ATKINS

Guilford County, NC

Guilford County Multi-Jurisdictional Hazard Mitigation Plan

DRAFT | May **2020**

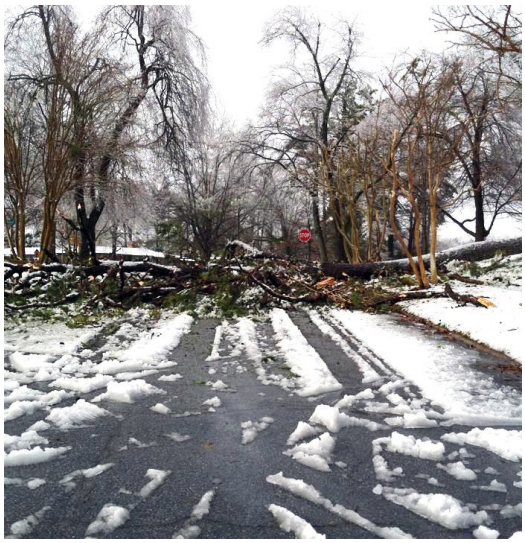

TABLE OF CONTENTS

SECTION 1
INTRODUCTION

This section provides a general introduction to the Guilford County Multi-Jurisdictional 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 hazardous materials 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.

Guilford County is located in the Piedmont area of North Carolina. The County includes the Town of Gibsonville, City of Greensboro, City of High Point, Town of Jamestown, Town of Oak Ridge, Town of Pleasant Garden, Town of Sedalia, Town of Stokesdale, Town of Summerfield, Town of Whitsett, and all unincorporated areas within the county. This area is vulnerable to a wide range of natural hazards such as hurricanes, floods, severe thunderstorms, and tornados. It is also vulnerable to human-caused hazards including nuclear accidents and hazardous material spills. These hazards threaten the life and safety of residents in Guilford 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 Guilford 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.

The county and ten municipalities participating in the Guilford County Multi-Jurisdictional 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 Guilford 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.

In addition to federal requirements for hazard mitigation planning, the State of North Carolina also requires a hazard mitigation plan be in place for jurisdictions to receive mitigation and public assistance funds after a state-declared disaster. This requirement is codified in NC Senate Bill 300, which lays out the need for mitigation planning and ties it to disaster funding at the state level.

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 Guilford County Multi-Jurisdictional Hazard Mitigation Plan has been prepared in coordination with FEMA Region IV and the North Carolina Division of Emergency Management (NCEM) 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 Guilford County Multi-Jurisdictional 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 Guilford County Multi-Jurisdictional Hazard Mitigation Plan is on those hazards determined to be "high" or "moderate" risks to Guilford 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 Guilford County including all of its incorporated jurisdictions (see below) and unincorporated areas. **Table 1.1** indicates the participating jurisdictions.

TABLE 1.1: PARTICIPATING JURISDICTIONS IN THE GUILFORD COUNTY HAZARD MITIGATION PLAN

Guilford County	
Gibsonville	Pleasant Garden
Greensboro	Sedalia
High Point	Stokesdale
Jamestown	Summerfield
Oak Ridge	Whitsett

1.4 AUTHORITY

The Guilford County Multi-Jurisdictional 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 Guilford 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 region'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 Guilford County. The risk assessment also attempts to define any hazard risks that may uniquely or exclusively affect specific areas of Guilford County.

The Risk Assessment begins by identifying hazards that threaten Guilford 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 Guilford 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 Guilford 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 Guilford County Multi-Jurisdictional 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 Guilford County Multi-Jurisdictional 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 Guilford 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 Guilford County Multi-Jurisdictional 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 Guilford County
- 2.3 Preparing the 2020 Plan
- 2.4 The Guilford 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, and
- 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 GUILFORD COUNTY

Each of the eleven participating jurisdictions has previously adopted the Guilford County Hazard Mitigation Plan. This plan was developed using the multi-jurisdictional planning process recommended by the Federal Emergency Management Agency (FEMA). The FEMA approval date for this plan (1/20/2016), pertains to all communities listed below:

- *Guilford County Hazard Mitigation Plan*
  - Guilford County
  - City of Greensboro
  - City of High Point
  - Town of Gibsonville
  - Town of Jamestown
  - Town of Oak Ridge
  - Town of Pleasant Garden
  - Town of Sedalia
  - Town of Stokesdale
  - Town of Summerfield
  - Town of Whitsett

2.3 PREPARING THE 2020 PLAN

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 Guilford County decided to join together to create the *Guilford County Multi-Jurisdictional 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 a consulting firm, Atkins, was brought together to carry out the planning process. To meet planning requirements of the Community Rating System, the county ensured that 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). Further, 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 currently participate in the CRS program (City of Greensboro and Guilford County) and those that may wish to join in the future.

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 North Carolina Division of Emergency Management (NCEM) mitigation planning staff. 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.

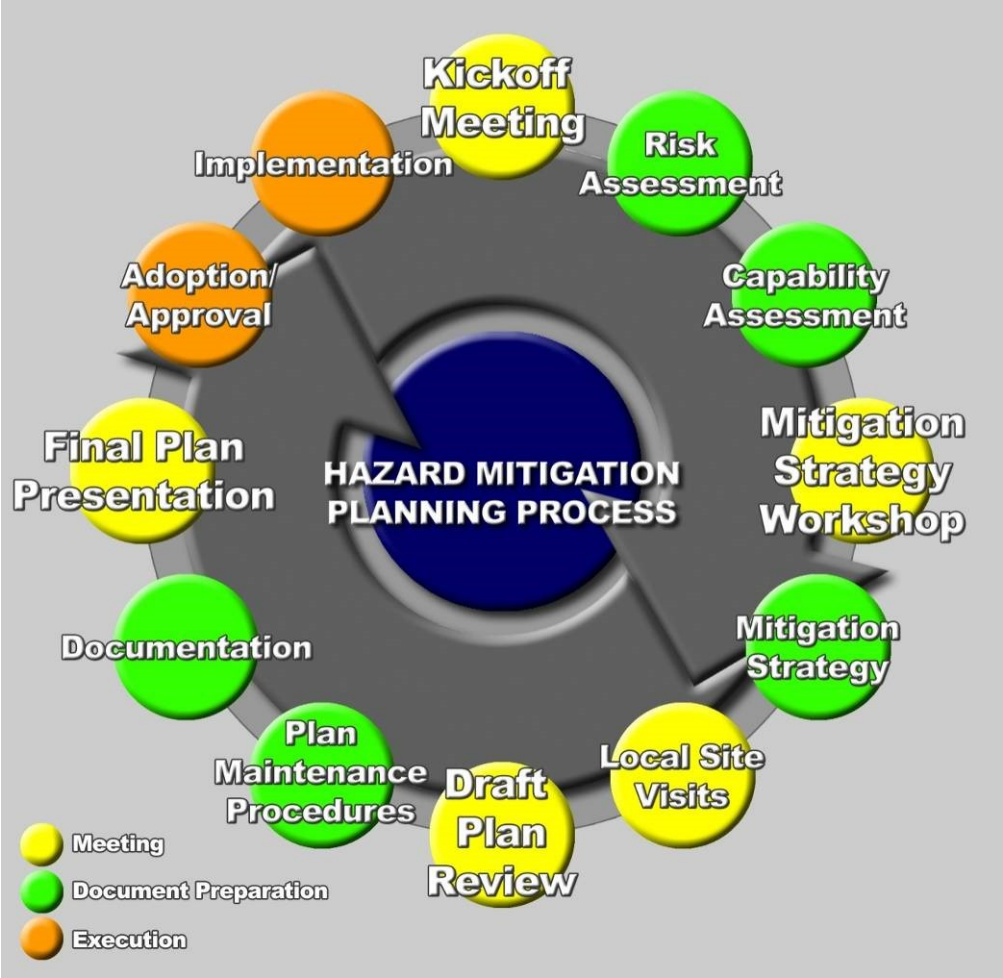
Key elements from the previously approved plan are referenced throughout the document (e.g., existing actions) and required a discussion of changes made. For example, all of the risk assessment elements needed to be updated to include most recent information. It was also necessary to review the goals 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.

The process used to prepare this Plan included twelve major steps that were completed over the course of approximately one year, beginning in May 2019. 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 GUILFORD 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.

Additionally, for the 2020 update, FEMA Community Rating System (CRS) requirements were integrated into the plan update. **Table 2.1** below provides an overview of how the CRS requirements were integrated into this plan update.

TABLE 2.1: FEMA HAZARD MITIGATION PLANNING REQUIREMENTS AND THE CRS 10-STEP PLANNING PROCESS REFERENCE TABLE

FEMA Disaster Mitigation Act Requirement	CRS Activity 510 Planning Requirement
Phase I – Planning Process	
§201.6(c)(1)	Step 1: Organize to Prepare the Plan
§201.6(b)(1)	Step 2: Involve the Public

FEMA Disaster Mitigation Act Requirement	CRS Activity 510 Planning Requirement
§201.6(b)(2) & (3)	Step 3: Coordinate
Phase II – Risk Assessment	
§201.6(c)(2)(i)	Step 4: Assess the Hazard
§201.6(c)(2)(ii) & (iii)	Step 5: Assess the Problem
Phase III – Mitigation Strategy	
§201.6(c)(3)(i)	Step 6: Set Goals
§201.6(c)(3)(ii)	Step 7: Review Possible Activities
§201.6(c)(3)(iii)	Step 8: Draft an Action Plan
Phase IV – Plan Maintenance	
§201.6(c)(5)	Step 9: Adopt the Plan
§201.6(c)(4)	Step 10: Implement, Evaluate and Revise the Plan

2.4 THE GUILFORD COUNTY HAZARD MITIGATION PLANNING TEAM

In order to guide the development of this Plan, Guilford County and its jurisdictions created the Guilford 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 May 2019, 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, committee 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 2020 *Guilford County Hazard Mitigation Plan*

Table 2.2 lists the members of the Hazard Mitigation Planning Team who were responsible for participating in the development of the Plan.

TABLE 2.2: MEMBERS OF THE GUILFORD COUNTY HAZARD MITIGATION PLANNING TEAM

Name	Position	Organization
Steven Grose	Emergency Management Coordinator	Guilford County
Catherine Hughes	Emergency Management Coordinator	Guilford County
Taylor Jones	Emergency Management Coordinator	Guilford County
Ken Jacobs	Town Administrator	Whitsett
Rachel Faucette	Emergency Management Coordinator	Guilford County
Chris Susi	Battalion Chief	Greensboro
Don Campbell	Emergency Management Division Director	Guilford County
Kenny Cole	Town Manager	Jamestown
Chris York	Town Planner	Summerfield
Thearon Hooks	Mayor Pro Term	Stokesdale
Alisa Houk	Town Clerk	Stokesdale
Aldoud Heron	Deputy Sheriff	GCSO
Jason Geary	Engineering Supervisor	Greensboro
Vivian Bou Gomez	Engineering Specialist	Greensboro
Perry Hall	Emergency Manager	High Point
Brandon Parker	Town Planner	Gibsonville
Frank Park	Chief Plans Engineer	Guilford County
Angela Deal	Town Clerk	Pleasant Garden
Paul Blanchard	Public Services Director	Jamestown
Ashley Royal	Deputy Clerk	Oak Ridge
Teresa Andrews	Stormwater Program Administrator	Guilford County
Bobby Carman	Deputy Fire Marshal	Guilford County
Stephen Dew	GIS Manager	Guilford County
Matthew Smith	Fire Captain	Greensboro
Bobbie Hatley	Town Clerk	Pleasant Garden
Conor Baker	Emergency Management Coordinator	Guilford County
Kenny Stewart	Emergency Management Coordinator	UNCG
Ben Baxley	Town Manager	Gibsonville
Cam Dungee	Town Clerk	Sedalia

2.4.1 Multi-Jurisdictional Participation

The *Guilford County Multi-Jurisdictional Hazard Mitigation Plan* includes Guilford County and its ten incorporated municipalities. To satisfy multi-jurisdictional participation requirements, the county and its participating jurisdictions were required to perform the following tasks:

- Participate in mitigation planning workshops;
- Identify completed and update existing mitigation projects, if applicable; and

- 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.[1] 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.


May 30, 2019 Guilford County HMPC Meeting

May 30, 2019
First Hazard Mitigation Planning Team Meeting – Bur-Mill Park Clubhouse

The Guilford County Emergency Management Director started the meeting by welcoming the representatives from the county, participating municipal jurisdictions, and other stakeholders. He then introduced the Project Manager from the project consulting team, Atkins.

The Project Manager led the kickoff meeting and began by providing an overview of the items to be discussed at the meeting. He briefly reviewed each of the handouts that were distributed in the meeting packets (agenda, presentation slides, and the public survey). He then provided a brief overview/reminder of mitigation and discussed the impetus for the update of the hazard mitigation plan as per the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

The Project Manager from Atkins then explained the six different categories of mitigation techniques (prevention; property protection; natural resource protection; emergency services; structural projects; public education and awareness) and gave examples of each. This explanation culminated with an Ice Breaker Exercise for the attendees. The Project Manager instructed attendees on how to complete the exercise.

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

Attendees were each given an equal amount of fictitious FEMA money ($20) and asked to spend it in the various mitigation categories. Participants were asked to imagine this to be grant money that their community or organization received that could be used towards mitigation projects or actions. Attendees were asked to target their money towards areas of mitigation that were of greatest concern for their community/organization. Ideally, the exercise was intended to pinpoint areas of mitigation that the community may want to focus on when developing their mitigation action plan and overall mitigation program in the community.

After completing the exercise, the Project Manager reviewed several items that were new in mitigation planning during this update cycle. He then noted that all local governments in the county are participating in the existing county-level hazard mitigation plan and that this plan expires in January of 2021, so the planning team will plan to develop a draft to submit to FEMA by February 2020.

He then discussed the key objectives and structure of the planning process, explaining the specific tasks to be accomplished for this project, including the planning process, risk and vulnerability assessment, capability assessment, mitigation strategy, plan maintenance procedures, and documentation. The project schedule was presented and the need for assistance with data collection and public outreach efforts were also discussed.

The Project Manager then reviewed the roles and responsibilities of Atkins and participating communities/stakeholders. The presentation concluded with a discussion of the next steps to be taken in the project development, which included discussing data collection efforts, continuing public outreach, and the next meeting for the HMPT.

The Project Manager then shared the results of the Icebreaker Exercise which was carried out earlier in the meeting. The results were as follows:

- Prevention $119
- Property Protection $62
- Natural Resource Protection $33
- Structural Projects $66
- Emergency Services $112
- Public Education and Awareness $69

The meeting was opened for questions and comments and, as there were none, the meeting was adjourned.

August 28, 2019
Second Hazard Mitigation Planning Team Meeting – Guilford County Emergency Services Building

The Emergency Management Director with Guilford County Emergency Services welcomed everyone to the meeting and went over safety and administrative topics. He then passed the meeting over to the Project Manager to lead the presentation and discussion for the remainder of the meeting.

The Project Manager initiated the meeting with a review of the meeting handouts, which included an agenda, presentation slides, the current critical facility list, a capability assessment table, and the

existing mitigation actions from current plan. The Project Manager reviewed the discussion from the previous meeting explained that the project was still on schedule.

He then went on to present the findings of the risk assessment, starting with a review of the hazards that had been identified to profile and assess in the plan. He then explained the process for preparing Hazard Profiles and discussed how each hazard falls into one of four categories: Natural, Biological, Technological, and Man-Made/Intentional. He indicated that each hazard must be evaluated and profiled to determine a relative risk for each hazard.

The Project Manager reviewed the information and analysis for each hazard using the Hazard Profiles as a baseline. The following bullets summarize the information presented:

Natural Hazards

- DROUGHT. There have been eight years between 2000 and 2019 where drought conditions have been reported as at least severe in Guilford County.

- EARTHQUAKES. There have been 5 recorded earthquake events in Guilford County since 1850. Overall earthquake risk is relatively low.

- EXTREME COLD. Cold temperatures as low as -8 degrees have occurred in the county and indicate that extreme cold events are possible.

- EXTREME HEAT. Extreme temperatures of 106 degrees have occurred in the county and indicate that extreme heat events are possible.

- FIRE/WILDFIRE. There have been an average of 33 fires per year reported in Guilford County.

- FLOOD. There have been over $18 million of recorded damages due to flood events in Guilford County since 1996 according to NCEI. There have been almost 600 flood insurance claims since 1978 and approximately $5.6 million in claims.

- HAILSTORM. These events occur frequently and hail stones as large as 2.75 inches in diameter have been recorded.

- HURRICANES AND TROPICAL STORMS. NOAA data shows that more than 55 storm tracks have come within 75 miles of Guilford County since 1850 and 5 federal disaster declarations have been made due to hurricanes in the county.

- THUNDERSTORM WIND/LIGHTNING. There have been more than 250 severe thunderstorm events reported since 1950 and the county is in an area that experiences 6 to 12 lightning flashes per square mile per year.

- TORNADOES. There have been 2 federal disasters declared in the county and the county has experienced an EF3 level tornado.

- WINTER STORM. The greatest 24-hour snowfall in the county was 20 inches and there have been 6 federal disaster declarations related to winter weather in Guilford County.

Biological Hazards

- BIOTERRORISM. There have not been any major bioterrorism incidents in the county, but future occurrences are possible and may cause major impacts to hospitals and loss of economic productivity.

- PUBLIC HEALTH/EMERGING DISEASE. There have been several disease outbreaks in the county, notably in 1999 (SARS) and 2003 (West Nile). Impacts could be widespread, affecting thousands.

Technological Hazards

- BUILDING/STRUCTURE COLLAPSE. Few past incidents have been recorded. Future occurrences are possible, but damage would be highly localized.

- COMMUNICATIONS SYSTEMS DISRUPTION/FAILURE. At least one past event occurred in 2011 and there would potentially be delays in emergency service response time during these events as a result of diminished in-building radio coverage due to the building's construction.

- ENERGY/POWER/UTILITY FAILURE. A number of impacts could occur including traffic issues and loss of heat and air conditioning associated with a loss of power. Loss of other utilities could cause public health concerns or downtime for businesses.

- HAZARDOUS MATERIALS INCIDENTS. There have been more than 2,000 reported hazardous materials events reported in the county. Certain areas in High Point and Greensboro contain higher concentrations of hazardous materials facilities.

- NUCLEAR ACCIDENT. The southeastern portion of the county falls within the 50-mile ingestion pathway zone of Shearon Harris Nuclear Plant, but there have been no major incidents and future occurrences are unlikely.

- PIPELINE FAILURE. Some major pipelines run through Guilford County and there is a center of breakout tanks located off I-40 that has experienced at least one major incident in the past.

- RESOURCE SHORTAGE (WATER/FUEL). Several water and fuel shortages have impacted the county in the past 20 years. Future incidents could have major impacts on businesses and consumers.

- TRANSPORTATION INCIDENT. Several plane and train incidents have occurred in the county in past years in addition to numerous vehicle incidents. Impacts are typically very localized but can cause logistical issues.

Man-Made/Intentional Hazards

- CIVIL DISTURBANCE. Few recent events but future occurrences are most likely to occur in prominent locations causing work stoppages and loss of productivity.

- CYBER-SECURITY THREAT. No large-scale cyber-attacks have been recorded in Guilford County, but these have impacted neighboring communities and may result in theft, loss of IT functions, or dissemination of misinformation.

- TERRORISM. There have been no major historic terrorism events in the county, but several facilities were identified as potential targets and confirmed by the planning team.

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 Winter Storm.

In general, the planning team agreed with the overall rankings of the hazards and felt that they accurately represented the relative risk in the county. In concluding the review of Hazard Profiles, the Project Manager stated if anyone had additional information for the hazard profiles, or had concerns with any of the data presented, they could call or email him.

The Project Manager then walked the planning team through another exercise related to critical facilities. A list of all of the critical facilities that had been pre-identified was presented to each planning team member. Members were asked to review the list and ensure that the proper information (name, location, etc.) was attached to each facility. Further, the team was asked to provide suggestions on any facilities that should be removed or added to the list. After reviewing, several suggestions were made to include additional facilities to the list. The Project Manager made note of these suggestions and made updates to the list accordingly.

Next, the Project Manager reviewed the data that would be included in the hazard vulnerability assessment. Because of the detailed and granular level of the analysis, an in-depth review of this data was not presented to the planning team during this meeting. Instead, the overall process of carrying out the vulnerability assessment was described to the team.

After the conclusion of the Risk and Vulnerability findings were presented, the Project Manager presented the Capability Assessment findings. Atkins developed a scoring system that was used to rank the participating jurisdictions in terms of capability in four major areas (Planning and Regulatory; Administrative and Technical; Fiscal; Political). Important capability indicators include National Flood Insurance Program (NFIP) participation, Building Code Effective Grading Schedule (BCEGS) score, and Community Rating System (CRS) participation were evaluated as part of the Local Capability Assessment Survey conducted by Atkins.

The Project Manager reviewed the Relevant Plans and Ordinances, Relevant Staff/Personnel Resources, and Relevant Fiscal Resources. All of these categories were used to rate the overall capability of the participating counties and jurisdictions. Most jurisdictions were found to be in the moderate to high range overall for capability based upon the scoring methodology developed by Atkins. The planning team was then asked to review the capability scoring and note any areas where Atkins' analysis had not accurately captured the actual capability of the community. A few areas were noted by the planning team and these changes were recorded by the Project Manager.

The Project Manager also discussed the results of the public participation survey that was posted on the county and municipal websites as well as made available in hard copy form at several government locations. As of the meeting date, around 50 responses had been received. The Project Manager explained that the survey would close August 31, so the HMPT could make one final push to get responses back from the public. Based on preliminary survey results, respondents felt that hurricane/tropical storm posed the greatest threat to their neighborhood. Ninety-two percent of the

respondents were interested in making their homes more resistant to hazards. However, sixty-three percent do not know who to contact regarding reducing their risks to hazards.

The Project Manager then reminded team members of the results of the icebreaker exercise from the first Hazard Mitigation Team meeting, where attendees were given "money" to spend on various hazard mitigation techniques and compared them to the results of the public survey. The results of the public survey ranked the categories as follows:

- Prevention
- Emergency Services
- Public Education and Awareness
- Structural Projects
- Property Protection
- Natural Resource Protection

Finally, the Project Manager gave an overview of Mitigation Strategy Development and presented the existing goals for the plan and explained that Atkins recommended keeping the goals as they are. The Hazard Mitigation Team accepted the existing goals for the plan. The Project Manager then provided an overview and examples of suggested mitigation actions tailored for Guilford County. The Project Manager then asked each county and the municipalities to provide a status update for their existing mitigation actions (completed, deleted, or deferred) by September 30, 2019. The Project Manager also asked planning team members to include any new mitigation actions by this time.

The Project Manager thanked the group for taking the time to attend and the Emergency Management Director explained that if team members had any issues or questions about the planning process or their next steps, they could contact him or the Project Manager. The meeting was adjourned.

November 6, 2019
Sedalia Mitigation Planning Team Meeting – Sedalia Town Hall

Due to the small size of the Town of Sedalia and the limited availability of its staff, representatives from the town were unable to attend the first two meetings of the planning team. Therefore, a separate meeting was held with the town at their town hall to ensure that the town was involved as an active participant in the planning process. The minutes from this meeting are as follows.

The Project Manager led the meeting and began by providing an overview of the items to be discussed at the meeting. He briefly reviewed each of the handouts that were distributed in the meeting packets (agenda, mitigation actions, capability assessment). He then provided a brief overview/reminder of mitigation and discussed the impetus for the update of the hazard mitigation plan as per the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

The Project Manager then went over a number of the findings from the Risk Assessment which had been reviewed at the last meeting of the planning team. He described the hazard profiles and critical facilities that had been identified through the planning process and worked with the community to understand all aspects of the information provided. The community then provided feedback on what was presented, and the Project Manager took note of the few comments the community had.

Next, the Project Manager worked with the community to update the capability assessment worksheet that was provided and then to write status updates for each of the existing mitigation actions that the community had presented in the previous plan update. These updates were completed and the discussion moved to whether there were any new actions that the community would like to add to the plan during this update cycle. The community members present wished to further discuss with other staff and said they would provide any new actions to the Project Manager via email.

The meeting concluded with a discussion of the next steps to be taken in the project development, which getting the draft plan ready to share with the planning team. The Project Manager asked the community to review the draft and provide comments in accordance with the timeline set out in the forthcoming draft review email.

The Project Manager asked if there were any final questions or comments and, as there were none, 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 Guilford County Multi-Jurisdictional 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 county and municipal websites and at government offices along with contact information for providing input.

The general public was provided three opportunities to be involved in the development of the county plan: (1) 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, an open meeting was held on June 13, 2019 at the American Red Cross building in Greensboro. 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 participating community websites.

A final open public meeting was held on XXXXX at XXXXX. The meeting, specifically held to discuss the hazard mitigation plan, was held more than two weeks prior to plan adoption and was advertised by the participating jurisdictions on community websites and through community newsletters and ebulletins. The purpose of the meeting was to present the final plan and its findings and recommendations and so that the 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. The meeting agenda and sign-in sheet are included in Appendix D.

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 a *Public Participation Survey*. The *Public Participation Survey* was designed to capture data and information from residents of Guilford County that might not be able to attend public meetings or participate through other means in the mitigation planning process and to facilitate participation for any who wished to participate.

Copies of the *Public Participation Survey* were distributed to the Hazard Mitigation Planning Team to be made available for residents at local public offices. A link to an electronic version of the survey was also posted on the county and municipal websites. The responses that were received provided valuable, additional input for the Hazard Mitigation Planning Team to consider in the development of the plan update. Selected survey results are presented below.

- Approximately 32 percent of survey respondents were very or extremely concerned about the possibility of being impacted by a disaster.
- The top 5 hazards of greatest concern according to the survey were hurricane/tropical storm, thunderstorm, tornado, winter storm, and energy/power/utility failure
- Approximately 71 percent of respondents felt at least moderately prepared if a disaster were to occur.
- Only 22 percent of respondents felt very informed about the risks and impacts of disasters.
- Around 92 percent of respondents expressed interest in making their homes safer from hazards, but only 47 percent had already taken action to make their homes safer.

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

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

In addition to the planning team itself, which was composed of core stakeholders who were primarily involved in making substantive decisions about mitigation in their respective communities, the planning team felt it was important to reach out to other affected stakeholders who were not directly involved on the planning team, but whose direct participation in the process could provide value to the plan overall. **Table 2.3** lists the key stakeholders who were involved in the planning process, but who were not directly involved as members of the planning team. They include a diverse set of interests including neighboring communities, academia, and other private/non-profit organizations. Each was solicited for input and information and given an advanced opportunity to comment on the draft plan.

TABLE 2.3: OTHER STAKEHOLDERS INVOLVED IN THE PLANNING PROCESS

Name	Position	Organization
Debbie Hatfield	Emergency Management Coordinator	Alamance County
Barry Lynch	Emergency Management Coordinator	Caswell County
Steve Newton	Emergency Management Director	Chatham County
Alton Hanes	Emergency Management Coordinator	Davidson County
August Vernon	Emergency Management Director	Forsyth County
Jared Byrd	Emergency Management Coordinator	Randolph County
Rodney Cates	Emergency Management Coordinator	Rockingham County
Greg Collins	Emergency Management Coordinator	Stokes County
Susan Smith	Senior Disaster Program Manager	American Red Cross
Margaret Erga	Senior DPS Volunteer Partner	American Red Cross
Wannetta Mallette	Transportation Planner	Burlington Graham MPO
Deborah Hooper	Chief Operating Officer	Greensboro Chamber of Commerce
Kenney McDowell	Director	Greensboro Engineering & Inspections
Jim Robinson	Deputy Fire Chief	Greensboro Fire Department
Jane Nickles	Director	Greensboro IT
Sue Schwartz	Director	Greensboro Planning Department
Russ Clegg	Senior Planner	Greensboro Planning Department
Bruce Adams	Public Transportation Manager	Greensboro Transit Authority
Craig McKinney	Transportation Planner	Greensboro Urban Area MPO
Virginia Spillman	Engineering Manager	Greensboro Water Resources
Steven Drew	Interim Asst. City Manager	Greensboro Water Resources
David Phlegar	Stormwater Management Manager	Greensboro Water Resources
Hemant Desai	CIO	Guilford County IT
Leslie Bell	Development Director	Guilford County Planning

Name	Position	Organization
Daryl Loftis	Captain	Guilford County Sheriff's Office
Rachel Moss	Chief Operating Officer	High Point Chamber of Commerce
Garey Edwards	Director	High Point Electric Utilities
Keith Pugh	Director	High Point Engineering Services
Steve Lingerfelt	Director	High Point IT
Lee Burnette	Director	High Point Planning & Development
Terry Houk	Director	High Point Public Services
Trevor Spencer	Manager	High Point Stormwater
Angela Wynes	Transit Manager	High Point Transit
Greg Venable	Transportation Planner	High Point Urban Area MPO
Katie McBride	Town Clerk	Jamestown
Travis Auman	Emergency Management Coordinator	North Carolina A&T State University
Sandra Smith	Town Clerk	Oak Ridge
Mark Kirstner	Director of Planning	Piedmont Authority for Regional Transportation
Jesse Day	Regional Planning Director	Piedmont Triad Regional Council
Scott Whitaker	Town Manager	Summerfield
Zach Smith	Emergency Management Director	University of North Carolina - Greensboro

Finally, the Hazard Mitigation Planning Team encouraged more open and widespread participation in the mitigation planning process by designing and distributing the *Public Participation Survey*. All of the aforementioned opportunities were provided for local officials, residents, businesses, academia, and other private interests in the county to be involved and offer input throughout the local mitigation planning process.

2.8 DOCUMENTATION OF PLAN PROGRESS

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

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 Guilford 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

Guilford County is located in the Piedmont area of North Carolina, centered along the piedmont industrial crescent stretching from Raleigh to Charlotte. For the purposes of this plan, Guilford County includes the Town of Gibsonville, City of Greensboro, City of High Point, Town of Jamestown, Town of Oak Ridge, Town of Pleasant Garden, Town of Sedalia, Town of Stokesdale, Town of Summerfield, Town of Whitsett, and all unincorporated areas within the county. An orientation map is provided as **Figure 3.1**.

Guilford County contains multiple university and higher learning facilities advocating higher education. The Cities of Greensboro and High Point each have an operational courthouse allowing Guilford County to be one of the few counties within the nation that have a dual court system. Various companies and businesses operate within the county, including the region's largest furniture merchandising, retail, and service industries.

Guilford County is included in the Piedmont Triad within the north-central region of North Carolina. The Triad consists of areas within Alamance, Davidson, Forsyth, Guilford, Randolph, Rockingham, and Surry Counties. Areas within and surrounding the three major cities of Greensboro, High Point, and Winston-Salem make up the base for of the Piedmont Triad. The Triad has an extensive freeway network consisting of four interstate highways and numerous secondary Interstate routes and US routes. This allows the area to support a mixed economy consisting of industry and manufacturing along with technology and biotechnology. The area also contains prominent regional shopping facilities.

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
Guilford County	**645.7 square miles**
Gibsonville*	3.5 square miles
Greensboro	126.5 square miles
High Point*	53.8 square miles
Jamestown	2.9 square miles

Jurisdiction	Total Land Area
Oak Ridge	15.4 square miles
Pleasant Garden	15.3 square miles
Sedalia	2.1 square miles
Stokesdale	19.2 square miles
Summerfield	26.6 square miles
Whitsett	2.6 square miles

*Portions of land that make up Gibsonville and High Point are located in neighboring counties. Note: these areas are not included in the Guilford County total.

Source: United States Census Bureau

Guilford County enjoys a moderate climate that is characterized by mild winters and hot, humid summers. In general, the spring months are marked by unpredictable weather and changes can occur rapidly with sunny skies yielding to severe thunderstorms in just a few hours.

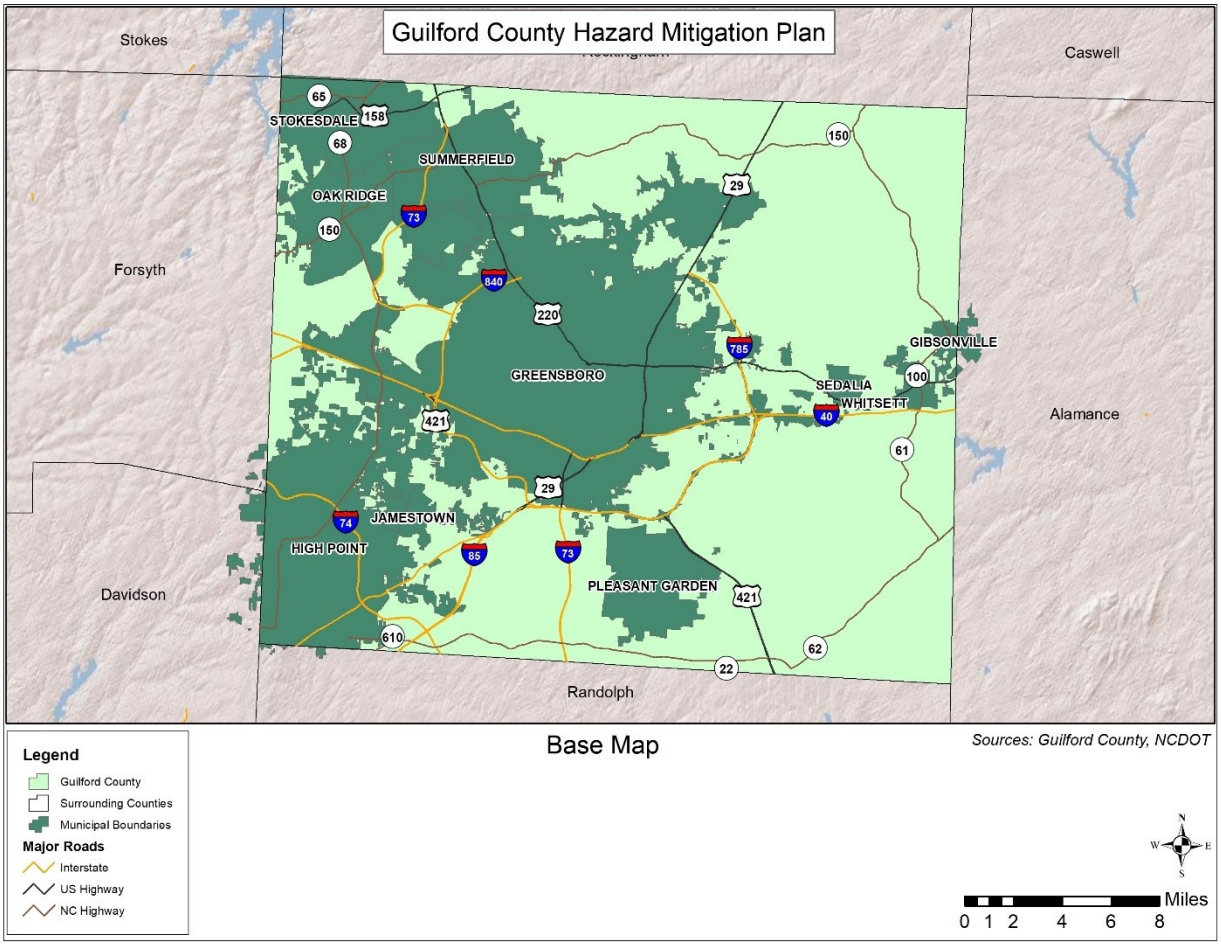
From March through May, temperatures have an average high in the mid 70s˚F with lows in the 40s˚F. Typically, the weather is milder by late March and warm by late April.

In the summer, afternoon showers and thunderstorms are common and average temperatures increase with afternoon highs reaching the upper 80s˚F in July and August. These months are also the most common for rain in Guilford County.

September through mid-November is typified by clear skies and cooler weather that alternates between warm days and cool nights. Highs and lows are usually similar to those experienced in the spring, with November days cooling off considerably.

Winter in Guilford County is generally moderate, but extremes do occur. High temperatures are usually in the lower 50s˚F and winter lows in the upper 20s˚F. Snow and ice do tend to occur.

FIGURE 3.1: GUILFORD COUNTY ORIENTATION MAP



3.2 POPULATION AND DEMOGRAPHICS

Greensboro is the largest participating municipal jurisdiction by area and it also has the largest population. Between 2000 and 2017, the majority of participating jurisdictions experienced population growth. Oak Ridge had the highest county growth rate at around 69%. Population counts from the US Census Bureau for 1990, 2000, and 2010 and from the American Community Survey for 2017 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	2017 ACS Population	% Change 2000-2017
Guilford County	**347,420**	**421,048**	**488,406**	**517,197**	**22.8%**
Gibsonville*	3,441	4,372	6,410	6,845	56.6%
Greensboro	183,521	223,891	269,666	284,816	27.2%
High Point*	69,496	85,839	104,371	109,849	28.0%
Jamestown	2,600	3,088	3,382	3,836	24.2%
Oak Ridge	4,716	3,988	6,185	6,728	68.7%

Jurisdiction	1990 Census Population	2000 Census Population	2010 Census Population	2017 ACS Population	% Change 2000-2017
Pleasant Garden	2,228	4,714	4,489	4,762	1.0%
Sedalia	--	618	623	548	-11.3%
Stokesdale	2,134	3,267	5,047	5,331	63.2%
Summerfield	2,051	7,018	10,232	10,957	56.1%
Whitsett	--	686	590	973	41.8%

*The population counts of Gibsonville and High Point include population residing in neighboring counties. Note: these populations are not included in the Guilford County total.
Source: United States Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

Based on the 2017 American Community Survey, the median age of residents in Guilford County is 37.2. The racial characteristics of the participating jurisdictions are presented in **Table 3.3**. Generally, whites make up the majority of the population in the county accounting for over 56 percent of the population in overall. However, Sedalia has a much higher minority population.

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)*
Guilford County	**56.1%**	**33.7%**	**0.4%**	**4.8%**	**0.1%**	**2.6%**	**2.3%**	**7.7%**
Gibsonville	76.8%	15.6%	1.5%	0.9%	0.0%	0.7%	4.4%	4.3%
Greensboro	48.0%	41.8%	0.4%	4.4%	0.1%	2.7%	2.5%	7.3%
High Point	51.4%	34.0%	0.4%	8.2%	0.1%	3.3%	2.7%	10.1%
Jamestown	79.9%	16.2%	0.0%	2.9%	0.5%	0.3%	0.2%	5.1%
Oak Ridge	78.6%	9.3%	1.4%	8.3%	0.0%	0.7%	1.8%	3.8%
Pleasant Garden	88.0%	6.9%	0.6%	0.4%	0.0%	0.5%	3.5%	5.7%
Sedalia	23.0%	73.7%	0.9%	0.0%	0.0%	1.8%	0.5%	8.4%
Stokesdale	89.6%	7.0%	0.0%	1.1%	0.0%	0.0%	2.3%	6.9%
Summerfield	94.2%	2.8%	0.1%	1.8%	0.0%	0.0%	1.2%	3.4%
Whitsett	87.4%	8.8%	0.0%	2.6%	0.0%	0.0%	1.2%	0.2%

*Hispanics may be of any race, so also are included in applicable race categories
Source: United States Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

3.3 HOUSING, INFRASTRUCTURE, AND LAND USE

3.3.1 Housing

According to the 2017 American Community Survey, there were 225,009 housing units in Guilford County, the majority of which are single family homes or multiple unit homes. Housing information for the ten participating jurisdictions is presented in **Table 3.4**. As shown in the table, Guilford County has a very low percentage of seasonal housing across the jurisdictions; however, Whitsett and Gibsonville have a slightly higher rate compared to the other municipalities.

TABLE 3.4: HOUSING CHARACTERISTICS OF PARTICIPATING JURISDICTIONS

Jurisdiction	Housing Units (2010)	Housing Units (2017)	Seasonal Units, Percent (2017)	Median Home Value (2017)
Guilford County	**218,017**	**225,009**	**0.6%**	**$160,200**
Gibsonville*	2,798	2,684	1.7%	$153,400
Greensboro	124,074	129,162	0.5%	$152,300
High Point*	46,677	46,550	1.0%	$144,900
Jamestown	1,517	1,609	0.0%	$222,200
Oak Ridge	2,226	2,378	0.4%	$338,600
Pleasant Garden	1,819	1,830	0.4%	$158,500
Sedalia	279	276	0.0%	$139,700
Stokesdale	1,955	1,952	0.0%	$189,600
Summerfield	3,756	3,904	0.0%	$349,000
Whitsett	279	421	1.7%	$186,700

*The housing unit counts for Gibsonville and High Point include units located in neighboring counties. Note: these housing units are not included in the Guilford County total.
Source: United States Census Bureau, 2013-2017 American Community Survey 5-Year Estimates

3.3.2 Infrastructure

Transportation

There are several major highways that cross through Guilford County. The county is connected to other counties in the region by Interstates 40, 73, 74, and 85. Interstate 40 runs through the state of North Carolina from the Tennessee state line. Interstate 73 runs into the county directly from the south and into Greensboro. Interstate 74 is partially completed within the state of North Carolina. The first section in the Piedmont Triad starts at the Virginia state line running through the southwest corner of Guilford County. Interstate 85 runs northeast-southwest through North Carolina and is the second longest interstate in the state (behind Interstate 40). Within Guilford County, multiple transportation routes run in concurrency.

The Piedmont Triad International Airport serves Guilford County. The airport has five airlines that service it with flights daily. Residents within the county also use the Charlotte-Douglas International Airport, the largest airport in the state, and Raleigh-Durham International Airport. The Charlotte-Douglas International Airport currently offers 1,400 daily flights on 15 airlines to cities around the country and the world. The Raleigh-Durham International Airport offers more than 400 daily domestic and international flights on 10 different airlines.

In terms of other transportation services, Guilford County provides a public transit system that serves residents without access to additional public transportation services in Greensboro or High Point. Transportation is provided for medical appointments, employment, education, senior services, nutrition sites, and senior citizen care. The Piedmont Authority for Regional Transportation (PART) also provides bus services throughout the Triad.

Utilities

Electrical power in Guilford County is provided primarily by Duke Energy, a major provider in many areas of North Carolina, although some areas are served by Energy United or other local cooperatives. The

City of High Point provides electricity to most of the City of High Point. Duke Energy also owns Piedmont Natural Gas, which provides natural gas service to much of the population.

Water and sewer services are provided throughout Guilford County by several municipalities including the City of Greensboro, City of High Point, Town of Jamestown, Sedgefield Sanitary District, City of Burlington, and Town of Stokesdale. Guilford County does not directly manage any water or sewer systems but is responsible for well and septic system permits.

Community Facilities

There are a number of public buildings and community facilities located throughout Guilford County. According to the data collected for the vulnerability assessment (Section 6.4.1), there are 75 fire stations, 17 public safety facilities (including police and sheriff's offices), and 218 schools located within the study area.

There are five acute care hospitals in the county, which provide nearly 1,500 licensed beds. Major hospitals located in Guilford County include Moses H. Cone Memorial Hospital, Wake Forest Baptist High Point Medical Center, Kindred Hospital Greensboro, Cone Health Wesley Long Hospital, and Cone Health MedCenter High Point. Cone Health Network System also operates several satellite locations throughout the county. Additionally, three nationally prominent teaching hospitals are within an hour's drive of the county.

Guilford County affords the full range of amenities of a thriving urban area, including three regional shopping malls and more than three million square feet of retail space. Guilford County is also home to several parks, including: Bur-Mil Park, Gibson Park, Guilford-Mackintosh Park, Hagan-Stone Park, Northeast Park, Southwest Park, and Triad Park. There are also a number of municipal parks located throughout the communities.

3.3.3 Land Use

Guilford County positions itself to accommodate new growth and redevelopment that is efficient and cost-effective; improves the quality of life for residents; enhances economic vitality; is respectful to citizen-based area plans; supports creativity and innovative design; and protects and preserves the natural, historic, and cultural resources and assets of the county.

The county continues to utilize the future land uses depicted on citizen-based area plans, in conjunction with the rezoning guidance matrix, as the basis for land use and policy recommendations. Guilford County is an active partner in the planning and implementation of large-scale multi-jurisdictional land use initiatives such as the Heart of the Triad and transit-oriented development. Local land use and associated regulations are further discussed in *Section 7: Capability Assessment.*

3.4 EMPLOYMENT AND INDUSTRY

Guilford County's traditional employment base of textiles, apparel, and furniture has diversified greatly in the last fifty years, and now encompasses more than 300 companies producing a wide range of products. An excellent transportation infrastructure, including two interstate highways, Piedmont Triad International Airport, and readily available rail and truck service, has helped solidify the county's position as a major distribution and transportation center in the Southeast.

Many corporate and regional offices are located in Guilford County, including Polo/Ralph Lauren, BB&T, Lincoln Financial, Volvo Trucks North America, and ITG Brands. The International Home Furnishings Market in High Point attracts some 150,000 visitors annually, generating millions of dollars in economic benefits to the community. Aggressive economic recruitment efforts by both private and public sectors have yielded many new corporate neighbors.

According to the 2013-2017 American Community Survey, Guilford County had an average annual employment of 246,145 workers and an average unemployment rate of 6.6 percent in 2017 (compared to 7.2 percent for the state). Educational services, and health care and social assistance employed 23.8 percent of the county's workforce followed by manufacturing (12.9%); retail trade (12.7%); and professional, scientific, and management, and administrative and waste management services (10.1%). The average annual median household income in Guilford County in 2017 was $49,253 compared to $50,320 for the State of North Carolina.

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

Guilford 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, intentional, etc.) is encouraged, though not required, for plan approval. Guilford County has included a comprehensive 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 Guilford County (Gibsonville, Greensboro, High Point, Jamestown, Oak Ridge, Pleasant Garden, Sedalia, Stokesdale, Summerfield, and Whitsett) 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 the Guilford County Hazard Mitigation Planning Team members, research of past disaster declarations in the county[1], and review of the North Carolina Enhanced State Hazard Mitigation Plan (2018). 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 33 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 federal disaster declarations in Guilford County.

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

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.

Table 4.4 provides a summary of the hazard identification and evaluation process noting that 24 of the 33 initially identified hazards are considered significant enough for further evaluation through this Plan's risk assessment (marked with a "☑").

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.
Fire/Wildfire	A wildfire is 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. A structure fire is any fire in or on a building or other structure, even if the structure itself was not damaged. Mobile property used as a fixed structure, such as manufactured homes and portable buildings, are considered structures. These fires occur frequently in today's world and are often caused by humans within their homes or businesses.
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/Other Tropical Disturbance	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.
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	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.
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.
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.

Thunderstorm (Wind and Lightning)	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. 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.
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.
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.

BIOLOGICAL HAZARDS	
Bioterrorism	Bioterrorism is defined by the Centers for Disease Control as an attack wherein there is a deliberate release of viruses, bacteria, or other germs (agents) used to cause illness or death in people, animals, or plants. These agents are typically found in nature, but it is possible that they could be changed to increase their ability to cause disease, make them resistant to current medicines, or to increase their ability to be spread into the environment.
Public Health/Emerging Disease Threat	Public health threats are often defined by an infectious disease that involves 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.
TECHNOLOGICAL HAZARDS	
Building/Structure Collapse	According to the United States Department of Labor, a collapsed structure occurs when internal load bearing structural elements fail and the building collapses into itself with the exterior walls being pulled into the falling structure. This scenario may be caused by construction activity, an earthquake, or fire, and may result in a dense debris field with a small footprint. Alternatively, if the structural failure is caused by an explosion or natural forces such as weather, the building may collapse in an outward direction, resulting in a less dense and more scattered debris field.
Communications Systems Disruption/Failure	The failure or disruption of communications systems occurs when emergency response personnel or government officials are unable to utilize their existing communications equipment due to overload of the system or impacts from a hazard. These events can have a critical impact because they may result in lengthened response times and cause miscommunication among responders, resulting in additional impacts that may otherwise have been avoided.
Energy/Power/Utility Failure	Energy/power/utility failures often occur hand in hand with other hazards and are often 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 areas of this infrastructure are affected.
Hazardous Materials Incident	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.

Nuclear Power Plant Emergency	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.
Pipeline Failure	In the case of this plan, a pipeline incident generally refers to a spill, explosion, or fire caused in the transport of flammable liquid or gas being carried by fixed pipes across the United States. These pipes often carry petroleum-based products that are dangerous to health and safety of people as well as the environment if exposed in large quantities.
Resource Shortage (Water/Fuel)	A resource shortage occurs whenever supplies of a resource have been depleted to the point that there is very little to none of the resource available to the public. Most commonly resource shortages occur when there has been a steady decrease in the amount of available resource over time, but these shortages can also be the result of a major event that quickly reduces supply.
Transportation Incident	Transportation incidents come in many forms in the United States, especially given the many forms of transportation available today. The most common types of transportation incidents are motor vehicle accidents, but plane, train, and watercraft accidents occur as well and often have higher magnitude impacts.
MAN-MADE/INTENTIONAL HAZARDS	
Civil Disturbance	Public unrest has been evident in society from the earliest recordings of civilization. Most of these disturbances have been related to political or social issues. Insurrection has framed much of history, dictating the governance and progression of society. In recent years, most of the publicized disturbances have been protests and riots. Rioting does not occur very often in the United States; however, marches and protests are common and could subsequently lead to riots.
Cyber-Security Threat	Cyber-security threats are 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 cyber-security threats 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
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, cyber attacks (computer-based), and the use of chemical, biological, nuclear and radiological weapons.

4.3 DISASTER DECLARATIONS

Federal disaster declarations provide initial insight into the hazards that may impact the Guilford County planning area. Since 1989, 13 presidential disaster declarations have been reported in Guilford County. This includes six storms related to severe winter weather, two tornado events, and five hurricanes.

However, this list is not inclusive of many of the major disaster events that impacted the county and which ultimately resulted in Small Business Administration disaster loan assistance such as the straight line wind event that occurred on May 21, 2001 and the High Point tornado (2010).

TABLE 4.2: GUILFORD COUNTY FEDERAL DISASTER DECLARATIONS

Year	Disaster Number	Description
1989	827	TORNADOES
1989	844	HURRICANE HUGO
1996	1087	BLIZZARD OF 96
1996	1103	WINTER STORM
1996	1134	HURRICANE FRAN
1999	1292	HURRICANE FLOYD MAJOR DISASTER DECLARATIONS
2000	1312	SEVERE WINTER STORM
2002	1448	SEVERE ICE STORM
2003	1457	ICE STORM
2004	1553	HURRICANE IVAN
2014	4167	SEVERE WINTER STORM
2018	4364	TORNADO AND SEVERE STORMS
2018	4393	HURRICANE FLORENCE

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 the NC State Hazard Mitigation Plan • Review of the previous Guilford 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 removed from the North Carolina State Hazard Mitigation Plan after determining the mountain elevation in Western North Carolina did have enough snow to produce this hazard. • Avalanche is not included in the previous Guilford County hazard mitigation plan. • There is no risk of avalanche events in this area of North Carolina.
Drought	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of the US Drought Monitor website	• Drought is a normal part of virtually all climatic regimes, including areas with high and low average rainfall. • Droughts are discussed in the NC State Hazard Mitigation Plan as a threat to Guilford County. • Drought is included in the previous Guilford County hazard mitigation plan. • There are reports of at least moderate drought conditions in 15 of the last 19 years in Guilford County, according to the US 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 NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • 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 NC State Hazard Mitigation Plan and Guilford County is considered to be at low to moderate risk to an earthquake event. • Earthquake was included in the previous Guilford County hazard mitigation plan. • Earthquakes have occurred in and around the State of North Carolina in the past. The state is affected by several fault zones including the Charleston and the New Madrid (near Missouri) zones which have generated a magnitude 8.0 earthquake in the last 200 years. • According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for Guilford County is approximately 2 to 5%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 NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan	• Coastal erosion is discussed in the NC State Hazard Mitigation Plan but only for coastal areas. Guilford County is not located in a coastal area. • Erosion is not included as a hazard in the previous Guilford County hazard mitigation plan. • Riverine erosion remains a natural, dynamic, and continuous process that has the potential to affect Guilford County since several rivers/streams run through the county. But, upon evaluation, this did not warrant inclusion for further hazard evaluation.
Expansive Soils	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of USDA Soil Conservation Service's Soil Survey	• The effects of expansive soils are most prevalent in parts of the Southern, Central, and Western U.S. • Expansive soils are not specifically identified in the NC State Hazard Mitigation Plan. • Guilford County is located in an area that has little to no clay swelling potential. • The previous Guilford 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	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the North Carolina State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database	• Many areas of the United States are susceptible to extreme cold, including North Carolina. • Extreme cold was included in the previous Guilford County hazard mitigation plan. • The county has experienced extreme cold events a number of times in the past.
Extreme Heat	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the North Carolina State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database	• Many areas of the United States are susceptible to heat waves, including North Carolina. • Extreme heat was included in the previous Guilford County hazard mitigation plan under the extreme temperatures hazard. • The county has experienced extreme heat events a number of times in the past.

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?
Fire/Wildfire	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of Southern Wildfire Risk Assessment (SWRA) Data • Review of the NC Division of Forest Resources website	• 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 state plan, though Guilford County, is located in an area with relatively lower risk compared to other parts of the state. • The previous Guilford County hazard mitigation plan addressed fire and wildfire. • A review of SWRA data indicates that there are some areas of elevated concern to wildfire in Guilford County. • According to the North Carolina Forest Service, over the period 2010-2019, Guilford County experienced an average of 65 fires each year which burned an average of 40.0 acres per year. • Structure fires happen across the United States in all areas of the country and can impact any building. Many structure fires have occurred in Guilford County historically.

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?
Flood	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database • Review of historical disaster declarations • 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 NC State Hazard Mitigation Plan. Much like a majority of the state, Guilford County was found to have vulnerability to flooding. • The previous Guilford County hazard mitigation plan addresses flood hazard. • NCEI reports that Guilford County has been affected by 92 flood events since 1996. In total, these events caused 1 death and an estimated $18.8 million (2019 dollars) in property damages. • None of the county's Presidential Disaster Declarations were specifically flood-related, however, several declarations were hurricane-related which caused flooding issues. • All jurisdictions in the county participate in the NFIP and Guilford County (unincorporated area) and the City of Greensboro also participate in the CRS.
Hail	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI 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 NC State Hazard Mitigation Plan under the Tornadoes/Thunderstorms • Hail is included in the previous Guilford County hazard mitigation plan. • NCEI reports 177 hailstorm events (0.75 to 2.75 inch size hail) for Guilford County since 1950.

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?
Hurricane and Tropical Storm	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Analysis of NOAA historical tropical cyclone tracks and National Hurricane Center Website • Review of NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations	• The Atlantic and Gulf regions are most prone to landfall by hurricanes and tropical storms. • Hurricane and tropical storm events are discussed in the NC State Hazard Mitigation Plan and are listed as a hazard that can affect any area in the state. • Hurricanes and tropical weather were addressed in the previous Guilford County hazard mitigation plan. • NOAA historical records indicate 58 hurricanes/tropical storms have come within 75 miles of Guilford County since 1850. • NCEI reports 4 hurricane events since 1996 for Guilford County. • Numerous disaster declarations in Guilford County were directly related to hurricane events.

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?
Landslide	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of USGS Landslide Incidence and Susceptibility Hazard Map • Review of the North Carolina Geological Survey database of historic landslides	• 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 state plan, but Guilford County does not have much risk. • The previous Guilford County hazard mitigation plan did not address landslides. • USGS landslide hazard maps indicate that a moderate incidence rate is found across the northwestern half of the county. • Data provided by NCGS indicate there are no recorded landslide events in the Guilford County.
Land Subsidence	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan	• Land subsidence affects at least 45 states, including North Carolina. However, because of the broad range of causes and impacts, there has been limited national focus on this hazard. • The state plan identifies certain areas that are susceptible to land subsidence hazards in North Carolina; however, Guilford County does not have soil types that are highly susceptible to subsidence. • The previous Guilford 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?
Nor'easter	NO	• Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database	• Nor'easters are not identified as a hazard in the state plan. • Nor'easters were not identified in the previous Guilford County hazard mitigation plan. • NCEI does not report any nor'easter activity for Guilford County. However, nor'easters may have affected the area as severe winter storms. In this case, the activity would be reported under winter storm events.
Storm Surge	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database	• Given the inland location of Guilford County, storm surge would not affect the area. • Storm surge is discussed in the NC State Hazard Mitigation Plan under the hurricane hazard and Guilford County does not have any vulnerability to storm surge. • The previous Guilford County hazard mitigation plan did not address storm surge. • No historical events were reported by NCEI.

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?
Thunderstorm (Wind and Lightning)	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan Review of NOAA NCEI Storm Events Database • Review of Vaisala's NLDN Lightning Flash Density Map	• Severe thunderstorm events were addressed in the previous Guilford County hazard mitigation plan. • NCEI reports 311 thunderstorm/high wind events in Guilford County since 1950. These events have resulted in $2.6 million (2019 dollars) in property damage. • 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 NC State Hazard Mitigation Plan as part of the tornado/thunderstorm and wildfire hazards. • Lightning is included in the previous Guilford County hazard mitigation plan. • According to Vaisala's U.S. National Lightning Detection Network, Guilford County is located in an area that experienced an average of 6 to 12 lightning flashes per square mile per year.

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?
Tornado	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI Storm Events Database • Review of historical presidential disaster declarations	• Tornado events are discussed in the NC State Hazard Mitigation Plan. Since there is risk of tornadoes across the state, Guilford County is at risk. • Tornado events were addressed in the previous Guilford County hazard mitigation plan. • NCEI reports 15 tornado events in Guilford County since 1950. These events have resulted in $87.9 million (2019 dollars) in property damage with the most severe being an EF3. • Two of the county's disaster declarations were directly related to tornadoes.
Tsunami	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford 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 mid-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 identified as a hazard in the state plan and Guilford County is not a coastal community so has no tsunami hazard risk. • The previous Guilford 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.

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?
Volcano	NO	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC 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 North Carolina. • There has not been a volcanic eruption in North Carolina in over 1 million years. • No volcanoes are located near Guilford County.
Winter Storm and Freeze	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of NC State Hazard Mitigation Plan • Review of the previous Guilford County hazard mitigation plan • Review of NOAA NCEI 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 NC State Hazard Mitigation Plan and can affect all areas of the state. • Winter snow and ice storm events were addressed in the previous Guilford County hazard mitigation plan. • NCEI reports that Guilford County has been affected by 69 snow and ice events since 1996. These events resulted in $9.4 million (2019 dollars) in damages. • Seven of the county's disaster declarations were directly related to winter storm events.

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?
BIOLOGICAL HAZARDS			
Bioterrorism	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included bioterrorism and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • There have been no major bioterrorism events in the county, however, these kinds of events are often unpredictable and Guilford County could be affected.
Public Health/Emerging Disease Threat	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included public health/emerging disease threat and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • 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.
TECHNOLOGICAL HAZARDS			
Building/Structure Collapse	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included building/structure collapse and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Building/structure collapse is a hazard that often happens on a very localized level, but the impacts can be severe and could potentially occur anywhere.

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?
Communications Systems Disruption/Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included communications systems disruption/failure and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Communications systems disruptions can happen in any location throughout the United States and throughout the county.
Energy/Power/Utility Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included energy/power/utility failure and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Energy/Power/Utility failures occur frequently in the county, especially during winter storms or high wind events. These will continue to impact the county going forward.

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?
Hazardous Materials Incident	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Review Facility Registry Service data • 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 Guilford County hazard mitigation plan included hazardous materials incidents and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Fifty PHMSA-reported HAZMAT incidents in the county were classified as "serious" incidents. In total, these incidents have resulted in over $2.9 million (2019 dollars) in property damages.
Nuclear Power Plant Emergency	YES	• Review of IAEA data on the location of nuclear reactors • Review of the Guilford County HIRA • Discussion with local officials about location of nuclear power stations • Discussions with local officials	• The Shearon Harris Nuclear Power Plant is located within 50 miles of the southeastern corner of Guilford County. • The previous Guilford County hazard mitigation plan included nuclear power plant emergency and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • A nuclear accident is unlikely to occur, but could cause severe damage in the event of a major incident.

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?
Pipeline Failure	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included pipeline failure and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • There have been several pipeline failures that occurred within the county, including two in 1978 on a line leading eastward from Greensboro's tank farm and one caused by digging near Lake Brandt in 1987.
Resource Shortage (Water/Fuel)	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included resource shortage and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Resource shortages of both fuel and water have occurred in the county in the past and are likely to occur again in the future.
Transportation Incident	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included transportation incident and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Given the number of transportation corridors and hubs located within Guilford County, it is highly likely that more transportation incidents will occur in the future.

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?
MAN-MADE/INTENTIONAL HAZARDS			
Civil Disturbance	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included civil disturbance and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Although there have not been any major civil disturbances in the county in many years, there is some possibility that this could impact the county in the future.
Cyber-Security Threat	YES	• Review of FEMA's Multi-Hazard Identification and Risk Assessment • Review of the Guilford County HIRA • Discussions with local officials	• The previous Guilford County hazard mitigation plan included cyber-security threats and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • Cyber-security threats can occur without regard to specific location, so it was evaluated in this plan.
Terrorism	YES	• Review of the Guilford County HIRA • Review of local official knowledge • Discussions with local officials	• The previous Guilford County hazard mitigation plan included terrorism and it is a hazard addressed in the County's Hazard Identification and Risk Assessment document. • There are several high profiles targets in the area that caused the planning team to determine that the hazard should be evaluated further.

4.5 HAZARD IDENTIFICATION RESULTS

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

NATURAL HAZARDS	BIOLOGICAL HAZARDS
☐ Avalanche	☑ Bioterrorism
☑ Drought	☑ Public Health/Emerging Disease Threat
☑ Earthquake	**TECHNOLOGICAL HAZARDS**
☐ Erosion	☑ Building/Structure Collapse
☐ Expansive Soils	☑ Communications Systems Disruption/Failure
☑ Extreme Cold	☑ Energy/Power/Utility Failure
☑ Extreme Heat	☑ Hazardous Materials Incident
☑ Fire/Wildfire	☑ Nuclear Power Plant Emergency
☑ Flooding	☑ Pipeline Failure
☑ Hail	☑ Resource Shortage (Water/Fuel)
☑ Hurricane/Other Tropical Disturbance	☑ Transportation Incident
☐ Landslide	**MAN-MADE/INTENTIONAL HAZARDS**
☐ Land Subsidence	☑ Civil Disturbance
☐ Nor'easter	☑ Cyber-Security Threat
☐ Storm Surge	☑ Terrorism
☑ Thunderstorm (Wind and Lightning)	
☑ Tornado	
☐ Tsunami	
☐ Volcano	
☑ Winter Storm	

☑ = Hazard considered significant enough for further evaluation in the Guilford 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 Guilford County Hazard Mitigation Plan. It contains the following subsections:

Overview

- 5.1 Overview
- 5.2 Study Area
- 5.3 Climate Adaptation

Natural Hazards

- 5.4 Drought
- 5.5 Earthquake
- 5.6 Extreme Cold
- 5.7 Extreme Heat
- 5.8 Fire/Wildfire
- 5.9 Flooding
- 5.10 Hail
- 5.11 Hurricane / Other Tropical Disturbance
- 5.12 Thunderstorm (Wind and Lightning)
- 5.13 Tornado
- 5.14 Winter Storm

Biological Hazards

- 5.15 Bioterrorism
- 5.16 Public Health / Emerging Disease Threat

Technological Hazards

- 5.17 Building / Structure Collapse
- 5.18 Communications Systems Disruption / Failure
- 5.19 Energy / Power / Utility Failure
- 5.20 Hazardous Materials Incident
- 5.21 Nuclear Power Plant Emergency
- 5.22 Pipeline Failure
- 5.23 Resource Shortage (Water / Fuel)
- 5.24 Transportation Incident

Man-Made / Intentional Hazards

- 5.25 Civil Disturbance
- 5.26 Cyber-Security Threat
- 5.27 Terrorism

Conclusion

- 5.28 Conclusions on Hazard Risk
- 5.29 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 Guilford 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 Guilford County Hazard Mitigation Planning Team as it relates to unique historical or anecdotal hazard information for Guilford County or a participating municipality within it.

The following hazards were identified:

- **Natural**
  - Drought
  - Extreme Cold
  - Extreme Heat
  - Fire/Wildfire
  - Flooding
  - Hail
  - Hurricane / Other Tropical Disturbance
  - Thunderstorm (wind and lightning)
  - Tornado
  - Winter Storm
- **Biological**
  - Bioterrorism
  - Public Health / Emergency Disease Threat
- **Technological**
  - Building / Structure Collapse
  - Communications Systems Disruption / Failure
  - Energy / Power / Utility Failure
  - Hazardous Materials Incident
  - Nuclear Power Plant Emergency
  - Pipeline Failure
  - Resource Shortage (Water / Fuel)
  - Transportation Incident
- **Man-Made / Intentional**
  - Civil Disturbance
  - Cyber-Security Threat
  - Terrorism

5.2 STUDY AREA

Guilford County includes 10 municipalities: Gibsonville, Greensboro, High Point, Jamestown, Oak Ridge, Pleasant Garden, Sedalia, Stokesdale, Summerfield, and Whitsett. **Table 5.1** provides a summary table of the participating jurisdictions. In addition, **Figure 5.1** provides a base map, for reference, of Guilford County.

TABLE 5.1: PARTICIPATING JURISDICTIONS IN THE GUILFORD COUNTY HAZARD MITIGATION PLAN

Guilford County	
Gibsonville	Pleasant Garden
Greensboro	Sedalia
High Point	Stokesdale
Jamestown	Summerfield
Oak Ridge	Whitsett

FIGURE 5.1: GUILFORD COUNTY BASE MAP

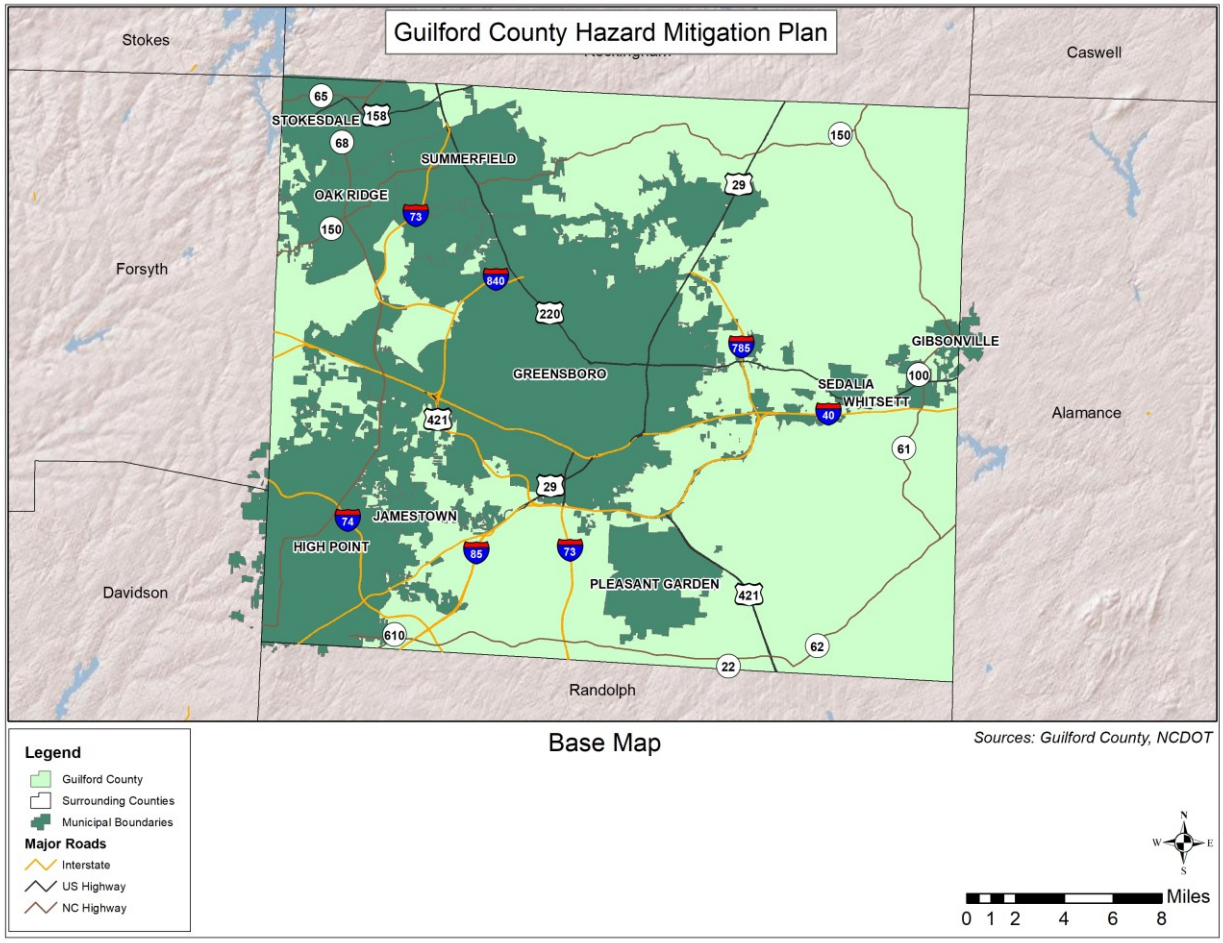


Table 5.2 lists each significant hazard for Guilford County and identifies whether or not it has been determined to be a specific hazard of concern for the 10 municipal jurisdictions and the county's unincorporated areas. This is the based on the best available data and information from the Guilford County Hazard Mitigation Planning Team. (● = hazard of concern)

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN GUILFORD COUNTY

Jurisdiction	Natural												Biological	
	Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding	Hail	Hurricane / Other Tropical Disturbance	Thunderstorm – Wind	Thunderstorm – Lightning	Tornado	Winter Storm	Bioterrorism	Public Health / Emerging Disease Threat
Guilford County														
Gibsonville	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Greensboro	●	●	●	●	●	●	●	●	●	●	●	●	●	●
High Point	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Jamestown	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Oak Ridge	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Pleasant Garden	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Sedalia	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Stokesdale	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Summerfield	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Whitsett	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●	●	●	●	●

TABLE 5.2 SUMMARY OF IDENTIFIED HAZARD EVENTS IN GUILFORD COUNTY (CONTINUED)

Jurisdiction	Technological							Man-Made		
	Building / Structure Collapse	Communications Systems Disruption / Failure	Energy / Power / Utility Failure	Hazardous Materials Incident	Nuclear Power Plant Emergency	Resource Shortage (Water / Fuel)	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Guilford County										
Gibsonville	●	●	●	●	●	●	●	●	●	●
Greensboro	●	●	●	●	●	●	●	●	●	●
High Point	●	●	●	●		●	●	●	●	●
Jamestown	●	●	●	●		●	●	●	●	●
Oak Ridge	●	●	●	●		●	●	●	●	●
Pleasant Garden	●	●	●	●	●	●	●	●	●	●
Sedalia	●	●	●	●	●	●	●	●	●	●
Stokesdale	●	●	●	●		●	●	●	●	●
Summerfield	●	●	●	●		●	●	●	●	●
Whitsett	●	●	●	●	●	●	●	●	●	●
Unincorporated Area	●	●	●	●	●	●	●	●	●	●

5.3 CLIMATE ADAPTATION

The *Piedmont Together Climate Adaptation Report* is a climate adaptability report that has been developed for the Piedmont Triad Region (including Guilford County) and is based upon a wealth of

information and data analysis.[1] Much of the data indicates that the primary factor in altering the global climate is greenhouse gas emissions from human activities. Guilford County appears to be fundamentally changing due to climate change which has resulted in more violent thunderstorms, higher temperatures, increased drought risk, greater winter precipitation, and more intense hurricanes. These changes are expected to continue in the foreseeable future for the county and the region. Primary public health concerns as a result of climate change impacts in the Piedmont Triad include impacts of the urban heat island effect upon city residents and outdoor workers, impacts to rural workers (primarily farmworkers), health of elderly in both rural an urban communities, and impacts to local ecosystems.

Compared to other regions of the nation and world, the impacts of climate change on Guilford County may less dramatically alter lifestyles and the environment from today's "normal," but there will be fundamental changes to the Piedmont Triad which are discussed (where applicable) in the hazard profiles found in this section.

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.

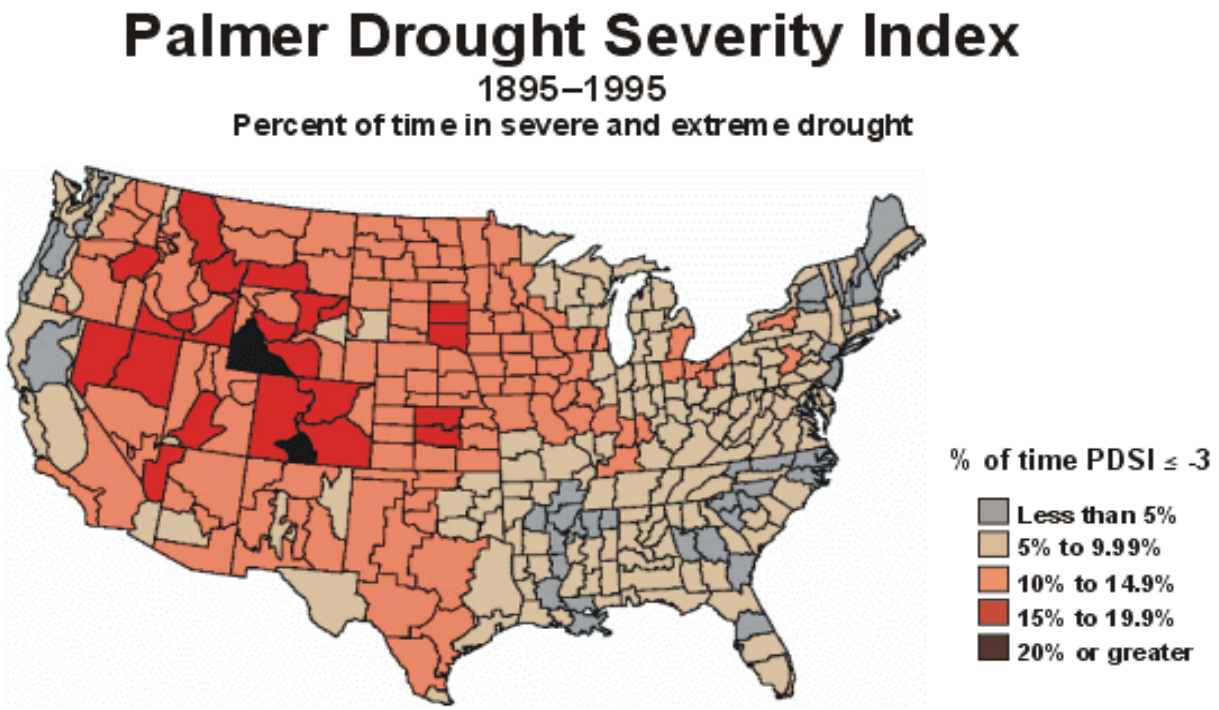
Source: Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy, FEMA

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.

[1] https://www.ptrc.org/Home/ShowDocument?id=7238

The Palmer Drought Severity Index (PDSI) is based on observed drought conditions and ranges 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 is 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, North Central North Carolina has a relatively low risk for drought hazard compared to much of the country. However, local areas may experience much more severe and/or frequent drought events than what is represented on the Palmer Drought Severity Index map. Furthermore, it is assumed that Guilford 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 reports data on North Carolina drought conditions from 2000 to 2019. It classifies drought by county on a scale of D0 to D4 where:

- D0: Abnormally Dry
- D1: Moderate Drought

- D2: Severe Drought
- D3: Extreme Drought
- D4: Exceptional Drought

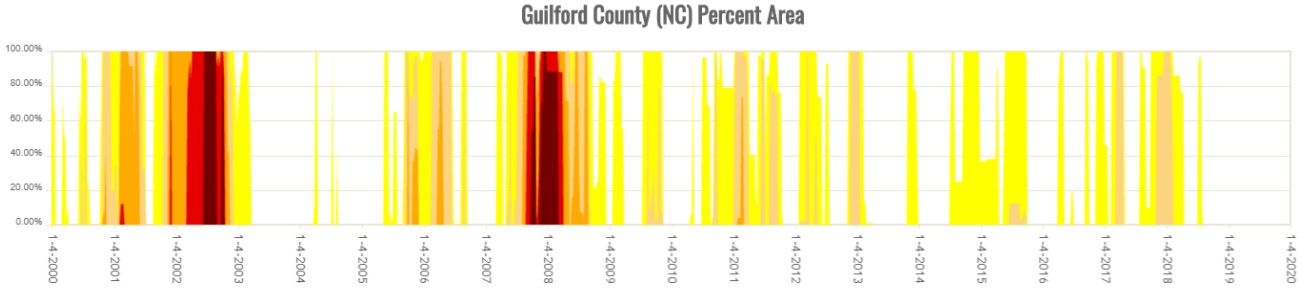
According to the United States Drought Monitor records, Guilford County experienced at least moderate drought occurrences in 15 of the last 19 years (2000-2018). **Table 5.4** shows the most severe drought condition reported for each year in Guilford County and **Figure 5.3** shows historic data on these drought conditions in time-series format. However, it should be noted that the most severe classification reported is based on monthly regional averages, and conditions in Guilford County may actually have been less or more severe than what is reported.

TABLE 5.4: HISTORICAL DROUGHT OCCURRENCES IN GUILFORD COUNTY

Year	Drought Level
2000	SEVERE
2001	EXTREME
2002	EXCEPTIONAL
2003	ABNORMAL
2004	ABNORMAL
2005	SEVERE
2006	SEVERE
2007	EXCEPTIONAL
2008	EXCEPTIONAL
2009	MODERATE
2010	MODERATE
2011	SEVERE
2012	MODERATE
2013	MODERATE
2014	ABNORMAL
2015	MODERATE
2016	ABNORMAL
2017	MODERATE
2018	MODERATE
2019*	NONE

Source: United States Drought Monitor
**Data only available through 7/2/19*

FIGURE 5.3: HISTORIC DROUGHT CONDITIONS IN GUILFORD COUNTY



Source: United States Drought Monitor

Data from the National Centers for Environmental Information (NCEI) was also reviewed to obtain additional information on historical drought events in the county, but no events were reported in Guilford County. However, according to the *Piedmont Together Climate Adaptation Report*, 2012 was the year in which 64% of the continental U.S. experienced drought that directly led to over 100 deaths. Additionally, the report found that in the 2007-2008 drought, North Carolina recorded heat stress levels of almost 16 hospitalizations per 100,000 people and almost 13 deaths per 100,000, with 84% of these hospitalizations occurring between June and August.

5.4.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Guilford County has a probability level of likely (10 to 100 percent annual probability) for future drought events. This hazard may vary slightly by location but each area has an equal probability of experiencing a drought. However, historical information also indicates that there is a much lower probability for extreme, long-lasting drought conditions. Additionally, according to the *Piedmont Together Climate Adaptation Report*, the increased likelihood of drought due to climate change will 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 Guilford 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. Although the general public may be subject to water restrictions during extreme drought events, it is unlikely that public confidence in the state's governance would be impacted severely as a result of a drought.

Responders

Although drought would have many of the same impacts on responders as it would on the public, the overall effects would be relatively limited when compared to other hazards could potentially have on responders. Since a drought is typically a slowly developing event, the risk and exposure that responders would face is minimal.

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. Normal operations would very likely be able to continue throughout the event and there would likely be little change to the program's management overall.

Built Environment (Property, Facilities, and Infrastructure)

Water Use

Drought has the potential to affect Guilford 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 may have an impact on personal property to some degree, though generally these restrictions are meant to protect life safety by ensuring adequate supplies of drinking water for consumption and other critical purposes.

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. 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

Drought can have a detrimental effect on agricultural and agribusiness industry sectors which account for more than 16 percent of North Carolina's workforce.[2] 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.

Environment

Agriculture
The agriculture sector of Guilford County is particularly susceptible to drought damage. **Table 5.5** shows there are 962 farms in Guilford County, with 90,750 acres in total farmland.[3] Agricultural drought has the potential to directly affect much of the land in Guilford County. Agricultural areas at particular risk are cropland and pastures.

TABLE 5.5: GUILFORD COUNTY FARMLAND OVERVIEW

Census of Agriculture (2012)	
Number of Farms	962
Total Land in Farms, Acres	90,750
Average Farm Size, Acres	94

Source: United States Department of Agriculture

Crops
Prolonged periods of dry weather are the most difficult and damaging problem faced by crop growers and agricultural suppliers. According to the USDA's Census of Agriculture, Guilford County has 36,234 acres of harvested cropland.

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 5.6** for a list of Guilford 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.

[2] United States Department of Agriculture. (2018). *North Carolina Agricultural Statistics.* Retrieved October 8, 2019, from https://www.nass.usda.gov/Statistics_by_State/North_Carolina/Publications/Annual_Statistical_Bulletin/AgStat/Section01.pdf
[3] Guilford *County: Census of agriculture—2012*. Retrieved October 8, 2019, from https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_2_County_Level/North_Carolina/

TABLE 5.6: GUILFORD COUNTY CROP INFORMATION

Crops	Acres Harvested	Farms
Corn for Grain	3,761	70
Corn of Silage or Greenchop	1,961	21
Wheat for grain, all	5,256	104

Source: United States Department of Agriculture

Livestock[4]

Table 5.7 shows the type of livestock in Guilford County, including the quantity of livestock and the number of farms. 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 5.7: GUILFORD COUNTY LIVESTOCK (2012)

Livestock	Number	Farms
Cattle and calves inventory	14,861	378
Beef cows	5,293	300
Milk cows	1,484	11
Hogs and pigs	14,502	29
Layers inventory	306,500	83
Broilers and other meat-type chickens sold	Information withheld	5

Source: United States Department of Agriculture

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.

[4] North Carolina Division of Water Resources. (2009). *The water connection: Water resources, drought and the hydrologic cycle in North Carolina*. Retrieved May 7, 2012, from http://www.ncwater.org/Reports_and_Publications/primer/The_Water_Connection_Booklet_9x12_150dpi.pdf

5.5 EARTHQUAKE

5.5.1 Background

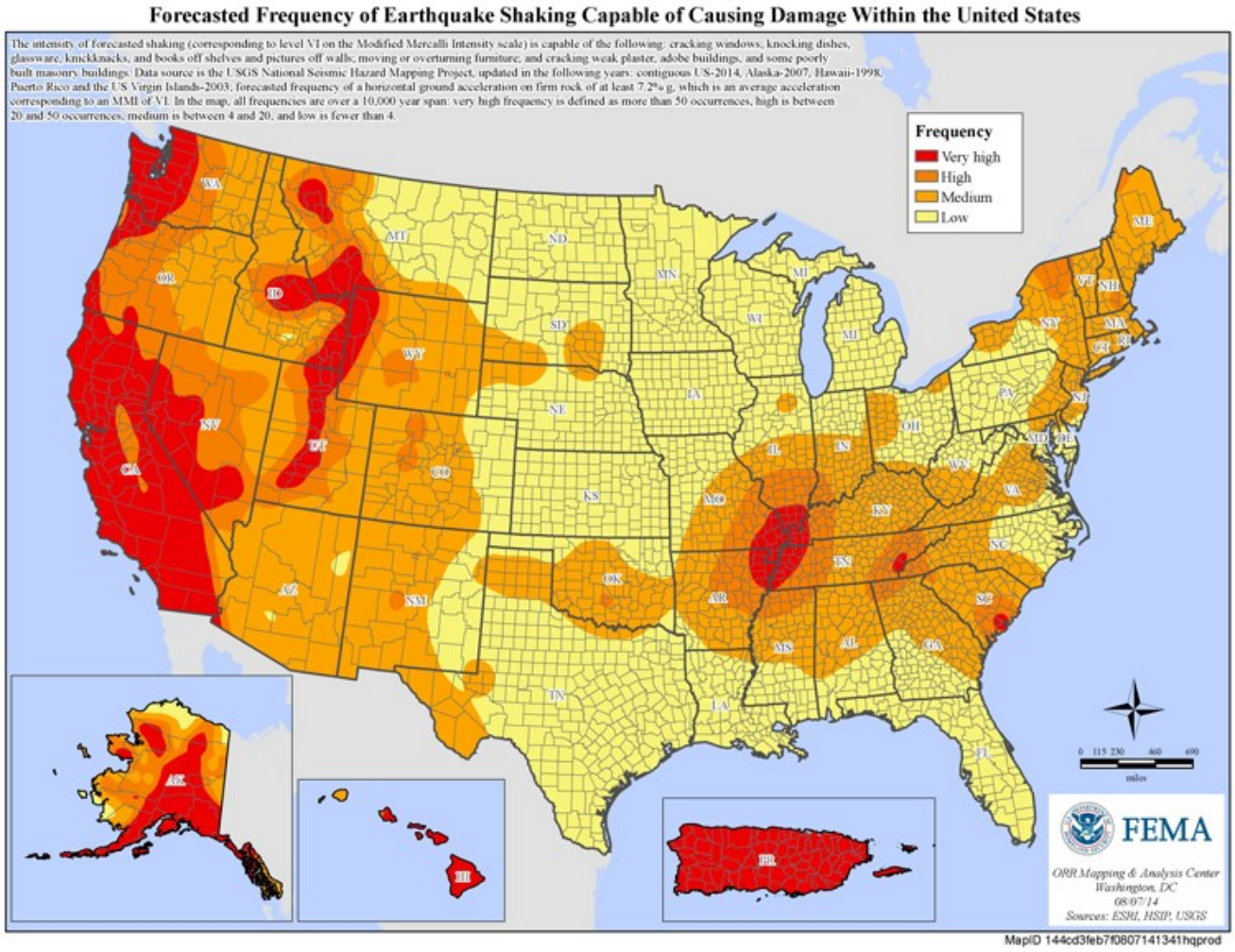
An earthquake is movement or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles, cause damage to property measured 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 State does face moderate risk to less frequent, less intense earthquake events. **Figure 5.4** shows relative seismic risk for the United States.

FIGURE 5.4: UNITED STATES EARTHQUAKE HAZARD MAP



Source: Federal Emergency Management Agency, 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 5.8**). 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 5.9**.

TABLE 5.8: 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 5.9: 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
XII	CATASTROPHIC	Total destruction; trees fall; ground rises and falls in waves.	> 8.1

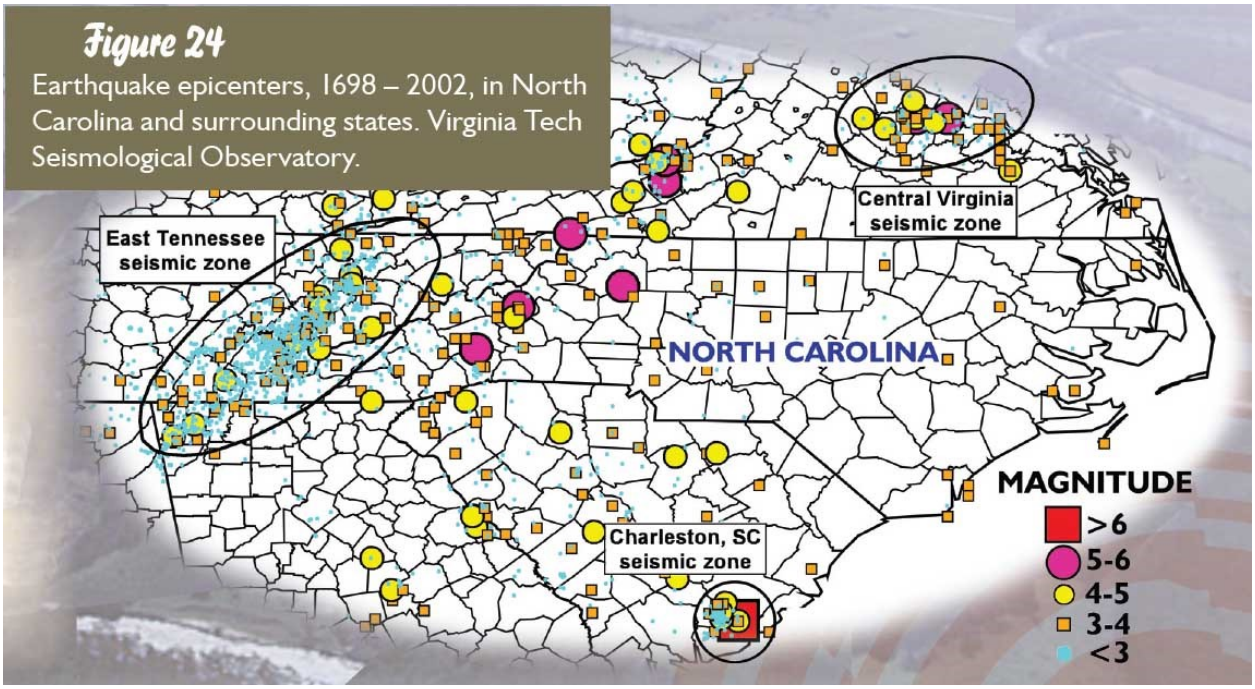
Source: Federal Emergency Management Agency

5.5.2 Location and Spatial Extent

Much of North Carolina is subject to earthquakes, with the western and southeast region most vulnerable to a very damaging earthquake. The state is affected by the Charleston seismic zone in South Carolina, the East Tennessee seismic zone in Tennessee, and the Central Virginia seismic zone in Virginia. The Charleston fault has generated earthquakes measuring greater than 8 on the Richter Scale during

the last 200 years. In addition, there are several smaller fault lines throughout North Carolina. **Figure 5.5** is a map showing geological and seismic information for North Carolina.

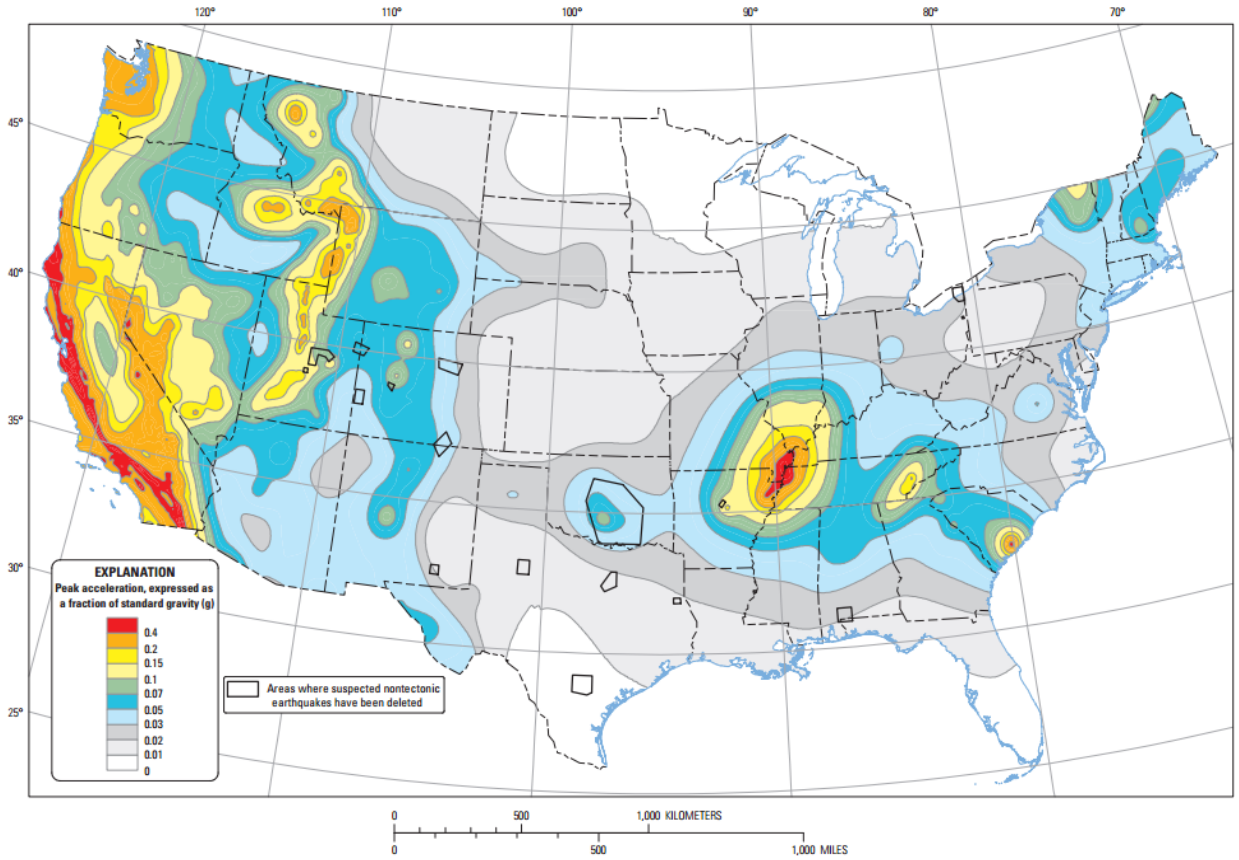
FIGURE 5.5: GEOLOGICAL AND SEISMIC INFORMATION FOR NORTH CAROLINA



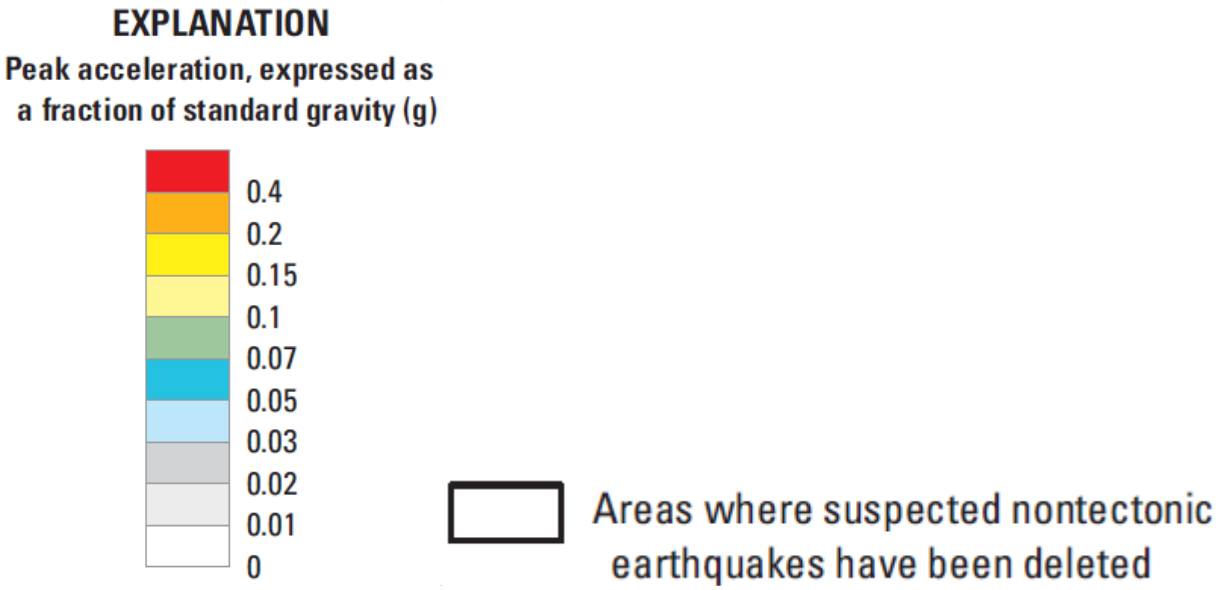
Source: Virginia Tech Seismological Observatory, North Carolina Department of Environmental Quality

Figure 5.6 shows the intensity level associated with Guilford County, based on the national USGS map of peak acceleration with 10 percent probability of exceedance in 50 years. It 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 10 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, Guilford County lies within an approximate zone of 0.02 to 0.05 peak ground acceleration. This indicates that the county as a whole exists within an area of low to moderate seismic risk.

