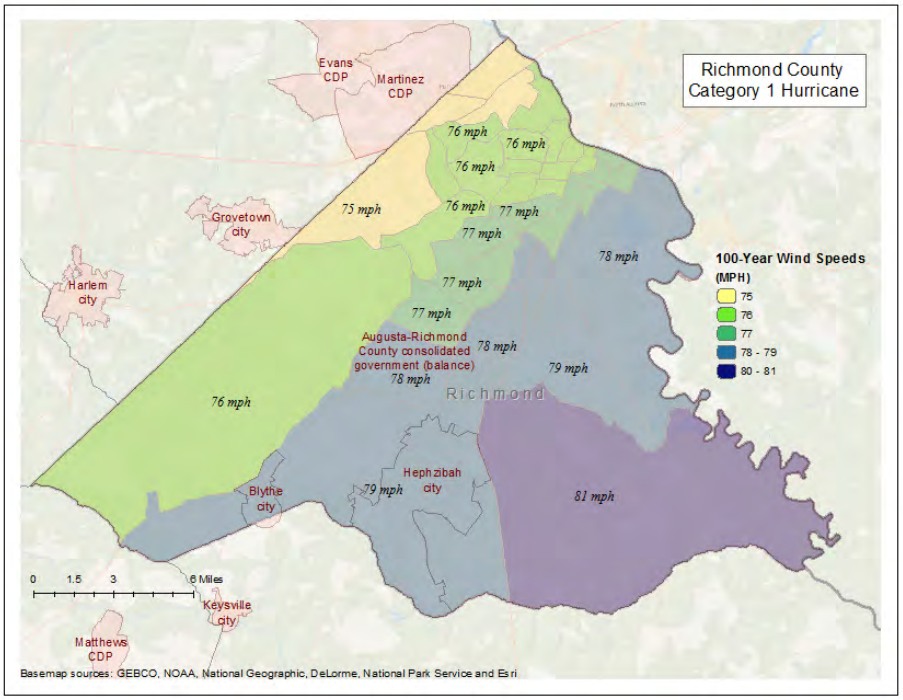
The following probabilistic risk assessment is categorized into two sections:

1. Wind damage assessment
2. Flood (storm surge) damage assessment

Wind Damage Assessment

Separate analyses were performed to determine wind and hurricane storm surge related flood losses. This section describes the wind-based losses to Richmond County. Wind losses were determined from probabilistic models run for the Category 1 storm which equates to the 1% chance storm event. Figure 1 shows wind speeds for the modeled Tropical Storm.

Figure 1: Wind Speeds by Storm Category



Wind-Related Building Damages

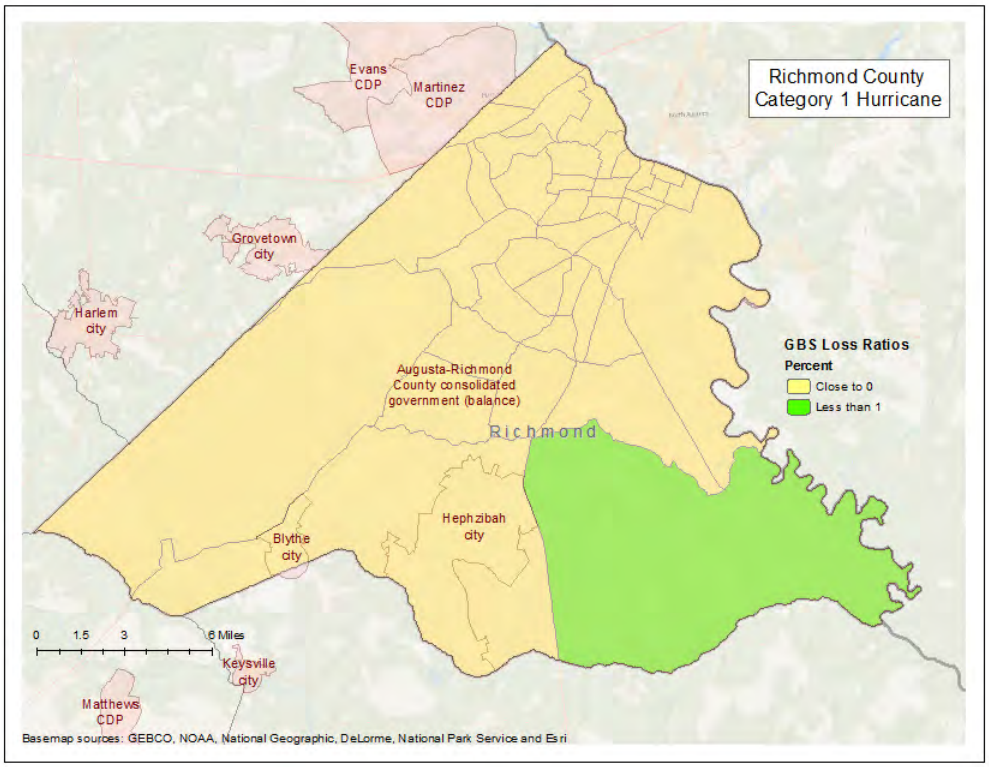
Buildings in Richmond County are vulnerable to storm events, and the cost to rebuild may have significant consequences to the community. The following table shows a summary of the results of wind-related building damage in Richmond County for the Category 1 (100 Year Event) storm. The loss ratio expresses building losses as a percentage of total building replacement cost. Figure 2 illustrates the building loss ratios of the modeled Category 1 storm.

