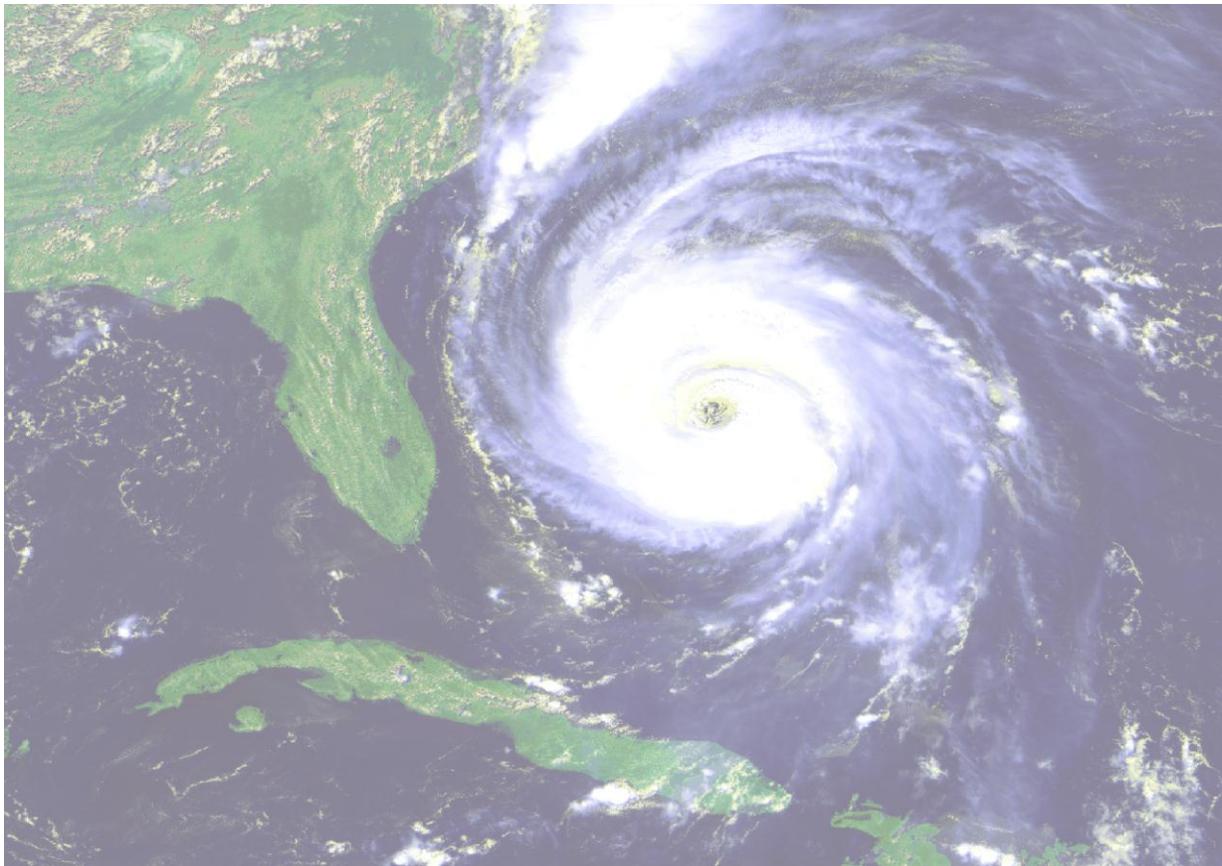


HAZARD MITIGATION PLAN

for



TOWN OF KNIGHTDALE NORTH CAROLINA



2009 UPDATE

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Section I - Introduction

A. STATEMENT OF THE PROBLEM

Although it is not possible to prevent natural hazards from occurring, it is possible to reduce or eliminate the loss of life and property damage resulting from these hazards. According to the Federal Emergency Management Association (FEMA), the occurrence of natural hazards and resulting disasters in the previous decade has caused emergency managers on federal, state, and local levels to revise their approach to disaster response and recovery. The approach was shifted from a disaster-response driven system to a system based on pre-disaster or ongoing risk analysis to allow for proactive rather than reactive response to hazard events. In an effort to prepare for these events before they occur and respond to them more effectively after they occur, the Town of Knightdale completed its first Hazard Mitigation Plan in 2004.

Mitigation is the cornerstone of emergency management. FEMA defines hazard mitigation as “any sustained action taken to reduce long-term risk to human life and property from natural hazards.” Mitigation strategies include prevention, property protection, natural resource protection, structural projects, and public information.

This Plan has been updated in accordance with Keeping Natural Hazards from Becoming Disasters – A Mitigation Planning Guidebook for Local Governments. This guidebook, written by The North Carolina Division of Emergency Management (NCEM), Hazard Mitigation Section, Risk Assessment and Planning Branch, outlines the steps necessary to prepare a Hazard Mitigation Plan to satisfy requirements of the Disaster Mitigation Act of 2000. The organization of this report follows the outline given in the guidebook.