FIGURE 5.6: 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

5.5.3 Historical Occurrences

At least five earthquakes are known to have affected Guilford County since 1852. The strongest of these measured a IV on the Modified Mercalli Intensity (MMI) scale. **Table 5.10** provides a summary of earthquake events reported by the National Geophysical Data Center between 1638 and 1985. **Table 5.11** presents a detailed occurrence of each event including the date, distance from the epicenter, magnitude, and Modified Mercalli Intensity (if known).[5]

TABLE 5.10: SUMMARY OF SEISMIC ACTIVITY IN GUILFORD COUNTY (1638-1985)

Location	Number of Occurrences	Greatest MMI Reported	Richter Scale Equivalent
Gibsonville	0	--	--
Greensboro	5	IV	4.3
High Point	0	--	--
Jamestown	0	--	--
Oak Ridge	0	--	--
Pleasant Garden	0	--	--
Sedalia	0	--	--
Stokesdale	0	--	--
Summerfield	0	--	--
Whitsett	0	--	--
Unincorporated Area	0	--	--
GUILFORD COUNTY TOTAL	**5**	**IV**	**4.3**

Source: National Geophysical Data Center

TABLE 5.11: SIGNIFICANT SEISMIC EVENTS IN GUILFORD COUNTY (1638-1985)

Location	Date	Epicentral Distance	Magnitude	MMI
Gibsonville				
None Reported	--	--	--	--
Greensboro				
Greensboro	4/29/1852	--	--	III
Greensboro	12/23/1875	205.0	--	IV
Greensboro	2/21/1916	252.0	--	III
Greensboro	3/12/1960	348.0	--	IV
Greensboro	11/20/1969	183.0	4.3	IV
High Point				
None Reported	--	--	--	--
Jamestown				
None Reported	--	--	--	--
Oak Ridge				
None Reported	--	--	--	--

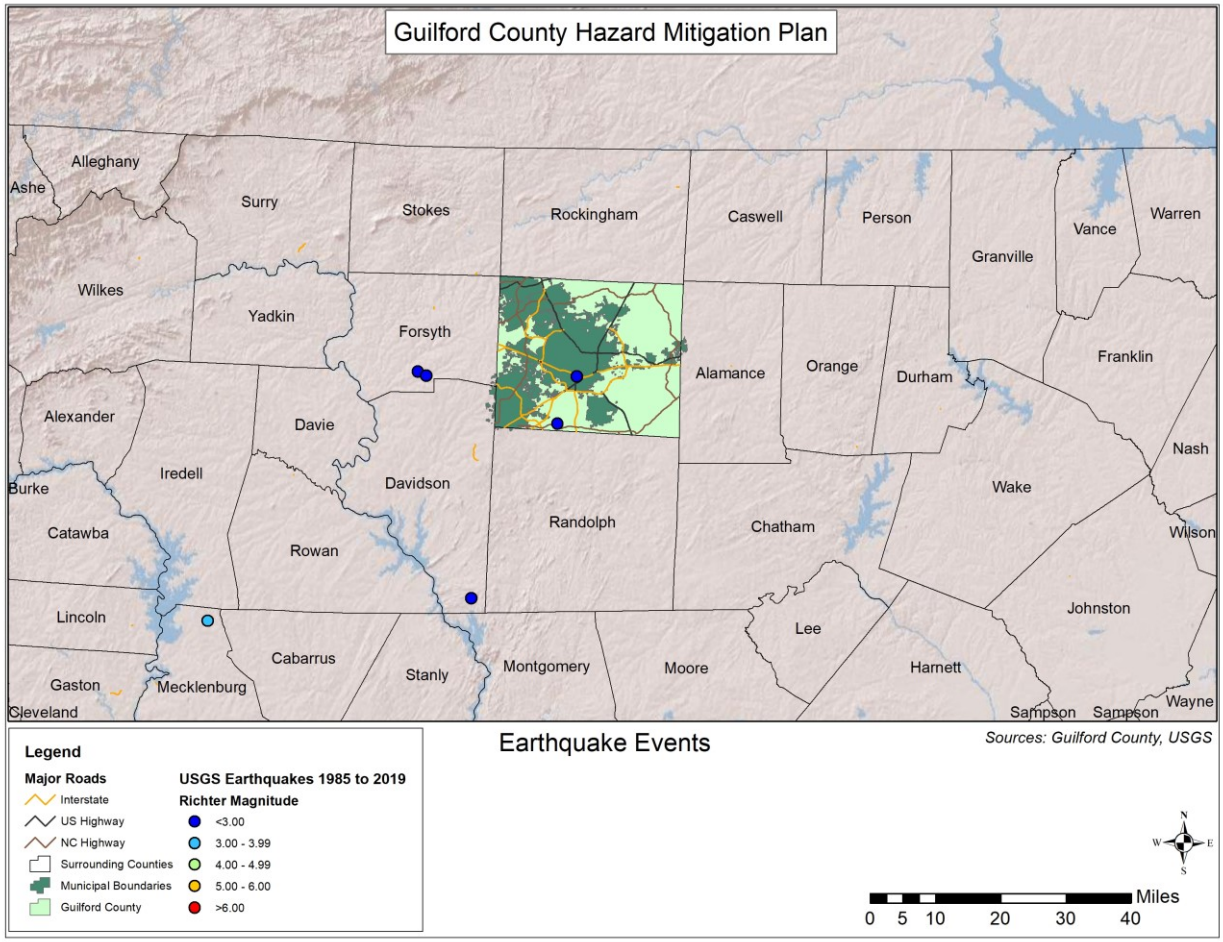
[5] Due to reporting mechanisms, not all earthquakes events were recorded during this time. Furthermore, some are missing data, such as the epicenter location, due to a lack of widely used technology. In these instances, a value of "unknown" is reported.

Location	Date	Epicentral Distance	Magnitude	MMI
Pleasant Garden				
None Reported	--	--	--	--
Sedalia				
None Reported	--	--	--	--
Stokesdale				
None Reported	--	--	--	--
Summerfield				
None Reported	--	--	--	--
Whitsett				
None Reported	--	--	--	--
Unincorporated Area				
None Reported	--	--	--	--

Source: National Geophysical Data Center

Figure 5.7 shows the earthquake epicenters that have occurred in and around Guilford County starting in 1985 and running through 2019.

FIGURE 5.7: HISTORIC EARTHQUAKES, 1985-2019



Source: United States Geological Survey, 2018, supplemented by information provided by Guilford County

In addition to those earthquakes specifically affecting Guilford County, a list of earthquakes that have caused damage throughout North Carolina is presented below in **Table 5.12.**

TABLE 5.12: EARTHQUAKES WHICH HAVE CAUSED NOTABLE DAMAGE IN NORTH CAROLINA

Date	Location	Richter Scale (Magnitude)	MMI (Intensity)	MMI in North Carolina
12/16/1811 - 1	NE Arkansas	8.5	XI	VI
12/16/1811 - 2	NE Arkansas	8.0	X	VI
12/18/1811 - 3	NE Arkansas	8.0	X	VI
01/23/1812	New Madrid, MO	8.4	XI	VI
02/071812	New Madrid, MO	8.7	XII	VI
04/29/1852 *	Wytheville, VA	5.0	VI	VI
08/31/1861	Wilkesboro, NC	5.1	VII	VII
12/23/1875 *	Central Virginia	5.0	VII	VI
08/31/1886	Charleston, SC	7.3	X	VII
05/31/1897	Giles County, VA	5.8	VIII	VI
01/01/1913	Union County, SC	4.8	VII	VI
02/21/1916 *	Asheville, NC	5.5	VII	VII
07/08/1926	Mitchell County, NC	5.2	VII	VII
11/03/1928	Newport, TN	4.5	VI	VI
05/13/1957	McDowell County, NC	4.1	VI	VI
07/02/1957	Buncombe County, NC	3.7	VI	VI
11/24/1957	Jackson County, NC	4.0	VI	VI
10/27/1959 **	Chesterfield, SC	4.0	VI	VI
07/13/1971	Newry, SC	3.8	VI	VI
11/30/1973	Alcoa, TN	4.6	VI	VI
11/13/1976	Southwest Virginia	4.1	VI	VI
05/05/1981	Henderson County, NC	3.5	VI	VI
08/23/2011	Louisa County, VA	5.8	VII	V

*This event is accounted for in the Guilford County occurrences.

** Conflicting reports on this event, intensity in North Carolina could have been either V or VI

Source: This information compiled by Dr. Kenneth B. Taylor and provided by Tiawana Ramsey of NCEM. Information was compiled from the National Earthquake Center, Earthquakes of the US by Carl von Hake (1983), and a compilation of newspaper reports in the Eastern Tennessee Seismic Zone compiled by Arch Johnston, CERI, Memphis State University (1983).

5.5.4 Probability of Future Occurrences

The probability of significant, damaging earthquake events affecting Guilford County is unlikely. However, it is possible that future earthquakes resulting in light to moderate perceived shaking and damages ranging from none to very light will affect the county. The annual probability level for the county is estimated between 1 and 10 percent (possible).

5.5.5 Consequence Analysis

People (The Public and Public Confidence)

Earthquakes in Guilford County generally are not high impact events that cause injury or death as most are low to moderate in terms of impact. 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, because Guilford County is only likely to experience a moderate earthquake magnitude at a maximum. Since there would be minimal damage to structures and infrastructure, responders would likely not be impacted in their ability to respond to an earthquake. If there were any major collapses of buildings or infrastructure however, responders will need to take care when accessing these structures in case they have become structurally unstable and unsafe. It should also be noted that because earthquakes can knock items such as candles off shelves or damage gas lines, fires are possible directly after an event. This may cause additional emergency calls for responders and create a burden on response operations.

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 during an event. The most likely impact may be downed communication networks which could cause interruptions to normal 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 damaged 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.

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.

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

[6] Association of Bay Area Governments. (2012). *Guide to housing vulnerable resources*. Retrieved October 8, 2019, from http://quake.abag.ca.gov/housing/

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.

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

Economy
There are several sources of economic loss associated with an earthquake including property damage and business interruption costs; cost to repair public transportation, communication, or utility systems; and debris removal costs. Historically, there have been very minor 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 Guilford 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. For instance, a ruptured pipeline could release dangerous materials that could damage the surrounding environment, but the likelihood of an earthquake causing this in Guilford County is relatively low.

5.6 EXTREME COLD

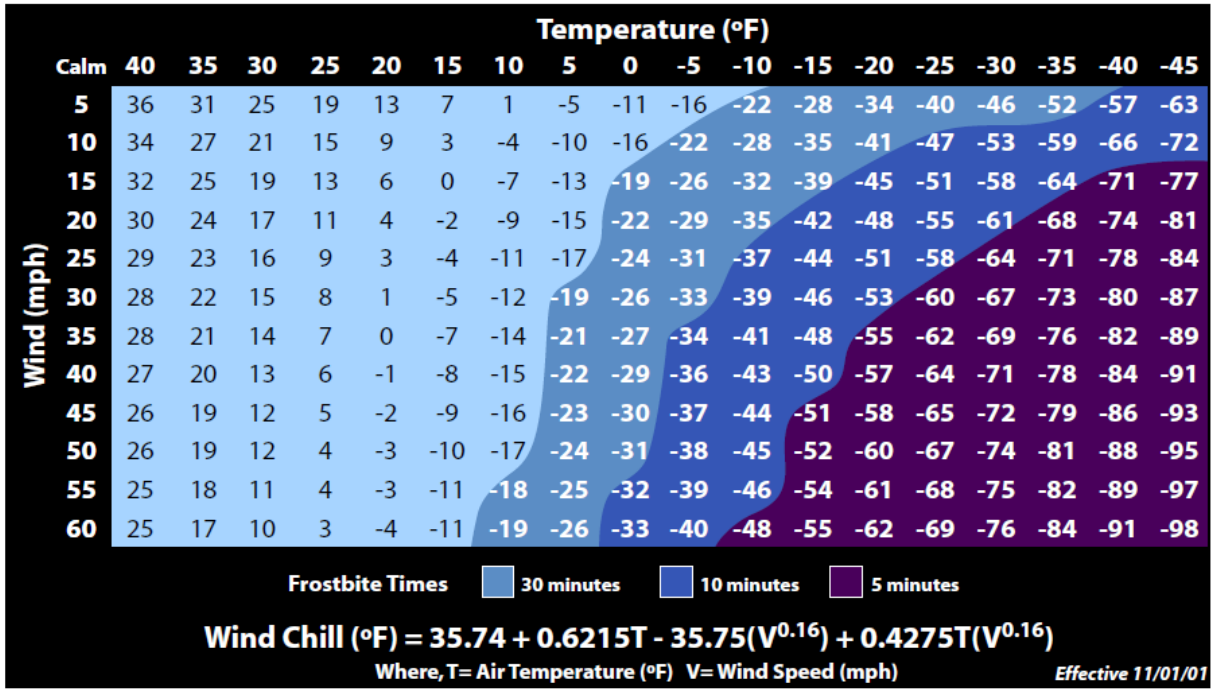
5.6.1 Background

What constitutes extreme cold and its effect varies across different regions of the United States, according to the National Weather Service (NWS). In the South and other areas relatively unaccustomed to cold weather, temperatures near or below freezing (32°F) are considered extreme cold. Freezing temperatures in these areas may cause damage to citrus fruit crops and other vegetation and may cause pipes to freeze and burst in homes that are poorly insulated or without heat. However, in the North, temperatures well below 0°F are considered extreme cold, and long cold spells can cause rivers to freeze, which can disrupt shipping, and ice jams to form, which can lead to flooding.

Prolonged exposure to extreme cold temperatures can lead to serious health problems, including hypothermia, cold stress, frostbite, or freezing, and infants and the elderly are most susceptible to these conditions. Extreme cold events are most likely to occur during January and February, and even areas that normally experience mild winters can be hit with extreme cold.

Extreme cold conditions can be the result of cold temperatures and high winds, a combination known as “wind chill.” The Wind Chill Temperature index, in **Figure 5.8**, shows the apparent temperature combining the effect of wind and air temperatures on exposed skin.

FIGURE 5.8: WIND CHILL TEMPERATURE INDEX



Source: National Weather Service, National Oceanic and Atmospheric Administration

The NWS issues wind chill advisories when wind chill hazards are potentially hazardous. Wind chill warnings are issued when wind chill temperatures are life threatening. Criteria for issuing wind chill warnings and advisories are set locally. For example, in Rochester, New York, wind chill advisories are issued when the wind chill temperature is expected to fall between -15°F to -24°F, and wind chill warnings are issued when wind chill temperature is expected to fall at or below -25°F. This warning system should not be mistaken as describing the extent or magnitude of extreme cold; rather, it is intended to provide advanced notice of excessive cold conditions for the protection of life and property.

5.6.2 Location and Spatial Extent

Extreme cold typically impacts a large area and cannot be confined to any geographic or political boundaries. The entire county is susceptible to extreme cold conditions.

5.6.3 Historical Occurrences

Data from the National Centers for Environmental Information was used as one source to determine historical extreme cold events in Guilford County. One event was reported:

February 3, 1996 – *Cold/Wind Chill* – a cold/wind chill event impacted Guilford County for two days.
In addition, information from the State Climate Office of North Carolina was reviewed to obtain historical temperature records in the county. Temperature information has been recorded in Guilford

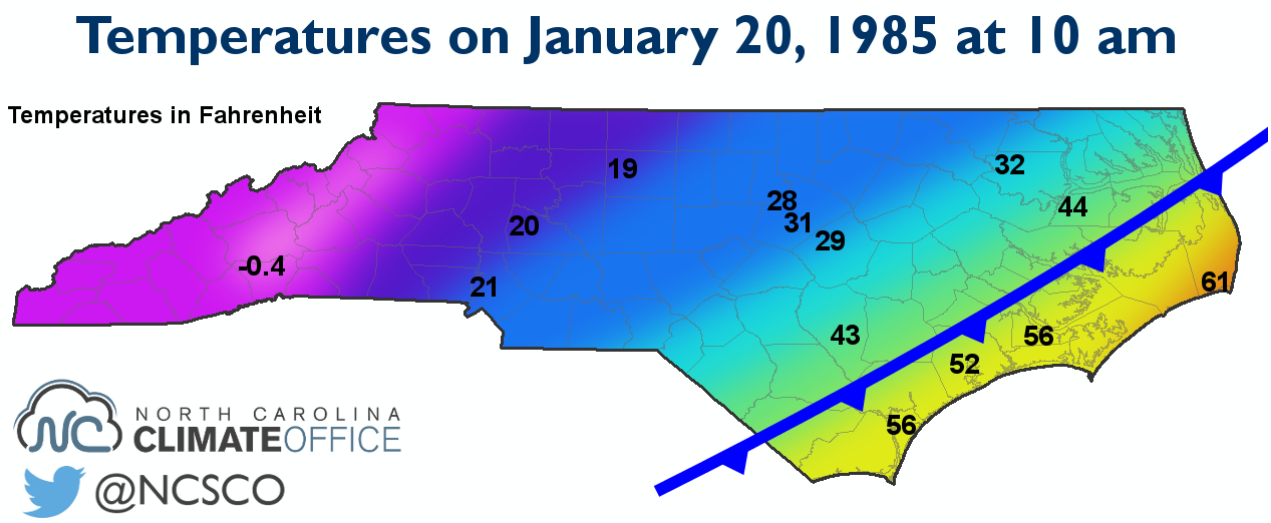
County since 1903. The recorded minimum for the county can be found below in **Table 5.13**. **Figure 5.9** shows temperatures across the state on the day when the coldest temperature was recorded.

TABLE 5.13: LOWEST RECORDED TEMPERATURES IN GUILFORD COUNTY

Location	Date	Temperature (°F)
Greensboro Airport	01/21/1985	-8
Greensboro Airport	1/27/1940	-7
Greensboro Airport	1/29/1940	-7
High Point	1/21/1985	-7
Greensboro Airport	1/20/1985	-6

Source: State Climate Office of North Carolina

FIGURE 5.9: RECORDED TEMPERATURES ON COLDEST DAY IN GUILFORD COUNTY



Source: State Climate Office of North Carolina

The State Climate Office also reports average minimum temperatures at various stations in the county. The most centralized location is in Greensboro. **Table 5.14** shows the average minimum temperatures from 1971 to 2000 at the Greensboro Airport observation station which can be used as a general baseline for the county.

TABLE 5.14: AVERAGE MINIMUM TEMPERATURE IN GUILFORD COUNTY

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Max (°F)	28.2 °F	30.6 °F	37.8 °F	45.5 °F	54.7 °F	63.5 °F	68.1 °F	66.8 °F	60.1 °F	47.5 °F	38.6 °F	31.4 °F

Source: State Climate Office of North Carolina

5.6.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Guilford County has a probability level of possible (1 to 10 percent annual probability) for future extreme cold events to impact the county.

5.6.5 Consequence Analysis

People (The Public and Public Confidence)

Extreme cold can affect many people and to varying degrees. Often the elderly and very young are susceptible to the most detrimental impacts, but hypothermia and frostbite can plague anyone. Extreme cold events generally have minimal effects on public confidence.

Responders

Extreme cold can also affect responders who are often more susceptible to the effects of cold weather because they are forced to be exposed to the elements to complete tasks for their jobs. In these cases, responders could be negatively impacted by extreme cold.

Continuity of Operations

Extreme cold 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.

Built Environment (Property, Facilities, and Infrastructure)

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

Economy

An extreme cold 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 cold 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 cold as many plants and animals that are not able to withstand lower temperatures may die off and crops and livestock may be impacted by unusually low temperatures, resulting in death or illness.

5.7 EXTREME HEAT

5.7.1 Background

Extreme heat, like drought and extreme cold, 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[1]. 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 5.10**, uses air temperature and humidity to determine the heat index or apparent temperature. **Table 5.15** 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.

FIGURE 5.10: HEAT INDEX CHART

	Relative Humidity (in percent)																				
Air Temp (in F)		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

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

TABLE 5.15: 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

Urban areas are at greater risk to heat effects. 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.

5.7.2 Location and Spatial Extent

Excessive heat typically impacts a large area and cannot be confined to any geographic or political boundaries. The entire county is susceptible to extreme heat conditions. Additionally, according to the *Piedmont Together Climate Adaptation Report*, the Piedmont Triad has the state's largest elderly and aging populations—the fastest growing age demographic both nationally and regionally—making heat stress one of the leading climate adaptability priorities for the region and Guilford County.

5.7.3 Historical Occurrences

According to the *Piedmont Together Climate Adaptation Report*, the 10 warmest years in recorded history have occurred since 1997. Data from the National Centers for Environmental Information was used to determine historical extreme heat and heat wave events in Guilford County. Two events were reported:

July 22, 1998 –*Heat* – Excessive heat plagued central North Carolina during July 22 through July 23. Maximum temperatures reached the 98 to 103 degree range combined with dew points in the 78 to 80 degree range with little wind to give heat index values of around 110 degrees for several hours each afternoon. To make matters worse, the minimum temperatures did not fall below 80 at several locations and those that did achieved that feat for only an hour or two. Strong thunderstorms ended the 2 day excessive heat ordeal on the evening of the 23 when rain cooled the environment enough to send temperatures into the lower 70s at most locations.

May 27, 2008 –*Heat* – North Carolina A&T State University Senior Chad Wiley collapsed after a voluntary football workout on campus Tuesday May 27th. Chad was 22 years old.

In addition, information from the State Climate Office of North Carolina was reviewed to obtain historical temperature records in the county. Temperature information has been recorded in Guilford County since 1903. The five highest temperatures recorded for the county can be found below in **Table**

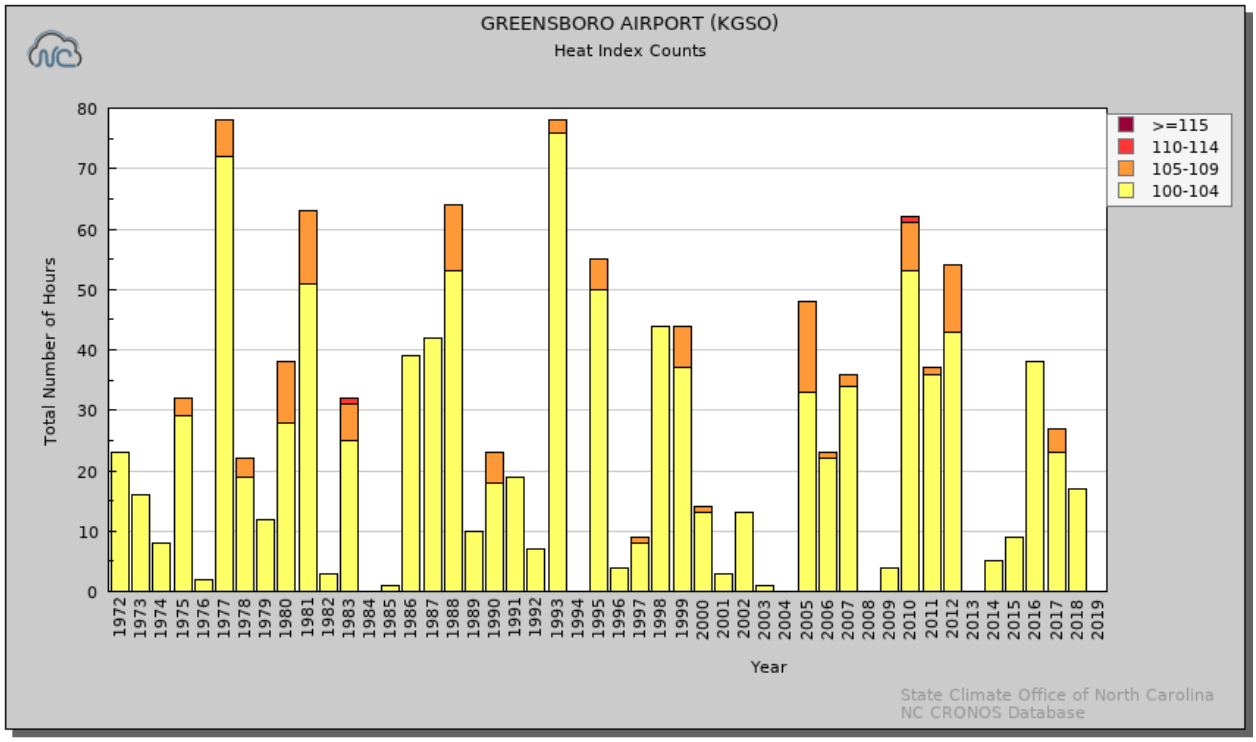
5.16. In addition, **Figure 5.11** shows the number of times the heat index value was recorded at over 100°F at Greensboro Airport since 1972.

TABLE 5.16: HIGHEST RECORDED TEMPERATURE IN GUILFORD COUNTY

Location	Date	Temperature (°F)
High Point	07/20/1926	106
High Point	7/29/1952	106
High Point	6/28/1934	105
High Point	7/15/1954	105
High Point	8/31/1932	105

Source: State Climate Office of North Carolina

FIGURE 5.11: HEAT INDEX COUNTS AT GREENSBORO AIRPORT (1972-2019)



**Counts are defined as the number of hours in a given year where the heat index reached or exceeded 100 degrees Fahrenheit*

Source: State Climate Office of North Carolina

The State Climate Office also reports average maximum temperatures at various stations in the county. The most centralized location is in Greensboro. **Table 5.17** shows the average maximum temperatures from 1971 to 2000 at the Greensboro Airport Observation Station which can be used as a general baseline for the county.

TABLE 5.17: AVERAGE MAXIMUM TEMPERATURE IN GUILFORD COUNTY

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Avg. Max (°F)	47.2 °F	51.7 °F	60.3 °F	69.7 °F	76.9 °F	83.8 °F	87.6 °F	85.7 °F	79.4 °F	69.6 °F	59.9 °F	50.6 °F

Source: State Climate Office of North Carolina

5.7.4 Probability of Future Occurrences

Based on historical occurrence information, it is assumed that all of Guilford County has a probability level of likely (10 to 100 percent annual probability) for future extreme heat events to impact the county. Additionally, according to the *Piedmont Together Climate* Adaptation Report, the average increase in annual temperature for the Piedmont Triad is estimated to be 5°F and higher annual average temperatures will likely create a longer growing season that may be supportive of agriculture. However, these hot, dry summers and wetter winter conditions could stress farms. Furthermore, the increased likelihood of heat waves due to climate change will result in a higher number of rolling brown/blackouts and decreased air quality in the county.

5.7.5 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. People who are overweight, who overexert during work or exercise, and who are ill or are on certain medications are also at greater risk of suffering from heat-related illness. Risks from exposure to extreme heat include heat cramps, heat exhaustion, heat stroke, and death. Many of the impacts of extreme heat on people are the result of heat exhaustion or improperly functioning air conditioning units.

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. However, if an extreme heat event results in a large number of illnesses and fatalities, government organizations may be accused of failing to properly prepare for or respond to the threat, and public confidence could suffer.

Responders

Extreme heat can also affect responders who are often more susceptible to heat stroke and exhaustion due to the nature of their work. This work forces police and emergency medical providers to be exposed to the elements, physically exert themselves, or wear heavy personal protective equipment. In these cases, responders could be negatively impacted by extreme heat and will need to protect themselves and prepare 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. During times of extreme heat, air conditioning units work harder and require more electricity, making brownouts and blackouts possible if electricity demands exceed generation. Extreme heat can also cause transportation infrastructure such as roads, bridges, railways, and runways to buckle, crack, or shatter.

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 indoors, causing them to reduce overall spending and negatively impact businesses in the community. Additionally, extreme heat events can also result in decreased worker productivity as high temperatures can result in decreased energy, loss of concentration, and heat-related illness in workers. This can cause disruptions to the regular working of the local economy. Extended periods of extreme heat may also disrupt the local economy if agricultural, dairy, and livestock production declines, resulting in income loss for farmers and other related industries as well as increased prices for consumers.

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. Heat waves can also contribute to higher levels of air pollution since air becomes stagnant and traps emitted pollutants, often causing increased levels of surface ozone.

5.8 FIRE/WILDFIRE

5.8.1 Background

Wildfire

A wildfire is any outdoor fire (i.e. grassland, forest, brush land) that is not under control, supervised, or prescribed.[8] 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 North Carolina, a majority of fires are caused by debris burning.

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.

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

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.

Structure Fire

According to the National Fire Protection Association (NFPA), any fire in or on a building or other structure is considered a structure fire even if the structure itself was not damaged. Mobile property used as a fixed structure, such as manufactured homes and portable buildings, are considered structures. In general, structure fires occur frequently in the United States and can have serious impacts such as death, injury and economic loss. Although structure fires can be caused by wildfires, in this plan, structure fires are categorized separately as a fires that are typically localized to the built environment and have generally been caused by humans.

The NFPA reports that, in 2018, structure fires that were not related to wildfire caused around $11 billion in property damage in the United States, with an average loss of around $22,244. Among the deadliest of these are fires that occur in nightclubs and other social establishments because they allow large numbers of people to congregate in a single location, thereby making egress difficult in situations where fires occur.

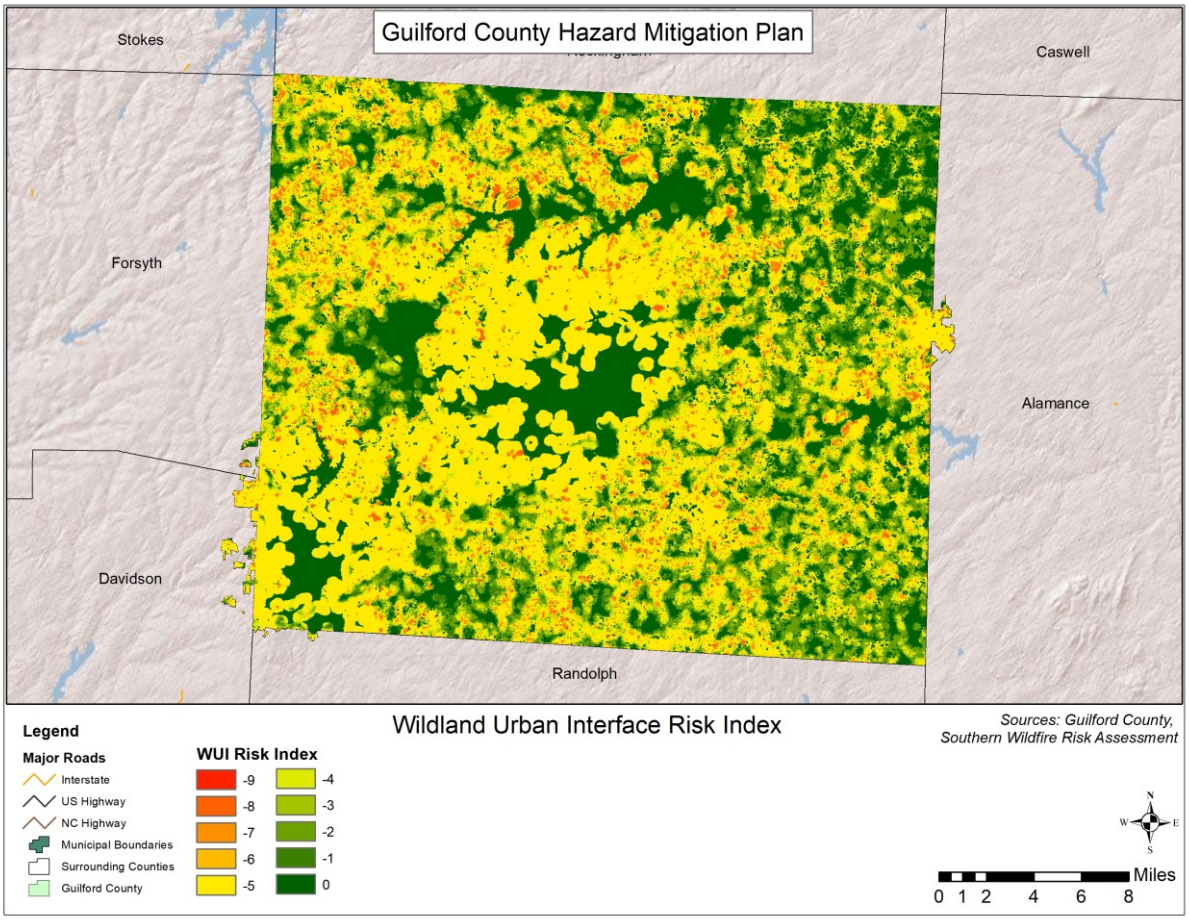
5.8.2 Location and Spatial Extent

Wildfire

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 Wildland Urban Interface Risk Index data shown in **Figure 5.12** below gives an indication of areas where there is higher risk to wildfire for people/property in Guilford County.

FIGURE 5.12: WILDLAND URBAN INTERFACE RISK INDEX IN GUILFORD COUNTY

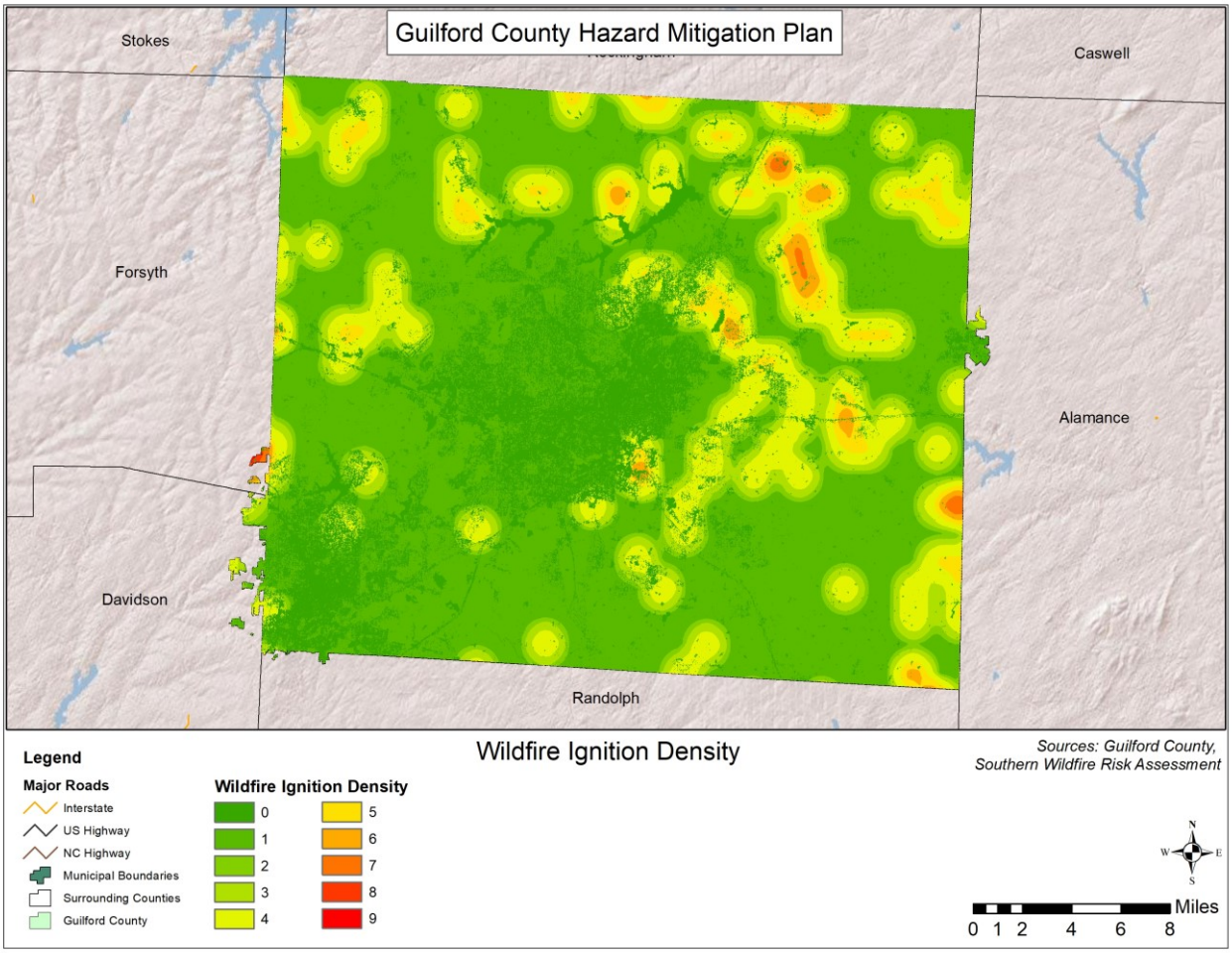


Source: Southern Wildfire Risk Assessment

Figure 5.13, Figure 5.14, **Figure 5.15**, **Figure 5.16**, **Figure 5.17**, **Figure 5.18**, **Figure 5.19**, **Figure 5.20**, **Figure 5.21**, **Figure 5.22**, and **Figure 5.23** show the Wildfire Ignition Density in Guilford 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.[9]

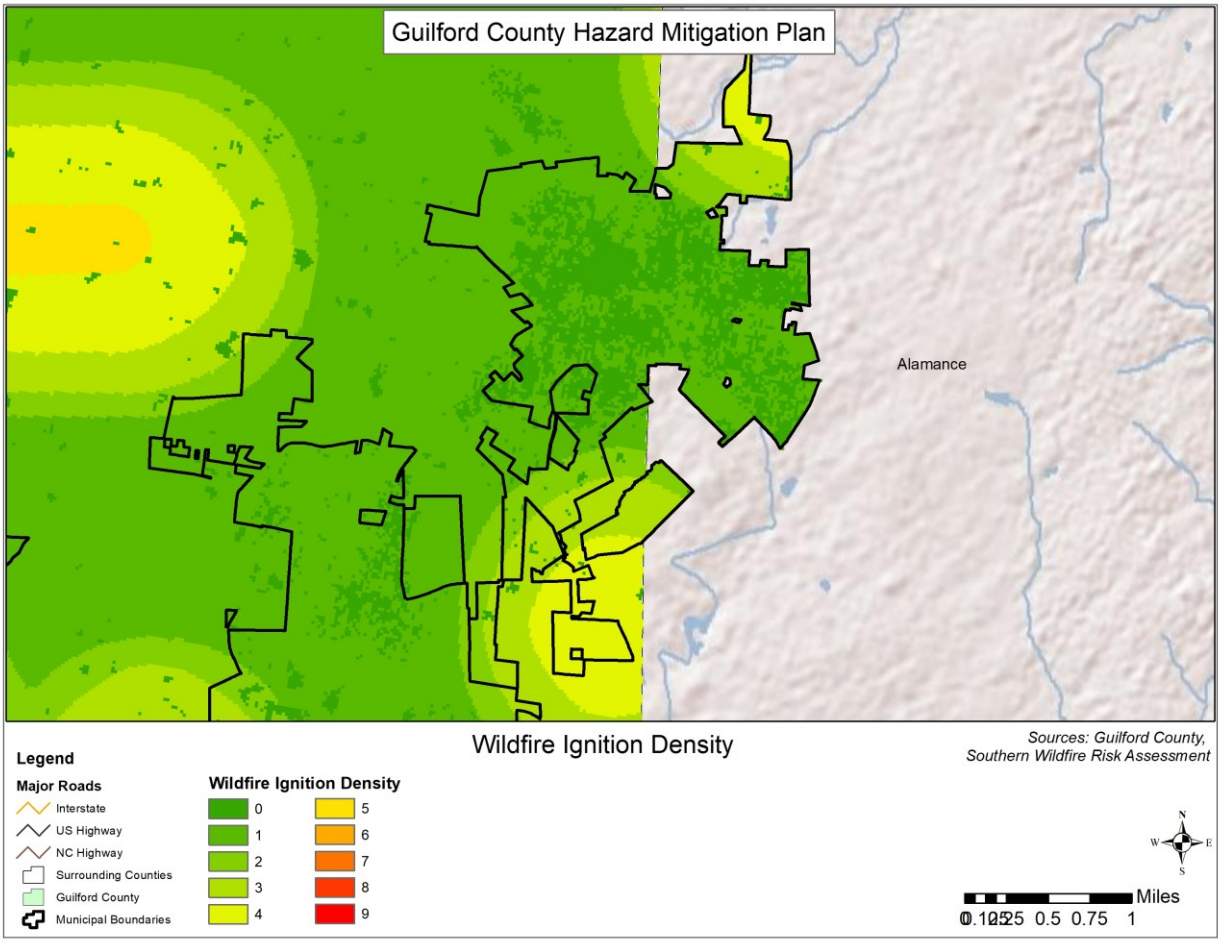
[9] Southern Wildfire Risk Assessment, 2014.

FIGURE 5.13: WILDFIRE IGNITION DENSITY IN GUILFORD COUNTY



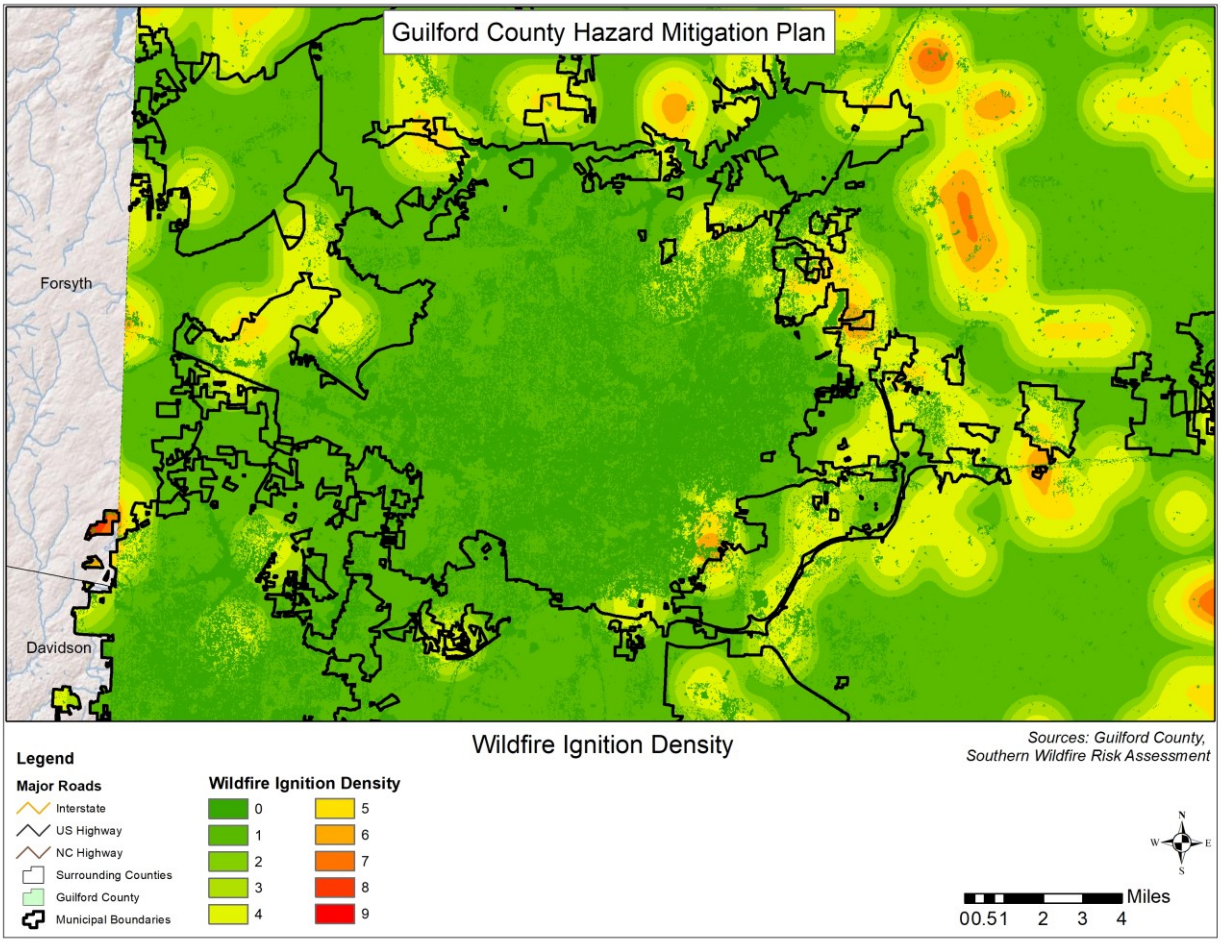
Source: Southern Wildfire Risk Assessment

FIGURE 5.14: WILDFIRE IGNITION DENSITY IN GIBSONVILLE



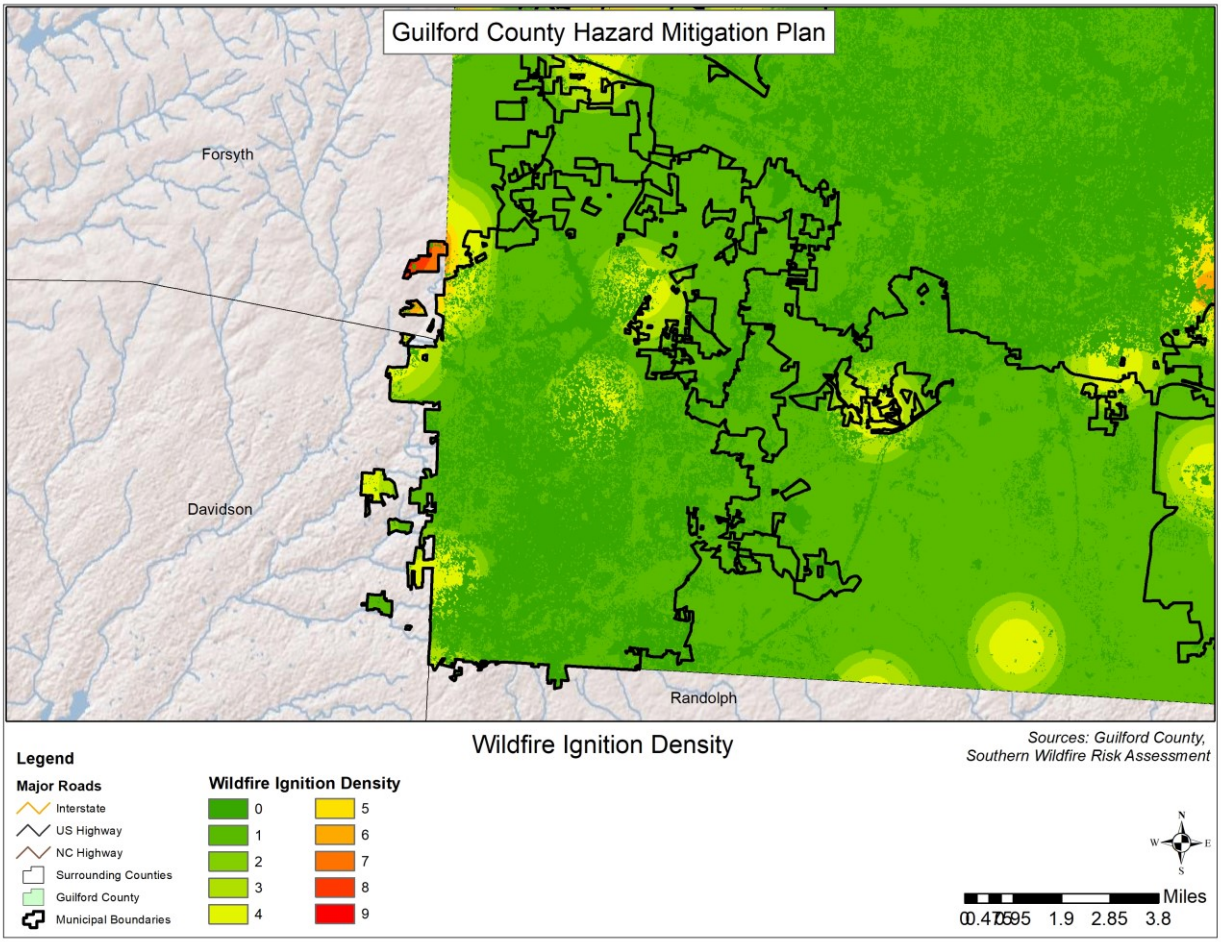
Source: Southern Wildfire Risk Assessment

FIGURE 5.15: WILDFIRE IGNITION DENSITY IN GREENSBORO



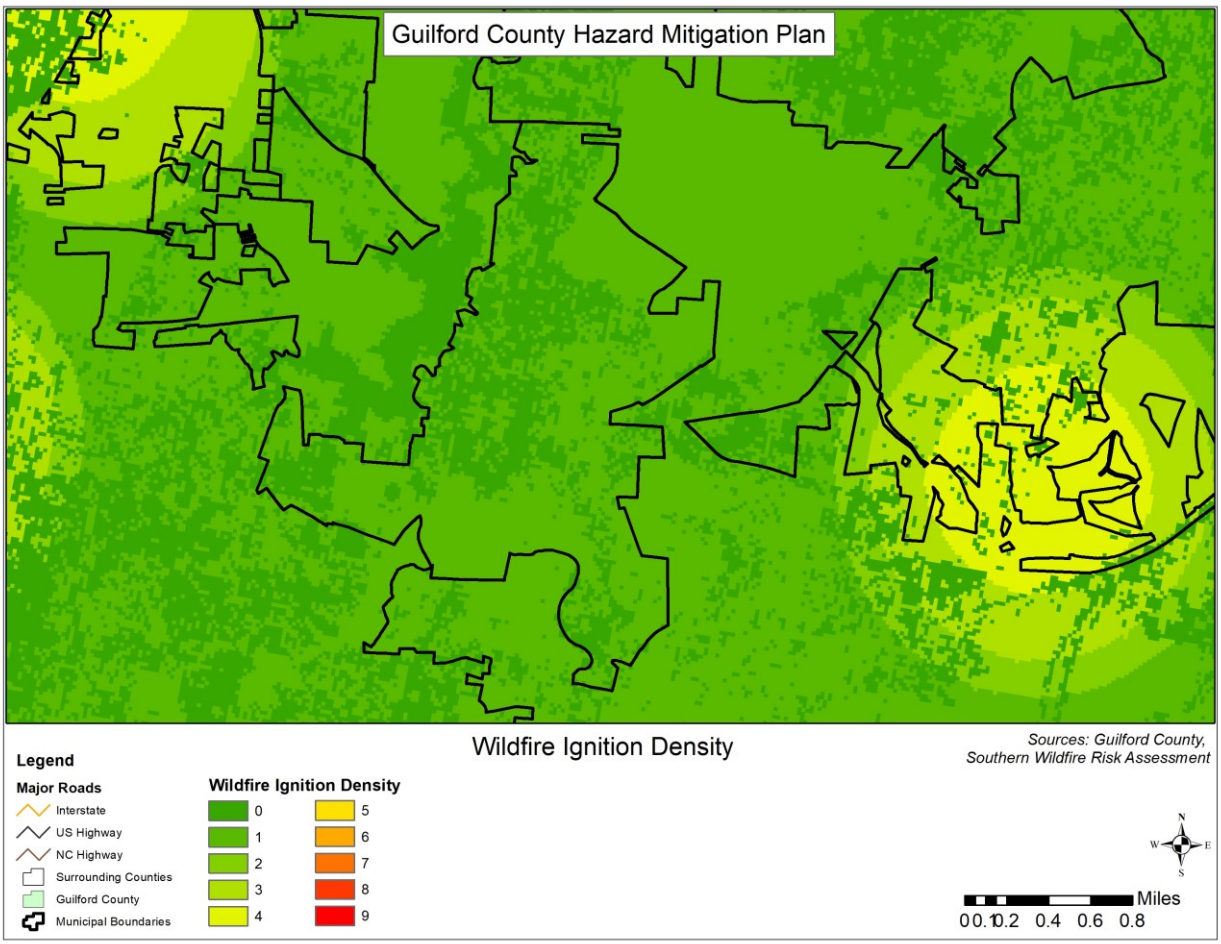
Source: Southern Wildfire Risk Assessment

FIGURE 5.16: WILDFIRE IGNITION DENSITY IN HIGH POINT



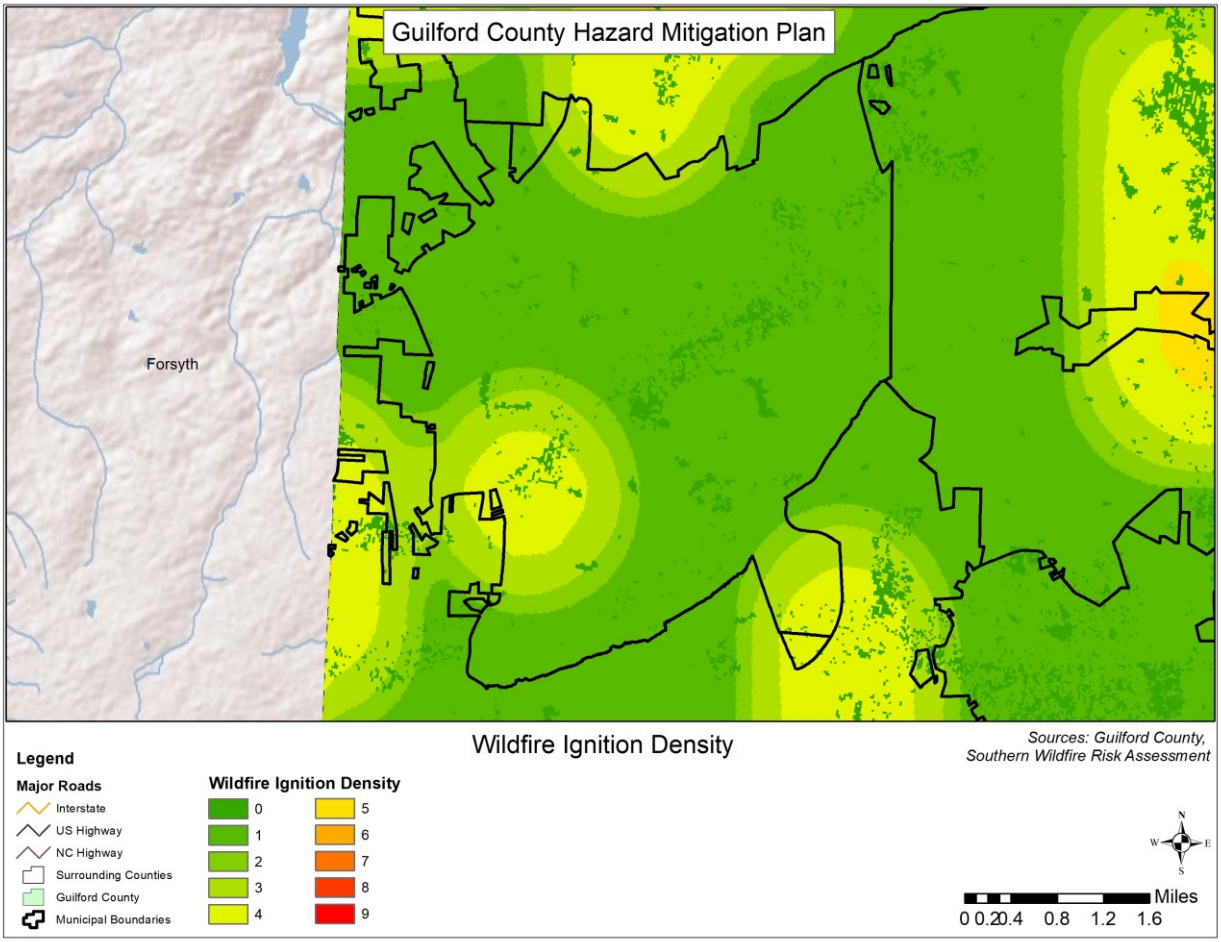
Source: Southern Wildfire Risk Assessment

FIGURE 5.17: WILDFIRE IGNITION DENSITY IN JAMESTOWN



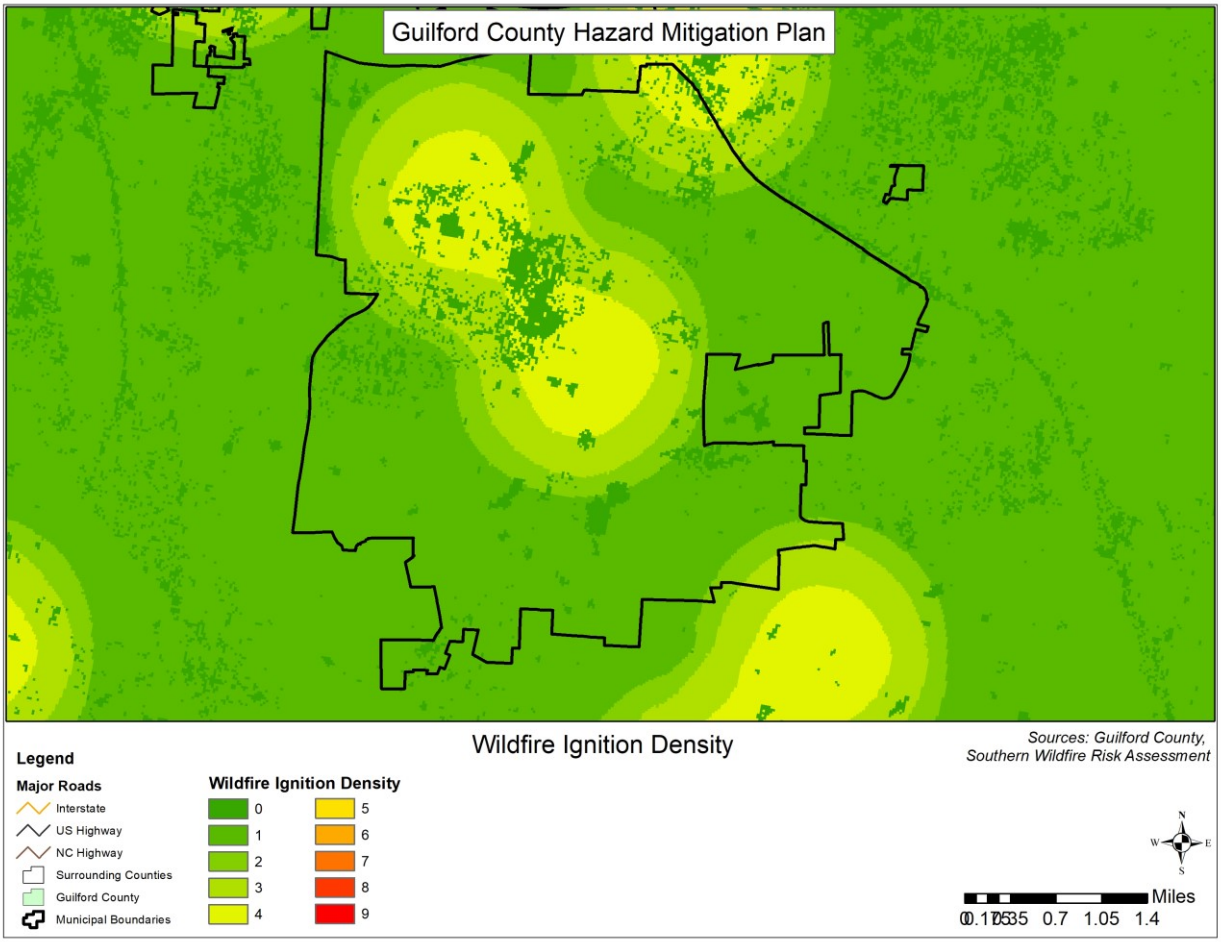
Source: Southern Wildfire Risk Assessment

FIGURE 5.18: WILDFIRE IGNITION DENSITY IN OAK RIDGE



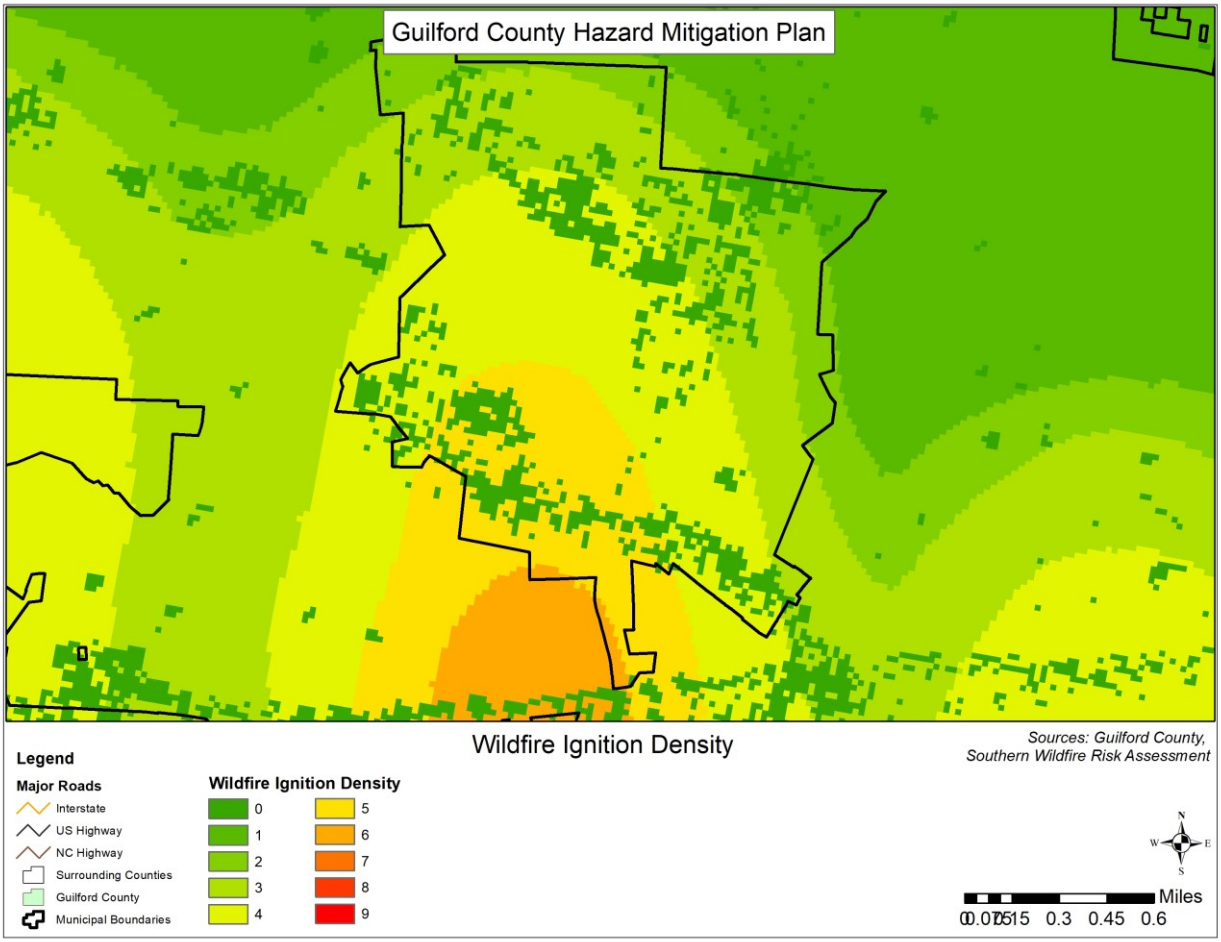
Source: Southern Wildfire Risk Assessment

FIGURE 5.19: WILDFIRE IGNITION DENSITY IN PLEASANT GARDEN



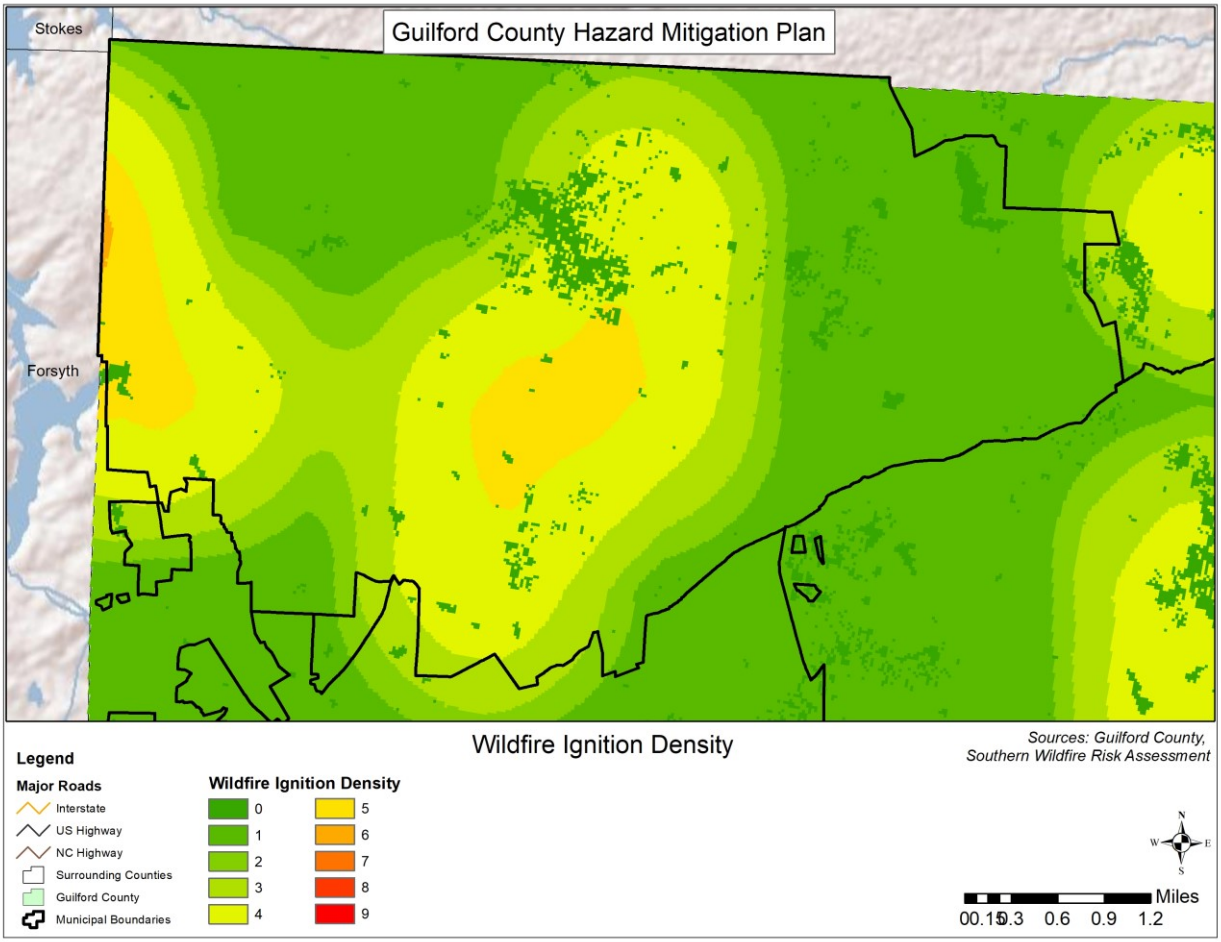
Source: Southern Wildfire Risk Assessment

FIGURE 5.20: WILDFIRE IGNITION DENSITY IN SEDALIA



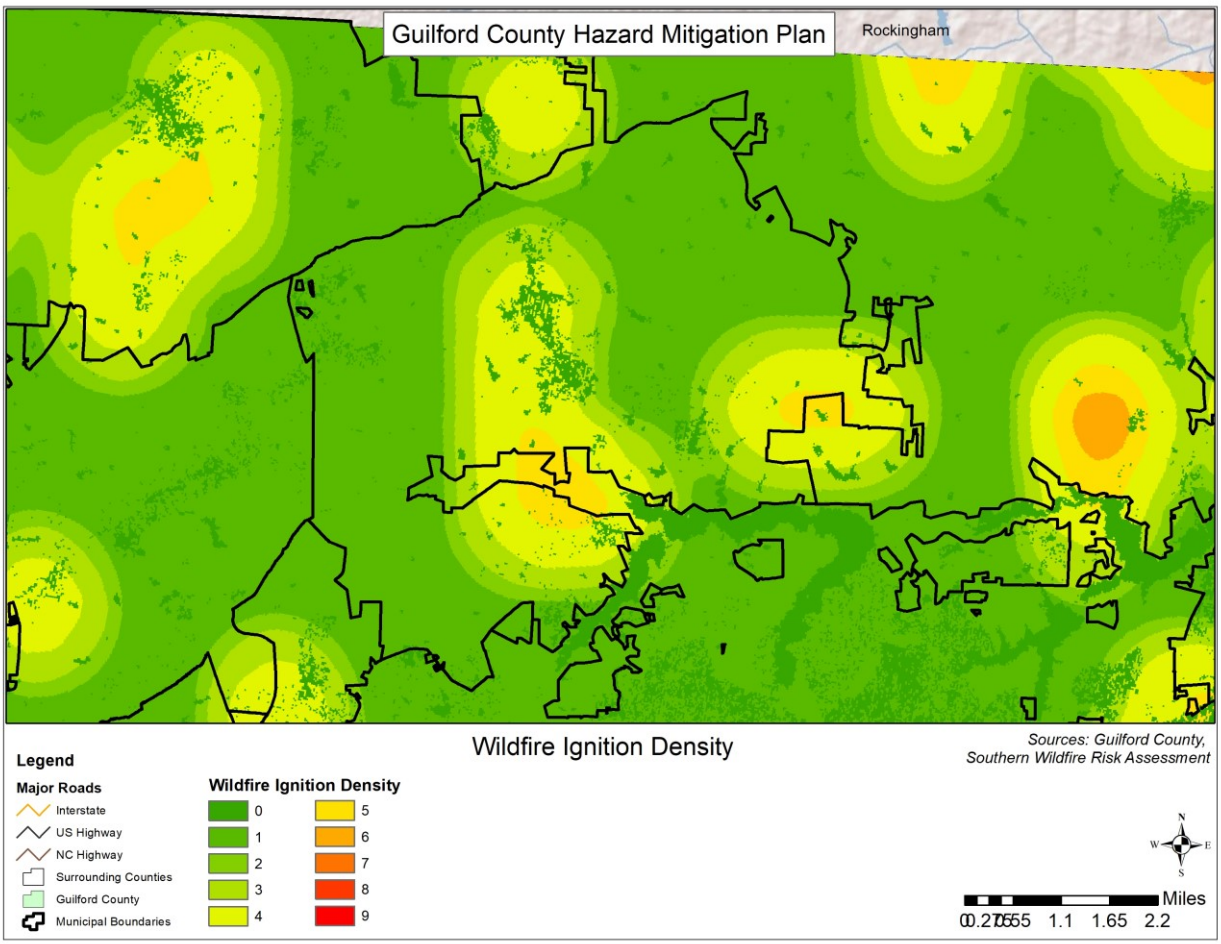
Source: Southern Wildfire Risk Assessment

FIGURE 5.21: WILDFIRE IGNITION DENSITY IN STOKESDALE



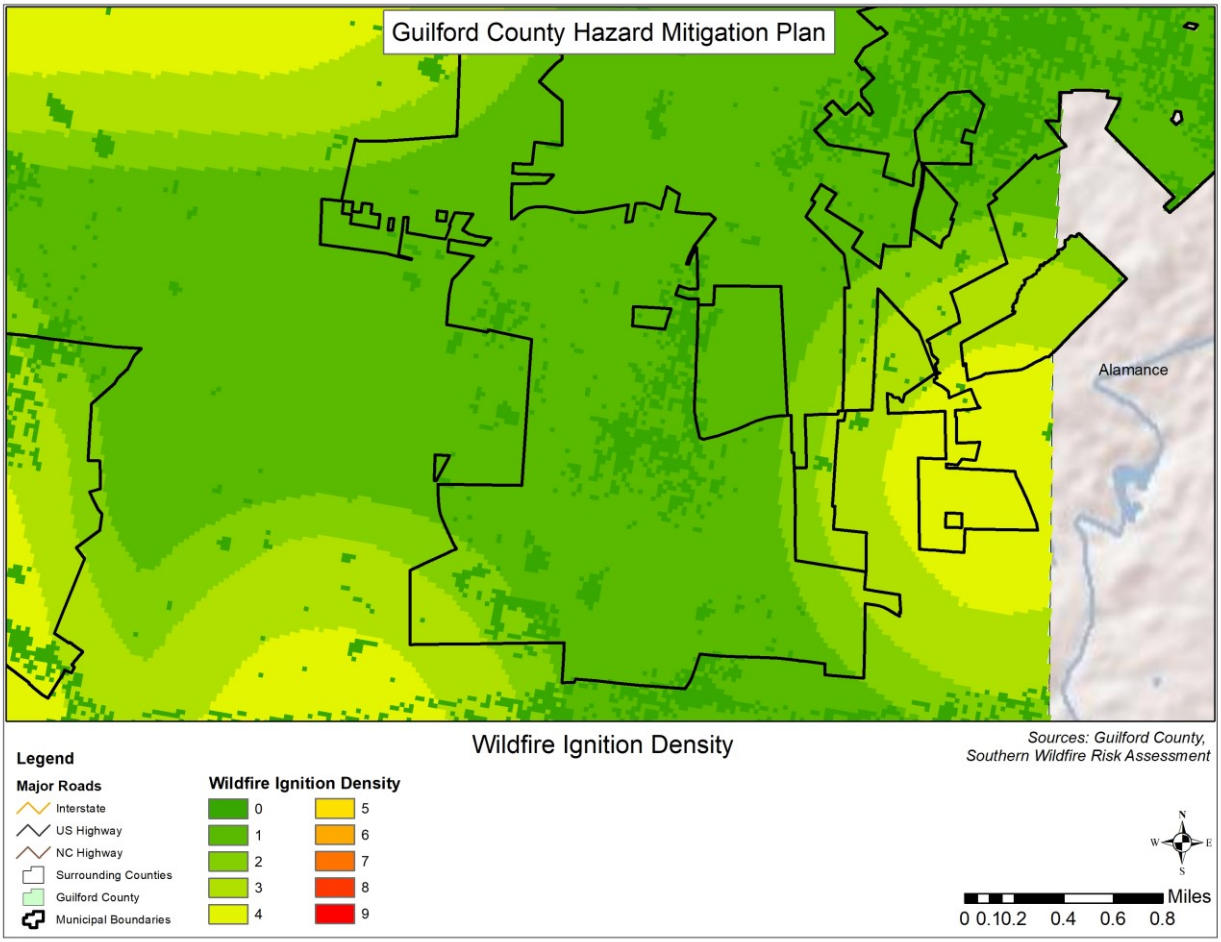
Source: Southern Wildfire Risk Assessment

FIGURE 5.22: WILDFIRE IGNITION DENSITY IN SUMMERFIELD



Source: Southern Wildfire Risk Assessment

FIGURE 5.23: WILDFIRE IGNITION DENSITY IN WHITSETT



Source: Southern Wildfire Risk Assessment

Structure Fire

Structure fires can occur anywhere within the county because there are structures located throughout the county and all structures are potentially vulnerable to a structure fire. A higher concentration of structure fires typically occurs in areas that are more densely populated because there are more structures in those areas, and therefore a higher likelihood that a fire will occur in any given structure. Therefore, areas in Guilford County with the densest concentration of urban development, such as Greensboro, are likely to be impacted most often by structure fires.

5.8.3 Historical Occurrences

Wildfire

Based on data from the North Carolina Forest Service (NCFS) from 2010 to 2019, Guilford County experienced an average of 65 wildfires annually which burn an average of 40.0 acres per year. The data indicates that most of these fires are small, averaging less than 1 acre per fire. **Table 5.18** lists the number of reported wildfire occurrences in the county between the years 2010 and 2019.

TABLE 5.18: HISTORICAL WILDFIRE OCCURRENCES IN GUILFORD COUNTY

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019*
Guilford County										
Number of Fires	27	61	41	52	139	89	61	88	53	42
Number of Acres	17.6	40.9	36.5	42.4	53.8	58.4	33.6	74.3	23.6	19.1

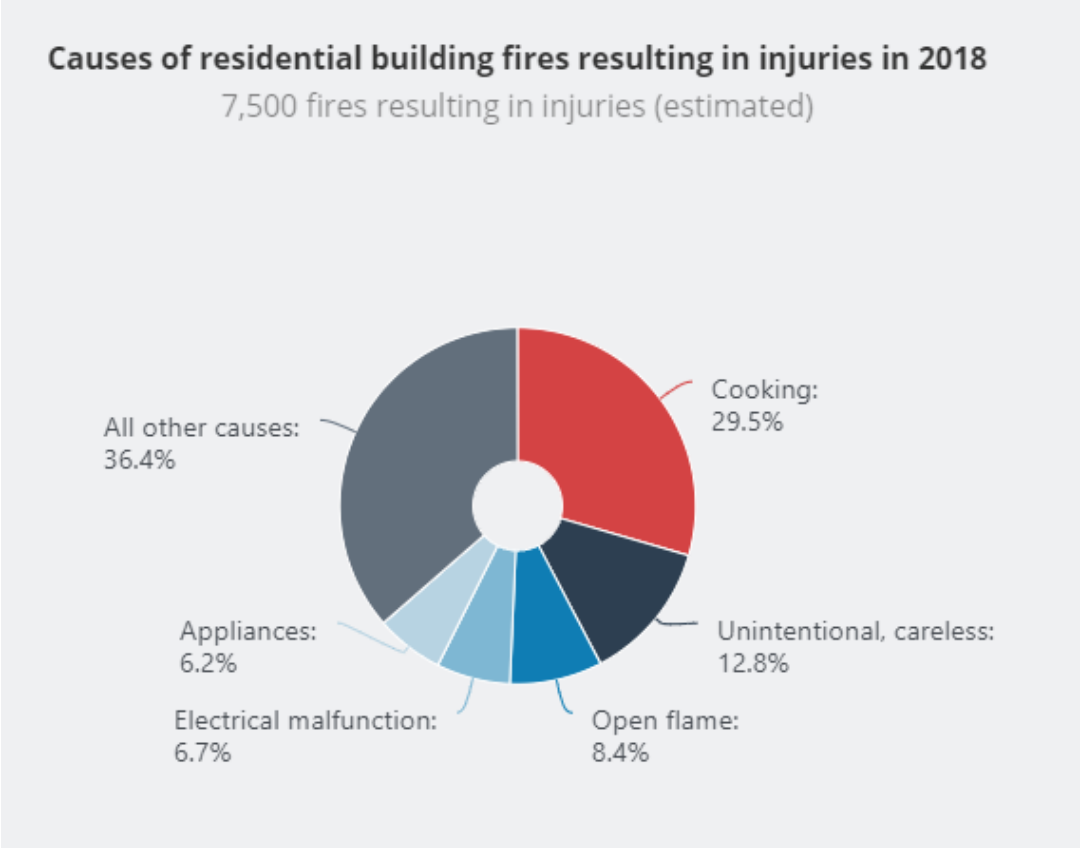
**Through November 1, 2019*
Source: North Carolina Forest Service

Structure Fire

As mentioned above, structure fires occur frequently throughout the United States and in Guilford County. In 2018, the NFPA reported that there were almost 500,000 structure fires in the United States, causing around $11 billion in damages. These numbers are on par with statistics from previous years as there were no less than 480,000 structure fires in any of the ten years prior to 2018.

Figure 5.24 shows the primary causes of building fires in the United States in 2018. As the figure shows, almost one third of these fires are caused by cooking, which is the highest single-identified cause. It is also notable that the United States Fire Association (USFA) reports that the leading property type for fire deaths is residential. The result of this is that most deaths, injuries, and dollar losses from fires across the country occur in residential fires.

FIGURE 5.24: BUILDING FIRE CAUSES IN THE UNITED STATES



Source: United States Fire Association

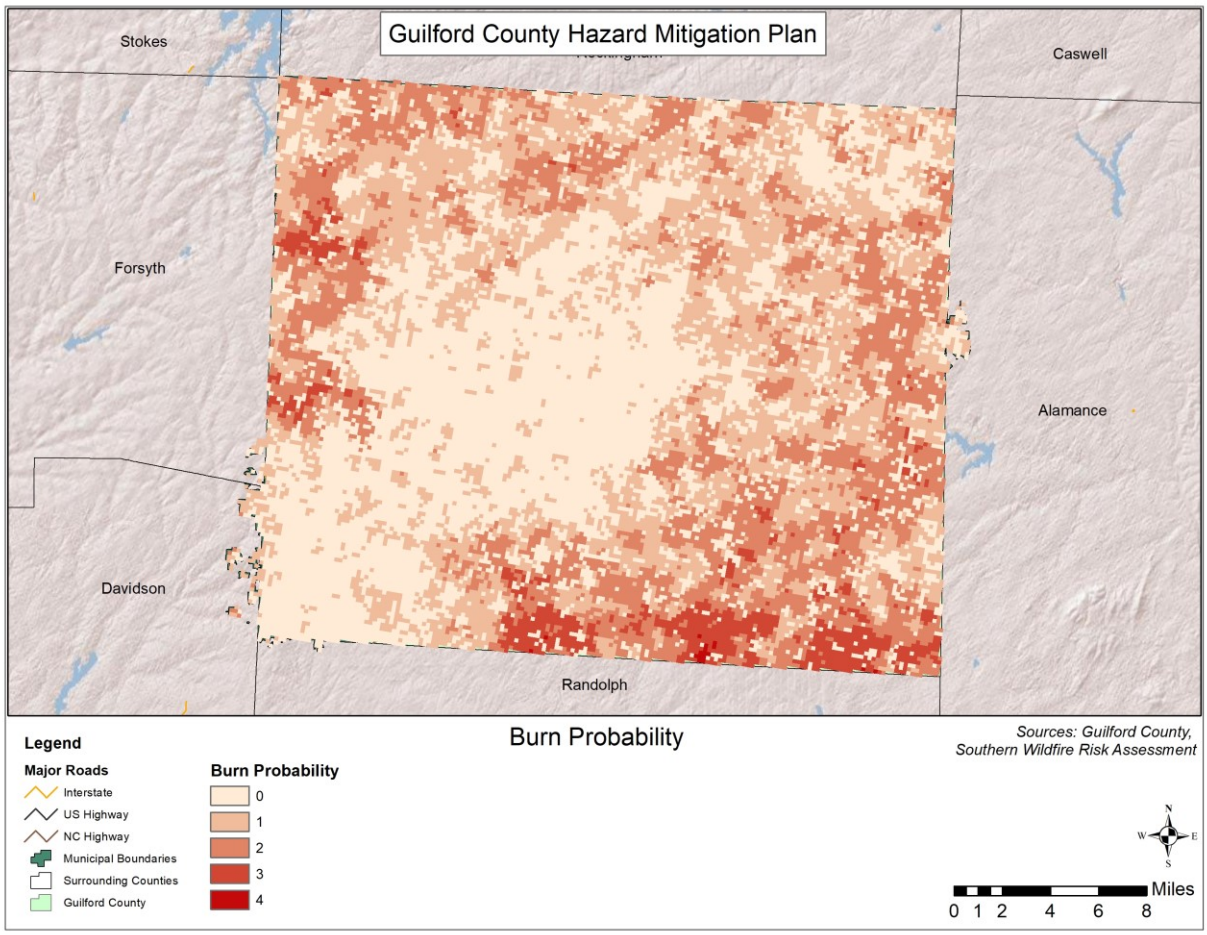
5.8.4 Probability of Future Occurrences

Wildfire

Wildfire events will be an ongoing occurrence in Guilford 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 to 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 Guilford County for future wildfire events is likely (10 to 100 percent annual probability). Additionally, according to the *Piedmont Together Climate Adaptation Report*, the increased likelihood of wildfire due to climate change will result in greater structural/property damage and decreased air quality in the county.

FIGURE 5.25: BURN PROBABILITY IN GUILFORD COUNTY



Source: Southern Wildfire Risk Assessment

Structure Fire

Structure fires are very common and have occurred frequently in Guilford County in the past. As the county continues to grow, the built environment will expand and there will be more structures that could potentially be impacted by a fire. This will result in more human lives at risk and the potential for costly property damage. The probability of structure fires in the futures remains high and is likely to continue to increase going forward as the county grows.

5.8.5 Consequence Analysis

People (The Public and Public Confidence)

There are a number of potential losses from a wildland fire in Guilford County. Potential losses include human life, structures, and natural resources. Health hazards from smoke caused by wildland fires within or outside the county can 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. 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. 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. 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 Guilford 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. Like the general public, 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. However, their risk is often more prominent as they are often in the middle of an incident through their responsibilities as a responder.

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 Guilford 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 WUI are particularly susceptible to the threat. Population increases in Guilford 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, 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.

All types of private property may suffer losses from wildfires. This includes business properties, 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. Additional 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 a number of 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 the state. If homes or businesses are burned, the cost of rebuilding could be substantial. Impacts to agricultural crops are another economic loss that the state could face in the event of a wildland fire. Wildfires can be particularly damaging to the lumber and Christmas tree farming industries which are important to the state in general and may impact Guilford County.

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. Indirect losses could include loss of growing stock as well as irrigation systems. Another potential loss includes damage and destruction to a wide variety of common or protected habitats in Guilford County. Finally, the release of smoke from wildfires can pollute the air and reduce air quality.

Additional factors that contribute to wildland fire susceptibility in Guilford County include long growing seasons with frequent rainfall and wind, which can significantly affect vegetation growth.

It should also be noted, however, that wildfires are a naturally occurring element of the environment and have played an important part in the development of many ecosystems in that they are regenerative and provide vital nutrients for the soil which can help sustain a forest habitat and all of the organisms living within it. Therefore, although there are some negative impacts of wildfire, there are also some positive impacts on the environment.

5.9 FLOODING

5.9.1 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, 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.

5.9.2 Location and Spatial Extent

Special flood hazard areas in Guilford County were mapped using Geographic Information System (GIS) and FEMA Digital Flood Insurance Rate Maps (DFIRM).[10] 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). According to GIS analysis, of the 657.6 square miles of land that make up Guilford County, there are 41.3 square miles of land in zone A and AE (1-percent annual chance floodplain/100-year floodplain) and 5.1 square miles of land in zone X500 (0.2-percent annual chance floodplain/500-year floodplain). The county totals are presented below in **Table 5.19**.

TABLE 5.19: SUMMARY OF FLOODPLAIN AREAS IN GUILFORD COUNTY

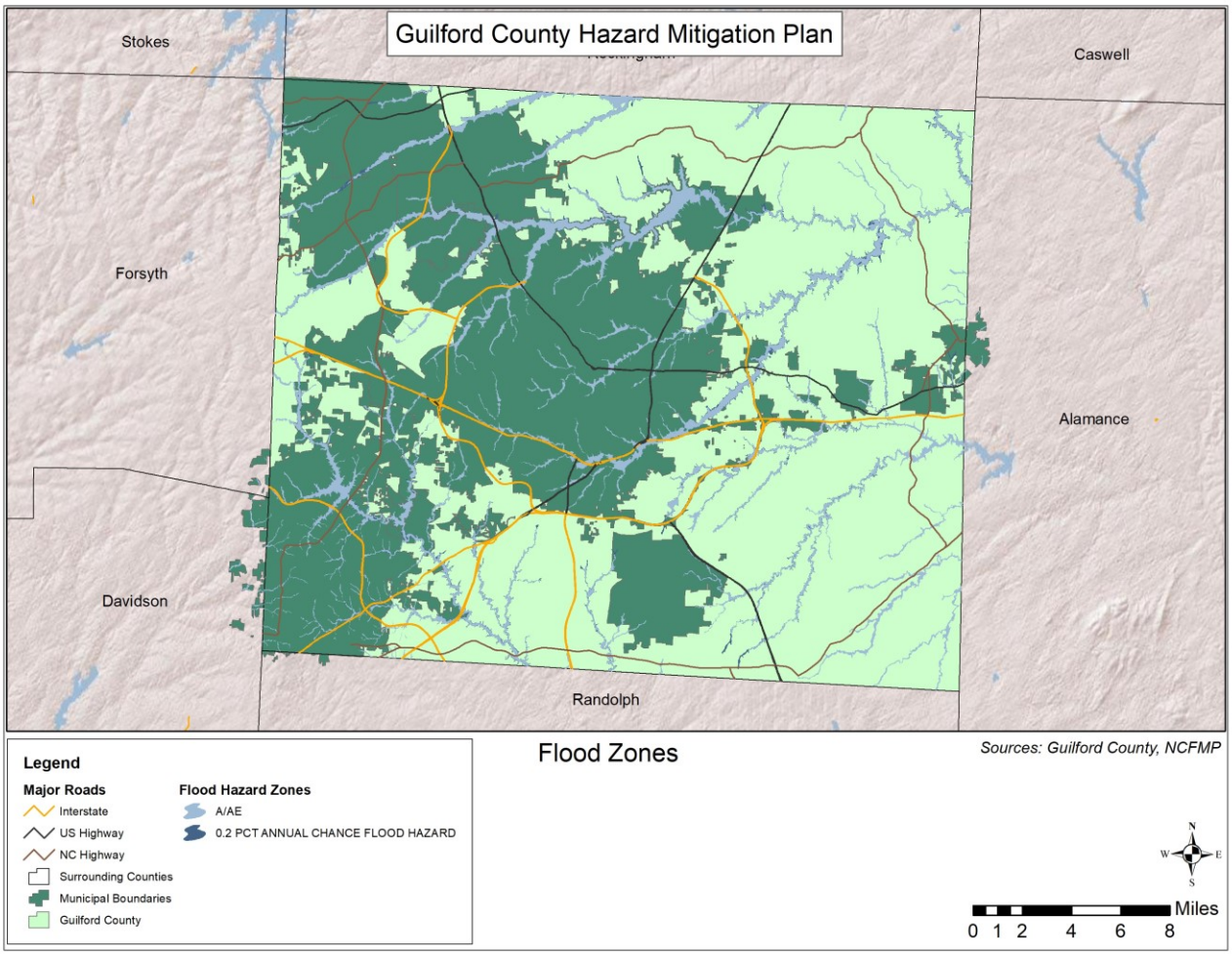
Location	100-year area (square miles)	500-year area (square miles)
Gibsonville	0.5	0.0
Greensboro	15.3	1.0
High Point	6.0	0.5
Jamestown	0.9	0.1
Oak Ridge	1.5	0.3
Pleasant Garden	0.4	0.1
Sedalia	0.1	0.0
Stokesdale	1.0	0.2
Summerfield	2.7	0.3
Whitsett	0.0	0.0
Unincorporated Area	12.9	2.6
GUILFORD COUNTY TOTAL	**41.3**	**5.1**

These flood zone values account for 7.1 percent of the total land area in Guilford County. It is important to note that while NCFMP/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 5.26**, **Figure 5.27**, **Figure 5.28**, **Figure 5.29**, **Figure 5.30**, **Figure 5.31**, **Figure 5.32**, **Figure 5.33**, **Figure 5.34**, **Figure 5.35**, and

[10] The county-level DFIRM used for Guilford County was updated in 2009.

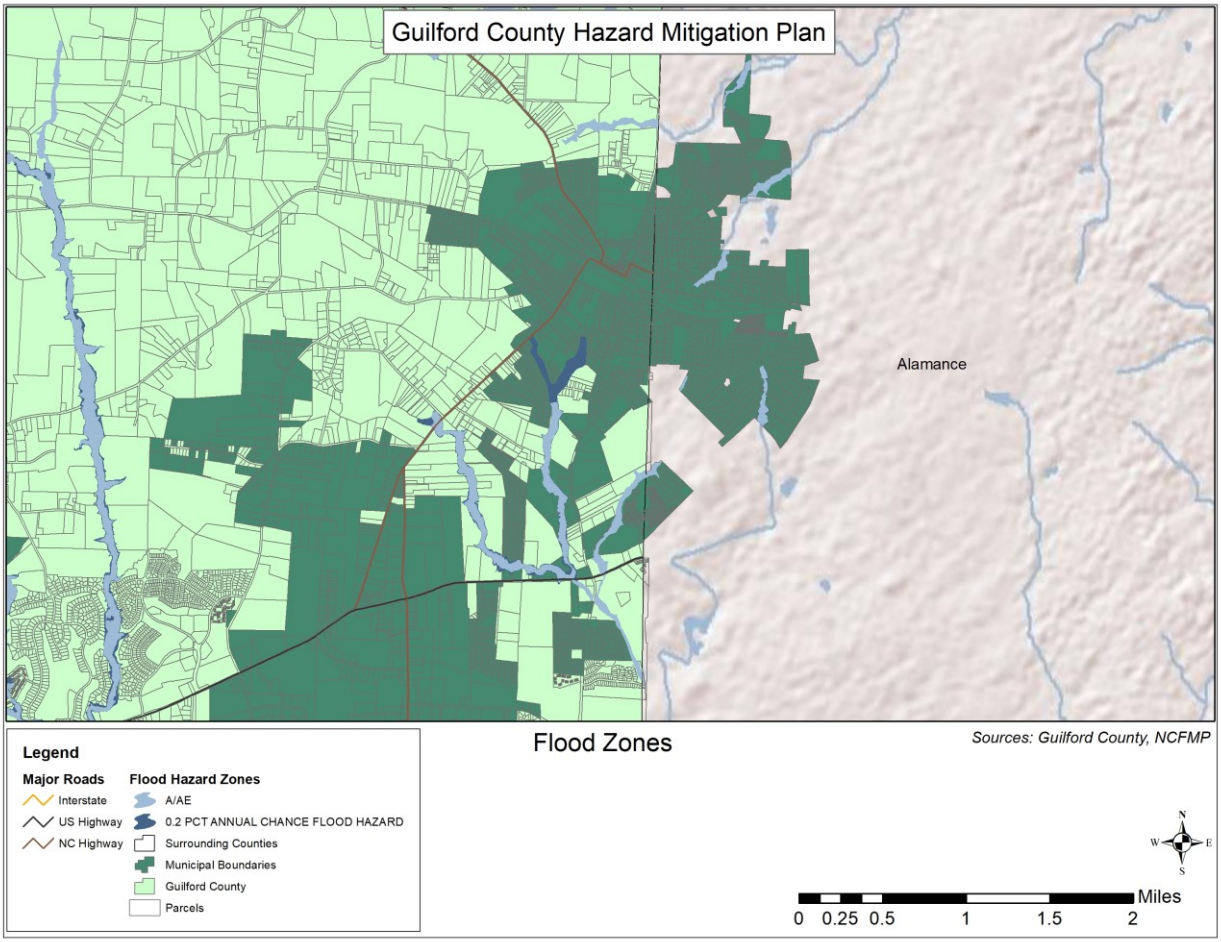
Figure 5.36 illustrate the location and extent of currently mapped special flood hazard areas for Guilford County and its municipalities based on best available NCFMP/FEMA DFIRM data.