Table 5: Hurricane Wind Building Damage

Classification	Number of Buildings Damaged	Total Building Damage	Total Economic Loss[4]	Loss Ratio
Category 1 Storm	951	$26,148,000	$37,195,000	0.24%

Note that wind damaged buildings are not reported by jurisdiction. This is due to the fact that census tract boundaries – upon which hurricane building losses are based – do not closely coincide with jurisdiction boundaries.

Figure 2: Hurricane Wind Building Loss Ratios



[4] Includes property damage (infrastructure, contents, and inventory) as well as business interruption losses.

Essential Facility Losses

Essential facilities are also vulnerable to storm events, and the potential loss of functionality may have significant consequences to the community. Hazus identified the essential facilities that may be moderately or severely damaged by winds. The results are compiled in Table 6.

There are 234 essential facilities in Richmond County.

Classification	Number
EOCs	1
Fire stations	25
Hospitals	17
Police stations	9
Schools	182

Table 6: Wind-Damaged Essential Facility Losses

Classification	Facilities At Least Moderately Damaged > 50%	Facilities Completely Damaged > 50%	Facilities with Expected Loss of Use (< 1 day)
Category 1	2	0	234

Shelter Requirements

Hazus estimates the number of households evacuated from buildings with severe damage from high velocity winds as well as the number of people who will require short-term sheltering. The results are listed in Table 7 and mapped in Figure 3.

Table 7: Displaced Households and People

Classification	# of Displaced Households	# of People Needing Short-Term Shelter
Category 1	1	0

Figure 3: Hurricane Wind Shelter Requirements

(No shelter needs are anticipated for this event. Therefore, no map was generated.)

Debris Generated from Hurricane Wind

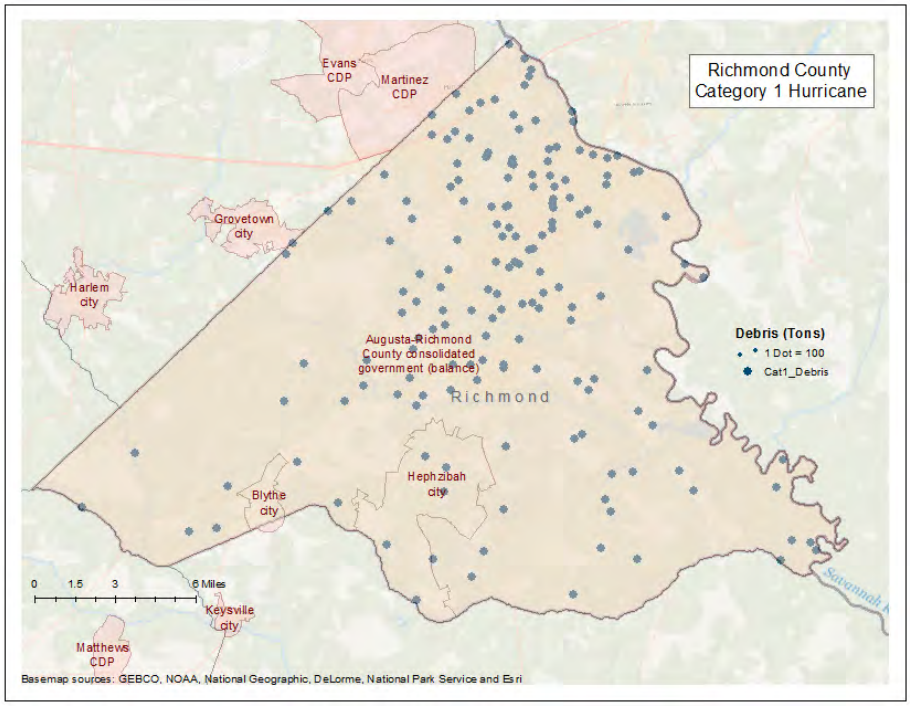
Hazus estimates the amount of debris that will be generated by high velocity hurricane winds and quantifies it into three broad categories to determine the material handling equipment needed: 1) brick/wood, 2) concrete/steel, and 3) tree debris. Different material handling equipment is required for each category of debris. The results are listed in Table 8 and mapped in Figure 4. The amount of hurricane wind related tree debris that is estimated to require pick up at the public's expense is listed in the eligible tree debris column.

Table 8: Wind-Related Debris Weight (Tons)

Classification	Brick, Wood, and Other	Reinforced Concrete and Steel	Eligible Tree Debris	Other Tree Debris	Total
Category 1	4,335	0	11,988	44,562	60,885

Figure 4 shows the distribution of all wind related debris resulting from a Category 1 hurricane. Each dot represents 100 tons of debris within the census tract in which it is located. The dots do not represent the specific location of debris sites.

Figure 4: Wind-Related Debris Weight (Tons)



FLOOD RISK ASSESSMENT

Hazard Definition

Flooding is a significant natural hazard throughout the United States. The type, magnitude, and severity of flooding are functions of the amount and distribution of precipitation over a given area, the rate at which precipitation infiltrates the ground, the geometry and hydrology of the catchment, and flow dynamics and conditions in and along the river channel. Floods can be classified as one of three types: upstream floods, downstream floods, or coastal floods.

Upstream floods, also called flash floods, occur in the upper parts of drainage basins and are generally characterized by periods of intense rainfall over a short duration. These floods arise

with very little warning and often result in locally intense damage, and sometimes loss of life, due to the high energy of the flowing water. Flood waters can snap trees, topple buildings, and easily move large boulders or other structures. Six inches of rushing water can upend a person; another 18 inches might carry off a car. Generally, upstream floods cause damage over relatively localized areas, but they can be quite severe in the local areas in which they occur. Urban flooding is a type of upstream flood. Urban flooding involves the overflow of storm drain systems and can be the result of inadequate drainage combined with heavy rainfall or rapid snowmelt. Upstream or flash floods can occur at any time of the year in Georgia, but they are most common in the spring and summer months.