In updating this plan, the following natural hazards were analyzed: Dam/Levee Failure, Drought/Heat Wave, Earthquakes, Flooding, Hurricanes/Coastal Storms, Landslides/Debris Flow, Tornadoes/Severe Thunderstorms, Wildfires, and Severe Winter Weather. The hazards have been reevaluated and ranked according to the potential damage they could cause within the Town of Knightdale, and hazards whose impacts could potentially be reduced by mitigation were identified. Of the nine (9) hazards addressed, mitigation strategies have been revised or developed for the following: flooding; hurricanes/coastal storms;



tornadoes/severe thunderstorms; drought/heat waves; and severe winter storms. A complete identification and analysis of the hazards can be found in Appendix A.

The continued vulnerability of the Town to natural hazards was assessed for both existing conditions and projected future conditions in accordance with current development regulations. Specifically, the number of people and amount of property that could be impacted by flooding, hurricanes/coastal storms, tornadoes/severe thunderstorms, and severe winter storms were estimated. The vulnerability assessment can be found in Appendix B.

The capacity of the Town to deal with natural hazards was also assessed. This included an evaluation of existing policies, practices, programs, regulations, and ordinances that affect the vulnerability to hazards as well as the Town's current technical capability, fiscal capability and political climate. The capability assessment can be found in Appendix C.

The completion and reevaluation of the background analyses of hazard identification, vulnerability assessment, and capability assessment continues to lead the Advisory Committee to the conclusion that the Town of Knightdale is susceptible to natural hazards whose impacts can be reduced or eliminated through the existence of an updated Hazard Mitigation Plan. Specifically, the impacts of flooding, hurricanes/coastal storms, tornadoes/severe thunderstorms, drought/heat waves and severe winter storms are addressed in the Plan. The mitigation values and goals can be found in Section II. The mitigation strategies associated with these goals are discussed in Section III.

B. PURPOSE OF THE PLAN

The Town of Knightdale has prepared this updated Hazard Mitigation Plan in order to continue to be eligible to receive State and Federal assistance funding. Local governments must have an approved Hazard Mitigation Plan that meets the requirements of the Disaster Mitigation Act of 2000 (DMA2K) in order to receive federal mitigation assistance. The Town of Knightdale applied for and was accepted into the Hazard Mitigation Grant Program (HMGP). A requirement of the program is that all local governments who receive funding must prepare and adopt a state-approved local mitigation plan.



In addition to meeting various State and Federal requirements, the Plan has other purposes. They are as follows:

1. Save lives and property
2. Identify and reduce potential impacts of natural hazards
3. Save money over time
4. Facilitate state and federal funding following disasters
5. Facilitate recovery following disasters
6. Educate residents about natural hazards and their potential impacts
7. Show that the Town is committed to improving the health and safety of its residents

C. PARTICIPANTS IN THE PLANNING PROCESS

The participants in the continued planning process included an Advisory Committee, the Mayor of the Town of Knightdale, the Town Council, the Town's Land Use Review Board and the public. The public was given an opportunity to have input in the plan through public meetings at Town Hall that were advertised in the Eastern Wake Times, the newspaper that serves the Town. By issuing invitations, the Town invited representatives of academia, nonprofit interest groups, business, and neighboring communities to participate in its planning process.

The Advisory Committee continues to oversee the preparation of the Plan and the updates to it. The Committee is comprised of local Town officials representing administration, planning, building and inspections, parks and recreation, engineering, public works, public utilities and public safety. The Committee has regrouped and is conducting meetings on a regular basis to update the Plan and is committed to monitoring progress on the Plan at least once per year. A list of the members of the Advisory Committee along with their function in preparing the Plan appears below.



Table I-1 - Members of Advisory Committee

Name	Agency	Position	Function
Chris Hills	Town of Knightdale Planning Department	Planner II & Interim Planning Director	Plan oversight and Community Development
Jeff Triezenberg	Town of Knightdale Planning Department	Planner II	Plan oversight
Tim Guffey	Town of Knightdale Public Safety Department	Fire Division Commander	Emergency Management
Tracy Pedigo	Town of Knightdale Public Works Department	Public Works Director	Public Works
Cesar Sanchez	City of Raleigh Public Utilities Department	Engineer	Public Utilities (Water and Sewer)
Tina Cheek	Town of Knightdale Parks and Recreation Department	Parks and Recreation Director	Public Facilities Management
Seth Lawless	Town of Knightdale Administration	Assistant Town Manger	Emergency Management
Fred Boone	Town of Knightdale Engineering Department	Engineering Department Director	Engineering
Scott Wells	Town of Knightdale Engineering Department	Construction Inspector	Inspections
Mike Chalk	Town of Knightdale Town Council	Mayor-Pro-Tem	Plan oversight
Terry Gleason	Town of Knightdale Town Council	Councilor	Plan oversight

The background analyses, including the hazard identification and analysis, vulnerability assessment, and community capability assessment were re-assessed by the Advisory Committee with input from the public. Mitigation values and goals were re-assessed by the Advisory Committee and reformulated as found necessary. An overview of the update process along with the Plan's values and goals were presented at the first public meeting which was held prior to a regular



meeting of the Town's Land Use Review Board at 6:00pm on Monday, November 10, 2008. The public was encouraged to attend through an advertisement in the Eastern Wake News on November 5, 2008, a notice included in the Town's weekly e-Views electronic newsletter, and an invitation run in rotation on the area's public access television station – East Wake TV. The meeting's notice of advertisement, sign-in sheet, TV slide, e-Views notice, PowerPoint® presentation and copies of completed vulnerability assessment worksheets can be found in Appendix D.