FIGURE 5.26: SPECIAL FLOOD HAZARD AREAS IN GUILFORD COUNTY



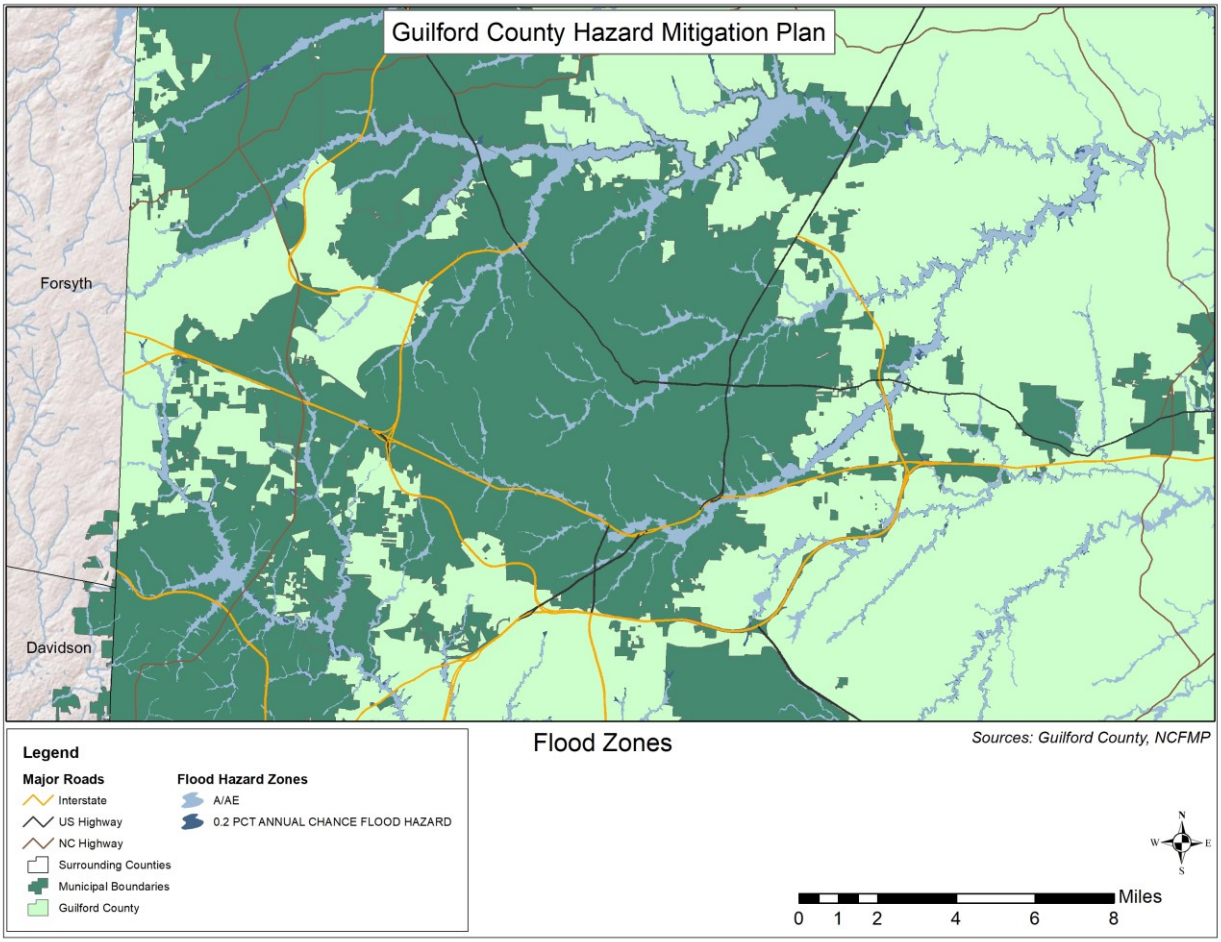
Source: North Carolina Floodplain Mapping Program

FIGURE 5.27: SPECIAL FLOOD HAZARD AREAS IN GIBSONVILLE



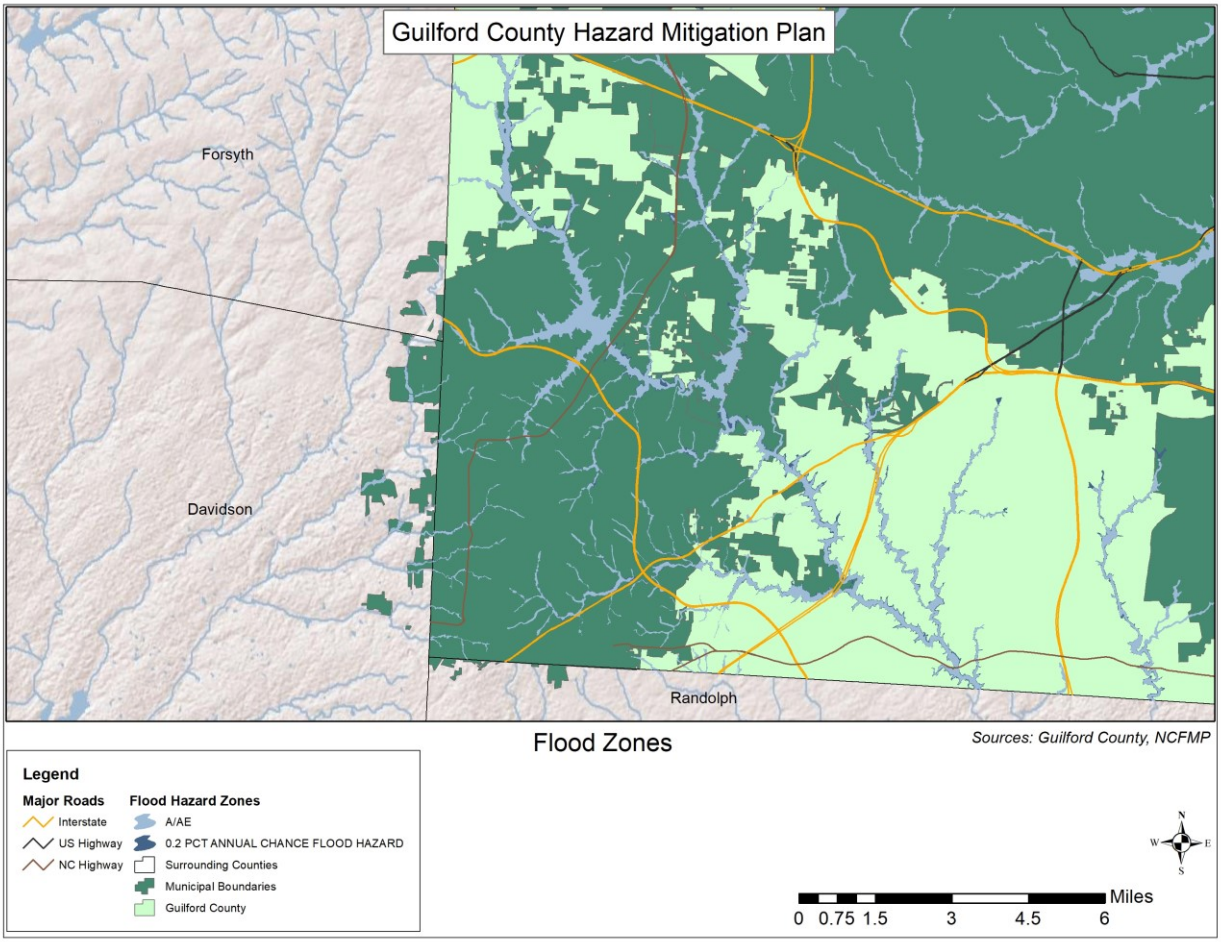
Source: Federal Emergency Management Agency

FIGURE 5.28: SPECIAL FLOOD HAZARD AREAS IN GREENSBORO



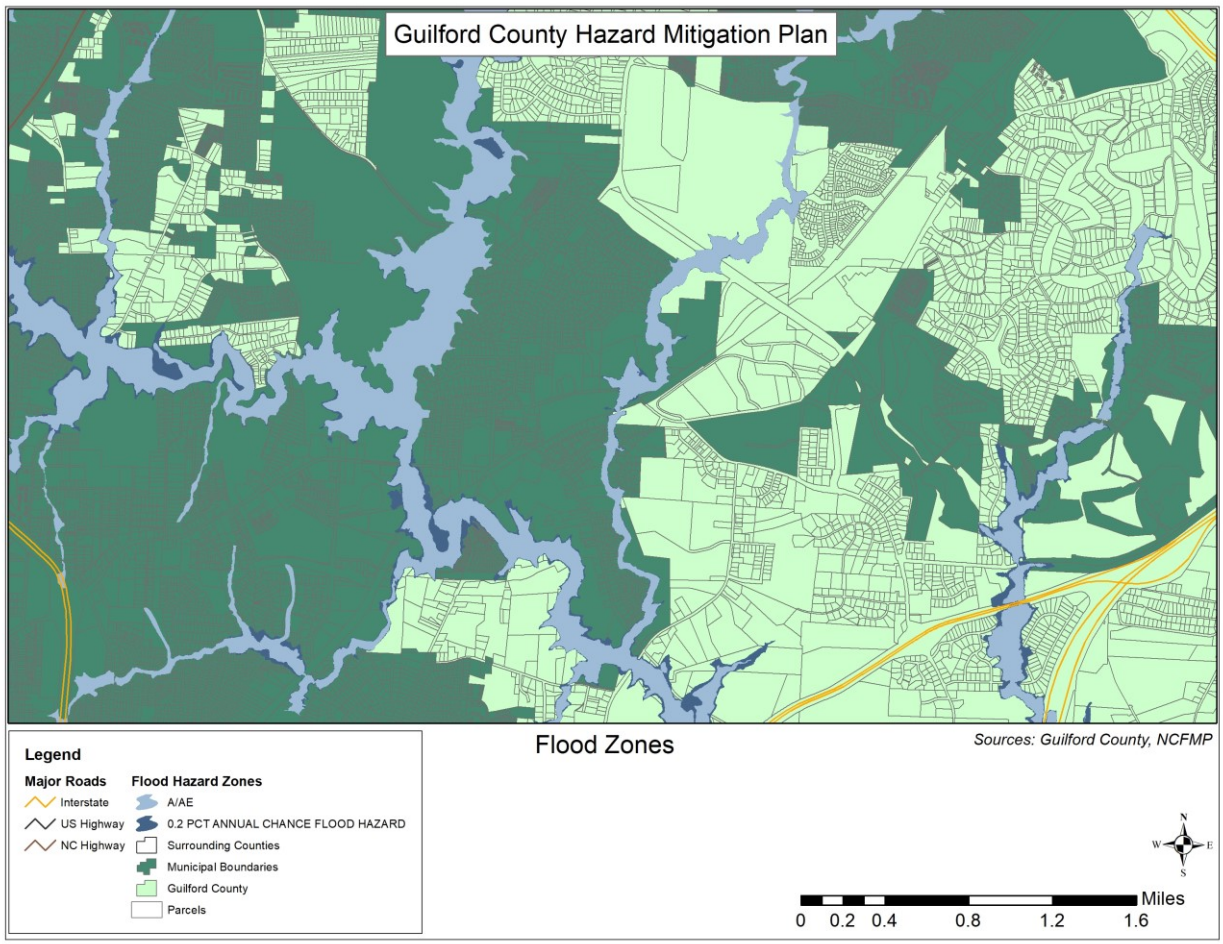
Source: Federal Emergency Management Agency

FIGURE 5.29: SPECIAL FLOOD HAZARD AREAS IN HIGH POINT



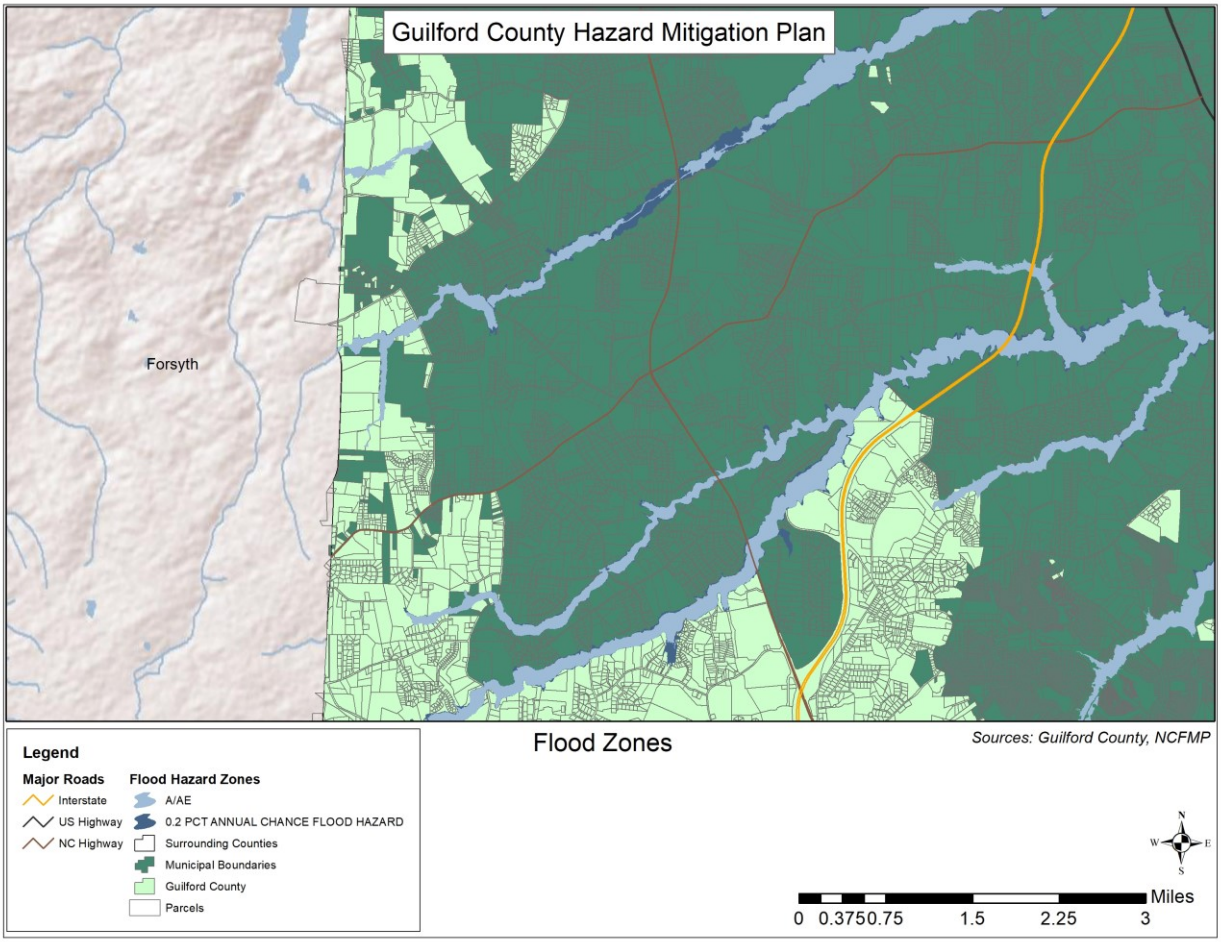
Source: Federal Emergency Management Agency

FIGURE 5.30: SPECIAL FLOOD HAZARD AREAS IN JAMESTOWN



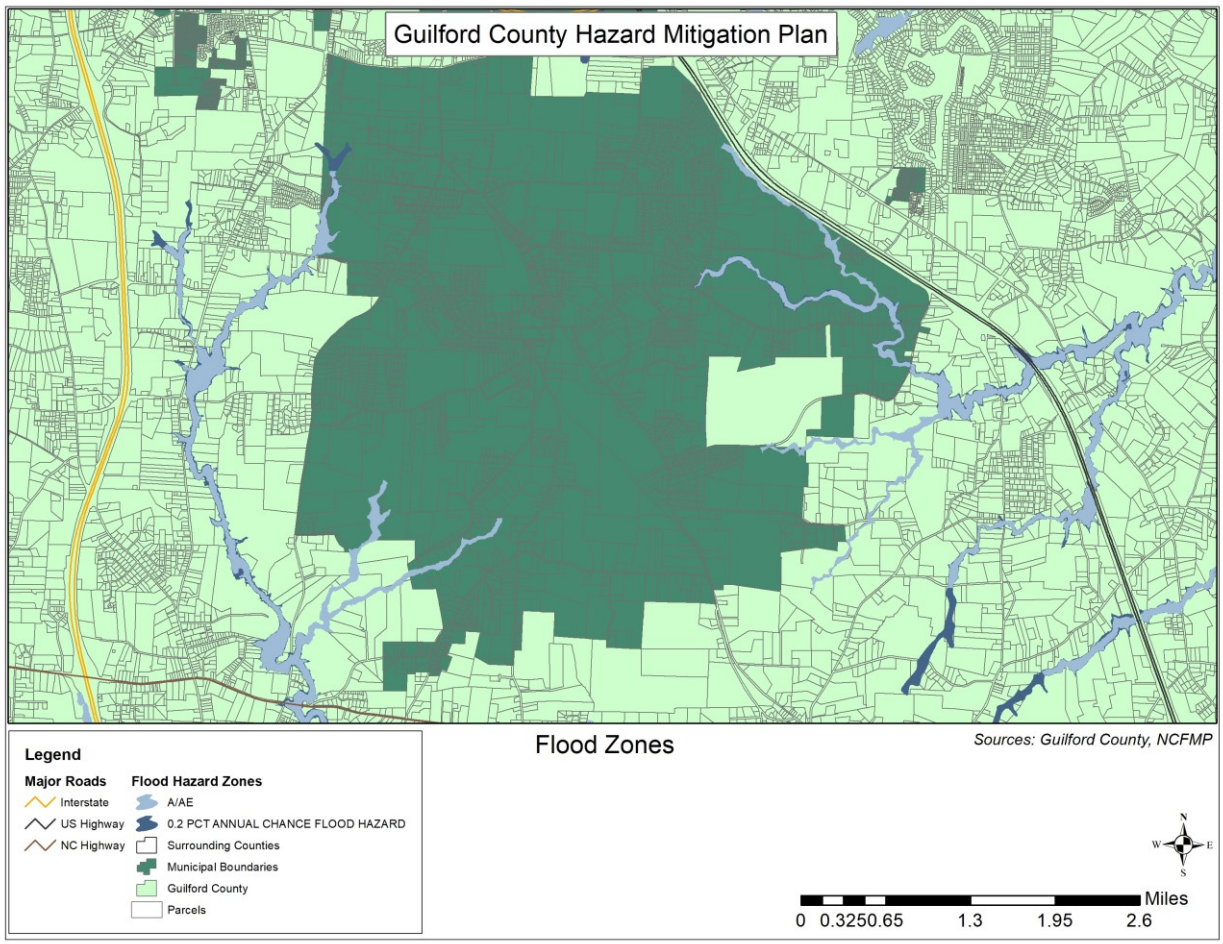
Source: Federal Emergency Management Agency

FIGURE 5.31: SPECIAL FLOOD HAZARD AREAS IN OAK RIDGE



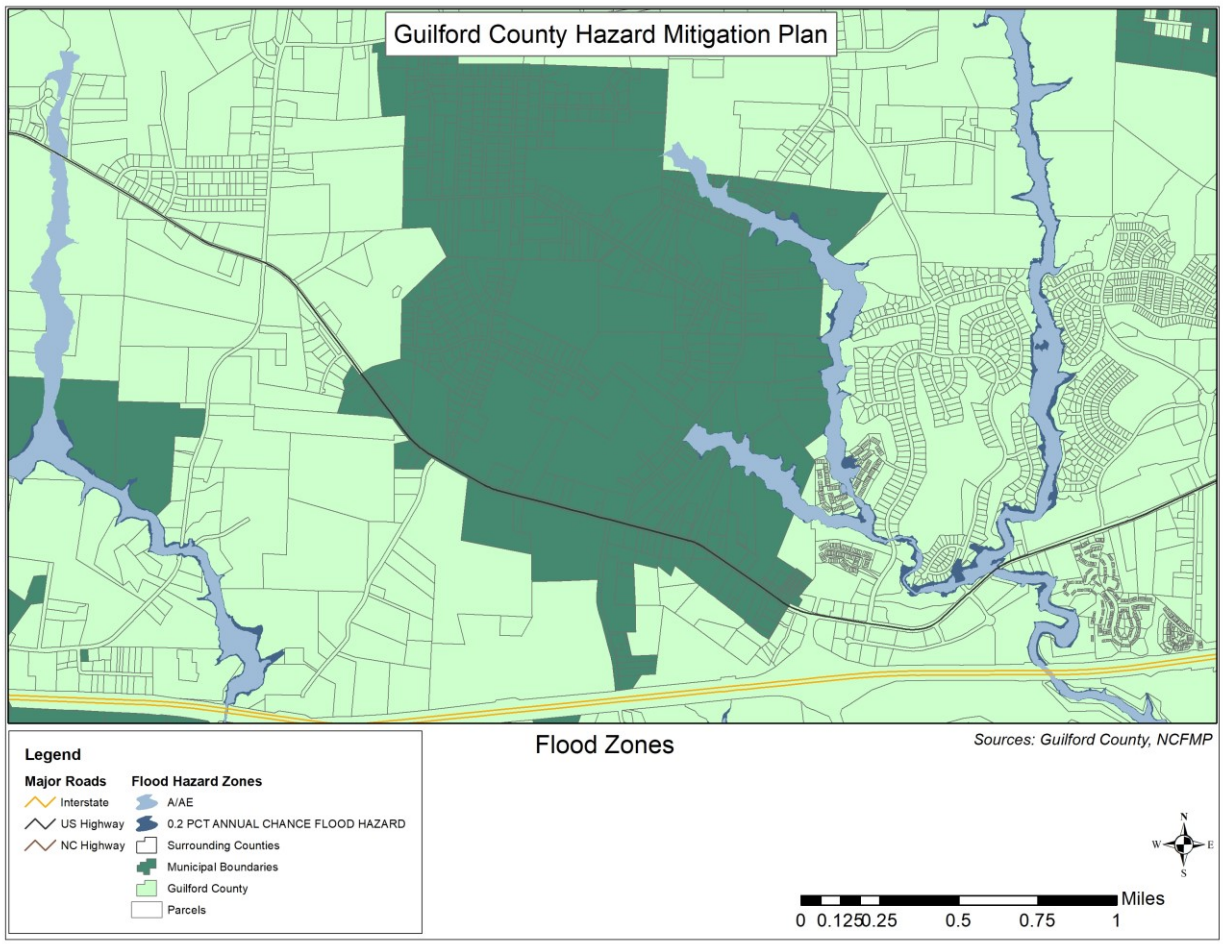
Source: Federal Emergency Management Agency

FIGURE 5.32: SPECIAL FLOOD HAZARD AREAS IN PLEASANT GARDEN



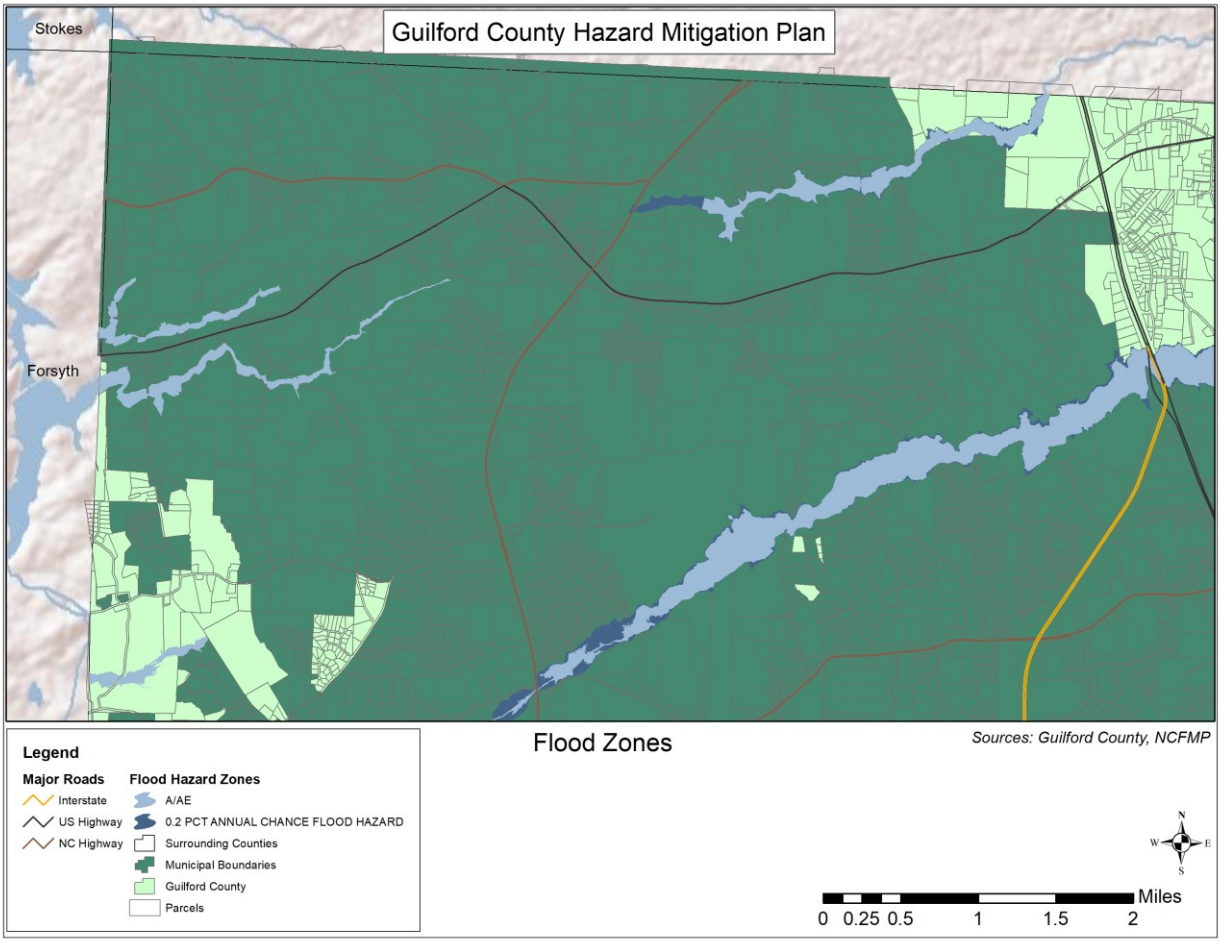
Source: Federal Emergency Management Agency

FIGURE 5.33: SPECIAL FLOOD HAZARD AREAS IN SEDALIA



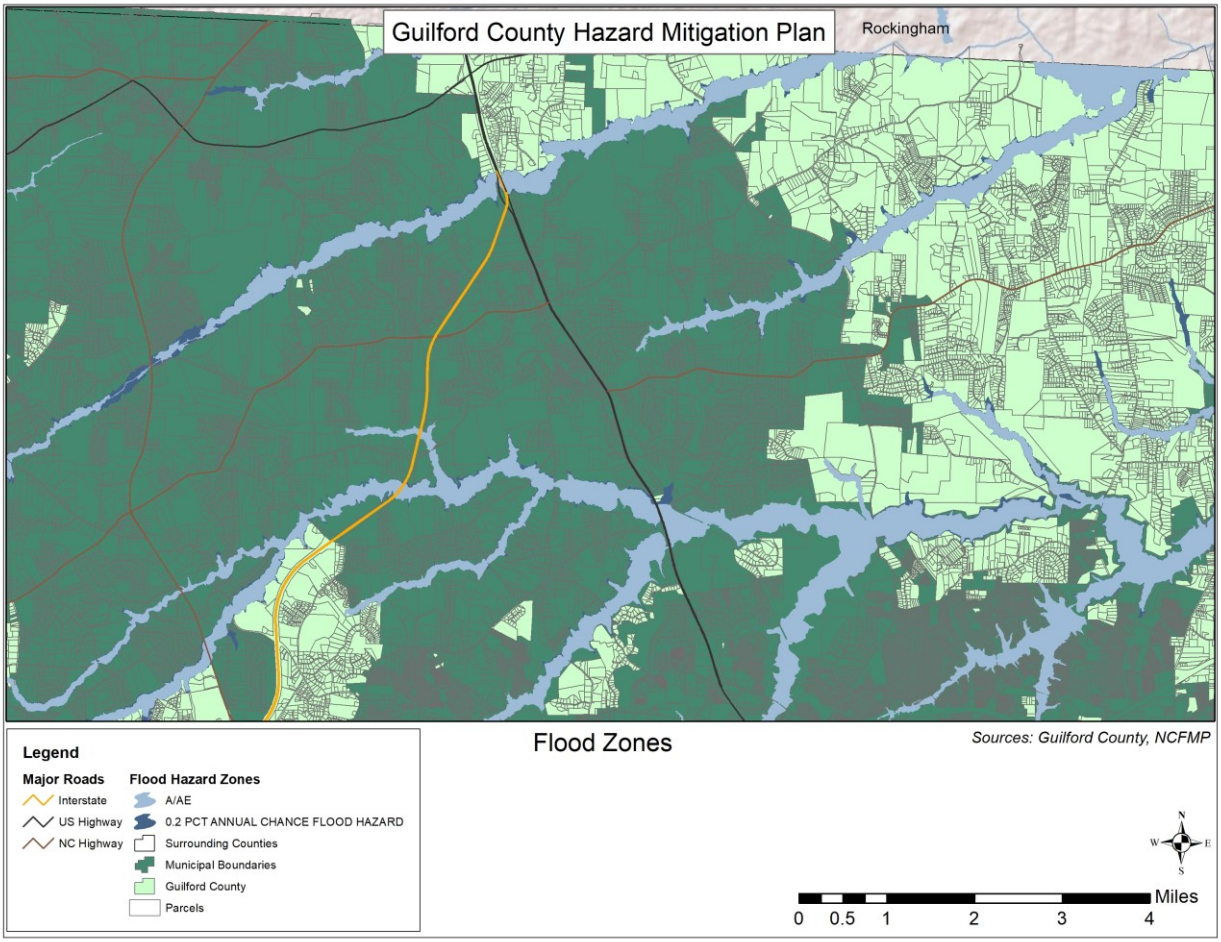
Source: Federal Emergency Management Agency

FIGURE 5.34: SPECIAL FLOOD HAZARD AREAS IN STOKESDALE



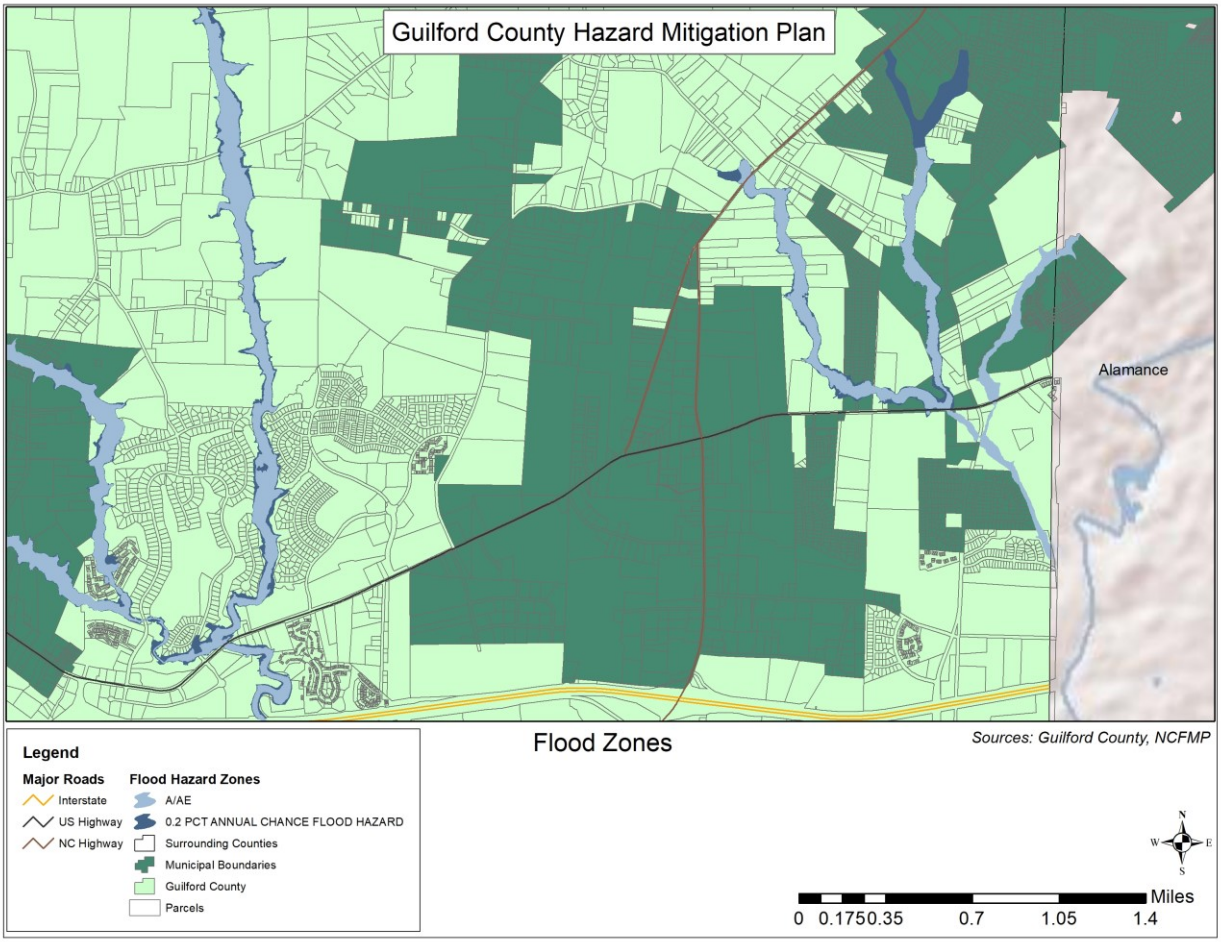
Source: Federal Emergency Management Agency

FIGURE 5.35: SPECIAL FLOOD HAZARD AREAS IN SUMMERFIELD



Source: Federal Emergency Management Agency

FIGURE 5.36: SPECIAL FLOOD HAZARD AREAS IN WHITSETT



Source: Federal Emergency Management Agency

5.9.3 Historical Occurrences

Information from the National Centers for Environmental Information was used to ascertain historical flood events. The National Centers for Environmental Information reported a total of 92 events throughout Guilford County since 1996.[11] A summary of these events is presented in **Table 5.20**. These events accounted for over $18.7 million (2019 dollars) in property damage throughout the county and at least 1 death.[12] Specific information on flood events for each jurisdiction, including date, type of flooding, and deaths and injuries, can be found in **Table 5.21**.

[11] These flood events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1996 through March 2019. It is likely that additional occurrences have occurred and have gone unreported in Guilford County.
[12] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

TABLE 5.20: SUMMARY OF FLOOD OCCURRENCES IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Gibsonville	0	0/0	$0	$0
Greensboro	26	1/0	$2,391,245	$66,438,818
High Point	11	0/0	$570,591	$1,307,473
Jamestown	1	0/0	$0	$0
Oak Ridge	2	0/0	$0	$0
Pleasant Garden	2	0/0	$0	$0
Sedalia	0	0/0	$0	$0
Stokesdale	0	0/0	$0	$0
Summerfield	6	0/0	$0	$0
Whitsett	0	0/0	$0	$0
Unincorporated Area	44	0/0	$15,813,140	$148,870
GUILFORD COUNTY TOTAL	**92**	**1/0**	**$18,7774,976**	**$67,895,161**

Source: National Centers for Environmental Information

TABLE 5.21: HISTORICAL FLOOD OCCURRENCES IN GUILFORD COUNTY

	Date	Type	Deaths / Injuries	Property Damage*
Gibsonville				
None Reported	--	--	--	--
Greensboro				
GREENSBORO	7/25/1996	Flash Flood	0/0	$0
GREENSBORO	2/3/1998	Heavy Rain	0/0	$0
GREENSBORO	6/19/2000	Flash Flood	0/0	$0
GREENSBORO	8/27/2000	Flash Flood	0/0	$0
GREENSBORO	8/28/2000	Flash Flood	0/0	$0
GREENSBORO	9/1/2000	Flash Flood	0/0	$0
GREENSBORO	7/4/2001	Flash Flood	0/0	$0
GREENSBORO	8/17/2003	Flash Flood	0/0	$16,647
GREENSBORO	8/31/2003	Flash Flood	0/0	$0
GREENSBORO	9/23/2003	Flash Flood	0/0	$0
GREENSBORO	7/17/2004	Flash Flood	0/0	$0
GREENSBORO	9/8/2004	Flash Flood	0/0	$0
GREENSBORO	9/27/2004	Flash Flood	0/0	$0
GREENSBORO	12/10/2004	Flash Flood	0/0	$0
GREENSBORO	6/14/2006	Flash Flood	0/0	$0
GREENSBORO	8/30/2006	Flash Flood	0/0	$0
GREENSBORO	4/15/2007	Flash Flood	0/0	$0
GREENSBORO	6/27/2007	Flash Flood	0/0	$0
GREENSBORO	6/27/2007	Flash Flood	0/0	$0
GREENSBORO	6/27/2007	Flash Flood	0/0	$0
GREENSBORO	6/3/2009	Flash Flood	1/0	$2,374,597
GREENSBORO	11/12/2009	Flash Flood	0/0	$0
GREENSBORO	1/25/2010	Flash Flood	0/0	$0

	Date	Type	Deaths / Injuries	Property Damage*
GREENSBORO	7/13/2010	Flash Flood	0/0	$0
GREENSBORO	8/11/2010	Flash Flood	0/0	$0
GREENSBORO	5/21/2016	Flash Flood	0/0	$0
High Point				
HIGH POINT	7/25/1996	Flash Flood	0/0	$0
HIGH POINT	9/3/1996	Flash Flood	0/0	$32,458
HIGH POINT	4/17/1998	Flood	0/0	$0
HIGH POINT	9/18/2002	Flash Flood	0/0	$0
HIGH POINT	6/23/2006	Flash Flood	0/0	$0
HIGH POINT	6/23/2006	Flash Flood	0/0	$0
HIGH POINT	6/27/2006	Flash Flood	0/0	$0
HIGH POINT	8/30/2006	Flash Flood	0/0	$0
HIGH POINT	9/30/2010	Flash Flood	0/0	$0
HIGH POINT	9/29/2015	Flood	0/0	$538,133
HIGH POINT	5/23/2018	Flash Flood	0/0	$0
Jamestown				
JAMESTOWN	9/30/2010	Flash Flood	0/0	$0
Oak Ridge				
OAK RIDGE	9/14/2000	Flash Flood	0/0	$0
OAK RIDGE ARPT	8/17/2013	Flash Flood	0/0	$0
Pleasant Garden				
PLEASANT GARDEN	9/3/2012	Flash Flood	0/0	$0
PLEASANT GARDEN	6/27/2015	Flash Flood	0/0	$0
Sedalia				
None Reported	--	--	--	--
Stokesdale				
None Reported	--	--	--	--
Summerfield				
SUMMERFIELD	7/13/2003	Flash Flood	0/0	$0
SUMMERFIELD	7/30/2007	Flash Flood	0/0	$0
SUMMERFIELD	7/30/2007	Flash Flood	0/0	$0
SUMMERFIELD	7/30/2007	Flash Flood	0/0	$0
SUMMERFIELD	1/25/2010	Flash Flood	0/0	$0
SUMMERFIELD	11/12/2018	Flash Flood	0/0	$0
Whitsett				
None Reported	--	--	--	--
Unincorporated Area				
SE PTN	4/28/1997	Flash Flood	0/0	$0
WEST PORTION	2/22/2003	Flash Flood	0/0	$0
GUILFORD (ZONE)	3/20/2003	Flood	0/0	$0
GUILFORD (ZONE)	4/10/2003	Flood	0/0	$0
CLIMAX	8/4/2003	Flash Flood	0/0	$0
GUILFORD	6/23/2006	Flash Flood	0/0	$0
TERRA COTTA	6/22/2008	Flash Flood	0/0	$0

	Date	Type	Deaths / Injuries	Property Damage*
(GSO)GREENSBORO RGNL	8/27/2008	Flash Flood	0/0	$35,067
GREENSBORO MAY ARPT	8/27/2008	Flash Flood	0/0	$175,337
HAMILTON LAKES	11/11/2009	Flash Flood	0/0	$0
RANKIN	1/25/2010	Flash Flood	0/0	$0
HAMILTON LAKES	6/16/2010	Flash Flood	0/0	$0
TERRA COTTA	7/27/2010	Flash Flood	0/0	$0
FOUR MILE	9/30/2010	Flash Flood	0/0	$0
DEEP RIVER	9/30/2010	Flash Flood	0/0	$0
BESSEMER	6/11/2011	Flash Flood	0/0	$0
GUILFORD CO.	6/11/2011	Flash Flood	0/0	$0
GREENSBORO MAY ARPT	6/28/2011	Flash Flood	0/0	$0
GUILFORD CO.	6/28/2011	Flash Flood	0/0	$0
BESSEMER	7/8/2011	Flash Flood	0/0	$0
BESSEMER	9/6/2011	Flash Flood	0/0	$0
TERRA COTTA	9/23/2011	Flash Flood	0/0	$0
BATTLE GROUND	6/22/2012	Flash Flood	0/0	$0
HAMILTON LAKES	7/9/2012	Flash Flood	0/0	$111,780
TERRA COTTA	8/19/2012	Flash Flood	0/0	$0
RANKIN	8/22/2012	Flash Flood	0/0	$0
PINECROFT	9/3/2012	Flash Flood	0/0	$0
HAMILTON LAKES	6/10/2013	Flash Flood	0/0	$0
BROADVIEW	6/25/2013	Flash Flood	0/0	$0
GUILFORD	7/10/2013	Flash Flood	0/0	$54,815
BROADVIEW	7/21/2013	Flash Flood	0/0	$21,926
HAMILTON LAKES	8/6/2015	Flash Flood	0/0	$0
HAMILTON LAKES	12/30/2015	Flash Flood	0/0	$0
GUILFORD	7/16/2016	Flash Flood	0/0	$0
BATTLE GROUND	8/5/2016	Flash Flood	0/0	$0
GUILFORD	8/27/2016	Flash Flood	0/0	$0
GUILQUARRY	10/8/2016	Flash Flood	0/0	$0
SEDGEFIELD	6/19/2017	Flash Flood	0/0	$5,227
GUILQUARRY	8/2/2018	Flash Flood	0/0	$10,157
DEEP RIVER	8/2/2018	Flash Flood	0/0	$50,782
BROADVIEW	9/1/2018	Flash Flood	0/0	$0
GUILQUARRY	9/17/2018	Flash Flood	0/0	$0
GUILFORD CO.	9/17/2018	Flood	0/0	$14,841,708
GUILQUARRY	10/11/2018	Flash Flood	0/0	$506,341

*Property damage is reported in 2019 dollars; All damage may not have been reported.
Source: National Centers for Environmental Information

5.9.4 Historical Summary of Insured Flood Losses

According to FEMA flood insurance policy records as of March 2019, there have been 372 flood losses reported in Guilford County through the National Flood Insurance Program (NFIP) since 1978, totaling over $4.9 million in claims payments. A summary of these figures for each jurisdiction is provided in **Table 5.22**. It should be emphasized that these numbers include only those losses to structures that

were insured through the NFIP policies, and the payments columns only include instances in which claims were received. It is likely that many additional instances of flood loss in Guilford County were either uninsured, denied claims payment, or not reported.

TABLE 5.22: SUMMARY OF INSURED FLOOD LOSSES IN GUILFORD COUNTY

Location	Number of Flood Claims	Building Claims Payments ($)	Contents Claims Payments ($)
Gibsonville	5	$56,566	$17,110
Greensboro	439	$4,973,510	$816,310
High Point	86	$271,713	$15,538
Jamestown	3	$47,298	$4,321
Oak Ridge	1	$13,230	$4,720
Pleasant Garden	2	$0	$0
Sedalia	0	$0	$0
Stokesdale	0	$0	$0
Summerfield	0	$0	$0
Whitsett	2	$19,124	$6,452
Unincorporated Area	38	$300,355	$17,638
GUILFORD COUNTY TOTAL	**576**	**$5,681,796**	**$882,089**

Source: Federal Emergency Management Agency, National Flood Insurance Program

5.9.5 Repetitive and Severe Repetitive Loss Properties

FEMA defines a Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A RL property may or may not be currently insured by the NFIP.

Severe repetitive loss properties are defined as any insurable building for which: 1) four or more claims of more than $5,000, with the cumulative amount of such claims exceeding $20,000, were paid by the NFIP or 2) at least two claims exceeding the market value of the structure were paid by the NFIP, since 1978. A severe repetitive loss property may or may not be currently insured by the NFIP.

As of January 2019, there are 54 repetitive loss properties and 11 severe repetitive loss properties located in Guilford County, which accounted for over 300 losses and over $7 million in claims payments under the NFIP. Most of the properties are single-family residential buildings, and the remaining are a mix of other residential and commercial properties. **Table 5.23** and **Table 5.24** present detailed information on severe repetitive loss and repetitive loss properties and NFIP claims for Guilford County.

TABLE 5.23: SUMMARY OF REPETITIVE LOSS PROPERTIES IN GUILFORD COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Gibsonville	1	1 single-family residential	2	$13,065	$1,111	$14,177	$7,089
Greensboro	49	30 single-family	205	$3,910,497	$565,811	$4,476,308	$21,836

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
		residential; 11 other residential; 2 condo; 6 commercial					
High Point	0	--	0	$0	$0	$0	$0
Jamestown	0	--	0	$0	$0	$0	$0
Oak Ridge	0	--	0	$0	$0	$0	$0
Pleasant Garden	0	--	0	$0	$0	$0	$0
Sedalia	0	--	0	$0	$0	$0	$0
Stokesdale	0	--	0	$0	$0	$0	$0
Summerfield	0	--	0	$0	$0	$0	$0
Whitsett	0	--	0	$0	$0	$0	$0
Unincorporated Area	4	4 single-family residential	17	$243,077	$27,905	$270,982	$1,322
GUILFORD COUNTY TOTAL	**54**		**224**	**$4,166,639**	**$594,828**	**$4,761,466**	**$23,227**

Source: National Flood Insurance Program

TABLE 5.24: SUMMARY OF SEVERE REPETITIVE LOSS PROPERTIES IN GUILFORD COUNTY

Location	Number of Properties	Types of Properties	Number of Losses	Building Payments	Content Payments	Total Payments	Average Payment
Gibsonville	0	--	0	$0	$0	$0	$0
Greensboro	11	5 single-family residential; 6 other residential	72	$2,447,857	$25,184	$2,473,040	$34,348
High Point	0	--	0	$0	$0	$0	$0
Jamestown	0	--	0	$0	$0	$0	$0
Oak Ridge	0	--	0	$0	$0	$0	$0
Pleasant Garden	0	--	0	$0	$0	$0	$0
Sedalia	0	--	0	$0	$0	$0	$0
Stokesdale	0	--	0	$0	$0	$0	$0
Summerfield	0	--	0	$0	$0	$0	$0
Whitsett	0	--	0	$0	$0	$0	$0
Unincorporated Area	0	--	0	$0	$0	$0	$0
GUILFORD COUNTY TOTAL	**11**		**72**	**$2,447,857**	**$25,184**	**$2,473,040**	**$34,348**

Source: National Flood Insurance Program

5.9.6 FIMAN Gage Data

North Carolina Emergency Management has developed a statewide website that is at the forefront of the field called the Flood Inundation Mapping and Alert Network (FIMAN). The goal of the site is to

provide rain and stage gage data, flood inundation maps, flooding impacts and alerts in real-time to support risk-based decisions regarding flooding.

The site provides a clearinghouse for more than 500 gages across the state and pulls data from gages that are owned and operated at all levels of government. Many are managed by NCEM, while others are operated by USGS, local governments, and private organizations.

One of the key components that the site provides in terms of planning is the inundation mapping at gage sites. Using historic gage data and elevation data, inundation maps have been created around many gage sites and can show the impacts on buildings, roads, and infrastructure from various incremental rises in flood waters. **Table 5.25** presents information on several gages, but additional detailed data is available on the FIMAN website: https://fiman.nc.gov/. **Figure 5.37** shows an example of how the platform looks for the inundation mapping from the South Buffalo Creek near Pomona gage in Greensboro.

TABLE 5.25: FIMAN GAGES WITH INUNDATION MAPPING IN GUILFORD COUNTY

Location	Maximum Historic Gage Height (ft)	FIMAN Scenario #1 Stage (ft)	FIMAN Scenario #1 Elevation (NAVD 88)	FIMAN Scenario #1 Number of Buildings Damaged	FIMAN Scenario #2 Stage (ft)	FIMAN Scenario #2 Elevation (NAVD 88)	FIMAN Scenario #2 Number of Buildings Damaged
South Buffalo Creek near Pomona	15.45	15.4	786.5	17	18.9	790.0	42
South Buffalo Creek at US 220 near Greensboro	16.77	16.7	738.0	2	23.7	745.0	32
N Buffalo Creek at Westover Terrace at Greensboro	14.07	14.0	749.5	8	16.5	752.0	29
N Buffalo Creek at Church St at Greensboro	17.81	17.5	734.5	14	31.5	748.5	165

Source: NC FIMAN

FIGURE 5.37: INUNDATION MAPPING AT THE SOUTH BUFFALO CREEK NEAR POMONA GAGE (STAGE LEVEL 15.4 FT)

Source: NC FIMAN

5.9.7 Dam Failures

A dam failure is a special consideration as it relates to flood risk. Many of the impacts of a dam failure would be similar to those of a major flood event, but may include some distinctions, particularly the velocity of the flood waters.

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. The failure of a dam has the potential to place large numbers of people and great amounts of property in harm's way.

The North Carolina Department of Environmental Quality provides information on dams, including a hazard potential classification. There are three hazard classifications—high, intermediate, and low—that correspond to qualitative descriptions and quantitative guidelines. **Table 5.26** explains these classifications. It should be noted that these classifications do not pertain to the condition of the dam, only the potential impact that the dam would have if it were to fail. So, a high hazard dam is not more likely to fail or breach than a low hazard dam, but its impacts if it were to fail would potentially be greater.

TABLE 5.26: NORTH CAROLINA DAM HAZARD CLASSIFICATIONS

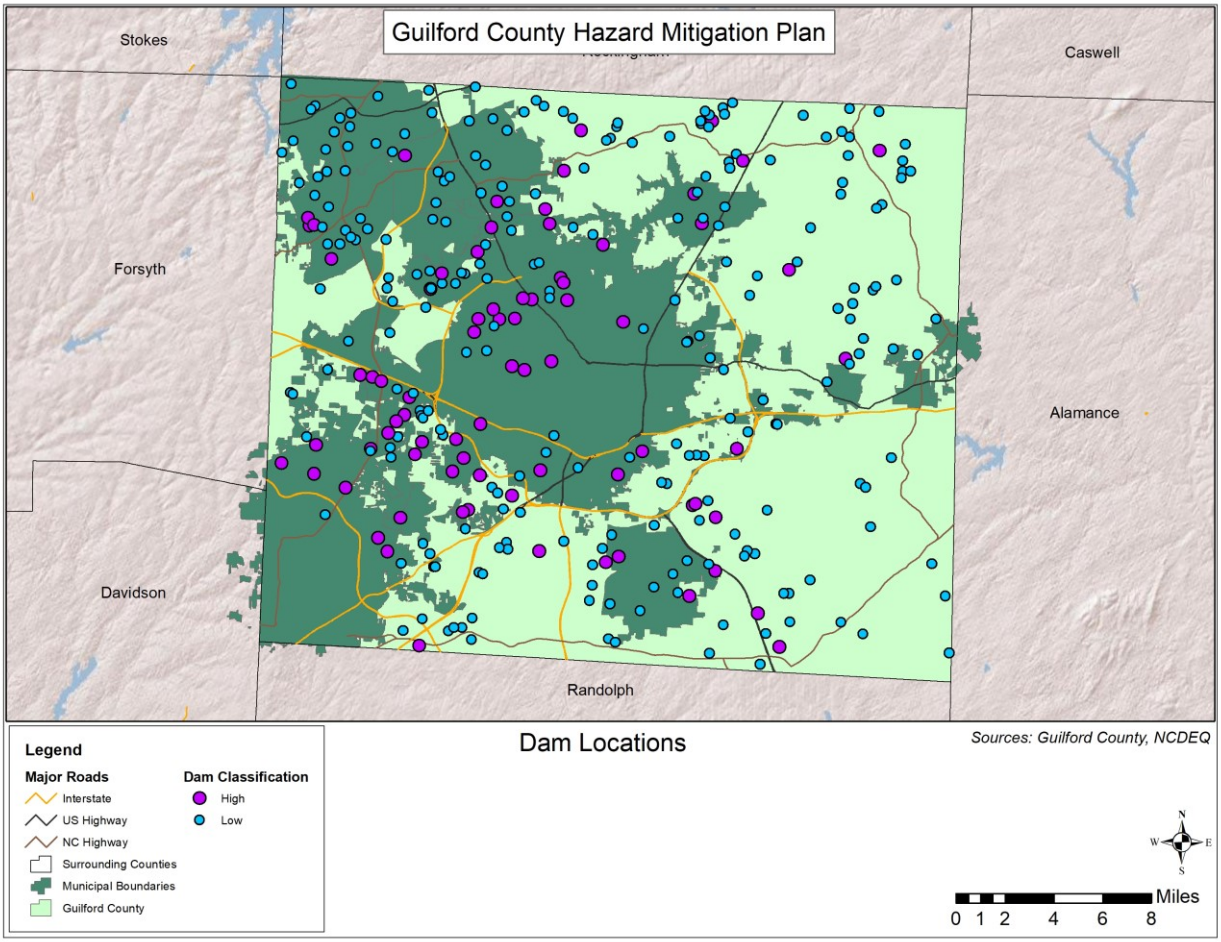
Hazard Classification	Description	Quantitative Guidelines
Low	Damage to low volume roads, Interruption of service	Less than 25 vehicles per day
	Economic damage	Less than $30,000
Intermediate	Damage to primary roads, Interruption of service	25 but less than 250 vehicles per day
	Economic damage	$30,000 to less than $200,000
High	Damage to highways/major roads, Interruption of service	More than 250 vehicles per day
	Economic damage	More than $200,000
	Loss of human life	Probable loss of 1 or more human lives

Source: North Carolina Department of Environmental Quality

According to the North Carolina Department of Environmental Quality, there are 320 dams in Guilford County.[13] **Figure 5.38** shows the dam location and the corresponding hazard ranking for each. Of these dams, 76 are classified as high hazard potential, none as intermediate hazard potential, and 244 as low hazard potential.

[13] The latest update to the North Carolina dam inventory, dated July 16, 2018, was retrieved from the North Carolina Department of Environmental Quality on October 30, 2019: https://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permits/dam-safety .

FIGURE 5.38: DAM LOCATION AND HAZARD CLASSIFICATION



Source: North Carolina Department of Environmental Quality, 2018

5.9.8 Probability of Future Occurrences

Flood events will remain a threat in Guilford 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). Additionally, according to the *Piedmont Together Climate Adaptation Report*, the increased likelihood of extreme precipitation events due to climate change will result in greater risks of flash flooding and impacts from stormwater runoff in the county.

It can be inferred from the floodplain location maps, previous occurrences, and severe repetitive loss properties that risk varies throughout Guilford County. For example, Greensboro has more floodplain and thus a higher risk of flood than the other municipalities. Mitigation actions may be warranted, particularly for severe repetitive loss and repetitive loss properties.

5.9.9 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. Even when injuries and fatalities are avoided, the impact on the public can be great as many people will be forced into shelters or will need to find temporary lodging as they wait for flooding to recede. They may be unable to return to their homes if the damage is great and may find their homes uninhabitable if personal property has become waterlogged and is unusable.

Another major impact on the public can be the deteriorating health conditions that result from flooding. After floodwaters recede, homes and personal property that were covered in water may begin to become infested with mold which can create serious health risks. Additionally, waterborne diseases can be pervasive in areas impacted by flooded sewer and water systems. Mosquitoes and other carriers of illnesses often thrive in post-flood conditions, increasing the chances of transmitting vector-borne diseases.

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 the government and a loss of public confidence.

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. Water rescues can be some of the most dangerous as rapidly moving flood waters are difficult to navigate. Rescuers are typically at high risk to loss of life or personal injury during flood events, especially compared to other types of natural hazards.

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 Guilford County. Operations would be most impacted at a localized level as areas that are flooded would experience the most disruption to normal operations.

Built Environment (Property, Facilities, and Infrastructure)

Many buildings and structures could be impacted by a flood event, but critical infrastructure and key resources (CIKR) within the county are especially important to identify. When these facilities are located in flood-prone areas, there is a substantial risk to important functions of government such as law enforcement and medical care. This also includes any assets, systems, and networks that are vital to the continued operation of government services such as power generation facilities, transmission infrastructure, and road networks, among others. The incapacitation or destruction of these resources would have a debilitating and costly effect on many aspects of the state's normal functionality.

Often, in the case of flooding, water and wastewater infrastructure are some of the most prominently impacted. Since these types of infrastructure deal directly with water, often they are located in the most flood prone areas and are severely impacted during flood events. When these facilities or infrastructure

are flooded, it complicates recovery and impacts people who are unable to utilize normal water sources for drinking, sanitation, and other everyday uses.

In addition, personal property such as homes and businesses have been impacted to a large degree by past flooding events and are a major concern in future flooding events. Although a great deal of effort has been undertaken to reduce the number of properties at risk through the use of progressively improved risk assessment and mitigation techniques, there are still a significant number of structures throughout the county which are located in flood zones or which have not been properly mitigated to reduce risk. These properties may sustain significant costs due to damage during future flood events and are often a major focus of post-disaster recovery efforts.

Economy

There are a variety of economic impacts that could result from a large-scale flood event. One major impact is on soil that is covered by flood waters, causing the rapid depletion of oxygen, which is essential for plant growth and development. This can hurt agricultural production in areas where that is a key economic driver. Secondly, flooding often causes the shutdown of businesses, many of which never re-open after a flood event. Indeed, FEMA reports that almost 40 percent of small businesses never reopen their doors after a disaster because only small amounts of flood waters can cause thousands of dollars of damage.[14] The shutdown of these small businesses in many communities can be devastating as many communities rely heavily on these small businesses as economic drivers and the base of the local economy.

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. Most features of the environment have come to adapt to the effects of a flood event and respond quickly, although it is possible that some species may not be resilient enough to survive and will experience population loss.

However, areas that have been modified by human activity tend to suffer more negative consequences from flooding which can result from modifying stream banks or removing vegetation from riverside. When these modifications are present, flooding can cause unnatural erosion of sediment into the waterway and create an imbalance of nutrients in the water which may harm ecosystems and have a negative impact on downstream water quality.[15]

5.10 HAIL

5.10.1 Background

Hailstorms are a potentially damaging outgrowth of severe thunderstorms (thunderstorms are discussed in a separate 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

[14] FEMA. (2017). *Protecting Your Businesses*. Retrieved October9, 2019, from https://www.fema.gov/protecting-your-businesses
[15] Office of the Queensland Australia Chief Scientist (2017). *What are the consequences of floods?* Retrieved October 9, 2019, from: http://www.chiefscientist.qld.gov.au/publications/understanding-floods/flood-consequences

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 5.27** shows the TORRO Hailstorm Intensity Scale which is a way of measuring hail severity.

TABLE 5.27: TORRO HAILSTORM INTENSITY SCALE

	Intensity Category	Typical Hail Diameter (mm)*	Probable Kinetic Energy, J-m^2	mm to inch conversion (inches)	Typical Damage Impacts
H0	Hard Hail	5	0-20	0 - 0.2	No damage
H1	Potentially Damaging	5-**15**	>20	0.2 - 0.6	Slight general damage to plants, crops
H2	Significant	10-**20**	>100	0.4 - 0.8	Significant damage to fruit, crops, vegetation
H3	Severe	20-**30**	>300	0.8 - 1.2	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
H4	Severe	25-**40**	>500	1.0 - 1.6	Widespread glass damage, vehicle bodywork damage
H5	Destructive	30-**50**	>800	1.2 - 2.0	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			Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: http://www.torro.org.uk/site/hscale.php

5.10.2 Location and Spatial Extent

Hailstorms frequently accompany thunderstorms, so their locations and spatial extents coincide. It is assumed that Guilford 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.

5.10.3 Historical Occurrences

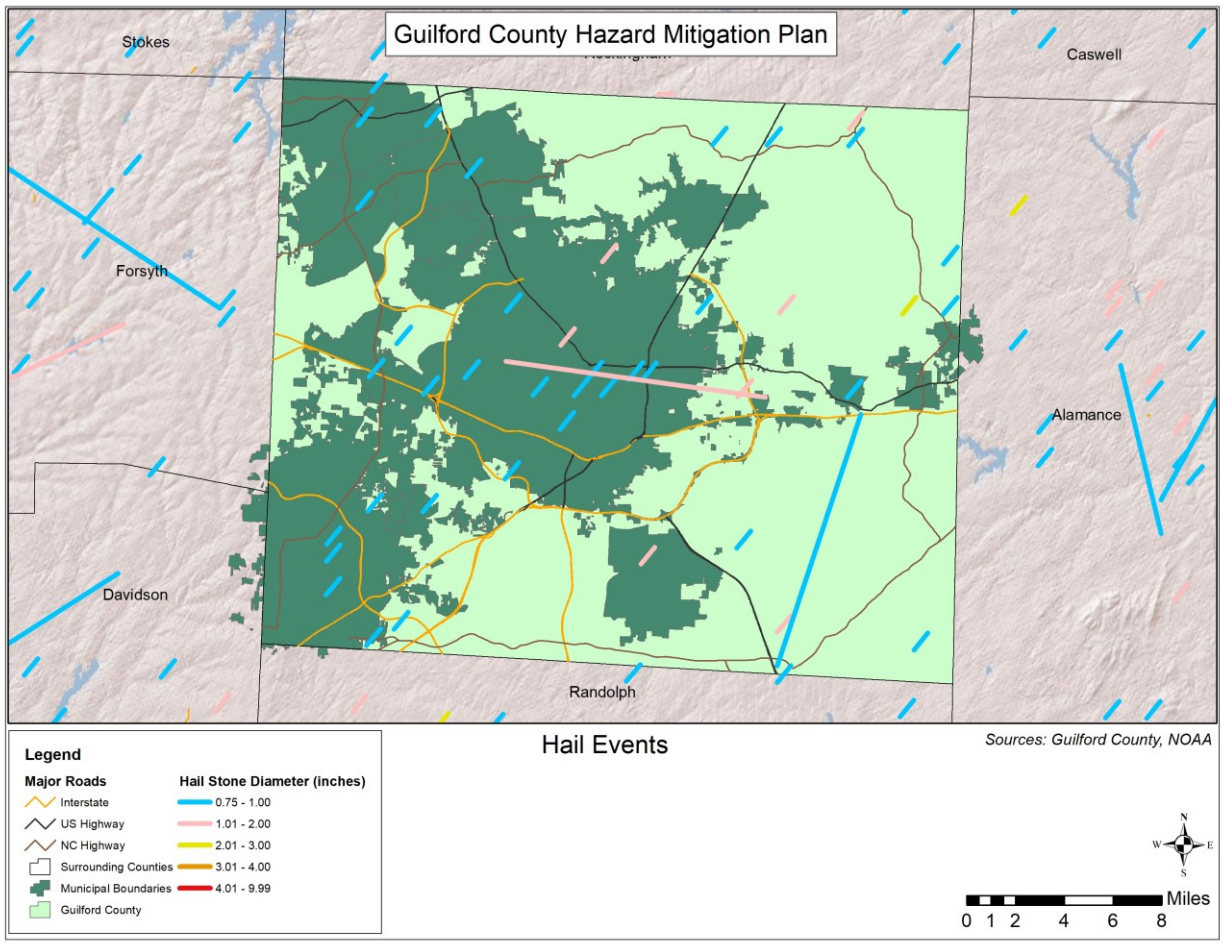
According to the National Centers for Environmental Information, 164 recorded hailstorm events have affected Guilford County since 1967.[16] **Table 5.28** is a summary of the hail events in Guilford County. **Table 5.29** provides detailed information about each event that occurred in the county. **Figure 5.39** illustrates the location and magnitude of historic hailstorms that have occurred in the county.

In all, hail occurrences resulted in around $2,000 (2019 dollars) in recorded property damages.[17] Hail ranged in diameter from 0.75 inches to 2.75 inches. It should be noted that hail is notorious for causing substantial damage to cars, roofs, and other parts of the built environment that may not be reported to the National Centers for Environmental Information. It is likely that damages are greater than the reported value.

[16] These hail events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1950 through March 2019. It is likely that additional hail events have affected Guilford County. In addition to NCEI, the North Carolina Department of Insurance office was contacted for information. As additional local data becomes available, this hazard profile will be amended.

[17] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

FIGURE 5.39: HISTORIC HAIL EVENTS (1950-2019)



Source: National Centers for Environmental Information

TABLE 5.28: SUMMARY OF HAIL OCCURRENCES IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Gibsonville	4	0/0	$0	$0
Greensboro	43	0/0	$0	$0
High Point	16	0/0	$0	$0
Jamestown	1	0/0	$0	$0
Oak Ridge	4	0/0	$0	$0
Pleasant Garden	4	0/0	$0	$0
Sedalia	3	0/0	$0	$0
Stokesdale	7	0/0	$0	$0
Summerfield	5	0/0	$0	$0
Whitsett	1	0/0	$0	$0
Unincorporated Area	89	0/0	$2,019	$39
GUILFORD COUNTY TOTAL	**177**	**0/0**	**$2,019**	**$39**

Source: National Centers for Environmental Information

TABLE 5.29: HISTORICAL HAIL OCCURRENCES IN GUILFORD COUNTY

	Date	Magnitude	Deaths / Injuries	Property Damage*
Gibsonville				
GIBSONVILLE	4/3/1998	0.75 in.	0/0	$0
GIBSONVILLE	5/23/2004	0.88 in.	0/0	$0
GIBSONVILLE	5/14/2006	0.88 in.	0/0	$0
GIBSONVILLE	5/14/2006	0.88 in.	0/0	$0
Greensboro				
GREENSBORO	9/13/1996	0.75 in.	0/0	$0
GREENSBORO	3/5/1997	0.75 in.	0/0	$0
GREENSBORO	8/25/1997	0.75 in.	0/0	$0
GREENSBORO	5/20/1998	1.75 in.	0/0	$0
GREENSBORO	5/26/1998	0.75 in.	0/0	$0
GREENSBORO	6/15/1998	0.75 in.	0/0	$0
GREENSBORO	5/25/2001	1.00 in.	0/0	$0
GREENSBORO	5/25/2001	1.00 in.	0/0	$0
GREENSBORO	7/4/2002	0.88 in.	0/0	$0
GREENSBORO	7/4/2002	0.75 in.	0/0	$0
GREENSBORO	4/26/2003	1.25 in.	0/0	$0
GREENSBORO	5/31/2003	1.00 in.	0/0	$0
GREENSBORO	8/5/2003	0.75 in.	0/0	$0
GREENSBORO	8/22/2003	0.88 in.	0/0	$0
GREENSBORO	5/9/2004	0.75 in.	0/0	$0
GREENSBORO	3/23/2005	1.75 in.	0/0	$0
GREENSBORO	4/3/2006	0.75 in.	0/0	$0
GREENSBORO	5/14/2006	0.88 in.	0/0	$0
GREENSBORO	5/14/2006	0.88 in.	0/0	$0
GREENSBORO	5/14/2006	0.88 in.	0/0	$0
GREENSBORO	5/14/2006	1.00 in.	0/0	$0
GREENSBORO	5/14/2006	0.88 in.	0/0	$0
GREENSBORO	5/14/2006	1.00 in.	0/0	$0
GREENSBORO	5/14/2006	1.75 in.	0/0	$0
GREENSBORO	5/14/2006	1.75 in.	0/0	$0
GREENSBORO	5/15/2006	0.75 in.	0/0	$0
GREENSBORO	5/26/2006	1.00 in.	0/0	$0
GREENSBORO	6/11/2006	0.75 in.	0/0	$0
GREENSBORO	6/11/2006	1.50 in.	0/0	$0
GREENSBORO	6/11/2006	0.75 in.	0/0	$0
GREENSBORO	6/23/2006	0.88 in.	0/0	$0
GREENSBORO	6/23/2006	1.00 in.	0/0	$0
GREENSBORO	6/23/2006	1.00 in.	0/0	$0
GREENSBORO	6/23/2006	0.75 in.	0/0	$0
GREENSBORO	8/30/2006	0.75 in.	0/0	$0
GREENSBORO	9/28/2006	0.88 in.	0/0	$0
GREENSBORO	4/15/2007	0.88 in.	0/0	$0
GREENSBORO	6/27/2007	0.75 in.	0/0	$0
GREENSBORO	6/27/2007	0.75 in.	0/0	$0

	Date	Magnitude	Deaths / Injuries	Property Damage*
GREENSBORO	5/31/2008	1.00 in.	0/0	$0
GREENSBORO	8/19/2009	0.75 in.	0/0	$0
GREENSBORO	6/1/2012	1.75 in.	0/0	$0
GREENSBORO	9/28/2016	1.75 in.	0/0	$0
High Point				
HIGH POINT	8/27/1994	0.75 in.	0/0	$0
HIGH POINT	7/18/1996	0.75 in.	0/0	$0
HIGH POINT	4/17/1998	0.88 in.	0/0	$0
HIGH POINT	5/7/1998	0.88 in.	0/0	$0
HIGH POINT	6/3/2000	1.75 in.	0/0	$0
HIGH POINT	7/2/2002	0.88 in.	0/0	$0
HIGH POINT	4/30/2003	0.75 in.	0/0	$0
HIGH POINT	5/2/2003	0.75 in.	0/0	$0
HIGH POINT	7/4/2004	0.75 in.	0/0	$0
HIGH POINT	7/17/2004	1.00 in.	0/0	$0
HIGH POINT	5/14/2006	1.00 in.	0/0	$0
HIGH POINT	6/8/2006	0.75 in.	0/0	$0
HIGH POINT	6/23/2006	0.88 in.	0/0	$0
HIGH POINT	8/30/2006	1.00 in.	0/0	$0
HIGH POINT	8/30/2006	0.75 in.	0/0	$0
HIGH POINT	4/20/2008	1.00 in.	0/0	$0
Jamestown				
JAMESTOWN	4/26/2003	0.88 in.	0/0	$0
Oak Ridge				
OAK RIDGE	5/12/2001	0.88 in.	0/0	$0
OAK RIDGE	3/23/2005	1.00 in.	0/0	$0
OAK RIDGE ARPT	7/20/2009	1.75 in.	0/0	$0
OAK RIDGE ARPT	4/20/2015	1.00 in.	0/0	$0
Pleasant Garden				
PLEASANT GARDEN	7/1/2002	1.50 in.	0/0	$0
PLEASANT GARDEN	8/7/2006	0.75 in.	0/0	$0
PLEASANT GARDEN	5/9/2009	0.88 in.	0/0	$0
PLEASANT GARDEN	4/19/2013	1.00 in.	0/0	$0
Sedalia				
SEDALIA	9/20/2005	0.75 in.	0/0	$0
SEDALIA	9/28/2016	1.00 in.	0/0	$0
SEDALIA	9/28/2016	1.25 in.	0/0	$0
Stokesdale				
STOKESDALE	7/24/1997	1.00 in.	0/0	$0
STOKESDALE	7/3/2002	1.75 in.	0/0	$0
STOKESDALE	7/19/2003	0.88 in.	0/0	$0
STOKESDALE	6/11/2006	0.75 in.	0/0	$0
STOKESDALE	6/11/2006	0.75 in.	0/0	$0
STOKESDALE	7/4/2006	1.00 in.	0/0	$0
STOKESDALE	9/28/2006	0.75 in.	0/0	$0

	Date	Magnitude	Deaths / Injuries	Property Damage*
Summerfield				
SUMMERFIELD	8/18/2000	2.50 in.	0/0	$0
SUMMERFIELD	7/13/2003	0.88 in.	0/0	$0
SUMMERFIELD	10/21/2005	0.75 in.	0/0	$0
SUMMERFIELD	9/28/2006	0.75 in.	0/0	$0
SUMMERFIELD	5/31/2008	0.75 in.	0/0	$0
Whitsett				
WHISTETT	6/22/2008	0.75 in.	0/0	$0
Unincorporated Area				
GUILFORD CO.	8/7/1967	0.75 in.	0/0	$0
GUILFORD CO.	6/22/1978	1.00 in.	0/0	$0
GUILFORD CO.	8/21/1979	1.00 in.	0/0	$0
GUILFORD CO.	4/27/1982	1.00 in.	0/0	$0
GUILFORD CO.	5/29/1982	1.75 in.	0/0	$0
GUILFORD CO.	4/2/1983	2.75 in.	0/0	$0
GUILFORD CO.	4/14/1984	1.75 in.	0/0	$0
GUILFORD CO.	5/6/1984	1.75 in.	0/0	$0
GUILFORD CO.	5/15/1985	0.75 in.	0/0	$0
GUILFORD CO.	5/22/1985	2.50 in.	0/0	$0
GUILFORD CO.	6/3/1985	1.00 in.	0/0	$0
GUILFORD CO.	6/5/1985	1.25 in.	0/0	$0
GUILFORD CO.	6/5/1985	1.00 in.	0/0	$0
GUILFORD CO.	4/12/1987	1.75 in.	0/0	$0
GUILFORD CO.	6/1/1987	1.75 in.	0/0	$0
GUILFORD CO.	5/16/1988	0.75 in.	0/0	$0
GUILFORD CO.	5/17/1988	0.75 in.	0/0	$0
GUILFORD CO.	5/17/1988	0.75 in.	0/0	$0
GUILFORD CO.	5/17/1988	0.75 in.	0/0	$0
GUILFORD CO.	5/17/1988	1.00 in.	0/0	$0
GUILFORD CO.	6/21/1988	0.75 in.	0/0	$0
GUILFORD CO.	7/10/1988	1.75 in.	0/0	$0
GUILFORD CO.	4/27/1989	0.75 in.	0/0	$0
GUILFORD CO.	6/2/1989	1.00 in.	0/0	$0
GUILFORD CO.	5/1/1990	1.00 in.	0/0	$0
GUILFORD CO.	5/1/1990	1.00 in.	0/0	$0
GUILFORD CO.	5/27/1990	1.00 in.	0/0	$0
GUILFORD CO.	5/27/1990	1.75 in.	0/0	$0
GUILFORD CO.	7/1/1990	1.75 in.	0/0	$0
GUILFORD CO.	4/30/1992	0.75 in.	0/0	$0
GUILFORD CO.	6/26/1992	0.75 in.	0/0	$0
JULIAN	10/27/1995	1.50 in.	0/0	$0
JULIAN	5/29/1996	1.75 in.	0/0	$0
JULIAN,CLIMAX	10/18/1996	0.75 in.	0/0	$0
MONTICELLO	5/1/1998	0.75 in.	0/0	$0
GUILFORD	5/20/1998	1.00 in.	0/0	$0
MC LEANSVILLE	6/23/2006	1.75 in.	0/0	$0

	Date	Magnitude	Deaths / Injuries	Property Damage*
CLIMAX	3/4/2008	0.75 in.	0/0	$0
GREENSBORO MAY ARPT	3/4/2008	0.75 in.	0/0	$0
COLFAX	3/4/2008	0.75 in.	0/0	$0
BROWNS SUMMIT	5/8/2008	0.75 in.	0/0	$0
BATTLE GROUND	5/8/2008	1.75 in.	0/0	$0
BROWNS SUMMIT	5/9/2008	0.75 in.	0/0	$0
SHERWOOD VLG	5/20/2008	0.88 in.	0/0	$0
BATTLE GROUND	5/31/2008	0.75 in.	0/0	$0
BATTLE GROUND	5/31/2008	0.88 in.	0/0	$0
GUILFORD	5/31/2008	1.00 in.	0/0	$0
BATTLE GROUND	5/31/2008	0.88 in.	0/0	$0
PINECROFT	5/31/2008	1.00 in.	0/0	$0
BATTLE GROUND	5/31/2008	1.25 in.	0/0	$0
BATTLE GROUND	5/31/2008	1.00 in.	0/0	$0
GUILFORD	6/22/2008	0.75 in.	0/0	$0
BATTLE GROUND	6/22/2008	0.75 in.	0/0	$0
HAMILTON LAKES	6/22/2008	0.88 in.	0/0	$0
HAMILTON LAKES	6/22/2008	0.88 in.	0/0	$0
BATTLE GROUND	6/3/2009	1.00 in.	0/0	$0
BROADVIEW	6/3/2009	0.75 in.	0/0	$0
BESSEMER	6/3/2009	1.00 in.	0/0	$0
CLIMAX	6/9/2009	1.00 in.	0/0	$0
HILLSDALE	7/20/2009	0.75 in.	0/0	$0
BROWNS SUMMIT	3/28/2010	1.00 in.	0/0	$1,471
DEEP RIVER	5/15/2010	1.00 in.	0/0	$0
DEEP RIVER	5/15/2010	1.00 in.	0/0	$0
VANDALIA	5/15/2010	1.00 in.	0/0	$0
GREENSBORO ARPT	4/27/2011	0.75 in.	0/0	$0
HAMILTON LAKES	4/27/2011	0.75 in.	0/0	$0
GREENSBORO ARPT	4/27/2011	0.88 in.	0/0	$0
BROWNS SUMMIT	6/9/2011	1.50 in.	0/0	$0
FOUR MILE	9/27/2011	1.00 in.	0/0	$0
GREENSBORO ARPT	3/24/2012	1.00 in.	0/0	$0
GROOMTOWN	3/24/2012	1.00 in.	0/0	$0
CLIMAX	3/24/2012	1.00 in.	0/0	$0
PINECROFT	6/1/2012	1.00 in.	0/0	$0
POMONA	6/25/2013	1.75 in.	0/0	$548
GROOMTOWN	6/10/2014	1.25 in.	0/0	$0
KOONTZVILLE	6/16/2014	1.25 in.	0/0	$0
BRIGHTWOOD	6/16/2014	1.25 in.	0/0	$0
BRIGHTWOOD	6/16/2014	1.75 in.	0/0	$0
BRIGHTWOOD	6/16/2014	1.50 in.	0/0	$0
BROADVIEW	6/16/2014	1.00 in.	0/0	$0
SCALESVILLE	4/28/2016	1.00 in.	0/0	$0
GREENSBORO ARPT	5/2/2016	0.88 in.	0/0	$0
GUILFORD	5/2/2016	0.88 in.	0/0	$0

	Date	Magnitude	Deaths / Injuries	Property Damage*
(GSO)GREENSBORO RGNL	5/2/2016	1.00 in.	0/0	$0
GUILFORD	5/2/2016	1.00 in.	0/0	$0
GUILQUARRY	5/12/2016	1.00 in.	0/0	$0
GUILQUARRY	6/29/2016	1.00 in.	0/0	$0
OSCEOLA	9/28/2016	1.00 in.	0/0	$0
CLIMAX	4/6/2017	1.00 in.	0/0	$0

*Property damage is reported in 2019 dollars; All damage may not have been reported.
Source: National Centers for Environmental Information

5.10.4 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 assumed that the entire county has equal exposure to this hazard. It can be expected that future hail events will continue to cause minor damage to property and vehicles throughout the county.

5.10.5 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, including homeless populations, are detrimentally impacted if they cannot find shelter, but hail can impact anyone. There would be little negative impact on public confidence.

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.

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, 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 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.

5.11 HURRICANE / OTHER TROPICAL DISTURBANCE

5.11.1 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 5.30**), which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

TABLE 5.30: 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 5.31** 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 5.31: HURRICANE DAMAGE CLASSIFICATIONS

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

Source: National Hurricane Center

5.11.2 Location and Spatial Extent

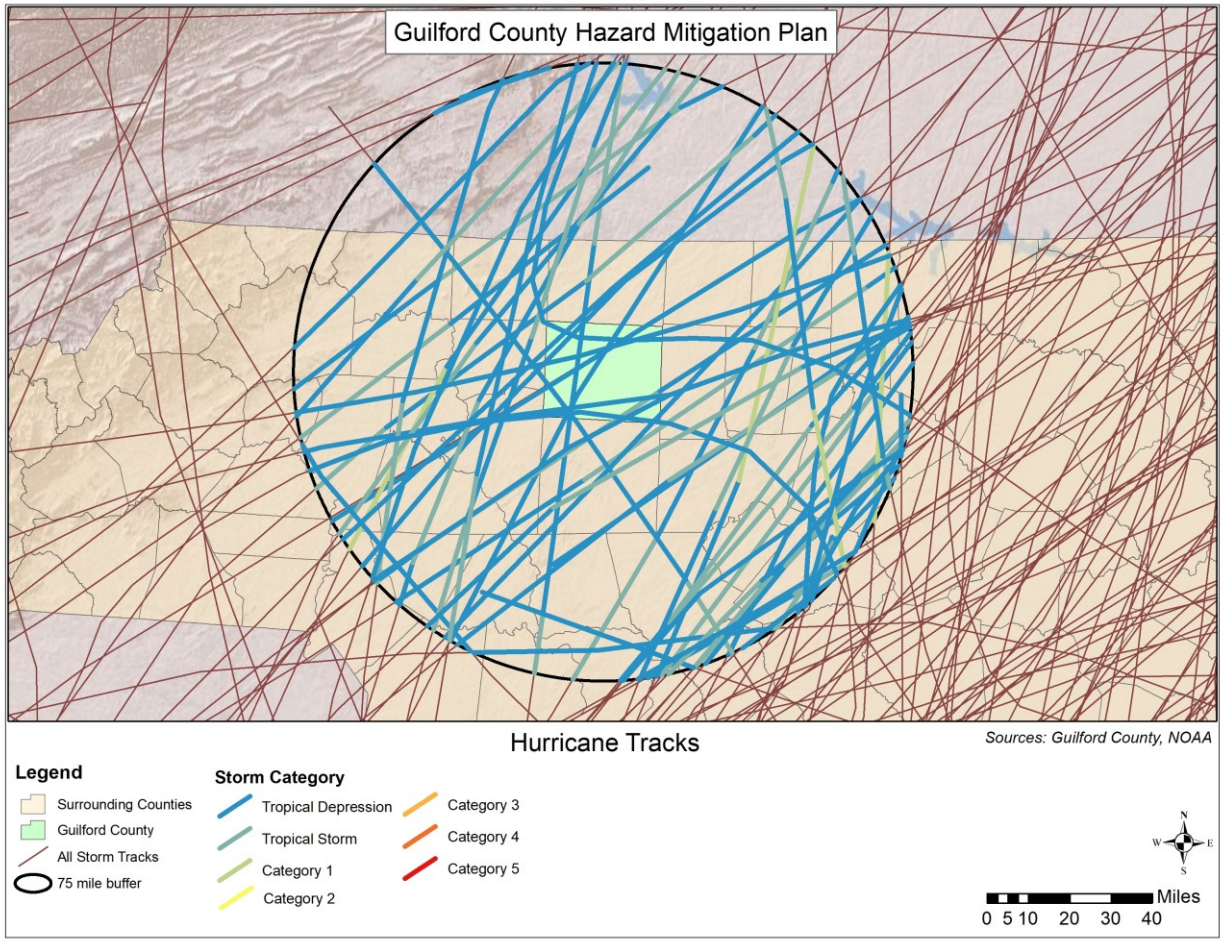
Hurricanes and tropical storms threaten the entire Atlantic and Gulf seaboards of the United States. While coastal areas are most directly exposed to the brunt of landfalling storms, their impact is often felt hundreds of miles inland and they can affect Guilford County. All areas in Guilford County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

5.11.3 Historical Occurrences

According to the National Hurricane Center's historical storm track records, 60 hurricane/tropical storm tracks have passed within 75 miles of Guilford County since 1850.[18] This includes 6 hurricanes, 29 tropical storms, and 25 tropical depressions.

Of the recorded storm events, 13 have traversed directly through Guilford County as shown in **Figure 5.40**. **Table 5.32** provides the date of occurrence, name (if applicable), maximum wind speed (as recorded within 75 miles of Guilford County), and Category of the storm based on the Saffir-Simpson Scale for each event.

FIGURE 5.40: HISTORICAL HURRICANE STORM TRACKS WITHIN 75 MILES OF GUILFORD COUNTY



Source: National Oceanic and Atmospheric Administration; National Hurricane Center

[18] 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.

TABLE 5.32: HISTORICAL STORM TRACKS WITHIN 75 MILES OF GUILFORD COUNTY (1850-2019)

Date of Occurrence	Storm Name	Maximum Sustained Wind Speed (knots)	Storm Category
9/10/1854	NOT NAMED	40	Tropical Storm
9/17/1859	NOT NAMED	40	Tropical Storm
11/2/1861	NOT NAMED	0	Tropical Depression
9/18/1863	NOT NAMED	0	Tropical Depression
10/2/1863	NOT NAMED	0	Tropical Depression
6/23/1867	NOT NAMED	0	Tropical Depression
9/19/1875	NOT NAMED	0	Tropical Depression
10/4/1877	NOT NAMED	50	Tropical Storm
9/12/1878	NOT NAMED	60	Tropical Storm
9/11/1882	NOT NAMED	40	Tropical Storm
10/13/1885	NOT NAMED	40	Tropical Storm
6/22/1886	NOT NAMED	35	Tropical Storm
7/2/1886	NOT NAMED	40	Tropical Storm
9/10/1888	NOT NAMED	35	Tropical Storm
9/24/1889	NOT NAMED	40	Tropical Storm
8/28/1893	NOT NAMED	65	Category 1
10/13/1893	NOT NAMED	80	Category 1
6/12/1895	NOT NAMED	0	Tropical Depression
9/30/1896	NOT NAMED	70	Category 1
10/31/1899	NOT NAMED	0	Tropical Depression
6/16/1902	NOT NAMED	35	Tropical Storm
10/12/1902	NOT NAMED	35	Tropical Storm
9/14/1904	NOT NAMED	60	Tropical Storm
9/23/1907	NOT NAMED	35	Tropical Storm
8/31/1911	NOT NAMED	25	Tropical Depression
9/3/1913	NOT NAMED	40	Tropical Storm
8/4/1915	NOT NAMED	40	Tropical Storm
9/23/1920	NOT NAMED	35	Tropical Storm
10/3/1927	NOT NAMED	35	Tropical Storm
8/11/1928	NOT NAMED	30	Tropical Depression
10/2/1929	NOT NAMED	50	Tropical Storm
9/6/1935	NOT NAMED	45	Tropical Storm
10/20/1944	NOT NAMED	45	Tropical Storm
9/18/1945	NOT NAMED	45	Tropical Storm
8/29/1949	NOT NAMED	50	Tropical Storm
8/31/1952	ABLE	40	Tropical Storm
8/28/1952	NOT NAMED	30	Tropical Depression
8/17/1955	DIANE	55	Tropical Storm
7/10/1959	CINDY	30	Tropical Depression
8/31/1964	CLEO	25	Tropical Depression
6/9/1968	ABBY	25	Tropical Depression
5/26/1970	ALMA	25	Tropical Depression
9/16/1976	NOT NAMED	25	Tropical Depression
9/5/1979	DAVID	45	Tropical Storm
7/25/1985	BOB	45	Tropical Storm

Date of Occurrence	Storm Name	Maximum Sustained Wind Speed (knots)	Storm Category
8/18/1985	DANNY	25	Tropical Depression
9/8/1987	NOT NAMED	0	Tropical Depression
8/29/1988	CHRIS	20	Tropical Depression
9/22/1989	HUGO*	85	Category 2
9/6/1996	FRAN	65	Category 1
7/24/1997	DANNY	30	Tropical Depression
9/16/1999	FLOYD*	90	Category 2
9/5/1999	DENNIS	30	Tropical Depression
9/19/2000	GORDON	20	Tropical Depression
7/2/2003	BILL	0	Tropical Depression
8/30/2004	GASTON	30	Tropical Depression
9/18/2004	IVAN	20	Tropical Depression
9/28/2004	JEANNE	20	Tropical Depression
7/7/2005	CINDY	20	Tropical Depression
9/7/2018	FLORENCE*	50	Tropical Storm
10/11/2018	MICHAEL	45	Tropical Storm

*Although the track of these storms traversed outside of the 75-mile buffer area, they were included in the hazard history since a federal disaster area was declared for Guilford County as a result of the storm's impact.
Source: National Hurricane Center

The National Centers for Environmental Information reported four events associated with a hurricane or tropical storm in Guilford County since 1996. Additionally, Federal records indicate that five disaster declarations were made in 1989 (Hurricane Hugo), 1996 (Hurricane Fran), 1999 (Hurricane Floyd), 2004 (Hurricane Ivan), 2018 (Hurricane Florence) for the county.[19]

Flooding is often the greatest hazard of concern with hurricane and tropical storm events in Guilford County. Most events do not carry winds that are above that of the thunderstorms and straight line winds received by the county. Some anecdotal information is available for the major storms that have impacted that area as found below:

Hurricane Hugo – September 22-24, 1989
Hurricane Hugo was one of the largest storms on record in the Atlantic Basin that produced high winds and dumped heavy rains over much of North Carolina and South Carolina. Hugo reached a peak level of Category 5 on the Saffir-Simpson scale and made landfall near Isle of Palms in South Carolina as a Category 4, eventually passing over Charlotte and much of the surrounding area as a Category 1 storm. Although the storm caused its greatest damage in South Carolina, over 1,000 structures were destroyed or severely damaged in North Carolina, causing over $1 billion dollars in damages. Wind gusts reached over 40 mph and numerous trees were downed throughout much of south and western North Carolina.

Hurricane Fran – September 5-6, 1996
After being hit just a few weeks earlier by Hurricane Bertha, North Carolina was impacted by the one of the most devastating storms to ever make landfall along the Atlantic Coast. Fran dropped more than 10 inches of rain in many areas and had sustained winds of around 115 miles per hour as it hit the coast and began its path along the I-40 corridor central North Carolina. In the end, over 3 billion dollars in

[19] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Identification*.

damages were reported in the state. Damages to infrastructure and agriculture added to the overall toll and more than 1.7 million people in the state were left without power.

Hurricane Floyd – September 16, 1999
Hurricane Floyd, combined with the weather conditions before and immediately after this hurricane, resulted in the most severe flooding and devastation in North Carolina history. In North Carolina, the storm resulted in 35 fatalities, over $3 billion in damages, 7,000 destroyed homes, 56,000 damaged homes, 1,500 people rescued from flooded areas, and more than 500,000 customers without electricity. Additionally, the flooding caused an estimated $813 million in agricultural losses affecting 32,000 farmers. There was also significant loss of livestock including 2,860,827 poultry, 28,000 swine, and 619 cattle.

Hurricane Ivan – September 16-17, 2004
Just a week and a half following Tropical Storm Frances, the remnants of Hurricane Ivan hit western North Carolina when many streams and rivers were already well above flood stage. The widespread flooding forced many roads to be closed and landslides were common across the mountain region. Wind gusts reached between 40 and 60 mph across the higher elevations of the Appalachian Mountains resulting in numerous downed trees. More than $13.8 million of federal aid was dispersed across North Carolina following Ivan.

Hurricane Florence – September 12-15, 2018
Florence produced extensive wind damage along the North Carolina coast from Cape Lookout, across Carteret, Onslow, Pender and New Hanover counties. Thousands of downed trees caused widespread power outages to nearly all of eastern North Carolina. The historic legacy of Hurricane Florence will be record breaking storm surge of 9 to 13 feet and devastating rainfall of 20 to 30 inches, which produced catastrophic and life-threatening flooding. The hardest hit areas included New Bern, Newport, Belhaven, Oriental, North Topsail Beach and Jacksonville, along with Downeast Carteret County, or basically south of a line from Kinston to Cedar Island. A storm total rainfall of 34.00 inches was reported in Swansboro, while the NWS office in Newport recorded 25.20 inches. Wind gusts of 106 mph were reported at Cape Lookout with 105 mph at Fort Macon.

5.11.4 Probability of Future Occurrences

Given the inland location of the county, it is more likely to be affected by remnants of hurricane and tropical storm systems (as opposed to a major hurricane) which may result in flooding or high winds. The probability of being impacted is less than coastal areas, but still remains a real threat to Guilford County due to induced events like flooding and erosion. Based on historical evidence, the probability level of future occurrence is likely (between 10 and 100 percent annual probability). Given the regional nature of the hazard, all areas in the county are equally exposed to this hazard. However, when the county is impacted, the damage could be catastrophic, threatening lives and property throughout the planning area. Additionally, according to the *Piedmont Together Climate Adaptation Report*, the increased likelihood of hurricanes due to climate change will result in greater wind damage and increased flooding in the county.

5.11.5 Consequence Analysis

People (The Public and Public Confidence)

During previous hurricane events in Guilford County, there have been significant losses of life and injuries to citizens. A number of people may be displaced from their homes and will require accommodations in temporary public shelters due to a hurricane. Many people may also be permanently displaced and require longer term housing after a major event. In addition, many of the same health and property damage effects listed under the flood hazard would also likely occur as a result of a hurricane. A major difference is that hurricanes can also bring negative effects from high winds. High winds can shatter glass and cause personal injury during the event and can cause loss of life if members of the public are not cautious and fail to take proper precautions prior to and during an event.

This hazard could potentially have a large negative effect on public confidence due to the possibility of a high magnitude event and the difficulties that might arise for local governments in terms of response and recovery. As has been the case with several previous events, members of the public who are displaced or whose homes/property are damaged may be frustrated causing a failure of confidence in the government's ability to respond to disasters.

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 their actual 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 Guilford 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. Some may experience damage from the storm themselves and be unable to work putting a strain on staff who are working as they will be forced to take on additional responsibilities during and after an event. In major events, all staff will likely be called on to work additional hours to maintain continuity of operations, which may result in fatigue and a reduced capability of employees in the long run.

Built Environment (Property, Facilities, and Infrastructure)

Many buildings and structures could be impacted by a hurricane or tropical storm event including many local and state critical facilities such as police stations, fire stations, medical facilities, and other key buildings. Large-scale damage to infrastructure such as bridges and roads could occur from flood waters. Stormwater infrastructure such as culverts could also be damaged if they are clogged with debris from the storm or their design capacity is overrun. Many utilities including water/wastewater may be affected as a result of their location near rivers and other water sources. Power lines may be downed by falling

trees or limbs and, due to high demand across the state, utility companies may face challenges in restoring power in a timely manner.

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. Businesses may be shut down for long periods as owners try to rebuild after damage from flood waters, downed trees, or wind. Even business owners without direct physical damage to their workplaces may be shut down temporarily by loss of power or because employees are unable to come in to work as a result of roads that are shut down or personal property damage. As mentioned in the flooding analysis, many businesses that shut down after a major disaster never re-open their doors, which can have a major negative impact on local economies, especially in smaller communities.

Environment

Flooding and wind damage are the main impacts that would be felt by a hurricane in North Carolina. Hurricane winds can down trees and cause disruptions to local ecosystems, particularly if damage is heavy in areas where endangered or protected species are present. As mentioned in the flood analysis, flood waters may cause some losses in species population. Hurricane events can also sometimes cause spills of hazardous materials which would have damaging effects on the environment (as detailed further in the hazardous materials analysis below).

5.12 THUNDERSTORM (WIND AND LIGHTNING)

5.12.1 Background

Thunderstorms can produce a variety of accompanying hazards including wind (discussed here), hail, and lightning (discussed here).[20] 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.

[20]The hail hazard is discussed as a separate hazard in this section.

Wind

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 Guilford County. Therefore, high winds are also reported in this section.

High winds can form due to pressure off the Northeast coast 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. It is common for gusts of 30 to 60 miles per hour to occur during the winter months.

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.”

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 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.

5.12.2 Location and Spatial Extent

Wind

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, Guilford County typically experiences several straight-line wind events each year. These wind events can and have caused significant damage. It is

assumed that Guilford County has uniform exposure to a thunderstorm/wind event and the spatial extent of an impact could be large.

Lightning

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

5.12.3 Historical Occurrences

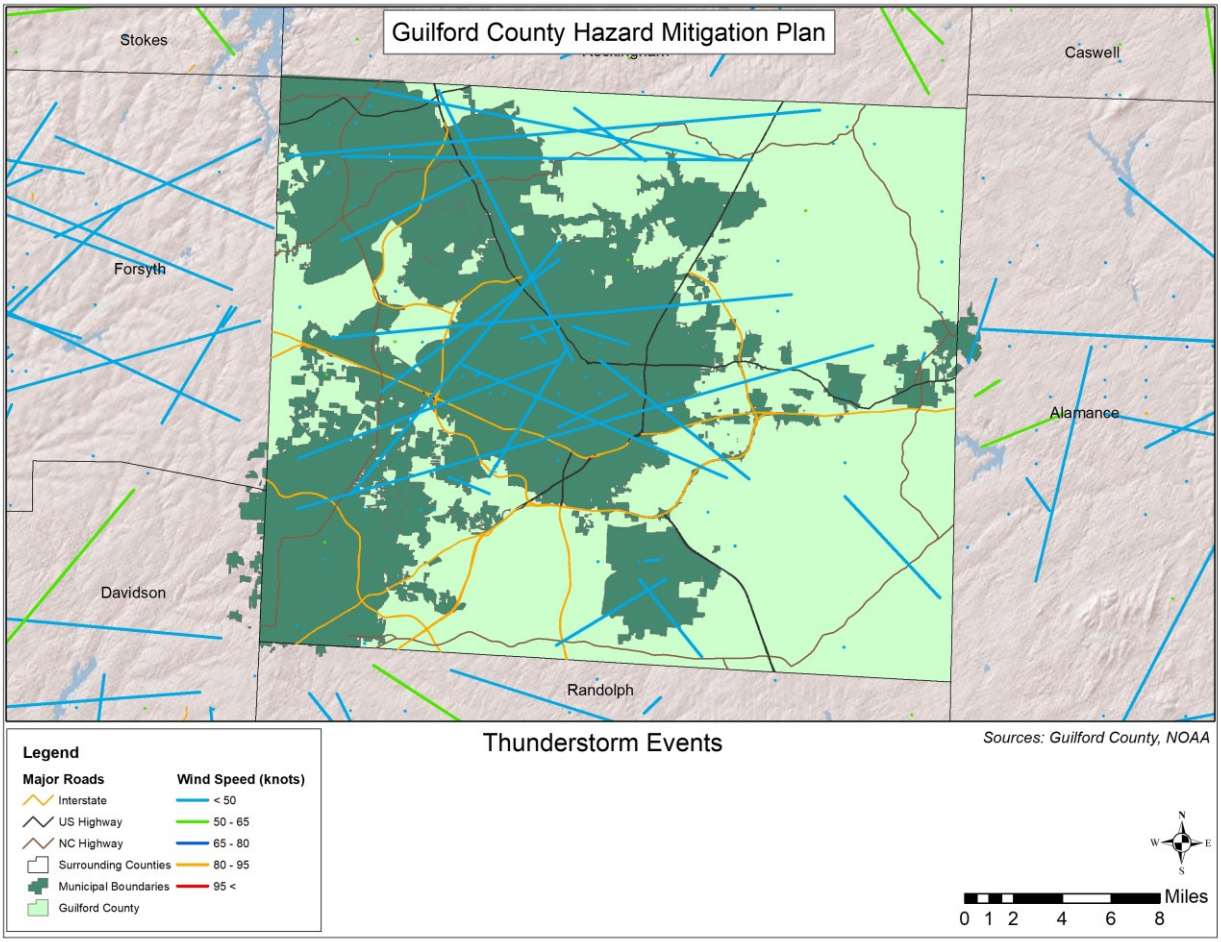
Wind

According to NCEI, there have been 311 reported thunderstorm wind and high wind events since 1950 in Guilford County.[21] These events caused over $2.6 million (2019 dollars) in damages.[22] There were also reports of at least two fatalities and two injuries. **Table 5.33** summarizes this information. **Table 5.34** provides detailed thunderstorm wind and high wind event reports, including date, magnitude, and associated damages for each event. **Figure 5.41** shows historic thunderstorm and high wind events as reported by NCEI.

[21] These thunderstorm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1955 through March 2019 and these high wind events are only inclusive of those reported by NCEI from 1996 through March 2019. It is likely that additional thunderstorm and high wind events have occurred in Guilford County. As additional local data becomes available, this hazard profile will be amended.