Downstream floods, also called riverine floods, refer to floods on large rivers at locations with large upstream catchments. Downstream floods are typically associated with precipitation events that are of relatively long duration and occur over large areas. Flooding on small tributary streams may be limited, but the contribution of increased runoff may result in a large flood downstream. The lag time between precipitation and time of the flood peak is much longer for downstream floods than for upstream floods, generally providing ample warning for people to move to safe locations and, to some extent, secure some property against damage.

Coastal floods occurring on the Atlantic and Gulf coasts may be related to hurricanes or other combined offshore, nearshore, and shoreline processes. The effects of these complex interrelationships vary significantly across coastal settings, leading to challenges in the determination of the base (1-percent-annual-chance) flood for hazard mapping purposes. Land area covered by floodwaters of the base flood is identified as a Special Flood Hazard Area (SFHA). The Richmond County flood risk assessment analyzed at risk structures in the SFHA.

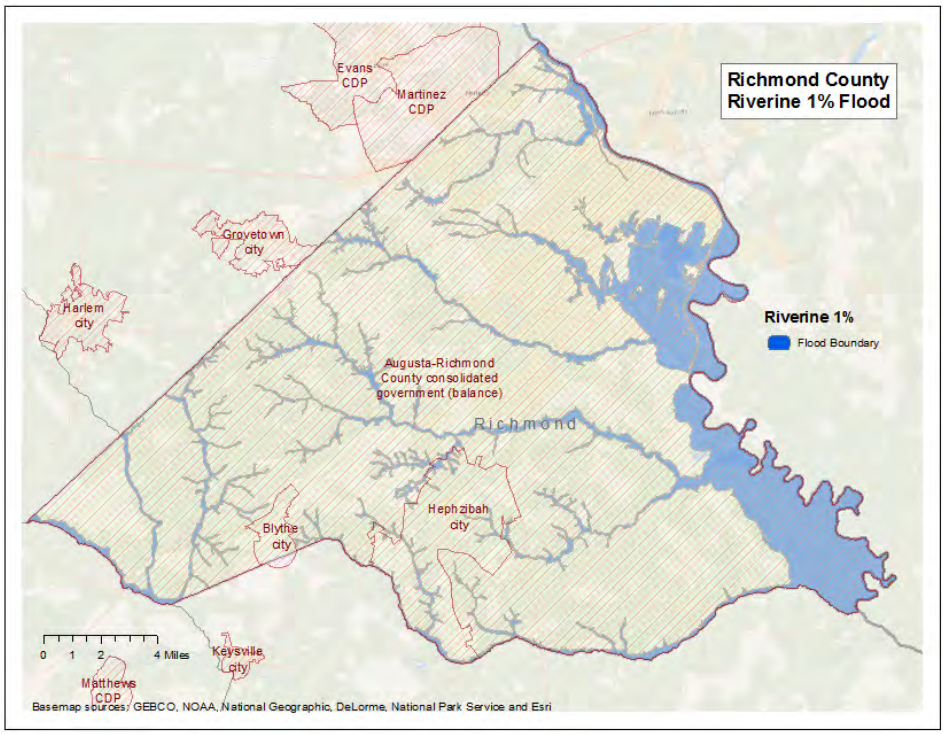
> The SFHA is the area where the National Flood Insurance Program's (NFIP) floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies. The owner of a structure in a high-risk area must carry flood insurance, if the owner carries a mortgage from a federally regulated or insured lender or servicer.

The following probabilistic risk assessment addresses only riverine flooding.

Riverine 1% Flood Scenario

Riverine losses are determined from the 1% flood boundaries found in the March 2012 DFIRM maps provided by the Georgia Department of Community Affairs. The flood boundaries were overlaid with the USGS DEM to generate riverine depth grids. The riverine flood depth grids were then imported into Hazus-MH to calculate the riverine flood loss estimates. Figure 5 illustrates the riverine boundary associated with the one-percent-annual chance.

Figure 5: Riverine 1% Flood Inundation



Riverine 1% Flood Building Damages

Buildings in Richmond County are vulnerable to flooding from the 1% Riverine Flood and the cost to rebuild may have significant consequences to the community. Table 9 shows a summary of the results of flood-related building damage in Richmond County for the Riverine 1% storm. Figure 6 reflects the loss ratios from flood damage and Figure 7 maps the buildings located in the inundation area.

Table 9: Richmond County County Riverine 1% Building Losses

Classification	Number of Buildings Damaged	Total Building Loss ($)	Loss Ratio
Augusta-Richmond County consolidated government			
Residential	1,831	$54,296,880	0.6%
Commercial	166	$6,159,415	0.2%
Industrial	3	$537,382	0.5%
Agricultural	8	$385,430	1%
Religious	8	$421,412	0.1%
Government	0	$0	0.00%
Education	1	$65,743	0.03%
Hephzibah City			
Residential	67	$3,704,390	2%
Commercial	0	$0	0.00%
Industrial	0	$0	0.00%
Agricultural	1	$21,816	0.3%
Religious	1	$139,524	0.3%
Government	0	$0	0.00%
Education	0	$0	0.00%
Blythe City			
There are no structures predicted to sustain damage from the riverine 1% flooding			