A draft of the updated Plan was written by the Town's Planning Department staff with input from the Advisory Committee. Upon completion, the draft was presented to the Town Council at its January 21, 2009 meeting. The Mayor and other council members were given the opportunity to comment on the updated Plan.

After review by NCEM staff, the updated Hazard Mitigation Plan was ready to be adopted by the Town before submittal to FEMA for review and approval. The second required public meeting was held at the time of adoption of the plan. This meeting is described in the Adoption portion of this section.

D. DESCRIPTION OF THE PLANNING PROCESS

The Plan was prepared in accordance with Keeping Natural Hazards from Becoming Disasters - A Mitigation Planning Guidebook for Local Governments. This guidebook, written by The North Carolina Division of Emergency Management, Hazard Mitigation Section, Risk Assessment and Planning Branch, outlined the steps necessary to prepare a Hazard Mitigation Plan to satisfy requirements of the Disaster Mitigation Act of 2000.

An Advisory Committee was re-formed to oversee the planning process as none of the original members were employed or under contract with the Town. Meetings with the Advisory Committee, NCEM staff, and the public were conducted during the planning process. A description of these meetings follows:



Table I-2 - Planning Meetings

Date	Meeting Purpose/Topic	Participants
July 17, 2008	Hazard Mitigation Update Training, Part 1 – Burlington, NC	Town Planning Department Staff and NCEM Staff
August 8, 2008	Kickoff Meeting	Advisory Committee
September 5, 2008	Evaluate Strategies, Update Mitigation Actions, Re-assess Town’s vulnerability and capability	Advisory Committee
October 29, 2008	Hazard Mitigation Update Training, Part 2 – Burlington, NC	Town Planning Department Staff and NCEM Staff
November 10, 2008	Public Meeting, Describe Plan Update Process, Assess public’s perception of current hazard vulnerability	Town Planning Department Staff and Public
November 25, 2008	Update Mitigation Action Table, Assign Specific Update Tasks	Advisory Committee
January 21, 2009	Town Council Meeting Present Draft of Plan	Town Council and Planning Department Staff

The steps taken to update the plan are as follows:

1. Identify the hazards – This first step in developing the mitigation plan involves identifying and analyzing the hazards facing the Town of Knightdale. According to FEMA and NCEM requirements, nine (9) hazards were identified and addressed by the Plan. For each hazard the likelihood of occurrence, intensity, and level of impact analyzed. The Hazard Identification is found in Appendix A.

2. Assess hazard vulnerability – Once the hazards that could potentially have an impact on the town were identified, the Town assessed its vulnerability to each hazard. This step predicted the number of people and amount of property that could be impacted by the hazards identified in the previous step. The Town’s vulnerability was predicted for both existing conditions and projected future conditions in accordance with current development



regulations. This step also included mapping the hazards and showing how community features such as critical facilities, existing development, projected future development, and infrastructure could be impacted by the hazards. The Vulnerability Assessment is found in Appendix B.

3. Assess community capability – An evaluation was conducted to identify how well existing Town policies and programs mitigate hazards. The assessment included an evaluation of existing policies, practices, programs, regulations, and ordinances that affect the vulnerability to hazards. Additionally, the Town’s legal and fiscal capability as well as political climate were assessed. The Capability Assessment is found in Appendix C.
4. Form interim conclusions – This step, also called the acceptability assessment, involves the determination of whether preparation of a Hazard Mitigation Plan is warranted.
5. Establish values and goals – Establishing goals and values is an integral part of any plan. After identifying potential hazards, vulnerability to those hazards, and the current effectiveness of the Town to mitigate damages resulting from them, the Town was able to formulate the values and goals of the Hazard Mitigation Plan. This includes the identification of existing community goals that support the mitigation of natural hazards and the formulation of new goals specific to vulnerability and mitigation issues. The Mitigation Goals and Values are found in Section II of the Plan.
6. Formulate mitigation policies and strategies – The mitigation policies and strategies describe how the mitigation goals will be met. It includes identification, evaluation, and analysis of mitigation actions to reduce the effects of each hazard addressed by the Plan. The Mitigation Strategies and Policies as well as the implementation process for each of the policies are found in Section III of the Plan.
7. Establish procedures for monitoring, evaluating, and reporting progress – In order for any plan to be successful, it must continuously be reviewed to ensure that policies are revised and updated as community conditions change. Section IV, Monitoring, Evaluating and Reporting Progress



outlines how the Town of Knightdale will establish a regular schedule for reviewing and assessing the Plan's effectiveness.

8. Establish procedures for revisions and updates – The Town of Knightdale expects tremendous growth and development over the next several decades. These dynamic changes require that processes for revising and updating the plan are established and incorporated into the Plan. This step identifies the person responsible for reviewing the monitoring reports and making revisions and updates to the Plan as needed. It also specifies that any updates to the plan will require submittal to state and federal review agencies. Revision and Update procedures are found in Section V.
9. Adoption – Formal adoption of the Hazard Mitigation Plan is necessary in order to make it an enforceable policy. A description of the process that was used for formal adoption of the Plan appears below.