[22] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

FIGURE 5.41: HISTORIC THUNDERSTORM/HIGH WIND EVENTS (1950-2019)



Source: National Centers for Environmental Information

TABLE 5.33: SUMMARY OF THUNDERSTORM / HIGH WIND OCCURRENCES IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Gibsonville	8	0/0	$50,814	$1,954
Greensboro	38	0/1	$423,050	$16,271
High Point	13	0/0	$312,132	$16,428
Jamestown	5	0/0	$0	$0
Oak Ridge	12	0/0	$2,190	$115
Pleasant Garden	9	0/0	$5,875	$309
Sedalia	4	0/0	$2,541	$159
Stokesdale	5	0/0	$0	$0
Summerfield	10	0/0	$13,881	$631
Whitsett	2	0/0	$0	$0
Unincorporated Area	205	2/1	$1,837,585	$29,168
GUILFORD COUNTY TOTAL	**311**	**2/2**	**$2,648,068**	**$65,036**

Source: National Centers for Environmental Information

TABLE 5.34: HISTORICAL THUNDERSTORM / HIGH WIND OCCURRENCES IN GUILFORD COUNTY

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
Gibsonville					
GIBSONVILLE	8/26/1993	Thunderstorm Wind	0 kts.	0/0	$0
GIBSONVILLE	5/20/2000	Thunderstorm Wind	60 kts.	0/0	$0
GIBSONVILLE	8/18/2000	Thunderstorm Wind	50 kts.	0/0	$0
GIBSONVILLE	7/20/2006	Thunderstorm Wind	50 kts.	0/0	$0
GIBSONVILLE	6/11/2007	Thunderstorm Wind	50 kts.	0/0	$0
GIBSONVILLE	6/27/2007	Thunderstorm Wind	50 kts.	0/0	$0
GIBSONVILLE	9/2/2012	Thunderstorm Wind	50 kts.	0/0	$0
GIBSONVILLE	6/20/2018	Thunderstorm Wind	50 kts.	0/0	$50,814
Greensboro					
GREENSBORO	8/12/1993	Thunderstorm Wind	0 kts.	0/0	$0
GREENSBORO	8/17/1993	Thunderstorm Wind	65 kts.	0/0	$0
GREENSBORO	8/26/1993	Thunderstorm Wind	0 kts.	0/0	$0
GREENSBORO	4/20/1996	Thunderstorm Wind	0 kts.	0/0	$0
GREENSBORO	5/11/1996	Thunderstorm Wind	60 kts.	0/0	$327,065
GREENSBORO	5/24/1996	Thunderstorm Wind	0 kts.	0/0	$0
GREENSBORO	3/5/1997	Thunderstorm Wind	50 kts.	0/0	$80,029
GREENSBORO	7/28/1997	Thunderstorm Wind	50 kts.	0/0	$15,956
GREENSBORO	6/16/1998	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/30/1998	Thunderstorm Wind	50 kts.	0/1	$0
GREENSBORO	7/7/1999	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	5/25/2000	Thunderstorm Wind	70 kts.	0/0	$0
GREENSBORO	8/10/2000	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/1/2002	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/27/2003	Thunderstorm Wind	52 kts.	0/0	$0
GREENSBORO	6/27/2003	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	4/3/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	4/17/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/11/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/11/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/11/2006	Thunderstorm Wind	52 kts.	0/0	$0
GREENSBORO	6/11/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/11/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	8/3/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	8/30/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	9/28/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	11/16/2006	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	4/15/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/4/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/4/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/4/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/5/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	8/21/2007	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	6/3/2009	Thunderstorm Wind	50 kts.	0/0	$0

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
GREENSBORO	6/22/2011	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	7/21/2013	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO	9/1/2018	Thunderstorm Wind	50 kts.	0/0	$0
High Point					
HIGH POINT	5/20/2000	Thunderstorm Wind	60 kts.	0/0	$0
HIGH POINT	5/25/2000	Thunderstorm Wind	60 kts.	0/0	$0
HIGH POINT	3/8/2005	Thunderstorm Wind	54 kts.	0/0	$0
HIGH POINT	4/17/2006	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	4/17/2006	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	7/19/2006	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	7/13/2009	Thunderstorm Wind	50 kts.	0/0	$17,838
HIGH POINT	4/5/2011	Thunderstorm Wind	50 kts.	0/0	$284,666
HIGH POINT	6/1/2012	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	6/19/2014	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	6/19/2014	Thunderstorm Wind	50 kts.	0/0	$0
HIGH POINT	8/5/2015	Thunderstorm Wind	50 kts.	0/0	$4,298
HIGH POINT	5/3/2016	Thunderstorm Wind	50 kts.	0/0	$5,330
Oak Ridge					
OAK RIDGE	6/15/2000	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE	7/4/2006	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE ARPT	6/27/2007	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE	5/26/2011	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE	5/27/2011	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE ARPT	9/8/2012	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE ARPT	4/19/2013	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE ARPT	8/10/2013	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE	8/10/2013	Thunderstorm Wind	50 kts.	0/0	$1,095
OAK RIDGE	8/10/2013	Thunderstorm Wind	50 kts.	0/0	$1,095
OAK RIDGE	6/19/2014	Thunderstorm Wind	50 kts.	0/0	$0
OAK RIDGE ARPT	7/21/2018	Thunderstorm Wind	50 kts.	0/0	$0
Pleasant Garden					
PLEASANT GARDEN	3/11/2000	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	5/22/2001	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	8/7/2006	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	7/8/2008	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	5/9/2009	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	6/23/2010	Thunderstorm Wind	50 kts.	0/0	$5,875
PLEASANT GARDEN	7/20/2010	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	4/28/2011	Thunderstorm Wind	50 kts.	0/0	$0
PLEASANT GARDEN	8/5/2015	Thunderstorm Wind	50 kts.	0/0	$0
Sedalia					
SEDALIA	7/13/2003	Thunderstorm Wind	50 kts.	0/0	$0
SEDALIA	3/8/2005	Thunderstorm Wind	50 kts.	0/0	$0
SEDALIA	7/4/2011	Thunderstorm Wind	50 kts.	0/0	$0

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
SEDALIA	7/6/2018	Thunderstorm Wind	50 kts.	0/0	$2,541
Stokesdale					
STOKESDALE	9/14/2000	Thunderstorm Wind	50 kts.	0/0	$0
STOKESDALE	8/12/2004	Thunderstorm Wind	50 kts.	0/0	$0
STOKESDALE	6/19/2007	Thunderstorm Wind	50 kts.	0/0	$0
STOKESDALE	6/27/2007	Thunderstorm Wind	50 kts.	0/0	$0
STOKESDALE	8/21/2007	Thunderstorm Wind	50 kts.	0/0	$0
Summerfield					
SUMMERFIELD	7/28/1997	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	6/15/2000	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	5/13/2002	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	7/28/2006	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	8/30/2006	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	6/24/2010	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	6/24/2010	Thunderstorm Wind	50 kts.	0/0	$11,749
SUMMERFIELD	7/24/2011	Thunderstorm Wind	50 kts.	0/0	$0
SUMMERFIELD	5/21/2016	Thunderstorm Wind	50 kts.	0/0	$2,132
SUMMERFIELD	7/21/2018	Thunderstorm Wind	50 kts.	0/0	$0
Whitsett					
WHITSETT	8/14/2011	Thunderstorm Wind	50 kts.	0/0	$0
WHITSETT	7/21/2012	Thunderstorm Wind	50 kts.	0/0	$0
Unincorporated Area					
GUILFORD CO.	8/2/1956	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/17/1957	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/25/1960	Thunderstorm Wind	60 kts.	0/0	$0
GUILFORD CO.	8/9/1962	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	3/19/1963	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	7/3/1964	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/13/1964	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/27/1965	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/4/1965	Thunderstorm Wind	55 kts.	0/0	$0
GUILFORD CO.	5/1/1966	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/29/1967	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/4/1967	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/24/1969	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/4/1970	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/29/1971	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	3/24/1975	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	2/18/1976	Thunderstorm Wind	54 kts.	0/0	$0
GUILFORD CO.	7/15/1976	Thunderstorm Wind	84 kts.	0/0	$0
GUILFORD CO.	8/14/1976	Thunderstorm Wind	60 kts.	0/0	$0
GUILFORD CO.	8/14/1976	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/4/1979	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/21/1979	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/1/1980	Thunderstorm Wind	50 kts.	0/0	$0

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
GUILFORD CO.	8/15/1980	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/6/1981	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/28/1981	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/29/1982	Thunderstorm Wind	52 kts.	0/0	$0
GUILFORD CO.	3/6/1983	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/10/1984	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	7/26/1984	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/26/1984	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/3/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/5/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/5/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/4/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/4/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/10/1985	Thunderstorm Wind	55 kts.	0/0	$0
GUILFORD CO.	10/15/1985	Thunderstorm Wind	52 kts.	0/0	$0
GUILFORD CO.	10/15/1985	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/28/1986	Thunderstorm Wind	52 kts.	0/0	$0
GUILFORD CO.	7/29/1986	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/29/1986	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/15/1987	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/1/1987	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	9/10/1987	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/10/1988	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/17/1988	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/23/1988	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	6/26/1988	Thunderstorm Wind	0 kts.	1/0	$0
GUILFORD CO.	7/10/1988	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/10/1988	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/26/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/5/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/5/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/6/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/6/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/6/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/23/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	6/16/1989	Thunderstorm Wind	0 kts.	1/0	$0
GUILFORD CO.	6/16/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/12/1989	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	2/10/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	5/1/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/1/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	7/11/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/29/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	10/18/1990	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/9/1991	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/29/1991	Thunderstorm Wind	0 kts.	0/0	$0

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
GUILFORD CO.	7/3/1991	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	7/3/1991	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	3/10/1992	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	3/10/1992	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	4/24/1992	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/11/1992	Thunderstorm Wind	0 kts.	0/0	$0
GUILFORD CO.	8/11/1992	Thunderstorm Wind	57 kts.	0/0	$0
GUILFORD CO.	11/22/1992	Thunderstorm Wind	0 kts.	0/0	$0
BROWNES SUMMIT	6/8/1995	Thunderstorm Wind	0 kts.	0/0	$0
JULIAN	10/27/1995	Thunderstorm Wind	0 kts.	0/0	$0
COUNTYWIDE	1/19/1996	Thunderstorm Wind	0 kts.	0/0	$0
CLIMAX	7/16/1997	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	2/16/1998	High Wind	45 kts.	0/0	$0
GREENSBORO ARPT	5/25/2000	Thunderstorm Wind	71 kts.	0/0	$0
GREENSBORO ARPT	9/14/2000	Thunderstorm Wind	52 kts.	0/0	$0
COLFAX	8/17/2003	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	3/7/2004	High Wind	50 kts.	0/0	$0
MONTICELLO	7/13/2005	Thunderstorm Wind	50 kts.	0/0	$0
CLIMAX	5/18/2006	Thunderstorm Wind	50 kts.	0/0	$0
MC LEANSVILLE	7/19/2006	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	4/16/2007	High Wind	54 kts.	0/0	$0
MC LEANSVILLE	6/27/2007	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	2/10/2008	Strong Wind	43 kts.	0/0	$6,049
GUILFORD	3/4/2008	Thunderstorm Wind	52 kts.	0/0	$0
DEEP RIVER	3/4/2008	Thunderstorm Wind	51 kts.	0/0	$0
HAMILTON LAKES	3/4/2008	Thunderstorm Wind	50 kts.	0/0	$0
(GSO)GREENSBORO RGNL	5/8/2008	Thunderstorm Wind	54 kts.	0/0	$0
MONTICELLO	5/8/2008	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO MAY ARPT	6/23/2008	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	1/7/2009	Strong Wind	39 kts.	0/0	$1,213
COLFAX	5/6/2009	Thunderstorm Wind	50 kts.	0/0	$0
RUDD	6/3/2009	Thunderstorm Wind	50 kts.	0/0	$0
HAMILTON LAKES	6/3/2009	Thunderstorm Wind	50 kts.	0/0	$0
DEEP RIVER	6/3/2009	Thunderstorm Wind	58 kts.	0/0	$0
GUILQUARRY	6/10/2009	Thunderstorm Wind	50 kts.	0/0	$0
CLIMAX	8/5/2009	Thunderstorm Wind	50 kts.	0/0	$0
BRIGHTWOOD	8/20/2009	Thunderstorm Wind	50 kts.	0/0	$0
BROWNS SUMMIT	9/28/2009	Thunderstorm Wind	50 kts.	0/0	$0
BROWNS SUMMIT	9/28/2009	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	11/11/2009	Strong Wind	35 kts.	0/0	$1,184
GUILFORD (ZONE)	12/9/2009	Strong Wind	40 kts.	0/0	$1,186
GUILFORD (ZONE)	2/10/2010	High Wind	50 kts.	0/0	$1,182
COLFAX	4/8/2010	Thunderstorm Wind	50 kts.	0/0	$0
POMONA	6/14/2010	Thunderstorm Wind	50 kts.	0/0	$1,175

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
PINECROFT	6/14/2010	Thunderstorm Wind	50 kts.	0/0	$0
SCALESVILLE	6/15/2010	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO MAY ARPT	6/15/2010	Thunderstorm Wind	50 kts.	0/0	$0
HAMILTON LAKES	6/16/2010	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD	7/13/2010	Thunderstorm Wind	50 kts.	0/0	$0
DEEP RIVER	7/16/2010	Thunderstorm Wind	50 kts.	0/0	$5,873
HILL TOP	8/5/2010	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO ARPT	8/11/2010	Thunderstorm Wind	50 kts.	0/0	$0
COLFAX	11/16/2010	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	2/25/2011	Strong Wind	44 kts.	0/0	$1,157,169
HILLSDALE	4/28/2011	Thunderstorm Wind	50 kts.	0/0	$0
BESSEMER	4/28/2011	Thunderstorm Wind	50 kts.	0/0	$0
MONTICELLO	4/28/2011	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	4/28/2011	Strong Wind	49 kts.	0/0	$1,139
GREENSBORO MAY ARPT	5/26/2011	Thunderstorm Wind	50 kts.	0/0	$0
MC LEANSVILLE	6/11/2011	Thunderstorm Wind	50 kts.	0/0	$0
HILLSDALE	6/18/2011	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO MAY ARPT	6/18/2011	Thunderstorm Wind	50 kts.	0/0	$0
BESSEMER	6/22/2011	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	6/28/2011	Thunderstorm Wind	50 kts.	0/0	$0
COLFAX	7/24/2011	Thunderstorm Wind	50 kts.	0/0	$0
GUILQUARRY	2/22/2012	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO MAY ARPT	2/22/2012	Thunderstorm Wind	50 kts.	0/0	$0
BATTLE GROUND	2/24/2012	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO ARHRBR AR	3/24/2012	Thunderstorm Wind	50 kts.	0/0	$0
TERRA COTTA	6/1/2012	Thunderstorm Wind	50 kts.	0/0	$16,740
BATTLE GROUND	6/22/2012	Thunderstorm Wind	50 kts.	0/0	$0
CLIMAX	7/20/2012	Thunderstorm Wind	50 kts.	0/0	$0
GBSNVLL MC LEAN ARPT	8/8/2015	Thunderstorm Wind	50 kts.	0/0	$0
BATTLE GROUND	9/2/2012	Thunderstorm Wind	50 kts.	0/0	$0
PINECROFT	9/2/2012	Thunderstorm Wind	50 kts.	0/0	$0
HILLSDALE	10/18/2012	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	1/30/2013	Strong Wind	40 kts.	0/0	$2,224
DEEP RIVER	1/30/2013	Thunderstorm Wind	50 kts.	0/0	$556
GROOMTOWN	4/19/2013	Thunderstorm Wind	50 kts.	0/0	$551
GUILFORD	6/10/2013	Thunderstorm Wind	50 kts.	0/0	$0
GUILQUARRY	6/13/2013	Thunderstorm Wind	50 kts.	0/1	$219,347
BATTLE GROUND	6/25/2013	Thunderstorm Wind	50 kts.	0/0	$0
SEDGEFIELD	6/28/2013	Thunderstorm Wind	50 kts.	0/0	$2,193
SEDGEFIELD	8/10/2013	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD CO.	9/1/2013	Thunderstorm Wind	50 kts.	0/0	$1,094

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
HAMILTON LAKES	2/21/2014	Thunderstorm Wind	50 kts.	0/0	$3,272
(GSO)GREENSBORO RGNL	3/12/2014	Thunderstorm Wind	53 kts.	0/0	$5,419
HAMILTON LAKES	6/10/2014	Thunderstorm Wind	50 kts.	0/0	$1,074
BRIGHTWOOD	6/16/2014	Thunderstorm Wind	50 kts.	0/0	$0
GUILQUARRY	6/19/2014	Thunderstorm Wind	50 kts.	0/0	$0
BATTLE GROUND	9/16/2014	Thunderstorm Wind	50 kts.	0/0	$0
HILLSDALE	4/20/2015	Thunderstorm Wind	50 kts.	0/0	$0
DEEP RIVER	6/30/2015	Thunderstorm Wind	52 kts.	0/0	$26,829
MC LEANSVILLE	6/30/2015	Thunderstorm Wind	50 kts.	0/0	$0
(GSO)GREENSBORO RGNL	7/13/2015	Thunderstorm Wind	64 kts.	0/0	$0
SEDGEFIELD	8/5/2015	Thunderstorm Wind	50 kts.	0/0	$0
VANDALIA	8/5/2015	Thunderstorm Wind	50 kts.	0/0	$0
GREENSBORO MAY ARPT	8/5/2015	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	10/2/2015	Strong Wind	35 kts.	0/0	$538
GUILFORD (ZONE)	10/2/2015	Strong Wind	35 kts.	0/0	$538
GUILFORD (ZONE)	10/2/2015	Strong Wind	35 kts.	0/0	$538
GUILFORD (ZONE)	10/3/2015	Strong Wind	35 kts.	0/0	$538
SEDGEFIELD	2/24/2016	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	4/9/2016	Strong Wind	41 kts.	0/0	$21,407
GUILFORD	5/2/2016	Thunderstorm Wind	50 kts.	0/0	$5,330
BATTLE GROUND	5/2/2016	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD	5/2/2016	Thunderstorm Wind	50 kts.	0/0	$26,651
GREENSBORO MAY ARPT	5/12/2016	Thunderstorm Wind	50 kts.	0/0	$1,066
OSCEOLA	6/24/2016	Thunderstorm Wind	50 kts.	0/0	$531
BATTLE GROUND	7/8/2016	Thunderstorm Wind	50 kts.	0/0	$0
COLFAX	7/8/2016	Thunderstorm Wind	50 kts.	0/0	$0
GUILQUARRY	7/27/2016	Thunderstorm Wind	50 kts.	0/0	$5,321
COLFAX	7/27/2016	Thunderstorm Wind	50 kts.	0/0	$0
FOUR MILE	8/27/2016	Thunderstorm Wind	50 kts.	0/0	$2,658
VANDALIA	8/27/2016	Thunderstorm Wind	50 kts.	0/0	$0
GUILFORD (ZONE)	10/8/2016	Strong Wind	30 kts.	0/0	$105,942
BATTLE GROUND	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$10,464
MONTICELLO	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$10,464
BROWNS SUMMIT	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$104,641
TERRA COTTA	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$0
HILLSDALE	5/5/2017	Thunderstorm Wind	50 kts.	0/0	$10,464
OSCEOLA	5/31/2017	Thunderstorm Wind	50 kts.	0/0	$2,093
GUILQUARRY	6/13/2017	Thunderstorm Wind	50 kts.	0/0	$10,455
GUILFORD	6/13/2017	Thunderstorm Wind	50 kts.	0/0	$3,136
BATTLE GROUND	6/14/2017	Thunderstorm Wind	50 kts.	0/0	$5,227
ALLEN JAY	6/18/2017	Thunderstorm Wind	50 kts.	0/0	$523
PINECROFT	6/18/2017	Thunderstorm Wind	50 kts.	0/0	$0
MC LEANSVILLE	7/13/2017	Thunderstorm Wind	50 kts.	0/0	$5,231

	Date	Type	Magnitude	Deaths / Injuries	Property Damage*
HILL TOP	7/23/2017	Thunderstorm Wind	50 kts.	0/0	$5,231
GUILFORD (ZONE)	1/23/2018	Strong Wind	35 kts.	0/0	$10,332
GUILFORD (ZONE)	3/2/2018	Strong Wind	35 kts.	0/0	$20,524
GUILFORD (ZONE)	3/2/2018	Strong Wind	35 kts.	0/0	$8,210
BESSEMER	7/6/2018	Thunderstorm Wind	50 kts.	0/0	$0
MONTICELLO	7/22/2018	Thunderstorm Wind	50 kts.	0/0	$2,541
MC LEANSVILLE	8/7/2018	Thunderstorm Wind	50 kts.	0/0	$0
BROADVIEW	9/1/2018	Thunderstorm Wind	50 kts.	0/0	$1,522

*Property damage is reported in 2019 dollars; All damage may not have been reported.
Source: National Centers for Environmental Information

Lightning

According to the National Centers for Environmental Information, there have been a total of nine recorded lightning events in Guilford County since 1996, as listed in summary **Table 5.35**.[23] These events resulted in over $2.6 million (2019 dollars) in damages.[24] Detailed information on historical lightning events can be found in **Table 5.36**.

It is certain that more than nine events have occurred within 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 5.35: SUMMARY OF LIGHTNING OCCURRENCES IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Gibsonville	0	0/0	$0	$0
Greensboro	1	0/0	$315,102	$18,535
High Point	1	0/0	$9,954	$586
Jamestown	0	0/0	$0	$0
Oak Ridge	2	0/0	$7,118	$324
Pleasant Garden	0	0/0	$0	$0
Sedalia	0	0/0	$0	$0
Stokesdale	0	0/0	$0	$0
Summerfield	0	0/0	$0	$0
Whitsett	0	0/0	$0	$0
Unincorporated Area	5	0/0	$2,325,236	$136,779

[23] These lightning events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1997 through March 2019. It is certain that additional lightning events have occurred in Guilford 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.
[24] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
GUILFORD COUNTY TOTAL	**9**	**0/0**	**$2,657,410**	**$156,223**

Source: National Centers for Environmental Information

TABLE 5.36: HISTORICAL LIGHTNING OCCURRENCES IN GUILFORD COUNTY

	Date	Deaths / Injuries	Property Damage*	Details
Gibsonville				
None Reported	--	--	--	--
Greensboro				
GREENSBORO	3/26/2002	0/0	$315,102	Lightning started a fire that destroyed the third floor of a home.
High Point				
HIGH POINT	7/1/2002	0/0	$9,954	A lightning strike caused minor damage to a public library.
Jamestown				
None Reported	--	--	--	--
Oak Ridge				
OAK RIDGE	7/28/1997	0/0	$0	LIGHTNING HIT A HOME IN OAK RIDGE. NO DAMAGE DETAILS WERE AVAILABLE.
OAK RIDGE	6/26/2002	0/0	$7,118	At least four house fires were started by lightning strikes in the Oak Ridge area.
Pleasant Garden				
None Reported	--	--	--	--
Sedalia				
None Reported	--	--	--	--
Stokesdale				
None Reported	--	--	--	--
Summerfield				
None Reported	--	--	--	--
Whitsett				
None Reported	--	--	--	--
Unincorporated Area				
SEDGEFIELD	5/1/2002	0/0	$427,295	A lightning strike started a fire that severely damaged a historic home.

	Date	Deaths / Injuries	Property Damage*	Details
HAMILTON LAKES	6/12/2010	0/0	$1,762,384	Lightning struck a large fuel tank at the Colonial Pipeline gasoline tank farm resulting in a large fire destroying the tank and resulting in the closure of Interstate 40 for four hours. The tank contained 840,000 gallons of gasoline at the time of the fire.
(GSO)GREENSBORO RGNL	6/16/2010	0/0	$117,492	Lightning struck the runway at the Piedmont Triad International Airport creating a hole two feet wide and 18 inches deep in the runway.
DEEP RIVER	8/11/2010	0/0	$17,596	A home on Windstream Court in High Point sustained roof damage due to a lightning strike. The damages were estimated.
BESSEMER	8/11/2010	0/0	$469	A lightning strike damaged an outbuilding at 3865 Arbor Drive in Greensboro. The damage was estimated at $300 and the content loss was $100.

*Property Damage is reported in 2019 dollars; all damage may not have been reported.
Source: National Centers for Environmental Information

5.12.4 Probability of Future Occurrences

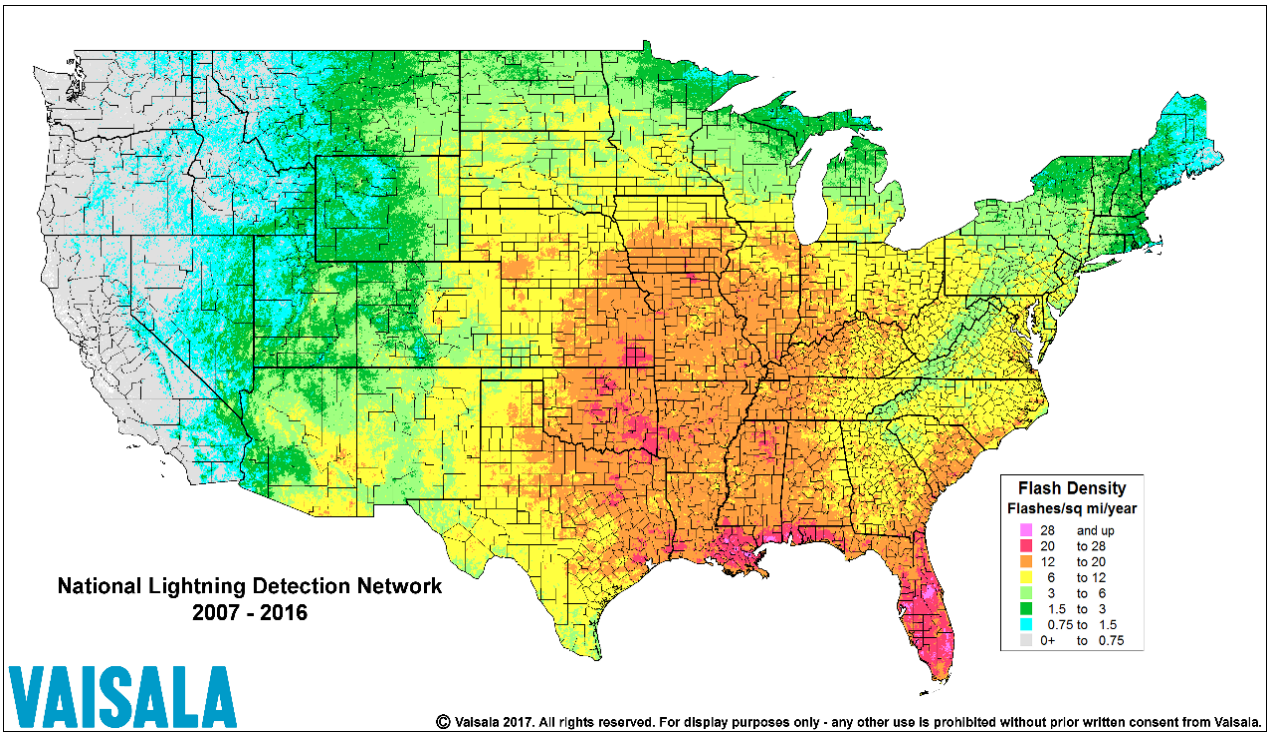
Wind

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 wind events for the entire county. Additionally, according to the *Piedmont Together Climate Adaptation Report*, storm wind speeds are estimated to increase at a proportional rate of 1-8 percent based upon rising global ocean temperatures.

Lightning

Although there was not a high number of historical lightning events reported throughout Guilford County via NCEI 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. **Figure 5.42** shows the lightning flash density map for the years 2007-2016 based upon data provided by Vaisala's U.S. National Lightning Detection Network (NLDN®). Guilford County is located in an area of the country that experienced an average of 6 to 12 lightning flashes per square mile per year between 2007 and 2016.

FIGURE 5.42: LIGHTNING FLASH DENSITY IN THE UNITED STATES



Source: Vaisala United States National Lightning Detection Network

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.

5.12.5 Consequence Analysis

People (The Public and Public Confidence)

Wind

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. However, the public confidence is usually not affected to a large degree as a result of thunderstorms.

Lightning

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

Wind

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 increase their response time.

Lightning

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 increase response times as staying inside and away from lightning is the best way to avoid injury from the hazard.

Continuity of Operations

Wind

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 and their impacts are not wide enough to disrupt continuity of operations in Guilford County.

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.

Built Environment (Property, Facilities, and Infrastructure)

Wind

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 even though any given event will cause relatively little damage, because damaging events occur so frequently.

Lightning

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 fires that can result in widespread damage to property.

Economy

Wind

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.

Lightning
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
Wind
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.

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

5.13 TORNADO

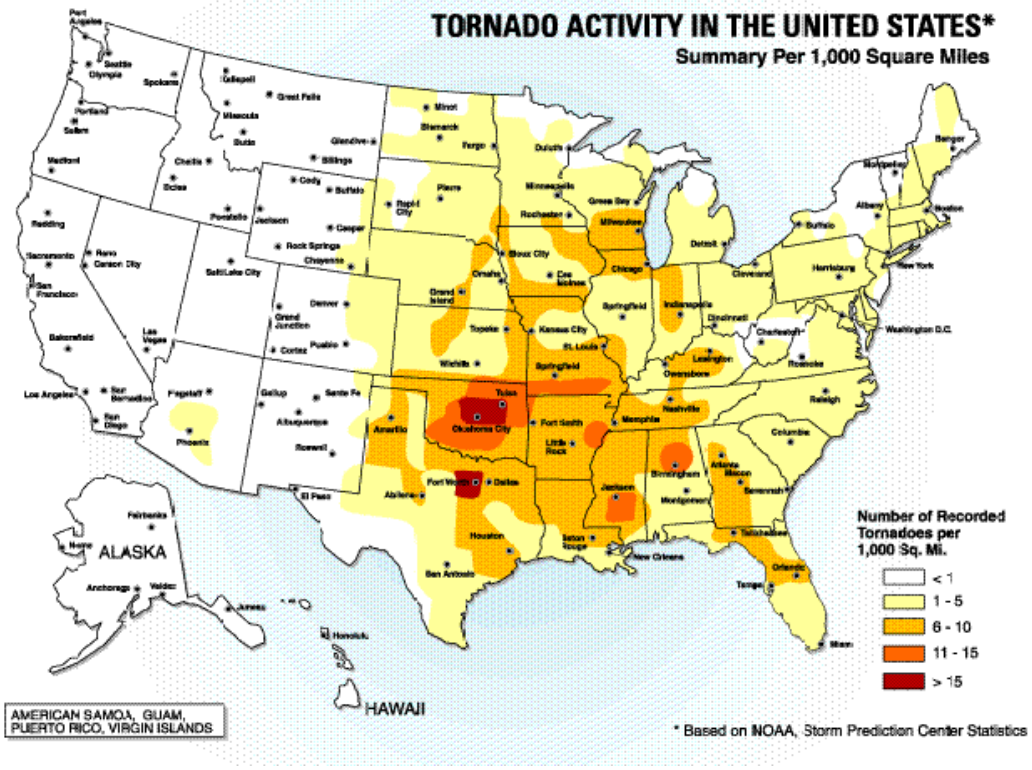
5.13.1 Background

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.[25] 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"), many other states experience severe and frequent tornadoes as well. **Figure 5.43** shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

[25] NOAA, 2009.

FIGURE 5.43: 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 catastrophic 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 5.37**). Tornado magnitudes that occurred in 2005 and later were determined using the Enhanced Fujita Scale (**Table 5.38**).

TABLE 5.37: 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 5.38: THE ENHANCED FUJITA SCALE (EFFECTIVE 2005 AND LATER)

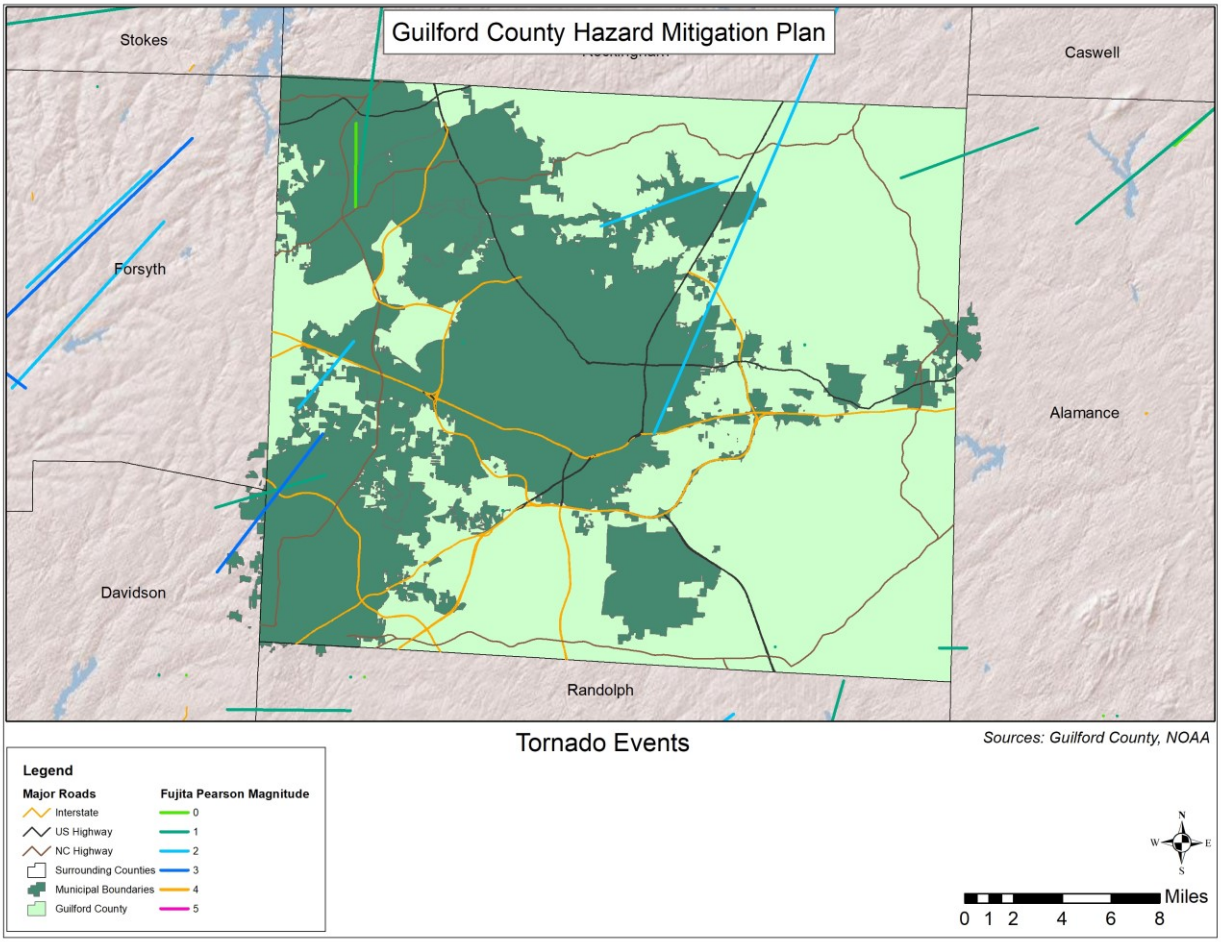
EF-SCALE NUMBER	INTENSITY PHRASE	3 SECOND GUST (MPH)	TYPE OF DAMAGE DONE
EF0	GALE	65–85	Some damage to chimneys; breaks branches off trees; pushes over shallow-rooted trees; damages to sign boards.
EF1	MODERATE	86–110	The lower limit is the beginning of hurricane wind speed; peels surface off roofs; 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

5.13.2 Location and Spatial Extent

Tornadoes occur throughout the State of North Carolina, and thus in Guilford 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 Guilford County is uniformly exposed to this hazard. With that in mind, **Figure 5.44** 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 5.44: HISTORICAL TORNADO TRACKS IN GUILFORD COUNTY



Source: National Centers for Environmental Information

5.13.3 Historical Occurrences

Tornadoes were responsible for two disaster declarations in Guilford County in 1989 and 2018.[26] According to the National Centers for Environmental Information, there have been a total of 15 recorded tornado events in Guilford County since 1950 (**Table 5.39**), resulting in $87.9 million (2019 dollars) in property damages.[27] [28] In addition, one death and five injuries were reported (**Table 5.40)**. 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 at least some occurrences have gone unreported.

[26] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[27] These tornado events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1950 through March 2019. It is likely that additional tornadoes have occurred in Guilford County. As additional local data becomes available, this hazard profile will be amended.
[28] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

TABLE 5.39: SUMMARY OF TORNADO OCCURRENCES IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Gibsonville	0	0/0	$0	$0
Greensboro	1	0/0	$66,438,818	$66,438,818
High Point	1	0/0	$11,767,257	$1,307,473
Jamestown	0	0/0	$0	$0
Oak Ridge	2	0/0	$0	$0
Pleasant Garden	0	0/0	$0	$0
Sedalia	0	0/0	$0	$0
Stokesdale	1	0/0	$0	$0
Summerfield	0	0/0	$0	$0
Whitsett	0	0/0	$0	$0
Unincorporated Area	10	1/5	$9,676,555	$148,870
GUILFORD COUNTY TOTAL	**15**	**1/5**	**$87,882,630**	**$67,895,161**

Source: National Centers for Environmental Information

TABLE 5.40: HISTORICAL TORNADO OCCURRENCES IN GUILFORD COUNTY

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
Gibsonville					
None Reported	--	--	--	--	--
Greensboro					
GREENSBORO	4/15/2018	EF2	0/0	$66,438,818	The tornado initially touched down on the north side of I-40 near where Willow Road crosses I-40. Damage at this point consisted of snapped trees and was consistent with 90 mph wind speeds, or EF-1 on the Enhanced Fujita Scale. The tornado remained on the ground as it traveled north toward Peeler Elementary School. Numerous homes in this area were damaged along with substantial tree damage. The tornado wind speeds at this location were estimated to be approximately 100 mph. The tornado continued traveling north and reached a peak intensity and maximum path width in the Hampton Community and near Hampton Elementary School. At this school a large portion of the roof was blown off and three adjacent portable classroom buildings (manufactured buildings) were completely destroyed and leveled. The damage to the main school building was consistent with wind speeds around 110 mph (DI 15/DOD 6), while the damage to the adjacent portable units was

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
					consistent with wind speeds of 135 mph (DI 4/DOD 12), which is a high-end EF2 on the Enhanced Fujita Scale. It is worth noting that the neighborhoods adjacent to this school experienced a wide and substantial path of devastation which included snapped and uprooted trees, snapped power poles, homes that were pushed off of their foundation, numerous homes that lost most or all of their roof cover, and several homes with exterior walls blown out. The survey found the width of the tornado, and particularly the width of the EF1 and EF2 wind speeds, contributed to a particularly wide path of destruction. The tornado then continued north-northeast and mostly remained on the ground all the way to the Guilford/Rockingham County line. Along the way, the damage consisted mostly of snapped and uprooted trees, and roof and siding damage to several additional homes. The tornado appeared to produce minor tree damage (with wind speeds 80 mph or less) just before crossing into Rockingham County. Finally, the aforementioned path length (16 miles) consists of just the Guilford County path. The tornado continued into Rockingham County, and remained on the ground for an additional 17.6 miles.
High Point					
HIGH POINT	3/28/2010	EF3	0/0	$11,767,257	The tornado initially touched down as an EF1 with winds around 100 mph near Old Plank Road in southwest Guilford County. It was in this area where the Apple Tree Academy sustained significant damage and two vehicles including a small bus were rolled 50 yards across the street. From this point the tornado continued northeast across Highway 311. The next area to experience damage was just north of Highway 311 and south of Old Mill Road along Langdale, Imperial and Impala Drives. Tornado damage in this area continued to indicate EF1 winds with numerous trees down along with a number of home with roof and siding

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
					damage. The tornado intensified to an EF2 as it crossed Old Mill Road towards Johnson Street. The EF2 tornado severely damaged numerous homes along Brandon Drive. In one instance, an entire bedroom was blown off a single story home. Three individuals who were taking shelter in a bedroom closet were carried 50 feet and were buried under the debris. One individual experienced several broken bones but overall injuries were not serious. The remainder of the house was shifted off the foundation approximately 8 inches. EF2 tornado damage continued north of Old Mill Road to Skeet Club Road along either side of Johnson Road with winds around 130 mph for most of its duration but briefly reached EF3 intensity with winds of 138 mph near Hampton Park Drive at 1278 Silverstone Court where the upper level of a two story home was blown off. Fifty to sixty homes along Hampton Park Drive, Scarlet Drive, Ruskin Drive and Johnson Road were severely damaged. The tornado crossed Johnson Road as an EF2 crossing Elmwood Avenue, Oakforest Drive and Maplewood Avenue. Nearly every home in this highly urbanized area experienced minor to moderate damage. The upper floor of a two story home on Elmwood Avenue was blown off. The tornado weakened to an EF1 as it crossed Maplewood Avenue and Wellingham Lane, where numerous homes experienced roof and siding damage. The tornado finally lifted off the ground north of Kendale Road. In total 603 single family homes were damaged with 21 homes being completely destroyed. Thirty-one multifamily homes were damaged with 16 reported destroyed. Finally, eleven businesses sustained damage, with 3 businesses completely destroyed.
Jamestown					
None Reported	--	--	--	--	--
Oak Ridge					
OAK RIDGE	7/7/2005	F0	0/0	$0	A tornado blew down trees from Oak

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
					Ridge to Stokesdale.
OAK RIDGE	9/14/2007	Funnel Cloud	0/0	$0	A funnel cloud was reported by the public at Highway 150 and Union Grove Road near Oak Ridge.
Pleasant Garden					
None Reported	--	--	--	--	--
Sedalia					
None Reported	--	--	--	--	--
Stokesdale					
STOKESDALE	9/17/2004	F1	0/0	$0	A tornado touched down near the intersection of Harrell Road and Lee's Glen Road. Three garages lost their roofs and numerous trees were snapped or uprooted. The tornado then tracked north across Meadows Drive and Haw Meadows Drive where falling trees caused significant damage to at least three well-built homes, one of which was a total loss. The tornado continued north to Prince Edward road where about 70 percent of the trees in a heavily wooded area were snapped or downed. Along Kelly Court, a garage was destroyed. At South Point Drive, the roof was blown off a house resulting in major structural damage. Other houses lost shingles, siding and porches. The tornado then continued across the county line into Rockingham County. In Guilford County, three houses suffered total losses, nine homes sustained major damage, and 52 sustained minor damage.
Summerfield					
None Reported	--	--	--	--	--
Whitsett					
None Reported	--	--	--	--	--
Unincorporated Area					
GUILFORD CO.	6/16/1954	F2	0/1	$23,800	--
GUILFORD CO.	4/5/1957	F1	0/1	$2,294,731	--
GUILFORD CO.	9/29/1959	F1	0/0	$218,509	--
GUILFORD CO.	6/12/1962	F1	0/0	$21,200	Small tornado near McLeansville. Funnel moved northeastward, remaining just above ground level and making a noise like a diesel locomotive. Trees broken off above ground, roofs damaged. No evidence of high winds outside immediate path of storm.

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
GUILFORD CO.	4/17/1967	F1	0/0	$193,423	Storm moved southwest-northeast across field near Whitsett. Porch ripped off a home, several outbuildings demolished. Apple orchard severely damaged. Hail and heavy rain with storm. Meteorologist visited scene, reported damage apparently caused by tornado moving on a skipping path.
GUILFORD CO.	5/14/1967	F1	0/0	$1,928,404	--
GUILFORD CO.	10/8/1976	F1	0/0	$110,575	A tornado skipped along near Vickery Chapel Road off Highway I-85 near Greensboro. A trailer truck was damaged, trees, and some homes. Damage about $15,000.
GREENSBORO ARPT	5/7/1998	F1	0/0	$157,305	A tornado touched down approximately 1 mile southeast of the Piedmont-Triad International Airport near Greensboro. The first damage occurred just south of West Friendly Avenue. The tornado moved to the southeast and lifted at Jamestown Road approximately 1.5 miles from its initial touchdown. Damage was rated at F1 initially and F0 at the point it rose back into the thunderstorm. This tornado was produced by the same parent storm that produced the Clemmons tornado less than an hour before this one.
CLIMAX	5/7/1998	F1	0/0	$0	A tornado touched down in extreme southeast Guilford county and tracked to the southeast for approximately 2.5 miles. It moved into extreme northeast Randolph county before lifting about 2 miles north of Liberty. The tornado produced F1 damage. The exact path stretched from Lake Juno Road to Liberty Grove Road.
DEEP RIVER	5/8/2008	EF2	1/3	$4,728,609	The tornado, originally an EF-0, initially touched down just north of Squire Davis Park near the intersection of Sandy Ridge Road and Johnson Street. From there the tornado tracked northeast and intensified to EF-1 intensity as it approached the Farmers Market and Interstate 40. The tornado overturned several cars and tractor trailers as it crossed Interstate 40. A roof was blown off of an office building just north of the interstate

	Date	Magnitude	Deaths/ Injuries	Property Damage*	Details
					as the tornado continued to intensify. As the tornado moved further northeast into an industrial complex, it further strengthened to EF-2 with winds estimated around 130 mph based on damage to warehouses. Numerous warehouses along Little Santee Road, Capital Drive, and West Market Street sustained significant damage. Numerous vehicles and tractor trailers were also overturned in the industrial complex. At its widest point, the tornado was just over 200 yards wide. The tornado quickly lifted off of the ground after crossing West Market Street near the post office. The tornado was on the ground for about four miles. One fatality occurred along West Market Street next to the Lamination Service Building located at 8717 West Market Street. The fatality occurred as a 51 year old man slept in the rig of his tractor trailer. Three other injuries were reported, two of which occurred in automobiles and another in the I.H. Caffey Warehouse Distribution Center.

*Property damage is reported in 2019 dollars; All damage may not have been reported.
Source: National Centers for Environmental Information

5.13.4 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 Guilford County experience a direct tornado strike. The probability of future tornado occurrences affecting Guilford County is likely (10 to 100 percent annual probability).

5.13.5 Consequence Analysis

People (The Public and Public Confidence)

The entire Guilford 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 Guilford County is well prepared for such an event, disruption of operations will likely take place to some degree.

Built Environment (Property, Facilities, and Infrastructure)

Building Inventory

According to the NCEI, North Carolina has been impacted by tornadoes ranging in intensity from F0/EF0 to F4/EF4 based on the Fujita scale. An F5/EF5 has never been experienced, but it is certainly possible. Because it cannot be predicted where a tornado may touch down, all buildings, facilities, and infrastructure within Guilford County are considered exposed to the hazard and at risk for being impacted. Older buildings that are constructed with less-advanced building techniques are at higher risk, as are mobile homes.

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 change of withstanding a tornado event. Homes constructed of wood or manufactured material are most at risk. Non-engineered structures are far more vulnerable than engineered buildings to damage from tornado winds. It is also notable that materials that are well-tied to all other building components are also more likely to survive extreme wind events.[29] 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 state's infrastructure system is also 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.

Economy

A tornado can impact any area of Guilford County at any time and bring with it significant property damage costs to individual citizens and the disrupt 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

[29] Federal Emergency Management Agency. *Tornado Protection: Selecting Refuge Areas in Buildings. FEMA P-431, Second Edition, October 2009.* Retrieved August 21, 2017 from: https://www.fema.gov/media-library-data/20130726-1456-20490-4099/fema_p_431.pdf

often been high. The loss of power can also interrupt local economies and have a strong negative impact on daily functioning of business activities.

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 statewide cleanup efforts after a tornado can include removal of debris, but much debris ends up remaining in 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.

5.14 WINTER STORM

5.14.1 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 greater 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 of 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. Winter storms are often accompanied by sleet, freezing rain, or an ice storm. Such freeze events are particularly hazardous as they create treacherous surfaces.

Ice Storms

Ice storms, which are much more common in Guilford 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, etc. – 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.

5.14.2 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. Guilford County is accustomed to severe winter weather conditions and often receives winter weather during the winter months. Given the atmospheric nature of the hazard, the entire county has uniform exposure to a winter storm.

5.14.3 Historical Occurrences

Winter weather has resulted in six disaster declarations in Guilford County. This includes the Blizzard of 1996, one subsequent 1996 winter storm, a severe winter storm in 2000, ice storms in 2002 and 2003, and a severe ice storm in 2014.[30] The National Centers for Environmental Information does not report winter storm events at the municipal level, however, there have been a total of 69 recorded winter storm events in Guilford County since 1996 (**Table 5.41**).[31] These events resulted in over $9.4 million (2019 dollars) in damages.[32] Detailed information on the recorded winter storm events can be found in **Table 5.42**.

TABLE 5.41: SUMMARY OF WINTER STORM EVENTS IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage (2019)	Annualized Property Loss
Guilford County	69	0/0	$9,407,685	$409,030

Source: National Centers for Environmental Information

TABLE 5.42: HISTORICAL WINTER STORM EVENTS IN GUILFORD COUNTY

	Date	Type of Storm	Deaths / Injuries	Property Damage*
Guilford County				
GUILFORD (ZONE)	1/6/1996	Heavy Snow	0/0	$0
GUILFORD (ZONE)	1/11/1996	Ice Storm	0/0	$0
GUILFORD (ZONE)	2/2/1996	Ice Storm	0/0	$0
GUILFORD (ZONE)	2/16/1996	Heavy Snow	0/0	$0
GUILFORD (ZONE)	1/8/1997	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/13/1997	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/29/1997	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/23/1998	Ice Storm	0/0	$0
GUILFORD (ZONE)	1/2/1999	Ice Storm	0/0	$0
GUILFORD (ZONE)	1/18/2000	Winter Storm	0/0	$0

[30] A complete listing of historical disaster declarations can be found in Section 4: *Hazard Profiles*.
[31] These ice and winter storm events are only inclusive of those reported by the National Centers for Environmental Information (NCEI) from 1996 through March 2019. It is likely that additional winter storm conditions have affected Guilford County.
[32] Adjusted dollar values were calculated based on the Consumer Price Index for All Urban Consumers (CPI-U) U.S. city average series for all items, not seasonally adjusted. This data represents changes in the prices of all goods and services purchased for consumption by urban households. This monthly index value has been calculated every year since 1913. The 2019 dollar values were calculated based on buying power in May 2019.

	Date	Type of Storm	Deaths / Injuries	Property Damage*
GUILFORD (ZONE)	1/20/2000	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/22/2000	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/24/2000	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/28/2000	Winter Storm	0/0	$0
GUILFORD (ZONE)	11/19/2000	Heavy Snow	0/0	$0
GUILFORD (ZONE)	2/12/2001	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/3/2002	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/6/2002	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/4/2002	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/16/2003	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/27/2003	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/13/2003	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/26/2004	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/15/2004	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/26/2004	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/30/2005	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/15/2005	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/18/2007	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/21/2007	Winter Weather	0/0	$0
GUILFORD (ZONE)	12/7/2007	Winter Weather	0/0	$24,386
GUILFORD (ZONE)	1/17/2008	Winter Weather	0/0	$0
GUILFORD (ZONE)	2/13/2008	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/22/2009	Winter Weather	0/0	$0
GUILFORD (ZONE)	2/3/2009	Winter Weather	0/0	$0
GUILFORD (ZONE)	3/1/2009	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/18/2009	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/30/2009	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/29/2010	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/5/2010	Winter Storm	0/0	$59,078
GUILFORD (ZONE)	2/12/2010	Winter Weather	0/0	$0
GUILFORD (ZONE)	3/2/2010	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/4/2010	Winter Weather	0/0	$0
GUILFORD (ZONE)	12/16/2010	Winter Weather	0/0	$0
GUILFORD (ZONE)	12/25/2010	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/10/2011	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/17/2013	Winter Storm	0/0	$0
GUILFORD (ZONE)	11/26/2013	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/21/2014	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/28/2014	Winter Weather	0/0	$0
GUILFORD (ZONE)	2/12/2014	Winter Storm	0/0	$0
GUILFORD (ZONE)	3/3/2014	Winter Weather	0/0	$0
GUILFORD (ZONE)	3/6/2014	Winter Storm	0/0	$0
GUILFORD (ZONE)	3/6/2014	Ice Storm	0/0	$8,778,699
GUILFORD (ZONE)	3/17/2014	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/13/2015	Winter Weather	0/0	$0
GUILFORD (ZONE)	2/16/2015	Winter Storm	0/0	$0

	Date	Type of Storm	Deaths / Injuries	Property Damage*
GUILFORD (ZONE)	2/24/2015	Winter Weather	0/0	$0
GUILFORD (ZONE)	2/25/2015	Winter Storm	0/0	$545,522
GUILFORD (ZONE)	3/1/2015	Winter Weather	0/0	$0
GUILFORD (ZONE)	1/22/2016	Winter Storm	0/0	$0
GUILFORD (ZONE)	2/14/2016	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/6/2017	Winter Storm	0/0	$0
GUILFORD (ZONE)	12/8/2017	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/17/2018	Winter Storm	0/0	$0
GUILFORD (ZONE)	3/12/2018	Winter Storm	0/0	$0
GUILFORD (ZONE)	3/21/2018	Winter Weather	0/0	$0
GUILFORD (ZONE)	3/24/2018	Winter Weather	0/0	$0
GUILFORD (ZONE)	12/9/2018	Winter Storm	0/0	$0
GUILFORD (ZONE)	1/12/2019	Winter Storm	0/0	$0

*Property damage is reported in 2019 dollars; All damage may not have been reported.
Source: National Centers for Environmental Information

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

1996 Winter Storm – January 6-8, 1996
This storm left two feet of snow in some areas and several thousand citizens without power for up to nine days. Although shelters were opened, some roads were impassible for many days. This event caused considerable disruption to business, industry, schools, and government services.

2002 Ice Storm – December 4-5, 2002
An ice storm produced up to an inch of freezing rain in central North Carolina impacting 40 counties. A total of 24 people were killed, and as many as 1.8 million people were left without electricity. Additionally, property damage was estimated at almost $100 million. New records were also set for traffic accidents and school closing durations. The scale of destruction was comparable to that of hurricanes that have impacted the state, such as Hurricane Fran in 1996. The storm cost the state $97.2 million in response and recovery.

2014 Ice Storm – March 7, 2014
A significant ice storm impacted the region with between a tenth and a half of an inch of ice accumulation across the county along with between a trace and 7 inches of snow. The county was quickly affected by hazardous road conditions and numerous downed trees and power lines. Based on the number of reported power outages, a warming center was opened in the City of Greensboro and this eventually transitioned over to an emergency shelter that remained open for several days, finally closing on Monday, March 10th in the evening. A Point of Distribution (POD) was established on March 9th in Pleasant Garden to provide bottled water for the community. Over 5,000 gallons of bottled water was provided over a two-day period. As a result of this incident Guilford County received a presidential disaster declaration for Public Assistance (PA).

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.

5.14.4 Probability of Future Occurrences

Winter storm events will remain a regular occurrence in Guilford County due to its location in the western half of the state. According to historical information, Guilford County generally experiences several winter storm events each year. Therefore, the annual probability is highly likely (100 percent). Additionally, according to the *Piedmont Together Climate Adaptation Report*, the increased likelihood of ice storms due to climate change will result in a higher number of automobile accidents (injuries, fatalities, and traffic jams) as well as more power outages in the county.

5.14.5 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.

Another indirect impact of winter weather on the public is its 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.

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 to responders 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 over and vehicles cannot pass through.

Continuity of Operations

Generally, continuity of operations can be maintained during a winter storm event in Guilford County. However, winter weather does have the potential to affect power transmission as the weight of ice and snow can cause trees and limbs to fall and damage transmission lines. Winter precipitation can also freeze to roadways or create slick conditions that make it difficult for local government employees to get to work. As a result, there will likely be some disruption of operations during a winter weather event.

Built Environment (Property, Facilities, and Infrastructure)

One of the primary identified impacts of winter weather in North Carolina 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. Damage to this infrastructure is one of the major consequences of a winter weather event in the state and can lead to life-threatening situations if the public is unable to utilize central heating systems to keep warm during the concurrent cold weather that often accompanies winter weather.

Winter weather also has the potential to create hazardous driving conditions leading to accidents on roadways. The North Carolina Climate Office reports that 70 percent of winter-weather–related injuries are a result of accidents on the road.[33] The North Carolina Highway Patrol call volume can double during a winter storm compared to a typical 24-hour period. This creates significant problems for emergency workers. Accidents can cause highways to become "large parking lots" as well as 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 weather can also cause delays and cancellations of flights at airports in the state due to slick conditions on runways. There is also the potential of a loss of power that can close the airport.

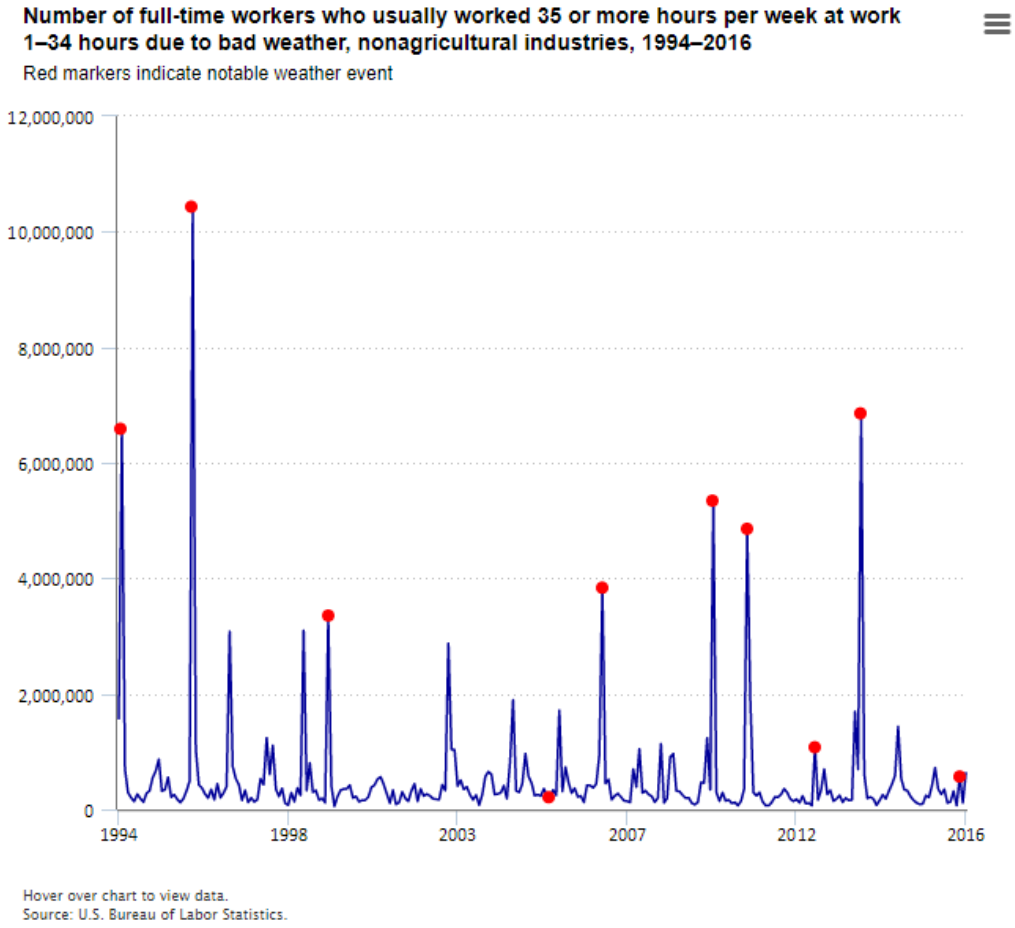
Economy

In the event of winter weather, 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 state. This can be attributed 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. In general, absenteeism is higher during winter weather events as many employers rightly encourage employees to stay home and avoid potential injury in unsafe driving conditions. As can be seen in **Figure 5.45** below, the Bureau of Labor Statistics[34] notes that although any major weather event can cause absences at work, workers are more likely to be absent because of bad weather during winter months because winter weather tends to impact much larger areas and makes travel difficult throughout much more of the transportation network.

[33] State Climate Office of North Carolina. *Winter weather—impacts*. Retrieved August 21, 2017, from http://www.nc-climate.ncsu.edu/climate/winter_wx/Impacts.php

[34] United States Bureau of Labor Statistics. *Work Absences Due to Bad Weather from 1994 to 2016*. Retrieved August 21, 2017, from https://www.bls.gov/opub/ted/2017/work-absences-due-to-bad-weather-from-1994-to-2016.htm

FIGURE 5.45: IMPACTS FROM WINTER WEATHER ON WORKER ABSENTEEISM



Source: United States Bureau of Labor Statistics

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 may threaten wildlife.

Biological Hazards

5.15 BIOTERRORISM

5.15.1 Background

While there are many biological agents to be concerned with as they exist in nature, there are some that can also be used as a weapon. It is very difficult to spread many of these diseases to large populations of people. There have been few instances of bioterrorism to this point. While it is likely that another

bioterrorism event will be attempted, it is unlikely that a large population will be exposed or that it will affect Guilford County and its citizens. However, consideration and planning must still address the possibility, no matter how slight.

Examples of agents identified by the Centers for Disease Control and Prevention (CDC) that have been or have the potential to be used in bioterrorism form include anthrax, botulism, brucellosis, plague, smallpox, tularemia, and viral hemorrhagic fevers, among others.

Anthrax, a serious disease caused by Bacillus anthracis, a bacterium that forms spores, was used as a biological weapon in the United States in 2001 when it was deliberately spread through the postal system. Botulism, a muscle-paralyzing disease caused by a toxin made by a bacterium called Clostridium botulinum, could potentially be released into food sources, causing foodborne illnesses. Brucellosis is a rare infectious disease caused by the bacteria Brucella; used a biological weapon, the bacteria could also be introduced into a food source for human consumption.

Plague, a disease caused by Yersinia pestis, a bacterium found in rodents and their fleas in many areas around the world, could be used in an aerosol attack through its pneumonic form. Because of the delay in exposure and becoming sick, those infected with the disease could travel around the globe transmitting the disease to others before knowing they were sick. This could have dire consequences in controlling the outbreak of the disease in large populations.

Smallpox is a serious, contagious infectious disease caused by the variola virus; no treatment exists and the only prevention is vaccination. According to the CDC, the disease is now eradicated after a successful worldwide vaccination program; however, there is still concern that the variola virus could still be used as an agent of bioterrorism through the development of the disease in a laboratory setting.

Tularemia is a highly infectious disease caused by the bacterium Francisella tularensis, which is found in animals. Used as a biological weapon, the bacteria would likely be made airborne for exposure by inhalation. Because the bacterium is widely found in nature, the disease could be grown in large quantity in a laboratory; however, an effective aerosol weapon has yet to be manufactured to release it in a bioterrorism event.

Viral hemorrhagic fevers (VHFs) refer to illnesses caused by specific viruses that cause severe multisystem syndromes. Many of these have been considered for bioterrorism. The Marburg and Ebola viruses are well-known examples of VHFs.

5.15.2 Location and Spatial Extent

Due to the nature of a bioterrorism event, it would be difficult to predict a precise location where this type of event would occur. Moreover, a large-scale event may have impacts that spread throughout the county. Therefore, all areas in Guilford County are considered equally susceptible to bioterrorism.

5.15.3 Historical Occurrences

No major incidents have ever been recorded as affecting those within the bounds of Guilford County.

5.15.4 Probability of Future Occurrence

Although no incidents have been recorded in Guilford County, future occurrences are considered possible.

5.15.5 Consequence Analysis

Additional details on consequences of disease threats and terrorist events are described in the Public Health/Emerging Disease Threat and Terrorism sections below. Most of the consequences outlined in those sections are also applicable to a Bioterrorism event.

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.

A bioterrorism event may or may not elicit a large-scale response from government and nongovernmental organizations, dependent on the scope of the attack. For major incidents, public notification and information will be important to prevent further exposure and ensure the public that efforts are underway to handle the situation. Communicating with the media will not only assist in this dispersal of information, but also ensure that appropriate information is getting out. These efforts can help bring about positive outcomes and positive public perception.

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 maximize the efficiency and effectiveness of the combined efforts.

Continuity of Operations

Continuity of operations may be impacted if those in governmental or other key roles are impacted by the bioterrorism event 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 affect continuity of operations.

Built Environment (Property, Facilities, and Infrastructure)

Hospitals are a key component of the built environment that may be impacted by a bioterrorism event. The primary impacts for hospitals during bioterrorism events are an increase in patients due to infected and exposed individuals and the spread of the biological substance within the facility. Additionally, the workload of emergency services may be increased as individuals infected and exposed to the biological substance may require transport to a hospital facility.

Economy

The economic impact of a bioterrorism event is dependent on where it took place, the severity of the incident, and if the threat of another event seems likely. Tourism could be significantly impacted in some areas, affecting commerce and large public gatherings.

Environment

The environmental impact is dependent on whether the particular biological substance being transmitted can impact/infect animal or plant life, or if it can be distributed through the water supply. Also, the delivery method of the agent's release could cause physical harm to the environment as well.

5.16 PUBLIC HEALTH EMERGING DISEASE THREAT

5.16.1 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 Guilford 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 Guilford 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 Centers 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. Many of these threats were discussed in the "Bioterrorism" section.

Below, several types of threats are described that may face the county. All may be of national and international importance as any emerging disease threat may impact large populations beyond the immediate areas where the threat originated.

Viral outbreaks, such as the West Nile Virus, are typically passed to humans or animals by mosquitoes and can often be spread widely as many of those infected experience no symptoms. Those who do may experience fever, fatigue, or, in serious cases, central nervous system inflammation. Another example of a virus that has had impacts on large populations is Severe Acute Respiratory Syndrome (SARS), which is a respiratory syndrome that is transmitted by airborne droplets. This virus was first reported in Asia in the early 2000s and while both of these conditions caused a great deal of public health concern when they were first identified, SARS has all but disappeared, while West Nile Virus occurs with low frequency and causes serious disease in only a very small percentage of cases.

Other communicable diseases pose a greater threat to the residents of Guilford 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, Guilford 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. Guilford County and the state of North Carolina experience numerous norovirus outbreaks every year. No vaccine or treatment exists for the Norovirus, making it especially dangerous for the public in the event of an outbreak.

Tuberculosis (TB) is a bacterial infection that originates from airborne exposure. Currently there are only a couple of dozen new tuberculosis cases in Guilford County each year. However, multiple drug-resistant strains, and even new extreme drug-resistant strains, are showing up with increasing frequency. Since Guilford County has a large and varied immigrant and refugee population of persons coming from countries with drug-resistant strains, TB is a disease that could become a cause of greater concern in coming years.

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.

5.16.2 Location and Spatial Extent

Due to the nature of a public health/emerging disease event, it would be difficult to predict a precise location where this type of event would occur. Moreover, a large-scale event may have impacts that spread throughout the county and beyond. Therefore, all areas in Guilford County are considered equally susceptible to public health/emerging diseases.

5.16.3 Historical Occurrences

In 2003, the SARS outbreak that began in Southeast Asia began showing up in the United States. There was a single confirmed case of SARS in North Carolina in 2003, with 8 suspected cases, as described by Guilford County Department of Public Health.

An outbreak of the West Nile Virus began showing up in the United States in 1999, with Guilford County reporting its first infected bird in 2000. One individual with ties to Guilford County was confirmed as being infected with West Nile Virus in South Carolina in 2002. No other cases have been reported in Guilford County.

As stated previously, influenza, norovirus, and tuberculosis are regularly occurring health issues in Guilford County. With the exception of tuberculosis, these conditions are not legally reportable to county or state public health agencies, so data on disease incidence is not readily available. However, these diseases are monitored through local epidemiological surveillance systems in hospitals and health departments, and any potential outbreaks are investigated promptly.

During events involving outbreaks, as stated in NCGS § 130A – 145, the State Health Director and a local health director are empowered to exercise quarantine and isolation authority. Quarantine and isolation authority shall be exercised only when and so long as the public health is endangered, all other reasonable means for correcting the problem have been exhausted, and no less restrictive alternative exists.

5.16.4 Probability of Future Occurrence

Due to some recent incidents that have been recorded in Guilford County, the probability of a major outbreak is considered possible.

5.16.5 Consequence Analysis

People (The Public and Public Confidence)

The general public can be exposed to infectious 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 preventative measures to limit or avoid exposure. According to the North Carolina Public Health Department, in terms of vaccine-preventable diseases, in 2016 there was a slightly higher occurrence rate of Hepatitis A and Mumps in 2016 compared to the five-year average from 2011-2015.[35] There were also increased rates of non-vaccine-preventable diseases like Zika which have become more prominent across the United States in recent years.

Public confidence in government 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. Responders are much more likely on the whole to be impacted by an infectious disease since they will be working directly with those affected to help treat the disease (especially EMS personnel). This will make them more susceptible to becoming infected and, as such, it is critical that they wear the appropriate personal

[35] North Carolina Department of Public Health (2016). Vaccine-Preventable Diseases Reported in North Carolina, 2016. Retrieved August 21, 2017 from: http://epi.publichealth.nc.gov/cd/figures.html

protective equipment to minimize their risk and ensure they can continue providing the care and assistance that is needed to help the public.

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. Since many diseases are spread through some form of contact with others who have already been infected, a disease event could rapidly disable many of those who are working together to carry out normal operations. Due to their close proximity to one another and need to communicate and coordinate on a daily basis, it is incredibly important to try to reduce the spread of the disease among key personnel once an outbreak has been identified.

Built Environment (Property, Facilities, and Infrastructure)

An infectious disease would likely have little direct impact on the built environment itself as the disease would not affect the structural stability of any buildings or infrastructure. However, an infectious disease would have a major impact on the functioning of many structures that would be operating at a high capacity during an infectious disease event, especially medical care facilities.

Hospitals and Medical Care Facilities

The primary impacts for hospitals/medical facilities during disease outbreaks are an increase in patients and the spread of disease within hospitals. It is highly likely that those affected by the disease will make their way to a medical care facility and it may be necessary to implement quarantines or other measures to reduce the risk of disease spreading. Hospitals and other medical care facilities should have plans in place to deal with such a scenario and also reduce risk of spreading the disease to medical care providers whose workload may be increased as individuals infected with disease may require treatment.

Economy

One of the more significant economic impacts that could be seen in Guilford 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.

City centers and downtown areas tend to be where large masses of people congregate and thus may be where the likelihood of disease spread is more prominent. Many people may realize this and avoid these key economic hubs which would result in reduced revenue and a negative impact on the economy overall. Additionally, large events may have to be cancelled if the outbreak is large enough or has the potential to be spread easily and quickly. This would also reduce revenue for many local economies.

Environment

The environmental impact is dependent on whether the particular biological substance or disease is transmittable to animal or plant life or if it can be distributed through the water supply. If the infectious disease in question can be transmitted to other species, there could be an extremely negative impact on species populations. Since animal life does not have the same capacity as humanity to understand the

spread of disease and reduce transmission rates, the disease may spread more quickly through animal populations and cause larger-scale loss of life.

Technological Hazards

5.17 BUILDING / STRUCTURE COLLAPSE

5.17.1 Background

A building or structure collapse, also called a structural failure, can be defined as any significant compromise of a standing, built enclosure, including its roof, walls, floors (in multi-story structures), or other large areas. Any material used to build structures has a strength limit that once passed can lead to a structural failure.

Building/structure collapses have a variety of causes, typically occurring as a secondary impact following the incidence of another hazard. The most common occurrences of structure collapse are external in nature, including explosions (both accidental and purposeful) and vehicles striking the structure and destroying key supports. Buildings that are under construction are more likely to experience a structure collapse from the effects of another hazard.

5.17.2 Location and Spatial Extent

A building or structure collapse is an uncommon occurrence anywhere, especially as structural engineering has continued to progress throughout time. Most of the structure collapses that occur are at construction sites but occasionally can be due to outside forces. Some areas near fault lines or other hazards are more prone to collapse, as not all residences and businesses are built to withstand the hazard(s) that are associated with fault lines.

5.17.3 Historical Occurrences

Collapses in general are especially uncommon in Guilford County. Several calls per year include vehicles striking structures, where a rescue of those within the vehicle or structure is necessary. Most of these collapses do not cause significant impact to the county as a whole, but there is potential for greater impact if the incidence were at a location of interest such as one of the hospitals, the Greensboro Coliseum, a large employer during business hours, or a mall.

5.17.4 Probability of Future Occurrence

There have been few past incidents of structure collapse in Guilford County, though future occurrences are considered possible.

5.17.5 Consequence Analysis

People (The Public and Public Confidence)

The collapse of an occupied building is a highly dangerous situation to occupants and passersby. Falling debris and debris that is carried out by the pressure of the collapse can injure those outside the building.

Those persons who are inside the structure are most likely to be injured. Generally, these occupants will have more severe injuries, which can include death. Following a collapse anyone inside the structure is likely to be trapped and could suffer further injury while awaiting rescue and removal from the structure.

During and after a building collapse, the public will be influenced by the perceived effectiveness of the response to the collapse. This perception could be impacted by eyewitness accounts, victims, and in particular the reporting of the event by the media. Expectations may or may not be met, affecting public confidence in the ability of government and other involved entities to make decisions and act in emergency situations.

Responders

First responders will be impacted by a building collapse, as they are required to respond to such incidents. The possibility exists for secondary collapses to occur during rescue operations. If such secondary instances occur, rescuers could be injured and the condition of those trapped may worsen. Highly-trained teams such as Urban Search and Rescue teams exist for these situations and should be activated early and utilized fully to minimize the impact. Until these teams arrive, rescuers must be cognizant of the dangers associated with secondary collapses and proceed with caution.

Continuity of Operations

Generally, continuity of operations can be relatively easily maintained during a structure collapse in Guilford County. Since the effects will be very localized and are not likely to directly impact availability of personnel, there is a low risk of impact on continuity of operations.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

In cases of structure collapse, homes may become uninhabitable or require significant repair and displace residents. Building collapses in business settings could lead to disruptions to normal operations or closures and work stoppages. Structural issues at hazardous materials sites could not only bring about the operational issues noted in business settings but could also cause hazardous material releases or spills.

Critical Facilities and Personnel

Structural issues at a hospital or key medical facility could significantly impact operations. Some departments may close completely and force patients to be sent to other facilities. In some areas, biohazards or other hazardous materials may be released or spilled. Structural failures in emergency services facilities could lead to the use of alternative operating areas or the need for mutual aid assistance. In some buildings, critical systems may be housed and could experience disruptions. Shelters may be activated if there are numerous displaced persons from large businesses or residential areas that experience collapses (for example, due to an earthquake).

Critical Utilities

There can be impacts if the building that collapses is directly tied to the functioning or management of power or other utilities. If the building collapses on equipment or structures that are part of the distribution network, it could also have significant impact on the delivery of services.

Economy

The economic impact of a building collapse is ultimately dependent on what structures collapse and the extent of the damage. If the collapse occurs in a business district and forces other businesses to be closed for cleanup or inspected for possible damage, this could have impacts on the local economy. Of greatest economic concern are large employers that have a significant stake in the local economy such as any of the hospitals, schools, or colleges. A structural collapse at a financial institution could also be especially problematic to the local economy, depending on what equipment and systems are impacted.

It should also be noted that building collapses in city centers could lead to disruptions in everyday commerce or bring about closures and work stoppages. Similarly, a collapse of a large arena or event center can have a significant impact on the local economy, as significant revenue is generated by large events.

Environment

The environmental impact of a building collapse would most likely be minimal. Run off from the collapsed building could contaminate nearby wildlife and/or water supplies if it is not controlled.

5.18 COMMUNICATIONS SYSTEM DISRUPTION / FAILURE

5.18.1 Background

The widespread failure or disruption of communications systems is uncommon. In most cases, there are backup systems in place to keep communication lines flowing. Extreme situations or the presence of several significant hazards would be necessary for an incident that would affect multiple communications systems. Communications infrastructure is designed to withstand high winds and other weather elements; however, failure is always a possibility and must be planned for regardless of the unlikelihood. In Guilford County, one issue that can cause or exacerbate a communications system disruption is that numerous facilities in the county are constructed in a way that radio coverage is greatly diminished within the building. This kind of disruption can occur without a precipitating event and result in similar impacts to communication among response personnel.

Disruptions are more likely to occur than actual failures. Overloaded systems due to other hazards or disaster circumstances may cause temporary connectivity issues, especially in cell phone networks. The public, government, and business operations have become more reliant on cell phones for communicating. During large-scale events or emergencies when cell phone traffic is high, it can cause overload situations and disruptions could result.

5.18.2 Location and Spatial Extent

Since a communications disruption/failure would generally have impacts throughout the county's entire network, the location for this hazard is considered countywide.

5.18.3 Historical Occurrences

In Wilmington, North Carolina, Hurricane Floyd caused a temporary outage of the county's 800 megahertz (MHz) radio system. Guilford County had a similar instance in the spring of 2011 when the 800 MHz radio system entered into Failsoft mode. This significantly impacted radio transmissions as

multiple sets of talk groups were consolidated into single channels, a result of the system losing "trunking" capability. Occasional impediments in radio transmissions can be expected in these situations. Many digital talk groups in Greensboro had disruptions, especially those associated with law enforcement. Decision makers may ultimately decide to switch operational communications over to a backup system until the primary system's issues are corrected.

During and immediately after Hurricane Katrina, the city of New Orleans, Louisiana and adjacent areas experienced significant communications issues as flooding impacted multiple systems. Cell phone towers and their generators, landline infrastructure, and other communications equipment and structures were temporarily out of service. Much of this scenario was due to the strength of the storm and the area's topographical characteristics. A similar incident is unlikely to occur in Guilford County due to its geographic location and topography.

5.18.4 Probability of Future Occurrence

Since there have been some previous occurrences of communication disruption/failure and communications are becoming more and more integrated into daily life, the probability is considered to be likely.

5.18.5 Consequence Analysis

People (The Public and Public Confidence)

The public has become increasingly reliant on cell phone communications, with many households deciding to forgo landline services completely in exchange for cell phones. In large-scale emergencies, many calls will be made to dispatch centers, loved ones, etc. that may cause overloading of the cell phone networks. These disruptions can cause issues that range from slight nuisances for the end user to preventing an emergency from being reported. Extended disruptions or complete outages can significantly impact communications and in extreme cases, put people in danger during emergencies as responders will be delayed or may not receive notification at all.

Public confidence may be impacted based upon societal expectations, media influence, and past experience with issues or failures in communication systems. 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. Lastly, the public's experience with prior incidents of similar type and scope will affect confidence because the public may compare services rendered from one communications interruption or failure to another.

Responders

The impact to responders may center more on operational information passing rather than performing physical tasks such as rescue, patient care, and firefighting. Communication is vital to efficient and effective service, and disruptions or breakdowns could impact the service provided. Backup forms of communication must be identified and maintained in order to provide a means for critical communications while primary systems are repaired and restored. Once the primary systems are operational, an appropriate transition away from the backup systems should be implemented to lessen the transition's impact on ongoing operations.

Continuity of Operations

A communications disruption/failure would potentially have extensive impacts on continuity of operations because of the loss of ability for local government operations to communicate effectively. This could cause a great deal of stress to operations and create some level of disorder in terms of continuity.

Built Environment (Property, Facilities, and Infrastructure)

Most of the built environment (e.g. homes, buildings, roadways) would not be directly 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 may be impacted such as traffic lights, street lights, and cell phone towers that may rely on communications equipment to function properly. At many key facilities, there are backup systems in place and many facilities utilize radios that allow for continued communication within the facility. There may be more significant impacts when trying to communicate outside of the facility.

Airports and other transportation facilities can be particularly impacted by communications issues, especially if the communication failure is internal. Such communications failures could impact travel locally, regionally, and potentially at a national level, especially if the failures are widespread. External communications failures may delay the reporting of general conditions or promote compounding incidents and in turn delay the dispatch of appropriate personnel.

Economy

Significant economic impact is unlikely unless communications systems are down for extended periods of time. Days or weeks of outages will affect businesses and commerce significantly and may require numerous resources to fix, replace, or temporarily take the place of the current system in place. Large employers can be significantly impacted depending on the communications system involved and the length of the incident. Backup systems may limit or eliminate any impact but will still cause some disruption.

Environment

There will likely be relatively minimal impacts on the environment from a communications system failure. These types of events do not directly impact plants or animals and typically do not have any effect on water systems or other natural areas. There may be indirect impacts if, for example, communications systems are damaged at facilities that house hazardous materials which, in turn, results in releases into the environment. However, the likelihood of this occurring is relatively low.

5.19 ENERGY / POWER / UTILITY FAILURE

5.19.1 Background

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.

5.19.2 Location and Spatial Extent

Due to the unpredictable nature of where exactly a power or 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.

5.19.3 Historical Occurrences

Most of the lengthy power outages that have occurred in Guilford County have been due to winter storms with ice accumulation, as the area occasionally experiences this type of weather during the winter months. This 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, its location, and its form.

On February 25, 2010, one such ice accumulation event occurred, as ¼ of an inch of icing followed a 3-inch snowfall. The weight of the icepack and snow during this storm caused the downing of trees and power lines, resulting in over 12,000 homes without power. More recently, in 2014 a major ice storm impacted the county and many areas of the state knocking down power lines and causing power outages for several days in some cases. In 2018, Hurricanes Florence and Michael caused widespread outages in the county as hundreds of thousands lost power in these storms.

Guilford County experienced record power outages during an ice storm on December 4, 2002. Almost a million people in central North Carolina lost power due to ½ an inch to an inch of ice accumulation causing power line failures and downed trees. Some areas lost power for a week or more in this event. Power outages do not occur only during weather-related events.

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.

In October 2018, Guilford County experience a widespread power outage due to Tropical Storm Michael. More than 145,000 power outages were reported in the Greensboro area following the impact of the storm.

5.19.4 Probability of Future Occurrence

Based on the high number of outages that have occurred in past years, the probability of a power or utility failure is considered likely.

5.19.5 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. 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 lead to negative perception 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 above, there may be issues relating to transportation, medical equipment, extreme weather temperatures, and communications issues in the event of a power outage or other utility loss. 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. Law enforcement may become strained if additional personnel are needed to deal with unusual circumstances such as unrest, looting, or traffic control when signals are not operating appropriately.

Continuity of Operations

Generally, continuity of operations can be maintained during a power or utility outage event in Guilford County. However, when utilities go down, it can make it difficult for local government employees to get to work. Furthermore, there is a limited supply of both permanent and mobile emergency generators available in the county to maintain power during an outage. As a result, there will likely be some disruption of operations during an outage.

Built Environment (Property, Facilities, and Infrastructure)

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. Power outages can also sometimes lead to sparks that may rarely ignite fires or damage other components of the electric grid, causing extensive damage. Other utility failures may

also cause damage when they go down, such as sewer systems. Shut downs or damage to these systems can result in hazardous environments that expose the built environment to waste products.

In terms of transportation infrastructure, airports may have to ground flights and suspend operations as a result of a power outage until power can be restored. Extended outages may cause more significant impacts on flight patterns. Signals at railroad crossings may not work appropriately and in more severe cases, networks may be stopped until power is restored to prevent incidents.

Communications infrastructure may also be damaged or disrupted. 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. Internet connections that originate from or are linked to energy sources in affected areas will likely see effects from a power outage.

Economy

Extended utilities 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 business(es) that are affected. Outages would have particularly major effects if they occur during business hours. Power outages could also have a significant impact on facilities like the Greensboro Coliseum if an event is taking place and is disrupted. This could deprive the local economy of a great deal of commercial activity.

Environment

The impacts to the environment from a utility outage will likely be minimal. Most utility outages do not affect environmental features, despite having a major effect on humans and the built environment. It is possible that some outages may cause spillover effects from cascading events such as fires or sewer backups, but these would likely have a relatively minor impact.

5.20 HAZARDOUS MATERIALS INCIDENT

5.20.1 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, and 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. HAZMAT incidents are caused when solid, liquid, and/or gaseous contaminants 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, 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. In addition to causing incidents, these can also hinder response efforts. In the case of Hurricane Floyd in September 1999, communities along the Eastern United States were faced with flooded junkyards, disturbed cemeteries, deceased livestock, floating propane tanks, uncontrolled fertilizer spills, and a variety of other environmental pollutants that caused 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.

5.20.2 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. In addition, a number of other environmental laws (CAA, CWA, RCRA, etc) require facilities to report on the housing of potentially hazardous materials. The information collected through this reporting process is housed in the Facility Registry Service (FRS). FRS sites indicate where hazardous materials or places of environmental interest are located.

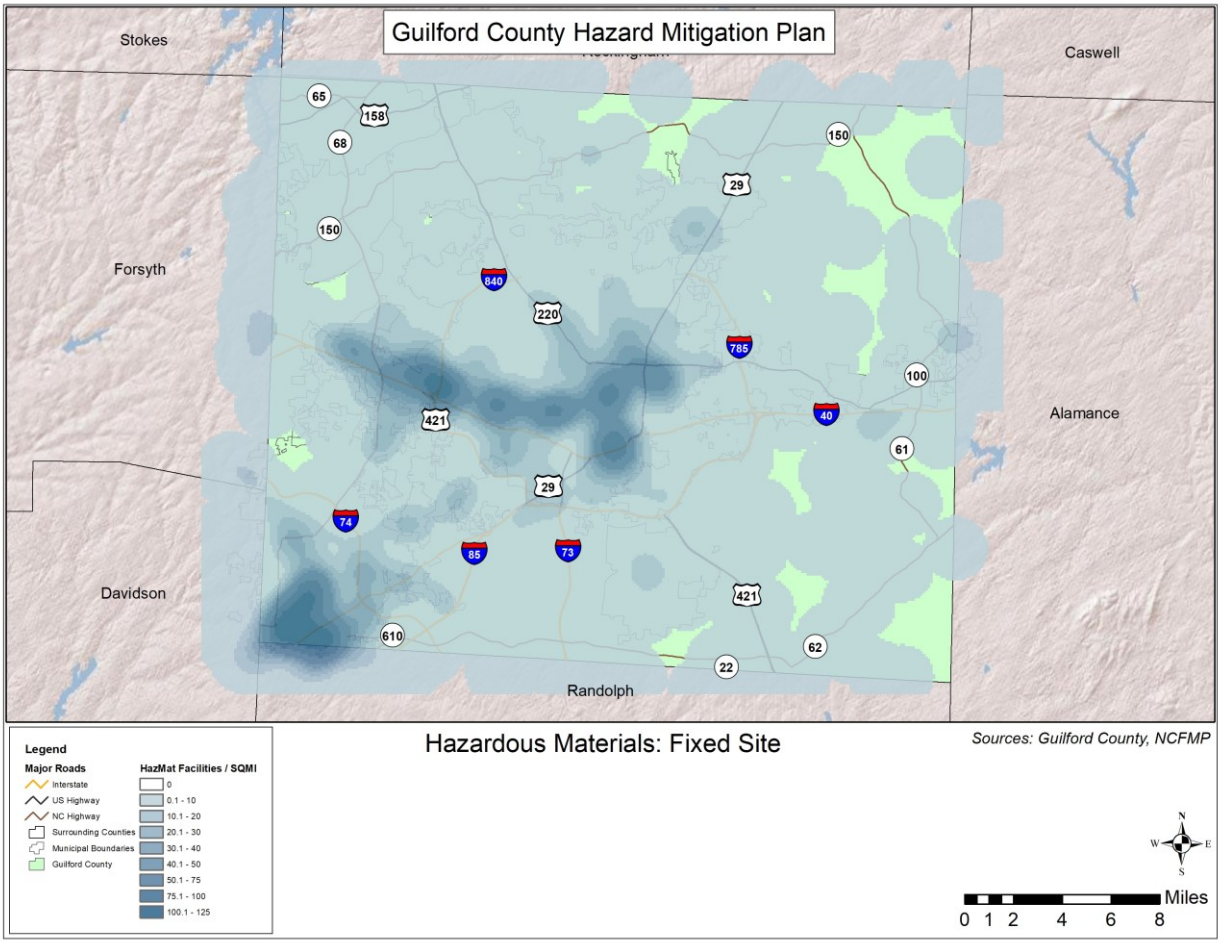
Guilford County currently has thousands of sites listed on the FRS. As such, it would be overwhelming to list all of these facilities in the plan or show them all on a single map. Instead, all of these fixed hazardous materials sites are summarized in **Table 5.43** and shown in **Figure 5.46.** Additionally, facilities that use extremely hazardous substances are required to develop a Risk Management Plan (RMP) that must be revised and resubmitted to the EPA ever five years. There are 13 RMP facilities in Guilford County and these are identified as critical facilities and are assessed in that section of the plan.

TABLE 5.43: SUMMARY OF FACILITY REGISTRY SERVICE SITES IN GUILFORD COUNTY

Location	FRS Facilities
Gibsonville	33
Greensboro	2,904
High Point	1,458
Jamestown	52
Oak Ridge	27
Pleasant Garden	47
Sedalia	2
Stokesdale	48
Summerfield	28
Whitsett	4
Unincorporated Area	944

Location	FRS Facilities
GUILFORD COUNTY TOTAL	5,547

FIGURE 5.46: FACILITY REGISTRY SERVICE SITES HEAT MAP



Source: Environmental Protection Agency

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

5.20.3 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 has been a total of 2,739 recorded HAZMAT incidents in Guilford County since 1971 (**Table 5.44**). These events resulted in over $2.9 million of property damage as well as 1 death and 30 injuries. **Table 5.45** presents detailed information on historical HAZMAT incidents in Guilford 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 5.44: SUMMARY OF HAZMAT INCIDENTS IN GUILFORD COUNTY

Location	Number of Occurrences	Deaths / Injuries	Property Damage
Gibsonville	2	0/0	$28,462
Greensboro	2,610	1/27	$2,380,529
High Point	113	0/3	$12,719
Jamestown	8	0/0	$328,600
Oak Ridge	0	0/0	$0
Pleasant Garden	0	0/0	$0
Sedalia	1	0/0	$2,800
Stokesdale	2	0/0	$194,500
Summerfield	0	0/0	$0
Whitsett	3	0/0	$0
Unincorporated Area	10	0/0	$16,768
GUILFORD COUNTY TOTAL	**2,749**	**1/30**	**$2,964,378**

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

TABLE 5.45: SERIOUS HAZMAT INCIDENTS IN GUILFORD COUNTY

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)	Quantity Released
Gibsonville							
None Reported	--	--	--	--	--	--	--
Greensboro							
I-1976030738	3/1/1976	GREENSBORO	Highway	Yes	0/0	$0	300 LGA
I-1977070198	6/28/1977	GREENSBORO	Highway	Yes	0/0	$0	300 LGA
I-1979041231	4/14/1979	GREENSBORO	Highway	Yes	0/0	$0	300 LGA
I-1979061010	5/1/1979	GREENSBORO	Highway	Yes	0/0	$0	385 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)	Quantity Released
I-1979120614	11/8/1979	GREENSBORO	Highway	Yes	0/0	$0	805 LGA
I-1980090308	8/18/1980	GREENSBORO	Highway	Yes	0/0	$0	563 LGA
I-1980100440	9/20/1980	GREENSBORO	Highway	Yes	0/0	$0	5,869 LGA
I-1980101010	9/25/1980	GREENSBORO	Highway	Yes	0/0	$0	930 SLB
I-1982030735	2/20/1981	GREENSBORO	Highway	Yes	0/0	$0	750 LGA
I-1982100088	9/22/1982	GREENSBORO	Highway	Yes	0/0	$0	0
I-1982100088	9/22/1982	GREENSBORO	Highway	Yes	0/0	$0	13,000 SLB
I-1987110100	10/30/1987	GREENSBORO	Highway	Yes	1/4	$0	8,000 LGA
I-1990080042	7/26/1990	GREENSBORO	Highway	Yes	0/0	$0	600 LGA
I-1991090582	9/8/1991	GREENSBORO	Highway	Yes	0/0	$0	129 LGA
I-1991110412	9/26/1991	GREENSBORO	Highway	Yes	0/0	$0	55 LGA
I-1992090751	8/20/1992	GREENSBORO	Highway	Yes	0/0	$0	700 LGA
I-1993090117	8/24/1993	GREENSBORO	Highway	Yes	0/0	$0	5,000 LGA
I-1995071369	7/5/1995	GREENSBORO	Highway	Yes	0/0	$0	0.264172 LGA
I-1997100017	9/4/1997	GREENSBORO	Highway	Yes	0/0	$36,983	1,300 LGA
I-1997100623	9/5/1997	GREENSBORO	Highway	Yes	0/0	$0	200 LGA
I-1999101169	9/30/1999	GREENSBORO	Highway	Yes	0/1	$0	9,000 LGA
I-2000040521	3/30/2000	GREENSBORO	Rail	Yes	0/3	$0	5,300 LGA
I-2001060345	11/13/2000	GREENSBORO	Highway	Yes	0/0	$0	4,500 LGA
I-2003050215	8/28/2002	GREENSBORO	Highway	Yes	0/0	$0	5,500 LGA
I-2003090170	1/30/2003	GREENSBORO	Highway	Yes	0/0	$0	260 LGA
I-2003100511	9/25/2003	GREENSBORO	Highway	Yes	0/0	$0	324.14 LGA
I-2003120134	10/2/2003	GREENSBORO	Highway	Yes	0/0	$0	175 LGA
E-2009020080	12/23/2008	GREENSBORO	Highway	Yes	0/0	$0	500 LGA
E-2009110327	10/27/2009	GREENSBORO	Highway	Yes	0/0	$0	387.5 LGA
I-2011010037	12/10/2010	GREENSBORO	Highway	Yes	0/0	$0	300 LGA
I-2012040248	11/29/2011	GREENSBORO	Highway	Yes	0/0	$0	200 LGA
I-2012040248	11/29/2011	GREENSBORO	Highway	Yes	0/0	$0	1,000 LGA
I-2014120003	11/14/2014	GREENSBORO	Highway	Yes	0/0	$2,450	200 LGA
I-2015040484	12/5/2014	GREENSBORO	Highway	Yes	0/0	$59,806	2021 LGA
I-2016100044	9/7/2016	GREENSBORO	Highway	Yes	0/0	$73,512	57.1875 LGA
I-2016100044	9/7/2016	GREENSBORO	Highway	Yes	0/0	$73,512	108.25 LGA
E-2019010304	12/13/2018	GREENSBORO	Highway	Yes	0/0	$153,000	8499 LGA
E-2019050725	4/8/2019	GREENSBORO	Highway	Yes	0/0	$0	130 LGA
I-2019070105	4/30/2019	GREENSBORO	Highway	Yes	0/0	$4,500	150 LGA
E-2019070319	5/9/2019	GREENSBORO	Highway	Yes	0/0	$0	249 LGA
High Point							
I-1977010157	12/31/1976	HIGH POINT	Highway	Yes	0/0	$0	5,200 LGA
I-1985060263	5/29/1985	HIGH POINT	Highway	Yes	0/0	$0	150 LGA
I-2011010135	11/10/2010	HIGH POINT	Highway	Yes	0/0	$0	181 LGA
Jamestown							
I-1989040054	3/15/1989	JAMESTOWN	Rail	Yes	0/0	$0	2,600 LGA
I-2001050986	3/19/2001	JAMESTOWN	Highway	Yes	0/0	$4,022	300 LGA
E-2013030384	3/27/2013	JAMESTOWN	Highway	Yes	0/0	$0	100 LGA

Report Number	Date	City	Mode	Serious Incident?	Fatalities / Injuries	Damages ($)	Quantity Released
Oak Ridge							
None Reported	--	--	--	--	--	--	--
Pleasant Garden							
None Reported	--	--	--	--	--	--	--
Sedalia							
None Reported	--	--	--	--	--	--	--
Stokesdale							
I-1978020301	1/31/1978	STOKESDALE	Highway	Yes	0/0	$0	6,000 LGA
I-2002120039	11/12/2002	STOKESDALE	Highway	Yes	0/0	$13,198	4,000 LGA
Summerfield							
None Reported	--	--	--	--	--	--	--
Whitsett							
None Reported	--	--	--	--	--	--	--
Unincorporated Area							
None Reported	--	--	--	--	--	--	--

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

5.20.4 Probability of Future Occurrence

Given the location of numerous FRS and RMP facilities in Guilford County as well as prior roadway, railway, air, and other incidents it is highly likely that a hazardous material incident may occur in the county (100 percent annual probability). However, county and municipal officials are mindful of this possibility and take precautions through pre-planning to respond to an occurrence.

5.20.5 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 substances and should take preparedness actions at home and in the workplace to act should a release of substances occur.

Hazardous materials incidents 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 hazardous materials and the level of control that humans have over hazardous material incidents compared to natural hazards, public confidence could be damaged severely in the event of an incident.

Responders

First responders must be vigilant when 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 could likely be maintained with some additional 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)

Hazardous Materials Facilities

A hazardous materials event is most likely to take place where the substance is created or stored. Hazardous materials facilities have their own highly-trained personnel for handling and cleaning up the particular materials stored onsite. The facility's plans are highly specific to the substances stored there, thus providing for effective responses to incidents that involve these substances. 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.

Utilities

Natural gas distribution lines can be problematic with some hazardous substances 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 substance involved in the incident. One example of how this may occur is if a utility, work crew, or citizen strikes a gas line causing a leak. Degradation of the line may also be the cause of a release. A gas leak would cause an immediate threat and explosions and fires would be significant concerns for the immediate vicinity.

Transportation Systems

Hazardous substances can have an impact on transportation infrastructure if a release occurs on or in the vicinity of a roadway, which may be the case if a truck or other vehicle carrying hazardous materials is involved in a traffic accident. Significant traffic disruptions may occur, slowing commerce or forcing alternative routing and further congestion of other areas. Similarly, rail lines are one of the more prominent places that hazardous substances are transported. A hazardous substance 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 a time.

Critical Facilities

Hospitals utilize and store some hazardous substances 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. A large event may also create a high demand on hospital services and cause an overload on resources. Similarly, some emergency services facilities such as emergency shelters may be opened if homes have been exposed to hazardous substances and evacuations occur.

Other Structures
Commercial, industrial, and residential buildings all may have hazardous substances contained within them that are not reported through the official facility reporting system but which could still present a smaller scale hazard. Proper containers and labeling can prevent inappropriate use, but accidents can still cause workers to be exposed. Cleaning products, fertilizers, and pesticides are common examples of supplies that are considered hazardous substances and which could cause a smaller incident.

Economy
The economic impact of a hazardous materials related incident can be significant locally. 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 substance(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 can be a less significant cost and is typically handled by the party responsible for the spill or release.