Figure 6: Richmond County Riverine Related Losses

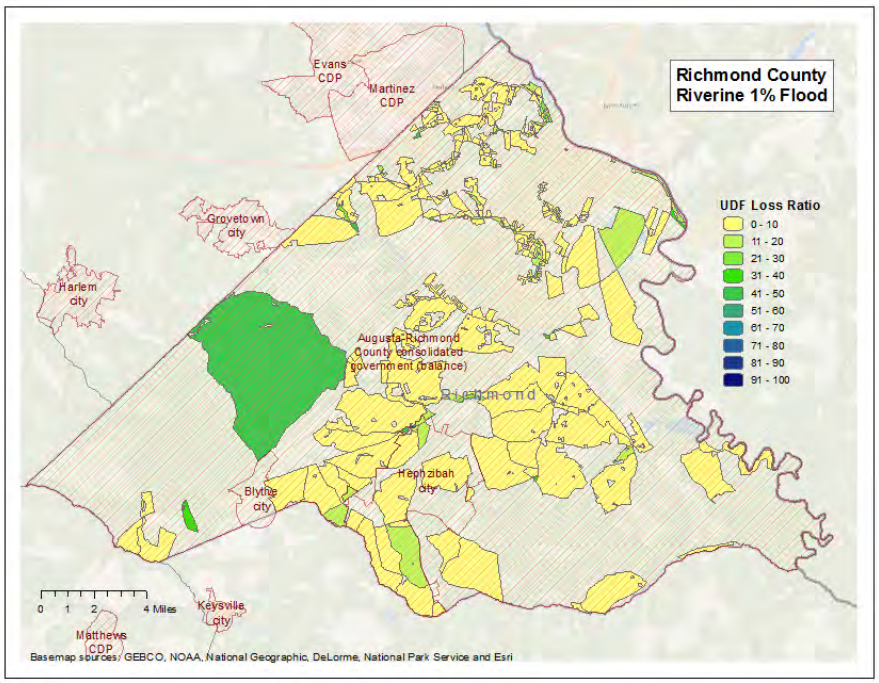
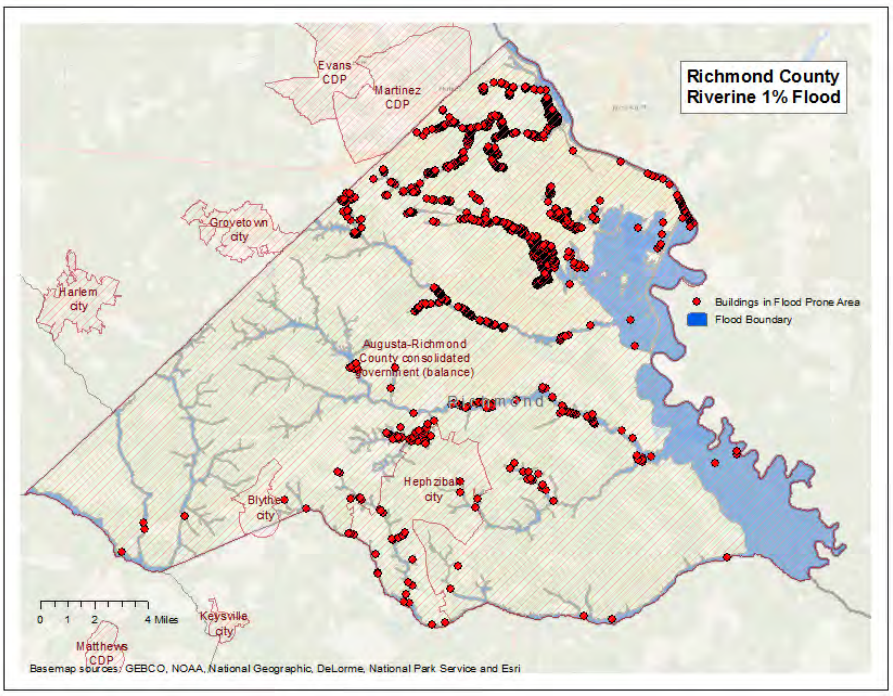


Figure 7: Richmond County Buildings in Riverine Floodplain (1% Flood)



Riverine 1% Flood Essential Facility Losses

An essential facility may encounter many of the same impacts as other buildings within the flood boundary. These impacts can include structural failure, extensive water damage to the facility and loss of facility functionality (e.g. a damaged police station will no longer be able to serve the

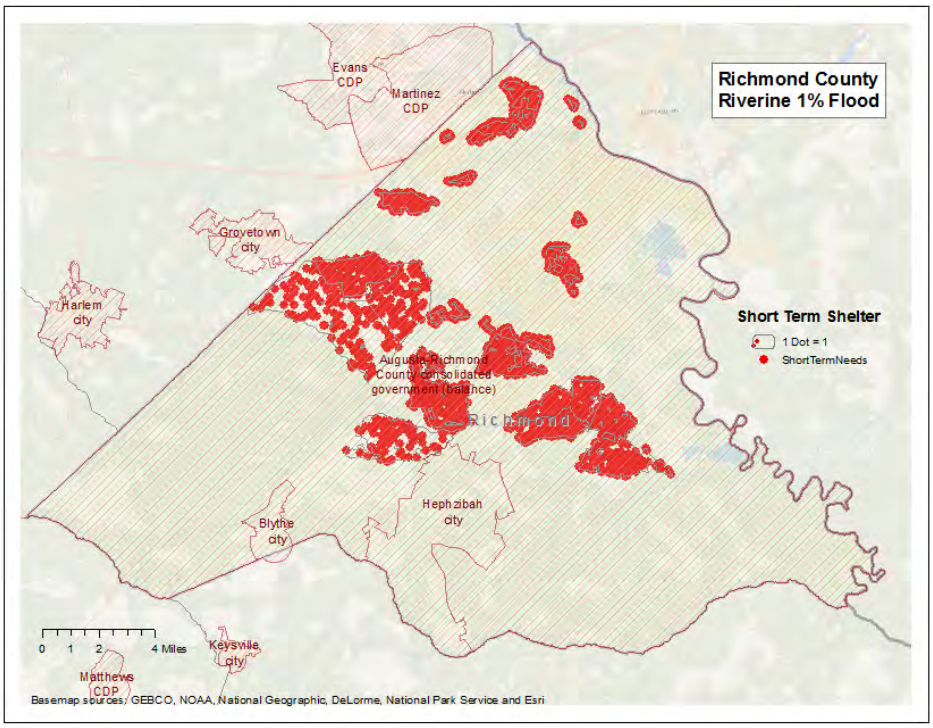
community). The analysis identified the following essential facilities that were subject to damage in the Richmond County 1% probability floodplain.