E. ADOPTION

In order to become an enforceable policy, the updated Hazard Mitigation Plan must be formally adopted by the Town. According to the existing FEMA guidelines, adoption is required before the Plan is submitted to FEMA for review and approval.

Following review of the Hazard Mitigation Plan by NCEM staff, the Advisory Committee recommended that the Town Council adopt the plan. A Public Hearing was held in conjunction with a Town Council meeting on August 19, 2009 to allow for public comment and officially adopt the plan. This was the second public meeting held during the planning process to allow Town residents and other interested parties to contribute to the plan.

A copy of **RES# 09-08-19-002 Resolution for the Adoption of the 2009 Update to the Town of Knightdale Hazard Mitigation Plan**, signed by Mayor Russell M. Killen on August 19, 2009 appears on the following page.



Section II - Values and Goals

A. PROCESS

In updating the Plan, the Advisory Committee went back and identified continued and new hazards, reassessed vulnerability, and reassessed the Town's capability to mitigate natural hazards. Following completion of these background analyses, the Advisory Committee reaffirmed the set of community values and goals previously established by the initial Plan with a general agreement that the impacts of drought must be addressed.

The Advisory Committee was particularly interested as part of the Plan update to seek the public's input on their perception of the likelihood, magnitude and impact each type of natural hazard might have on the community. Six (6) members of the public attended a public meeting at Town Hall on November 10, 2008 at 6:00pm as mentioned in Section I of this report. After viewing a slide presentation on the purpose of the Hazard Mitigation Plan Update, members of the public received instructions and were asked to fill out a vulnerability assessment sheet. Upon completion, Town staff produced the composite ranking for each hazard. The Advisory Committee was apprised of the results of the public meeting and found them to mirror their own rankings. The meeting's notice of advertisement, sign-in sheet, slide show and vulnerability assessment sheets can be found in Appendix D. The public made no comments on the values and goals, and the Advisory Committee agreed they should remain the same with the addition of one specific goal to reduce the impacts of drought.

B. GOALS

The community goals are broad in scope. They continue to serve as the basis for formulation of mitigation strategies and policies. Some of the goals address specific hazards (goals 3, 4, 5, 6 and 7) while others address the Town's overall ability to reduce the impact of natural hazards and better educate residents about hazards before they occur (goals 1, 2, and 8). The goals are as follows.

1. Generally reduce the impact of all natural hazards.
2. Establish plans for public education and outreach.
3. Specifically reduce the impact of flooding.
4. Specifically reduce the impact of hurricanes.
5. Specifically reduce the impact of tornadoes and severe thunderstorms.



6. Specifically reduce the impact of winter storms/freezes.
7. Improve technical capability.
8. Specifically reduce the impact of drought.

Once the goal statements were completed, mitigation strategies and policies were assigned to each of the goals. These strategies and policies are outlined in Section III.



Section III – Mitigation Strategies and Policies

A. PROCESS

The Advisory Committee reformulated eight (8) goals that will be put into action through the use of mitigation strategies and policies. The first step was to evaluate and update the mitigation strategies already assigned to each goal. NCEM has divided the strategies into five (5) categories. These categories are described below.

1. **Prevention** strategies keep hazards from worsening, usually by reducing future vulnerability in currently undeveloped areas. They include policies in the areas of planning, zoning, open space preservation, floodplain regulation, stormwater management, and capital improvements.
2. **Property protection** strategies safeguard existing structures through modification or removal from hazardous locations. They include relocation, acquisition, modification of building elevations, windproofing, and floodproofing.
3. **Natural resource protection** strategies reduce impacts of hazards by preserving or restoring areas that naturally mitigate hazards, such as floodplains. Floodplain protection and greenway system development are examples of natural resource protection strategies.
4. **Structural** strategies include projects designed to lessen the impacts of hazards. Examples are reservoirs, levees, diversions, channel modifications, and storm sewer systems.
5. **Public information** strategies advise the public about hazards and give ways to lessen impacts due to the hazards. They include outreach projects, production of hazard maps, warning systems, hazard disclosure for real estate transactions, technical assistance, and educational programs for school children.

As mitigation strategies for each goal were evaluated and updated, the Advisory Committee reviewed the mitigation policies for carrying out the strategies. In



order to be considered for inclusion in the Mitigation Action Plan, each policy had to be cost-effective, feasible, and not harmful to the environment. The implementation process, including potential funding sources, the department responsible for implementation, and target completion date, was also re-evaluated for each policy. Evaluation indicators were established so that the effectiveness of each policy could be monitored, and the priority for each policy was given.



B. MITIGATION ACTION TABLE

The Mitigation Action Table, which follows as Table III-1 lists each goal, policy, and action item; designates whether the policy is new, a continuation of an existing policy or change in an existing policy; and lists the hazards targeted, funding source, responsible party, and target completion date. Monitoring/evaluation indicators are listed for each policy. These indicators will be assessed in preparation of the plan maintenance report, as described in Section IV.