A hazardous materials incident could occur at any large gathering if it was the target of a terrorism event (see Terrorism below). Also, a large event arena could be forced to deal with a hazardous substance incident if it is located in close proximity to them. Arenas and other major event venues may be at significant threat as they are often situated along transportation routes where vehicles transporting such substances could become involved in an accident.

Environment
The environmental impact is highly dependent on the location and the severity of the event. Some of the substances 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 or killed. 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. The threat to water sources is perhaps the greatest potential threat of a hazardous materials spill on the environment. Water can rapidly transport the substance great distances and expand the scope of the incident. This can make it difficult to respond to the incident and cause serious health impacts.

5.21 NUCLEAR POWER PLANT EMERGENCY

5.21.1 Background

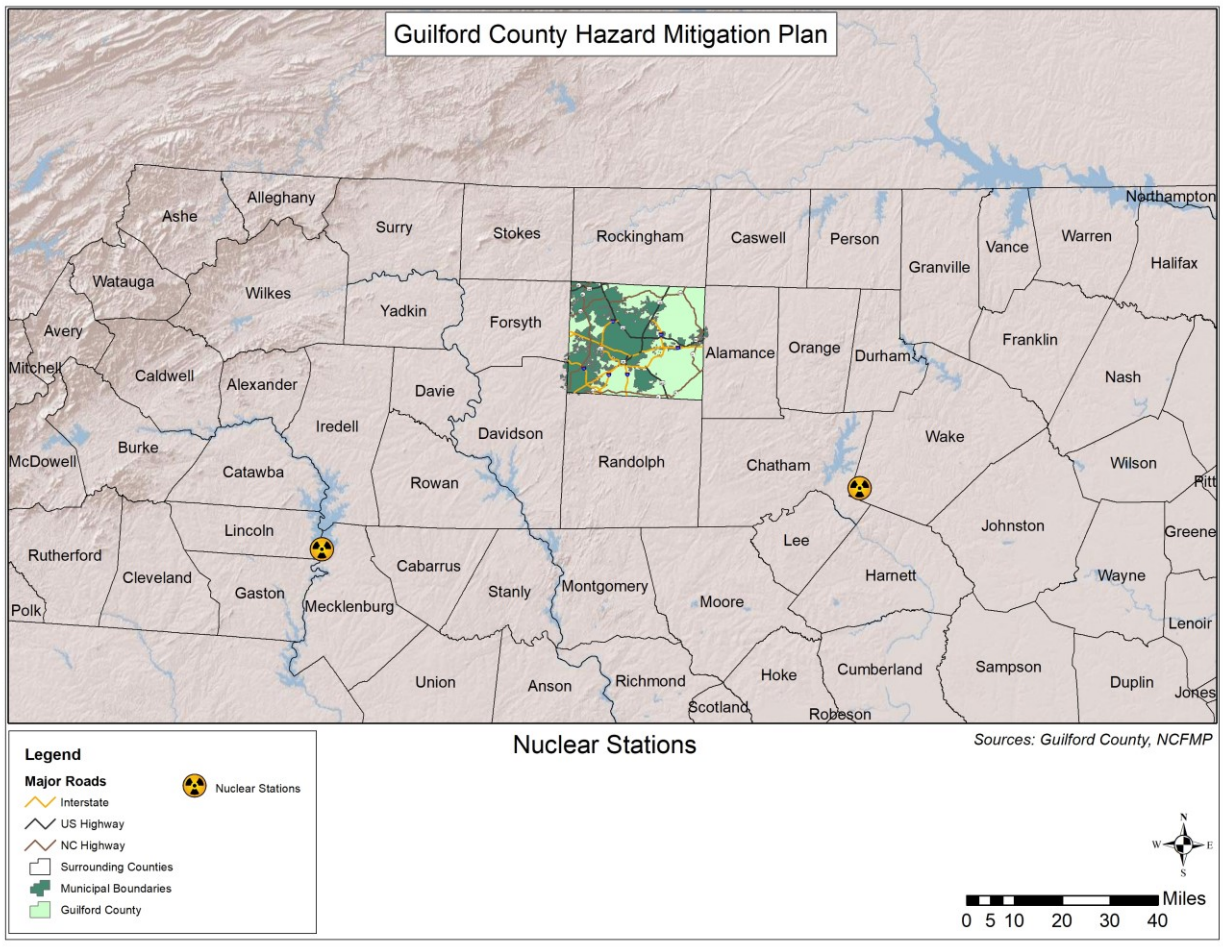
A nuclear and radiation accident is defined by the International Atomic Energy Agency as “an event that has led to significant consequences to people, the environment or the facility.” This type of incident may result from damage to the reactor core of a nuclear power plant which can release radioactivity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

By some estimates, over 50 percent of nuclear accidents that have ever occurred were in the United States.[36] 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.

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.

Shearon Harris Nuclear Power Plant, which is the plant located closest to Guilford County, is a 2,948 megawatt power plant that began commercial operation in 1987. It has pressurized water reactors and operates with a very high level of security. **Figure 5.47** shows the plants' locations in relation to Guilford County.

FIGURE 5.47: NUCLEAR POWER PLANTS LOCATED NEAR GUILFORD COUNTY



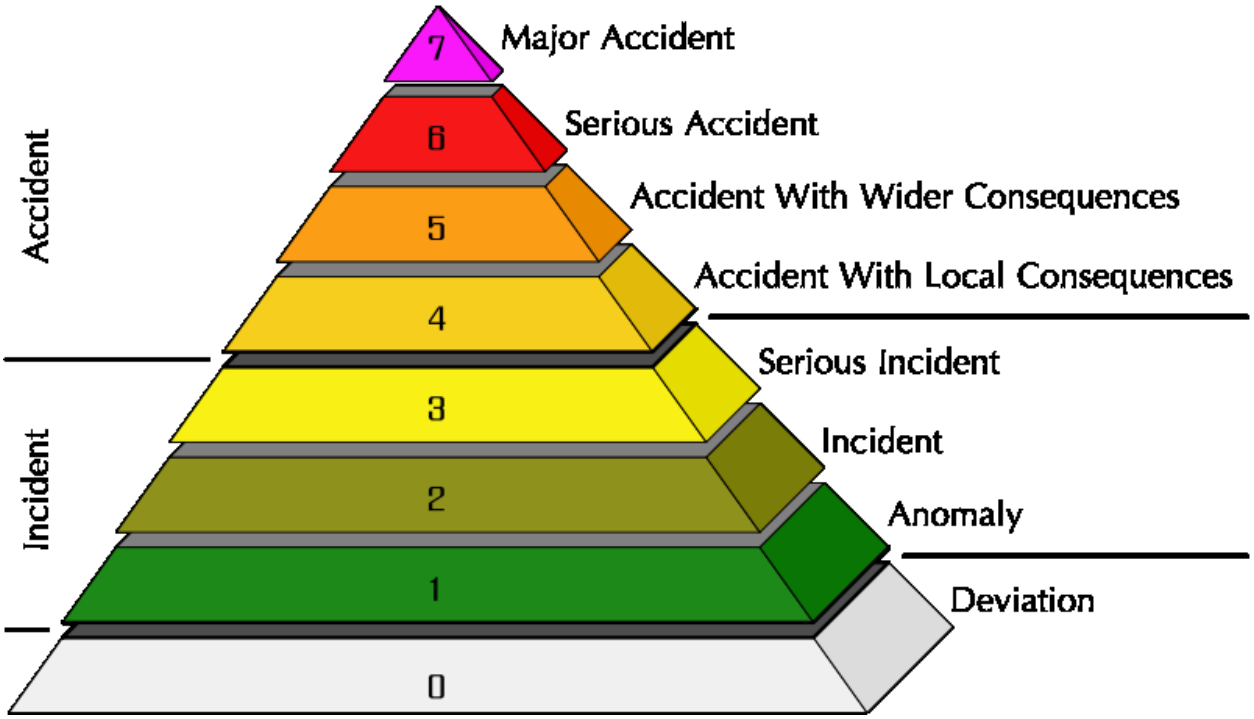
Source: International Atomic Energy Agency

[36] 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.

5.21.2 Location and Spatial Extent

The southeastern portion of Guilford County is at risk to impacts from a nuclear incident at the Shearon Harris Nuclear Power Plant. Areas in this part of the county are susceptible due to their relative proximity to the Shearon Harris Nuclear 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 5.48**).

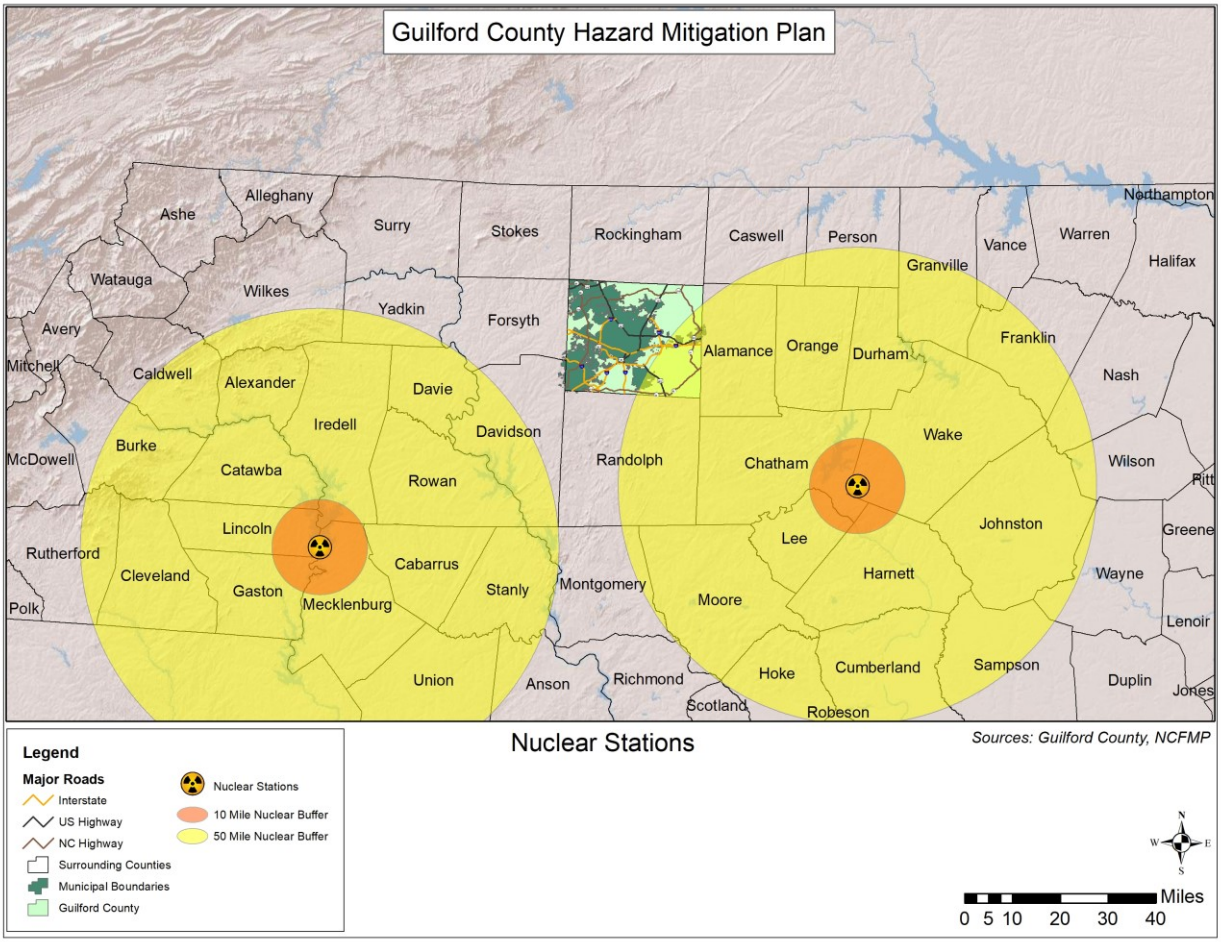
FIGURE 5.48: INTERNATIONAL NUCLEAR EVENT SCALE



Source: International Atomic Energy Agency

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. The most concerning effects in the secondary 50-mile zone are related to ingestion of food and liquids that may have been contaminated. None of the county is located within the 10-mile radius of the power plant; however, a portion of the county is located within this 50-mile radius which is still considered to be at risk from a nuclear incident (**Figure 5.49**).

FIGURE 5.49: NUCLEAR POWER PLANT EXPOSURE ZONES IN RELATION TO GUILFORD COUNTY



Source: International Atomic Energy Agency

5.21.3 Historical Occurrences

Although there have been no major nuclear events at the Shearon Harris 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.

5.21.4 Probability of Future Occurrences

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).

5.21.5 Consequence Analysis

People (The Public and Public Confidence)

In the 50-mile zone, the public would be most impacted from ingesting the material(s) through home grown crops, milk produced from livestock which have fed on contaminated grasses, and consuming

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. It is extremely difficult to purge the material from the body.

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 non-government service providers, but it is likely that confidence in the county's governance will be a significant concern.

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 and operate 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. Since responders will be first on the scene and directly dealing with the issues of an incident, their risk will potentially be very high.

Continuity of Operations

In the wake of a nuclear accident, continuity of operations in Guilford County would likely be maintained relatively well since the county is only impacted in some areas by the 50-mile buffer area. Generally, operations may need to proceed from outside their normal location, as there are plans at all stations for setting up command posts outside of high-risk areas when incidents occur. This will likely impact continuity of operations to some degree, though exercises on incidents are carried out frequently by government officials in conjunction with plant operators.

Built Environment (Property, Facilities, and Infrastructure)

It is unlikely that a radiological incident would cause the kind of damage that is typical of many other hazards identified in this plan as there would be minimal destruction of buildings and other infrastructure as a result of this type of incident. However, many structures and facilities could potentially be contaminated with radioactivity, rendering it extremely dangerous for humans to be near them or live/work there. In this sense, a major nuclear event may cause significant damage to the built environment and result in large areas that must be quarantined or considered off-limits to the public after an incident, though that is less likely in Guilford County than in counties closer to nuclear facilities. Further, checkpoints and decontamination stations may need to be set up along routes that leave the evacuation zones, resulting in increased travel times along major roadways and necessitating traffic re-routes.

Economy

Economies within and nearby the risk zones are likely to see decreased spending as evacuation takes place. Travel and tourism across the region may be limited for an extended period of time due to travelers associating the entire area with the incident. Interstate commerce may be impacted as decontamination stations may need to be established and some drivers may elect to attempt to circumnavigate the region altogether, extending travel times and increasing the time to market for products on a regional and statewide level. Employers in the surrounding areas may see increased absenteeism and requests for leaves of absence to deal with the aftermath of the event and some employees may self-evacuate, resulting in a loss of productivity.

Environment

Environmental impacts as a result of a nuclear incident may be very serious. Contaminants may impact the land and water for many years and wildlife may experience increased likelihood of cancer and other health problems. In general, habitats and ecosystems will suffer long-term from a radiological incident as the organisms within these areas will face similar impacts to those that humans experience, but since they are unable to evacuate or permanently migrate to new locations, they will be exposed for longer periods and be impacted to a greater degree.

5.22 PIPELINE FAILURE

5.22.1 Background

Pipelines in the United States are used to transport and distribute a number of products from their extraction point to sites where those materials are utilized throughout the country. Pipelines are most commonly used to transport energy sources such as natural gas and petroleum products but are also often used in the transportation of other hazardous liquids. Transportation of these products via pipeline is abundant in the United States due to the cost-effectiveness of the process which allows quick movement with relatively minimal cost.

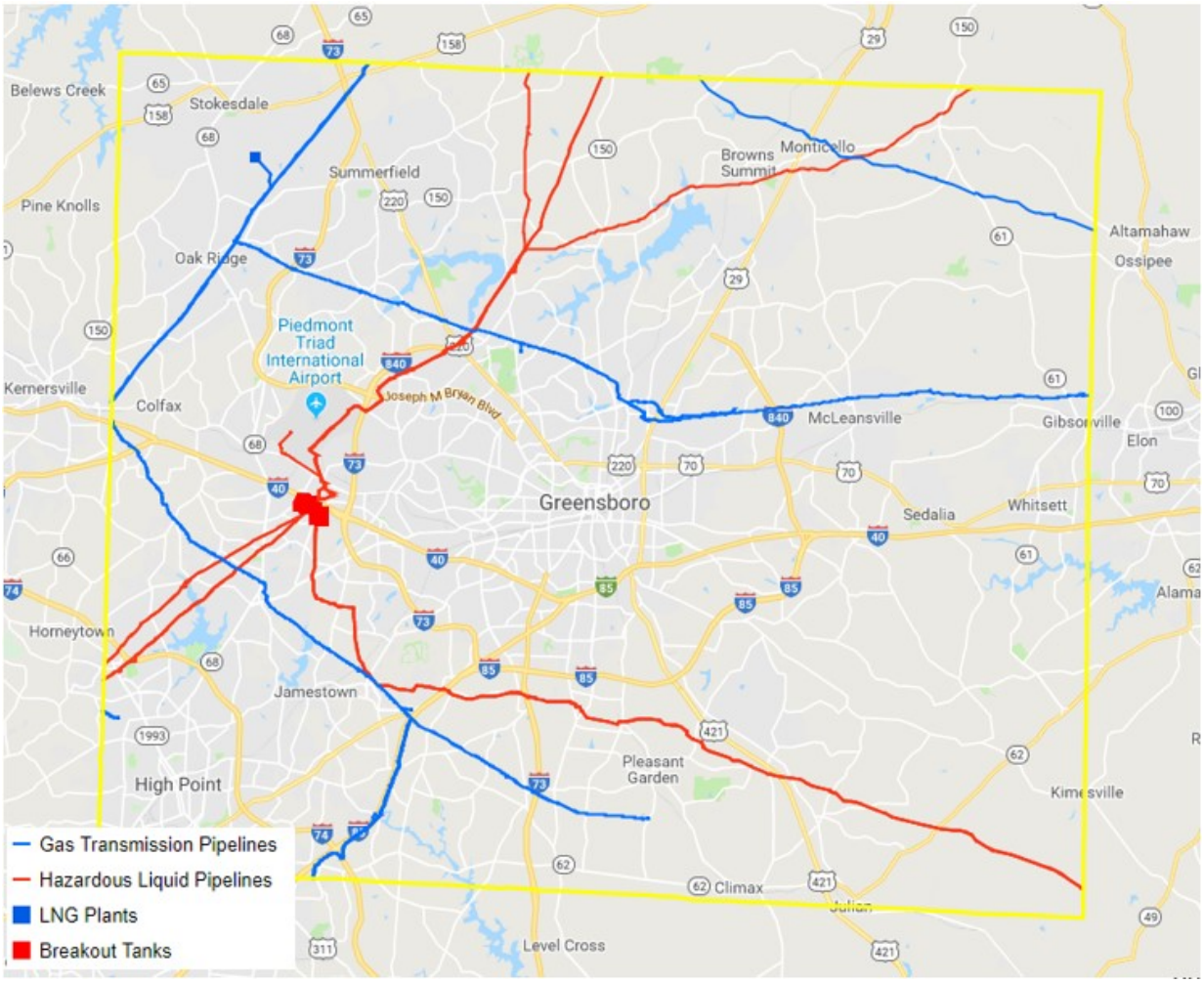
Generally, pipelines are safe and effective, transporting materials where they are needed without incident. However, many pipelines in the United States were installed over 60 years ago and were made with materials such as cast and wrought iron or bare steel which degrade over time. This presents a definitive danger to people and property as a leak or spill of hazardous products from a degraded pipeline could prove disastrous, causing costly damage to property and injury or death.

As a result, there has been a recent movement to replace many of these older pipelines with newer materials such as plastics that can reduce the risk of a pipeline failure and a hazard incident. In 2011, the Pipeline Safety, Regulatory Certainty, and Job Creation Act was passed and called for the US Department of Transportation to conduct a state by state survey of pipelines and accelerate repairs of aging infrastructure. The following website provides a state by state update of the progress of this initiative: http://primis.phmsa.dot.gov/comm/states.htm?nocache=4496.

5.22.2 Location and Spatial Extent

Pipelines exist throughout the state of North Carolina and in Guilford County. Across the state, there are over 192,000 miles of hazardous liquid line, 17,591 miles of gas transmission gathering lines, and 1,263,987 miles of gas distribution main lines. In Guilford County, there are 1,248 miles of gas lines and 822 miles of hazardous liquid lines. For more specific description of the location of pipelines in Guilford County, see **Figure 5.50** below.

FIGURE 5.50: PIPELINES IN GUILFORD COUNTY



Source: Pipeline and Hazardous Material Safety Administration

5.22.3 Historical Occurrences

There have been some reported incidents of pipeline disruptions/failures within Guilford County, dating back to the 1970s. In 1978 there were two spills that occurred on a line connected to the Greensboro tank farm. As a result of these spills, 14,700 gallons and 8,400 gallons of gas were spilled, respectively. In 1987, a 17,000 gallon spill occurred near Lake Brandt on the Plantation Pipeline that was caused by digging in the area. As a result, there was leakage into the nearby neighborhood of Guilford Green, although fortunately the fuel did not reach the lake itself.

Additionally, the events of Hurricane Katrina in September 2005 led to significant disruptions in the distribution networks of both liquid petroleum products and natural gas throughout the Southeast, including Guilford County. The impacts were significant as motorists lined up at gas stations trying to acquire fuel while it was available. Some stations could not keep up with the demand and ran out of

fuel.[37] Natural gas customers experienced significant price hikes as a result of the pipeline disruptions and other network damages caused by the hurricane.

Finally, in 2010, a lightning strike near one of the storage tanks along Interstate 40 in Greensboro caused a fire in the early hours of June 13. The fire was brought under control quickly but caused closures of several roads and destroyed the tank that was impacted and which contained over 800,000 gallons of gasoline.

5.22.4 Probability of Future Occurrence

Since there have been some reported incidents of major pipeline disruptions or failures within Guilford County, future occurrences are possible.

5.22.5 Consequence Analysis

People (The Public and Public Confidence)

The main concerns for the public with natural gas/pipeline incidents include fire ignition, explosions, and service loss. Any part of the distribution network that contains product may experience some form of failure as discussed above. The release of natural gas has the potential to spark fires or cause explosions due to the material's characteristics. This is especially hazardous in residential or other populated areas.

Public confidence will be impacted depending on the severity of the incident and location. If the incident occurs in an area where it has major impacts on the population and there are fatalities or injuries, there may be a loss of confidence in the government. Smaller incidents that only impact transmission or storage facilities of the product will likely result in less impact on public confidence.

Responders

First responders would be primarily tasked with evacuating people within potentially hazardous environments, treating and transporting patients, containing any releases, and preventing and/or extinguishing fires or explosions. Responders will likely be the first on the scene to these types of events and so will likely face the most potential impacts as they try to assist in efforts to address the incident.

Continuity of Operations

Continuity of operations can typically be maintained during a pipeline event in Guilford County. However, a large-scale pipeline explosion or failure would certainly put a strain on operations, requiring a great deal of attention from responders. This would certainly disrupt continuity of operations to some degree.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

The primary concerns with residential buildings during a pipeline failure include gas inhalation, fires, explosions, and loss of heating. Natural gas leaks could lead to asphyxia in some cases. The natural gas that is used in home heating has the compound mercaptan, which has a distinctly strong odor that can detect a leak before the environment becomes hazardous to health. The fire and explosion risks are

[37] Jad Mouawad, 2005. "Katrina's Shock to the System," *New York Times*. http://www.nytimes.com/2005/09/04/business/04oil.html?pagewanted=all

present due to the presence of methane in natural gas, which is highly flammable and can be explosive in certain conditions. Gasoline is also flammable but is not an explosive risk. Lastly, some homes may lose their primary heat source when natural gas service is disrupted.[38]

Some businesses in Guilford County have natural gas heating systems or rely on natural gas for some of their food preparation processes. A pipeline failure would interrupt these processes, thus having a negative impact on business. If a facility or business containing hazardous materials is located near a natural gas release, the potential exists for interactions between the hazardous materials stored on the site and the natural gas. Also, any fires or explosions caused by a release of fuels or natural gas could cause containment failures for the hazardous materials on the site(s). The I-40 Fuel Farm is a key facility in the distribution of these materials and could potentially be the site of an incident in the future as it has experienced incidents in the past.

If there is a pipeline break near an interstate or other component of the transportation infrastructure, responders may have to shut traffic down until the release is contained. Lanes of travel may be blocked by vehicles that run out of fuel during shortages.

Economy

A major concern with the pipelines in Guilford County is the distribution and availability of fuels. A shortage in gasoline and/or diesel could have drastic impacts on the local economy and potentially the national economy depending on the breadth or duration of the shortage. Much of the impact would be from lost commerce, as the travel of cargo, workers, and visitors could be limited or completely stopped depending on the severity of the supply issues. The primary financial effects of a significant natural gas incident in the pipeline system would be on the natural gas industry and businesses that rely on natural gas for heating or other services. The costs of lost service and repairs could be severe in the case of a pipeline failure for the natural gas providers. Business closures could have a significant impact on the local economy. Some restaurants may rely on natural gas for some of their food preparation as well.

Environment

Impacts would be confined to the immediate area of the pipeline failure, including exposure of vegetation and wildlife. Fires or other contamination on the environment may have similar impacts as those described in the Hazardous Materials Incident section above.

5.23 RESOURCE SHORTAGE (WATER / FUEL)

5.23.1 Background

Society relies on many resources to conduct routine activities. Without the most critical resources in ample supply, the public's way of life can be severely hampered. Water, electricity, and fuel are among the most critical resources and occasionally may be subject to supply issues. Electrical disruptions and outages were addressed in the Energy/Power/Utility Failure section. This section will address water and fuel shortages.

[38] National Institute of Health, 2011, *What You Need to Know About Natural Gas Detectors*. http://www.nidcd.nih.gov/health/smelltaste/pages/gasdtctr.aspx

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 1.2% is surface water. Fresh, potable water is in even more limited supply.[39] In the case of a water shortage, rationing or elimination of nonessential activities or events could become viable options to limit unnecessary consumption of water during times of concern.

Fuel, or petroleum, is also a limited resource that is used globally for many different purposes. Petroleum alone makes up about 40% of the total energy consumption in the United States.[40] When there are shortages of this valuable commodity, the activities and commerce of impacted areas could be significantly slowed. Decisions must be made to sustain critical operations, such as first response capabilities. Rationing or the elimination of nonessential activities or events could become viable options to limit unnecessary consumption of fuel during times of concern.

5.23.2 Location and Spatial Extent

Since a water or fuel shortage would impact the entire county when it occurs, the location of this hazard is considered to be countywide.

5.23.3 Historical Occurrences

In July of 2002, there was a major water shortage throughout North Carolina. This shortage was exacerbated by exceptional drought conditions over an extended period of time. The majority of the years between 1998 and 2002 were marked as under some level of drought. The shortage led to a significant water emergency for Guilford County, in particular in the City of Greensboro. At its worst point, the city had only a 67 day water supply and emergency conservation measures were put in place.

In September of 2008, the impacts of Hurricanes Gustav and Ike caused shortages of fuel in Guilford County and many other parts of the Southeast. Oil refineries in the Gulf of Mexico and the pipelines that deliver the product to various distribution points experienced significant disruptions or damages. Three years prior in August of 2005, Hurricane Katrina caused major shortages of fuel after it damaged or shut down many of the refineries and pipelines in the same region. In both shortages, there were long lines of vehicles at gas stations as the public attempted to fill up gas tanks before the supply ran out. Some stations were completely out of diesel and regular unleaded gasoline.

The fuel situation in the area was also critical during the OPEC fuel crisis in 1973 and 1974. Some gas stations in Greensboro implemented limits on refueling, including one station recorded as asking customers to purchase a maximum of 10 gallons. This illustrates how the geopolitical climate with respect to oil in the Middle East and other major oil reserves can have a significant impact on the price and supply of fuel.

[39] United States Geological Survey, *Where Is Earth's Water,* https://www.usgs.gov/special-topic/water-science-school/science/where-earths-water?qt-science_center_objects=0#qt-science_center_objects

[40] The National Academy of Sciences, *What You Need to Know About Energy – Supply and Demand,* http://www.nap.edu/reports/energy/supply.html

5.23.4 Probability of Future Occurrence

Fuel and water shortages have occurred a number of times in Guilford County over the past several decades. Water shortages were more common in recent years, but fuel shortages have certainly impacted the county as well. As a result, the probability of future occurrences is likely.

5.23.5 Consequence Analysis

People (The Public and Public Confidence)

During events such as drought that cause water shortages or emergencies, the public is given limitations on using water for non-essential purposes such as watering lawns or washing vehicles. Water shortages beyond this are possible but less likely. Greater restrictions could be implemented and enforced in extreme water emergencies. Due to these impacts to the public, first response agencies may require additional resources to deal with heightened public safety or medical emergency concerns.

Fuel shortages are not as critical to life safety but could impact decisions made about travel and other life activities. When fuel supply issues become apparent, the public often resorts to panic buying, and lines become long at gas stations. Before the shortage even takes place, gas stations may be overtaxed, as fuel is dispensed faster than it can be replenished. In extreme shortages, limitations could be placed on consumers and in some cases businesses, governments, and other groups. Rationing at gas stations may be implemented and non-essential business or governmental activities may be put on hold or eliminated completely.

Water and other resource shortages can have an influence on the public and its outlook on how the government and any related nongovernmental organizations respond to the shortage. If rationing and restrictions are put in place, it will impact the public and its confidence in the entities responsible for dealing with these limitations. Collaboration with the media could have some influence on what is reported and could reduce negative perception.

Responders

Water shortages are more likely to present life safety issues than fuel shortages. In the event of a water shortage, more health-related emergencies such as dehydration can be expected, particularly if mechanisms are not in place to effectively obtain water from other areas. The concern is heightened during warm weather conditions, especially with extreme temperatures. Water shortages may also hamper firefighting.

Continuity of Operations

The nature of a resource shortage generally means that there is some recognition that the shortage may be forthcoming in advance of major issues. The county generally has plans in place to ensure that continuity of operations can be maintained during a resource shortage. Still, a long-term resource shortage could have an impact on operations as it begins to affect staff in the same ways as the general public is affected.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

In the midst of a water shortage, the prime concerns for residential areas would deal with hydration, preparation of food, and personal hygiene. In a fuel shortage, generators that run on fuel may not be

operational. In both water and fuel shortage scenarios, there may be limitations put on property maintenance. Water intensive processes may be disrupted during water shortages for commercial and industrial operations. Accommodations such as restrooms for employees may not be operational. During fuel supply shortages, generators may not be able to be used, and property maintenance may be limited. Also, business operations that require transportation could be impacted significantly.

Critical Facilities and Personnel
During water or fuel shortages, there could be significant impacts on medical facilities and operations. Water intensive processes within the facility may be disrupted. Some medical procedures may need to be postponed or altered. In the event of a fuel shortage, interfacility transportation of patients may be impacted and backup generators may not be operational if needed. The major concern for emergency services during water shortages deals with firefighting. At the emergency services facilities, accommodations such as restrooms or showers and gear washing machines may not have the water needed for use. Fuel shortage events would spur concerns about emergency vehicles' consumption of fuel, as well as equipment and generators that run off of fuel.

The primary concern at the I-40 Fuel Farm during water supply emergencies is fire protection on site. Some water-intensive processes or basic accommodations for employees may be affected as well. The Fuel Farm's operations could be significantly impacted by the shortage of fuel. Productivity and profit would be of concern, but security issues may be an additional concern. There may be attempts of theft at the site when the fuel supply becomes critically low.

Transportation Systems
There would be few expected impacts on the transportation system during a water shortage. However, these systems could see significant impacts during a fuel shortage. Many travelers' vehicles may breakdown due to running out of fuel, which could block roadways for others. Maintenance and response mechanisms could be limited or unavailable depending on whether fuel is available as well. There could also be significant impacts on airport operations. Maintenance measures or accommodations on the airplanes that require water may not be able to be carried out. Accommodations such as restrooms for patrons and employees at the airport may not be operational, which could force the facility to shut down operations until the crisis is resolved. A fuel crisis can be equally as problematic as, without fuel, the airplanes cannot fly and again operations could be shut down.

Economy

Shortages dealing with critical resources such as water and fuel can have detrimental impacts on the economy. Governmental entities, businesses and the public may be forced to make significant and drastic decisions in order to deal with the complexities of shortages. Water supply disruptions could impact tourism and commerce if water is needed in key processes. Businesses such as hotels and restaurants may have to consider having water brought in or closing. The transport and delivery of goods and supplies can be severely impacted by fuel shortages, causing significant disruptions in economic activity. The overall impact is dependent on the severity and the duration of the shortage. It is also dependent on the availability of the resource from other sources and the ability to effectively get these resources to the intended end user. Workers may not be able to commute to work, bringing about productivity concerns and significant costs.

Environment

In the case of a severe water shortage, vegetation and crops, livestock, and aquatic wildlife may experience some impact. Livestock may not be provided adequate water and could experience illness or death. Typical or alternative sources of water may be tapped for more water, affecting ecosystems as water levels drop. There would be little expected impact to the environment during a fuel shortage.

5.24 TRANSPORTATION INCIDENT

5.24.1 Background

While transportation accidents occur on a daily basis, large-scale incidents that have major impacts on commerce or mass transit are uncommon. This section will focus on large-scale incidents, which will include incidents involving airplanes on and off airport properties in Guilford County and incidents involving trains or major highway as when these do occur, they can have significant impacts on the community. The area has experienced several incidents in the past, but occurrence is relatively infrequent and significant impacts are rare. The most common impacts involve how the incident will impact daily life, such as travel and commerce.

In Guilford County, the most prominent site for air travel is Piedmont Triad International Airport (PTIA) located in Greensboro. There are smaller airports within the county such as Southeast Greensboro Airport which have much smaller operations that are of very low significance to national air travel. Incidents have and will occur both on and off of airport properties as will be discussed in the "Historical Data" section.

Guilford County is also a major thoroughfare for rail commerce and travel. A major rail line passes through the downtown areas of both Greensboro and High Point. Norfolk Southern and Amtrak are the two major carriers of cargo and passengers.

There are also several major highways and interstate highways that run through Guilford County including Interstate-40, Interstate-73, Interstate-74, Interstate-85, and Interstate-840.

5.24.2 Location and Spatial Extent

Transportation incidents are most likely to occur along major transportation corridors such as highways, interstates, or railways. However, transportation incidents can occur throughout the county, especially given the number of planes that take flight in and out of regional and local airports and the many roads that are found throughout the county.

5.24.3 Historical Occurrences

There have been numerous incidents in Guilford County involving airplanes. Some of these incidents have occurred at PTIA while others were outside of any airport's boundaries. The following incidents are just a sample of some of the incidents that have occurred within the county. Much of this information is from response records in the Guilford Metro 9-1-1 system archive.

- In 1989, the left main gear in the landing gear system of a 737 airplane was not functioning correctly. The plane made an emergency landing at PTIA with 107 occupants. There were no injuries or deaths.
- In August of 2000, a DC-9 airplane made an emergency landing at PTIA due to smoke in the cockpit. Of the 63 crew and passengers, no one was injured during the landing or the fire that resulted, which damaged the plane substantially.[41]
- In November of 2002, a small plane struck trees while in flight and crashed near Route 421 near Southeast Greensboro Airport. The pilot was the only occupant and the only injury/fatality in the incident.
- In January of 2004, a plane went off of the runway during its takeoff attempt. There were no significant injuries or deaths.
- In October of 2011, a small private plane crashed into a home in a subdivision in Colfax. There was no one inside the home at the time, but the occupants of the airplane did not survive.
- On February 11, 2015, there was a plane crash at 150 Air Harbor Road. This was a single engine aircraft and there was one fatality.
- In December 2018, a fuel tanker crashed resulting in a fire that damaged the Interstate 73 Overpass and requiring the highway to be closed for repairs.

There have also been several incidents within Guilford County that involved trains.

- In December of 2005, 11 cars derailed in Greensboro. No one was injured.[42]
- In May of 2010, a derailment occurred in downtown Greensboro. No one was injured in the incident, where six of the train's cars derailed.[43]

Trains also have collided with other travelers.

- In 1979, another train struck a gasoline tanker in Greensboro.
- In October of 1987, a 57-car train struck a gasoline tanker in Greensboro.

Both of these incidents occurred near the Interstate 40 Fuel Farm, where fuel is continuously being distributed to and from the facility.

5.24.4 Probability of Future Occurrence

Transportation incidents are a highly likely event given that automobile accidents occur nearly every single day to some degree. However, these smaller-scale transportation incidents would have a relatively low impact overall on the community. Transportation incidents are fairly common, and the probability of a major future occurrence is likely.

5.24.5 Consequence Analysis

People (The Public and Public Confidence)

In the event of a transportation incident such a car accident, plane crash, or train derailment, there is a strong possibility of injury or death. The first concern in any incident is toward life safety, and

[41] Aviation Safety Network, 2000, ASN Aircraft accident McDonnell Douglas DC-9-32 N838AT Greensboro, NC. http://aviation-safety.net/database/record.php?id=20000808-0
[42] WXII 12 News, 2005, *Officials Investigate Train Derailment*.
[43] News and Record, May 25, 2010. *Roads Reopen in Greensboro Following Train Derailment.*

emergency services will respond to not only assist those directly involved, but to monitor for fire or hazardous materials that could impact others. A car accident or train derailment could impact the normal operations of the transportation system, as other cars or trains attempting to pass through the area of the incident may be stopped or redirected. A plane crash on the site of an airport could drastically alter operations, also causing stoppages or redirection. An offsite plane crash may not impact other flights, but could impact businesses, homes, and other parts of everyday life depending on where the incident takes place.

Public confidence in the response to a transportation incident is dependent on the expectations of the public and past experience with such incidents. If the incident is major and there are many casualties, public confidence could be reduced, but in most smaller scale cases, there will be little impact to public confidence.

Responders

During any transportation-related incident, first responders will be responsible for public safety and returning the area of the scene back to normal as best as possible. Some of the concerns that may be present during and after an incident include the injured, fatalities, and the protection of others from hazards that result from the incident. Hazardous materials (fuel or cargo), entrapped passengers, fires, and explosions are some examples of these hazards, and are possible in any type of transportation incident. Response agencies are trained to identify, monitor, and react to any of these possibilities to provide an effective public safety response.

Continuity of Operations

Since these types of events occur on a relatively regular basis and their impact is generally fairly localized, there would probably be little disruption to continuity of operations from a transportation incident. However, if it is a major incident, staff resources may be strained and there could be some effect on continuing normal operations.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

A transportation incident having an impact on any given residence is highly unlikely. If it were to occur, there could be structural damage to the residence and the potential for fire and severe localized damage to the particular structure impacted. If the incident involves hazardous materials release the impact on homes could be more widespread.

Critical Facilities and Personnel

Similarly, impacts to any given critical facility are unlikely. However, a transportation incident could increase the volume of patients at a hospital and strain the ability of responders. Facilities may be located in close proximity to rail lines or roadways, and a major incident near one of those facilities could have an impact on the community overall.

Transportation Systems

Transportation infrastructure will be directly affected by incidents. Short term or potentially long-term closures are possible depending on the magnitude of the incident. For example, while Piedmont Triad International Airport is not one of the major national travel hubs, any disruptions to its operations will have some impact on air travel and commerce.

Economy

The economic impact of a transportation incident would be relatively minor. Plane crashes may discourage some from traveling while a train derailment may have a temporary impact on commerce. However, operations are expected to return to normal in a short period of time following the incident.

There are some rail lines that pass through the downtown Greensboro area, which makes it possible for impacts from a derailment incident to a more widespread economy, but these would likely remain fairly localized. For example, a rail line runs very close by the Greensboro Coliseum and impacts are possible. These impacts could vary from access issues to the arena to a complete closure due to hazardous materials or other significant safety concerns.

Environment

The impacts of a transportation incident vary on the types of materials contained. Most transportation vehicles use some type of fuel that may be spilled during an incident and these fuels are hazardous to plant and wildlife populations and may also be harmful if spilled into a water source. Other contained chemicals and materials that are being transported by freight vehicles can be hazardous to these populations as well, depending on the characteristics of the substance(s). These are described above in the Hazardous Materials Incident section.

Man-Made / Intentional Hazards

5.25 CIVIL DISTURBANCE

5.25.1 Background

Public unrest has been evident in society from the earliest recordings of civilization. Most of these disturbances have been related to political or social issues. Insurrection has framed much of history, dictating the governance and progression of society. In recent years, most of the publicized disturbances have been protests and riots. Rioting does not occur very often in the United States; however, marches and protests are common and could subsequently lead to riots.

5.25.2 Location and Spatial Extent

Civil disturbance or unrest can occur in any location in the county but is more likely to take place in or near prominent locations such as government buildings or significant landmarks.

5.25.3 Historical Occurrences

In Guilford County, there have not been any major civil disturbances in recent years. While there are occasional marches and protests that take place in its bounds, they have not had significant threat of violence associated with them.

On November 3, 1979, an event since named the Greensboro Massacre saw members of the Ku Klux Klan and American Nazis clash with members of the Communist Party marching for African-American

industrial workers. The event climaxed with Klansmen opening gunfire on marchers, five of whom died.[44]

A disturbance near North Carolina Agricultural and Technical State University in Greensboro led to the shooting death of a college student on May 22, 1969. African American student protestors clashed with city police and members of the National Guard for three days (May 21-23), leading to several civilian and nine officer injuries in addition to the fatality. Dozens of students were arrested for disturbing the peace on public school property.[45]

Downtown Greensboro is well-publicized for its part in the non-violent, sit-in protests during the civil rights movement. In 1960, a group of four freshmen from North Carolina Agricultural and Technical College were denied service for being African Americans at a lunch counter in the business F.W. Woolworth. In response, they sat at the counter for several days, with others later joining in on the protest. A large boycott of the business followed, resulting in substantial losses for the company before it relented and enacted changes in policy chain-wide.[46]

Although some of the events described above are not considered hazards to the community per se, they are noted as they serve as examples of past points of conflicting ideology among citizens which can sometimes lead to interactions between groups that cause harm or hurt to those involved.

5.25.4 Probability of Future Occurrence

Despite some history of civil disturbance in Guilford County, there have been few recent events that caused major violence, injury, or fatalities, so the probability of future occurrences is possible.

5.25.5 Consequence Analysis

People (The Public and Public Confidence)

The United States and Guilford County are relatively stable politically and socially. However, there are United States citizens who hold extremist opinions and ideals. There is always the likelihood of some incident sparking some form of violence or disobedience. Most incidences of civil disturbance or insurrection have specific targets, unlike terrorism where maximum effect (including casualties) is desired. Therefore, collateral damage is not as likely but still possible.

The public confidence in government and nongovernmental organizations response is paramount during these incidents. There will be high emotions already present within the community, so an effective, organized, and professional response is crucial to instill confidence in community members. Working with the media is also an important component, as the messages disseminated can influence public perception. The incident response, the media, and also societal expectations will all factor into the positive or negative outcome in the minds of the public.

[44] University of North Carolina at Greensboro Libraries: Civil Rights Greensboro, *The Greensboro Massacre,* http://library.uncg.edu/dp/crg/topicalessays/greensmassacre.aspx
[45] University of North Carolina at Greensboro Libraries: Civil Rights Greensboro, *Dudley High School/NC A&T University Disturbances, May 1969,* http://library.uncg.edu/dp/crg/topicalessays/dudleyatprotest.aspx
[46] Library of Congress, *Greensboro Lunch Counter Sit-In,* http://www.loc.gov/exhibits/odyssey/educate/lunch.html

Responders

During riots and events that become violent, first responders are put into a situation of extreme danger. This is especially true of those employed by local, state, or federal governments as they may actually be targeted in such events. Law enforcement personnel are trained and equipped to deal with such situations and would be utilized to provide for public safety during these events. Other operations may be put on hold in areas of unrest until the situation improves.

Continuity of Operations

Continuity of operations could be disrupted by a civil disturbance, especially if the aim of the unrest is aimed at government buildings or officials. Plans to maintain continuity of operations are in place, but operations would likely be disrupted to some degree by a civil disturbance.

Built Environment (Property, Facilities, and Infrastructure)

Building Stock

If disturbances occur in residential areas, residents may be unable to access their homes and neighborhoods without putting their safety in jeopardy. Destruction of property is also possible in such a scenario. In commercial areas, civil unrest can lead to the destruction of property or theft of goods and equipment. Workers may not be able to access their workplaces or may not be able to work at all if the business is shut down during the disturbance. Industrial facilities are similarly vulnerable to the destruction of property, theft of goods or equipment, or sabotage of the equipment and systems housed in the facility(ies).

Critical Facilities and Personnel

During incidences of civil disturbance, hospitals may expect higher volume of patients. While hospitals are unlikely to be targeted during civil unrest, there could be some impacts if the violence is nearby. These impacts include the possibility of limited access to the hospital for workers, patients, and emergency/patient transportation crews. Incidents of violence in emergency departments and other sections of hospital are also more likely to occur. A civil disturbance event will likely increase call volume for emergency services, and increase the potential for the targeting of responders, or cause access issues relating to emergency scenes and the transportation of patients to hospitals.

Transportation Systems

Transportation systems may be blocked or otherwise damaged during a civil disturbance event, including damage to traffic lights, signs, etc. However, generally there would not be major impacts to the infrastructure itself.

Economy

The economic impact of civil disturbances is dependent on the extent of media coverage of the event and people's feelings of safety in the area(s) affected. Tourism can be negatively affected, causing potential visitors to go somewhere else or not travel at all. Businesses or homeowners may choose to shut down and real estate values could potentially fall as well if there are frequent incidents. These effects are dependent on the severity, the scope, and the nature of the disturbance(s). Civil disturbances can lead to work stoppages, which results in loss of productivity. Targeting of financial institutions could lead to significant economic hardship through the impairment of financial transactions. City centers could be the nexus of civil disturbance activity. This activity could limit access to businesses or services in the area, impairing commerce.

Environment

Impacts are unlikely as natural resources and the environment are not generally targeted and collateral impacts are not typical, unless other hazards are caused by violent acts.

5.26 CYBER-SECURITY THREAT

5.26.1 Background

Cyber-security threats are deliberate attacks 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 or outside group. Some common examples of cyber threats 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.

5.26.2 Location and Spatial Extent

Cyber-security threats 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.

5.26.3 Historical Occurrences

In Guilford County, large-scale cyber threats or attacks have not been reported, though there have been several breaches of other nearby, similar communities in North Carolina in recent years. These ransomware attacks impacted Charlotte-Mecklenburg County in 2017 and Davidson County in 2018.

In addition, the recently published 2016 Data Breach Investigation Report[47] shows that most of 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 5.51.**

[47] Data Breach Investigations Report. Verizon. 2016. Retrieved on January 3, 2017 from http://www.verizonenterprise.com/verizon-insights-lab/dbir/2016/

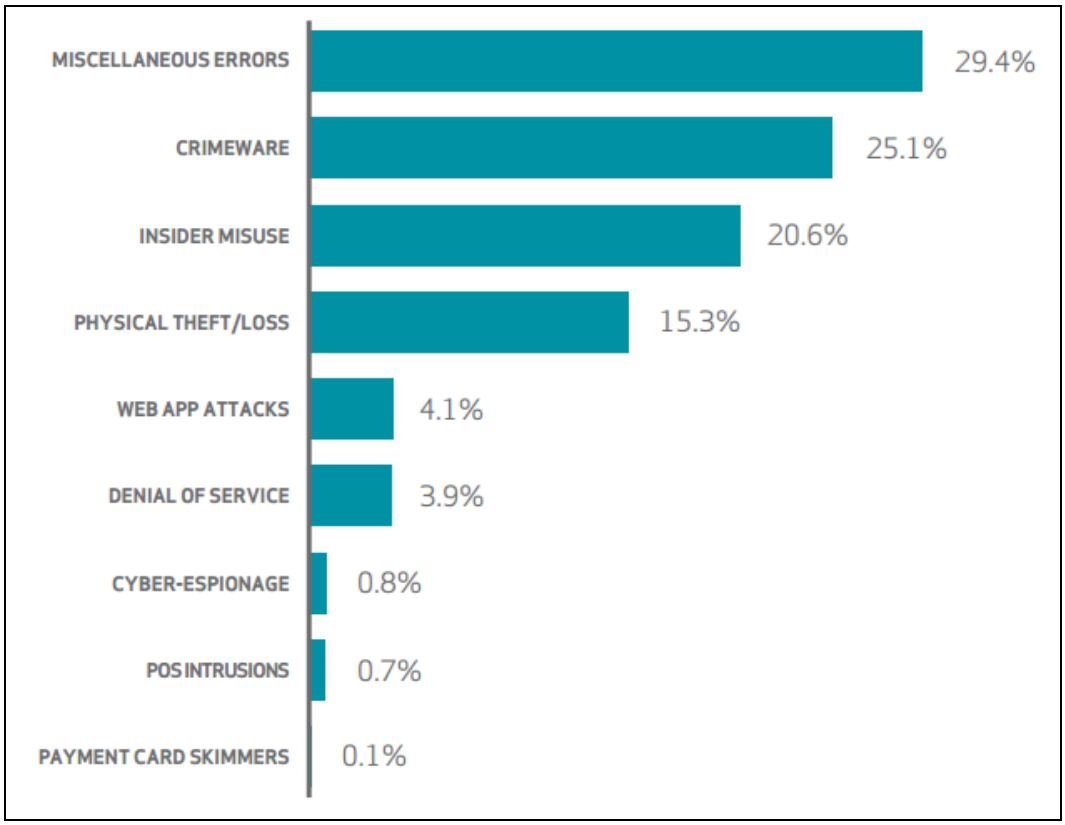
FIGURE 5.51: NATIONWIDE CYBER-BREACHES BY INDUSTRY SECTOR

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 5.52**, 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 5.52: BREAKDOWN OF BREACHES BY TYPE



Source: Data Breach Investigations Report, 2016

5.26.4 Probability of Future Occurrence

Although there have been no previous cyber threats in the county of significant impact, it is possible that the county could be impacted in the future.

5.26.5 Consequence Analysis

People (The Public and Public Confidence)

The aim of a cyber-security threat 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 cyber-breaches is warranted to lessen the potential impacts.

Public confidence in government and nongovernmental organizations may be impacted by an event based upon societal expectations and media influence with respect to cyber threats. There may be an expectation that government entities should do a better job of patrolling cyber crime and hold those responsible accountable. Public confidence may be impacted by media interpretation and reporting of the event, positive or negative.

Responders

Cyber threats may be used to try to intrude into electronic safety equipment or systems. This may increase call volume, block systems, or otherwise hinder emergency operations. Although responders are not likely to be at risk to a cyber attack in a physical sense, they may be impacted financially or through identity theft, much like members of the public.

Continuity of Operations

In the event of a cyber threat, 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 disruption to normal operations in the state and could make the state potentially vulnerable to other events that may be occurring simultaneously. In some past cases, entire IT operating systems have been held for ransom and carrying out normal operations is not possible. In these cases, continuity planning is critical to ensure basic functions can still be carried out.

Built Environment (Property, Facilities, and Infrastructure)

Cyber threats may have the effect of disrupting life sustaining equipment or systems in hospitals or medical facilities by causing technological disruptions. These attacks may also sabotage information networks and communications equipment that could disrupt services within medical facilities. Normal operations in communications equipment such as telephones, cell phones, and internet could all be severely impacted by a cyber threat which would impact large numbers of people including critical facilities operators.

Economy

Freezing, redirecting, or stealing financial assets can have drastic impacts on a business. Banking and credit institutions are commonly affected or targeted by fraudulent activities and often store a great deal of information on businesses, so large-scale intrusions can have significant impacts on the local economy. Large employers are more likely to be targeted by cyber attacks than individuals or small businesses. Larger businesses generally have greater assets to exploit and store more personal information on private individuals or employees.

Environment

Because cyber attacks occur in cyberspace and would not truly have any impacts outside of the physical sphere, there are no expected environmental impacts from this type of event.

5.27 TERRORISM

5.27.1 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.”[48] 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

[48] U.S. Code of Federal Regulations. 23 C.F.R. Section 0.85

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.[49] Terrorist acts can be committed by large, formally organized groups with terrorist cells in different parts 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.[50]

5.27.2 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 5.46** lists the U.S. Department of Homeland Security's (DHS) identified main critical infrastructure sectors.

TABLE 5.46: U.S. DEPARTMENT OF HOMELAND SECURITY CRITICAL INFRASTRUCTURE SECTORS

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

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

[49] Terrorism Research. *Terrorist groups*. Retrieved December 27, 2011, from http://www.terrorism-research.com/groups/
[50] *Ibid*.

5.27.3 Historical Occurrences

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

5.27.4 Probability of Future Occurrences

Guilford County has had no major recorded terrorist events. Due to no recorded incidents against the county, the probability of future occurrences of a terrorist attack is unlikely (less than 1 percent annual probability).

5.27.5 Consequence Analysis

People (The Public and Public Confidence)

In addition to the clear impacts that terrorism can have on human life and safety, there are a number impacts on the public that will be more widespread if major events take place. 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. Although public confidence will almost certainly be shaken, agencies and organizations in the government working together in an efficient and effective way will provide for the best chance of positive public perception of the government.

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 Guilford County or elsewhere in the state or nation. As front-line government officials, responders will be at a significant risk during an attack and may even be the object of the attack in some cases.

Depending on the location, the scope, and the nature of the event(s), response efforts could last hours, days, or potentially longer. 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)

Major Events/Centers

Often terrorist events are targeted at major events or at large event centers in an attempt to create widespread loss on a large number of people. Therefore, large arenas, convention centers, and event spaces may be at higher risk of a terrorist attack than most other buildings. Similarly, prominent or symbolic structures may also be at an elevated risk for targeting.

Critical Facilities

At 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 a terrorism event. In general, emergency services buildings are not considered high probability targets for 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. Shelters may need to be activated in a terrorism event to house and care for displaced individuals.

Transportation Systems

Bridges found throughout the interstate system may be targeted by terrorism. Not only would the actual structural failure affect those on, under, or near the bridge, but the loss of its functionality would also significantly hinder travel and commerce. Past experiences with using airplanes for terrorist activity suggest a need for planning and collaboration with all parties of interest at airports including local, state, and federal agencies. In terms of railway transportation, the most likely means of disrupting these lines would be the derailing of a train, primarily by sabotage of the rail or the switching control system. Using explosives would be more likely 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, which would add an element of complexity to the situation.

Utilities

Damage to high voltage lines or power plant structures 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 costly. Natural gas lines are also a concern as a target for terrorists. Major pipelines run through the county, 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.

Other Structures

Single-family dwellings and small businesses or industries are not likely to be targets for terrorism. However, areas that have high concentrations of certain 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 targeted event center may also be more likely to experience indirect impacts. Depending on the method of attack, impacts could include stray bullets or debris from explosions. These could affect people, electrical systems, water systems, cause structural collapse, or fires. Also, the presence of chemical agents can create health hazards through dangerous reactions with water sources or building materials.

Economy

The economic impact of a terrorist attack can vary from minimal to severe. If the incident occurs in Guilford County, it could hinder the county's 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. For example, the events of September 11, 2001 had an immediate impact on local, state, and national economies. This event and other large-scale attacks like it can drastically alter the economy in both the short- and long-term.

Major Events/Centers

Terrorism would mostly 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. 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. These could all have a negative impact economically on the county.

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, but there will certainly be at least some negative impacts from a terrorist attack including potentially the release of smoke, chemicals, or debris into the environment.

Conclusions

5.28 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 and experienced judgment regarding observed and/or anticipated hazard impacts. It also considers the findings in other relevant plans, studies, and technical reports.

5.28.1 Hazard Extent

Table 5.47 describes the extent of each natural hazard identified for Guilford County. The extent of a hazard is defined as its severity or magnitude, as it relates to the planning area.

TABLE 5.47:EXTENT OF GUILFORD COUNTY HAZARDS

Natural Hazards	
Drought	Drought extent is defined by US Drought Monitor classifications which include None, Abnormal, Moderate, Severe, Extreme, Exceptional classifications. According to these classifications, the most severe drought condition is Exceptional. Guilford County has experienced at least Severe ranking 8 times over the 20-year reporting period.
Earthquake	Earthquake extent can be measured by the Richter Scale and the Modified Mercalli Intensity (MMI) scale and the distance of the epicenter from Guilford County. According to data provided by the National Geophysical Data Center, the greatest MMI to impact the county was IV (moderate) with a correlating Richter Scale measurement of approximately 4.3 (last reported on November 20, 1969). The epicenter of this earthquake was located 183.0 km away.
Extreme Cold	The extent of extreme cold can be defined by the minimum temperature reached. The lowest temperature recorded in Guilford County is -8 degrees Fahrenheit (reported on January 21, 1985).
Extreme Heat	The extent of extreme heat can be defined by the maximum temperature reached. The highest temperature recorded in Guilford County is 106 degrees Fahrenheit (reported most recently on July 29, 1952).
Fire	Wildfire data was provided by the North Carolina Division of Forest Resources and is reported annually by county from 2010-2019. Analyzing the data indicates the following wildfire hazard extent for the county. • The greatest number of fires to occur in any year was 139 in 2014. • The greatest number of acres to burn in a single year occurred in 2015 when 58.4 acres were burned. Although this data lists the extent that has occurred, larger and more frequent wildfires are possible throughout the county.

Flooding

Flood extent can be measured by flood height and velocity. 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 September 25, 1947. Water reached a discharge of 11,600 cubic feet per second. The greatest gage height in the county was recorded on October 15, 1954 at 24.20 feet. Additional peak discharge readings and gage heights are in the table below.

Location	Date	Peak Discharge (cfs)	Gage Height (ft)
Guilford County			
Reedy Fork near Gibsonville	9/25/1947	11,600	20.77
South Buffalo Creek near Pomona	9/23/2003	3,350	15.45
South Buffalo Creek at US 220 near Greensboro	9/17/2018	3,340	16.77
South Buffalo Creek near Greensboro*	7/15/1949, 3/20/2003	10,000	14.37
West Fork Deep River near High Point	9/24/1947	8,450	19.92
East Fork Deep River near High Point*	9/24/1947, 9/23/2003	6,300	13.46
Reedy Fork near Oak Ridge*	10/10/1959, 9/22/1979	3,950	12.41
Haw River near Summerfield	10/15/1954	1,310	24.20
Rock Creek near Whitsett	10/15/1954	5,860	24.02
Candy Creek near Monticello	4/16/1987	356	6.77
Brush Creek at Muirfield Rd at Greensboro	9/17/2018	902	11.08
Brush Creek at Fleming Rd at Greensboro*	3/29/2001, 9/15/2000	221	8.96
Horsepen Creek at US 220 near Greensboro*	9/23/2003, 9/17/2018	2,800	11.99
Horsepen Creek at Battle Ground	9/24/1947	6,400	10.36
Ryan Creek below US 220 at Greensboro	7/13/2003	1,060	12.53
N Buffalo Creek at Westover Terrace at Greensboro	9/23/2003	2,520	14.07
N Buffalo Creek at Church St at Greensboro	9/23/2003	3,520	17.81
N Buffalo Creek near Greensboro	9/22/1979	9,140	20.12
Buffalo Creek at SR 2819 near Mcleansville	3/20/2003	6,720	19.35

*Peak discharge and peak gage height occurred on different dates.

Hail

Hail extent can be defined by the size of the hail stone. The largest hail stone reported in Guilford County was 2.75 inches (reported on April 2, 1983). 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. The greatest classification of hurricane/tropical storm within 75 miles of Guilford County was an unnamed storm in October 1893 which reached a maximum wind speed of 80 knots as a Category 1 hurricane. Although the county is much more likely to be impacted by the remnants of a hurricane or tropical storm, it is possible that a storm with hurricane-force winds can impact the county directly.
Thunderstorm – Wind	Thunderstorm extent is defined by the number of thunder events and wind speeds reported. The strongest recorded wind event in Guilford County was reported on July 15, 1976 at 84 knots (approximately 97 mph). It should be noted that future events may exceed these historical occurrences.
Thunderstorm – Lightning	According to the Vaisala flash density map, Guilford County is located in an area that experiences 6 to 12 lightning flashes per square mile per year.
Tornado	Tornado hazard extent is measured by tornado occurrences in the US provided by FEMA as well as the Fujita/Enhanced Fujita Scale. The greatest magnitude reported in Guilford County was an EF3 (reported on March 28, 2010). It should be noted that in 2018, an EF2 tornado caused extensive damage in the county.
Winter Storm	The extent of winter storms can be measured by the amount of snowfall received (in inches). The greatest 24-hour snowfall reported in the county was 20.0 inches on March 2, 1927. 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.
Biological Hazards	
Bioterrorism	A bioterrorism event would have significant consequences on the general public and could potentially cause major strain to hospitals and medical care providers. In some more severe scenarios, quarantines may be required as public health officials attempt to restrict the spread of infectious disease. The extent for this could be severe/widespread, impacting thousands of people.
Public Health / Emerging Disease Threat	A public health/emerging disease threat could have a large-scale effect 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.
Technological Hazards	
Building / Structure Collapse	A building or structure collapse would most likely occur to a building that is under construction. The impacts would be relatively localized, but could be very serious, causing death or injury to anyone in or around the structure. Depending on the size of the structure, possibly hundreds of people could be affected even though in this type of event, generally only a single structure would collapse and the area of impact would be relatively small.
Communications Systems Disruption / Failure	For a communications systems disruption or failure, the greatest extent that is possible is a complete shutdown of all communications equipment. However, this is unlikely to occur as it is more likely that a loss of one form of communication (radio, cell phone) will be shut down, causing emergency personnel to seek out other forms of communication and delaying/disrupting response time.

Energy / Power/ Utility Failure	There are many impacts that would occur as a result of an energy/power/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 utilities.
Hazardous Materials Incident	According to USDOT PHMSA, the largest hazardous materials incident reported in the county was 9,000 LGA released on the highway on September 30, 1999 and 13,000 SLB released on the highway on September 22, 1982. It should be noted that larger events are possible.
Nuclear Power Plant Emergency	Although there is no history of a nuclear accident at the Shearon Harris Power Plant, other events across the globe and in the United States 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 Shearon Harris is possible.
Pipeline Failure	A pipeline failure could be caused in several different ways. If an explosion or fire were the cause of the incident, the impacts might include fatalities or injuries as well as loss of a fuel source and damage to personal property. However, the impacts could also be less fatal in which case the more immediate effects might be down time for services and significant price hikes for consumers.
Resource Shortage (Water / Fuel)	A resource failure would likely have widespread impacts that cause a strain on the local economy and on everyone in the county. In the past, the county has experienced events wherein there was less than 70 days of water supply available which is very low. Similarly, the county has experienced rationing of fuel supplies. Both of these types of events could occur again and the extent could be similar or somewhat worse.
Transportation Incident	A transportation incident might cause death or injury to those involved in the accident as well as to bystanders near the site of the incident. The main effects of a transportation incident might be fire or explosions and a shutdown of transportation corridors. Although these events are relatively common and emergency officials deal with them fairly often, the impacts to individuals might be severe with disruption to daily life at a minimum.
Man-Made / Intentional Hazards	
Civil Disturbance	Often one of the greatest impacts from civil disturbances is collateral damage to people and property. During civil disturbances, property can be destroyed or stolen and citizens can be injured due to violence that erupts. First responders may also be targeted and many times are more likely to be injured as a result of civil unrest that the typical citizen.
Cyber-Security Threat	While there is seldom physical damage inflicted from a cyber-security 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 cyber-security event. Moreover, these events are often aimed at shutting down IT systems which can result in loss of productivity and damage to IT infrastructure.
Terrorism	There is no history of major terror threats in Guilford County; however; it is possible that one of these events could occur. If this were to take place, the magnitude of the event could be on the scale of critical damage with many fatalities and injuries to the population.

5.28.2 Priority Risk Index

In order to draw some meaningful planning conclusions on hazard risk for Guilford 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 Guilford 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 the hazard risks for mitigation planning purposes and, more specifically, the identification of hazard mitigation opportunities for the jurisdictions in Guilford County to consider as part of their proposed mitigation strategy.

The prioritization and categorization of identified hazards for Guilford 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 Guilford 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 Guilford 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 relative 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[51], as summarized in **Table 5.48**. 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 Guilford County, the highest PRI value is 3.1 (winter storm). Prior to being finalized, PRI values for each identified hazard were reviewed and accepted by the members of the Hazard Mitigation Planning Team.

[51] 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 5.48: PRIORITY RISK INDEX FOR GUILFORD 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	

5.28.3 Priority Risk Index Results

Table 5.49 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 5.49: SUMMARY OF PRI RESULTS FOR GUILFORD COUNTY

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Natural Hazards						
Drought	Likely	Minor	Large	More than 24 hours	More than 1 week	**2.5**
Earthquake	Possible	Minor	Moderate	Less than 6 hours	Less than 6 hours	**2.0**
Extreme Cold	Possible	Minor	Large	More than 24 hours	Less than 1 week	**2.1**
Extreme Heat	Likely	Minor	Large	More than 24 hours	Less than 1 week	**2.4**
Fire	Likely	Minor	Small	Less than 6 hours	Less than 1 week	**2.3**
Flooding	Highly Likely	Limited	Small	6 to 12 hours	Less than 1 week	**2.8**
Hail	Highly Likely	Minor	Moderate	6 to 12 hours	Less than 6 hours	**2.5**
Hurricane / Other Tropical Disturbance	Likely	Critical	Large	More than 24 hours	Less than 24 hours	**2.9**
Thunderstorm – Wind	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hours	**2.8**
Thunderstorm – Lightning	Highly Likely	Limited	Moderate	6 to 12 hours	Less than 6 hours	**2.8**
Tornado	Likely	Critical	Small	Less than 6 hours	Less than 6 hours	**2.7**
Winter Storm	Highly Likely	Critical	Moderate	More than 24 hours	Less than 1 week	**3.1**
Biological Hazards						
Bioterrorism	Unlikely	Critical	Small	Less than 6 hours	Less than 1 week	**2.3**
Public Health / Emerging Disease Threat	Possible	Critical	Small	Less than 6 hours	More than 1 week	**2.7**
Technological Hazards						
Building / Structure Collapse	Possible	Limited	Negligible	Less than 6 hours	Less than 6 hours	**1.9**
Communications Systems Disruptions / Failures	Possible	Limited	Large	Less than 6 hours	Less than 1 week	**2.7**
Energy / Power / Utility Failure	Likely	Limited	Small	Less than 6 hours	Less than 1 week	**2.6**
Hazardous Materials Incident	Likely	Critical	Small	Less than 6 hours	Less than 24 hours	**2.8**
Nuclear Power Plant Emergency	Unlikely	Limited	Moderate	6 to 12 hours	Less than 1 week	**2.1**
Pipeline Failure	Possible	Limited	Moderate	Less than 6 hours	Less than 1 week	**2.5**
Resource Shortage (Water / Fuel)	Possible	Limited	Large	More than 24 hours	More than 1 week	**2.5**
Transportation Incident	Likely	Critical	Negligible	Less than 6 hours	Less than 24 hours	**2.6**

Hazard	Category/Degree of Risk					
	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Man-Made / Intentional Hazards						
Civil Disturbance	Possible	Limited	Small	12 to 24 hours	More than 1 week	**2.2**
Cyber-Security Threat	Possible	Critical	Small	Less than 6 hours	Less than 24 hours	**2.5**
Terrorism	Unlikely	Critical	Small	Less than 6 hours	Less than 24 hours	**2.2**

5.29 FINAL DETERMINATIONS

The conclusions drawn from the hazard profiling process for Guilford 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 5.50**). 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 Guilford 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 5.50: CONCLUSIONS ON HAZARD RISK FOR GUILFORD COUNTY

HIGH RISK	Winter Storm Hurricane / Other Tropical Disturbance Thunderstorm (Wind/Lightning) Flooding Hazardous Materials Incident Tornado Public Health / Emerging Disease Threat Communications Systems Disruption / Failure
MODERATE RISK	Energy / Power / Utility Failure Transportation Incident Drought Resource Shortage (Water / Fuel) Pipeline Failure Cyber-Security Threat Hail Extreme Heat
LOW RISK	Fire Bioterrorism Civil Disturbance Terrorism Extreme Cold Nuclear Power Plant Emergency Earthquake Building / Structure Collapse

SECTION 6
VULNERABILITY ASSESSMENT

This section identifies and quantifies the vulnerability of the jurisdictions within Guilford 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 Guilford 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, Guilford County and the participating jurisdictions 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 jurisdictions in Guilford County. 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:

- Bioterrorism
- Building/Structure Collapse
- Civil Disturbance
- Cyber-Security Threat
- Drought
- Energy/Power/Utility Failure
- Extreme Cold
- Extreme Heat
- Hail
- Public Health/Emerging Disease Threat
- Pipeline Failure
- Resource Shortage (Water/Fuel)
- Terrorism
- Thunderstorm- Lightning
- Thunderstorm- Wind
- Tornado
- Winter Storm

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 man-made and technological 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 Guilford County that is vulnerable to these hazards. For all hazards, annualized loss estimates were determined using the best available data on historical losses from sources including NOAA's National Climatic Data Center records, existing 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 biological, technological and man-made hazards, no historical property damage data 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 6.16**.

6.2.2 GIS-Based Analysis

Other hazards have specified geographic boundaries that permit additional analysis using Geographic Information Systems (GIS). These hazards include:

- Fire/Wildfire
- Flood
- Hazardous Material Incident
- Nuclear Power Plant Emergency
- Transportation Incident

The objective of the GIS-based analysis was to determine the estimated vulnerability of critical facilities and populations for the identified hazards in Guilford 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 (e.g. critical facilities) when available.

ESRI® ArcGIS™ 10.5.1 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 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/Other Tropical Disturbance

There are several models that exist to model hazards. Hazus-MH was used in this vulnerability assessment to address the aforementioned hazards.

Hazus-MH

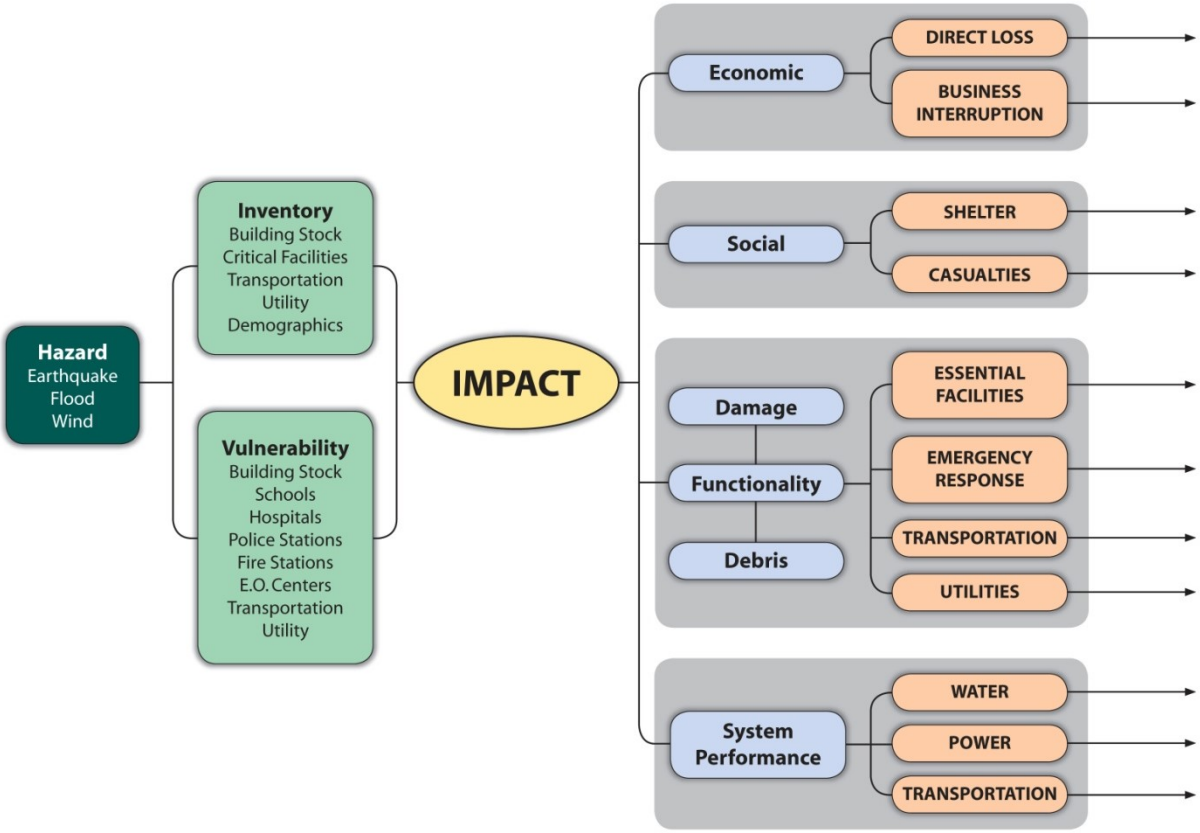
Hazus-MH ("Hazus") is a standardized loss estimation software program developed by FEMA. It is built upon an integrated GIS platform to conduct analysis at a regional level (i.e., not on a structure-by-

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 Guilford 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 4.2 SP2 was used to estimate potential damages from hurricane winds earthquake hazards using Hazus-MH methodology. Although the program can also model losses for flood and storm surge, 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 4.2 SP2 (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/building 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.

Hurricane and Tropical Storm Wind

Hazus-MH 4.2 SP2 (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 Guilford 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.

Hazardous Materials Incident

For the fixed hazardous materials incident analysis, Facility Registry Service data was used. According to the Environmental Protection Agency (EPA), the Facility Registry Services (FRS) is a centrally managed database that identifies facilities, sites or places subject to environmental regulations or of environmental interest. The FRS provides Internet access to a single integrated source of comprehensive (air, water, and waste) environmental information about those facilities, sites, or places.

The FRS is a publicly available database from the federal EPA that contains information on facilities that store potentially hazardous materials as reported by certain covered industry groups as well as federal facilities. This inventory was established under several environmental laws including the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) and Resource Conservation and Recovery Act (1976), among others. Each year, facilities that meet certain activity thresholds must report their activities for listed toxic chemicals to EPA and to their state or tribal entity.

For the mobile hazardous materials incident analysis, transportation data including major highways and railroads were obtained from the North Carolina 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 Guilford County is based on the location of the Shearon Harris and McGuire Nuclear Power Stations and buffer radii required 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 Guilford 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. The Wildland Urban Interface Risk Index (WUIRI) layer 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 Guilford County and its jurisdictions 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 Guilford County according to local building and parcel data provided by the county. It was supplemented by data from surrounding counties to account for the small areas of communities whose jurisdictional boundaries cross into these surrounding counties. The information has been expressed in terms of the number of parcels and total value of improvements (buildings) that may be exposed to the identified hazards. In addition, building footprint data was available for all jurisdictions and it was used to improve the overall assessment by providing a more accurate assessment of how many buildings are located in hazard areas.

2. Critical Facilities: Critical facilities vary by jurisdiction and the critical facilities provided by each jurisdiction are used in this section. It should be noted that this listing is not all-inclusive for

[1] While potentially not all-inclusive for the jurisdictions in Guilford 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.

assets located in the county, and it is anticipated that it may be expanded or adjusted during future plan updates as more geo-referenced data becomes available for use in GIS analysis.

The following tables provide a detailed listing of the geo-referenced assets that have been identified for inclusion in the vulnerability assessment Guilford County.

Table 6.1 lists the number of parcels, total value of parcels, total number of buildings, and the total value of improvements for participating areas of Guilford County (study area of vulnerability assessment).[2]

TABLE 6.1: IMPROVED PROPERTY IN GUILFORD COUNTY

Location	Number of Parcels	Total Value of Parcels	Number of Buildings	Total Improved Value of Buildings
Gibsonville	3,734	$8,482,488,110	2,091	$5,676,245,169
Greensboro	95,060	$540,392,697	109,882	$424,452,737
High Point	43,595	$23,287,964,120	41,906	$16,283,343,262
Jamestown	1,674	$8,373,635,345	1,627	$6,180,323,663
Oak Ridge	3,390	$424,827,000	4,055	$303,192,200
Pleasant Garden	2,325	$957,777,350	3,989	$695,968,600
Sedalia	575	$345,545,200	547	$244,763,200
Stokesdale	2,937	$50,376,800	4,023	$33,291,000
Summerfield	4,802	$607,368,020	6,603	$408,210,700
Whitsett	439	$1,426,424,100	815	$1,037,015,300
Unincorporated Area	50,310	$53,945,900	79,088	$34,084,300
GUILFORD COUNTY TOTAL	**208,841**	**$44,550,744,642**	**254,626**	**$31,320,890,131**

Source: Guilford County GIS Department, NC OneMap

Table 6.2 summarizes the primary critical facilities located in Guilford County by type. 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. All critical facility information was provided by local governments and the Guilford County GIS department.

In addition, **Figure 6.2** shows the locations of the primary critical facilities in Guilford County. **Table 6.17**, 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. Specific information concerning shelter locations has been removed from the plan as this information is considered protected by local governments and will be published on an as-needed basis. As noted previously, this list is not all-inclusive and only includes information provided by local governments.

[2] Total values for improvements is based on tax assessor records as joined to digital parcel data. It should be noted that this represents best available data and may not reflect actual on-the-ground conditions. For example, in some cases, parcels that contain structures do not have an associated building value. Therefore, this information should be used to provide a general understanding of potential exposure.

TABLE 6.2: CRITICAL FACILITY INVENTORY IN GUILFORD COUNTY

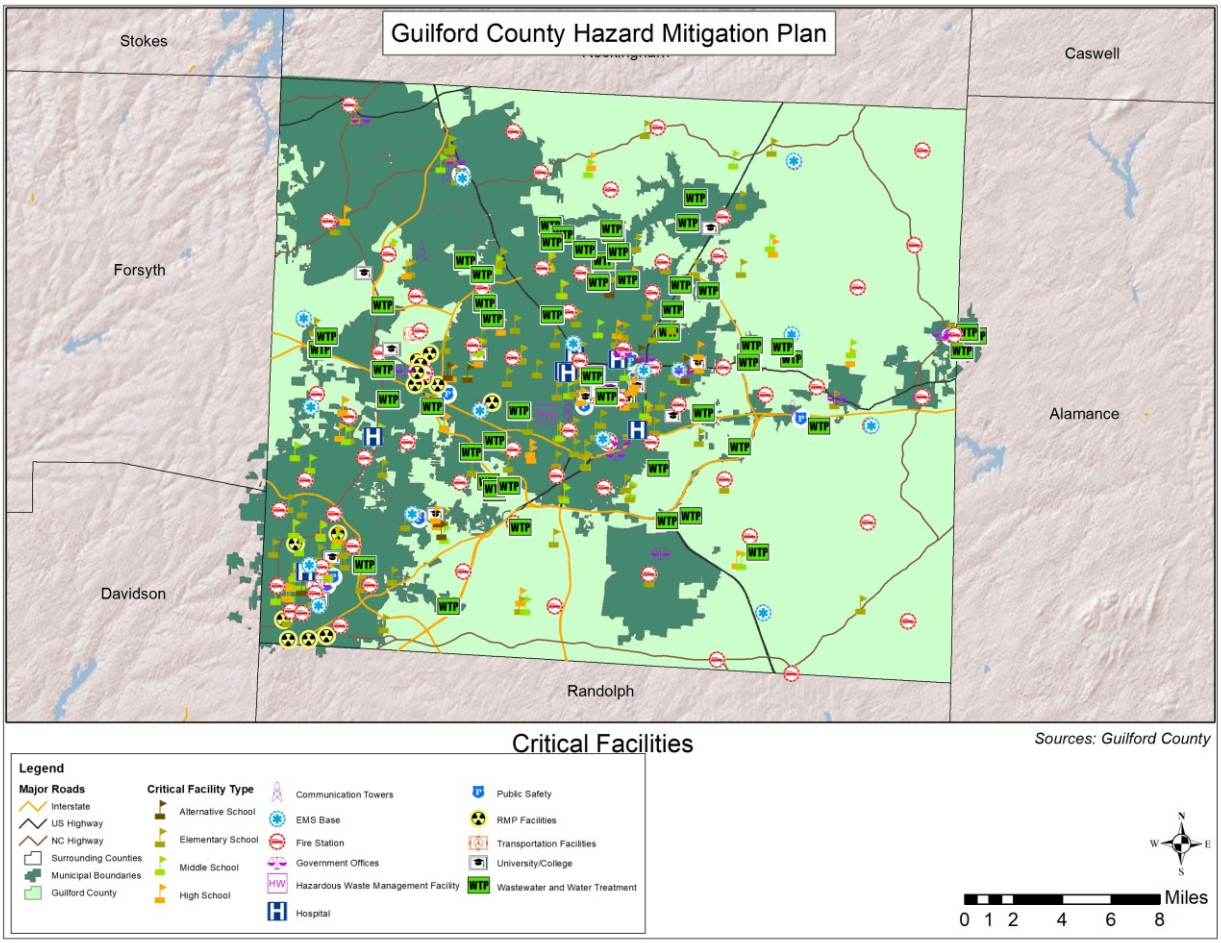
Location	Fire Stations	Public Safety	EMS Bases	Hospitals	Shelters	RMP Facilities/ Hazardous Waste
Gibsonville	1	1	0	0	n/a	0
Greensboro	27	11	5	5	n/a	9
High Point	15	2	3	2	n/a	6
Jamestown	1	1	1	0	n/a	0
Oak Ridge	1	0	0	0	n/a	0
Pleasant Garden	1	0	0	0	n/a	0
Sedalia	0	0	0	0	n/a	0
Stokesdale	1	0	0	0	n/a	0
Summerfield	3	1	1	0	n/a	0
Whitsett	1	0	0	0	n/a	0
Unincorporated Area	24	1	5	0	n/a	0
GUILFORD COUNTY TOTAL	**75**	**17**	**15**	**7**	**34**	**15**

Source: Local Governments

Location	Schools	Comm Towers	Government Offices	Trans. Facilities	University/ College	Water/ Wastewater Treatment
Gibsonville	1	0	2	0	0	3
Greensboro	109	5	11	1	9	68
High Point	48	0	1	1	2	2
Jamestown	4	0	1	0	0	0
Oak Ridge	3	0	1	0	0	0
Pleasant Garden	1	0	1	0	0	0
Sedalia	1	0	1	0	0	0
Stokesdale	1	0	1	0	0	0
Summerfield	6	2	1	0	0	0
Whitsett	0	0	1	0	0	0
Unincorporated Area	34	2	0	1	3	2
GUILFORD COUNTY TOTAL	**208**	**9**	**21**	**3**	**14**	**75**

Source: Local Governments

FIGURE 6.2: CRITICAL FACILITY LOCATIONS IN GUILFORD COUNTY



Source: Guilford County GIS Department, Municipal Officials

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 Guilford County that are potentially at risk to these hazards.

Table 6.3 lists the population by jurisdiction according to U.S. Census 2010 population estimates. The total population in Guilford County according to Census data is 488,406 persons. The annual American Community Survey (ACS) gives a more up to date estimate of the population counts for each community, but because data at the block level is not available through the ACS estimates, spatial analysis is not possible on ACS data (which are only available at the larger tract level). ACS population estimates are presented in Section 3: *Community Profile.*

TABLE 6.3: TOTAL POPULATION IN GUILFORD COUNTY

Location	Total 2010 Population
Gibsonville*	6,410
Greensboro	269,666

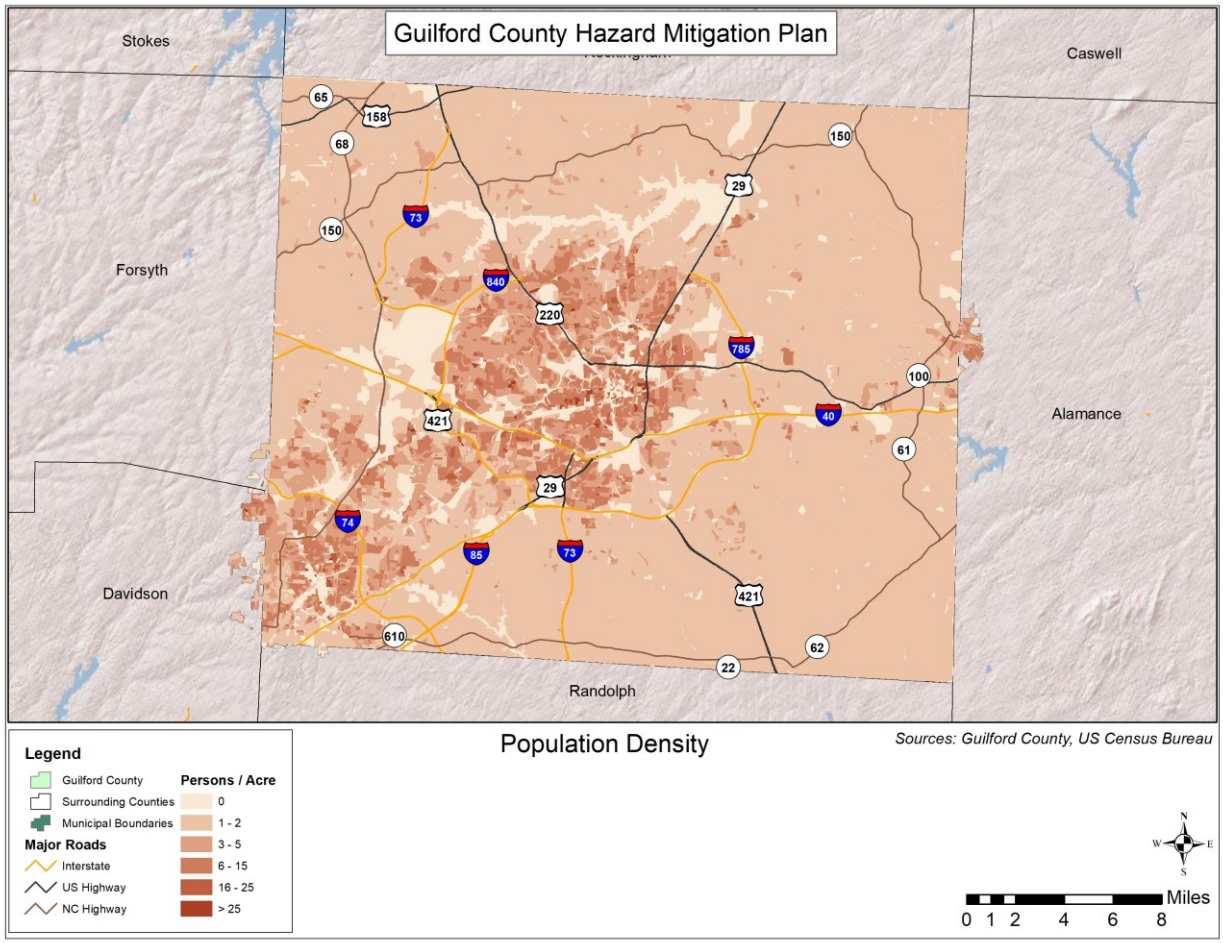
Location	Total 2010 Population
High Point*	104,371
Jamestown	3,382
Oak Ridge	6,185
Pleasant Garden	4,489
Sedalia	623
Stokesdale	5,047
Summerfield	10,232
Whitsett	590
Unincorporated Area	85,888
GUILFORD COUNTY TOTAL	**488,406**

*The population counts of Gibsonville and High Point include population residing in neighboring counties. Note: these populations are not included in the Guilford County total.

Source: United States Census 2010

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 GUILFORD COUNTY



Source: U.S. Census Bureau, 2010

6.4.3 Development Trends and Changes in Vulnerability

Since the previous hazard mitigation plan was approved in 2015, Guilford County has experienced moderate growth and development. **Table 6.4** shows the number of building units estimated in 2017 according to the American Community Survey (2017 was the latest year available from the ACS at the time of this planning process) and those constructed in 2014 or later.

TABLE 6.4: BUILDING COUNTS FOR GUILFORD COUNTY

Jurisdiction	Total Housing Units (2017)	Units Built 2014 or later	% Building Stock Built 2014 or later
Gibsonville*	2,684	91	3.4%
Greensboro	129,162	772	0.6%
High Point*	46,550	329	0.7%
Jamestown	1,609	6	0.4%
Oak Ridge	2,378	70	2.9%
Pleasant Garden	1,830	9	0.5%

Jurisdiction	Total Housing Units (2017)	Units Built 2014 or later	% Building Stock Built 2014 or later
Sedalia	276	0	0.0%
Stokesdale	1,952	77	3.9%
Summerfield	3,904	76	1.9%
Whitsett	421	15	3.6%
GUILFORD COUNTY TOTAL	**225,009**	**1,818**	**0.8%**

*The housing unit counts for Gibsonville and High Point include units located in neighboring counties. Note: These housing units are not included in the Guilford County total.
Source: United States Census Bureau

Table 6.5 shows population growth estimates for the county and municipalities from 2014 to 2017 based on the ACS 5-year estimates.

TABLE 6.5: POPULATION GROWTH FOR GUILFORD COUNTY

Jurisdiction	Population Estimates (as of July 1)				% Change 2014-2017
	2014	2015	2016	2017	
Gibsonville*	6,565	6,634	6,759	6,845	4.3%
Greensboro	276,225	279,427	282,177	284,816	3.1%
High Point*	106,797	108,031	108,982	109,849	2.9%
Jamestown	3,549	3,638	3,718	3,836	8.1%
Oak Ridge	6,435	6,513	6,617	6,728	4.6%
Pleasant Garden	4,585	4,632	4,684	4,762	3.9%
Sedalia	610	563	574	548	-10.2%
Stokesdale	5,177	5,221	5,278	5,331	3.0%
Summerfield	10,477	10,622	10,758	10,957	4.6%
Whitsett	770	756	809	973	26.4%
GUILFORD COUNTY TOTAL	**500,899**	**506,763**	**511,815**	**517,197**	**3.3%**

*The population counts for Gibsonville and High Point include populations residing in neighboring counties. Note: these populations are not included in the Guilford County total.
Note: ACS 5-year population estimates were used in this table to allow comparison of annual population counts (April 1 Census estimates were used for some other population counts throughout the plan which is why the counts may differ).
Source: United States Census Bureau, American Community Survey

Based on the data above, there has been a low to moderate rate of development in the county since 2013. In general, most communities experienced at least some growth, resulting in an increased number of structures that are vulnerable to the potential impacts of the identified hazards.

Additionally, 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. Sedalia and Whitsett experienced the lowest and highest rates of growth, respectively, compared to the rest of the county. However, the small size of both of these communities makes population estimates difficult, so these estimates should be taken with some caution.

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 identified high hazard areas.

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 (drought, extreme cold, extreme heat, hail, thunderstorm (lightning and high wind), tornado, winter storm, bioterrorism, public health/emerging disease, communications systems disruption/failure, and resource shortage,) or, due to lack of data, analysis would not lead to credible results (building/structure collapse, energy/power/utility failure, pipeline failure, transportation incident, civil disturbance, cyber-security threat and 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 6.15.**

The hazards presented in this subsection include: hurricane and tropical storm winds, earthquake, flood, hazardous materials incident, nuclear accident, transportation incident, and wildfire.

6.5.1 Hurricane and Tropical Storm

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 storm surge and is not capable of modeling and estimating cumulative losses from all hazards associated with hurricanes. Since Guilford County is not susceptible to storm surge, 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 4.2 SP2 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. Hazus-MH reports losses at the U.S. Census tract level, so determining participating jurisdiction losses was not possible.

TABLE 6.6: ANNUALIZED LOSS ESTIMATIONS FOR HURRICANE WIND HAZARD

Location	Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Guilford County	$3,174,000	$650,000	$12,000	$3,836,000

Source: Hazus-MH 4.2 SP2

In addition, probable peak wind speeds were calculated in Hazus. These are shown below in **Table 6.7.**

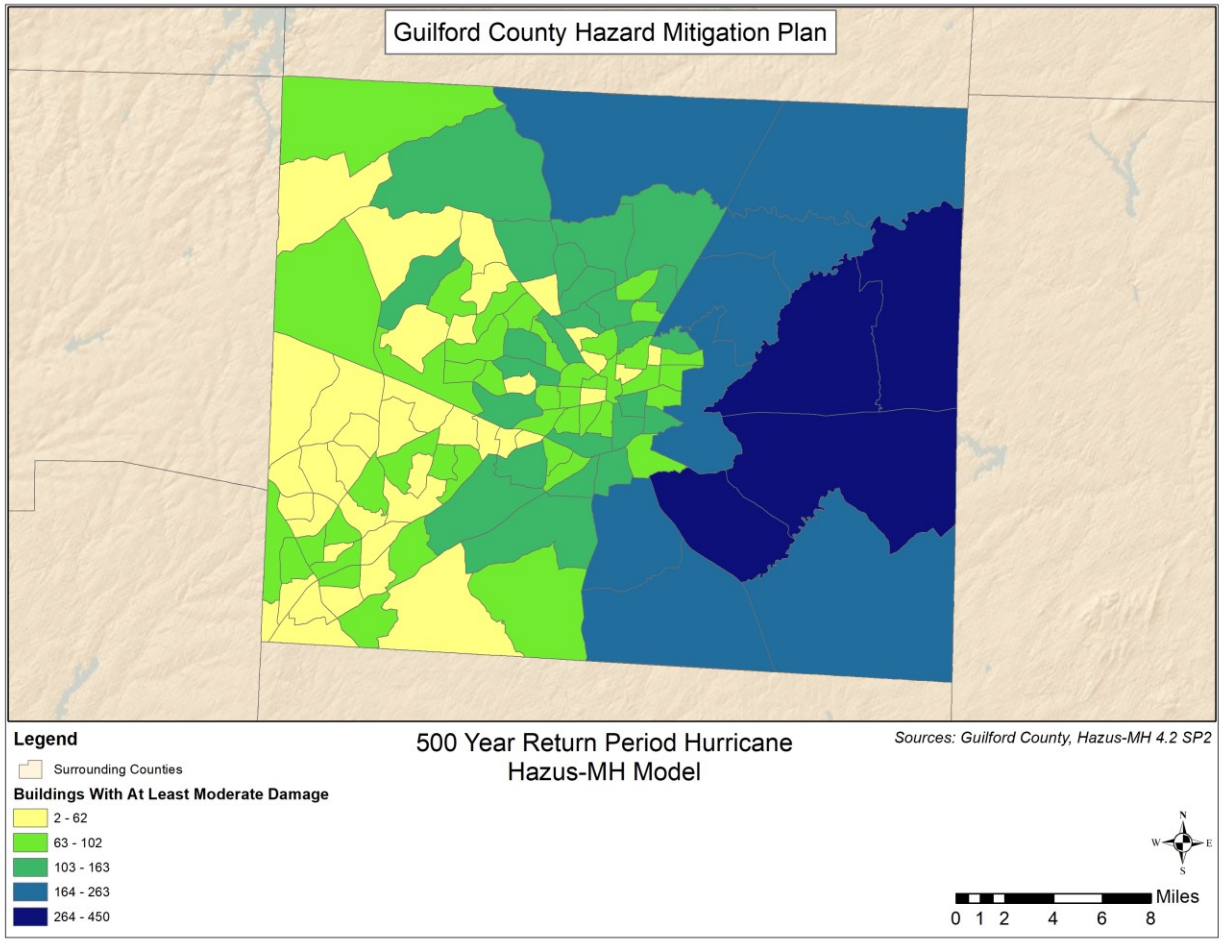
TABLE 6.7: PROBABLE PEAK HURRICANE/TROPICAL STORM WIND SPEEDS (MPH)

Location	50-year event	100-year event	500-year event	1,000-year event
Gibsonville	63.1	71.4	88.7	96.7
Greensboro	64.0	72.3	90.0	98.5
High Point	63.2	71.7	88.6	96.4
Jamestown	61.2	69.2	86.9	95.8
Oak Ridge	62.8	71.0	89.1	97.5
Pleasant Garden	61.4	69.3	87.7	96.3
Sedalia	61.7	69.7	87.3	96.7
Stokesdale	63.2	71.7	88.6	96.4
Summerfield	63.7	72.3	89.6	98.5
Whitsett	63.1	71.2	89.4	97.9
Unincorporated Area	64.5	73.0	89.5	98.1
MAXIMUM WIND SPEED REPORTED	**64.5**	**73.0**	**89.5**	**98.1**

Source: Hazus-MH 4.2 SP2

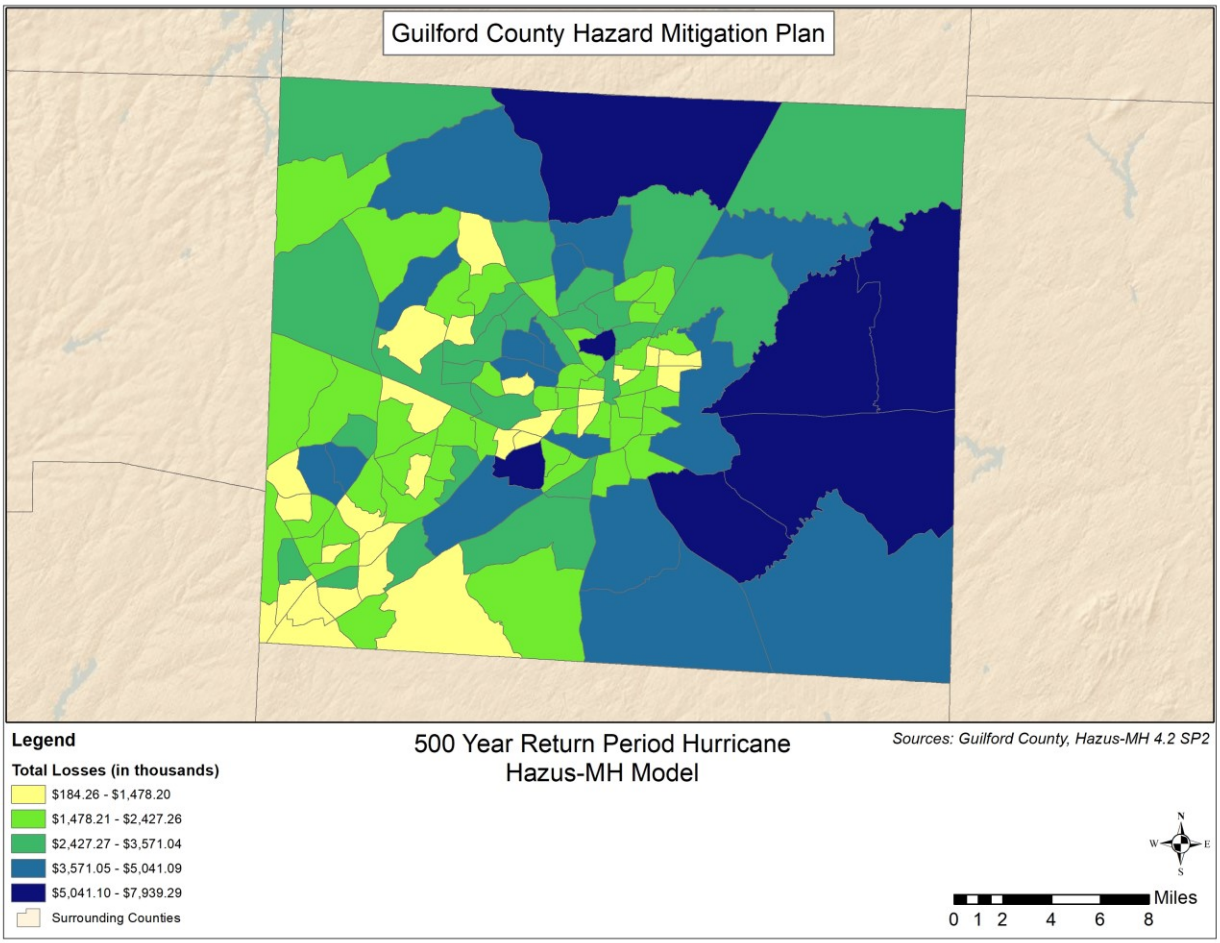
In addition, **Figure 6.4** and **Figure 6.5** show potential damage from a 500-year return period hurricane by census tract as estimated by a Hazus-MH model run.