Category	Facility Name
School	Westminster Schools of Augusta, Adminstr
School	C.H. Terrell Academy

Riverine 1% Flood Shelter Requirements

Hazus estimates that the number of households that are expected to be displaced from their homes due to riverine flooding and the associated potential evacuation. The model estimates 2,921 households will be displaced due to the flood. Displacement includes households evacuated within or very near to the inundated area. Displaced households represent 8,762 individuals, of which 6,419 will require short term publicly provided shelter. The results are mapped in Figure 8.

Figure 8: Riverine 1% Flood Shelter Requirements

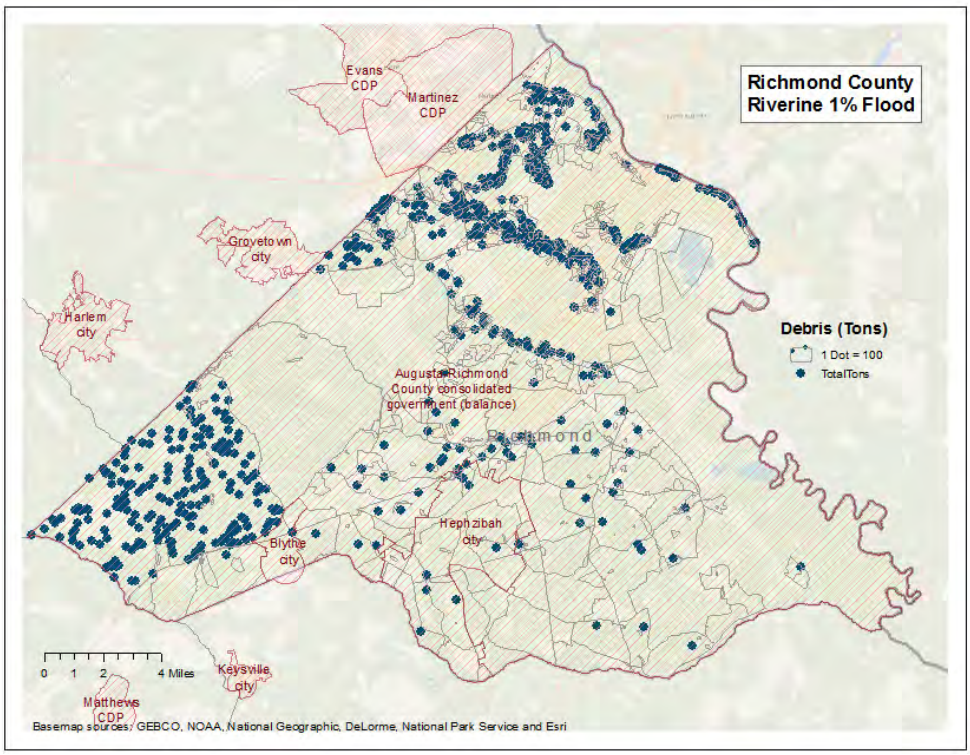


Riverine 1% Flood Debris

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). Different types of material handling equipment will be required for each category. Debris definitions applied in Hazus are unique to the Hazus model and so do not necessarily conform to other definitions that may be employed in other models or guidelines.

The analysis estimates that an approximate total of 78,154 tons of debris will be generated: 1) Finishes- 25,026 tons; 2) Structures- 31,025 tons; and 3) Foundations- 22,103 tons. The results are mapped in Figure 9.

Figure 9: Riverine 1% Flood Debris Weight (Tons)



TORNADO RISK ASSESSMENT

Hazard Definition

Tornadoes pose a great risk to the state of Georgia and its citizens. Tornadoes can occur at any time during the day or night. They can also happen during any month of the year. The unpredictability of tornadoes makes them one of Georgia's most dangerous hazards. Their extreme winds are violently destructive when they touch down in the region's developed and populated areas. Current estimates place the maximum velocity at about 300 miles per hour, but higher and lower values can occur. 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. Considering these factors, it is easy to understand why tornadoes can be so devastating for the communities they hit.

Tornadoes are defined as violently-rotating columns of air extending from thunderstorms and cyclonic events. 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.

Tornadoes are classified according to the Fujita tornado intensity scale. Originally introduced in 1971, the scale was modified in 2006 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 10.