Goal/Objective	Action Item	New Policy, Continuation, Or Change	Strategy Type	Hazard(s) Targeted	Funding Source(s)	Responsible Party	Target Completion Date	Monitoring/Evaluation Indicators	Priority
1. Generally reduce the impact of all hazards									
Hazard Mitigation Plan	Adopt Hazard Mitigation Plan & Updates	Continuation	Prevention	All	Internal, HGMP	Town Council	Upon approval by FEMA	Verify that Plan was adopted – Initial Plan approved by FEMA on August 27, 2004; after being adopted by Town Council on July 6, 2004	High
	Prepare Plan Maintenance Report	Continuation	Prevention	All	Internal	Planning	Annually	Verify that report was prepared	High
	Prepare updates to Plan	Continuation	Prevention	All	Internal	Planning & Advisory Committee	As needed	Determine if updates were needed and made – Advisory Committee meets from late 2008 to early 2009 to prepare plan updates	High
	Revise Hazard Mitigation Plan	Continuation	Prevention	All	Internal	Planning & Advisory Committee	Every five years	Verify that Plan was revised – Revised plan submitted to NCEM in February 2009	High
Maintain Critical Facilities and Infrastructure	Keep evacuation routes open	Continuation	Prevention	All	Internal	Public Works & Public Safety	Ongoing	Determine if evacuation routes are passable	High
	Maintain water supply system, including generators at booster plant	Continuation	Prevention	All	Internal	City of Raleigh Public Utilities	Ongoing	Verify that quantity meets requirements, generators are operational	High
	Maintain sewer lift stations, including generators	Continuation	Prevention	All	Internal	City of Raleigh Public Utilities	Ongoing	Verify that lift stations function as designed, generators are operational	High
Improve emergency response	Update Emergency Response Plan	Change	Prevention	All	Internal	Public Safety	December 31,2009	Verify that plan has been updated – Last plan update completed in Spring 2008	High



Goal/Objective	Action Item	New Policy, Continuation, Or Change	Strategy Type	Hazard(s) Targeted	Funding Source(s)	Responsible Party	Target Completion Date	Monitoring/Evaluation Indicators	Priority
2. Establish plans for public education and outreach									
Inform citizens about natural hazards	Distribute "Ready Wake" brochures in libraries, Town Hall, public places and on the Town Web Site.	New	Public information	All	Internal	Administration	Ongoing	Verify that brochures were distributed and posted on the web.	Moderate
	Inform public of construction requirements in hazard areas	Continuation (Chp. 6, UDO)	Public information	All	Internal	Building/Inspections	Ongoing	Verify that construction requirements were given to public	Moderate
	Require disclosure of flood hazard in real estate transactions	Continuation	Public information	Flood	Internal	Planning	Ongoing	Verify that disclosure of hazard potential was made	Moderate
Involve public in Hazard Mitigation planning process	Present Plan at public meeting	New	Public information	All	Internal, HGMP	Planning	November 2009	Verify that public meeting was held	Moderate
	Post plan maintenance report for public comment	New	Public information	All	Internal	Administration	Annually	Verify that report was posted	Moderate
	Post copy of Plan on website, in Town Hall	New	Public information	All	Internal	Planning	Upon approval by FEMA	Verify that Plan was posted	Moderate

3. Specifically reduce the impact of flooding									
Inform property owners of flooding risk	Monitor areas known to flood. Directly contact affected property owners by phone or in person.	Continuation	Public Education	Flooding	Internal	Town Engineer, Public Works	Ongoing	Conduct post-event meeting to review and document Town response.	Low
	Make flood maps available to the public	Continuation	Public information	Flooding	Internal	Planning	Ongoing	Determine if maps are available	Moderate
Discourage development in flood-prone areas	Enforce UDO standards for development in flood hazard areas	Continuation	Prevention	Flooding	Internal	Planning, Inspections	Ongoing	Track development in flood hazard areas	High
	Prohibit development less than two (2) feet above BFE	Continuation (UDO Section 6.5D)	Prevention	Flooding	Internal	Planning	Ongoing	Verify all floodplain development permit requirements have been met.	High



Goal/Objective	Action Item	New Policy, Continuation, Or Change	Strategy Type	Hazard(s) Targeted	Funding Source(s)	Responsible Party	Target Completion Date	Monitoring/Evaluation Indicators	Priority
	Complete stormwater management plan and institute stormwater management program	Continuation (NPDES Phase II permit)	Prevention	Flooding	Internal	Public Works & Engineering	5 years from receipt of NPDES Stormwater Phase II permit	Verify that plan was implemented and budget established for program	High
Mitigate Flood Damage to Existing Structures in Flood Hazard Areas	Pursue Grants to Acquire, Elevate and or Relocate Flood Prone Structures and Property	New Policy	Prevention	Flooding	Internal, FEMA, NCEM	Planning	Ongoing	Monitor when Grants are to be submitted	High
	Require Floodproofing and/or removal of Structures requesting substantial improvements	Continuation (UDO Section 6.5D2b)	Prevention	Flooding	Internal	Planning, Inspections	Ongoing	Track developments in flood hazard area and inspect structures affected after flooding events	High
	Maintain list of all structures located within the floodplain	Continuation	Prevention	Flooding	Internal	Planning	December 2010	Track number of structures in floodplain	High