FIGURE 6.4: ESTIMATED COUNT OF STRUCTURES SUSTAINING AT LEAST MODERATE DAMAGE IN A 500-YEAR RETURN PERIOD EVENT



Source: Hazus-MH 4.2 SP2

FIGURE 6.5: ESTIMATED TOTAL DOLLAR LOSSES IN A 500-YEAR RETURN PERIOD EVENT



Source: Hazus-MH 4.2 SP2

Social Vulnerability

Given equal susceptibility across Guilford County, it is assumed that the total population is at risk to the hurricane and tropical storm hazard.

Critical Facilities

Given equal vulnerability across Guilford 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 6.17** 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 Guilford 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. The results of the analysis reported at the U.S. Census tract level do not make it feasible to estimate losses at the jurisdiction level. 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 6.8** summarizes the findings.

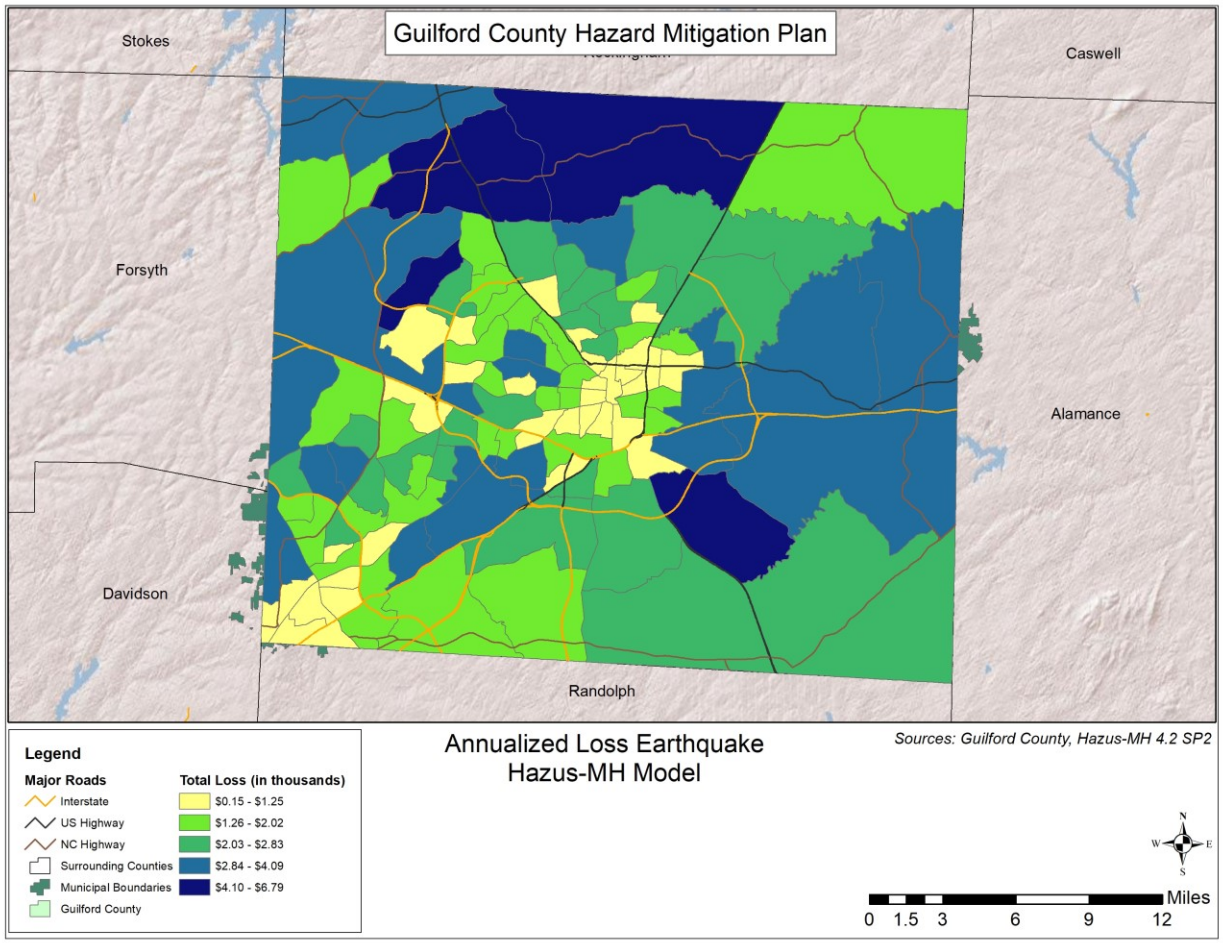
TABLE 6.8: ANNUALIZED LOSS ESTIMATIONS FOR EARTHQUAKE HAZARD

Location	Structural Building Loss	Non-Structural Building Loss	Contents Loss	Inventory Loss	Total Annualized Loss
Guilford County	$83,000	$335,000	$118,000	$5,000	$541,000

Source: Hazus-MH 4.2 SP2

In addition, **Figure 6.6** shows annualized loss estimates by census tract as calculated by a Hazus-MH model run.

FIGURE 6.6: ESTIMATED TOTAL ANNUALIZED DOLLAR LOSSES FROM EARTHQUAKES



Source: Hazus-MH 4.2 SP2

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 damage, should an event occur.

In conclusion, an earthquake has the potential to impact all existing and future buildings, facilities, and populations in Guilford County. Minor earthquakes may rattle dishes and cause minimal damage while stronger earthquakes will result in structural damage as indicated in the Hazus scenario above. 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. Such site-specific vulnerability determinations are outside the scope of this

assessment but will be considered during future plan updates if data/funding becomes available. Furthermore, mitigation actions to address earthquake vulnerability will be considered.

6.5.3 Flood

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 tax assessor records for each of the Guilford County municipalities. The determination of value at-risk (exposure) was calculated using GIS analysis by summing the building values for only those improved properties that were confirmed to be located within an identified floodplain. **Table 6.9** presents the potential at-risk property. Both the number of parcels/buildings and the approximate value are presented.

TABLE 6.9: ESTIMATED EXPOSURE OF PARCELS/BUILDINGS TO THE FLOOD HAZARD

Location	1.0-percent ACF			0.2-percent ACF		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[3]	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[4]
Gibsonville	2	3	$0	22	46	$1,987,500
Greensboro	960	1,261	$428,355,200	11	11	$3,599,300
High Point	621	659	$148,629,900	94	101	$12,749,000
Jamestown	22	17	$5,519,900	35	18	$10,512,000
Oak Ridge	9	14	$1,774,900	14	18	$3,581,500
Pleasant Garden	6	7	$444,500	4	6	$493,400
Sedalia	4	4	$320,400	0	0	$0
Stokesdale	3	6	$252,800	5	6	$639,800
Summerfield	1	2	$353,700	3	3	$499,400
Whitsett	0	0	$0	0	0	$0
Unincorporated Area	256	364	$26,526,300	209	248	$38,474,700
GUILFORD COUNTY TOTAL	**1,884**	**2,337**	**$612,177,600**	**397**	**457**	**$72,536,600**

Source: Federal Emergency Management Agency DFIRM

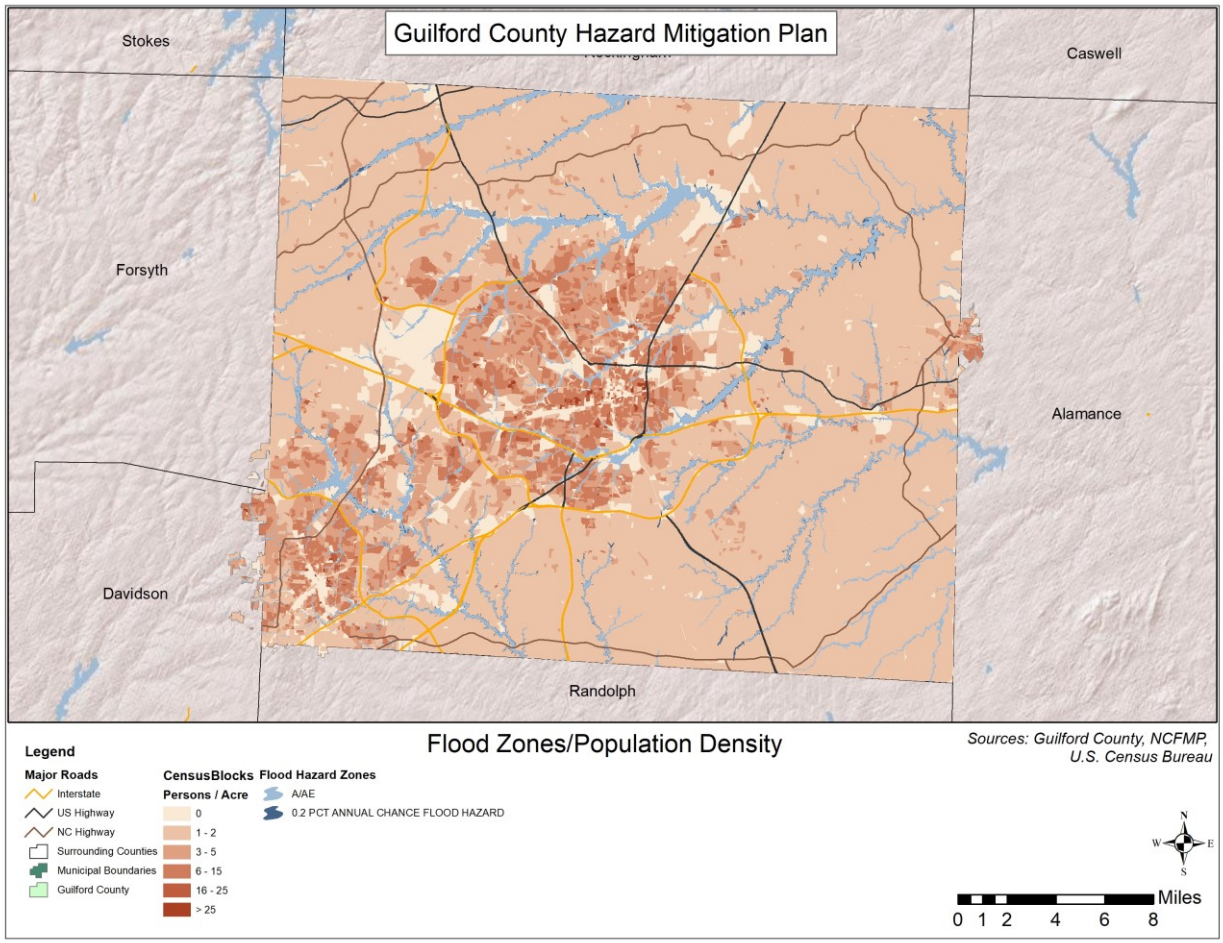
Social Vulnerability

U.S. Census 2010 population at the block level was used for analysis to determine where areas of high population concentration intersect with flood prone areas in the county. **Figure 6.7** is presented to gain a better understanding of the at-risk population.

[3] Improved value of buildings is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 1.0-percent annual chance floodplain, since building footprints were not associated with dollar value data.

[4] Improved value of buildings is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 0.2-percent annual chance floodplain, since building footprints were not associated with dollar value data. Buildings that were also counted as being located in the 1.0-percent annual chance floodplain were not counted as being in the 0.2-percent annual chance floodplain.

FIGURE 6.7 : POPULATION DENSITY NEAR FLOODPLAINS



Source: NCFMP, United States Census 2010

Critical Facilities

The critical facility analysis revealed that there are 7 critical facilities located in the either the 1.0-percent annual chance or 0.2 percent annual chance floodplain. Four of these facilities are water intake facilities, one is a fire station, one is a hospital, and one is a government office (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 6.17** at the end of this section.

In conclusion, a flood has the potential to impact many existing and future buildings, facilities, and populations in Guilford 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 1.0 percent and 0.2 percent annual chance FEMA regulated floodplain boundaries. It is certainly possible that more severe events could occur beyond these boundaries and urban flooding and stormwater issues can often impact additional structures. Such site-specific vulnerability determinations are outside the scope of this assessment but may be considered during future plan updates.

6.5.4 Hazardous Materials Incident

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. In a hazardous materials incident, solid, liquid, and/or gaseous contaminants may be released from fixed or mobile containers. Such events can cause multiple deaths, completely shut down facilities and cause affected properties to be destroyed or suffer major damage.

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 generally minimal to none.

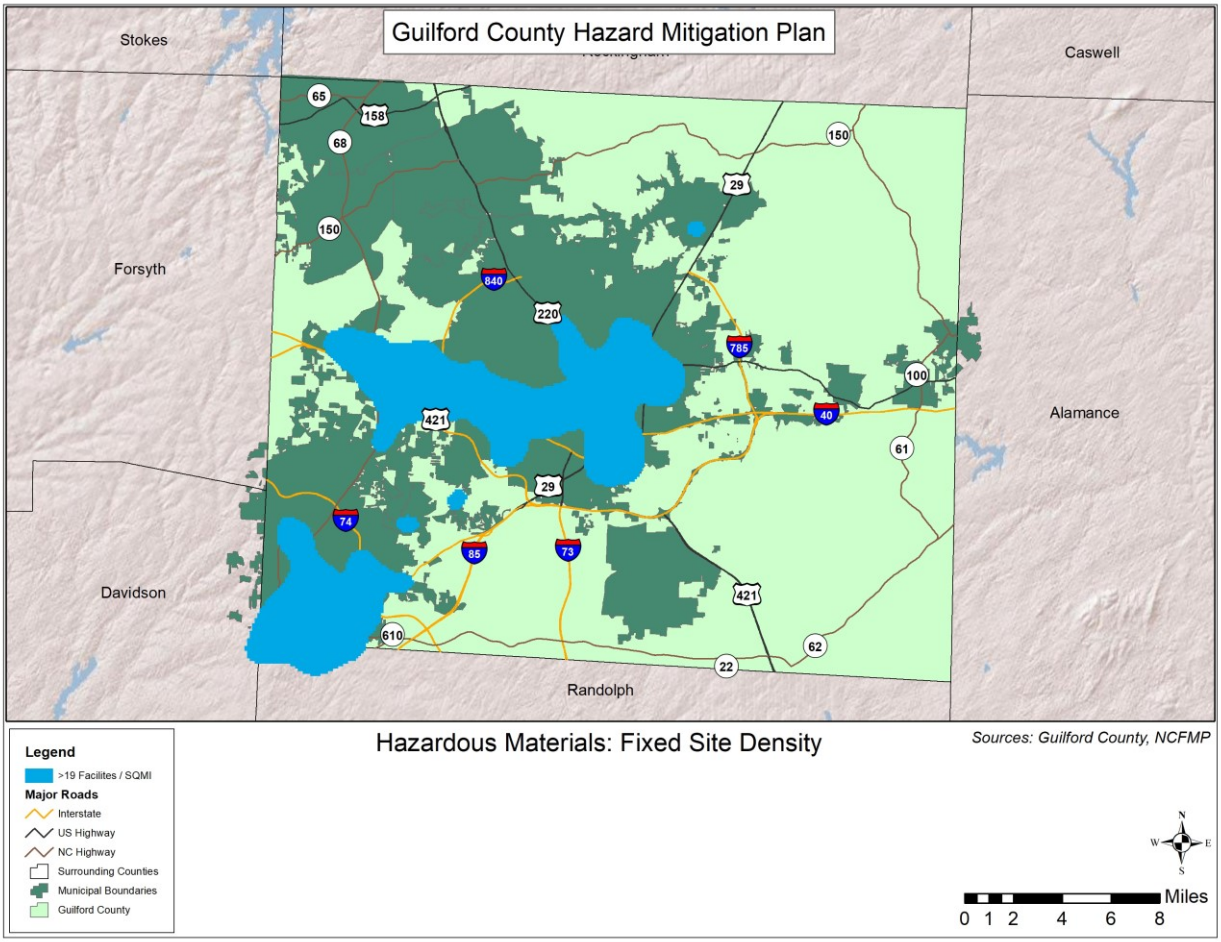
In order to conduct the vulnerability assessment for this hazard, GIS intersection analysis was used for fixed and mobile areas and building footprints/parcels.[5]

For the fixed analysis, a heat map showing the concentration of facilities per square mile was created to identify areas where the density of Facility Registry Service facilities was highest. The heat map was originally created as a raster and was converted to polygon to allow for overlay analysis with buildings and parcels. Areas where the density of facilities was higher than 19 facilities per square mile were used for analysis as shown in **Figure 6.8.** It should be noted that nearly all buildings are potentially at risk to a fixed site incident due to the prevalence of FRS facilities across the county.

For the mobile analysis, two sizes of buffers—0.5-mile and 1.0-mile—were used. These areas are assumed to represent the different levels of effect: immediate (primary) and secondary. Primary and secondary impact zones were selected using the PHMSA Emergency Response Guidebook to determine typical areas of risk for hazardous materials releases, but it should be noted that these areas may not be applicable for all hazardous materials incidents. Hazardous material-specific area analysis was not within the scope of this plan. Buffers of the major roads (Interstate highway, U.S. highway, and State highway) and railroads, where hazardous materials are primarily transported that could adversely impact people and buildings, were used for the GIS analysis. **Figure 6.9** and **Figure 6.10** 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 6.10** (fixed sites), **Table 6.11** (mobile road sites) and **Table 6.12** (mobile railroad sites).

[5] This type of analysis will likely yield inflated results (generally higher than what is actually reported after an actual event).

FIGURE 6.8: AREAS WHERE DENSITY OF FIXED FACILITY HAZARDOUS MATERIALS SITES IS GREATER THAN 19 FACILITIES/SQUARE MILE



Source: Environmental Protection Agency

TABLE 6.10: EXPOSURE OF IMPROVED PROPERTY TO FIXED SITES BASED ON DENSITY OF FRS FACILITIES (GREATER THAN 19 PER SQUARE MILE)

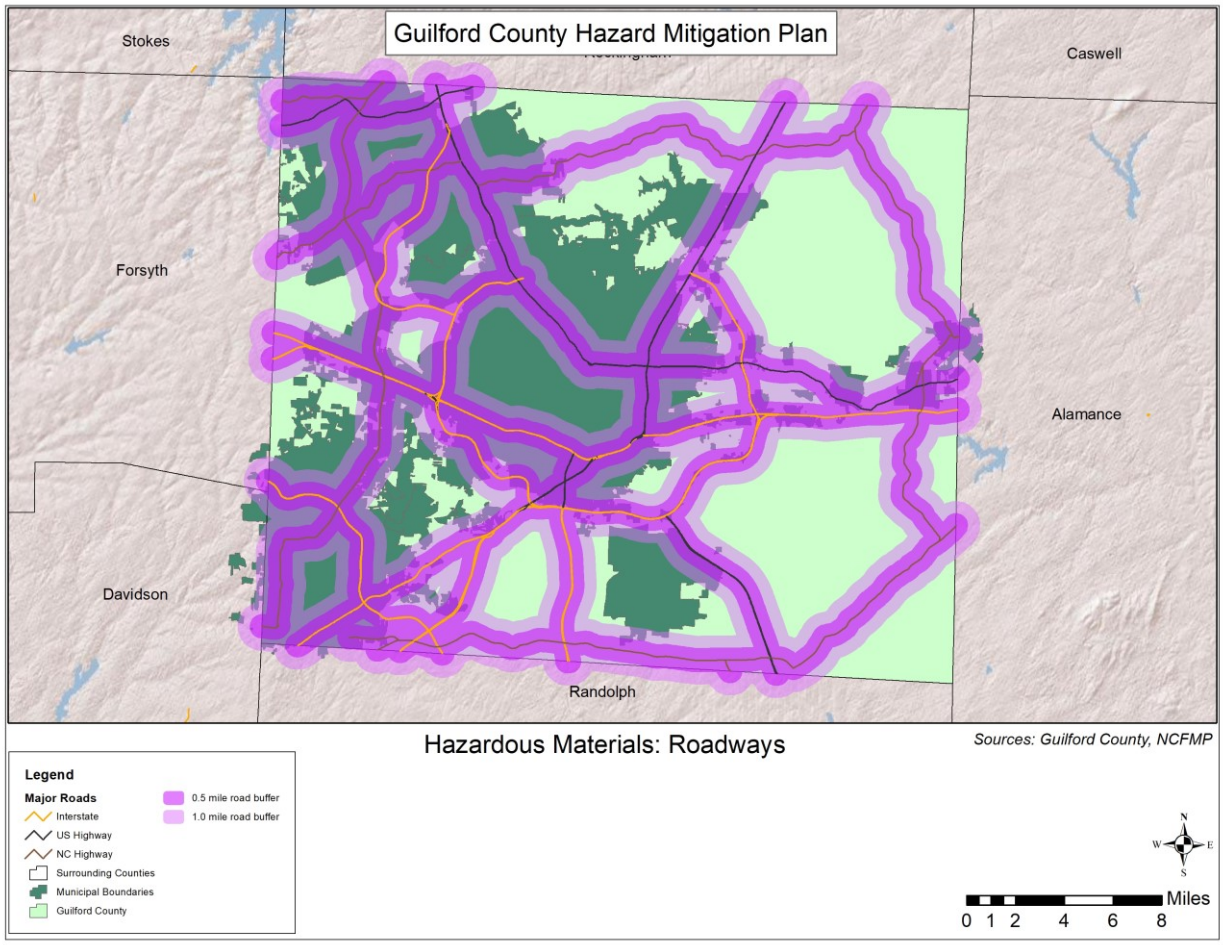
Location	Greater than 19 Facilities/SQMI		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[6]
Gibsonville	0	0	$0
Greensboro	31,685	44,583	$6,422,004,174
High Point	14,217	18,769	$2,362,202,705
Jamestown	241	219	$50,017,000
Oak Ridge	0	0	$0
Pleasant Garden	0	0	$0
Sedalia	0	0	$0

[6] Improved value of buildings is estimated based on the building value associated with parcels that have been identified as being located in the 50-mile buffer, since building footprints were not associated with dollar value data.

Location	Greater than 19 Facilities/SQMI		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[6]
Stokesdale	0	0	$0
Summerfield	0	0	$0
Whitsett	0	0	$0
Unincorporated Area	627	1,146	$77,551,200
GUILFORD COUNTY TOTAL	**46,770**	**64,717**	**$8,911,775,079**

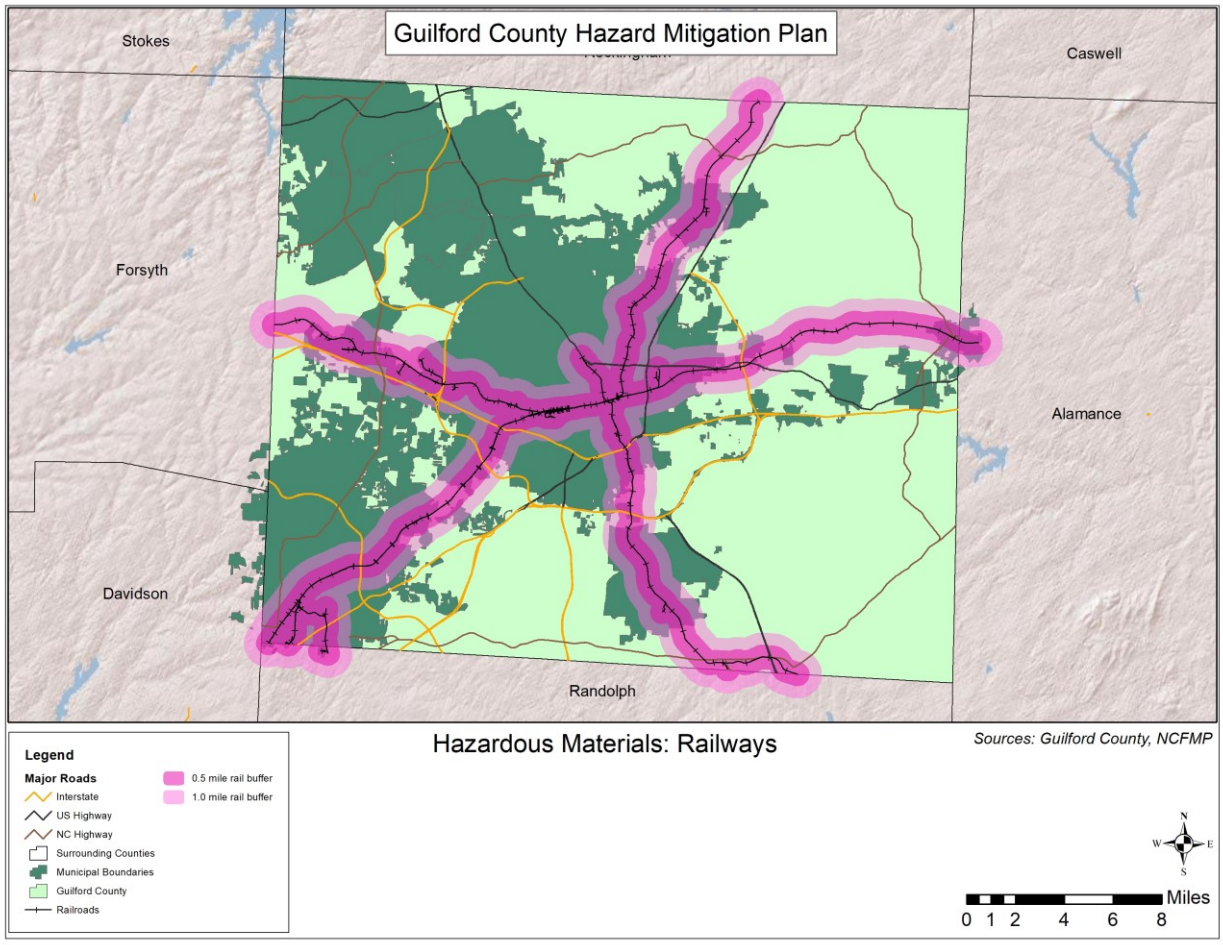
Source: Environmental Protection Agency

FIGURE 6.9: ROAD HAZMAT BUFFERS IN GUILFORD COUNTY



Source: NCDOT

FIGURE 6.10: RAIL HAZMAT BUFFERS IN GUILFORD COUNTY



Source: NCDOT, FRA

TABLE 6.11: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - ROAD)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[7]	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[8]
Gibsonville	1,317	1,819	$145,218,211	208	272	$20,375,439
Greensboro	29,506	39,914	$5,404,317,074	25,970	33,612	$4,299,925,700
High Point	14,644	18,170	$2,325,038,500	13,284	15,441	$1,638,092,340
Jamestown	0	0	$0	70	117	$29,022,600
Oak Ridge	1,534	2,462	$359,648,900	517	866	$120,292,600
Pleasant Garden	201	420	$24,153,800	346	620	$57,123,000

[7] Improved value is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 0.5-mile buffer, since building footprints were not associated with dollar value data.
[8] Improved value is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 1.0-mile buffer, since building footprints were not associated with dollar value data. Buildings that were also counted as being located in the 0.5-mile buffer were not counted as being in the 1.0-mile buffer.

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[7]	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[8]
Sedalia	137	244	$15,155,000	159	252	$13,849,500
Stokesdale	1,673	3,094	$251,149,700	449	809	$85,284,500
Summerfield	1,853	3,286	$448,105,000	1,143	1,743	$290,770,200
Whitsett	248	634	$25,533,000	60	139	$5,409,500
Unincorporated Area	14,468	29,408	$1,776,107,220	9,712	18,552	$1,353,485,734
GUILFORD COUNTY TOTAL	**65,581**	**99,451**	**$10,774,426,405**	**51,918**	**72,423**	**$7,913,631,113**

TABLE 6.12: EXPOSURE OF IMPROVED PROPERTY TO HAZARDOUS MATERIALS SPILL (MOBILE ANALYSIS - RAILROAD)

Location	0.5-mile buffer			1.0-mile buffer		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[9]	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value[10]
Gibsonville	948	1,355	$89,410,103	236	347	$23,674,147
Greensboro	22,181	31,928	$4,677,007,362	20,305	26,573	$3,526,300,188
High Point	7,544	9,612	$1,268,061,475	6,203	8,056	$748,648,910
Jamestown	752	864	$158,289,600	584	681	$135,376,100
Oak Ridge	0	0	$0	0	0	$0
Pleasant Garden	632	1,416	$84,906,900	517	1,167	$55,303,700
Sedalia	0	0	$0	0	0	$0
Stokesdale	0	0	$0	0	0	$0
Summerfield	0	0	$0	0	0	$0
Whitsett	0	0	$0	16	20	$3,124,900
Unincorporated Area	2,763	6,126	$334,090,380	3,092	6,887	$496,163,980
GUILFORD COUNTY TOTAL	**34,820**	**51,301**	**$6,611,765,820**	**30,953**	**43,731**	**$4,988,591,925**

Social Vulnerability

Given high susceptibility across Guilford 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 FRS sites revealed that there are 180 facilities located in a HAZMAT risk zone. This includes nearly every type of facility analyzed in this assessment. A list of specific critical facilities and their associated risk can be found in **Table 6.17** at the end of this section.

[9] Improved value is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 0.5-mile buffer, since building footprints were not associated with dollar value data.

[10] Improved value is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in the 1.0-mile buffer, since building footprints were not associated with dollar value data. Buildings that were also counted as being located in the 0.5-mile buffer were not counted as being in the 1.0-mile buffer.

Mobile Analysis:
The critical facility analysis for road and railroad transportation corridors revealed that there are 290 critical facilities located in the primary and secondary mobile HAZMAT buffer areas for roads and 237 critical facilities located in the railroad HAZMAT buffer areas.

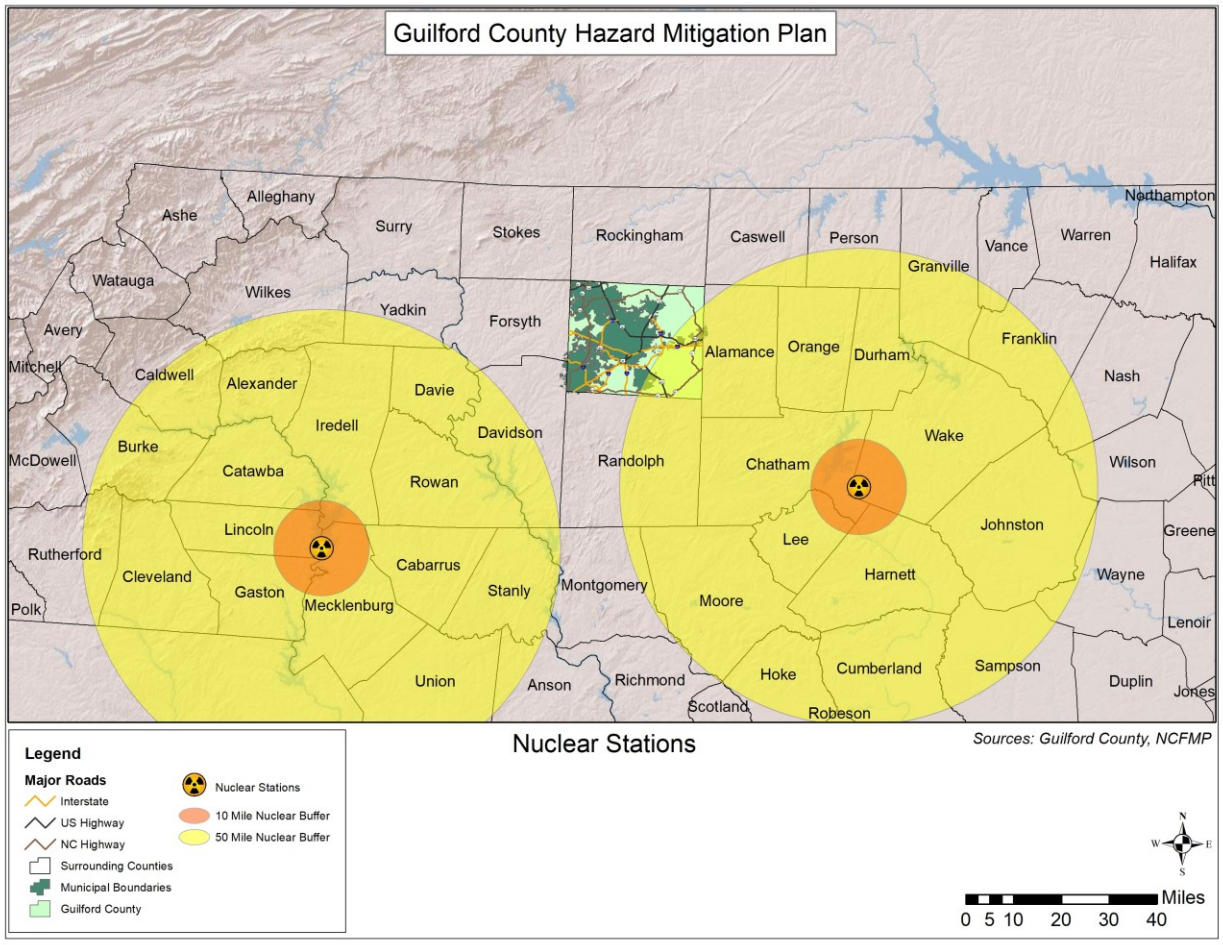
It should be noted that many of the facilities located in the buffer areas for railroad are also located in the buffer areas for road and/or the fixed site analysis. A list of specific critical facilities and their associated risk can be found in **Table 6.17** at the end of this section.

In conclusion, a hazardous material incident has the potential to impact many existing and future buildings, critical facilities, and populations in Guilford 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

In order to assess fixed 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 building values for only those improved properties that were confirmed to be located within one of the risk zones. There are no properties in Guilford County located within the 10-mile risk zone, so **Table 6.13** only presents potential at-risk properties in the 50-mile zone. Both the number of parcels/buildings and the approximate value are presented. **Figure 6.11** shows the 10-mile and 50-mile zones for Shearon-Harris and McGuire.

FIGURE 6.11: NUCLEAR STATIONS WITH RISK ZONES



Source: International Atomic Energy Agency

TABLE 6.13: ESTIMATED EXPOSURE OF PARCELS/BUILDINGS TO A NUCLEAR ACCIDENT

Location	50-mile buffer		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[11]
Gibsonville	1,520	2,091	$165,094,850
Greensboro	120	157	$43,531,900
High Point	0	0	$0
Jamestown	0	0	$0
Oak Ridge	0	0	$0
Pleasant Garden	485	1,032	$54,680,600
Sedalia	329	547	$32,512,000
Stokesdale	0	0	$0
Summerfield	0	0	$0
Whitsett	329	815	$33,287,900

[11] Improved value of buildings is estimated based on the building value associated with parcels that have been identified as being located in the 50-mile buffer, since building footprints were not associated with dollar value data.

Location	50-mile buffer		
	Approx. Number of Parcels	Approx. Number Buildings	Approx. Improved Value of Buildings[11]
Unincorporated Area	11,173	23,445	$1,386,410,376
GUILFORD COUNTY TOTAL	**13,956**	**28,087**	**$1,715,517,626**

Source: International Atomic Energy Agency

Social Vulnerability

Since areas in the southeast part of the county are within the 50-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 there are a total of 33 critical facilities located in the 50-mile nuclear buffer area. There were no facilities identified within the 10-mile area. A list of specific critical facilities and their associated risk can be found in **Table 6.17** at the end of this section.

In conclusion, a nuclear accident has the potential to impact some existing and future buildings, facilities, and populations in the Guilford County, and areas in the southeast of the county are at a higher risk than others.

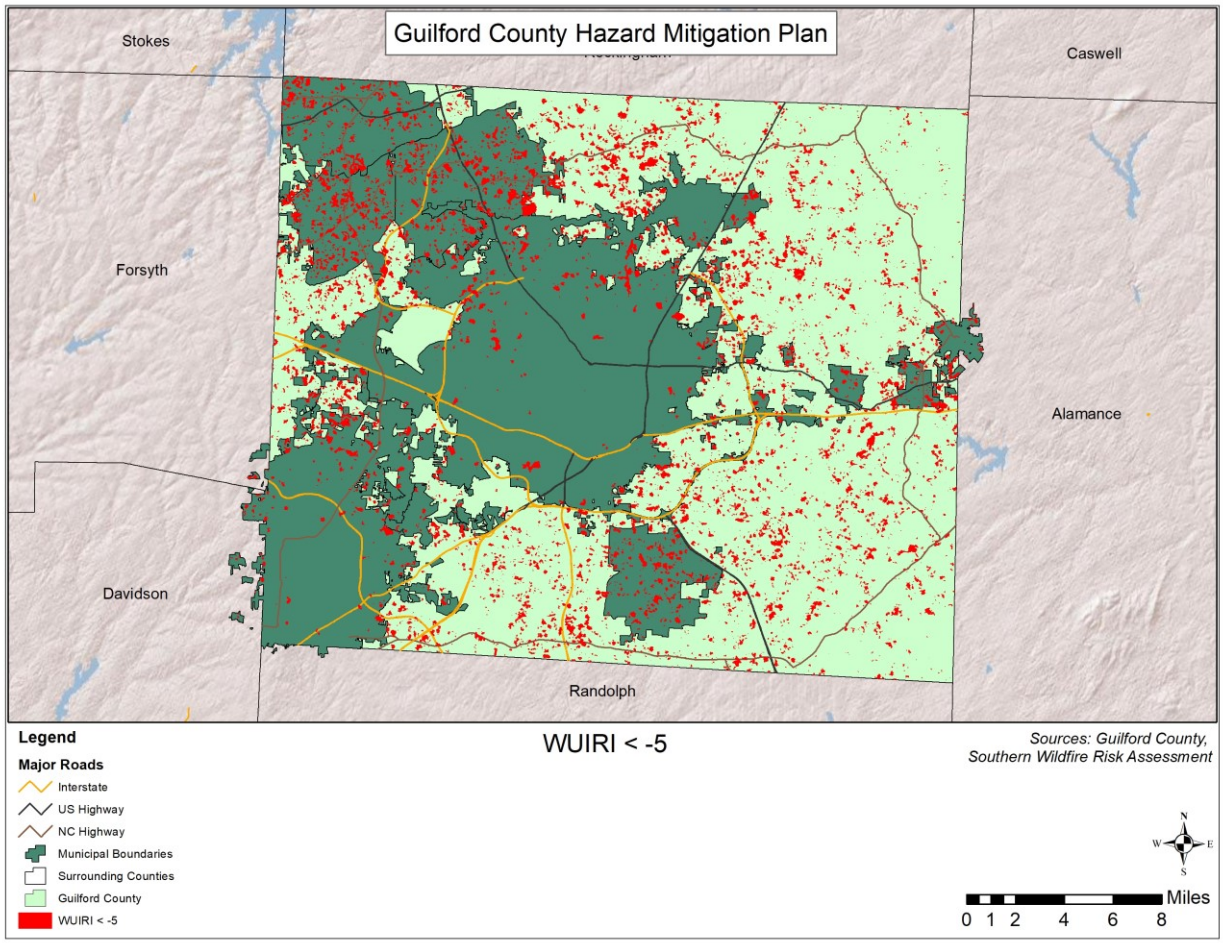
6.5.6 Fire/Wildfire

To estimate exposure to wildfire, the approximate number of buildings/parcels and their associated improved value was determined using GIS analysis. The Wildland Urban Interface Risk Index (WUIRI) data 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 is key information for defining potential wildfire impacts to people and homes. Initially provided as raster data, the WUIRI 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 6.12** 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 6.14 shows the results of the analysis.

FIGURE 6.12: WUI RISK INDEX AREAS LESS THAN -5 IN GUILFORD COUNTY



Source: Southern Wildfire Risk Assessment

TABLE 6.14: EXPOSURE OF IMPROVED PROPERTY TO WILDFIRE RISK AREAS

	HIGH WILDFIRE RISK AREA		
Location	**Approx. Number of Parcels**	**Approx. Number of Buildings**	**Approx. Improved Value[12]**
Gibsonville	105	153	$12,146,400
Greensboro	3,764	3,425	$845,151,300
High Point	1,358	1,273	$340,054,450
Jamestown	63	37	$22,416,500
Oak Ridge	835	1,168	$196,996,800
Pleasant Garden	379	659	$57,813,300
Sedalia	47	67	$4,902,700
Stokesdale	674	989	$118,653,100
Summerfield	1,152	1,588	$265,452,300
Whitsett	85	157	$9,299,800

[12] Improved value of buildings is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in wildfire risk zone, since building footprints were not associated with dollar value data.

	HIGH WILDFIRE RISK AREA		
Location	Approx. Number of Parcels	Approx. Number of Buildings	Approx. Improved Value[12]
Unincorporated Area	7,524	12,173	$1,105,449,530
GUILFORD COUNTY TOTAL	**15,986**	**21,689**	**$2,978,336,180**

Source: Southern Wildfire Risk Assessment

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. It is assumed that the total population is at low to moderate risk to the wildfire hazard. Populations residing along the wildland urban interface are likely at highest risk. Determining the exact number of people in wildfire risk areas is difficult with existing data and could be misleading.

Critical Facilities

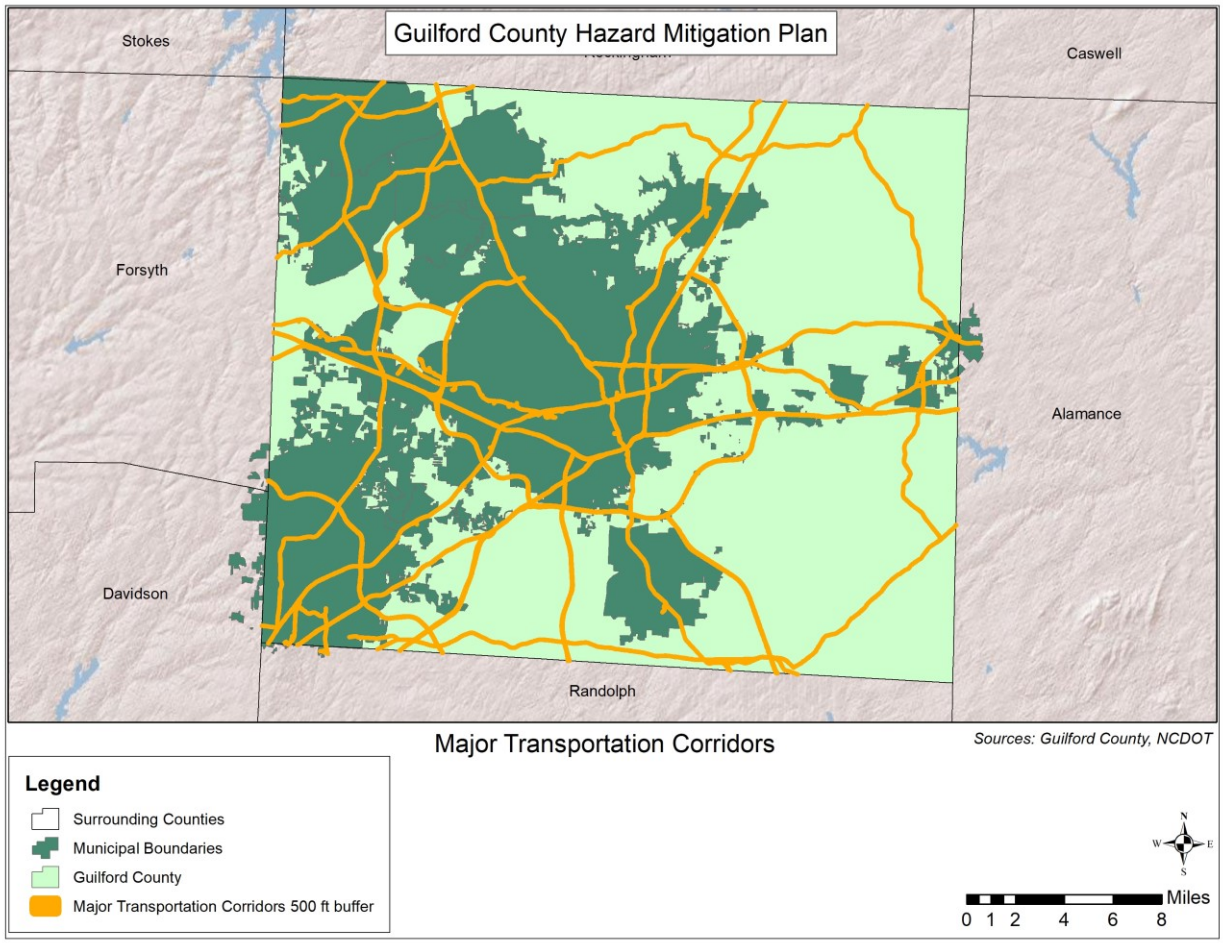
The critical facility analysis revealed that there are 21 critical facilities located in the wildfire risk area (areas where the WUIRI is less than -5). However, it should also be noted that several factors could impact the spread of a wildfire putting all facilities at some risk. A list of specific critical facilities and their associated risk can be found in **Table 6.17** 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 Guilford County, especially those located in non-urbanized areas of the county and in the wildland urban interface.

6.5.7 Transportation Incident

To estimate exposure to transportation incidents, major roadways and railways were identified and it was assumed that these incidents would impact a relatively narrow area along these corridors. A buffer of 500 feet was used to determine which buildings and parcels may be impacted along these corridors in the event of a major transportation incident. **Figure 6.13** shows the areas of analysis within 500 feet of a major roadway or railway in the county. **Table 6.15** shows the results of the analysis.

FIGURE 6.13: TRANSPORTATION INCIDENT 500 FEET BUFFER IN GUILFORD COUNTY



Source: NCDOT

TABLE 6.15: EXPOSURE OF IMPROVED PROPERTY TO TRANSPORTATION INCIDENT AREAS

	TRANSPORTATION INCIDENT AREAS		
Location	**Approx. Number of Parcels**	**Approx. Number of Buildings**	**Approx. Improved Value[13]**
Gibsonville	499	728	$60,000,415
Greensboro	7,469	10,264	$2,630,732,674
High Point	3,024	3,656	$804,923,510
Jamestown	85	110	$22,415,400
Oak Ridge	404	733	$90,643,500
Pleasant Garden	159	336	$23,916,700
Sedalia	69	123	$9,190,000
Stokesdale	631	1,219	$81,836,100
Summerfield	497	1,044	$78,548,800
Whitsett	142	376	$14,893,300

[13] Improved value of buildings is estimated based on the building value associated with parcels that contain buildings that have been identified as being located in wildfire risk zone, since building footprints were not associated with dollar value data.

	TRANSPORTATION INCIDENT AREAS		
Location	Approx. Number of Parcels	Approx. Number of Buildings	Approx. Improved Value[13]
Unincorporated Area	3,759	8,005	$521,347,290
GUILFORD COUNTY TOTAL	**16,738**	**26,594**	**$4,338,447,689**

Source: NCDOT

Social Vulnerability

Although not all areas have equal vulnerability, there is some susceptibility across the entire county. It is assumed that while the short term impacts of a transportation incident may be severe on those involved, the long term impacts to the population at-large would be relatively small and normal conditions would be returned quickly.

Critical Facilities

The critical facility analysis revealed that there are 98 critical facilities located in the transportation incident risk area. Any facility located near a transportation corridor is at some risk to impacts from a transportation incident. A list of specific critical facilities and their associated risk can be found in **Table 6.17** at the end of this section.

In conclusion, a transportation incident has the potential to impact some existing and future buildings, critical facilities, and populations in Guilford 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 Guilford 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 Guilford 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 Guilford 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 Guilford County and its municipalities.

Exposure to hazards can be an indicator of vulnerability. Economic exposure can be identified through building values 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 some commercial and residential owned structures are at risk to repetitive flooding, etc).

Table 6.16 presents a summary of annualized loss for each hazard in Guilford County. Due to the reporting of hazard damages primarily at the county level, it was difficult to determine an accurate annualized loss estimate for each municipality. Therefore, an annualized loss was determined using the damage reported from historical occurrences at the county level to the built environment. It does not take into consideration other types of damages, such as those to crops or vehicles. It should also be noted that many of these values have been collected from sources that may not account for all damages caused by a particular hazard and therefore, these values often underestimate loss. However, the annualized loss values are included as they may be used as an additional planning tool to evaluate risk and understand a baseline of expected losses.

TABLE 6.16: ANNUALIZED LOSS TO THE BUILT ENVIRONMENT FOR GUILFORD COUNTY*

Event	Guilford County
Natural Hazards	
Drought	$0
Earthquake	$83,000
Extreme Cold	$0
Extreme Heat	$0
Fire/Wildfire	*No Data*
Flooding	$847,555
Hail	$39
Hurricane/Tropical Disturbance	$3,174,000
Thunderstorm (Wind/Lightning)	$221,259
Tornado	$67,895,161
Winter Storm	$409,030
Biological Hazards	
Bioterrorism	*No Data*
Public Health/Emerging Disease	*No Data*
Technological Hazards	
Building/Structure Collapse	*No Data*
Communications Systems Failure	*No Data*
Energy/Power/Utility Failure	*No Data*
HAZMAT Incident	$15,360
Nuclear Power Plant Emergency	*No Data*
Pipeline Failure	*No Data*

Event	Guilford County
Resource Shortage (Fuel/Water)	*No Data*
Transportation Incident	*No Data*
Man-Made/Intentional Hazards	
Civil Disturbance	*No Data*
Cyber-Security Threat	*No Data*
Terrorism	*No Data*

*In this table, the term "No Data" is used to indicate that no historic property damage or other mechanism for estimating annualized risk to the built environment was available for the particular hazard. This is generally 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 cold, extreme heat, hail, hurricane and tropical disturbance, lightning, thunderstorm wind, tornado, and winter storm. All existing and future buildings are also vulnerable to many of the biological, technological, and man-made hazards including bioterrorism, public health/emerging disease, building/structure collapse, communications systems disruption/failure, energy/power/utility failure, pipeline failure, resource shortage, civil disturbance, cyber-security threat, and terrorism. Some buildings may be more vulnerable to these hazards based on locations, construction, and building type, but that level of analysis was outside the scope of this plan. **Table 6.17** shows the critical facilities vulnerable to additional 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 6.17: AT-RISK CRITICAL FACILITIES IN GUILFORD COUNTY

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
GIBSONVILLE																																
Gibsonville Elementary School / 401 E JOYNER ST	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
STA #6 / 218 Piedmont Ave	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Gibsonville Community Center/Rec Dept / 314 Tenth St	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
GIBSONVILLE TOWN HALL / 129 WEST MAIN ST	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Gibsonville Police HQ / 129 W Main St	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Broad Street Sewage Pump Station / 708 Broad St.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
Scott Drive Sewage Pump Station / 616 SCOTT DR	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X			X	X	X		X	X	X
Sullivan Court Sewage Pump Station / 213 SULLIVAN CT	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X			X	X	X		X	X	X
GREENSBORO																																
Doris Henderson Newcomers School Alternative School / 411 FRIENDWAY RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Gateway Education Center Alternative School / 3205 E WENDOVER AV	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Herbin-Metz Ed Center Alternative School / 400 O'FERRELL ST	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
High School Ahead Academy Alternative School / 329 COLLEGE RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
McIver Education Center Alternative School / 1401 SUMMIT AV	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X
SCALE - Greensboro Alternative School / 116 PISGAH CHURCH RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X					X		X	X	X		X	X	X
Twilight School Alternative School / 116 PISGAH CHURCH RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X					X		X	X	X		X	X	X
Justice Tower / 1201 Coliseum Blvd.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
McLeansville Tower / 900 Knox Rd.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X				X	X	X	X		X	X	X
Meadowood Tower / 1002 Meadowood St.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
NC A&T University VIPER Tower / 1201 Sullivan St.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Time Warner Tower / 1813 Spring Garden St.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Alderman Elementary School / 4211 CHATEAU DR	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
Archer Elementary School / 2610 FOUR SEASON BLVD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Bessemer Elementary School / 918 HUFFINE MILL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
Bluford Elementary School / 1901 TUSCALOOSA ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
B'nai Shalom Day School Elementary School / 804-A WINVIEW DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Brightwood Elementary School / 2001 BRIGHTWOOD SCHOOL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X			X	X	X		X	X	X
Brooks Global Studies Elementary School / 1215 WESTOVER TR	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
Caldwell Academy Elementary School / 2900 HORSE PEN CREEK RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
Canterbury School Elementary School / 5400 OLD LAKE JEANETTE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Claxton Elementary School / 3720 PINETOP RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Colfax Elementary School / 9112 W MARKET ST	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
Cone Elementary School / 2501 N CHURCH ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Cornerstone Charter Academy Elementary School / 2535 NEW GARDEN EAST RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Erwin Montessori Elementary School / 3012 E BESSEMER AV	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
Falkener Elementary School / 3931 NACO RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
Foust Elementary School / 2610 FLOYD ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X					X	X	X		X	X	X
Frazier Elementary School / 4215 GATWAY DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
General Greene Elementary School / 1501 BENJAMIN PKW	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X					X	X	X		X	X	X
Gillespie Park Elementary School / 1900 MARTIN LUTHER KING BLVD	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
Greensboro Academy Elementary School / 4049 BATTLEGROUND AVE	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Greensboro Day School Elementary School / 5401 LAWNDALE DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Greensboro Islamic Academy Elementary School / 2023 16TH ST	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
Greensboro Montessori School Elementary School / 2856 HORSE PEN CREEK RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Guilford Elementary School / 920 STAGE COACH TL	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Guilford Preparatory Academy Elementary School / 2210 E CONE BLVD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Hampton Academy Elementary School / 2301 TRADE ST	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
Hunter Elementary School / 1305 MERRITT DR	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
Irving Park Elementary School / 1310 SUNSET DR	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
Jefferson Elementary School / 1400 NEW GARDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Jesse Wharton Elementary School / 5813 LAKE BRANDT RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Jones Elementary School / 502 SOUTH ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

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Joyner Elementary School / 3300 NORMANDY RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Lindley Elementary School / 2700 CAMDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X		X	X	X		X	X	X
Morehead Elementary School / 4630 TOWER RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Murphey Traditional Academy Elementary School / 2306 ONTARIO ST	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
Napoleon B. Smith School / 1802 E Market St	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X		X	X	X		X	X	X
New Garden Friends School Elementary School / 1128 NEW GARDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Next Generation Academy / 1414 Cliffwood Rd.	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Noble Academy Elementary School / 3310 HORSE PEN CREEK RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Our Lady of Grace Catholic Sch Elementary School / 201 S CHAPMAN ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X		X	X	X		X	X	X
Pearce Elementary School / 2006 PLEASANT RIDGE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Peck Elementary School / 1601 W FLORIDA ST	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

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Peeler Open Elementary School / 2200 RANDALL ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Pilot Elementary School / 4701 CHIMNEY SPRING DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
Rankin Elementary School / 3301 SUMMIT AV	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X		X		X	X	X		X	X	X
Reedy Fork Elementary School / 4571 REEDY FORK PKY	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Ronald McNair Elementary School / 4603 YANCEYVILLE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Sedgefield Elementary School / 2905 GROOMETOWN RD	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
Simkins Elementary School / 3511 E LEE ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
St Pius X Catholic School Elementary School / 2200 N ELM ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Sternberger Elementary School / 518 N HOLDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Triad Math & Science Academy Elementary School / 700 CREEK RIDGE RD	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
Vandalia Elementary School / 407 E VANDALIA RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

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Washington Montessori Elementary School / 1110 E WASHINGTON ST	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
Wiley Elementary School / 600 W TERRELL ST	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
EMS Base 1 / 1339 Headquarters Dr	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
EMS Base 3 / 1002 Meadowood St	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
EMS Base 4 / 2206 Fernwood Dr	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X
EMS Base 6 / 300 Concord┬á St	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
PTAR 10 / 600 Huffine Mill Rd	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
STA #1 / 5107 N Church St	Fire Station	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
STA #10 / 4208 High Point Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X
STA #11 / 2602 S Elm-Eugene St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
STA #14 / 3633 Summit Ave	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X			X	X	X		X	X	X
STA #17 / 6405 Old Oak Ridge Rd	Fire Station	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #18 / 5903 Ballinger Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #19 / 6900 Downwind Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
STA #2 / 5107 N Church St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #20 / 8404 W Market St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
STA #21 / 2870 Horse Pen Creek Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #23 / 5107 Mackay Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X			X	X	X	X	X	X	X
STA #4 / 401 Gorrell St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
STA #40 / 1805 Pisgah Church Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #41 / 4212 Lake Brandt Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #43 / 4854 Lake Jeanette Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #48 / 1400 W Vandalia Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #49 / 4302 W Friendly Ave	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #5 / 1401 Westover Ter	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
STA #52 / 1000 Meadowood Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
STA #53 / 2013 Willow Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #56 / 820 Franklin Blvd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #57 / 1539 Mt Hope Curch Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #59 / 3803 Reedy Fork PW	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X		X	X	X	X	X	X	X
STA #61 / 105 W Vandalia Rd	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 / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
STA #63 (Under Construction) / 4302 Burlington Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
STA #7 / 1064 Gatewood Ave	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
STA #8 / 2201 Coliseum Blvd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X
BB&T Building (Guilford County Information Services) / 201 W. Market St.	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
City Of Greensboro City Coordination Center(Public Safety Training Facility) / 1510 N. Church St.	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
County Courts Building - Greensboro / 201 S. Eugene St.	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
GREENSBORO CITY HALL / 300 WEST WASHINGTON ST	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Greensboro City Services Center (Greensborto City Field Operations) / 401 Patton Ave.	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
Guilford County Agricultural Center (Guilford Co. Cooperative Extension) / 3309 Burlington Rd.	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
Guilford County EMS Maintenance Shop / 1321 N O'Henry Blvd	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Guilford County Juvenile Detention Center / 15 Lockheed Court	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X				X	X	X		X	X	X
GUILFORD COUNTY OLD COURT HOUSE / 221 W MARKET ST	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Guilford County Sheriff'S Office - Special Operations Office / 2814 Firestone Dr.	Government Offices	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X		X				X	X	X		X	X	X
INDEPENDENCE CENTER / 400 W MARKET ST	Government Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Ecoflo / 2750 Patterson St.	Hazardous Waste Management Facility	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X				X	X	X	X	X	X	X
Academy at Smith High School / 2225 S HOLDEN RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X	X		X	X	X
American Hebrew Academy High School / 4334 HOBBS RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X	X		X	X	X
Caldwell Academy High School / 2900 HORSE PEN CREEK RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X		X	X	X
Cornerstone Charter Academy High School / 2535 NEW GARDEN EAST RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X	X		X	X	X
Dudley High School / 1200 LINCOLN ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X			X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Early College at Guilford High School / 5608 W FRIENDLY AV	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Greensboro Day School High School / 5401 LAWNDALE DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Greensboro Middle College High School / 815 W MARKET ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
Grimsley High School / 801 WESTOVER TR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
GTCC Middle College-Greensboro High School / 3505 E WENDOVER AV	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Mell Burton School / 1601 Huffine Mill Rd.	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X		X		X	X	X		X	X	X
Middle College at Bennett High School / 722 GORRELL ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
Middle College at NC A&T High School / 1601 E MARKET ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Middle College at UNCG High School / 1408 WALKER AV	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
New Garden Frieds School Upper School-Page-Frederiksen Campus / 2015 Pleasant Ridge Rd.	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
New Garden Friends School High School / 1128 NEW GARDEN RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Noble Academy High School / 3310 HORSE PEN CREEK RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Page High School / 201 ALMA PINNIX DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X		X	X	X		X	X	X
Piedmont Classical High School High School / 1401 LEES CHAPEL RD	High School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X					X		X	X	X		X	X	X
Smith High School / 2407 S HOLDEN RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STEM Early College at NC A&T High School / 402 LAUREL ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X
Triad Math & Science Academy High School / 700 CREEK RIDGE RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X
Weaver Academy High School / 300 S SPRING ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
Western High School / 409 FRIENDWAY RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Kindred Hospital / 2401 S. Side Blvd.	Hospital	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X
MOSES CONE BEHAVIORAL HEALTH SYSTEM / 700 WALTER REED DR	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
MOSES H CONE MEMORIAL HOSPITAL / 1200 N ELM ST	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
WESLEY LONG COMMUNITY HOSPITAL / 501 N ELAM AV	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X
WOMEN'S HOSPITAL OF GREENSBORO / 801 GREEN VALLEY RD	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Academy at Lincoln Middle School / 1016 LINCOLN ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X		X	X	X	X	X	X	X
Allen Middle School / 1108 GLENDALE DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
B'nai Shalom Day School Middle School / 804-A WINVIEW DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Caldwell Academy Middle School / 2900 HORSE PEN CREEK RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Canterbury School Middle School / 5400 OLD LAKE JEANETTE RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Cornerstone Charter Academy Middle School / 2535 NEW GARDEN EAST RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Greensboro Academy Middle School / 4049 BATTLEGROUND AVE	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Greensboro Day School Middle School / 5401 LAWNDALE DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Greensboro Montessori School Middle School / 2856 HORSE PEN CREEK RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Guilford Preparatory Academy Middle School / 2210 E CONE BLVD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Hairston Middle School / 3911 NACO RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Jackson Middle School / 2200 ONTARIO ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X
Kernodle Middle School / 3600 DRAWBRIDGE PKY	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Kiser Middle School / 716 BENJAMIN PKY	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
Mendenhall Middle School / 205 WILLOUGHBY BLVD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
New Garden Frieds School Upper School-Page-Frederiksen Campus / 2015 Pleasant Ridge Rd.	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
New Garden Friends School Middle School / 1128 NEW GARDEN RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Noble Academy Middle School / 3310 HORSE PEN CREEK RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Our Lady of Grace Catholic Sch Middle School / 201 S CHAPMAN ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X		X	X	X		X	X	X
St Pius X Catholic School Middle School / 2200 N ELM ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Swann Middle School / 811 CYPRESS ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Triad Math & Science Academy Middle School / 700 CREEK RIDGE RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X
Western Guilford Middle School / 401 COLLEGE RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Central Operations Center / 100 Police Pl	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Eastern Operations Center / 1106 Maple St	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Greensboro Police HQ / 300 W Washington St	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Guilford County Sheriff's Office - Law Enforcement Center / 401 W. Sycamore St.	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Guilford County Sheriff's Office - Main Office / 400 W. Washington St.	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
N.C. Agricultural & Technical State Univ. Police Dept. / 406 Laurel St.	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X
Sheriff Office District 2 / 5440 Millstream Rd	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X				X	X	X	X		X	X	X
Sheriff/Detention Center / 201 S Edgeworth St	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Southern Operation Center / 2602 S Elm-Eugene ST	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
University of North Carolina - Greensboro Police Dept. / 1200 W. Lee St.	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
Western Operations Center / 300 S Swing Rd	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
BRENNTAG MID-SOUTH - 49 - BMS GREENSBORO (S) /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Greensboro II Terminal (Magellan Terminals) / 7101 W Market St.	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Guilford County Terminal /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X
Harris Teeter Frozen Foods Distribution Center /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Harris Teeter Perishables Distribution Center /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X		X	X	X		X	X	X
KMST Greensboro 1 /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
MOTIVA ENTERPRISES LLC - GREENSBORO /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
Pactiv LLC - Greensboro Plant /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
Galyon Transportation Center / 236 E. Washington St.	Transportation Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
BENNETT COLLEGE / 900 E WASHINGTON ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
ELON UNIVERSITY - SCHOOL OF LAW / 201 N GREENE ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X		X	X	X
GATEWAY UNIVERSITY RESEARCH PARK-NORTH / 5900 SUMMIT AV	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X		X	X	X		X	X	X
GATEWAY UNIVERSITY RESEARCH PARK-SOUTH / 2901 E LEE ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
GREENSBORO COLLEGE / 815 W MARKET ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X	X
GUILFORD COLLEGE / 5800 W FRIENDLY AV	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
GUILFORD TECHNICAL COMMUNITY COLLEGE / 3505 E MARKET ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
NORTH CAROLINA AGRICULTURAL & TECHNICAL STATE UNIVERSITY / 1601 E MARKET ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
THE UNIVERSITY of NORTH CAROLINA at GREENSBORO / 1400 SPRING GARDEN ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Abner Lift Station / 2000 Kaufelt St.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Airpark Ct Booster Station / 5 Sharp's Airpark Ct.	Wastewater and Water Treatment	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X		X	X	X
Airport Lift Station / 6307 Airport Pkwy.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Alamance Lift Station / 1035 Neese Rd.	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
American Express Lift Station / 7501-LS Business Park Dr	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Battleground Booster Station / 3110 Forest Lawn Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Beaver Creek / 3652-LS Southeast School Rd	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL													MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Big Alamance Lift Station / 3038-X Alamance Church Rd	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X		X	X	X		X	X	X
Birch Creek Lift Station / 210 Birch Creek Rd	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X			X		X	X	X		X	X	X
Bishop Road / 4715-X Evans Town Rd	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Bledsoe Drive Lift Station / 2783 Horsepen Creek Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Brandon Station Lift Station / 2104 - X Brandon Station Ct.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Brightwood Lift Station / 3240 Gatesville Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Bryan Park Lift Station / 6105 Townsend Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X			X	X	X	X	X	X	X
Burnt Poplar Road Lift Station / 6350 - LS Burnt Poplar Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Cardella Lift Station / 612 - LS Cardella Drive	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Cardinal Lift Station / 3861 Lewiston Rd	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Clifton Rd. 1 Booster Station / 3912 Clifton Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Corbin Road Lift Station / 4111-X Corbin Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
Eastern Shores Lift Station / 5002 Eastern Shores Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Foxburrow Lift Station / 5070 Foxburrow Rd.	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X						X	X	X	X		X	X	X
Foxcroft Lift Station / 4908-LS Peppercorn Ln	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Gallimore Dairy Lift Station / 502-X Gallimore Dairy Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X					X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Greensboro Wastewater Treatment Plant- N. Buffalo Plant / 2199 White St.	Wastewater and Water Treatment	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Greensboro Wastewater Treatment Plant- TZ Osborne / 2350 Huffine Mill Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X		X	X	X
Greensboro Water Treatment Plant - Lake Townsend / 6268 Bryan Park Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X			X	X	X		X	X	X
Greensboro Water Treatment Plant - NL Mitchell / 1041 Battleground Ave.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	X	X
Greensboro Water Treatment Plant - Reedy Fork / 5966 Lake Brant Rd.	Wastewater and Water Treatment	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Griffin Mill Lift Station / 6104 Bedstone Ln.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Groometown Rd Booster Station / 3700 Groometown Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Guilford Lift Station / 7998 Leabourne Rd	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Highway 70 Booster Station / 4501-A Burlington Rd.	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Hilltop Road Lift Station / 5230 - X Hilltop Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Horsepen Creek Lift Station / 3846-LS Battleground Av.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Hunters Ridge Lift Station / 4601-X Alliance Church Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
Jessup Grove Rd. 1 Booster Station / 4501 Jessup Grove Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Kenneth Road Lift Station / 700 Kenneth Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Lake Brandt Lift Station / 2535 North Beech Ln	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Lake Daniel 1 Booster Station / 502 Benjamin Parkway	Wastewater and Water Treatment	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X		X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL													MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Lawndale Lift Station / 5004-LS Bluff Run Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Lee's Chapel Rd. Tank 1 Booster Station / 1364-W Lee'S Chapel Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X					X		X	X	X		X	X	X
Long Branch Lift Station / 6199 Chimney Center Blvd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X
Lynwood Lakes Lift Station / 2018 Lynwood Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
McConnell Rd. Booster Station / 3409-A Mcconnell Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Mcknight Mill Road Lift Station / 3600-X Peterford Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Mcnairy Point Lift Station / 5221 N. Church St.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Nealtown Road Lift Station / 2003-LS White St.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Neelley Road Lift Station / 2022-X Neelley Way	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
New Garden Rd. 1 Booster Station / 1601 New Garden Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Northern Shores Lift Station / 802-LS Northern Shores Pt	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Peach Orchard Lift Station / 5702-X River Glen Dr	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Reedy Fork Lift Station / 6951 McLeansville Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X			X	X	X	X	X	X	X
Regional Rd. 1 Booster Station / 801 N. Regional Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
Reserve Lift Station / 1943-LS Pavillion Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Rock Creek Lift Station / 6595 Judge Adams Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X

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		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Sedgefield Lakes Lift Station / 5004 Ellery Ct.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X		X	X	X		X	X	X
Sedgefield Lift Station / 3413-X Old Onslow Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Shirley Lane Lift Station / 4109-LS Rev Williams Dr	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Stewart Mill Lift Station / 1500-X Stewart Mill Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X				X	X	X	X		X	X	X
Stoney Creek 1 Booster Station / 6430-A Burlington Rd.	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
Summerhill Lift Station / 5243 N Church St.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Sunfish Point Lift Station / 2 Sunfish Pt.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
Triad Drive Lift Station / 8700 Triad Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Twilla Acres Lift Station / 1315 Ranhurst Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Waterbury Lift Station / 6737 Barton Creek Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X			X	X	X		X	X	X
Wayne Road Lift Station / 4306 Wayne Rd.	Wastewater and Water Treatment	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Winston Booster 1 Booster Station / 9652 West Market	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X			X	X	X	X	X	X	X
Young's Mill Road Lift Station / 1723 Young's Mill Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
HIGH POINT																																
Pruette SCALE Academy Alternative School / 900 ENGLISH RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X				X	X		X	X	X
Allen Jay Elementary School / 1311 E SPRINGFIELD RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Brittain Academy Elementary School / 155 NORTHPOINT AV	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X
Fairview Elementary School / 608 FAIRVIEW ST	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 / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Florence Elementary School / 7605 FLORENCE SCHOOL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X						X	X		X	X	X
Hayworth Christian School Elementary School / 1696 WESTCHESTER DR	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
High Point Christian Academy Elementary School / 307 N ROTARY DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X					X	X		X	X	X
High Point Friends School Elementary School / 800 QUAKER LN	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X				X	X		X	X	X
Immaculate Heart of Mary Catholi Elementary School / 4145 JOHNSON ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X									X	X		X	X	X
Johnson Global Studies Elementary School / 1601 JOHNSON ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X							X	X		X	X	X
Kirkman Park Elementary School / 1101 N CENTENNIAL ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X		X				X	X		X	X	X
Montlieu Academy of Technology Elementary School / 1105 MONTLIEU AV	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X		X				X	X		X	X	X
Northwood Elementary School / 818 W LEXINGTON AV	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X							X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Oak Hill Elementary School / 320 WRIGHTENBERRY ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X		X	X	X
Oak View Elementary School / 614 OAKVIEW RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Parkview Elementary School / 325 GORDON ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X		X	X	X
Phoenix Academy Elementary School / 4191 MENDENHALL OAKS PKWY	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X	X	X	X	X
Shadybrook Elementary School / 503 SHADYBROOK RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Southwest Elementary School / 4372 SOUTHWEST SCHOOL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
The Piedmont School Elementary School / 815 OLD MILL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Triangle Lake Montessori Elementary School / 2401 TRIANGLE LAKE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X		X	X	X
Union Hill Elementary School / 3523 TRIANGLE LAKE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X		X	X	X
Wesleyan Christian Academy Elementary School / 1917 N CENTENNIAL ST	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
EMS Base 2 / 201 Montlieu Av	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X			X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
EMS Base 9 / 2011 Sandy Ridge Rd	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X									X	X		X	X	X
PTAR 7 / 901 S Elm St	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X					X	X		X	X	X
HP #1 / 508 N Centennial St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
HP #10 / 2419 Whites Mill Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X							X	X		X	X	X
HP #11 / 2604 Morris Farm Dr	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X									X	X		X	X	X
HP #12 / 4538 Barrow Rd	Fire Station	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X									X	X		X	X	X
HP #13 / 2414 Ambassador Ct	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X							X	X	X	X	X	X
HP #2 - Headquarters / 434 South Elm St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
HP #26 / 2127 Sandy Ridge Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X									X	X		X	X	X
HP #3 / 1309 Chestnut Dr	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X				X	X	X	X	X	X
HP #4 / 930 Old Winston Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X						X	X		X	X	X
HP #5 / 3828 Johnson St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X						X	X		X	X	X
HP #6 / 110 East Springfield Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
HP #7 / 1116 Gordon St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X				X	X		X	X	X
HP #8 / 208 Prospect St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X					X	X	X	X	X	X
HP #9 / 2707 Triangle Lake Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
HP Fire Training / 1035 W Ward Av	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X					X	X	X	X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Academy at Central High School / 700 CHESTNUT DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X		X	X	X
Andrews High School / 1920 MCGUINN DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Brittain Academy High School / 155 NORTHPOINT AV	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X
GTCC Middle College-High Point High School / 901 S MAIN ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
Hayworth Christian School High School / 1696 WESTCHESTER DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X
High Point Central High School / 801 FERNDALE BLVD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X			X	X		X	X	X
High Point Christian Academy High School / 307 N ROTARY DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X		X	X	X
Penn-Griffin High School / 825 E WASHINGTON DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
Phoenix Academy High School / 4191 MENDENHALL OAKS PKWY	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X
Southwest High School / 4364 BARROW RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
The Piedmont School High School / 815 OLD MILL RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Wesleyan Christian Academy High School / 1917 N CENTENNIAL ST	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
HIGH POINT REGIONAL HOSPITAL / 601 N ELM ST	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X				X			X	X		X	X	X
MOSES CONE MEDCENTER / 2630 WILLARD DAIRY RD	Hospital	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Brittain Academy Middle School / 155 NORTHPOINT AV	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X
Ferndale Middle School / 701 FERNDALE BLVD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X				X	X		X	X	X
Hayworth Christian School Middle School / 1696 WESTCHESTER DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	X
High Point Christian Academy Middle School / 307 N ROTARY DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X		X	X	X
High Point Friends School Middle School / 800 QUAKER LN	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X		X			X	X		X	X	X
Immaculate Heart of Mary Catholi Middle School / 4145 JOHNSON ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Johnson Street Global Middle School / 1601 JOHNSON ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Penn-Griffin Middle School / 825 E WASHINGTON DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X	X	X	X	X
Phoenix Academy Middle School / 4191 MENDENHALL OAKS PKWY	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X
Southwest Middle School / 4368 BARROW RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
The Piedmont School Middle School / 815 OLD MILL RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Welborn Academy Middle School / 1710 MCGUINN DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Wesleyan Christian Academy Middle School / 1917 N CENTENNIAL ST	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
HIGH POINT CITY HALL / 211 S HAMILTON ST	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
High Point Detention Cent / 507 East Green Drive	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
High Point Police HQ / 1009 Leonard Av	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
Future Foam, Inc /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X	X	X	X	X
Glass Unlimited of High Point /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X		X	X	X
High Point Facility /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X	X	X	X	X
Hunter Farms /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X						X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Kao Specialties Americas LLC /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Suiza Dairy Group LLC dba Land of Sun Dairies LLC (High Point) /	RMP Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X			X			X	X		X	X	X
AmTrak Train Station / 100 W. High Ave.	Transportation Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X	X	X	X	X
GUILFORD TECHNICAL COMMUNITY COLLEGE / 901 S MAIN ST	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
HIGH POINT UNIVERSITY / 833 MONTLIEU AV	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X					X			X	X		X	X	X
Eastside Wastewater Treatment Plant / 5898 Riverdale Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Frank L. Ward Water Treatment Plant / 2011 E. Kivett Dr.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X		X				X	X	X	X	X	X
JAMESTOWN																																	
Christine Joyner Ed Center Alternative School / 604 HIGH POINT RD	Alternative School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Jamestown Elementary School / 108 POTTER DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X			X				X	X		X	X	X
Millis Road Elementary School / 4310 MILLIS RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Medic 3/35 / 301 E Main St	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
STA #46 / 301-B East Main St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Ragsdale High School / 1000 LUCY RAGSDALE DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
JAMESTOWN TOWN HALL / 301 E MAIN ST	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Sheriff Office District 3 / 211 Hillstone Dr	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X	X	X	X	X
OAK RIDGE																																	
Oak Ridge Elementary School / 2050 OAK RIDGE RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
STA #15 / 8325 Linville Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Oak Ridge Military Academy High School / 2317 OAK RIDGE RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
Oak Ridge Military Academy Middle School / 2317 OAK RIDGE RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
OAK RIDGE TOWN HALL / 8315 LINVILLE RD	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
PLEASANT GARDEN																																	
Pleasant Garden Elementary School / 4833 PLEASANT GARDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
STA #3 / 4814 Pleasant Garden Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
PLEASANT GARDEN TOWN HALL / 4920 ALLIANCE CHURCH RD	Municipal Offices	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X					X			X	X		X	X	X
SEDALIA																																	
Sedalia Elementary School / 6120 BURLINGTON RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
SEDALIA TOWN HALL / 6121 BURLINGTON RD	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
STOKESDALE																																	
Stokesdale Elementary School / 8025 US HIGHWAY 158	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
STA #12 / 8401 US Hwy 158	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
STOKESDALE TOWN HALL / 8325 ANGEL-PARDUE	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
SUMMERFIELD																																	
Clarkland Tower / 5449 5459 Clarkland Rd	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Summerfield Tower / 5501 Centerfield Rd.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Revolution Academy Charter School / 3800 Oak Ridge Rd	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Laughlin Primary (CLOSED) Elementary School / 7911 SUMMERFIELD RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Summerfield Charter Academy Elementary School / 5303 US 220 N	Elementary School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
Summerfield Elementary School / 7501 SUMMERFIELD RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Medic 1 / 7400 Summerfield Rd	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #29 / 1800 Scalesville Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
STA #39 / 6214 Lake Brandt Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #9 / 7400 Summerfield Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Revolution Academy Charter School / 3800 Oak Ridge Rd	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
Summerfield Charter Academy Middle School / 5303 US 220 N	Middle School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
SUMMERFIELD TOWN HALL / 4117 OAK RIDGE RD	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
Sheriff Office District 1 / 7504 Summerfield Rd	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
WHITSETT																																	
STA #31 / 809 NC Hwy 61 S	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
WHISETT TOWN HALL / 809 NC HWY 61 S	Municipal Offices	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
UNINCORPORATED AREA																																
Meredith Leigh Inman ED Center Alternative School / 200 HAYNES RD	Alternative School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X		X			X	X		X	X	X
High Point Jail Tower / 507 E. Greene St.	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
North Tower / 3301 Forest Lawn Drive	Communication Towers	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Alamance Elementary School / 3600 WILLIAMS DAIRY RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Madison Elementary School / 3600 HINES CHAPEL RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
McLeansville Elementary School / 5315 FRIEDEN CHURCH RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Monticello-Brown Summit Elementary School / 5006 NC HIGHWAY 150 E	Elementary School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Nathanael Greene Elementary School / 2717 NC HIGHWAY 62 E	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	X	X
Northern Elementary School / 3801 NC HIGHWAY 150	Elementary School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Shining Light Academy Elementary School / 4530 W WENDOVER AV	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 / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Southern Elementary School / 5720 DRAKE RD	Elementary School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Sumner Elementary School / 1915 HARRIS DR	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Triad Christian Academy Elementary School / 5104 DUNSTAN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Tri-City Christian Academy Elementary School / 8000 CLINARD FARMS RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Vandalia Christian School Elementary School / 3919 PLEASANT GARDEN RD	Elementary School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X	X	X	X	X
EMS Base 5 / 6498 Franz Warner PW	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
Medic 2 / 6012 Liberty Rd	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
Medic 4 / 5326 Frieden Church Rd	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X	X	X	X	X
Medic 5 / 7806 Jackson School Rd	EMS Base	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Medic 6 / 9414 W Market St	EMS Base	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X	X	X	X	X
PTIA STA #100 / 803 N Terminal Service Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
STA #13 / 2505 Lee's Chapel Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
STA #16 / 9414 W Market St	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X	X	X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
STA #22 / 5342 Vickrey Chapel Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #24 / 2239 Bishop Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #25 / 6519 Coltrane Mill Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #27 / 3719 High Rock Rd	Fire Station	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
STA #28 / 6619 NC Hwy 61 North	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
STA #30 / 6012 Liberty Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #32 / 7806 Jackson School Rd	Fire Station	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
STA #33 / 3937 NC Hwy 150 E	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X	X	X	X	X
STA #34 / 6200 Osceola-Ossippee Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
STA #35 / 1210 NC Hwy 62 E	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
STA #36 / 4317 Folger Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X		X			X	X	X	X	X	X	X
STA #37 / 625 Knox Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X					X	X	X		X	X	X
STA #38 / 6651 Holts Store Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #44 / 4831 Blakeshire Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #45 / 6610 Humble Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
STA #47 / 5326 Frieden Church Rd	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 / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
STA #50 / 6498 Franz Warner PW	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #51 / 5219 Northwest School Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
STA #54 / 4107 Presbyterian Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X
STA #55 / 4629 Hicone Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
STA #58 / 6912 Spencer-Dixon Rd	Fire Station	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Eastern High School / 415 PEEDEN DR	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X							X	X	X		X	X	X
GTCC Middle College-Jamestown High School / 601 HIGH POINT RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
Northeast High School / 6700 MCLEANSVILLE RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Northern High School / 7101 SPENCER DIXON RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Northwest High School / 5240 NORTHWEST SCHOOL RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Shining Light Academy High School / 4530 W WENDOVER AV	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Southeast High School / 4530 SOUTHEAST SCHOOL RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Southern High School / 5700 DRAKE RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Tri-City Christian Academy High School / 8000 CLINARD FARMS RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Vandalia Christian School High School / 3919 PLEASANT GARDEN RD	High School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X	X	X	X	X
Brown Summit Middle School / 4720 NC HIGHWAY 150 E	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X			X			X	X	X	X	X	X
Eastern Middle School / 435 PEEDEN DR	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X					X		X	X	X		X	X	X
Jamestown Middle School / 301 HAYNES RD	Middle School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X			X					X	X		X	X	X
Northeast Middle School / 6720 MCLEANSVILLE RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Northern Middle School / 616 SIMSON-CALHOUN RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Northwest Middle School / 5300 NORTHWEST SCHOOL RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Shining Light Academy Middle School / 4530 W WENDOVER AV	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Southeast Middle School / 4825 WOODY MILL RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X				X	X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL															MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Southern Middle School / 5747 DRAKE RD	Middle School	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Tri-City Christian Academy Middle School / 8000 CLINARD FARMS RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Vandalia Christian School Middle School / 3919 PLEASANT GARDEN RD	Middle School	X	X	X	X				X	X	X	X	X	X	X	X	X	X			X	X				X	X	X	X	X	X
PTIA Police / 1000 A Ted Johnson Pkwy	Public Safety	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
Piedmont Triad International Airport (PTIA) / 1000 A Ted Johnson Pkwy.	Transportation Facilities	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X
GUILFORD TECHNICAL COMMUNITY COLLEGE / 601 HIGH POINT RD	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X				X				X	X		X	X	X
GUILFORD TECHNICAL COMMUNITY COLLEGE / 260 REGIONAL RD	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X		X	X				X	X		X	X	X
GUILFORD TECHNICAL COMMUNITY COLLEGE /	University/College	X	X	X	X				X	X	X	X	X	X	X	X	X	X		X						X	X		X	X	X
Travis Creek Sewage Pump Station / 2712 Amick Rd.	Wastewater and Water Treatment	X	X	X	X				X	X	X	X	X	X	X	X	X	X								X	X		X	X	X

FACILITY NAME / ADDRESS	FACILITY TYPE	NATURAL												BIO		TECHNOLOGICAL														MAN MADE		
		Drought	Earthquake	Extreme Cold	Extreme Heat	Fire/Wildfire	Flooding- 100 year	Flooding- 500 year	Hail	Hurricane	Thunderstorm	Tornado	Winter Storm	Bioterrorism	Public Health Threat	Building Collapse	Communications Failure	Energy/Utility Failure	Fixed HAZMAT	Mobile HAZMT0.5-mile (road)	Mobile HAZMT1.0-mile (road)	Mobile HAZMT0.5-mile (rail)	Mobile HAZMT1.0-mile (rail)	Nuclear Accident 10-mile	Nuclear Accident 50-mile	Pipeline Failure	Resource Shortage	Transportation Incident	Civil Disturbance	Cyber-Security Threat	Terrorism
Westside Wastewater Treatment Plant / 1044 W. Burton Rd.	Wastewater and Water Treatment	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 Guilford 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 Guilford 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 the 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 Guilford County and its municipalities, a detailed Capability Assessment Survey was completed for each of the participating jurisdictions based on the information found in the existing hazard mitigation plan and local government websites, and then distributed to the participating jurisdictions for review and update. 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 county and local jurisdictions can recast as opportunities for specific actions to be proposed as part of the hazard mitigation strategy.

The information collected in the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology[2] was then applied to quantify each jurisdiction's overall capability. 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" was determined according to the total number of points received. These classifications are designed to provide a basic, general assessment of local government capability and are used to inform 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 Guilford County to implement hazard mitigation activities. All information is based upon the review of the existing hazard mitigation plan and local government websites through the Capability Assessment Survey and input provided by local government officials during meetings of the Guilford County Hazard Mitigation Planning Team.

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 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,

[2] The scoring methodology used to quantify and rank the jurisdictions' capability can be found in Appendix B.

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 Guilford 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 Guilford 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 the county. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Guilford County Hazard Mitigation Plan.

TABLE 7.1: RELEVANT PLANS, ORDINANCES, AND PROGRAMS

Planning / Regulatory Tool	GUILFORD COUNTY	Gibsonville	Greensboro	High Point	Jamestown	Oak Ridge	Pleasant Garden	Sedalia	Stokesdale	Summerfield	Whitsett
Hazard Mitigation Plan	✓	†	†	†	†	†	†	†	†	†	†
Comprehensive Land Use Plan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Floodplain Management Plan											
Open Space Management Plan (Parks & Rec/Greenway Plan)	✓		✓	✓	✓	✓	✓		✓	*	
Stormwater Management Plan/Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Natural Resource Protection Plan	✓			✓						✓	
Flood Response Plan											
Emergency Operations Plan	✓	†	†	✓	†	†	†	†	†	†	†
Continuity of Operations Plan	✓	*	✓	✓		*	✓	✓		✓	✓
Evacuation Plan											
Disaster Recovery Plan	✓	†	†	†	†	†	†	†	†	†	†
Capital Improvements Plan	✓	✓	✓	✓	✓	✓	✓			*	

Planning / Regulatory Tool	GUILFORD COUNTY	Gibsonville	Greensboro	High Point	Jamestown	Oak Ridge	Pleasant Garden	Sedalia	Stokesdale	Summerfield	Whitsett
Economic Development Plan	✓		✓	✓							
Historic Preservation Plan			✓								
Flood Damage Prevention Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Zoning Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Subdivision Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Unified Development Ordinance	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Post-Disaster Redevelopment Ordinance											
Building Code	✓	✓	✓	✓	†	†	†	†	†	†	†
Fire Code	✓	†	✓	✓	†	†	†	†	†	†	†
National Flood Insurance Program (NFIP)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NFIP Community Rating System	✓		✓								

A more detailed discussion on the county's 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: FEMA

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.

- Guilford County has previously adopted a hazard mitigation plan. Each participating municipality was included in the county's plan.

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.

- Guilford County has developed a recovery framework plan that serves as the county's disaster recovery plan. This recovery framework pertains to all participating municipalities and each community acts as an integral part of the framework.

Emergency Operations Plan: An emergency operations plan outlines responsibilities and the means by which resources are deployed during and following an emergency or disaster.

- Guilford County maintains an emergency operations plan through the County Emergency Management Department. All 10 participating municipalities have adopted the county plan.
- The City of High Point has also adopted a municipal-level emergency operations plan.

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.

- Guilford County has adopted a continuity of operations planning program that allows all county departments to develop a department specific continuity of operations plan. As part of this program, Guilford County has also developed and adopted a continuity of government plan.
- Various departments within the Cities of Greensboro and High Point have developed department specific continuity of operations plans.
- Several of the municipalities within Guilford County have developed or are in the process of developing a continuity of government and/or continuity of operations plan for their jurisdiction.

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.

- The county does not currently have a flood response plan in place.

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 Guilford 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.

- Guilford County has adopted a county comprehensive plan.
- Each of the 10 participating municipalities has adopted a municipal land use 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.

- Guilford County, Gibsonville, Greensboro, High Point, Jamestown, Oak Ridge, and Pleasant Garden have capital improvement plans in place.

- The Town of Summerfield is currently in the process and developing a capital improvements plan.

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.

- The City of Greensboro has a Preservation Plan that is a sub-section of the city's Comprehensive Plan.
- None of the remaining participating municipalities have adopted 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.

- Guilford County and all 10 participating municipalities have adopted zoning ordinances.
- The county and all of the participating municipalities, except the Town of Whitsett, include zoning regulations as part of their local unified development ordinances. Whitsett has 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.

- Guilford County and all 10 participating municipalities have adopted subdivision ordinances.
- The county and all of the participating municipalities, except the Town of Whitsett, include subdivision regulations as part of their local unified development ordinances. Whitsett has 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.

- North Carolina has a state compulsory building code, which applies throughout the state; however, jurisdictions may adopt codes if approved as providing adequate minimum standards. The county and all 10 participating municipalities have adopted a building code.

- Guilford County provides building inspection services for all unincorporated areas of the county and through contractual agreements for the Towns of Jamestown, Oak Ridge, Pleasant Garden, Sedalia, Stokesdale, Summerfield, and Whitsett.
- Gibsonville, Greensboro, and High Point are responsible for enforcement of the building codes within their planning jurisdictions.

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).[3] In North Carolina, the North Carolina Department of Insurance assesses the building codes in effect in a particular community and how the community enforces its building codes *with special emphasis on mitigation of losses from natural hazards*. The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The concept is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses and, as a result, should have lower insurance rates.

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,

[3] 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 Guilford County.

TABLE 7.2: NFIP POLICY AND CLAIM INFORMATION

Jurisdiction	Date Joined NFIP	Map Panel Effective Date	NFIP Policies in Force	Insurance in Force	Closed Claims	Total Payments to Date
Guilford County†	06/04/80	11/17/17	119	$32,483,100	38	$317,993
Gibsonville	05/15/80	11/17/17	25	$6,015,600	5	$73,676
Greensboro	04/16/71	07/03/07	685	$172,509,800	439	$5,789,820
High Point	11/01/79	03/16/09	274	$64,886,200	86	$287,251
Jamestown	03/04/80	06/18/07	9	$3,179,800	3	$51,619
Oak Ridge	08/13/02	01/02/09	5	$1,686,500	1	$17,950
Pleasant Garden	03/17/09	06/18/07	4	$1,330,000	2	$0
Sedalia	10/09/08	06/18/07	1	$280,000	0	$0
Stokesdale	05/05/97	01/02/09	1	$350,000	0	$0
Summerfield	08/12/02	07/03/07	19	$5,782,000	0	$0
Whitsett	11/07/08	06/20/18	0	$0	2	$25,576

†Includes unincorporated areas of county only
Source: NFIP Community Status information as of 7/31/2019; NFIP claims and policy information as of 7/31/2019

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%

CRS Class	Premium Reduction
3	35%
4	30%
5	25%
6	20%
7	15%
8	10%
9	5%
10	0

Source: *FEMA*

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.

- Guilford County (Class 7) and the City of Greensboro (Class 8) are the only two jurisdictions that currently participate in the CRS. Participation in the CRS program should be considered as a mitigation action by the other participating municipalities. The program would be most beneficial to the City of High Point, which has 274 NFIP policies.

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. The county and all 10 participating municipalities participate in the NFIP and they all 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.

- Neither the county nor any of the participating municipalities have adopted floodplain management plans.

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.

- Guilford County participated in the development of the Piedmont Triad Regional Open Space Strategy which identifies a wide variety of key conservation opportunities across the region as

well as a strategy meant to serve as the foundation for future conservation planning efforts within the county.

- Greensboro, High Point, Jamestown, Oak Ridge, Pleasant Garden, and Stokesdale have adopted parks, recreation, greenways, and/or open space plans.
- The Town of Summerfield is currently in the process and developing an open space management plan.

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.

- Guilford County, the City of Greensboro, and the City of High Point are the only jurisdictions that have adopted a stormwater management plan.
- Guilford County and all 10 of the participating municipalities have 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 Guilford 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	GUILFORD COUNTY	Gibsonville	Greensboro	High Point	Jamestown	Oak Ridge	Pleasant Garden	Sedalia	Stokesdale	Summerfield	Whitsett
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	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
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	✓		✓			✓				✓	

Credit for having a floodplain manager was given to those jurisdictions that have a flood damage prevention ordinance, and therefore an appointed floodplain administrator, regardless of whether the appointee was dedicated solely to floodplain management. Credit was given for having a scientist familiar with the hazards of the community if a jurisdiction has a Cooperative Extension Service or Soil and Water Conservation Department. Credit was also given for having staff with education or expertise to assess the community's vulnerability to hazards if a staff member from the jurisdiction was a participant on the existing hazard mitigation plan's planning committee.

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 county's fiscal capability through the identification of locally available financial resources.

Table 7.5 provides a summary of the results for Guilford County with regard to relevant fiscal resources. A checkmark (✓) 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	GUILFORD COUNTY	Gibsonville	Greensboro	High Point	Jamestown	Oak Ridge	Pleasant Garden	Sedalia	Stokesdale	Summerfield	Whitsett
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: PDM, FMA, HMGP, PA, SBA, other Federal, state, and non-governmental funding sources, etc.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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 Guilford County. The previous hazard mitigation plan was reviewed for 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 previous local hazard mitigation plan identified existing ordinances that address natural hazards or are related to hazard mitigation such as flood damage prevention, watershed protection, soil erosion and sediment control, stormwater management, zoning, and subdivision.
- Most Guilford County residents are quite knowledgeable about the potential hazards that their community faces, and in recent years, they have become more familiar with the practices and principles of mitigation. A number flood prone structures have been acquired and demolished or elevated out of harm's way. It is strongly believed that such tangible and visual changes within the community have created a greater sense of awareness among local residents and that hazard mitigation is a concept that citizens are beginning to readily accept and support. Because of this fact, coupled with Guilford County's history with natural disasters, it is expected that the current and future political climates are favorable for supporting and advancing future hazard mitigation strategies.

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 results of the Capability Assessment Survey. This methodology, further described in Appendix B, attempts to assess the overall level of capability of Guilford 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 majority of the jurisdictions are in the moderate range. There is also some variation in the administrative and technical capability among the jurisdictions with larger jurisdictions generally having greater staff and technical resources. All of jurisdictions are in the limited range for fiscal capability.

Table 7.6 shows the results of the capability assessment using the designed scoring methodology. The capability score is based on the information found in the existing hazard mitigation plan and readily available on the jurisdictions' government websites. This information was reviewed by all jurisdictions and each jurisdiction provided feedback on the information included in the capability assessment. Local government input was vital to identifying capabilities. According to the assessment, the average local capability score for all jurisdictions is 38.8, which falls into the moderate capability ranking and nearly reaches the 40-point threshold for high capability.