Table 10: Enhanced Fujita Tornado Rating

Fujita Number	Estimated Wind Speed	Path Width	Path Length	Description of Destruction
EF0 *Gale*	65-85 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, branches broken, sign boards damaged, shallow-rooted trees blown over.
EF1 Moderate	86-110 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
EF2 Significant	111-135 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
EF3 Severe	136-165 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
EF4 Devastating	166-200 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
EF5 Incredible	> 200 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

Source: http://www.srh.noaa.gov

Hypothetical Tornado Scenario

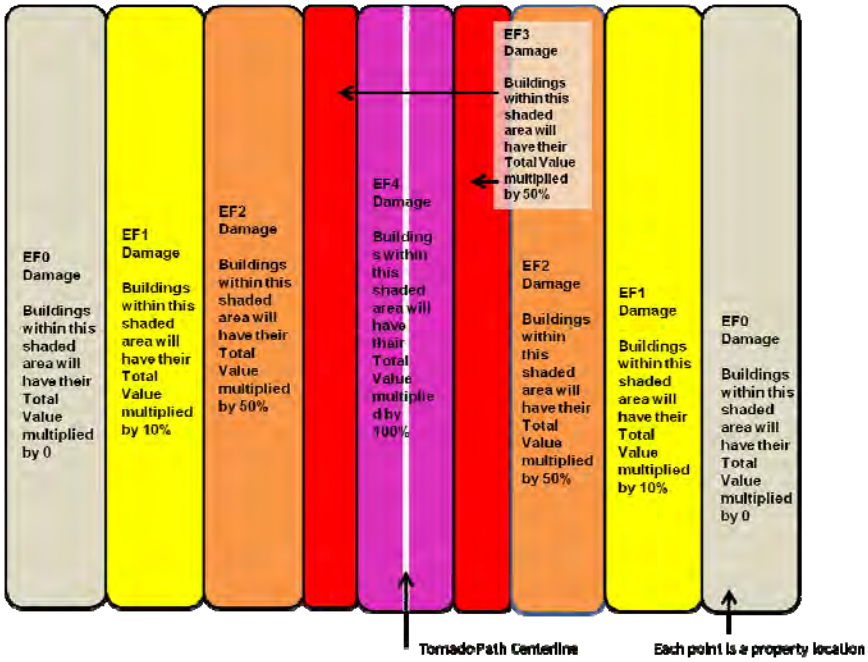
The following example scenario is described to gauge the anticipated impacts of tornadoes in the county, in terms of numbers and types of buildings and infrastructure. GIS overlay modeling was used to determine the potential impacts of an EF4 tornado. The analysis used a historical path based upon the F4 tornado event that ran for 17.68 miles just west of City of August in April of 2009. The selected widths were modeled after a re-creation of the Fujita-Scale guidelines based on conceptual wind speeds, path widths, and path lengths. There is no guarantee that every tornado will fit exactly into one of these categories. Table 11 depicts tornado path widths and expected damage.

Table 11: Tornado Path Widths and Damage Curves

Fujita Scale	Path Width (feet)	Maximum Expected Damage
EF-5	3000	100%
EF-4	2400	100%
EF-3	1800	80%
EF-2	1200	50%
EF-1	600	10%
EF-0	300	0%

Within any given tornado path there are degrees of damage. The most intense damage occurs within the center of the damage path, with decreasing amounts of damage away from the center. After the hypothetical path is digitized on a map, the process is modeled in GIS by adding buffers (damage zones) around the tornado path. Figure 10 and Table 12 describe the zone analysis. The selected hypothetical tornado path is depicted in Figure 11, and the damage curve buffers are shown in Figure 12.

Figure 10: EF Scale Tornado Zones



An EF4 tornado has four damage zones, depicted in Table 12. Total devastation is estimated within 150 feet of the tornado path. The outer buffer is 900 feet from the tornado path, within which buildings will experience 10% damage.

Table 12: EF4 Tornado Zones and Damage Curves

Zone	Buffer (feet)	Damage Curve
1	0-150	100%
2	150-300	80%
3	300-600	50%
4	600-900	10%