Goal/Objective	Action Item	New Policy, Continuation, Or Change	Strategy Type	Hazard(s) Targeted	Funding Source(s)	Responsible Party	Target Completion Date	Monitoring/Evaluation Indicators	Priority
4. Specifically reduce the impact of hurricanes									
Educate public about hurricanes	Distribute "Ready Wake" storm preparation brochures and post on the Town website.	Continuation	Public Education	Hurricane	Internal	Administration	December 2009	Verify that brochures were distributed and posted on website	Low
Reduce impacts to power lines and structures	Require burial of power lines for new developments	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Private	Planning	Ongoing	Verify that underground power is installed in new developments	Moderate
	Require new construction to comply with wind section of Building Code	Continuation	Prevention	Hurricanes, Tornadoes	Internal	Inspections	Ongoing	Verify that construction complies with Code	High
Speed hurricane recovery process	Establish post-disaster clean-up procedures	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal	Public Works	July 2010	Verify that post-disaster clean-up plan is maintained and that contracts are in place with national disaster response organizations.	High
	Prepare debris removal and disposal plan	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal, FEMA, NCEM	Public Works	July 2010	Maintain debris disposal plan and verify contracts are in place with national disaster response organizations.	Moderate
5. Specifically reduce the impact of tornadoes and severe thunderstorms									
Educate public about tornadoes and severe thunderstorms	Distribute "Ready Wake" storm preparation brochures and post on the Town website.	Continuation	Public Education	Tornadoes/ Severe Thunder-storms	Internal	Administration	December 2009	Verify that brochures were distributed and are available on website.	Low



Goal/Objective	Action Item	New Policy, Continuation, Or Change	Strategy Type	Hazard(s) Targeted	Funding Source(s)	Responsible Party	Target Completion Date	Monitoring/Evaluation Indicators	Priority
Reduce impacts to power lines and structures	Require burial of power lines for new developments	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Private	Planning	Ongoing	Verify that underground power is installed in new developments	Moderate
	Require new construction to comply with wind section of Building Code	Continuation	Prevention	Hurricanes, Tornadoes	Internal	Inspections	Ongoing	Verify that construction complies with Code	High
Speed tornado recovery process	Establish post-disaster clean-up procedures	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal	Public Works	July 2010	Verify that post-disaster clean-up plan is maintained and that contracts are in place with national disaster response organizations.	High
	Prepare debris removal and disposal plan	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal, FEMA, NCEM	Public Works	July 2010	Maintain debris disposal plan and verify contracts are in place with national disaster response organizations.	Moderate

6. Specifically reduce the impact of winter storms/freezes									
Educate public about winter storms/freezes	Distribute "Ready Wake" storm prep brochures and post on the Town's website	Continuation	Public Education	Winter Storms/freezes	Internal	Administration	December 2009	Verify that brochures were distributed and available on website	Low
Reduce impacts to power lines and structures	Require burial of power lines for new developments	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Private	Planning	Ongoing	Verify that underground power is installed in new developments	Moderate
	Require new construction to comply with snow load requirements of Building Code	Continuation	Prevention	Winter Storms/Freezes	Internal	Inspections	Ongoing	Verify that construction complies with Code	High
Speed winter storm recovery process	Establish post-disaster clean-up procedures	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal	Public Works	July 2010	Verify that post-disaster clean-up plan is maintained and that contracts are in place with national disaster response organizations.	High
	Prepare debris removal and disposal plan	Continuation	Prevention	Hurricanes, Tornadoes, Winter Storms/Freezes	Internal, FEMA, NCEM	Public Works	July 2010	Maintain debris disposal plan and verify contracts are in place with national disaster response organizations.	Moderate



7. Improve technical capability									
Improve use of email communication capabilities	Utilize electronic newsletter to keep citizens informed	New	Public Education	All	Internal	Administration	Ongoing	Verify that weekly electronic newsletter keeps Town hazard prevention and mitigation information current	Low
Increase information available on website	Keep website updated with latest storm and emergency response information	Continuation	Public Education	All	Internal	Administration	Ongoing	Verify that information on the website is current	Low

8. Specifically reduce the impact of drought									
Increase the area's water supply	Complete the Dempsey E. Benton Water Treatment Plant	New	Prevention	Drought	Internal	City of Raleigh Public Utilities	February 2010	Verify that water treatment plant is constructed and operational	High
	Protect and Obtain Land for the Little River Reservoir	New	Prevention & Property Protection	Drought	Internal	City of Raleigh Public Utilities	Ongoing with completion of reservoir in 2020	Monitor the success of getting interlocal agreements signed that aim to protect the land needed for the reservoir as it currently involves six (6) separate local government units	Moderate
Increase information available on website	Keep website updated with latest information on drought, water restrictions and water conservation techniques	New	Public Education	Drought	Internal	Administration	Ongoing	Verify that information on the website is current	Low



C. MITIGATION POLICY NARRATIVE

The following narrative describes the mitigation strategies and policies proposed for each goal.

Goal 1: Generally reduce the impact of all hazards.