TABLE 7.6: CAPABILITY ASSESSMENT RESULTS

Jurisdiction	Overall Capability Score	Overall Capability Rating
GUILFORD COUNTY	53	High
Gibsonville	36	Moderate
Greensboro	50	High
High Point	45	High
Jamestown	35	Moderate
Oak Ridge	37	Moderate
Pleasant Garden	35	Moderate
Sedalia	32	Moderate
Stokesdale	32	Moderate
Summerfield	41	High
Whitsett	31	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 Guilford County to follow in order to become less vulnerable to the identified hazards. It is based on the general consensus of the Guilford 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 Guilford County
- 8.5 Plan Update Requirement

8.1 INTRODUCTION

The intent of the Mitigation Strategy is to provide Guilford 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 Guilford County and its municipalities (provided separately in Section 9: *Mitigation Action Plan*). The county and 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 Guilford 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 Guilford 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] A general economic cost/benefit review was considered by the Hazard Mitigation Planning Team through the process of selecting and prioritizing mitigation actions as recommended by FEMA guidance. 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.

One of the primary goals of all local governments is generally to promote the public health, safety, and welfare of its citizens. In keeping with this standard, Guilford County and the participating municipalities have developed four goal statements for local hazard mitigation planning in the county. In developing these goals, the previous hazard mitigation plan was reviewed to determine if the goals remained applicable. The existing goals were presented, reviewed, voted on, and accepted by the Hazard Mitigation Planning Team (all of the goals remain unchanged). Each goal, purposefully broad in nature, serves to establish parameters that were used in developing mitigation actions. The Guilford County Mitigation Goals are presented in **Table 8.1**. Consistent implementation of actions over time will ensure that community goals are achieved.

TABLE 8.1: GUILFORD COUNTY MITIGATION GOALS

	Goal
Goal #1	Increase the internal capabilities of Guilford County and its municipalities to mitigate the effects of natural, biological, technical, and man-made hazards
Goal #2	Enhance existing or implement new County, City, and Town policies that will reduce the potential damaging effects of hazards without hindering other community goals.
Goal #3	Protect the most vulnerable populations, public buildings, and critical facilities in Guilford County, and its municipalities, through the implementation of cost-effective and technically-feasible mitigation projects.
Goal #4	Protect public health, safety, and welfare by increasing the public awareness of existing hazards and by enhancing both individual and public responsibility in mitigating risks due to those hazards throughout Guilford County and its municipalities.

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 Guilford 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 Guilford 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

Preventive 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 preventive 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 PIEDMONT TOGETHER CLIMATE ADAPTATION STRATEGIES

The *Piedmont Together Climate Adaptation Report* identifies strategies that will be necessary to ensure the health of the Piedmont Triad's people, economy, and ecosystems as the region grows to 2 million people and North Carolina ascends to a greater role nationally with its greater constituency. Although the strategies listed below in **Table 8.2** are not official actions included in the Hazard Mitigation Plan (Section 9: *Mitigation Action Plan*), they are potential strategies that can be considered by Guilford County and its municipalities to help to reduce the impacts and risks of climate change.

TABLE 8.2: RESILIENCE STRATEGIES FROM PIEDMONT TOGETHER CLIMATE ADAPTATION REPORT

Piedmont Together Resilient Climate Adaptation Strategy		
Goal	**Objective**	**Example Strategy**
Decrease the Piedmont Triad's Vulnerability to Climate Change	Decrease the Piedmont Triad's Vulnerability to Extreme Heat	Update county hazard mitigation plans to include extreme heat response strategies
	Decrease the Piedmont Triad's Vulnerability to Frozen Precipitation and Extreme Low Temperatures	Focus household weatherization programs on vulnerable populations
	Protect the Piedmont Triad's Water Supply and Quality	Develop source water protection plans for all drinking water sources
	Protect the Piedmont Triad's Air Quality	Promote and support the enhancement of the available alternative transportation infrastructure to reduce vehicle miles traveled
	Preserve Piedmont Triad Plants, Trees and Natural Landscapes	Enhance urban forest canopies so that all Triad municipalities have a 40% canopy cover
	Decrease the Piedmont Triad's Vulnerability to Wildfires	Partner with the county EMS and the NC Division of Parks and Recreation staffs to improve public awareness of wildfire risks
	Reduce the Vulnerability of Piedmont Triad Residents to Health Risks	Work with hospitals to monitor and respond to extreme heat conditions
	A Climate-Educated Piedmont Triad Public	Share Piedmont Together work with vested parties and develop a public engagement campaign
	Plan for Future Challenges	Adopt a regional green infrastructure plan to anticipate needs an mitigate their impacts to the public and ecology

Reduce Energy Consumption	Retrofit Commercial and Industrial Buildings	Develop weatherization program that targets those most vulnerable to extreme weather events
	Increase the Use of Energy-Efficient Appliances	Collaborate with retail partners to build upon existing appliance buy-back programs
	Promote Energy Reduction Through Water Conservation	Develop leak detection programs for water utility in the region
	Streamline Resources	Work with public and private sector partners to make structural and programmatic retrofits simpler and easier to implement
	Promote Clean and Renewable Energy Sources	Diversify the sources of energy generation used by power plants
	Improve Transportation Options	Promote transit-oriented development patterns
	Reduce Waste and Industrial Pollution	Switch to newer, less-toxic refrigerants

Additionally, many organizations in the Piedmont Triad, such as the Dan River Basin Association (DRBA), North Carolina Interagency Leadership Team, US Centers for Disease Control (CDC), and the National Oceanic and Atmospheric Administration (NOAA), have begun implementing climate adaptation strategies. Additional details on these strategies can be found in the *Piedmont Together Climate Adaptation Report*.

8.5 SELECTION OF MITIGATION TECHNIQUES FOR GUILFORD COUNTY

In order to determine the most appropriate mitigation techniques for the communities in Guilford 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).

8.6 PLAN UPDATE REQUIREMENT

In keeping with FEMA requirements for plan updates, the Mitigation Actions identified in the previous plans were evaluated to determine their 2020 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 2020 planning process.

SECTION 9
MITIGATION ACTION PLAN

This section includes the listing of the mitigation actions proposed by the participating jurisdictions in Guilford County. It consists of the following two subsections:

- 9.1 Overview
- 9.2 Mitigation Action Plans

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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 Guilford 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 Guilford County Multi-Jurisdictional 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 in Section 8.

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 should be completed. More information is provided when possible.

- Implementation Status (2020)—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
Guilford County	**9:3**	**23**
Gibsonville	9:9	16
Greensboro	9:14	16
High Point	9:22	16
Jamestown	9:28	14
Oak Ridge	9:32	14
Pleasant Garden	9:36	14
Sedalia	9:40	14
Stokesdale	9:44	14
Summerfield	9:48	19
Whitsett	9:53	14

Guilford County Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS	NC DEM	2025	The county continues to maintain appropriate layers and has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.
P-2	Regularly calculate and document the amount of flood prone property that is preserved as open space for additional credit points under the Community Rating System (CRS).	Flood	High	Guilford County NFIP/CRS	N/A	2025	The Guilford County Planning Department has continued to calculate and document the amount of flood prone property that is preserved as open space for additional CRS points. Guilford County would like to continue this effort on an annual basis to maximize CRS points.
P-3	Identify the county's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator	NC DEM; others as available	2025	The county frequently attempts to update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county attempts to identify potential mitigation actions to reduce risk to these facilities. The county will continue to carry out the update process going forward.
P-4	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services	Local	2025	The county works across departments to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Augment enforcement of the State Building Code and related County ordinances by encouraging wind-resistant design techniques for new residential construction during the county's permit process.	Hurricanes and Tropical Storms, Tornadoes	High	County and municipal code enforcement officials	None identified at this time	Completed	The 2018 NC Building Codes became mandatory on January 1, 2019. The wind speed design criteria increased from 90 mph to 115 mph for Guilford County. This action is considered complete.
P-6	Invest in cyber security equipment and training to mitigate future cyber incidents.	Cyber-security threat	High	Guilford County Information Services	Local	2025	The county has carried out a number of tasks related to this action including upgrading Firewall to Sonic Wall's latest appliance, adding other layers in email security such as Advanced Threat protection from Barracuda with their Essentials product line, and adding Cyber security topic and security best practices to the initial HR orientation for all new Employees. The county will continue to evolve Cyber Security strategies as threat landscape changes.
Property Protection							
PP-1	Continue to acquire and preserve parcel land subject to repetitive flooding from willing and voluntary property owners. The county will also consider other residential mitigation projects such as elevation and mitigation reconstruction	Flood	High	Guilford County Planning and Development Department	FEMA; NC DEM	2025	The county continues to update the Repetitive Loss Properties and include them on the mailings regarding federal flood assistance and flood protection measures. The county has also applied for HMGP grants to acquire parcels and is looking forward to implementing those projects in the future. Guilford County applied for two property acquisition projects under Hurricane Florence HMGP.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PP-2	Research and implement, if feasible, zoning regulations for critical facilities (schools and/or other vulnerable population facilities) located near hazardous materials and pipeline locations.	Hazardous Materials and Pipeline Failure	High	Guilford County Planning and Development, Information Services, and Emergency Management	Local	2025	There were some updates to the Unified Development Ordinance in 2018, but this action has not been fully completed so it will remain in the plan.
PP-3	Research and implement, if feasible, residential sprinkler code in Guilford County	Fire/Wildfire	Moderate	Guilford County Fire Marshal's Office	Local	2025	The latest building code for residential sprinkler systems in the county has not been updated. Research and implementation still need to take place, so this action will remain in the plan.
PP-4	Research and create a Historic Preservation Plan.	All	Moderate	Guilford County Planning and Development	Local	2025	There were some updates to the Unified Development Ordinance in 2018, but this action has not been fully completed so it will remain in the plan.
PP-5	Based on the March 6, 2014 Ice Storm Disaster Declaration, Guilford County applied under the Post Disaster Mitigation Grant program to relocate EMS Base 1.	Flooding	Moderate	Guilford County Emergency Services	Mitigation Grants, Local Capital Funding	2025	Applied for PDM funding in 2016 and determined that the Cost/Benefit to the Guilford County was not favorable at the time. The grant was declined. The county will continue to explore opportunities to complete this project in the future.
PP-6	Research grant funding opportunities for alternate power sources for critical facilities.	All Hazards	Moderate	Guilford County Emergency Management	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The county will continue to research opportunities to implement this action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Research safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Guilford County Emergency Management	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The county will continue to research opportunities to implement this action.
SP-2	Research and implement, if feasible, a local building code that requires new and modified commercial buildings to install communication repeaters/amplifiers within the structure to augment public safety radio systems.	Communicatio ns Disruption	Moderate	Guilford County Emergency Management	Local	2025	The latest building code for did not include a requirement for repeaters/amplifiers within structures to augment public safety radio systems. Research and implementation still need to take place, so this action will remain in the plan.
SP-3	Research and implement, if feasible, a building code modification to require that all vulnerable population facilities (assisted care facilities, group homes, etc.) have an alternate power source to sustain operations during power outages.	Power Outages	High	Guilford County Emergency Management	Local	Completed	This is now required as per the section 2702.1.7 of new 2018 NC State Building Codes which became effective as of 1/21/2019. This action is considered complete.
Emergency Services							
ES-1	Develop a Flood Response Plan to address the specific response to flooding events within the county.	Flood	High	Guilford County Emergency Management	Local	2025	Little action has been made on this action since the previous update. The county will continue to research opportunities to implement this action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
ES-2	Offer additional training to law enforcement officers regarding civil disturbances and provide necessary equipment to officers.	Civil Disturbance	High	Guilford County Sheriff's Office	Local	2025	The Sheriff's Office Civil Disorder Unit is in operational status. All members have been nationally certified in Field Force Operations in Anniston, AL by FEMA. The CDU trains monthly for 8 hours. We currently have 22 members on the team, with a few vacancies. We are working on filling the open spots at this time. Once the members are selected we will send them for the FEMA training.
Public Education and Awareness							
PEA-1	Promote the availability of flood insurance to County and City property owners.	Flood	High	Guilford County NFIP/CRS	Local	2025	The county makes efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county will continue these efforts going forward.
PEA-2	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to carry out this action going forward for repetitive loss properties.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. This action is still relevant and will remain in place.
PEA-4	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management	Local	2025	Guilford County works with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.
PEA-5	Explore Firewise program implementation in Guilford County.	Fire	Moderate	Guilford County Fire Marshal's Office	Various	Deleted	The Firewise Program has been identified as not being applicable to the wildfire risk in Guilford County. This project is being deleted.
PEA-6	Re-Certify as a StormReady Community through the National Weather Service	Thunderstorms and Tornadoes	Moderate	Guilford County Emergency Management	Local	2023	Guilford County was re-certified as a Storm Ready Community effective February 28th, 2020. This will expire February 28th, 2023. At this time, the county will again aim to re-certify, so this action will remain in the plan.

Town of Gibsonville Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Gibsonville Town Planner	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Gibsonville Town Planner	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Gibsonville Town Planner	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Promote the availability of flood insurance to City property owners.	Flood	Moderate	Gibsonville Town Planner	Local When Available	2025	The town has made efforts through regular contact with homeowners to encourage the purchase flood insurance and will continue to promote flood insurance for properties in floodplain.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Prevent encroachments, including fill, new construction, substantial improvements, and other developments within areas designated as floodways or non-encroachment areas	Flood	Low	Gibsonville Town Planner	Local	2025	The town implements Jordan Lake Buffer Rules and Stormwater Phase II ordinances, both of which are rules systems to address encroachments and development. Going forward, the town will continue to identify and implement rules to guide appropriate development as it pertains to flood prone areas.
P-6	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Gibsonville Town Planner	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.
P-7	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Gibsonville Town Planner	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-8	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Gibsonville Town Planner	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Property Protection							
PP-1	Continue to evaluate and update facilities and infrastructure that may be deemed "High Risk" facilities for various threats.	All	Moderate	Town of Gibsonville All Departments	Local	2025	The town has worked to identify facilities that may be at high risk to various threats and will continue to evaluate and mitigate, where possible, facilities and infrastructure that are in high risk areas.
PP-2	Continue to acquire and preserve parcel land subject to repetitive flooding from willing and voluntary property owners. The county will also consider other residential mitigation projects such as elevation and mitigation reconstruction	Flood	High	Guilford County Planning and Development Department; Gibsonville Town Planner	FEMA; NC DEM	2025	The county will continue to work with the town to update the Repetitive Loss Properties and include them on the mailings regarding federal flood assistance and flood protection measures. The county has also applied for HMGP grants to acquire parcels and is looking forward to implementing those projects in the future. The county will work with the town to coordinate on potential future projects.
PP-3	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Gibsonville Town Planner	State and Federal funding as available; HMGP	2025	New Action
Public Education and Awareness							
PEA-1	Stormwater Smart Information	Flood-Stormwater Runoff / illicit discharges	Moderate	Gibsonville Town Planner	PTRCOG	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Gibsonville Town Planner	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Gibsonville Town Planner	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Gibsonville Town Planner	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Gibsonville Town Planner	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

City of Greensboro Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	City of Greensboro Planning Department, Information Technology Department, GIS Department	NC DEM	2025	The City continues to maintain up to date mapping layer data in GIS for the use of many departments in conducting development review and permit issuance in an effort to mitigate known risks, including a recent effort by the fire department which implemented a new software system called "GOVAP" which captures hazards and assists with risk assessments and is based on fire, collapse, utility, and hazardous materials. The city will continue to evaluate its GIS and improve as needed.
P-2	Regularly calculate and document the amount of flood prone property that is preserved as open space for additional credit points under the Community Rating System (CRS).	Flood	High	City of Greensboro Water Resources Department	N/A	2025	Task has been carried out annually. The City of Greensboro Parks and Recreation Department enforces the drainage way and does open space calculations. The Water Resources Department works with the ISO representative to determine the amount of open space for CRS Credit. The open space for CRS Credit gets calculated and updated as property becomes available. This action will continue to be carried out going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-3	Identify the city's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	City of Greensboro Emergency Management Coordinator	NC DEM; others as available	2025	The city has applied for a number of grants through different programs of FEMA and Homeland Security to strengthen and mitigate its critical facilities, though it has not always been successful in gaining the funding. As such, there are a number of facilities that could benefit from additional retrofits and the city will continue to pursue efforts to carry out those projects. The city has undertaken a Flood Resiliency Project to identify each critical structure and the impacts associated with flooding events. Critical information is being gathered for each facility and individual improvements will be evaluated to mitigate future flooding impacts
P-4	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services	Local	2025	The Greensboro Emergency Management office works with other city departments to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
P-5	Revise the Flood Damage Prevention Ordinance on as needed basis	Flood	High	City of Greensboro	Local	2025	As of the 2020 update of this plan, the ordinance has been updated concerning substantial damage, but it will need to be updated again in the future so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-6	Invest in cyber security equipment and training to mitigate future cyber incidents. This includes deploying Malware prevention technology to detect zero-day and advanced persistent threats and gain visibility into advanced threat activity. Additionally, IT Security offers and conducts security awareness and training to all of the departments (onsite and online), sends monthly security bulletins (advisories) and sometimes alerts via email as needed, as well as a quarterly Cyber Security newsletter to the organization. The City now has Cyber Liability Insurance for the organization in the case of a breach that provides an end-to-end risk management solution to stay ahead of the curve of cyber risk and offers additional services that provide loss prevention tools to educate (training portal IT Security can use) and potentially prevent a breach.	Cyber-security threat	High	Guilford County Information Services	Local	2025	The City of Greensboro has developed and implemented a risk based cyber security program based on ISO/IEC 27001 standards. The goal of the cyber security program is to ensure compliance to laws and regulations and protect the City of Greensboro from advanced threats and cyber-attacks that aim at compromising systems and confidential information. The Cyber Security Team is continually looking for risks and threats in our environment to ensure compliance to laws and regulations; monitoring, evaluating and measuring processes and putting controls into place to ensure that these risks and threats do not compromise systems and confidential information. The Cyber Security Team will continue to make improvements to the cyber security program based on changes to business requirements, compliance requirements and industry threats. In May of 2018, IT underwent a table top exercise to go through a scenario of the City being attacked with Ransomware.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Property Protection							
PP-1	Continue to acquire and preserve parcels of land subject to repetitive flooding from willing and voluntary property owners. The city will also consider other residential mitigation projects such as elevation and mitigation reconstruction.	Flood	High	City of Greensboro Water Resources	FEMA; NC DEM	2025	The City of Greensboro Water Resources Department continues to update the Repetitive Loss Properties and include them on the mailings regarding federal flood assistance and flood protection measures. The city has also applied for HMGP grants to acquire parcels and is looking forward to implementing those projects in the future. The City has developed a strategy to prioritize flood prone properties for potential mitigation of these properties. This process involves potentially utilizing Hazard Mitigation Grant Program funding along with matching City funds to mitigate flood prone properties through either elevation of the property or acquisition and demolition. In 2019, the City of Greensboro acquired two flood prone parcels in the Mount Latham neighborhood using local funding.
PP-2	Augment enforcement of the State Building Code and related City of Greensboro ordinances by encouraging wind-resistant design techniques for new residential construction during the city's permit process.	Hurricanes and Tropical Storms, Tornadoes	High	City of Greensboro code enforcement officials	None identified at this time	Completed	The 2018 NC Building Codes became mandatory on January 1, 2019. The wind speed design criteria increased from 90 mph to 115 mph for Guilford County. This action is considered complete.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PP-3	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	City of Greensboro Emergency Management Coordinator	State and Federal funding as available; HMGP	2025	New Action
Emergency Services							
ES-1	Inventory and evaluate the City's emergency response activities. Identify the resources needed to accomplish specific response activities. Reviews shall include the needs of personnel, equipment, and required resources for emergency deployment.	All	Moderate	City of Greensboro Fire, GDOT and Police Departments	Local	2025	During the past year, the City experienced several natural weather-related events. These occurrences provided opportunities for both multi-agency responses and for post-event evaluations. Specifically, these events identified the need to continue to explore options for the combined City-County EOC with numerous agencies' involvement.
ES-2	Offer additional training to law enforcement officers regarding civil disturbances and provide necessary equipment to officers.	Civil Disturbance	High	Greensboro Police Department	Local	2025	The CEU team has continued to function as a special team within the Greensboro Police Department. For example, throughout 2018, they were activated for several planned protests within the city along with deployments outside the municipality at the request of other law enforcement agencies. The training program will be reviewed annually.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Public Education and Awareness							
PEA-1	Advertise and promote the availability of flood insurance to property owners that are located in flood hazard areas. Continue to review FEMA-identified repetitive loss properties for potential mitigation through the federal Flood Mitigation Assistance (FMA) program or other flood protection measures.	Flood	High	City of Greensboro	Local when available	2025	The Annual Public Education campaign for Flood Damage Prevention advertises and promotes the availability of flood insurance to property owners. Owners of properties in the floodplain receive a brochure yearly that provides information on different topics related to Flood Damage Prevention which includes flood insurance. In addition, the public information campaign includes mailing a letter to all repetitive loss structures and surrounding high risk structures that includes information regarding FEMA and flood protection measures. Article submissions are routinely published in the monthly At Your Service customer newsletter. The city plans to continue this campaign going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-2	As new Repetitive Loss Properties are identified within the City of Greensboro, contact all owners and inform them of the assistance available through the federal flood assistance programs, in addition to other flood protection measures.	Flood	High	City of Greensboro Water Resources Department	Local	2025	The City's public outreach project consists of flood informational inserts with water bills. Topics covered include a Flood Risk Map, Flood Safety, Property Protection Measures. We also run three educational programs on our local television channel. City staff advises citizens looking to purchase flood prone properties through our credited hazard disclosure measures. The City sends out annual letters to repetitive loss areas explaining property protection, financial assistance, and flood insurance. This program will continue in the future.
PEA-3	Continue to collect education materials as budgeting will allow for pamphlets to educate the public on family preparedness as well as mitigation measures that are available to property owners. These pamphlets shall remain on display for the public at the following locations: the City Library and designated City Facilities.	Flood	High	City of Greensboro	Local	2025	During FY18-19, GFD Fire Prevention and Life Safety have hired two additional personnel. They are currently exploring options to implement the best build-out the program. This is in addition to previous and continuing ongoing efforts and programs from past years and will continue going forward.
PEA-4	Continue to provide technical assistance for property owners located in flood hazard areas.	Flood	High	City of Greensboro Water Resources Department	Local	2025	The City of Greensboro Water Resources Department has provided technical assistance for property owners located in flood hazard areas and will continue to do so going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; City of Greensboro Emergency Management Coordinator	Local	2025	Guilford County and the city will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

City of High Point Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to identify areas in the city subject to repetitive flooding and institute mitigation measures as funds allow.	Flood	High	City of High Point Public Services Department	Local	2025	Seven priority areas have been identified within the city as those that have a greater potential loss of life and property damage and which are of greatest concern to citizens. A new Emergency Manager was hired in 2019 and the implementation of capital improvement projects will be a priority in the seven identified areas.
P-2	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; City of High Point Public Services	NC DEM	2025	The city continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.
P-3	Identify the city's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; City of High Point Public Services	NC DEM; others as available	2025	The county works with the city to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and city attempt to identify potential mitigation actions to reduce risk to these facilities. The county and city will continue to carry out the update process going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-4	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; City of High Point Public Services	Local	2025	The county works across departments and with the city to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to update City of High Point facilities and infrastructure to identify "High Risk" facilities for various threats. As budgetary resources allow, redefine the criteria and evaluate the aid of establishment of protective measures that may be required to mitigate and respond to incidents within the high risk facilities.	All	Moderate	All City of High Point Departments	Local	2025	The city has worked to identify facilities that may be at high risk to various threats and will continue to evaluate and mitigate, where possible, facilities and infrastructure that are in high risk areas.
PP-2	Each city department should have an established system to identify potential hazards within their supervised departments. This system should provide for mitigation strategies of known hazards in the department's planning and budget processes as needed. The list of hazard mitigation needs should be periodically revised and updated.	All	Moderate	All City of High Point Departments	Local	2025	The city has taken action at the departmental level to identify potential hazards, but this action will require consistent supervision. The city has a new EM and responsibility for managing this across departments will be carried out by the EM.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PP-3	Continue to acquire and preserve parcel land subject to repetitive flooding from willing and voluntary property owners. The county will also consider other residential mitigation projects such as elevation and mitigation reconstruction	Flood	High	Guilford County Planning and Development Department; City of High Point Public Services	FEMA; NC DEM	2025	The county will continue to work with the city to update the Repetitive Loss Properties and include them on the mailings regarding federal flood assistance and flood protection measures. The county has also applied for HMGP grants to acquire parcels and is looking forward to implementing those projects in the future. The county will work with the city to coordinate on potential future projects.
PP-4	Pursue grant funding as possible to allow for the purchase and installation of generators at critical facilities lacking same	All	High	Federal, State	Led by OEM, departments with such facilities assisting	2025	Since the last plan update, generators have been purchased for all fire stations in the city. There are still a number of facilities that do not have a generator, so this action will remain in place, but the progress to date has been noteworthy.
Structural Projects							
SP-1	Continue utility pole inspection program	Energy/Power/ Utility Failure	Medium	Local	Electric Utilities	2025	The utility pole inspection program is in place and has resulted in the replacement of numerous poles that were found to be deficient, which has had positive, mitigative impacts in avoiding potential losses and downtime during storms. The city will continue to implement this program and identify areas for improvement in the future.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Emergency Services							
ES-1	Inventory and evaluate the City's emergency response activities. Identify the resources needed to accomplish specific response activities. Reviews shall include the needs of personnel, equipment, and required resources for emergency deployment.	All	Moderate	City of High Point Fire and Police Departments	Local	2025	During the past few years, the city experienced several natural, weather-related events. These occurrences provided opportunities for both multi-agency responses and for poste-event evaluations. Specifically, these events identified the need to continue to explore options for the combined city-county EOC with numerous agencies involved. These activities will need to be reviewed annually.
ES-2	Continue to receive intelligence on law enforcement/security matters and monitor developments/best practices for management of same	All	High	Local	Police Department	2025	The city has been communicating with numerous agencies at all levels of government on intelligence matters to ensure staff are up to date on best practices. The city will continue to maintain these lines of coordination and ensure it is up to date on best practices.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Public Education and Awareness							
PEA-1	Advertise and promote the availability of flood insurance to property owners that are located in flood hazard areas. Continue to review FEMA-identified repetitive loss properties for potential mitigation through the federal Flood Mitigation Assistance (FMA) program or other flood protection measures.	Flood	High	City of High Point Public Services Department	FEMA	2025	The city has made efforts through regular contact with homeowners to encourage the purchase flood insurance and will continue to promote flood insurance for properties in floodplain. Additionally, the City's public outreach project consists of flood informational inserts with water bills. Topics covered include a Flood Risk Map, Flood Safety, Property Protection Measures. We also run three educational programs on our local television channel. The City's public library maintains flood protection materials provided by FEMA
PEA-2	Continue to collect education materials as budgeting will allow for pamphlets to educate the public on family preparedness as well as mitigation measures that are available to property owners. These pamphlets shall be posted on the High Point Emergency Management Website and will remain on display for the public at the following locations: the City Library, Public Services, and the Fire Department/City's Office of Emergency Management as budget and conditions allow.	All	High	City of High Point Fire Department/ Emergency Management	Local	2025	During FY18-19, GFD Fire Prevention and Life Safety have hired two additional personnel. They are currently exploring options to best build-out this program. This is in addition to previous and continuing ongoing efforts and programs from past years, many of which will be continued going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Update the educational pamphlet on the ICC (Increased Cost of Compliance) and how it associates with the policy holders within the City of High Point. This informational pamphlet should be distributed to the city property owners that receive substantial damage during a flood type event.	Flood	High	City of High Point Fire Department and Public Services	Local	2025	As described above, the city has made great efforts to educate the public on flood-related issues through various pamphlets and documents, including the ICC pamphlet. Most of these educational documents will need to be updated regularly, so this action will remain in the plan.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; City of High Point Emergency Management and Public Services	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the city to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; City of High Point Emergency Management and Public Services	Local	2025	Guilford County and the city will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Jamestown Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Jamestown Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Jamestown Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Jamestown Town Clerk	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Jamestown Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Jamestown Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Jamestown Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Jamestown Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Jamestown Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Town of Jamestown Town Clerk	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Public Education and Awareness							
PEA-1	Work with Guilford County to promote education and awareness through Town website and Facebook	All	High	Town of Jamestown Town Clerk	Local	2025	The town has worked to increase public awareness of hazards and potential mitigation measures. The town will continue to promote public education efforts in the future using multiple methods such as posting weather updates, emergency declarations, etc. on website and Facebook.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Jamestown Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Jamestown Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Jamestown Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Jamestown Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Oak Ridge Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Oak Ridge Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Oak Ridge Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Oak Ridge Town Clerk	Local	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Oak Ridge Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Oak Ridge Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Oak Ridge Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Oak Ridge Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Oak Ridge Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Town of Oak Ridge Town Clerk	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Public Education and Awareness							
PEA-1	Work with Guilford County to promote education and awareness through Town website and Facebook	All	High	Town of Oak Ridge Town Clerk	Local	2025	The town has worked to increase public awareness of hazards and potential mitigation measures. The town will continue to promote public education efforts in the future using multiple methods such as posting weather updates, emergency declarations, etc. on website and Facebook.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Oak Ridge Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Oak Ridge Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Oak Ridge Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Oak Ridge Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Pleasant Garden Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Pleasant Garden Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Pleasant Garden Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Pleasant Garden Town Clerk	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Pleasant Garden Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Pleasant Garden Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Pleasant Garden Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Pleasant Garden Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Pleasant Garden Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Install a back-up generator in Town Hall so the site can function as a staging or communications site during incidents	All	High	Town of Pleasant Garden Town Clerk	Town/grants	Deleted	This project was dropped by Town Council as it was decided to be too costly to implement locally. This action will be deleted and re-framed into action ES-1.
Public Education and Awareness							
PEA-1	Provide information, prevention tips, safety ideas, etc. in the town newsletter and on the town website for hazards pertinent to town residents	All	Moderate	Town of Pleasant Garden Town Clerk	Town	2025	Throughout the last several years, the town continued to share pertinent information within the town newsletter and website. This is a critical part of outreach, so this action will remain in place.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Pleasant Garden Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Pleasant Garden Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Pleasant Garden Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Pleasant Garden Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Sedalia Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Sedalia Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Sedalia Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Sedalia Town Clerk	Local	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Sedalia Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Sedalia Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Sedalia Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Pleasant Garden Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Sedalia Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Town of Sedalia Town Clerk	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Public Education and Awareness							
PEA-1	Provide information, prevention tips, safety ideas, etc. in the town newsletter and on the town website for hazards pertinent to town residents	All	Moderate	Town of Sedalia Town Clerk	Town	2025	Throughout the last several years, the town continued to share pertinent information within the town newsletter and website. This is a critical part of outreach, so this action will remain in place.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Sedalia Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Sedalia Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Sedalia Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Sedalia Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Stokesdale Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Stokesdale Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Stokesdale Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Stokesdale Town Clerk	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Stokesdale Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Stokesdale Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Stokesdale Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Stokesdale Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Stokesdale Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Town of Stokesdale Town Clerk	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Public Education and Awareness							
PEA-1	Provide information, prevention tips, safety ideas, etc. in the town newsletter and on the town website for hazards pertinent to town residents	All	Moderate	Town of Stokesdale Town Clerk	Town	2025	Throughout the last several years, the town continued to share pertinent information within the town newsletter and website. This is a critical part of outreach, so this action will remain in place.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Stokesdale Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Stokesdale Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Stokesdale Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Stokesdale Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Summerfield Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Summerfield Planning Department	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Summerfield Planning Department	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Summerfield Town Planner	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Require the installation of underground utilities to minimize outages during winter storms, tornadoes, hurricanes and other wind related storms - residential	Winter Storms Tornadoes/ Winds Hurricanes	Moderate	Summerfield Planning Department	Developer installed	2020	A Unified Development Ordinance (UDO) is under development and the Zoning Board will present the UDO to the Governing Body in 2020 for adoption. This UDO includes the mandatory underground installation of utility infrastructure.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Explore the installation of underground utilities to minimize outages during winter storms, tornadoes, hurricanes and other wind related storms – all other uses	Winter Storms Tornadoes/ Winds Hurricanes	Moderate	Summerfield Planning Department	Joint Town/Developer/ Utility Effort	2020	A Unified Development Ordinance (UDO) is under development and the Zoning Board will present the UDO to the Governing Body in 2020 for adoption. This UDO includes the mandatory underground installation of utility infrastructure.
P-6	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Summerfield Planning Department	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.
P-7	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Summerfield Planning Department	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-8	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Summerfield Planning Department	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Summerfield Planning Department	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Summerfield Planning Department	State and Federal funding as available; HMGP	2025	New Action
Natural Resource Protection							
NRP-1	Modify land regulation to reduce the amount of impervious surfaces and limit uses which may impact surface and groundwater quality	Resources – water/Public Health	High	Summerfield Planning Department	Watershed programs and State Water quality	2020	A Unified Development Ordinance (UDO) is under development and the Zoning Board will present the UDO to the Governing Body in 2020 for adoption.
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Guilford County Emergency Management	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Emergency Services							
ES-1	Explore joint ventures with commercial development to acquire water storage capacity for emergency services	Resource shortage water	Moderate	Summerfield Planning Department/ consulting engineers	Private/public	2025	The town has begun looking into increasing its water capacity to ensure sufficient supply during water shortages, but this is an ongoing process that will need to be revisited, so this action will remain in the plan.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
ES-2	Identify opportunities to develop new water supply and storage resources used in fire suppression by emergency services.	Resources - water	Moderate	Summerfield Planning Department/ consulting engineers	Balance from recent regional water study	2022	New Action
Public Education and Awareness							
PEA-1	Develop web pages to add to Community Website for information distribution regarding hazard education, risk awareness, and mitigation techniques.	All	High	Summerfield Planning Department	Local	2021	The town has leveraged its website as a platform to distribute information about hazards and risk and will continue to do so going forward.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Summerfield Planning Department	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Summerfield Planning Department	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Summerfield Planning Department	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Summerfield Planning Department	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

Town of Whitsett Mitigation Action Plan

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Prevention							
P-1	Continue to participate in the NFIP and improve floodplain management within the community. As part of this action the community will evaluate implementing: • Requirements to reduce new construction in SFHAs • Programs to improve information provided to citizens whose homes are located in the floodplain	Flood	High	Town of Whitsett Town Clerk	State and Federal funding as available	2025	As of 2020, the town is a participant in the NFIP and will continue to work towards meeting all requirements of the NFIP going forward and will work to make improvements to its participation as described.
P-2	Work with the County and State to complete hazard mitigation plan updates. As part of this action, the community will: • Annually evaluate its list of critical facilities for additions or changes • Identify new opportunities for actions that may be included in future plan updates	All	High	Town of Whitsett Town Clerk	State and Federal funding as available; Town planning expertise	2025	The town has been an active participant in the 2020 update of the hazard mitigation plan and will take an active role in future updates. The town will also work to implement the identified improvements to the plan in the interim between update cycles.
P-3	Continue to identify and document hazard occurrences and potential mitigation projects.	All	High	Town of Whitsett Town Clerk	Town planning expertise	2025	As of 2020, the town has worked with the county on a system to identify and document hazards that occur. The town will aim to improve its identification of mitigation projects in the future.
P-4	Maintain Geographic Information System (GIS) to maintain current cadastral (building/parcel) data for purposes of conducting more detailed hazard risk assessments and for tracking permitting and land use patterns.	All	High	Guilford County IS; Town of Whitsett Town Clerk	NC DEM	2025	The town continues to work with the county to maintain appropriate layers and has assisted as the county has installed cloud-based, data access paths. These pathways are currently being expanded, so this action will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
P-5	Identify the town's most at-risk vital/critical facilities, and evaluate the potential mitigation techniques for protecting each facility to the maximum extent possible.	All	Moderate	Guilford County Emergency Management Coordinator; Town of Whitsett Town Clerk	NC DEM; others as available	2025	The county works with the town to frequently update its list of vital/critical facilities, including through the update of this plan. Through these processes, the county and town attempt to identify potential mitigation actions to reduce risk to these facilities. The county and town will continue to carry out the update process going forward.
P-6	Monitor grant opportunities for funding to establish a local reserve fund for repairing and/or incorporating hazard mitigation measures for public facilities and infrastructure damaged by natural hazards.	All	Moderate	Guilford County Emergency Services; Town of Whitsett Town Clerk	Local	2025	The county works across departments and with the town to evaluate funding streams for various projects and will continue to work on establishing mechanisms to carry out this action.
Property Protection							
PP-1	Continue to identify potential mitigation projects (e.g. acquisition, elevation, reconstruction, etc) and continue to require floodplain dedication.	Flood	Moderate	Town of Whitsett Town Clerk	Local	2025	The town has not implemented any major mitigation projects in recent years, but will continue to work with the county to identify potential mitigation projects that may help reduce flood risk.
PP-2	When available, work with the county and state to invest in generator projects and power redundancy to ensure power availability during hazard events, particularly for critical facilities.	All	Moderate	Town of Whitsett Town Clerk	State and Federal funding as available; HMGP	2025	New Action

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
Structural Projects							
SP-1	Support county as it researches safe room grant opportunities to construct safe rooms in schools and vulnerable population locations.	Tornado	Moderate	Town of Whitsett Town Clerk	Various	2025	Little progress has been made on this action since the last plan update as grant opportunities have not been available. The town will continue to work with the county to research opportunities to implement this action.
Public Education and Awareness							
PEA-1	Provide information, prevention tips, safety ideas, etc. in the town newsletter and on the town website for hazards pertinent to town residents	All	Moderate	Town of Whitsett Town Clerk	Town	2025	Throughout the last several years, the town continued to share pertinent information within the town newsletter and website. This is a critical part of outreach, so this action will remain in place.
PEA-2	Maintain an all-hazards public education program to educate and prepare residents for all hazards identified in Guilford County.	All	High	Guilford County Emergency Management, Town of Whitsett Town Clerk	Local	2025	The county has developed a program aimed at all hazards education and Guilford County Emergency Management has performed presentations multiple times for various community groups. The town will work with the county to disseminate this information and encourage public attendance at these presentations. This action is still relevant and will remain in place.

Action #	Description	Hazard(s) Addressed	Relative Priority	Lead Agency/ Department	Potential Funding Sources	Implementation Schedule	Implementation Status (2020)
PEA-3	Promote the availability of flood insurance to County and Town property owners.	Flood	High	Guilford County NFIP/CRS; Town of Whitsett Town Clerk	Local	2025	The county and town coordinate to make efforts to promote the availability of flood insurance to property owners, especially those located in the floodplain or other flood prone areas. The county and town will continue these efforts going forward.
PEA-4	As new Repetitive Loss Properties are identified within the County and municipalities, contact all owners and inform them of the assistance available through the federal flood assistance programs, in additional to other flood protection measures.	Flood	High	Guilford County NFIP/CRS; Town of Whitsett Town Clerk	Local	2025	Guilford County has relatively few repetitive loss properties and has carried this out for all of these properties where required. The county will continue to work with the town to carry out this action going forward for repetitive loss properties.
PEA-5	Develop outreach program to local school administrators to help them identify sheltering areas for all schools	Tornadoes	Moderate	Guilford County Emergency Management; Town of Whitsett Town Clerk	Local	2025	Guilford County and the town will work with stakeholders in the school system to keep them informed of best practices in the industry and to coordinate and educate on critical matters related to disaster preparedness. Further coordination will take place going forward.

SECTION 10
PLAN MAINTENANCE

This section discusses how the Guilford County Mitigation Strategy and Mitigation Action Plan will be implemented and how the Multi-jurisdictional 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
- 10.1 Implementation and Integration
- 10.2 Monitoring, Evaluation, and Enhancement
- 10.3 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 the previous plan as all eleven 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.

Guilford County
During the 2016-2020 timeframe, the Guilford County Hazard Mitigation Plan included an annual review process and progress report on the plan. This review process was carried out by the Emergency Management Director at the request of the County Manager and Board of County Commissioners. During this review process, the Emergency Management Director solicited comments from all affected county departments and local governments via the hazard mitigation planning team.

During this review, the County Board of Commissioners received a report on the implementation status of the plan which included a review of mitigation actions in the plan and progress that had been made towards completing those actions.

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 reporting was done on the progress of the plan through the interim review period via annual meetings to discuss these progress reports. Going forward, the planning team will continue to conduct an annual Hazard Mitigation Planning Team meeting every year. This meeting will include monitoring, evaluating, and updating the plan, with particular emphasis on the mitigation actions and progress towards completing those.

10.2 IMPLEMENTATION AND INTEGRATION

Each agency, department, or other partner participating under the Guilford County Multi-Jurisdictional 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 city and county 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 Guilford 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 Guilford 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 information in the mitigation plan into county Geographic Information Systems; and

- Integrating the mitigation plan into the local reserve fund through 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 municipalities, 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 Guilford County. The Guilford County Emergency Management Director 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 Guilford 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 Guilford 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 Guilford County Emergency Management Director 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 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 Guilford County Multi-jurisdictional Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer at the North Carolina Division of Emergency Management (NCEM) 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 Guilford County Multi-Jurisdictional 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 Guilford County Multi-jurisdictional 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 Guilford County Emergency Management Director 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 Guilford 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 County/municipal departments, residents, and businesses. Information will also be forwarded to the North Carolina Division of Emergency Management. 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 Guilford County Hazard Mitigation Planning Team intends to make available to all of Guilford 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 operations plan to name a few examples, Guilford County Emergency Management will provide a copy of the hazard mitigation plan to the advisory committee of each relevant planning document. Guilford County Emergency Management 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 the risk of hazards or vulnerability of 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 most 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 Emergency Management 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 many 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 may include, among others:

- Advertising meetings of the Hazard Mitigation Planning Team in local newspapers, public bulletin boards and/or 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 will include the final approval letter and local adoption resolutions for each of the participating jurisdictions.

Appendix B
Planning Tools

This appendix includes the following:

1. List of Recommended Stakeholders
2. Blank Public Survey
3. GIS Data Inventory Sheet
4. Scoring Criteria for Capability Assessment
5. Blank Mitigation Action 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 PLANNING

We need your help! Please take a few minutes to complete this survey.

Guilford County is currently engaged in a planning process to become less vulnerable to disasters caused by natural, technological, biological, and man-made/intentional hazards, and your participation is important to us!

The county, along with local jurisdictions and other partners, is working to update its multi-jurisdictional *Hazard Mitigation Plan*. 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 August 31, 2019 and returning it to:

Ryan Wiedenman, Atkins
1616 E Millbrook Road, Suite 160
Raleigh, NC 27609

Surveys can also be faxed to: (919) 876-6848 c/o Ryan Wiedenman or scanned and emailed to: Ryan Wiedenman at ryan.wiedenman@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 *Guilford County Hazard Mitigation Plan*, please contact Atkins, planning consultant for the project. You may reach Ryan Wiedenman (Atkins) at 919-431-5295 or by email at ryan.wiedenman@atkinsglobal.com.

1. Where do you live?

- ❑ Unincorporated Guilford County
- ❑ Gibsonville
- ❑ Greensboro
- ❑ High Point
- ❑ Jamestown
- ❑ Oak Ridge
- ❑ Pleasant Garden
- ❑ Sedalia
- ❑ Stokesdale
- ❑ Summerfield
- ❑ Whitsett
- ❑ 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:**

<u>Natural Hazards</u>
- ❑ Drought
- ❑ Earthquake
- ❑ Extreme Cold
- ❑ Extreme Heat
- ❑ Fire
- ❑ Flooding
- ❑ Hail
- ❑ Hurricane/Other Tropical Disturbance
- ❑ Thunderstorm (Wind and Lightning)
- ❑ Tornado
- ❑ Winter Storm

<u>Biological Hazards</u>
- ❑ Bioterrorism
- ❑ Public Health/Emerging Disease Threat

<u>Technological Hazards</u>
- ❑ Building/Structure Collapse
- ❑ Communications Systems Disruption/Failure
- ❑ Energy/Power/Utility Failure
- ❑ Hazardous Materials Incident
- ❑ Nuclear Power Plant Emergency
- ❑ Pipeline Failure
- ❑ Resource Shortage (Water/Fuel)
- ❑ Transportation Incident

<u>Man-made/Intentional Hazards</u>
- ❑ Civil Disturbance
- ❑ Cyberterrorism
- ❑ Terrorism

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
Guilford County Multi-Jurisdictional 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
919-431-5295
ryan.wiedenman@atkinsglobal.com

Points System for Capability Ranking

0-19 points = Limited overall capability
20-39 points = Moderate overall capability
40-68 points = High overall capability

I. Planning and Regulatory Capability
(Up to 43 points)

Yes = 3 points
Under Development = 1 point
Included under County plan/code/ordinance/program = 1 point
No = 0 points

- Hazard Mitigation Plan
- Comprehensive Land Use Plan
- Floodplain Management Plan
- National Flood Insurance Program
- NFIP Community Rating System

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
- Stormwater Management Plan
- Natural Resource Protection Plan
- Flood Response Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Evacuation Plan
- Disaster Recovery Plan
- Flood Damage Prevention Ordinance
- Post-disaster Redevelopment / Reconstruction 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 10 points)

Yes = 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

MITIGATION ACTION WORKSHEETS

Mitigation Action Worksheets are used to identify potential hazard mitigation actions that participating jurisdictions in Guilford 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 County's Hazard Mitigation Plan.

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 no later than September 30, 2019 to:

Ryan Wiedenman, Project Manager Atkins
Electronic copies may be e-mailed to: ryan.wiedenman@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

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: Guilford County	**Title of Plan:** Guilford County Multi-Jurisdictional Hazard Mitigation Plan	**Date of Plan:** February 2020
Local Point of Contact: **Taylor Jones**	**Address:** **Guilford County Emergency Services** **1002 Meadowood Street** **Greensboro, NC 27409**	
Title: **Emergency Management Coordinator**		
Agency: **Guilford County Emergency Management**		
Phone Number: **336-641-2278**	**E-Mail:** **Tjones3@guilford-es.com**	

State Reviewer:	**Title:**	**Date:**

FEMA Reviewer:	**Title:**	**Date:**
Date Received in FEMA Region IV		
Plan Not Approved		
Plan Approvable Pending Adoption		
Plan Approved		

SECTION 1:

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 1.3; Section 2; App. D	X	
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. D	X	
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; App. B; App. D; App. F	X	
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	X	
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 10.3-10.4	X	
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 10.2-10.3	X	
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	X	
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 4; Section 5	X	
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	X	
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 5.9.5; Section 9	X	
ELEMENT B: REQUIRED REVISIONS			
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	X	
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 5.9; Section 7.3.4	X	
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	X	
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	X	
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	X	
C6. Does the Plan describe a process by which local governments will integrate the requirements of the mitigation plan into other planning	Section 10.3	X	

mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement §201.6(c)(4)(ii))			

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 3; Section 6.4.3; Section 6.5	X	
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	X	
D3. Was the plan revised to reflect changes in priorities? (Requirement §201.6(d)(3))	Section 5.28-5.29; Section 9.2	X	
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 (pending FEMA approval)		X
E2. For multi-jurisdictional plans, has each jurisdiction requesting approval of the plan documented formal plan adoption? (Requirement §201.6(c)(5))	App. A (pending FEMA approval)		X
ELEMENT E: REQUIRED REVISIONS			

ELEMENT F. ADDITIONAL STATE REQUIREMENTS (OPTIONAL FOR STATE REVIEWERS ONLY; NOT TO BE COMPLETED BY FEMA)			
F1.			
F2.			
ELEMENT F: REQUIRED REVISIONS			

SECTION 2:
PLAN ASSESSMENT

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

Element B: Hazard Identification and Risk Assessment

Element C: Mitigation Strategy

Element D: Plan Update, Evaluation, and Implementation (*Plan Updates Only*)

B. Resources for Implementing Your Approved Plan

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	Guilford County	County	Taylor Jones									
2	Town of Gibsonville	Town	Brandon Parker									
3	City of Greensboro	Town	Jason Geary									
4	City of High Point	Town	Perry Hall									
5	Town of Jamestown	Town	Paul Blanchard									
6	Town of Oak Ridge	Town	Ashley Royal									
7	Town of Pleasant Garden	Town	Angela Deal									
8	Town of Sedalia	Town	Cam Dungee									

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
9	Town of Stokesdale	City	Thearon Hooks									
10	Town of Summerfield	Town	Chris York									
11	Town of Whitsett	Town	Ken Jacobs									
12												
13												
14												
15												
16												
17												
18												
19												
20												

Appendix D
Planning Process Documentation

This appendix includes:

1. Meeting Agendas
2. Meeting Minutes
3. Meeting Sign-In Sheets
4. Other Affected Stakeholders Opportunity to Comment on Draft

AGENDA

Guilford County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Kickoff Meeting
May 30, 2019
10:00 AM – 12:00 PM

1) **Introductions**

2) **Mitigation Overview**
   a) Icebreaker Exercise

3) **Project Overview**
   a) Planning Process
   b) Risk Assessment
   c) Capability Assessment
   d) Mitigation Strategy
   e) Data Collection
   f) Public Involvement

4) **Roles & Responsibilities**
   a) Atkins
   b) County Leads
   c) Participating Jurisdictions

5) **Next Steps**
   a) Initiate data collection efforts
   b) Begin public outreach
   c) Attend next HMPT meeting

6) **Questions/Concerns?**

ATKINS

AGENDA

Guilford County Hazard Mitigation Plan Update
Hazard Mitigation Plan Public Meeting
June 13, 2019
9:00 AM – 10:30 AM

1) **Introductions**

2) **Mitigation Overview**
   a) What is mitigation and why do we do it?

3) **Mitigation Techniques**
   a) Prevention
   b) Property Protection
   c) Natural Resource Protection
   d) Structural Projects
   e) Emergency Services
   f) Public Education and Awareness

4) **Project Overview**
   a) Who is participating?
   b) Key Objectives
   c) Planning Process
   d) Public Participation and Survey

5) **Next Steps**

6) **Questions/Concerns?**

ATKINS

AGENDA

Guilford County Hazard Mitigation Plan Update
Hazard Mitigation Planning Team Kickoff Meeting
August 28, 2019
10:00 AM – 12:00 PM

1) **Overview of the Project so Far**

2) **Risk Assessment Findings**
   a) Hazard Profiles
   b) Critical Facilities
   c) Vulnerability

3) **Capability Assessment Findings**

4) **Public Involvement**

5) **Mitigation Strategy**
   a) Goals
   b) Actions

6) **Next Steps**

7) **Questions/Concerns?**

ATKINS

AGENDA

Guilford County Hazard Mitigation Plan Update
Hazard Mitigation Planning Sedalia Meeting
November 7, 2019
10:30 AM – 12:00 PM

1) **Overview of the Project so Far**

2) **Risk Assessment Findings**
   a) Hazard Profiles
   b) Critical Facilities
   c) Vulnerability

3) **Capability Assessment Findings**

4) **Public Involvement**

5) **Mitigation Strategy**
   a) Goals
   b) Actions

6) **Next Steps**

7) **Questions/Concerns?**

ATKINS

Meeting Minutes
Guilford County Multi-Jurisdictional Hazard Mitigation Plan
Project Kickoff Meeting
May 30, 2019

The Guilford County Emergency Management Director started the meeting by welcoming the representatives from the county, participating municipal jurisdictions, and other stakeholders. He then introduced the Project Manager from the project consulting team, Atkins.

The Project Manager led the kickoff meeting and began by providing an overview of the items to be discussed at the meeting. He briefly reviewed each of the handouts that were distributed in the meeting packets (agenda, presentation slides, and the public survey). He then provided a brief overview/reminder of mitigation and discussed the impetus for the update of the hazard mitigation plan as per the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

The Project Manager from Atkins then explained the six different categories of mitigation techniques (prevention; property protection; natural resource protection; emergency services; structural projects; public education and awareness) and gave examples of each. This explanation culminated with an Ice Breaker Exercise for the attendees. The Project Manager instructed attendees on how to complete the exercise.

Attendees were each given an equal amount of fictitious FEMA money ($20) and asked to spend it in the various mitigation categories. Participants were asked to imagine this to be grant money that their community or organization received that could be used towards mitigation projects or actions. Attendees were asked to target their money towards areas of mitigation that were of greatest concern for their community/organization. Ideally, the exercise was intended to pinpoint areas of mitigation that the community may want to focus on when developing their mitigation action plan and overall mitigation program in the community.

After completing the exercise, the Project Manager reviewed several items that were new in mitigation planning during this update cycle. He then noted that all local governments in the county are participating in the existing county-level hazard mitigation plan and that this plan expires in January of 2021, so the planning team will plan to develop a draft to submit to FEMA by February 2020.

He then discussed the key objectives and structure of the planning process, explaining the specific tasks to be accomplished for this project, including the planning process, risk and vulnerability assessment, capability assessment, mitigation strategy, plan maintenance procedures, and documentation. The project schedule was presented and the need for assistance with data collection and public outreach efforts were also discussed.

The Project Manager then reviewed the roles and responsibilities of Atkins and participating communities/stakeholders. The presentation concluded with a discussion of the next steps to be taken in the project development, which included discussing data collection efforts, continuing public outreach, and the next meeting for the HMPT.

The Project Manager then shared the results of the Icebreaker Exercise which was carried out earlier in the meeting. The results were as follows:

- Prevention $119
- Property Protection $62
- Natural Resource Protection $33
- Structural Projects $66
- Emergency Services $112
- Public Education and Awareness $69

The meeting was opened for questions and comments and, as there were none, the meeting was adjourned.

Meeting Minutes
Guilford County Multi-Jurisdictional Hazard Mitigation Plan
Public Meeting #1
June 13, 2019

The Guilford County Emergency Management Coordinator started the meeting by welcoming everyone.

He then provided a brief overview of mitigation and discussed the impetus for the update of the hazard mitigation plan as per the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

The EM Coordinator then explained the six different categories of mitigation techniques (prevention; property protection; natural resource protection; emergency services; structural projects; public education and awareness) and gave examples of each.

He then went on to explain that all incorporated communities within the county were participating in the plan update and that the current plan does not expire for more than a year, so the planning process is very much on track.

He then described the key objectives of the plan which include identifying potential mitigation projects and increasing public awareness of hazards and the risks they pose. The plan will be updated in compliance with state and federal requirements and involving the public is a key component. As such, there is a public survey that is available for completion and it is encouraged for members of the public to let others know about the survey even if they cannot attend public meetings.

The EM Coordinator then opened the floor for questions and comments and, as there were none, the meeting was adjourned.

Meeting Minutes
Guilford County Multi-Jurisdictional Hazard Mitigation Plan
Second Hazard Mitigation Planning Team Meeting
August 28, 2019

The Emergency Management Director with Guilford County Emergency Services welcomed everyone to the meeting and went over safety and administrative topics. He then passed the meeting over to the Project Manager to lead the presentation and discussion for the remainder of the meeting.

The Project Manager initiated the meeting with a review of the meeting handouts, which included an agenda, presentation slides, the current critical facility list, a capability assessment table, and the existing mitigation actions from current plan. The Project Manager reviewed the discussion from the previous meeting explained that the project was still on schedule.

He then went on to present the findings of the risk assessment, starting with a review of the hazards that had been identified to profile and assess in the plan. He then explained the process for preparing Hazard Profiles and discussed how each hazard falls into one of four categories: Natural, Biological, Technological, and Man-Made/Intentional. He indicated that each hazard must be evaluated and profiled to determine a relative risk for each hazard.

The Project Manager reviewed the information and analysis for each hazard using the Hazard Profiles as a baseline. The following bullets summarize the information presented:

<u>Natural Hazards</u>

- DROUGHT. There have been eight years between 2000 and 2019 where drought conditions have been reported as at least severe in Guilford County.

- EARTHQUAKES. There have been 5 recorded earthquake events in Guilford County since 1850. Overall earthquake risk is relatively low.

- EXTREME COLD. Cold temperatures as low as -8 degrees have occurred in the county and indicate that extreme cold events are possible.

- EXTREME HEAT. Extreme temperatures of 106 degrees have occurred in the county and indicate that extreme heat events are possible.

- FIRE/WILDFIRE. There have been an average of 33 fires per year reported in Guilford County.

- FLOOD. There have been over $18 million of recorded damages due to flood events in Guilford County since 1996 according to NCEI. There have been almost 600 flood insurance claims since 1978 and approximately $5.6 million in claims.

- HAILSTORM. These events occur frequently and hail stones as large as 2.75 inches in diameter have been recorded.

- HURRICANES AND TROPICAL STORMS. NOAA data shows that more than 55 storm tracks have come within 75 miles of Guilford County since 1850 and 5 federal disaster declarations have been made due to hurricanes in the county.

- THUNDERSTORM WIND/LIGHTNING. There have been more than 250 severe thunderstorm events reported since 1950 and the county is in an area that experiences 6 to 12 lightning flashes per square mile per year.

- TORNADOES. There have been 2 federal disasters declared in the county and the county has experienced an EF3 level tornado.

- WINTER STORM. The greatest 24 hour snowfall in the county was 20 inches and there have been 6 federal disaster declarations related to winter weather in Guilford County.

Biological Hazards

- BIOTERRORISM. There have not been any major bioterrorism incidents in the county, but future occurrences are possible and may cause major impacts to hospitals and loss of economic productivity.

- PUBLIC HEALTH/EMERGING DISEASE. There have been several disease outbreaks in the county, notably in 1999 (SARS) and 2003 (West Nile). Impacts could be widespread, affecting thousands.

Technological Hazards

- BUILDING/STRUCTURE COLLAPSE. Few past incidents have been recorded. Future occurrences are possible, but damage would be highly localized.

- COMMUNICATIONS SYSTEMS DISRUPTION/FAILURE. At least one past event occurred in 2011 and there would potentially be delays in emergency service response time during these events as a result of diminished in-building radio coverage due to the building's construction.

- ENERGY/POWER/UTILITY FAILURE. A number of impacts could occur including traffic issues and loss of heat and air conditioning associated with a loss of power. Loss of other utilities could cause public health concerns or downtime for businesses.

- HAZARDOUS MATERIALS INCIDENTS. There have been more than 2,000 reported hazardous materials events reported in the county. Certain areas in High Point and Greensboro contain higher concentrations of hazardous materials facilities.

- NUCLEAR ACCIDENT. Some of the county falls within the 50-mile buffer of Shearon Harris Nuclear Plant, but there have been no major incidents and future occurrences are unlikely.

- PIPELINE FAILURE. Some major pipelines run through Guilford County and there is a center of breakout tanks located off I-40 that has experienced at least one major incident in the past.

- RESOURCE SHORTAGE (WATER/FUEL). Several water and fuel shortages have impacted the county in the past 20 years. Future incidents could have major impacts on businesses and consumers.

- TRANSPORTATION INCIDENT. Several plane and train incidents have occurred in the county in past years in addition to numerous vehicle incidents. Impacts are typically very localized, but can cause logistical issues.

Man-Made/Intentional Hazards

- CIVIL DISTURBANCE. Few recent events but future occurrences are most likely to occur in prominent locations causing work stoppages and loss of productivity.

- CYBER-SECURITY THREAT. No large-scale cyber-attacks have been recorded in Guilford County, but these have impacted neighboring communities and may result in theft, loss of IT functions, or dissemination of misinformation.

- TERRORISM. There have been no major historic terrorism events in the county, but several facilities were identified as potential targets and confirmed by the planning team.

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 Winter Storm.

In general, the planning team agreed with the overall rankings of the hazards and felt that they accurately represented the relative risk in the county. In concluding the review of Hazard Profiles, the Project Manager stated if anyone had additional information for the hazard profiles, or had concerns with any of the data presented, they could call or email him.

The Project Manager then walked the planning team through another exercise related to critical facilities. A list of all of the critical facilities that had been pre-identified was presented to each planning team member. Members were asked to review the list and ensure that the proper information (name, location, etc.) was attached to each facility. Further, the team was asked to provide suggestions on any facilities that should be removed or added to the list. After reviewing, several suggestions were made to include additional facilities to the list. The Project Manager made note of these suggestions and made updates to the list accordingly.

Next, the Project Manager reviewed the data that would be included in the hazard vulnerability assessment. Because of the detailed and granular level of the analysis, an in-depth review of this data was not presented to the planning team during this meeting. Instead, the overall process of carrying out the vulnerability assessment was described to the team.

After the conclusion of the Risk and Vulnerability findings were presented, the Project Manager presented the Capability Assessment findings. Atkins developed a scoring system that was used to rank the participating jurisdictions in terms of capability in four major areas (Planning and Regulatory; Administrative and Technical; Fiscal; Political). Important capability indicators include National Flood Insurance Program (NFIP) participation, Building Code Effective Grading Schedule (BCEGS) score, and Community Rating System (CRS) participation were evaluated as part of the Local Capability Assessment Survey conducted by Atkins.

The Project Manager reviewed the Relevant Plans and Ordinances, Relevant Staff/Personnel Resources, and Relevant Fiscal Resources. All of these categories were used to rate the overall capability of the participating counties and jurisdictions. Most jurisdictions were found to be in the moderate to high

range overall for capability based upon the scoring methodology developed by Atkins. The planning team was then asked to review the capability scoring and note any areas where Atkins' analysis had not accurately captured the actual capability of the community. A few areas were noted by the planning team and these changes were recorded by the Project Manager.

The Project Manager also discussed the results of the public participation survey that was posted on the county and municipal websites as well as made available in hard copy form at several government locations. As of the meeting date, around 50 responses had been received. The Project Manager explained that the survey would close August 31, so the HMPT could make one final push to get responses back from the public. Based on preliminary survey results, respondents felt that hurricane/tropical storm posed the greatest threat to their neighborhood. Ninety-two percent of the respondents were interested in making their homes more resistant to hazards. However, sixty-three percent do not know who to contact regarding reducing their risks to hazards.

The Project Manager then reminded team members of the results of the icebreaker exercise from the first Hazard Mitigation Team meeting, where attendees were given "money" to spend on various hazard mitigation techniques and compared them to the results of the public survey. The results of the public survey ranked the categories as follows:

- Prevention
- Emergency Services
- Public Education and Awareness
- Structural Projects
- Property Protection
- Natural Resource Protection

Finally, the Project Manager gave an overview of Mitigation Strategy Development and presented the existing goals for the plan and explained that Atkins recommended keeping the goals as they are. The Hazard Mitigation Team accepted the existing goals for the plan. The Project Manager then provided an overview and examples of suggested mitigation actions tailored for Guilford County. The Project Manager then asked each county and the municipalities to provide a status update for their existing mitigation actions (completed, deleted, or deferred) by September 30, 2019. The Project Manager also asked planning team members to include any new mitigation actions by this time.

The Project Manager thanked the group for taking the time to attend and the Emergency Management Coordinator explained that if team members had any issues or questions about the planning process or their next steps, they could contact him or the Project Manager. The meeting was adjourned.

Meeting Minutes
Guilford County Multi-Jurisdictional Hazard Mitigation Plan
Project Kickoff Meeting
November 7, 2019

The Project Manager led the meeting and began by providing an overview of the items to be discussed at the meeting. He briefly reviewed each of the handouts that were distributed in the meeting packets (agenda, mitigation actions, capability assessment). He then provided a brief overview/reminder of mitigation and discussed the impetus for the update of the hazard mitigation plan as per the Disaster Mitigation Act of 2000 and NC Senate Bill 300.

The Project Manager then went over a number of the findings from the Risk Assessment which had been reviewed at the last meeting of the planning team. He described the hazard profiles and critical facilities that had been identified through the planning process and worked with the community to understand all aspects of the information provided. The community then provided feedback on what was presented, and the Project Manager took note of the few comments the community had.

Next, the Project Manager worked with the community to update the capability assessment worksheet that was provided and then to write status updates for each of the existing mitigation actions that the community had presented in the previous plan update. These updates were completed and the discussion moved to whether there were any new actions that the community would like to add to the plan during this update cycle. The community members present wished to further discuss with other staff and said they would provide any new actions to the Project Manager via email.

The meeting concluded with a discussion of the next steps to be taken in the project development, which getting the draft plan ready to share with the planning team. The Project Manager asked the community to review the draft and provide comments in accordance with the timeline set out in the forthcoming draft review email.

The Project Manager asked if there were any final questions or comments and, as there were none, the meeting was adjourned.

Guilford County Hazard Mitigation Plan
Hazard Mitigation Planning Team Kickoff Meeting

May 30, 2019

10:00AM-12:00PM

Name	Title	Organization	Phone Number	E-mail Address
Steven Grose	Emergency Management Coordinator	Guilford County	336-641-2278	sgrose@guilford-es.com
Catherine Hughes	Emergency Management Coordinator	Guilford County	336-641-2278	chughes@guilford-es.com
Taylor Jones	"	"	"	Tjones3@guilford-es.com
Ken Jacobs	Town administrator	Town of Whitsett	336-449-3580	cabmkrken@aol.com
Rachel Faucette	Guilford County Em	Guilford County	336-641-2278	rfaucet@guilford-es.com
Chris Susi	Battchief	Greensboro Fire	336 430-6011	Chris.Susi@greensboro-nc.gov
Don Campbell	EM Director	Guilford County	336-641-6567	dcampbe@guilford-es.com
Kenny Cole	Town manager	Jamestown	333-454-1135	Kcole@jamestown-nc.gov

Name	Title	Organization	Phone Number	E-mail Address
Chris York	Town Planner	Town of Summerfield	336-643-8681	cyork@summerfieldnc.gov
Thearon Hooks	Mayor PT	Stokesdale	336-601-2383	drthooks@gmail.com
Alisa Hook	Town Clerk	Stokesdale	336-643-4011	stokesdale@stokesdale.org
Alfonso Heron	Deputy Sheriff	GCSO	336-641-3938	aheron@guilfordcountync.gov
Jason Geary	Eng. Supervisor	City of Greensboro	336-373-2527	jason.geary@greensboro-nc.gov
Vivian Bou Gomez	Eng. Specialist	City of GSO	336-373-7748	vivian.bou-gomez@greensboro-nc.gov
Perry Hall	HighPoint EM	Fire	362-1124	perry.hall@highpointnc.gov
Brandon Parker	Town Planner	Town of Gibsonville	336-449-4144	bparker@gibsonville.net
Frank Park	Chief plans engineer ~~Guilford Co~~	Guilford County	336-641-3753	Frank@guilfordcountync.gov
Angela Deal	Town Clerk	Town of Pleasant Garden	336-674-3002	townclerk@pleasantgarden.net

ATKINS

Name	Title	Organization	Phone Number	E-mail Address
Paul Blanchard	Public Services Director	Town of Jamestown	336 454-1138	pblanchard@jamestown-nc.gov
Ashley Royal	~~Deputy~~ Clerk Deputy	Town of Oak Ridge	336-644-7009	aroyal@oakridgenc.com
Teresa Andrews	Stormwater program Admin	Guilford Co.	336-669-3923	tandrews@guilfordcountync.gov
Bobby Carmon	Deputy Fire Marshal	Guilford Co.	336-641-6563	bcarmon@Guilford-es.com
Stephen Dew	GIS Manager	" "	641-7583	sdew@guilfordcountyga gov

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
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Debbie Shoffner	City of Greensboro		
Vicki Farmer	American RedCross	336.332.6920	vicfarmer@redcross.org
DAVID LEONARD	NCEM	336-266-2692	david.leonard@ncdps.gov
Allen Bullis	Liberty Hardware	336-771-6012	Abullis@Libertyhardware.com
Matthew Smith	Greensboro Fire	336-430-6013	Matthew.smith@greensboro-nc.gov
Chris Susi	Greensboro Fire	336 430-6011	Chris.Susi@greensboro-nc.gov
Taylor Jones	Guilford EM	336 641 2278	Tjones36@guilford-es.com
Roy Rimmer	McLeansville Fire	336-698 0244	Deputyc7@Aol.com

Meeting: Hazard Mitigation Plan 2020 Public Meeting

Date: June 13, 2019

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
William Nieland	Zink Holdings LLC	336.449.8000 X-5431	bill.nieland@zink.com
EARL STRUBLE	VERIZON		
Jessica Roth	VERIZON	336 407 0050	Jessica.Roth@VZW.COM
Ken Dolcourt	Verizon	336 708 1032	Ken.dolcourt@vzw.com
Jim Gwyn	City of High Point	336-442-5207	jim.gwyn@highpointnc.gov
Steve Naylor	Guilford County EM	336-202-8978	snaylor@envirosafe.com
JOHN MATLOCK	SHAMROCK ENVIRO	336-708-9345	JMATLOCK@SHAMROCKENVIRO.COM
Kenny Stewart	UNCG EM	336-334-3339	Kenny.Stewart@uncg.edu
Kimberly Bostic	DS Smith Packaging	336-391-6365	kimberly.bostic@dssmith.com
Michael Chestnut	Piedmont Chemical	336-885-5131 mchestnut@piedmontchemical.com	
Richard "Woody" Bland	LANXESS		RICHARD.BLAND@LANXESS.COM

Meeting: Hazard Mitigation Plan 2020 Public Meeting

Date: June 13, 2019

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
Jackie Abou-Rizk	Thomas Built Buses	336-881-6025	jacqueline.abou-rizk@daimler.com
Dan Kilgaman	KSA	336-471-7400	on file
Scott Moore	Syngenta Crop Protection	336-501-7747	scott.moore-1@syngenta.com

Meeting: Hazard Mitigation Plan 2020 Public Meeting

Date: June 13, 2019

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail

Meeting: Hazard Mitigation Plan 2020 Public Meeting

Date: June 13, 2019

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
Steven Grose	Guilford County EM	336-641-2278	sgrose@guilford-es.com
Catherine Hughes	Guilford County EM	336-641-5445	chughes@guilford-es.com
Matthew N. Smith	Greensboro Fire	336-430-6013	Matthew.smith@greensboro-nc.gov
Frank Paek	GC Planning Depart	336-641-3753	Fpaek@guilfordcountync.gov
Robert Carmon	GC Fire Marshal	336-641-6563	Rcarmon@Guilford-es.com
Bobbie Hatley	Town of Pleasant Garden	336-674-3002	townclerk@pleasantgarden.net
Ken Jacobs	Town of Whitsett	336-263-4774	WhitsettNC@Embarq.com
Stephen Dew	GC	641-7583	sdew@guilfordcountync.gov
Conor Baker	GCEM	641-5517	Cbaker@guilford-es.com
Chris York	Summerfield	336-643-5051	cyork@summerfieldnc.gov

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
Taylor Jones	Guilford EM	336-641-5393	Tjones3@guilford-es.com
Kenny Stewart	UNCG EM	336-334-3339	Kenny.Stewart@uncg.edu
Ashley Royal	Town of Oak Ridge	336-644-7009	aroyal@oakridge[illegible]nc.com
JASON GEARY	City of GREENSBORO	336-373-2527	JASON.GEARY@GREENSBORO-NC.GOV
Vivian Bou Gomez	City of Greensboro	336-373-7748	vivian.bou-gomez@greensboro-nc.gov
ALISA HAWK	Town of Stokesdale	336-643-4011	Stokesdale@Stokesdale.org
Thermon Hooks	"	"	"
Pat Blanchard	Town of Jamestown	336 454 1138	pblanchard@jamestown-nc.gov

GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Name	Organization / Agency	Phone	E-Mail
Ben Baxley	Town of Gibsonville	(336) 449-4144 ext. 8	bbaxley@gibsonville.net

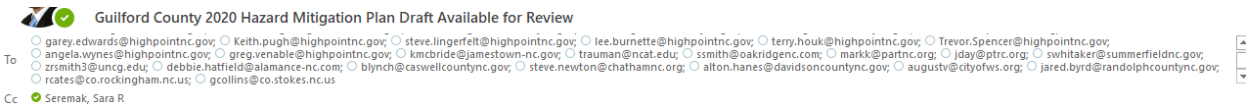
Guilford County Hazard Mitigation Plan
Sedalia Hazard Mitigation Planning Team Meeting

November 7, 2019

10:30AM-12:00PM

Name	Title	Organization	Phone Number	E-mail Address
Cam Dungee	Town Clerk	Town of Sedalia	(336) 449-1132	Sedaliatownhall@gmail.com
Taylor Jones	EM Coord.	Guilford County ES	336 641 5393	Tjones3@guilford-es.com
Ryan Wiederman	Project Manager	Atkins	919 431 5295	ryan.wiederman@atkinsglobal.com

Opportunity for Other Affected Stakeholders to Review Draft Plan



Guilford County 2020 Hazard Mitigation Plan Draft Available for Review

To: garey.edwards@highpointnc.gov; Keith.pugh@highpointnc.gov; steve.lingerfelt@highpointnc.gov; lee.burnette@highpointnc.gov; terry.houk@highpointnc.gov; Trevor.Spencer@highpointnc.gov; angela.wynes@highpointnc.gov; greg.venable@highpointnc.gov; kmcbride@jamestown-nc.gov; trauman@ncat.edu; ssmith@oakridgenc.com; markk@partnc.org; jday@ptrc.org; swhitaker@summerfieldnc.gov; zrsmith3@uncg.edu; debbie.hatfield@alamance-nc.com; blynch@caswellcountync.gov; steve.newton@chathamnc.org; alton.hanes@davidsoncountync.gov; augustv@cityofws.org; jared.byrd@randolphcountync.gov; rcates@co.rockingham.nc.us; gcollins@co.stokes.nc.us

Cc: Seremak, Sara R

Good morning everyone,

You are receiving this message because you participated in the development of the *Guilford County 2020 Hazard Mitigation Plan Update* or represent a community or organization that we would like to give an opportunity to review the draft version of this plan. This plan represents the hard work of many individuals, including Guilford County EM staff and the members of the planning team, so thanks to them for the time they devoted to the development of this plan.

The first draft is now available for review via the link below and **we strongly recommend downloading a copy of the plan rather than trying to view/review it in the online FTP site:**

https://atkins.box.com/s/m8y69x7572ireka4fdaz1r59e57l3ahb
(Download option should be in the upper right corner of the browser once you click this link. If you have trouble downloading, please let us know, we can look at some other options to get you a copy)

Please note that there are still just one or two outstanding items that you'll see highlighted in the plan. These are a couple of things we'll update once they've been completed towards the end of the process. Also, note that the Table of Contents is 'clickable' which we hope will make the plan easier to review if you are only interested in certain parts of it.

We definitely don't want anyone having this in the back of their mind when they should be enjoying time off at the very tail end of the year, so we're setting a deadline of December 20th (5 weeks) to review the plan and send us any comments/suggestions.

Please return any plan review comments by December 20th to:
Ryan Wiedenman- ryan.wiedenman@atkinsglobal.com
AND
Sara Seremak- sara.seremak@atkinsglobal.com

If anyone has any questions or issues, please don't hesitate to let us know.

Thanks in advance for taking the time to review!

Appendix E
Community Rating System

This section of the Plan provides a summary of mitigation measures that were considered by the participating jurisdictions in Guilford County to reduce their risk to the flood hazard specifically, thereby achieving the requirements set forth in Section 510 of the Community Rating System (specifically Step 7). These flood mitigation measures are based on suggested activities that have been shown to significantly reduce flood risk and have been analyzed by each of the respective communities that participate in the Guilford County Hazard Mitigation Plan. The measures are broken down into one of the following seven categories of activities that fall within the sphere of possible activities:

ACTIVITY TYPES CONSIDERED

- Preventive
- Floodplain Management
- Property Protection
- Protection of Natural and Beneficial Functions of the Floodplain
- Emergency Services
- Structural
- Public Information Activities

E.1 INTRODUCTION

This appendix to the Hazard Mitigation Plan was developed in order to enhance each jurisdiction's overall resilience to the flood hazard by documenting the steps taken, and those that need to be taken to help improve each jurisdiction's regulatory environment through a wide range of actions. In order to maximize points that can be awarded to reduce flood insurance rates through the Community Rating System, communities must thoroughly evaluate a range of mitigation measures.

Mitigation activities for consideration were evaluated by the Hazard Mitigation Planning Team. These included preventive activities, floodplain management activities, property protection activities, activities to protect the natural and beneficial functions of the floodplain, structural projects, emergency services activities, and public information activities. For each activity considered, the status (whether the action would be new or an update), pros and cons, appropriateness for the community and its flood problems, as well as an explanation of why or why not the activity is appropriate were identified by the planning team and are listed in **Table E.1** below.

TABLE E.1: MITIGATION ACTIVITIES FOR CONSIDERATION

Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate

Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate
Preventive Activities					
Comprehensive or Land Use Plan	Update	• Implements requirements to better designate growth	• May be detrimental to pre-existing buildings • Non-conforming uses may exist	Y	The land use informs more strategic development to make it more appropriate for that area.
Zoning Ordinance	Update	• Helps guide appropriate development	• May not be politically favorable	Y	Typically good for the safety and welfare of the public overall.
Stormwater Management Regulations	Update	• Manages runoff, storage, pervious pavement • Reduce localized flooding	• Can be expensive • Not everyone is open to it as it may commit a portion of someone's property to non-productive use	Y	To manage stormwater and reduce flooding and the demand on the drainage systems.
Building Codes	Update	• Guide structural development • Help to promote best practices	• Applicants may seek variances to code requirements	Y	Provides a safe structure for everyone.
Subdivision Ordinance	Update	• Creates safe and compliant subdivisions	• Cookie cutter • May be source of conflict for the public and developers • May increase cost of development	Y	Creates safer development.
Open Space Preservation	Update	• Creates opportunities for water to flow naturally • Protects natural floodplain functions • Increase recreational opportunities	• Removes option to use land for other commerce	Y	Water needs to flow somewhere, people want more green space, and this continues to reduce pervious areas. Increases value of surrounding areas.
Drainage system maintenance	Update	• Reduces flooding quickly • Keep everything running efficiently and where needed	• Expensive • Lose CRS points if not properly maintained • Could back up	Y	An efficient drainage system reduces flooding, protects properties, and costs less in the long run.
Capital improvements program	Update	• May be quicker than waiting for other funding sources • Keeping the plan in line with evolving needs	• Maintaining funding against other projects	Y	Investing locally can be more efficient and direct funding where needed most

Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate
Floodplain Management Activities					
Floodplain mapping	Update	• Provide information to public • Identify at-risk areas	• Costly! • Slow and technical • Not always accurate	Y	It is appropriate because it impacts everyone, helps to rate insurance, and provides level of risk.
Future conditions mapping	New	• Can provide better information for future planning • Maps bring future conditions to reality	• Can help deter development • May feel overwhelming or be disputed	N	Difficult to implement at this time.
Freeboard requirements	Update	• Better protected property and people • Protects investments • Significant savings on flood insurance	• Discourages developers • May not be politically feasible	Y	It protects communities and reduces exposure.
Setbacks	Update	• Can reduce impervious surface area	• May restrict development	Y	Help drive development to the way it should be to reduce flooding.
No-rise ordinance	Update	• Not increasing runoff	• Cost to implement	Y	To reduce flooding while allowing development.
Prohibit fill in floodplain	Update	• Allows place for water to go	• Requires changing development mentality	Y	To lessen the flooding on existing homes.
Compensatory storage requirement for new construction	Update	• No net impact	• Increase cost • Finding space to do it	Y	So that new development does not impact existing development or built environment.
Regulate development in upland areas	New	• Reduce water volume coming from upland areas	• May require coordination on a regional scale	N	At this time, this may be too difficult to coordinate among many stakeholders.
Require drainage study with new development	Update	• Modeling existing risks and impacts of new development	• Money • Time • Slows development	Y	Helps model potential impacts in new development areas.
Program to incentivize rain gardens	New	• Look nice • Reduces impermeable areas	• Who is in charge of maintenance and management	N	No available funding at this time.
Permeable surface requirements for new construction	New	• Incentives • Reduces impermeable areas	• May be issues from the development community in implementing	N	May be difficult to implement.

Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate
Limit/prevent construction in floodplain	Update	• Reduces impermeable areas • Reduces property/people at risk	• Difficult politically to completely prevent construction	Y	Providing limits on construction in floodplain can help reduce development at risk to flooding
Property Protection Activities					
Acquisition	Update	• Create storage capacity • Removes structure from risk	• Lose tax base	Y	May not be feasible in areas with high tax bases. Needs to be balanced and vetted between benefits and loss of revenue.
Retrofitting	Update	• Helps maintain continuity of operations	• May leave facilities in risk zones	Y	See insurance benefits and protect key facilities.
Flood Insurance	Update	• Provides fall back for owners who are flooded	• Damage still may occur, and recovery efforts take time	Y	Helps those who remain in risk zones to protect asset.
Elevation	New	• Reduces flood risk of individual structures	• Some populations may have difficulty with stairs • Leaves structures in risk zones	Y	Helps maintain tax base but protects structures.
Relocation	New	• Historic structures can be saved	• Moving structures may not be feasible or cost-effective	Y	This will likely be difficult to implement but will be considered for special cases.
Sewer backup protection	New	• Reduce damages and health risks	• Cost exceed benefits	N	May be difficult to implement programmatically and cost-effectively
Safe rooms	New	• Protect life	• Must locate in areas of high-density population to have effect	Y	These can protect life in certain areas
Activities to Protect the Natural and Beneficial Functions of the Floodplain					
Wetlands Protection	New	• First level of protection • Environmentally feasible	• Economic feasibility	Y	Would help in the protection of critical areas. Connected to erosion and sediment control.
Erosion and sediment control	Update	• Reduces risk to people and property	• Economic feasibility	Y	Connected to wetlands protection.
Natural area restoration	New	• Provide areas for filtration and retention	• Legal feasibility • Economic feasibility • Political feasibility	Y	Can help restore flood prone areas to natural state.

Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate
Water quality improvement	New	• Deliver cleaner water to our lakes • Enhancing recreational activities	• Administrative feasibility	Y	Important to care for water quality as it impacts human health
Coastal barrier protection	New	• N/A	• N/A	N	Community is not located near a coastal area.
Environmental corridors	New	• Likely created as open space that will act as pervious surface	• May require large areas to be preserved and undeveloped	N	Difficult to implement given amount of existing development
Emergency Services Activities					
Hazard warning systems	Update	• Public stays informed	• Cost and implementation • Educating public	Y	Increases public safety by giving advanced warning.
Evacuation planning and management	Update	• Promotes situation awareness and helps get people out of harm's way	• Often not necessary or possible in non-coastal areas	Y	Public safety, enhance efficiency of emergency response.
Shelter operations planning	Update	• Provides safe haven for public	• Cost • Manpower • Safety • Special needs	Y	Important part of public safety in hazard events.
Emergency response training and exercises	Update	• Community officials are more prepared • Fills gaps and needs	• Cost • Time/scheduling	Y	Emergency Management responses more efficient.
Sandbagging	Update	• Protects areas at risk temporarily • Can be deployed as last-minute solution	• Not long-term solution • Cost • Manpower • Storage	Y	Should not be considered long term solution, but can be helpful.
Structural Projects					
Levees	New	• Can help keep water away from development	• Water overtopping, failure	N	Levees are typically not a viable solution in community.
Reservoirs	Update	• Water can be held and released slowly	• Reservoirs may overtop if not managed	Y	Reservoirs can be useful part of the overall solution and provide drinking water
Channel Modifications	Update	• Water flow improvement	• Extremely costly	Y	This can help with areas where water needs to be controlled and managed.
Detention/ retention basins	Update	• Water can be held and released slowly	• Extremely costly	Y	Less strain on the drainage system at one time.

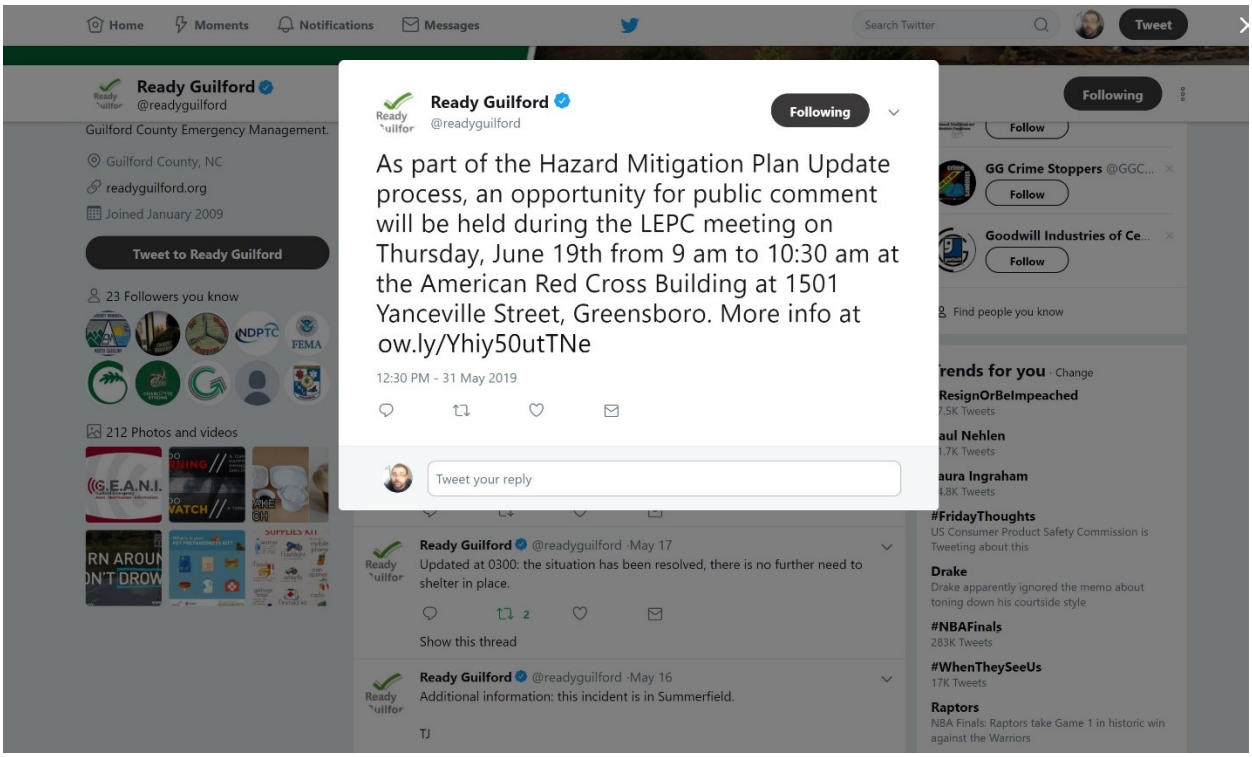
Activity	New or Update	Pros	Cons	Appropriate for the Community and its Flood Problems (Y/N)	Explanation of why or why not appropriate
Stormwater diversions	New	• Water can be directed to areas where it won't cause harm	• Extremely costly	Y	These may be used as part of an overall stormwater solution.
Dams	Update	• Can help keep water away from development	• Water overtopping, failure	Y	Dams can help provide protection and be amenities to the community.
Floodwalls	New	• N/A	• N/A	N	Typically used in coastal areas and community is not located near a coastal area.
Storm drain improvements	Update	• Improve drainage and help move water away from development	• Costly	Y	These may be used as part of an overall stormwater solution
Public Information Activities					
Outreach Projects	Update	• Keep public better informed • Keep public better educated	• Tech maintenance • Tech education	Y	Safety awareness.
Environmental Education Programs	Update	• Early education = greater information retention	• Time	Y	Geared to every age group.
Map information	Update	• Help make residents aware of current flood insurance	• May not fully encapsulate all areas of risk	Y	Assist with floodplain/ insurance understanding.
Real estate disclosure	Update	• Involves development community	• Difficult to get involved	Y	Helps get all sides of the flood insurance industry involved.
Public postings/ displays (e.g. at library)	Update	• Help make residents aware of flood risk	• These may only reach certain population groups	Y	Acts as one component of the public outreach strategy.
School education program	Update	• Early education = greater information retention	• Targeted at only a small part of population	Y	Helps long-term understanding of population.
Speaker series	New	• May be more informative and engaging for public	• Only reaches audience during certain times	Y	Can help get people interested and engaged in flood risk.
Hazard expositions	New	• Provides interactive opportunity	• Doesn't have wide-ranging reach	Y	Can be part of the solution to engage public.

Appendix F
Public Involvement

This appendix includes:

1. Public Outreach Documentation
2. Public Survey Summary Results

Guilford County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Joined January 2009
Tweet to Ready Guilford
23 Followers you know
212 Photos and videos
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#ResignOrBeImpeached
7.5K Tweets
Paul Nehlen
1.7K Tweets
Laura Ingraham
4.8K Tweets
#FridayThoughts
US Consumer Product Safety Commission is Tweeting about this
Drake
Drake apparently ignored the memo about toning down his courtside style
#NBAFinals
283K Tweets
#WhenTheySeeUs
17K Tweets
Raptors
NBA Finals: Raptors take Game 1 in historic win against the Warriors
Ready Guilford
@readyguilford
Following
As part of the Hazard Mitigation Plan Update process, an opportunity for public comment will be held during the LEPC meeting on Thursday, June 19th from 9 am to 10:30 am at the American Red Cross Building at 1501 Yanceville Street, Greensboro. More info at ow.ly/Yhiy50utTNe
12:30 PM - 31 May 2019
Tweet your reply
Ready Guilford @readyguilford ·May 17
Updated at 0300: the situation has been resolved, there is no further need to shelter in place.
Show this thread
Ready Guilford @readyguilford ·May 16
Additional information: this incident is in Summerfield.
TJ

Emergency Management Coordinator Taylor Jones, Guilford County Em...

Hazard Mitigation Plan - Public Meeting

Guilford County is updating our Hazard Mitigation Plan and looking for public input! Hazard Mitigation is how we as a community plan to reduce the impact of various hazards that can impact Guilford County. The current version of the plan can be found at https://www.guilfordcountync.gov/our-county/emergency-services/emergency-management/mitigation.

This is a required update that takes place every 5 years, with public input and meetings. A public comment period will be held during the June 13th Local Emergency Planning Committee (LEPC) meeting at the American Red Cross building, 1501 Yanceyville Street, Greensboro. The LEPC meeting will run from 09:00 to 10:30 and anyone from the public is welcome to attend.

Hazard Mitigation Program | Guilford County, NC

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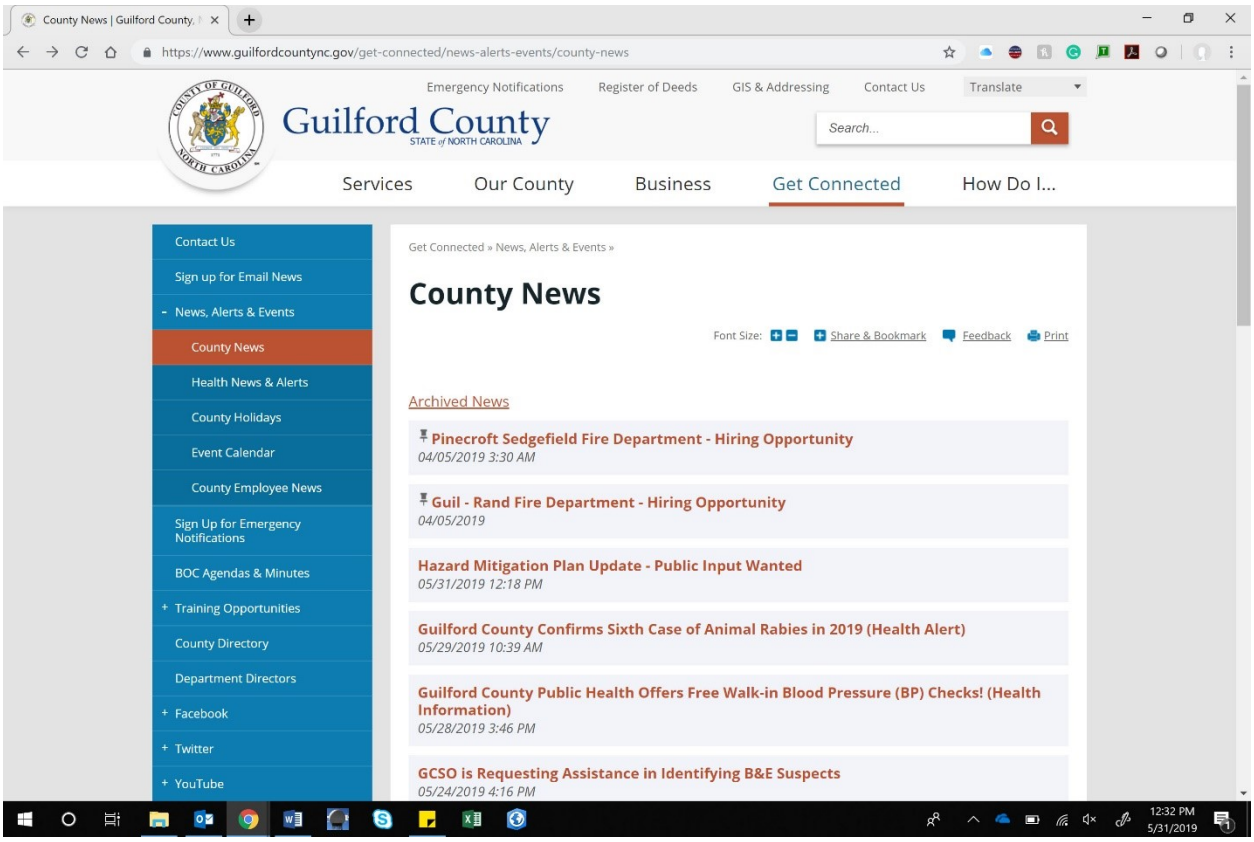
Just now · Subscribers of Guilford County Emergency Management

Reply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Pinecroft Sedgefield Fire Department - Hiring Opportunity
04/05/2019 3:30 AM
Guil - Rand Fire Department - Hiring Opportunity
04/05/2019
Hazard Mitigation Plan Update - Public Input Wanted
05/31/2019 12:18 PM
Guilford County Confirms Sixth Case of Animal Rabies in 2019 (Health Alert)
05/29/2019 10:39 AM
Guilford County Public Health Offers Free Walk-in Blood Pressure (BP) Checks! (Health Information)
05/28/2019 3:46 PM
GCSO is Requesting Assistance in Identifying B&E Suspects
05/24/2019 4:16 PM
12:32 PM
5/31/2019


Hazard Mitigation Plan Update
https://www.guilfordcountync.gov/Home/Components/News/News/1665/16
Emergency Notifications
Register of Deeds
GIS & Addressing
Contact Us
Translate
Guilford County
STATE of NORTH CAROLINA
Search...
Services
Our County
Business
Get Connected
How Do I...
Contact Us
Sign up for Email News
- News, Alerts & Events
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Hazard Mitigation Plan Update - Public Input Wanted
Post Date: 05/31/2019 12:18 PM
Guilford County is updating our Hazard Mitigation Plan and looking for public input! Hazard Mitigation is how we as a community plan to reduce the impact of various hazards that can impact Guilford County. The current version of the plan can be found at https://www.guilfordcountync.gov/our-county/emergency-services/emergency-management/mitigation. This is a required update that takes place every 5 years, with public input and meetings.
A public comment period will be held during the June 13th Local Emergency Planning Committee (LEPC) meeting at the American Red Cross building, 1501 Yanceyville Street, Greensboro. The LEPC meeting will run from 09:00 AM to 10:30 AM and anyone from the public is welcome to attend.
Return to full list >>
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County News

Guilford County Hazard Mitigation Plan Update Survey

Post Date: 06/27/2019 11:25 AM

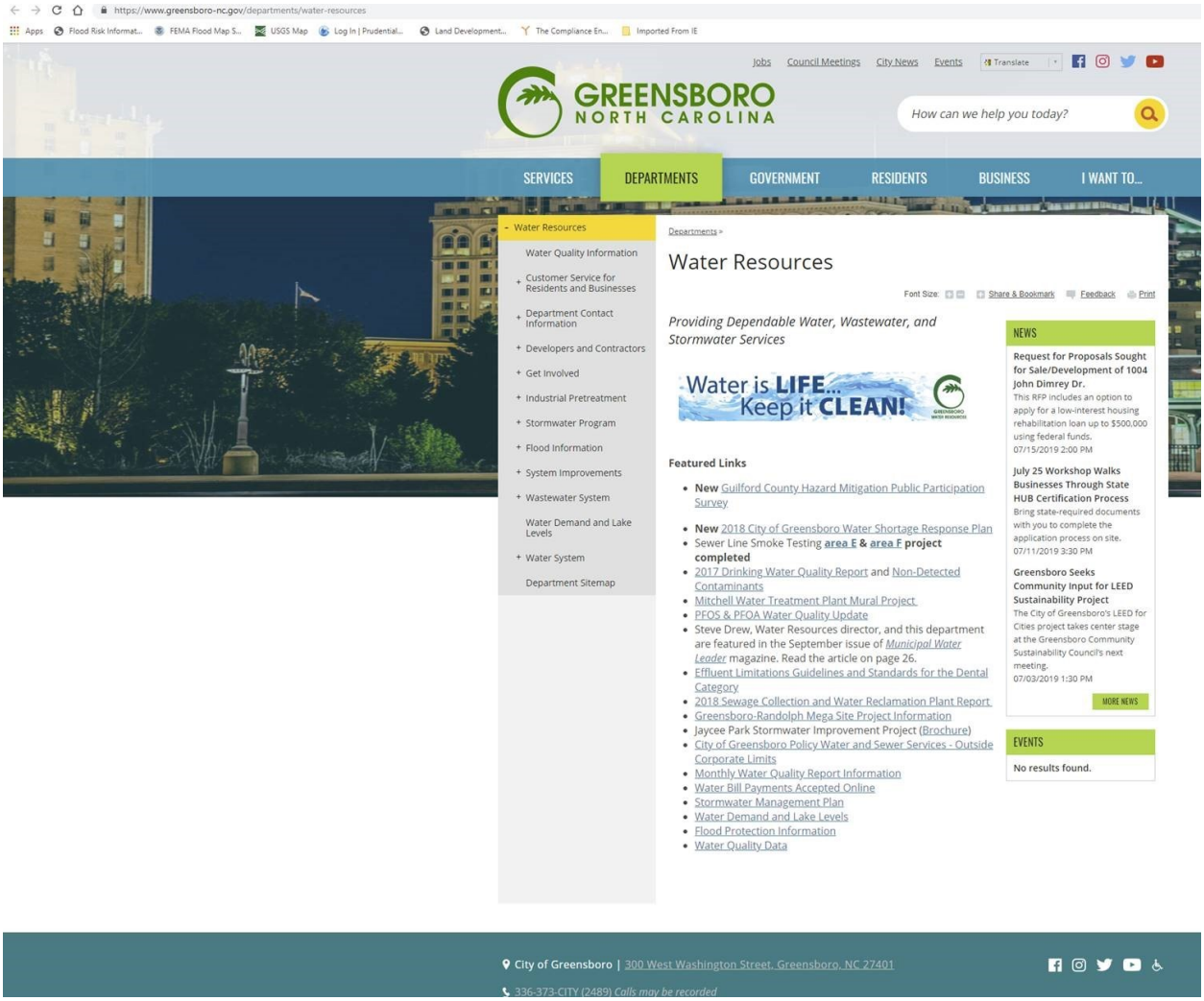
GUILFORD COUNTY
DEPARTMENT OF EMERGENCY SERVICES
EMERGENCY MANAGEMENT DIVISION

Guilford County is updating its Hazard Mitigation Plan and looking for public input! Hazard Mitigation is how we as a community plan to reduce the impact of various hazards that can impact Guilford County. The current version of the plan can be found at https://www.guilfordcountync.gov/our-county/emergency-services/emergency-management/mitigation.