Figure 11: Hypothetical EF4 Tornado Path in Richmond County

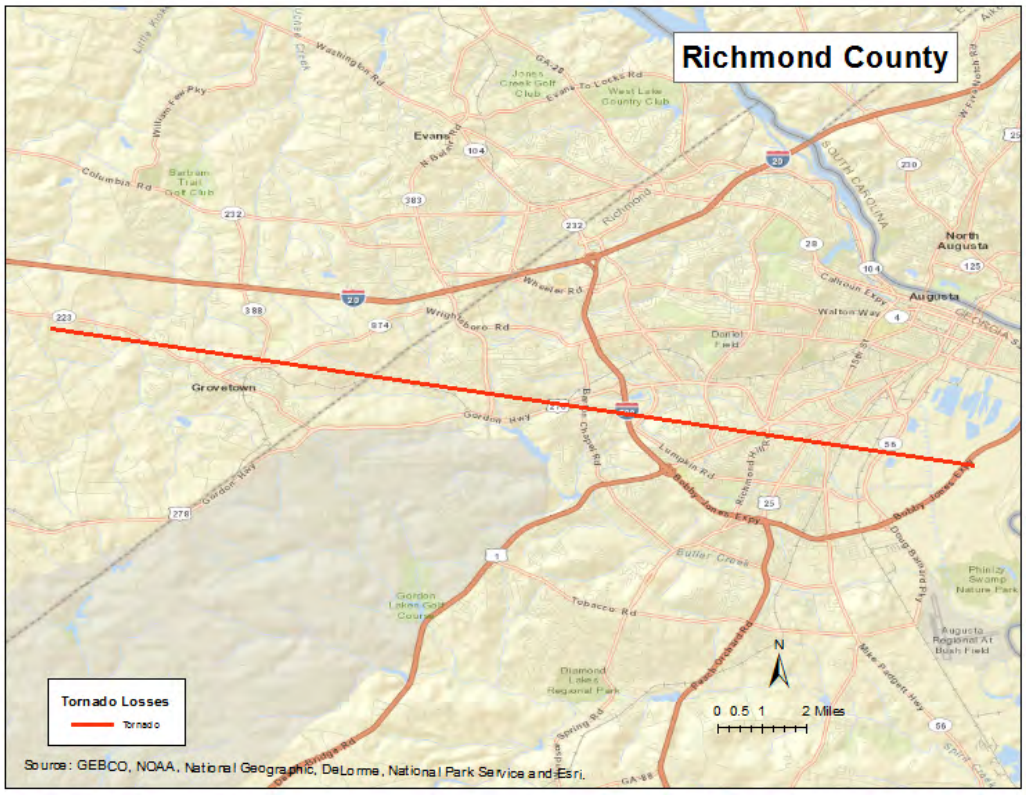
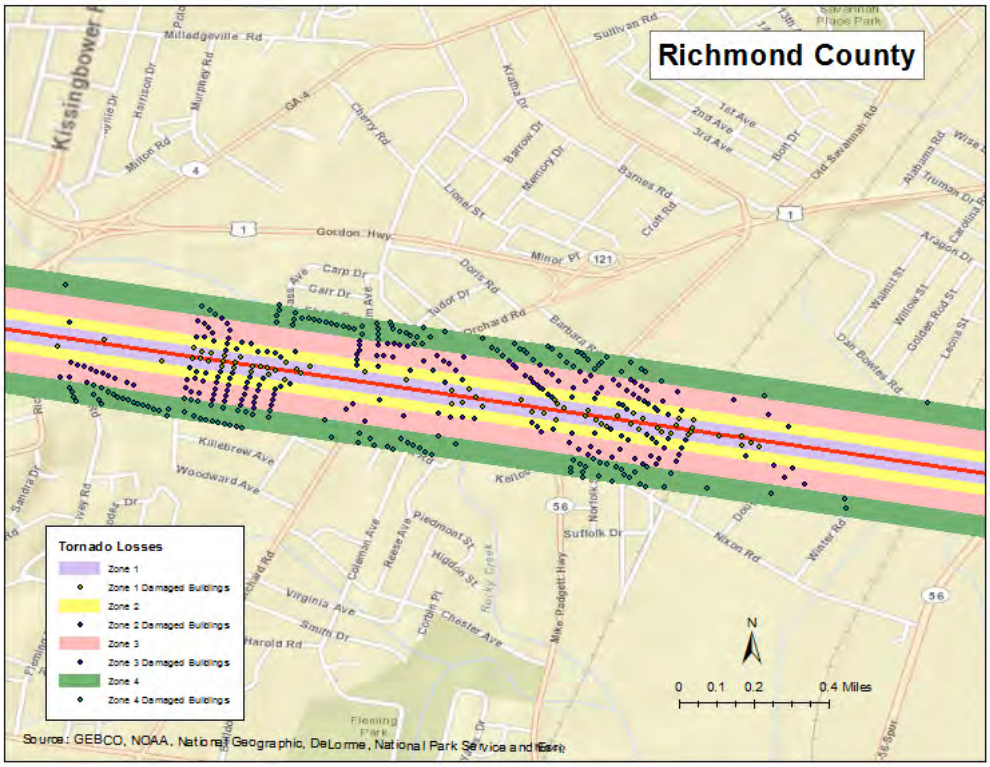


Figure 12: Modeled EF4 Tornado Damage Buffers in Richmond County



F4 Tornado Building Damages

The GIS analysis estimates that 1,721 buildings will be damaged, with estimated building losses of $95,149,510. The building losses are an estimate of building replacement costs multiplied by the percentages of damage. The overlay was performed against parcels provided by Richmond County that were joined with Assessor records showing estimated property replacement costs. The Assessor records often do not distinguish parcels by occupancy class if the parcels are not taxable and thus the number of buildings and replacement costs may be underestimated. The results of the analysis are depicted in Tables 13 and 14.

Table 13: Estimated Numbers of Buildings Damaged

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	290	303	519	530
Commercial	6	12	27	22
Industrial	1	0	0	0
Agriculture	0	2	1	0
Religious	2	3	1	1
Government	0	0	0	0
Education	1	0	0	0
Total	300	320	548	553

Table 14: Estimated Building Losses

Occupancy	Zone 1	Zone 2	Zone 3	Zone 4
Residential	$30,901,732	$23,482,202	$27,829,563	$5,446,233
Commercial	$590,410	$718,254	$1,175,857	$417,016
Industrial	$613,471	$0	$0	$0
Agriculture	$0	$184,080	$128,150	$0
Religious	$661,225	$1,651,753	$86,569	$132,998
Government	$0	$0	$0	$0
Education	$1,130,000	$0	$0	$0
Total	$33,896,838.00	$26,036,289.00	$29,220,139.00	$5,996,247.00