The first goal formulated by the Advisory Committee is to generally reduce the impact of all hazards. The mitigation objectives proposed in order to achieve this goal include preparation of Hazard Mitigation Plan updates, maintenance of critical facilities, and improvement of emergency response. All of the strategies can be categorized as prevention strategies. All of the objectives are being funded internally, and most of them involve the continuation of existing Town policies. The objectives associated with this goal are of highest priority.

Goal 2: Establish plans for public education and outreach.

The second goal is to establish plans for public education and outreach. The mitigation objectives proposed in order to achieve this goal include informing the public about natural hazards and involving the public in the Hazard Mitigation planning process. All of the strategies associated with this goal are categorized as public information strategies. Most of the public information addresses all hazards and the entire jurisdictional area of the Town, although information on construction requirements according to the building code and disclosure of hazard potential in real estate transactions relate specifically to particular hazards. All of the objectives are being funded internally, and most of them involve the continuation of existing Town policies.

The Town of Knightdale has a website as well as a weekly electronic newsletter ("e-Views") which are excellent sources of information for its residents. In addition to giving general information about the Town, they provide links to weather information, storm tracking information, and hazard preparation information for its residents and emergency response workers. It can be accessed at the following address: "<http://www.knightdalnc.gov>".



Goal 3: Specifically reduce the impact of flooding.

The third goal is to specifically reduce the impact of flooding. The mitigation objectives proposed to achieve this goal address the hazard of flooding in floodplains as defined by FEMA and shown on Flood Insurance Rate Maps for Wake County. They include informing the public of the risk of flooding; discouraging development in flood-prone areas; and elevation, acquisition, or relocation of existing structures in flood-prone areas. Public education, prevention, property protection, and natural resource protection strategies are associated with this goal. Funding for all of the objectives is internal with the exception of the new policy on structure elevation, acquisition, or relocation. Grants will be pursued in order to complete this objective.

The Town of Knightdale currently has regulations in place to restrict development in the floodplain. These regulations have been effective in limiting development in flood-prone areas to date. Also, the Town is currently preparing a stormwater management plan along with preparing to implement a stormwater management program as called for by the Town's NPDED Phase II Permit. It is anticipated that some of the projects identified by this plan will reduce the impact of flooding. Finally, the Town proposes to be proactive in reducing damages to existing structures located within flood hazard areas. To do this, the Town will maintain a list of all structures located within the flood plain, strictly enforce the flood ordinance as it deals with substantial improvements to these structures, and actively pursue grants to acquire, elevate or relocate these structures. Currently, the Town does not have any repetitive loss structures as classified by FEMA. However, according to a 2005 FIRM Survey, the Town identified 31 residential structures in the floodplain; however, it is likely that most if not all are built above the local BFE.

Goal 4. Specifically reduce the impact of hurricanes.

The fourth goal is to specifically reduce the impact of hurricanes. The mitigation objectives proposed in order to achieve this goal include educating the public about hurricanes and implementing plans to speed the recovery process after a hurricane. Hurricanes are not geographically defined; therefore, the objectives will apply to the entire jurisdictional area of the Town. Strategies associated with this goal are categorized as public information and prevention strategies.



Funding for the majority of these objectives is internal, with the exception of private funding for burial of power lines in new developments.

Hurricane impacts to Knightdale historically have included loss of power and destruction of property resulting in debris that has to be removed and disposed. Although burial of all power lines within the Town's jurisdiction would be prohibitively expensive, the Town can require that all new developments install underground power lines, which should minimize repairs necessary to restore power. In addition, the existence of a debris removal and disposal plan along with contracted disaster clean up companies will provide Knightdale with a means to quickly mobilize cleanup crews, prioritize critical areas for debris removal, and provide a cost-effective manner for processing vegetative debris.

Goal 5. Specifically reduce the impact of tornadoes and severe thunderstorms.

The fifth goal is to specifically reduce the impact of tornadoes and severe thunderstorms. The mitigation objectives proposed in order to achieve this goal include educating the public about tornadoes and severe thunderstorms, reducing impacts to power lines and structures, and implementing plans to speed the recovery process after a tornado or severe thunderstorm. Tornadoes and severe thunderstorms are not geographically defined; therefore, the objectives will apply to the entire jurisdictional area of the Town. Strategies associated with this goal are categorized as public information and prevention strategies. Funding for the majority of these objectives is internal, with the exception of private funding for burial of power lines in new developments.

Tornado and severe thunderstorm impacts to Knightdale are expected to include loss of power and destruction of property resulting in debris that has to be removed and disposed of. Although burial of all power lines within the Town's jurisdiction would be prohibitively expensive, the Town can require that all new developments install underground power lines, which should minimize repairs necessary to restore powers. The preparation of a debris removal and disposal plan will provide Knightdale with a means to quickly mobilize cleanup crews, prioritize critical areas for debris removal, and provide a cost-effective manner for processing vegetative debris.



Goal 6. Specifically reduce the impact of winter storms and freezes.