As part of this process, we are asking Guilford County residents to fill out a short Hazard Mitigation survey. The survey can be found at https://forms.gle/cRezsTQU7RnmFwve8. Any feedback is anonymous and will provide us with valuable information about how the county and its municipalities should approach mitigation in the future!

Return to full list >>

Greensboro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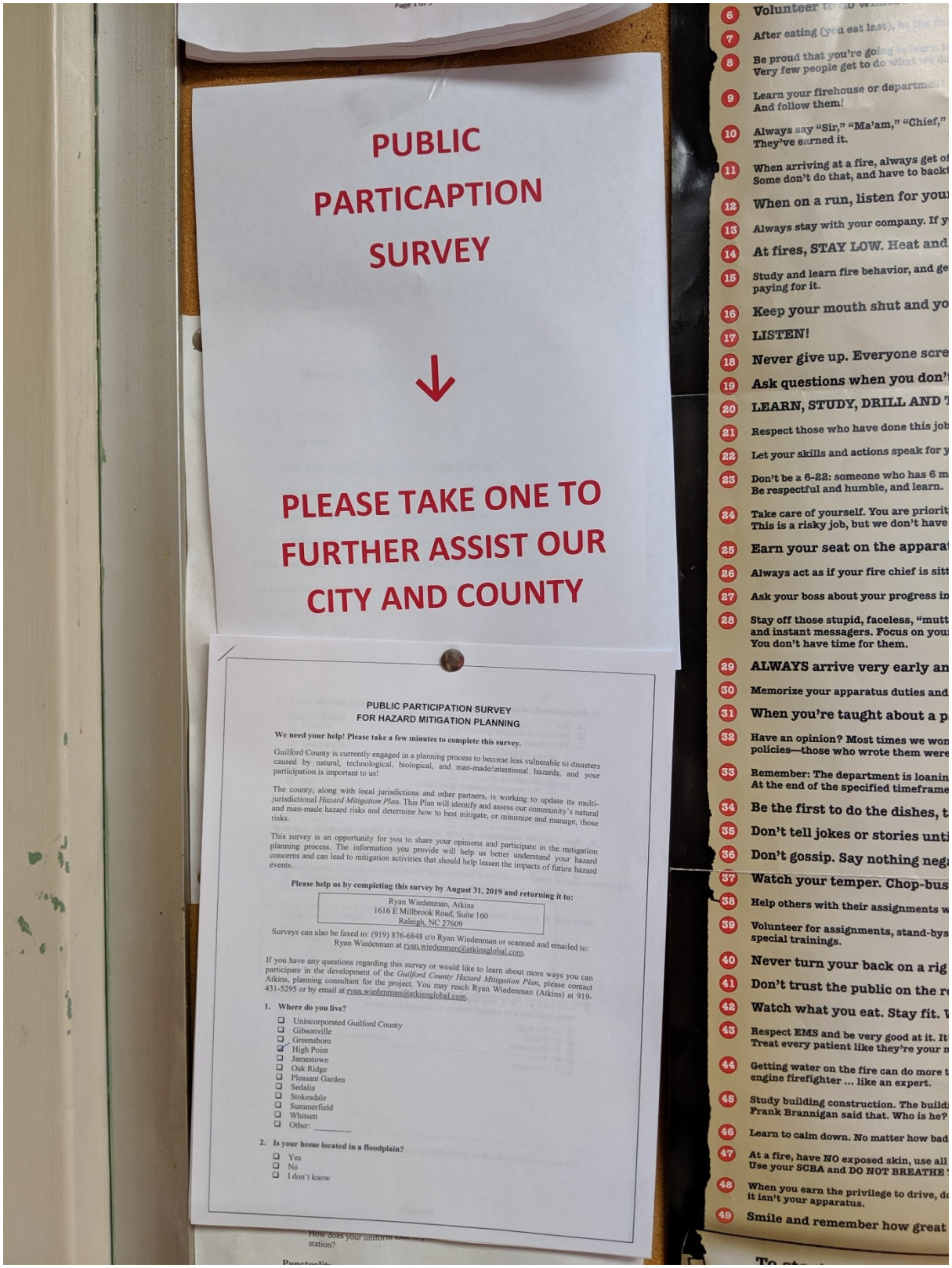
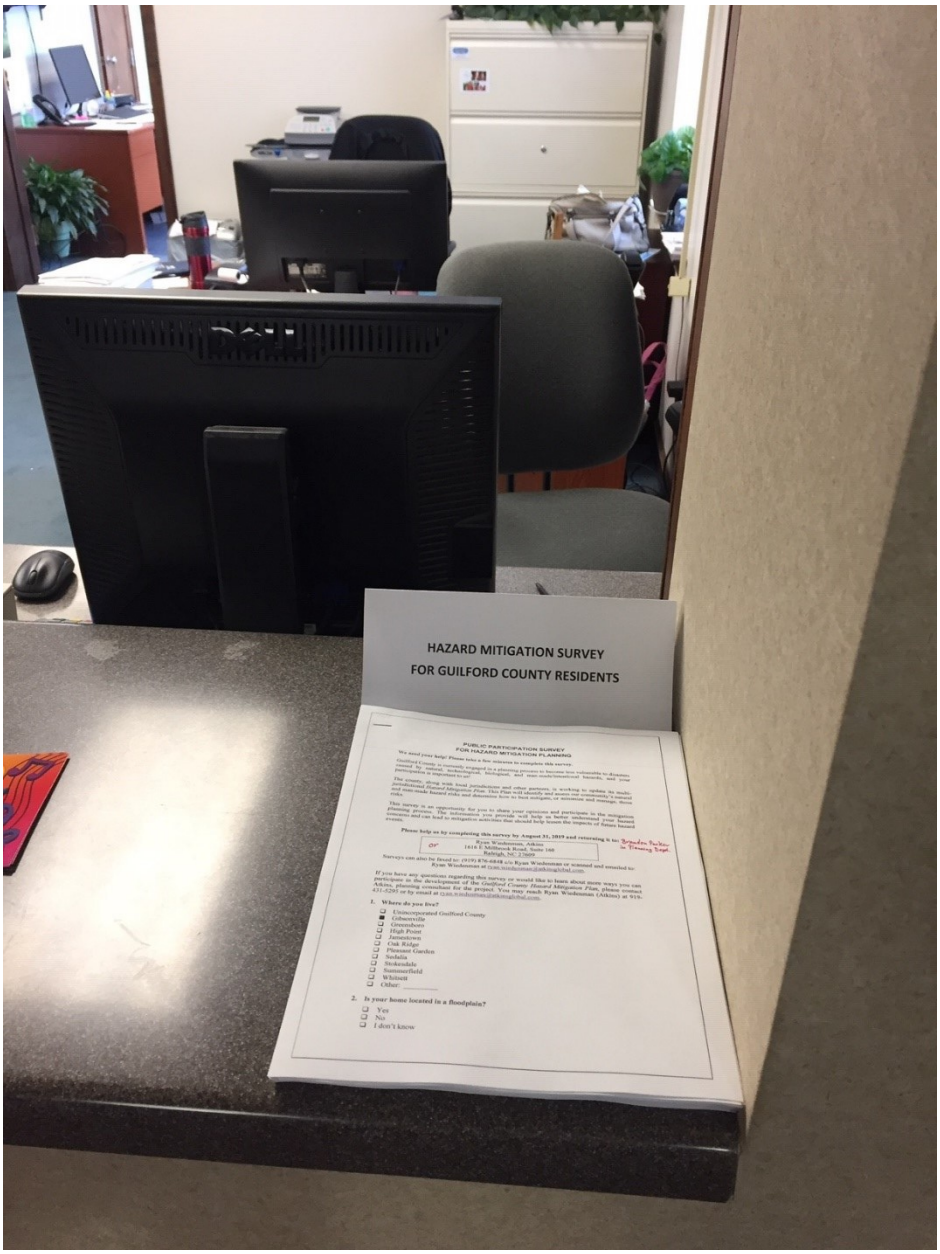
New Guilford County Hazard Mitigation Public Participation Survey
New 2018 City of Greensboro Water Shortage Response Plan
Sewer Line Smoke Testing area E & area F project completed
2017 Drinking Water Quality Report and Non-Detected Contaminants
Mitchell Water Treatment Plant Mural Project
PFOS & PFOA Water Quality Update
Steve Drew, Water Resources director, and this department are featured in the September issue of Municipal Water Leader magazine. Read the article on page 26.
Effluent Limitations Guidelines and Standards for the Dental Category
2018 Sewage Collection and Water Reclamation Plant Report
Greensboro-Randolph Mega Site Project Information
Jaycee Park Stormwater Improvement Project (Brochure)
City of Greensboro Policy Water and Sewer Services - Outside Corporate Limits
Monthly Water Quality Report Information
Water Bill Payments Accepted Online
Stormwater Management Plan
Water Demand and Lake Levels
Flood Protection Information
Water Quality Data
NEWS
Request for Proposals Sought for Sale/Development of 1004 John Dimrey Dr.
This RFP includes an option to apply for a low-interest housing rehabilitation loan up to $500,000 using federal funds.
07/15/2019 2:00 PM
July 25 Workshop Walks Businesses Through State HUB Certification Process
Bring state-required documents with you to complete the application process on site.
07/11/2019 3:30 PM
Greensboro Seeks Community Input for LEED Sustainability Project
The City of Greensboro's LEED for Cities project takes center stage at the Greensboro Community Sustainability Council's next meeting.
07/03/2019 1:30 PM
MORE NEWS
EVENTS
No results found.
City of Greensboro | 300 West Washington Street, Greensboro, NC 27401
336-373-CITY (2489) Calls may be recorded

High Point


PUBLIC
PARTICAPTION
SURVEY
PLEASE TAKE ONE TO
FURTHER ASSIST OUR
CITY AND COUNTY
PUBLIC PARTICIPATION SURVEY
FOR HAZARD MITIGATION PLANNING
We need your help! Please take a few minutes to complete this survey.
Guilford County is currently engaged in a planning process to become less vulnerable to disasters caused by natural, technological, biological, and man-made/intentional hazards, and your participation is important to us!
The county, along with local jurisdictions and other partners, is working to update its multi-jurisdictional Hazard Mitigation Plan. 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 August 31, 2019 and returning it to:
Ryan Wiedenman, Atkins
1616 E Millbrook Road, Suite 160
Raleigh, NC 27609
Surveys can also be faxed to: (919) 876-6848 c/o Ryan Wiedenman or scanned and emailed to: Ryan Wiedenman at ryan.wiedenman@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 Guilford County Hazard Mitigation Plan, please contact Atkins, planning consultant for the project. You may reach Ryan Wiedenman (Atkins) at 919-431-5295 or by email at ryan.wiedenman@atkinsglobal.com.
1. Where do you live?
Unincorporated Guilford County
Gibsonville
Greensboro
High Point
Jamestown
Oak Ridge
Pleasant Garden
Sedalia
Stokesdale
Summerfield
Whitsett
Other: _____
2. Is your home located in a floodplain?
Yes
No
I don't know
6 Volunteer
7 After eating (you eat last),
8 Be proud that you're
Very few people get to do
9 Learn your firehouse or
And follow them!
10 Always say "Sir," "Ma'am," "Chief,"
They've earned it.
11 When arriving at a fire, always get
Some don't do that, and have to
12 When on a run, listen for
13 Always stay with your company.
14 At fires, STAY LOW. Heat and
15 Study and learn fire behavior, and
paying for it.
16 Keep your mouth shut and
17 LISTEN!
18 Never give up. Everyone
19 Ask questions when you
20 LEARN, STUDY, DRILL AND
21 Respect those who have done this
22 Let your skills and actions speak for
23 Don't be a 6-22: someone who has 6
Be respectful and humble, and learn.
24 Take care of yourself. You are
This is a risky job, but we don't have
25 Earn your seat on the
26 Always act as if your fire chief is
27 Ask your boss about your progress
28 Stay off those stupid, faceless, "
and instant messagers. Focus on
You don't have time for them.
29 ALWAYS arrive very early
30 Memorize your apparatus duties
31 When you're taught about a
32 Have an opinion? Most times we
policies—those who wrote them
33 Remember: The department is
At the end of the specified timeframe
34 Be the first to do the dishes,
35 Don't tell jokes or stories
36 Don't gossip. Say nothing
37 Watch your temper. Chop-
38 Help others with their assignments
39 Volunteer for assignments, stand-bys
special trainings.
40 Never turn your back on a
41 Don't trust the public on the
42 Watch what you eat. Stay fit.
43 Respect EMS and be very good at it.
Treat every patient like they're your
44 Getting water on the fire can do more
engine firefighter ... like an expert.
45 Study building construction. The
Frank Brannigan said that. Who is he?
46 Learn to calm down. No matter how
47 At a fire, have NO exposed skin, use
Use your SCBA and DO NOT BREATHE
48 When you earn the privilege to drive,
it isn't your apparatus.
49 Smile and remember how great

Gibsonville


HAZARD MITIGATION SURVEY
FOR GUILFORD COUNTY RESIDENTS
PUBLIC PARTICIPATION SURVEY
FOR HAZARD MITIGATION PLANNING
1. Where do you live?
Unincorporated Guilford County
Gibsonville
Greensboro
High Point
Jamestown
Oak Ridge
Pleasant Garden
Sedalia
Stokesdale
Summerfield
Whitsett
Other
2. Is your home located in a floodplain?
Yes
No
I don't know

Guilford County Hazard Mitigation Plan Update Survey

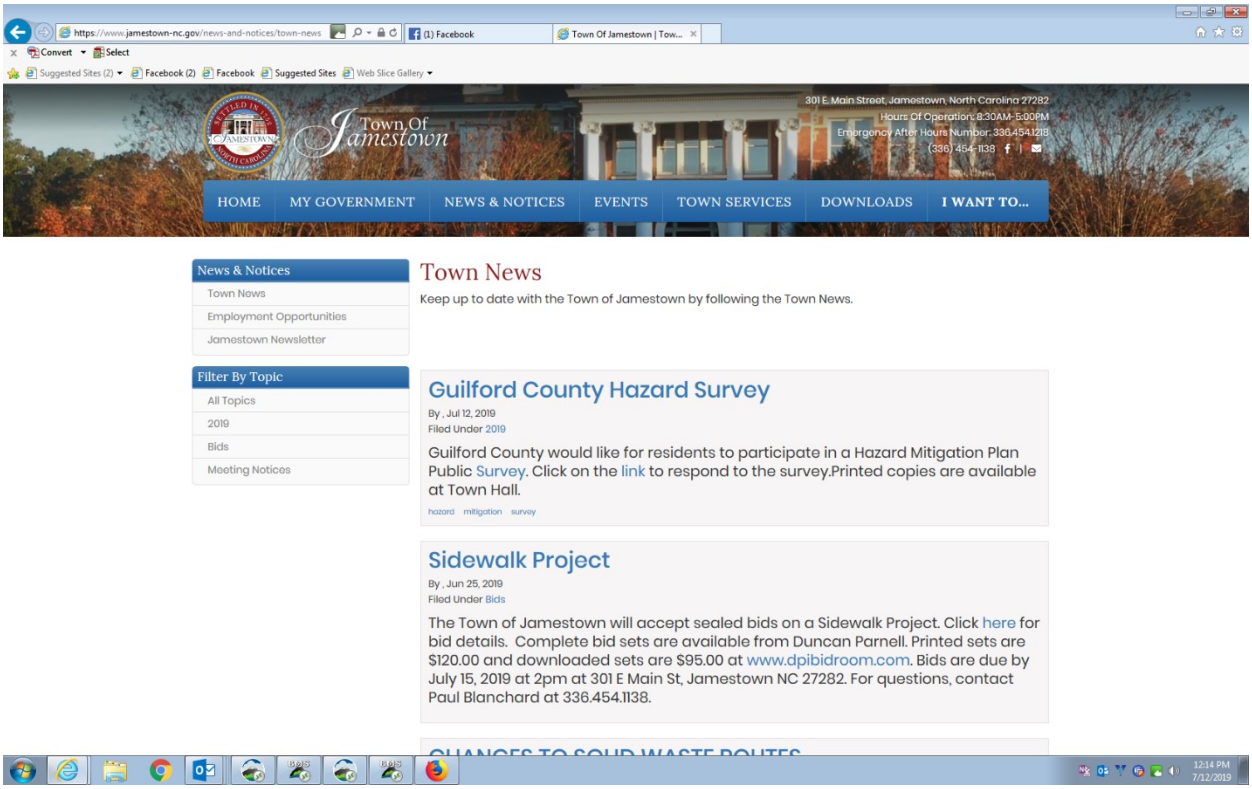
Guilford County is updating its Hazard Mitigation Plan and looking for public input! Hazard Mitigation is how we as a community plan to reduce the impact of various hazards that can impact Guilford County. The current version of the plan can be found at https://www.guilfordcountync.gov/our-county/emergency-services/emergency-management/mitigation.

As part of this process, we are asking Guilford County residents to fill out a short Hazard Mitigation survey. The survey can be found at https://forms.gle/cRezsTQU7RnmFwve8and will be available through August 31st. Any feedback is anonymous and will provide us with valuable information about how the county and its municipalities should approach mitigation in the future!

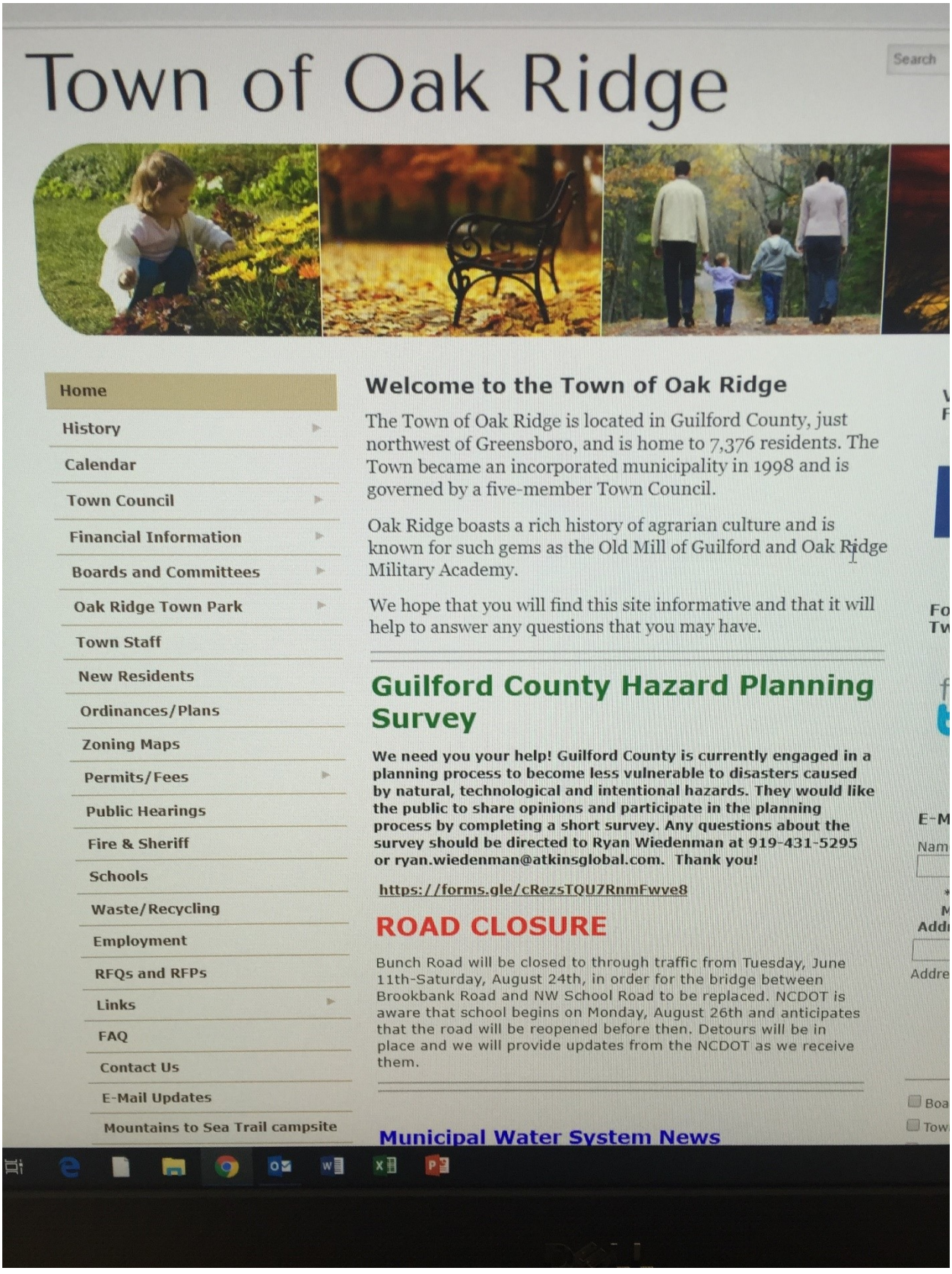
More info at https://www.guilfordcountync.gov/Home/Components/News/News/1707/16.

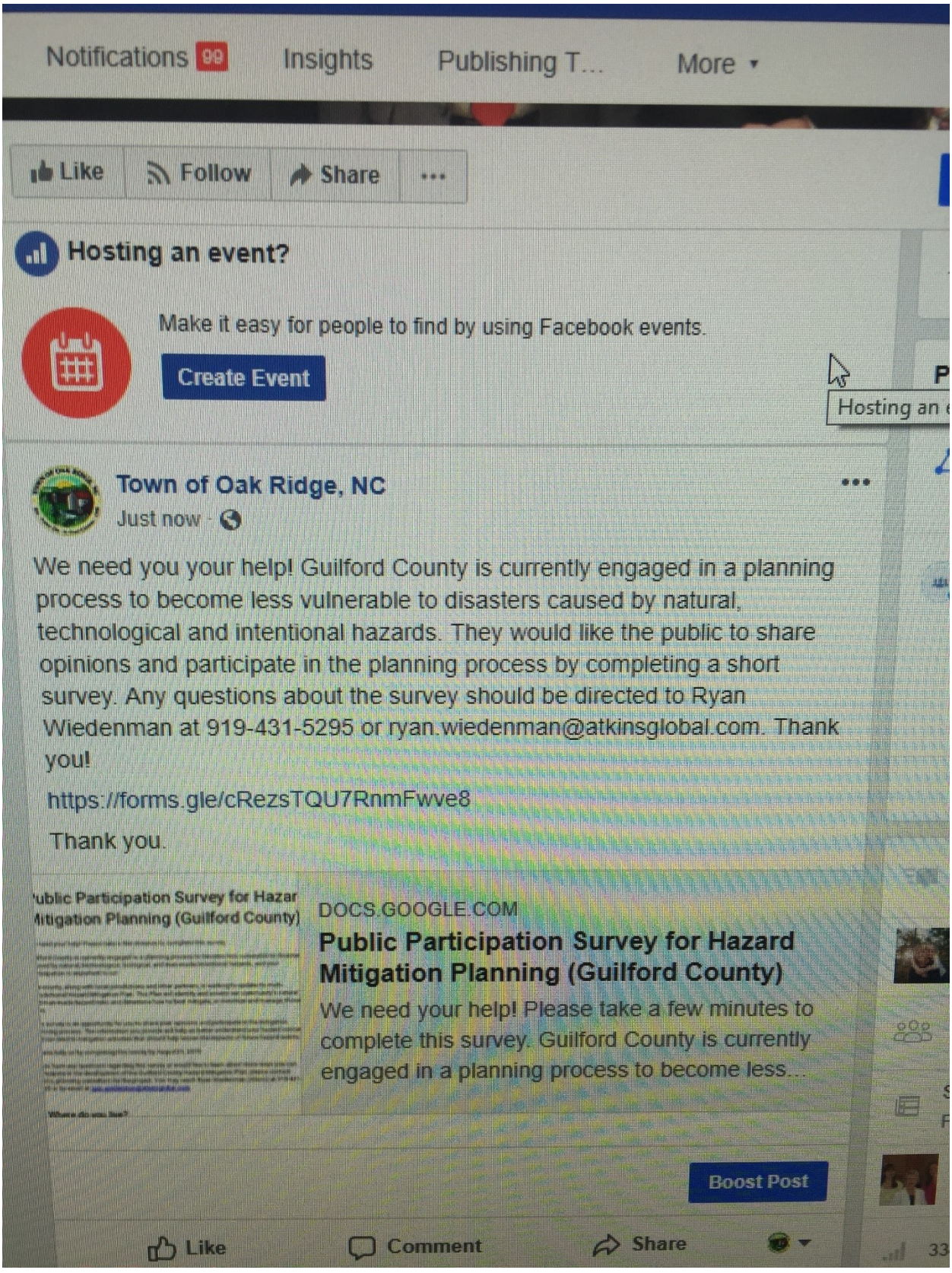
read more

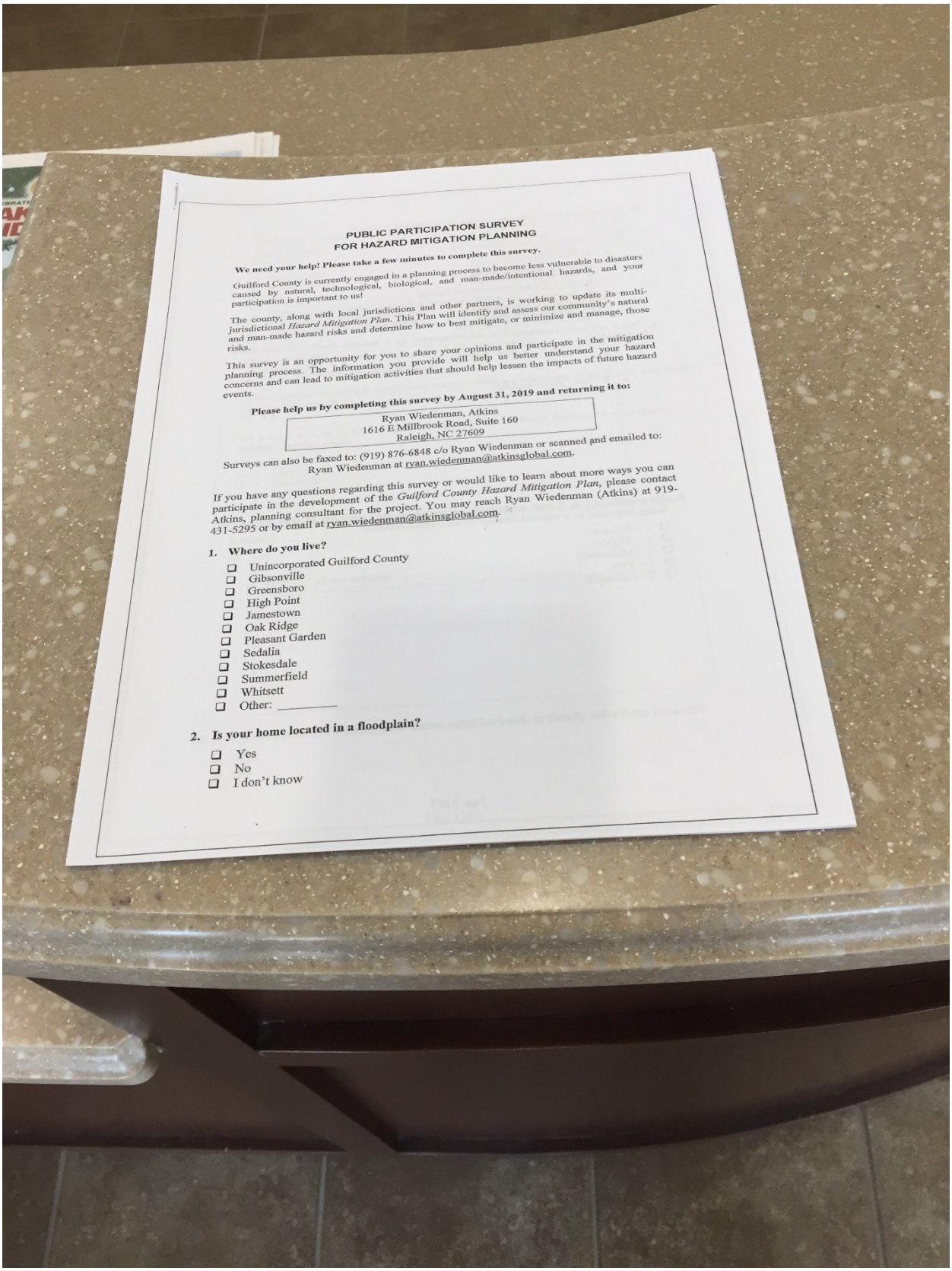
Jamestown


https://www.jamestown-nc.gov/news-and-notices/town-news
(1) Facebook
Town Of Jamestown | Tow...
Convert
Select
Suggested Sites (2)
Facebook (2)
Facebook
Suggested Sites
Web Slice Gallery
Town Of Jamestown
301 E. Main Street, Jamestown, North Carolina 27282
Hours Of Operation: 8:30AM-5:00PM
Emergency After Hours Number: 336.454.1138
(336) 454-1138
HOME
MY GOVERNMENT
NEWS & NOTICES
EVENTS
TOWN SERVICES
DOWNLOADS
I WANT TO...
News & Notices
Town News
Employment Opportunities
Jamestown Newsletter
Filter By Topic
All Topics
2019
Bids
Meeting Notices
Town News
Keep up to date with the Town of Jamestown by following the Town News.
Guilford County Hazard Survey
By , Jul 12, 2019
Filed Under 2019
Guilford County would like for residents to participate in a Hazard Mitigation Plan Public Survey. Click on the link to respond to the survey.Printed copies are available at Town Hall.
hazard mitigation survey
Sidewalk Project
By , Jun 25, 2019
Filed Under Bids
The Town of Jamestown will accept sealed bids on a Sidewalk Project. Click here for bid details. Complete bid sets are available from Duncan Parnell. Printed sets are $120.00 and downloaded sets are $95.00 at www.dpibidroom.com. Bids are due by July 15, 2019 at 2pm at 301 E Main St, Jamestown NC 27282. For questions, contact Paul Blanchard at 336.454.1138.
12:14 PM
7/12/2019

Oak Ridge


Town of Oak Ridge
Search
Home
History
Calendar
Town Council
Financial Information
Boards and Committees
Oak Ridge Town Park
Town Staff
New Residents
Ordinances/Plans
Zoning Maps
Permits/Fees
Public Hearings
Fire & Sheriff
Schools
Waste/Recycling
Employment
RFQs and RFPs
Links
FAQ
Contact Us
E-Mail Updates
Mountains to Sea Trail campsite
Welcome to the Town of Oak Ridge
The Town of Oak Ridge is located in Guilford County, just northwest of Greensboro, and is home to 7,376 residents. The Town became an incorporated municipality in 1998 and is governed by a five-member Town Council.
Oak Ridge boasts a rich history of agrarian culture and is known for such gems as the Old Mill of Guilford and Oak Ridge Military Academy.
We hope that you will find this site informative and that it will help to answer any questions that you may have.
Guilford County Hazard Planning Survey
We need you your help! Guilford County is currently engaged in a planning process to become less vulnerable to disasters caused by natural, technological and intentional hazards. They would like the public to share opinions and participate in the planning process by completing a short survey. Any questions about the survey should be directed to Ryan Wiedenman at 919-431-5295 or ryan.wiedenman@atkinsglobal.com. Thank you!
https://forms.gle/cRezsTQU7RnmFwve8
ROAD CLOSURE
Bunch Road will be closed to through traffic from Tuesday, June 11th-Saturday, August 24th, in order for the bridge between Brookbank Road and NW School Road to be replaced. NCDOT is aware that school begins on Monday, August 26th and anticipates that the road will be reopened before then. Detours will be in place and we will provide updates from the NCDOT as we receive them.
Municipal Water System News


Notifications 99
Insights
Publishing T...
More
Like
Follow
Share
Hosting an event?
Make it easy for people to find by using Facebook events.
Create Event
Town of Oak Ridge, NC
Just now
We need you your help! Guilford County is currently engaged in a planning process to become less vulnerable to disasters caused by natural, technological and intentional hazards. They would like the public to share opinions and participate in the planning process by completing a short survey. Any questions about the survey should be directed to Ryan Wiedenman at 919-431-5295 or ryan.wiedenman@atkinsglobal.com. Thank you!
https://forms.gle/cRezsTQU7RnmFwve8
Thank you.
DOCS.GOOGLE.COM
Public Participation Survey for Hazard Mitigation Planning (Guilford County)
We need your help! Please take a few minutes to complete this survey. Guilford County is currently engaged in a planning process to become less...
Boost Post
Like
Comment
Share



PUBLIC PARTICIPATION SURVEY
FOR HAZARD MITIGATION PLANNING

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Raleigh, NC 27609

Surveys can also be faxed to: (919) 876-6848 c/o Ryan Wiedenman or scanned and emailed to: Ryan Wiedenman at ryan.wiedenman@atkinsglobal.com.

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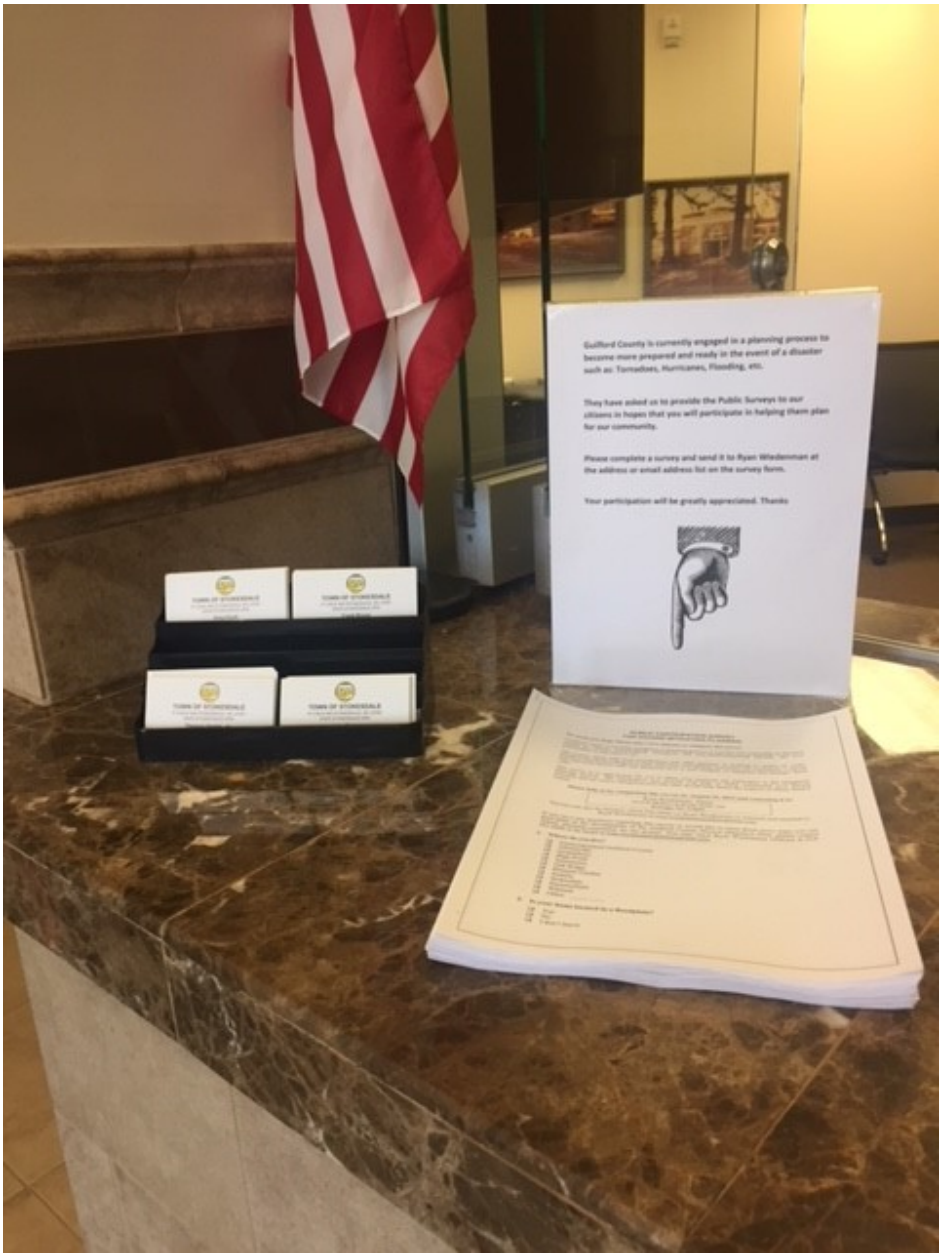
1. **Where do you live?**
   - ❑ Unincorporated Guilford County
   - ❑ Gibsonville
   - ❑ Greensboro
   - ❑ High Point
   - ❑ Jamestown
   - ❑ Oak Ridge
   - ❑ Pleasant Garden
   - ❑ Sedalia
   - ❑ Stokesdale
   - ❑ Summerfield
   - ❑ Whitsett
   - ❑ Other: _____

2. **Is your home located in a floodplain?**
   - ❑ Yes
   - ❑ No
   - ❑ I don't know

Stokesdale


Guilford County is currently engaged in a planning process to become more prepared and ready in the event of a disaster such as: Tornadoes, Hurricanes, Flooding, etc.
They have asked us to provide the Public Surveys to our citizens in hopes that you will participate in helping them plan for our community.
Please complete a survey and send it to Ryan Wiedenman at the address or email address list on the survey form.
Your participation will be greatly appreciated. Thanks

Stokesdale Town Hall
P O Box 465
8325 Angel Pardue Road
Stokesdale, NC 27357
(336) 643-4011

General Information
News & Notices
Parks
Urban Archery Season
Development Ordinances

Thank you, Mayor John Flynt

JUNE 10-JUNE 12 TOWN HALL AND TOWN PARK PARKING LOTS AND ROAD TO THE PARK WILL BE CLOSED FOR RESURFACING.
PLEASE PARDON THE INCONVIENCE
THERE WILL BE A SMALL AREA TO THE LEFT OF THE TOWN HALL BUILDING OPEN FOR ANYONE NEEDING TO COME INTO TOWN HALL.

2019 ELECTION FILING SCHEDULE
Friday, July 5, 2019 at Noon – Friday, July 19, 2019 at Noon for the following Municipalities:
High Point, Jamestown, Pleasant Garden, Sedalia, Oak Ridge, Stokesdale, Summerfield, Whitsett, Gibsonville, Sedgefield Sanitary District, City of Burlington, and Town of Kernersville
2019 ELECTION SCHEDULE TUESDAY, OCTOBER 8, 2019 MUNICIPAL PRIMARIES
to be conducted only in the necessary Municipal Precincts of High Point, Jamestown, Pleasant Garden, City of Burlington TUESDAY,
NOVEMBER 5, 2019 MUNICIPAL ELECTION
To be conducted in the Municipalities of High Point, Jamestown, Pleasant Garden, Sedalia, Oak Ridge, Stokesdale, Summerfield, Whitsett, Gibsonville, Sedgefield Sanitary District, City of Burlington, Town of Kernersville. Date Issued: January 9, 2019

Guilford County is currently engaged in a planning process to become better prepared to handle emergencies whether they be weather related or other types of disasters. They would like the public to share opinions and participate in the planning process by completing a short survey. Please go to: https://forms.gle/cRezsTOU7RnmFwve8 and fill out the survey. Thank you.

We have started a new flushing program. We will be flushing weekly each Tuesday and Friday around 1pm for 30 minutes each day on Nuegent Drive once warmer spring weather is here to stay We will not be flushing during the winter months. And will notify when we change locations. Thank you.

Town of Stokesdale Water Customers Please Note: After office hours and on holidays in the event of a TRUE water emergency (water main breaks, water gushing from the ground) Please call Mayor Flynt at 336-687-6019. He will contact our water contractors. For Water Disruption, during routine business hours, please call Town Hall at 336-643-4011 and someone will assist you with your account. Thank you.

To view the Town's Development Ordinances, please see the link below
https://www.municode.com/library/nc/stokesdale/codes/development_ordinance

ATKINS

Guilford County

Multi-Jurisdictional Hazard Mitigation Plan

Public Participation Survey Results

Public Participation Survey

ATKINS

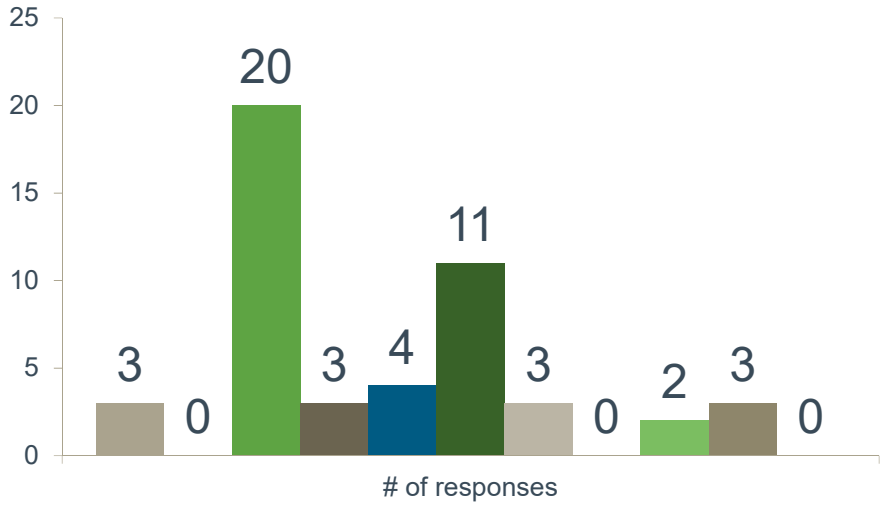
- Provides an opportunity for the public to share opinions and participate in the planning process
- Link to survey posted on county and municipal websites
- 50 completed surveys received

Public Participation Survey Highlights

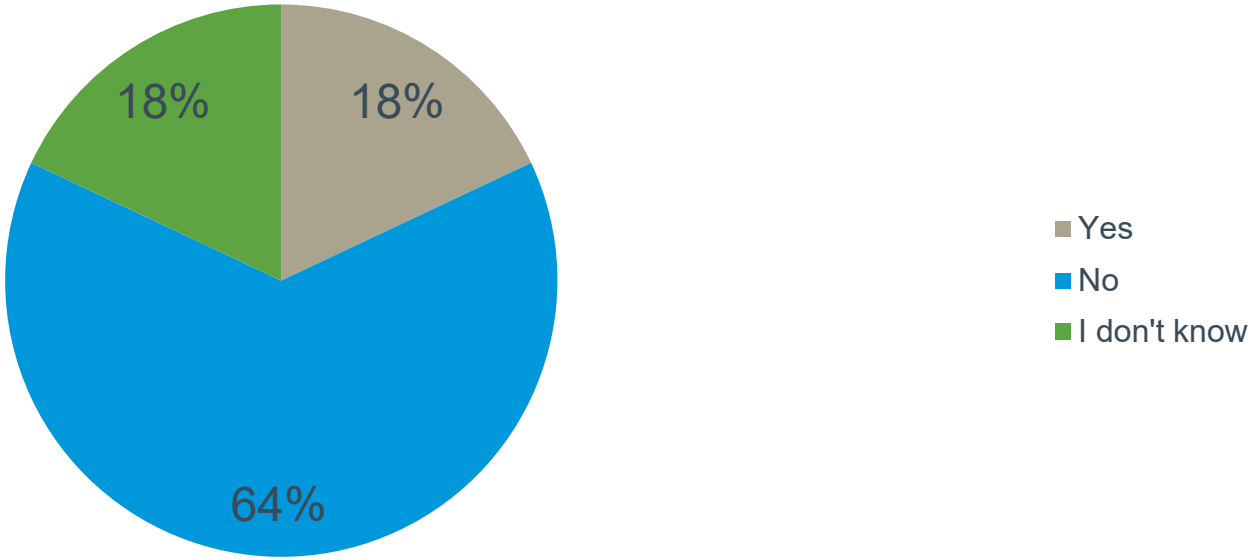
ATKINS

- 92% of respondents are interested in making their homes safer from hazards
- 48% have already taken action to make their homes safer from hazards
- 62% do not know who to contact regarding risks from hazards

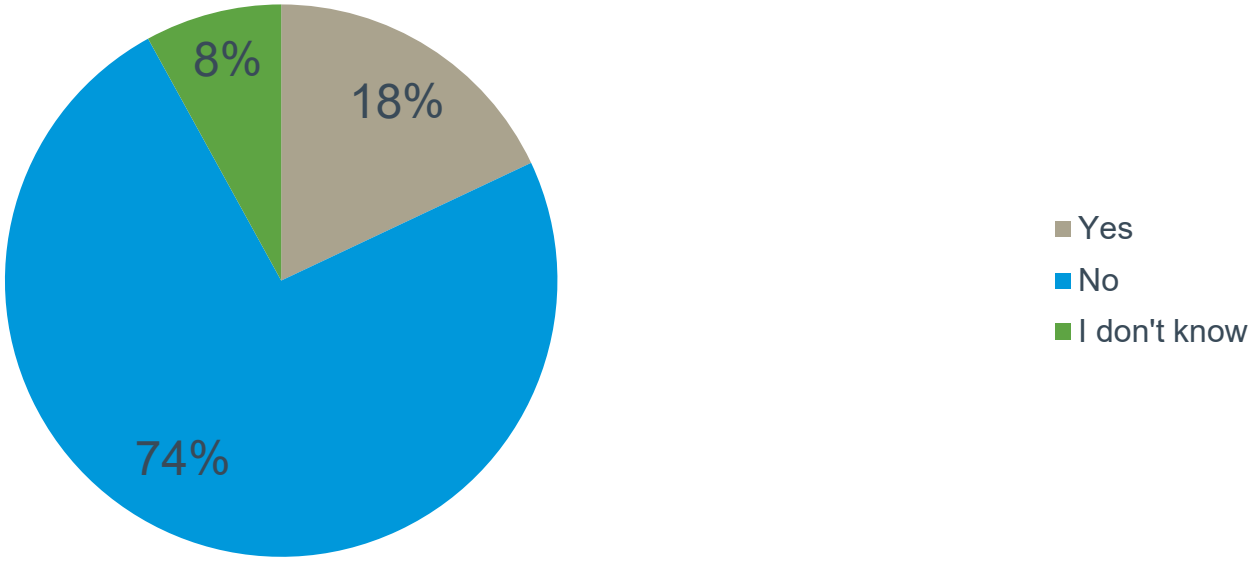
1. Where do you live?



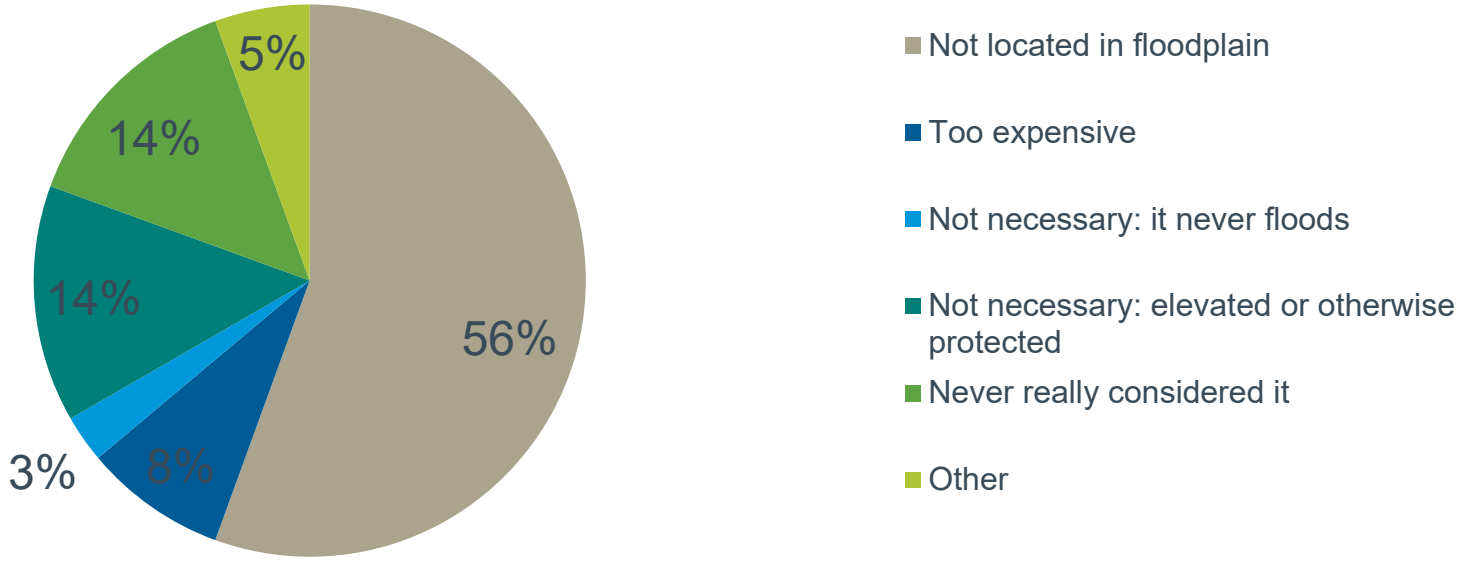
2. Is your home in a floodplain?



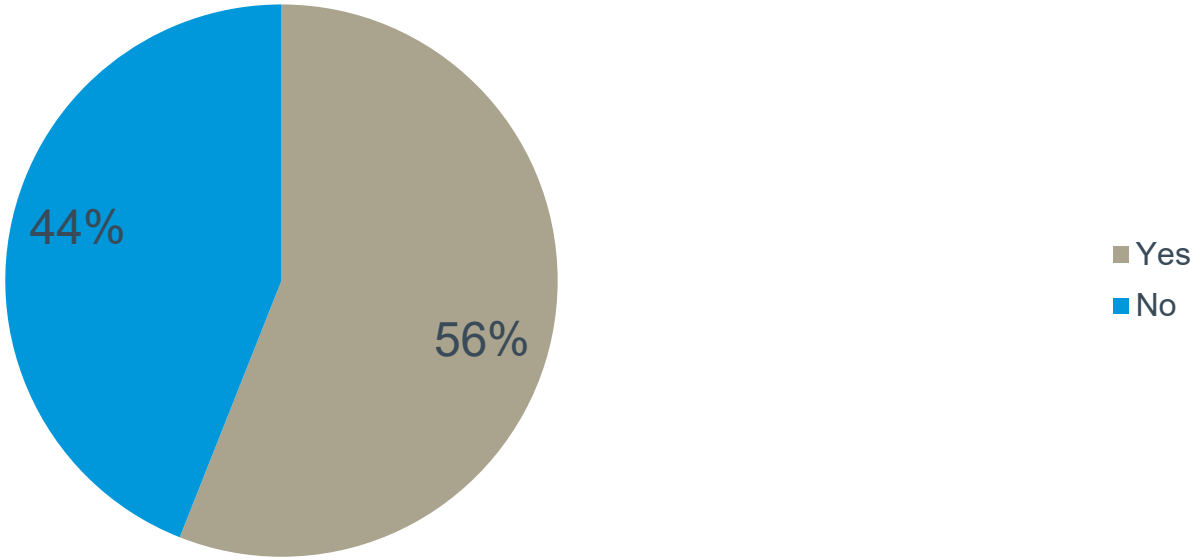
3. Do you have flood insurance?



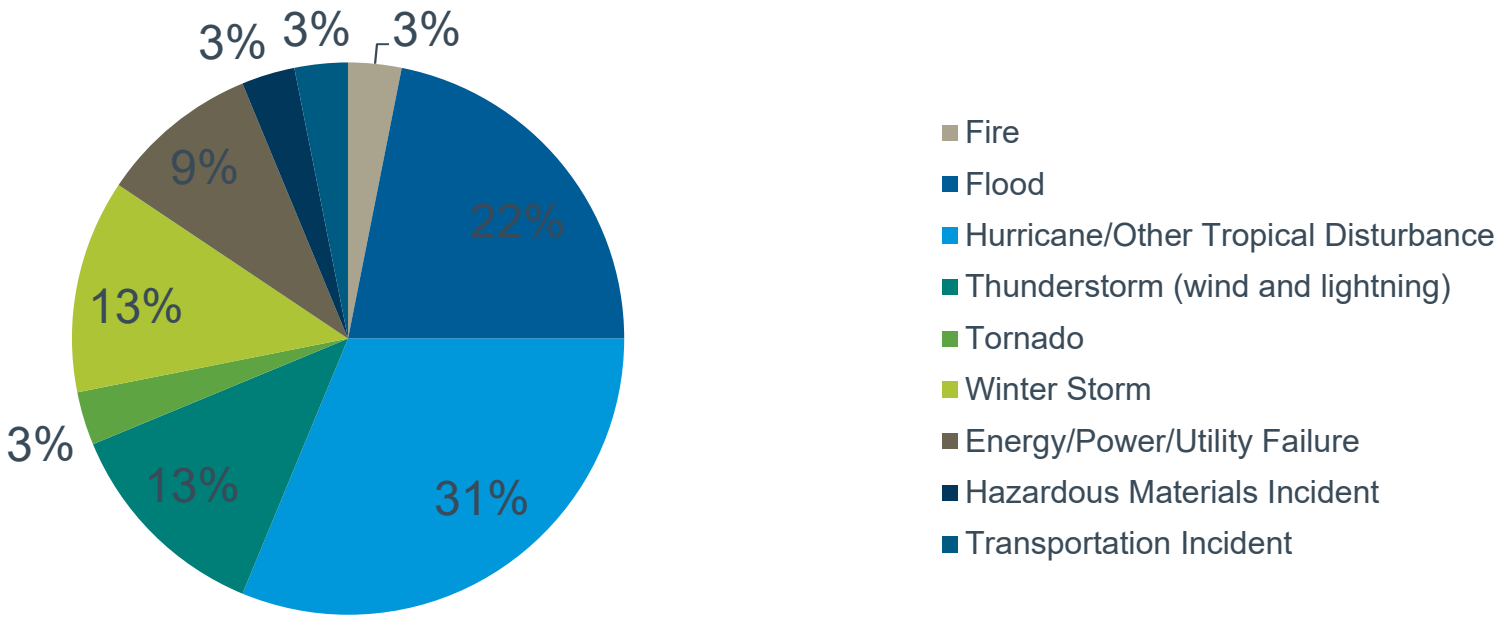
3a. Why no flood insurance?



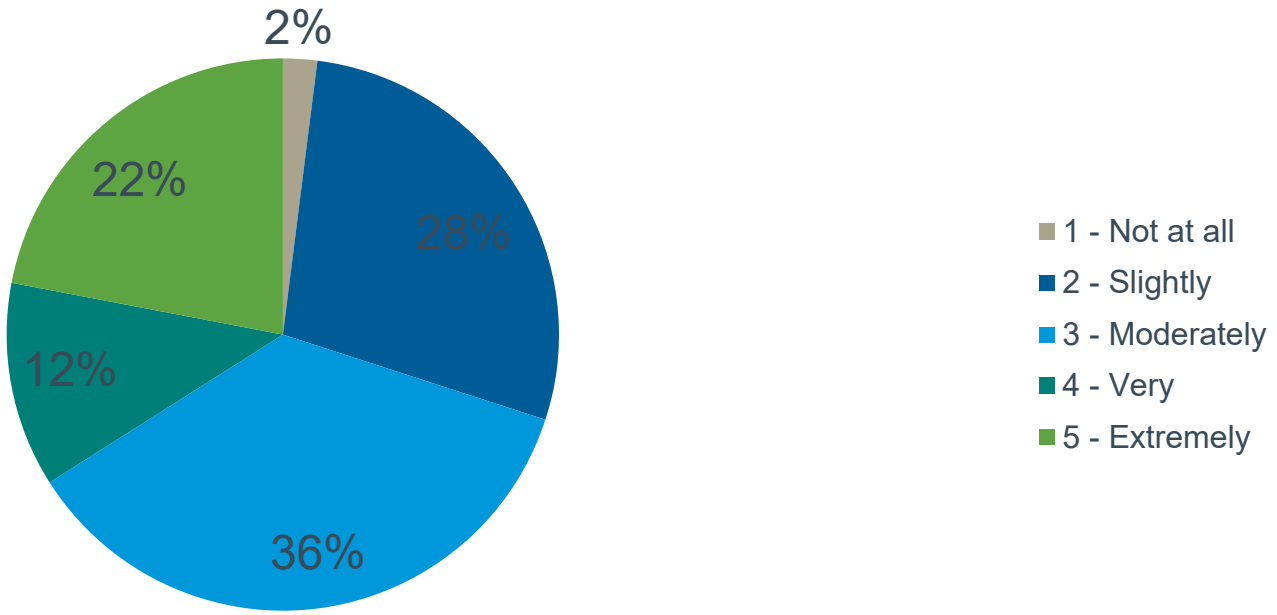
4. Have you experienced a disaster?



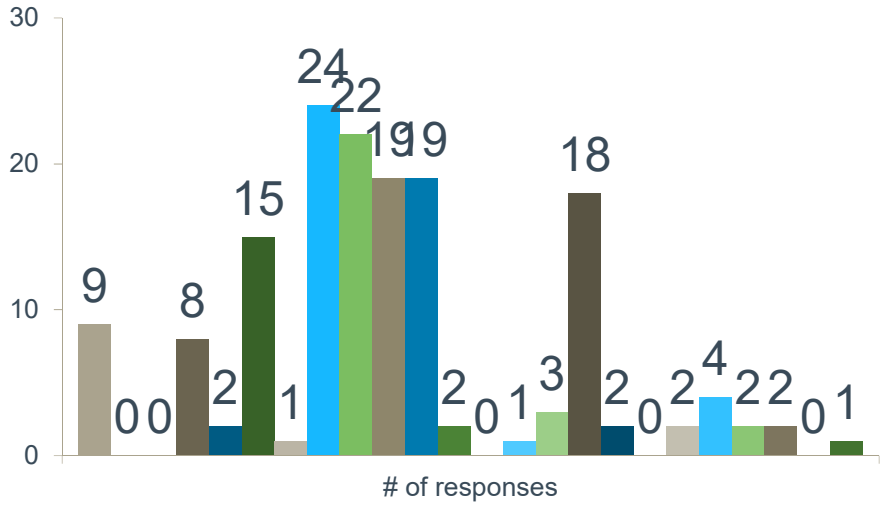
4a. Examples of disasters experienced



5. How concerned about possibility of being impacted by disaster?



6. Hazards of greatest concern?

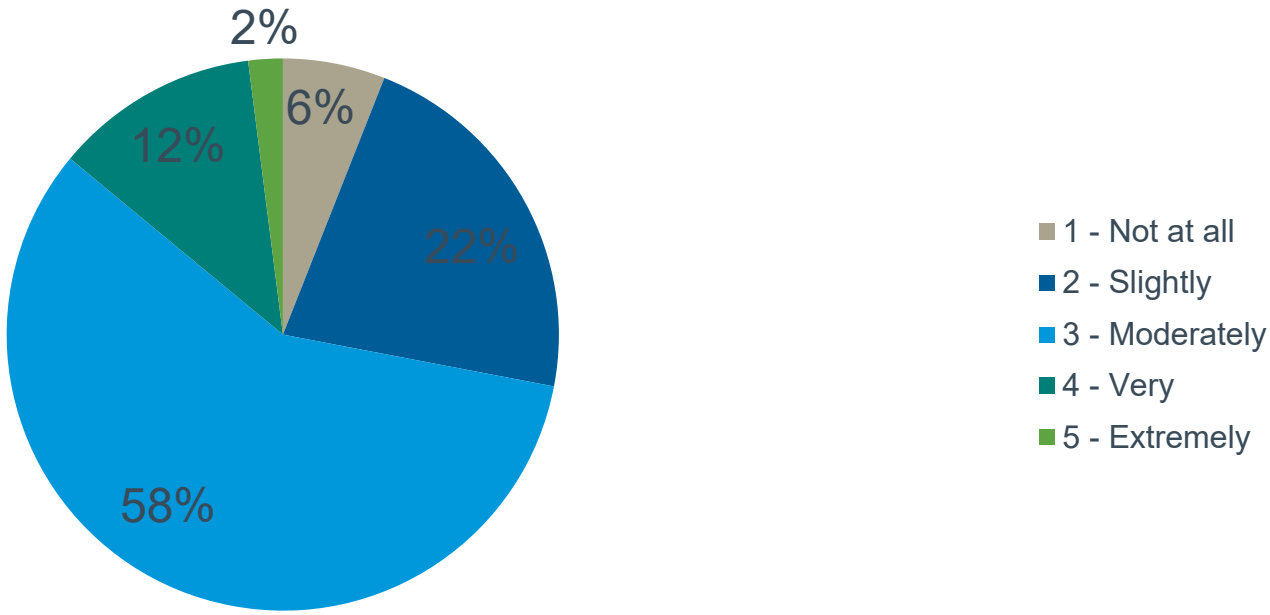


- Drought
- Earthquake
- Extreme Cold
- Extreme Heat
- Fire
- Flooding
- Hail
- Hurricane/Other Tropical Disturbance
- Thunderstorm (Wind and Lightning)
- Tornado
- Winter Storm
- Bioterrorism
- Public Health/Emerging Disease Threat
- Building/Structure Collapse
- Communications Systems Disruption/Failure
- Energy/Power/Utility Failure
- Hazardous Materials Incident
- Nuclear Power Plant Emergency
- Pipeline Failure
- Resource Shortage (Water/Fuel)
- Transportation Incident
- Civil Disturbance
- Cybersecurity
- Terrorism

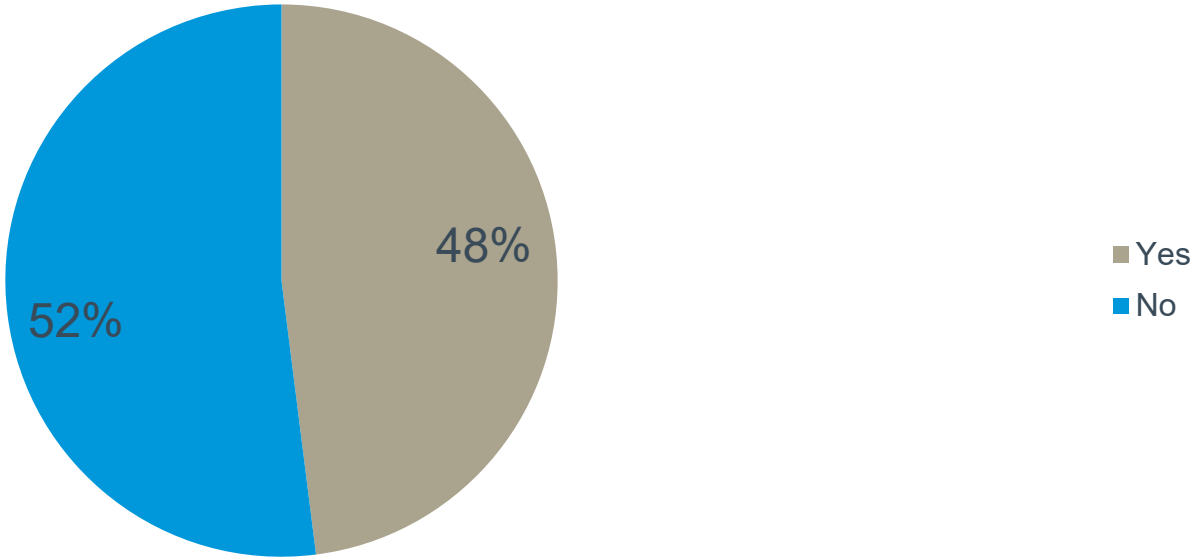
7. Other hazards not listed?

- Climate Change
- Home Invasion/Theft

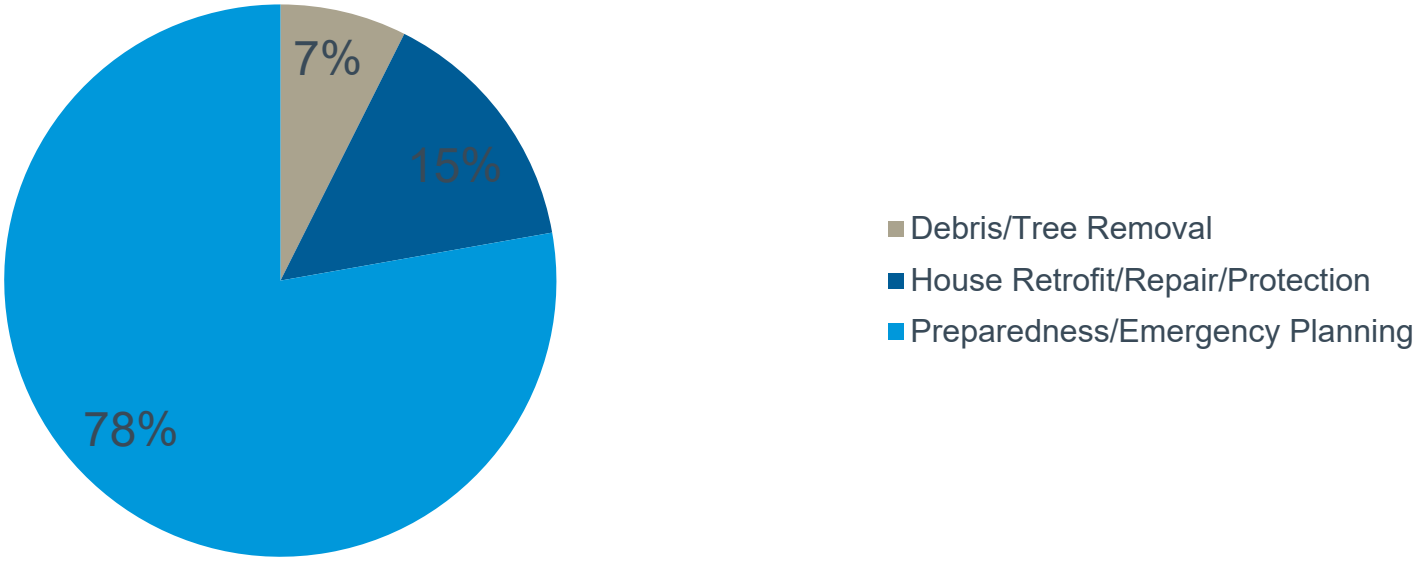
8. How prepared if disaster occurs?



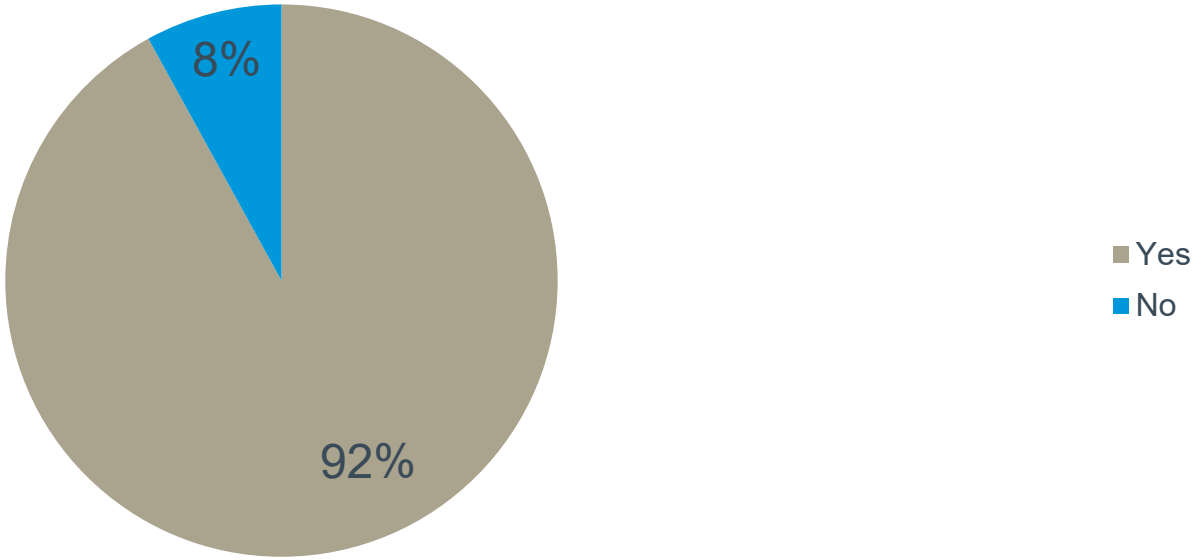
9. Taken action to be safer from hazards?



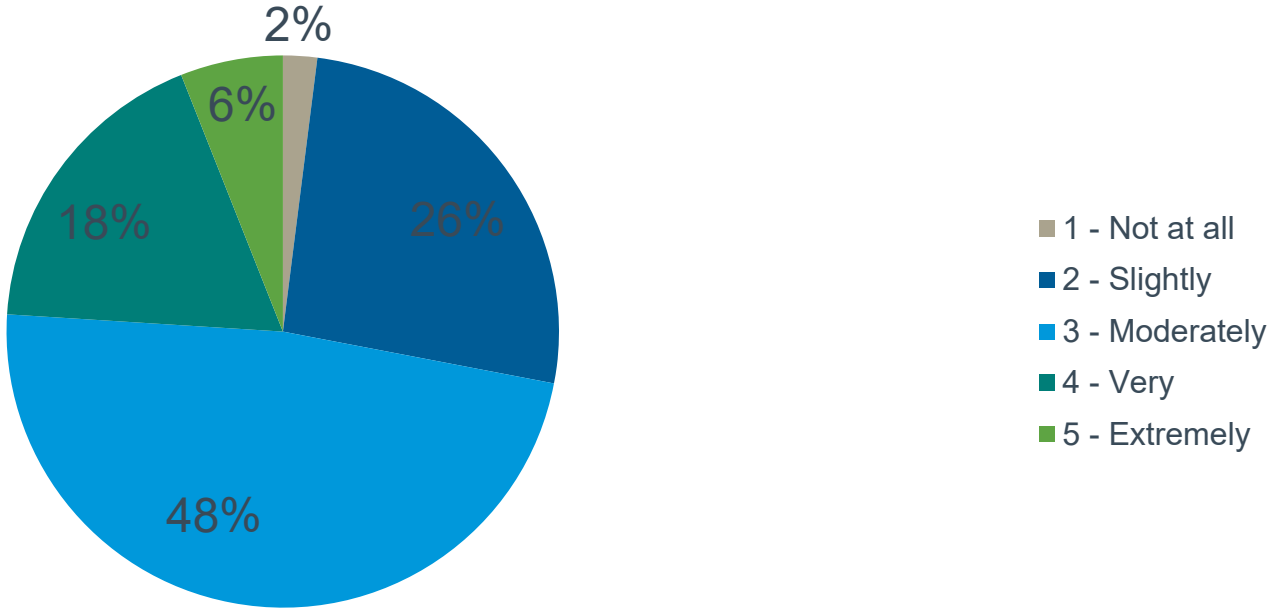
9a. Examples of actions taken



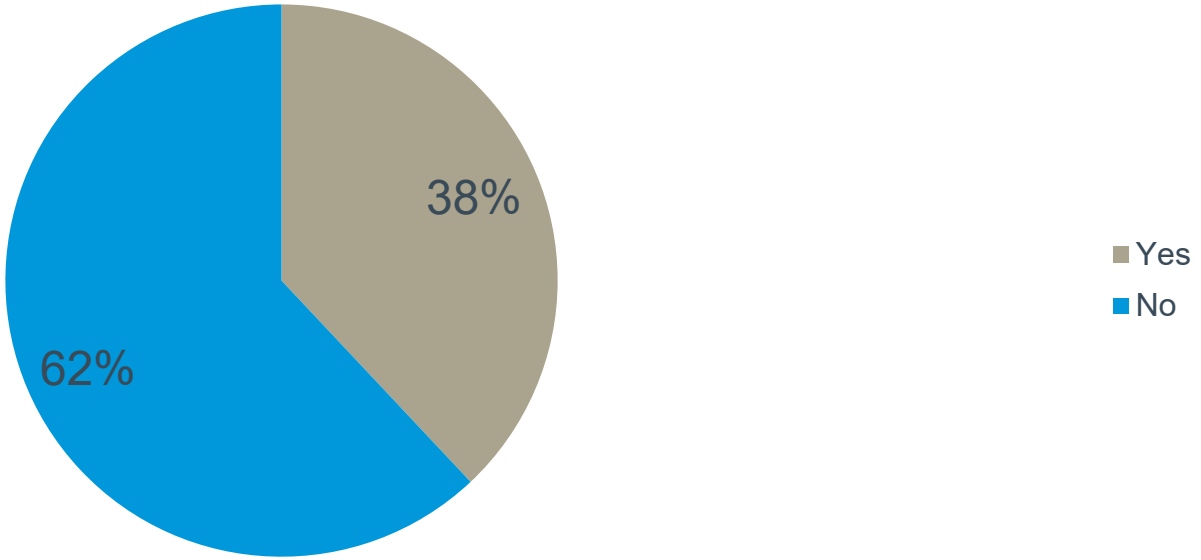
10. Interested in being safer from hazards?



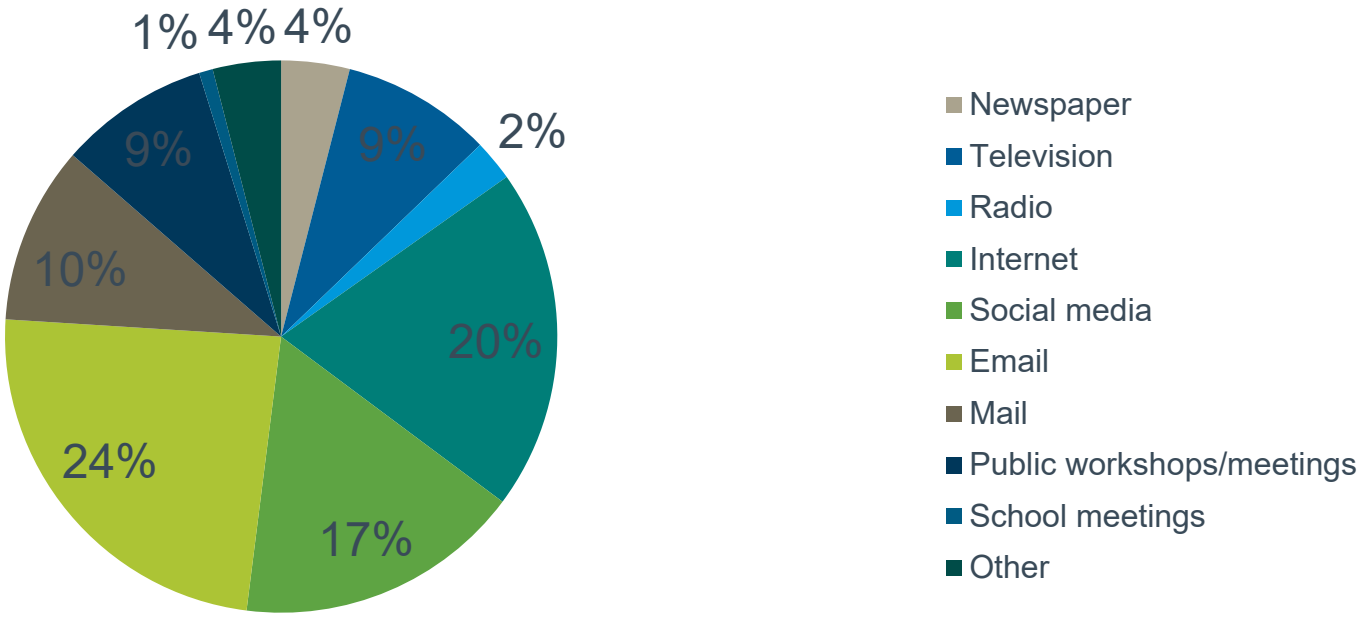
11.How informed about risks and impacts of disasters?



12. Know who to contact regarding risks from hazards?



13. Preferred way to receive info. about being safer from hazards?

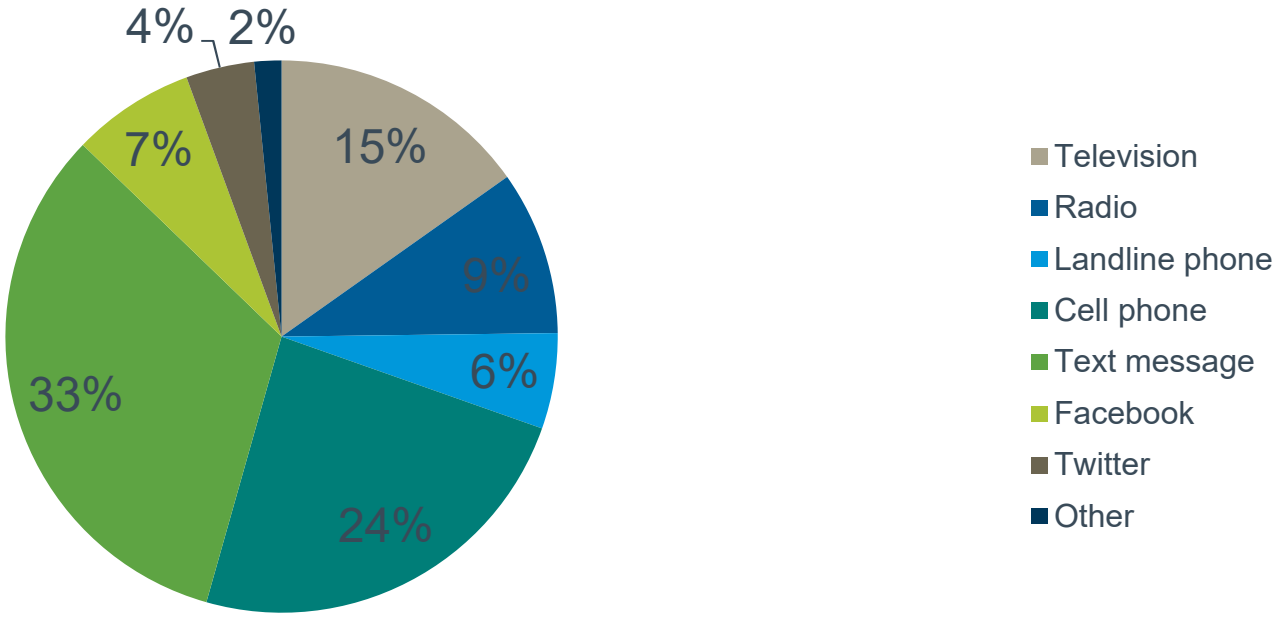


ATKINS

13. Other ways to receive information

- Text messages
- Neighborhood discussions

14. Preferred way to receive alerts/warnings about hazard events?

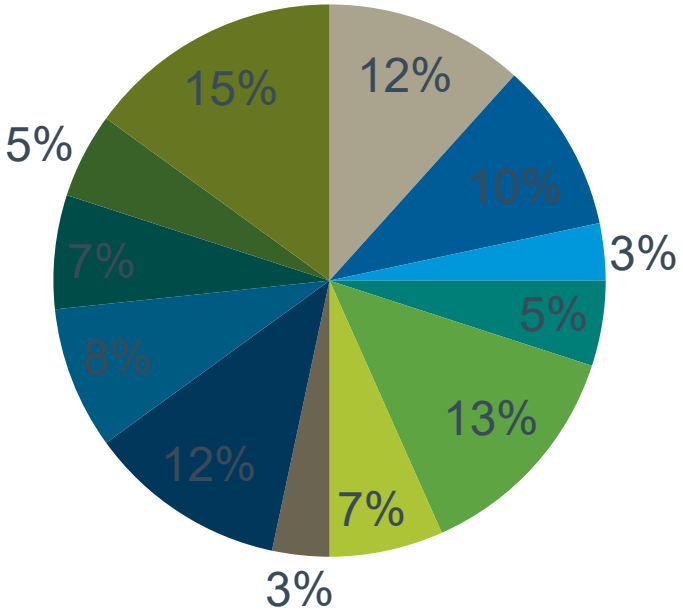


14. Other ways to receive alerts/warnings

- Siren/Warning System

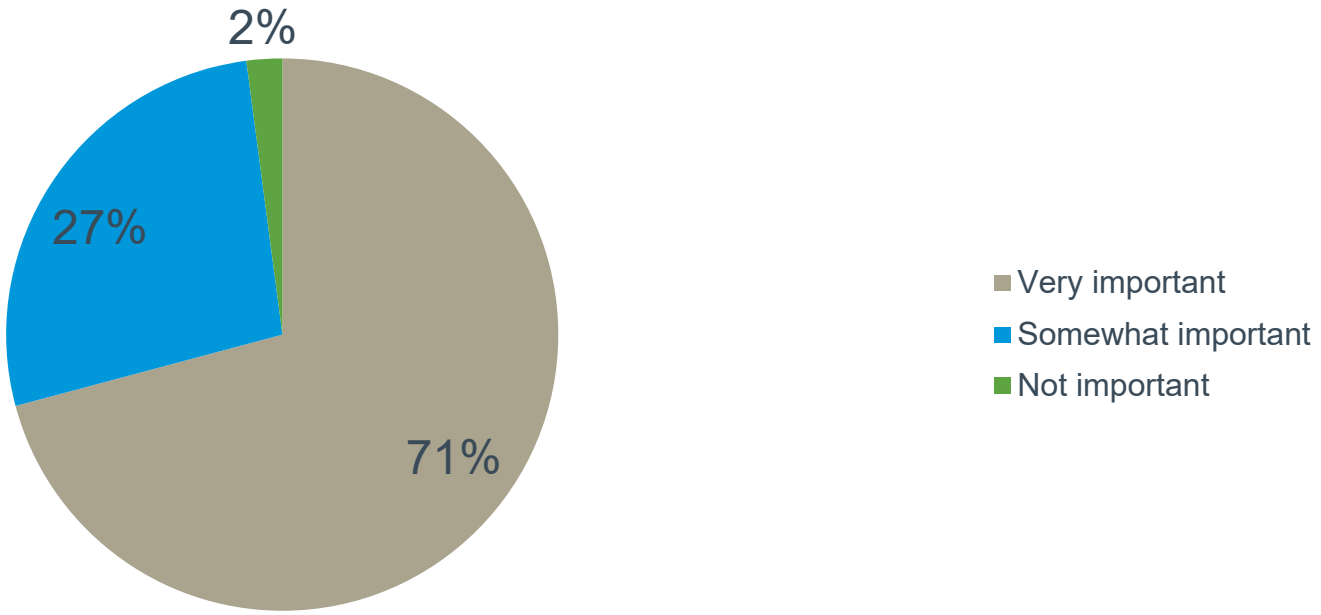
ATKINS

15. Steps local gov't could take to reduce risk

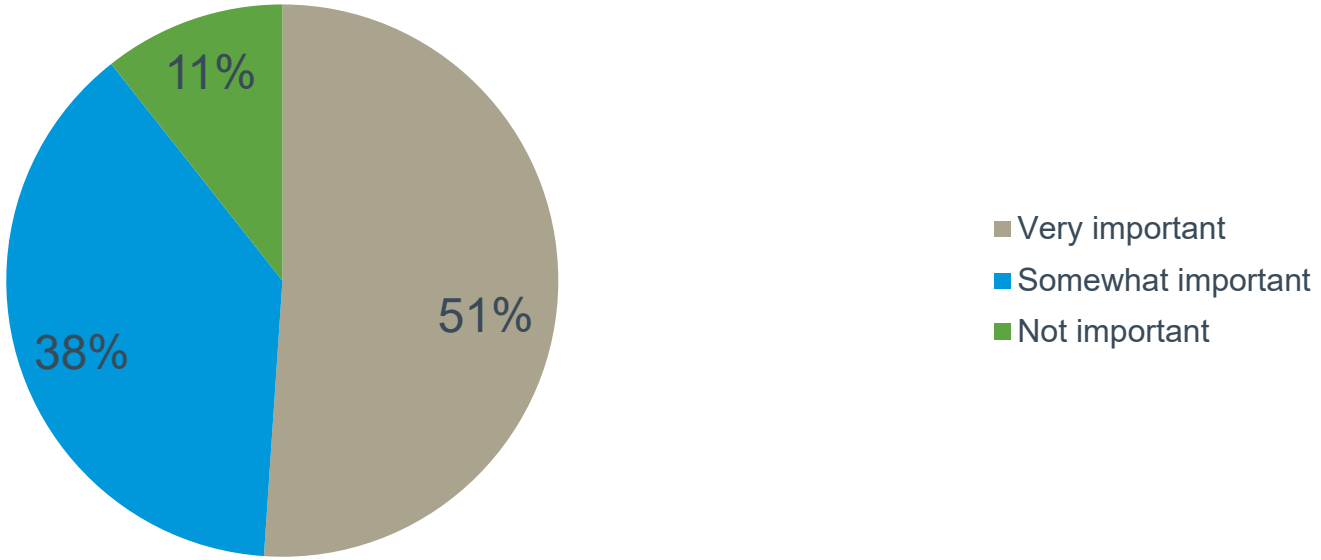


- Alert/Warning System
- Improve Communication/Coordination
- Emergency/Storm Shelters/Safe Rooms
- Debris/Tree Removal
- Improve/Maintain Drainage/Flood Protection
- Improve/Maintain/Retrofit Infrastructure
- Response/Recovery
- Preparedness/Emergency Planning
- Monitoring/Enforcement/Inspections
- Environment/Natural Resource Protection
- Grants/Budget/Funding
- Public Education/Awareness

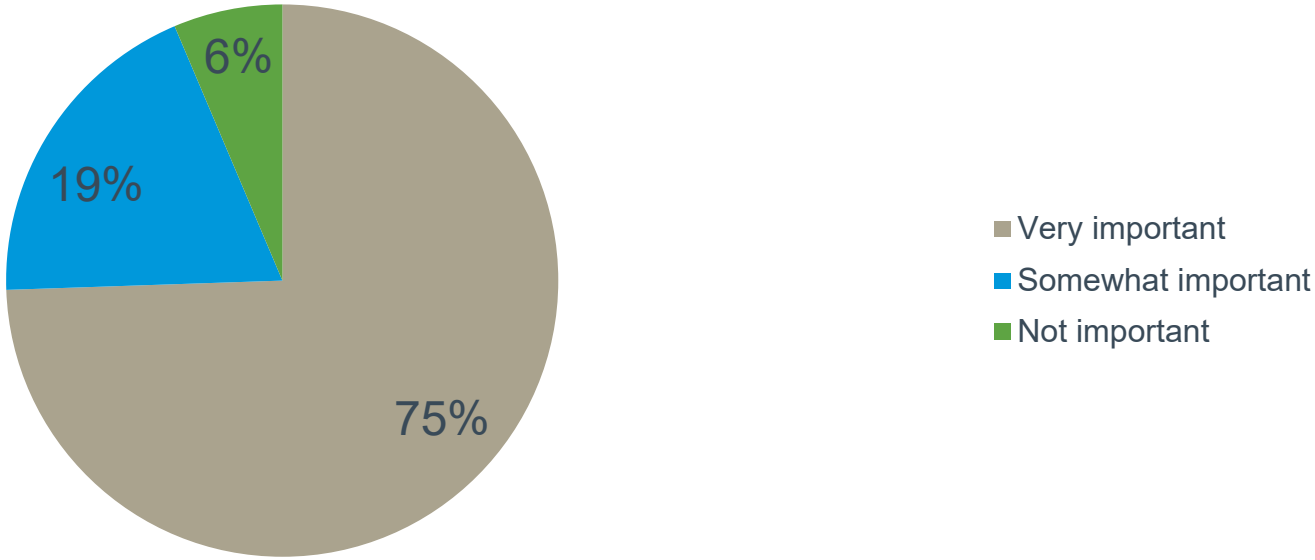
16. Mitigation Actions: Prevention



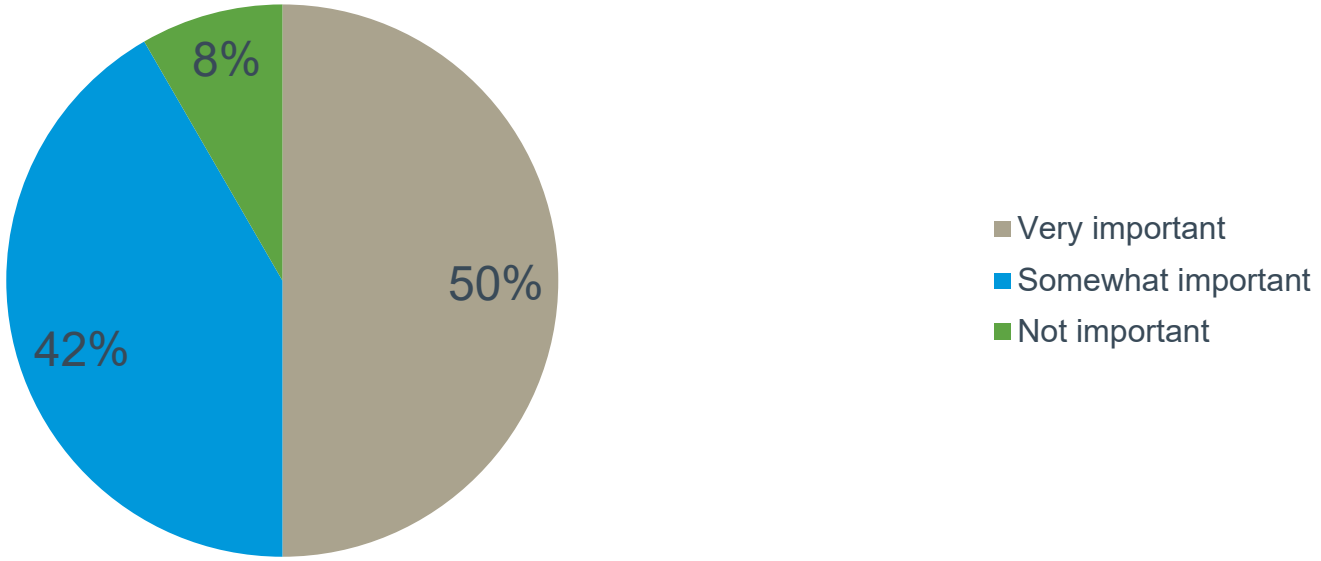
16. Mitigation Actions: Property Protection



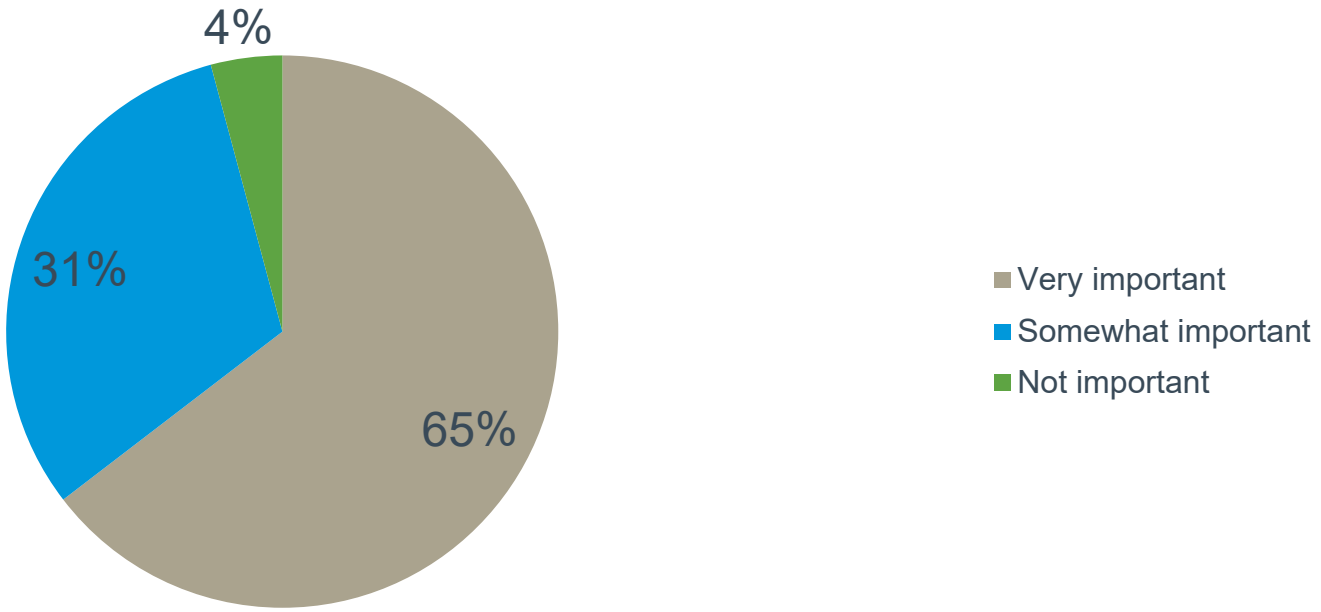
16. Mitigation Actions: Natural Resource Protection



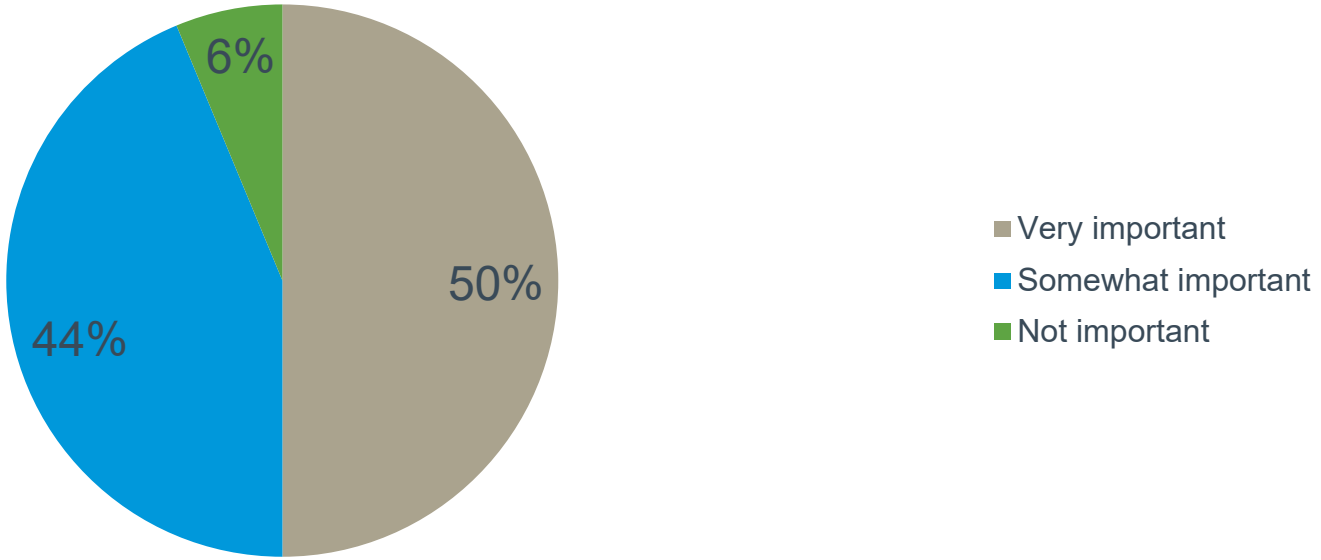
16. Mitigation Actions: Structural Projects



16. Mitigation Actions: Emergency Services



16. Mitigation Actions: Public Education and Awareness



16. Types of Mitigation Actions

ATKINS

Highest importance

- Natural Resource Protection
- Prevention

Moderate importance

- Emergency Services

Lower importance

- Public Education and Awareness
- Structural Projects
- Property Protection

Committee Results

Highest importance

- Prevention
- Emergency Services

Moderate importance

- Public Education and Awareness
- Structural
- Property Protection

Lower importance

- Natural Resource Protection

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