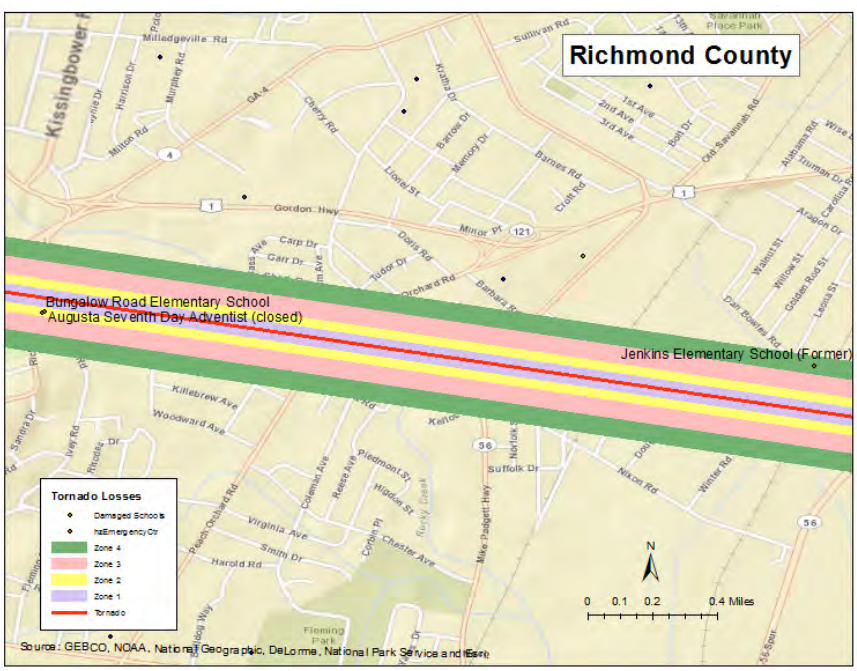
Tornado Essential Facility Damage

There are three essential facilities located within 900 feet of the historical tornado path. The model predicts three schools would experience damage. The affected facilities are identified in Table 15, and their geographic locations are shown in Figure 13.

Table 15: Estimated Essential Facilities Affected

Name
Augusta Seventh Day Adventist (closed)
Bungalow Road Elementary School
Jenkins Elementary School (Former)

Figure 13: Essential Facilities within Tornado Path



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Direct Economic Losses For Buildings: Annualized Losses

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	1,840	509	5	0.01	153	22	28	62	2,619
Total	**1,840**	**509**	**5**	**0.01**	**153**	**22**	**28**	**62**	**2,619**
Study Region Total	**1,840**	**509**	**5**	**0.01**	**153**	**22**	**28**	**62**	**2,619**

Study Region : AugustaRichmond

Scenario : Probabilistic

Direct Economic Losses For Buildings: 10 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	0	0	0	0.00	0	0	0	0	0
Total	**0**	**0**	**0**	**0.00**	**0**	**0**	**0**	**0**	**0**
Study Region Total	**0**	**0**	**0**	**0.00**	**0**	**0**	**0**	**0**	**0**

Direct Economic Losses For Buildings: 20 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	141	99	0	0.00	0	0	0	0	240
Total	**141**	**99**	**0**	**0.00**	**0**	**0**	**0**	**0**	**240**
Study Region Total	**141**	**99**	**0**	**0.00**	**0**	**0**	**0**	**0**	**240**

Direct Economic Losses For Buildings: 50 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	9,953	2,011	0	0.05	19	0	0	2	11,986
Total	**9,953**	**2,011**	**0**	**0.05**	**19**	**0**	**0**	**2**	**11,986**
Study Region Total	**9,953**	**2,011**	**0**	**0.05**	**19**	**0**	**0**	**2**	**11,986**

Direct Economic Losses For Buildings: 100 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	29,461	5,515	0	0.14	164	0	0	29	35,169
Total	**29,461**	**5,515**	**0**	**0.14**	**164**	**0**	**0**	**29**	**35,169**
Study Region Total	**29,461**	**5,515**	**0**	**0.14**	**164**	**0**	**0**	**29**	**35,169**

Direct Economic Losses For Buildings: 200 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	68,816	12,677	25	0.33	3,221	119	60	1,359	86,276
Total	**68,816**	**12,677**	**25**	**0.33**	**3,221**	**119**	**60**	**1,359**	**86,276**
Study Region Total	**68,816**	**12,677**	**25**	**0.33**	**3,221**	**119**	**60**	**1,359**	**86,276**

Direct Economic Losses For Buildings: 500 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	151,985	29,873	328	0.72	9,798	2,167	2,932	4,535	201,618
Total	**151,985**	**29,873**	**328**	**0.72**	**9,798**	**2,167**	**2,932**	**4,535**	**201,618**
Study Region Total	**151,985**	**29,873**	**328**	**0.72**	**9,798**	**2,167**	**2,932**	**4,535**	**201,618**

Direct Economic Losses For Buildings: 1000 - year Event

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses				Income Losses				
	Cost Building Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia									
Richmond	254,928	58,350	776	1.21	21,184	4,390	6,407	9,328	355,364
Total	**254,928**	**58,350**	**776**	**1.21**	**21,184**	**4,390**	**6,407**	**9,328**	**355,364**
Study Region Total	**254,928**	**58,350**	**776**	**1.21**	**21,184**	**4,390**	**6,407**	**9,328**	**355,364**

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/state were selected at the time of study region creation.

Study Region : AugustaRichmond

Scenario : Probabilistic

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RiskMAP Increasing Resilience Together

Direct Economic Losses For Buildings

May 26, 2017

All values are in thousands of dollars

	Capital Stock Losses					Income Losses				
	Cost Structural Damage	Cost Non-struct. Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Related Loss	Wages Losses	Rental Income Loss	Total Loss
Georgia										
Richmond	250	750	287	9	0.00	174	106	153	92	1,821
Total	**250**	**750**	**287**	**9**	**0.00**	**174**	**106**	**153**	**92**	**1,821**
Region Total	**250**	**750**	**287**	**9**	**0.00**	**174**	**106**	**153**	**92**	**1,821**

Totals only reflect data for those census tracts/blocks included in the user's study region and will reflect the entire county/state only if all of the census blocks for that county/states were selected at the time of study region creation.

Study Region : AugustaRichmond

Scenario : A-R Annualized Loss EQ

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