The sixth goal is to specifically reduce the impact of winter storms and freezes. The mitigation objectives proposed in order to achieve this goal include educating the public about winter storms and freezes, reducing impacts to power lines and structures, and implementing plans to speed the recovery process after a winter storm. Winter storms are not geographically defined; therefore, the objectives will apply to the entire jurisdictional area of the Town. Strategies associated with this goal are categorized as public information and prevention strategies. Funding for the majority of these objectives is internal, with the exception of private funding for burial of power lines in new developments.

Severe winter storm impacts to Knightdale historically have included loss of power and destruction of property resulting in debris that has to be removed and disposed of. Although burial of all power lines within the Town's jurisdiction would be prohibitively expensive, the Town can require that all new developments install underground power lines, which should minimize repairs necessary to restore powers. The preparation of a debris removal and disposal plan will provide Knightdale with a means to quickly mobilize cleanup crews, prioritize critical areas for debris removal, and provide a cost-effective manner for processing vegetative debris.

Goal 7. Improve technical capability.

The seventh goal is to improve the technical capability of the Town. The mitigation objectives proposed in order to achieve this goal include increasing the information available on the Town's website and the Town's electronic newsletter. Strategies associated with this goal are categorized as public information strategies.

The community capability assessment included an evaluation of the Town's technical capability. Knightdale has a Town website and electronic newsletter, both of which are beneficial to Town staff and residents, however improvements could be made. The Town's website and electronic newsletter should be updated whenever necessary to ensure that the latest storm and emergency response information as well as hazard prevention education materials are available to residents who access them.



Goal 8. Specifically reduce the impact of drought.

The eighth goal is to specifically reduce the impact drought. The mitigation objectives proposed in order to achieve this goal include educating the public about drought and water conservation, and increasing the regional potable water supply. Droughts are not geographically defined; therefore, the objectives will apply to the entire jurisdictional area of the Town. Strategies associated with this goal are categorized as public information, property protection and prevention strategies. Funding for these objectives is internal to either the Town of Knightdale or the City of Raleigh.

Drought impacts to Knightdale historically have included the restriction of various types of water usage. Although water cannot completely be cut off for essential services and uses, the Town can encourage water conservation techniques such as rain barrels, watering at night or in the early morning or installing water saving device on sinks and toilets which will help to stretch the regional water supply and help citizens and communities stave off the severity of an exceptional drought such as the one experienced throughout the region in 2007 and 2008.

D. IMPLEMENTATION THROUGH EXISTING POLICIES

As noted above, many of the objectives associated with the goals for the Hazard Mitigation Plan will be implemented through revisions and/or additions to existing Town plans and policies. The Town department responsible for implementation of each strategy is listed in the Mitigation Action Table. If implementation of a particular strategy requires modification to an existing policy, the department listed will be responsible for ensuring that the policy change has been made on or before the target completion date. The policies and programs that will be utilized in implementation of the Hazard Mitigation Plan include the following: Unified Development Ordinance, 2027 Comprehensive Plan, Emergency Operations Plan, Water Conservation Task Force, Building Codes, and Floodplain Regulations. The Community Capability Assessment, found in Appendix C, reviews these policies as well as other policies and programs currently implemented by the Town.



E. PRIORITIZATION METHODOLOGY

An important part of formulating policies to carry out the mitigation strategies is the determination of priority and identification of the potential funding source or sources for each policy. The mitigation objectives were divided into three categories of priority: high, moderate and low. The objectives that were given high priority involve facilities designated as critical by the Advisory Committee. These objectives must be accomplished in order for the Town to recover from disasters as quickly as possible. Moderate priority objectives will speed recovery by limiting damages to non-critical structures and infrastructure. Low priority objectives include natural resource protection and public information projects.

The objectives relating to developing a Hazard Mitigation Plan, maintaining critical facilities and infrastructure, limiting development in flood hazard areas, and preparation of post-disaster clean-up plans are of highest priority. Some of the high-priority objectives are short-term in nature and will be completed within six (6) months of approval of the updated plan. They are continuations of current policies, were identified as deficiencies during the planning process and implemented immediately, or are to be implemented upon approval of the plan. Long-term high-priority objectives are ongoing or are to be completed within five (5) years of the plan's adoption.

The objectives relating to the protection of non-critical structures and infrastructure and informing the public about the potential damages caused by hazards are of moderate priority. The majority of these objectives are continuations of existing Town policies.

Increasing the information available to the public on the Town's website and maintaining and expanding the Town's greenway system were given low priority designation. These projects are continuations of existing Town policies. Although the projects will aid in hazard mitigation to a small degree, other projects such as involving the public in the Hazard Mitigation Planning process and restricting development in the floodplain will be more effective in reducing the impacts of natural disasters.

The funding for the policies and programs listed in the Mitigation Action Table is internal with the following exceptions:



1) Grants may be pursued in order to mitigate damages to existing structures in flood hazard areas and to prepare a debris removal and disposal plan for the Town. 2) Private funding may be used for expansion of the Town's greenway system, maintenance of trees adjacent to power lines (handled by local energy providers) and critical facilities and burial of power lines in new developments.

Most of the mitigation objectives will be completed by Town staff and paid for by the Town. The Town's current budget does not allow for significant expenditures for hazard mitigation, therefore the Advisory Committee reviewed each potential policy along with the Town's capability assessment to verify that the Town had adequate staff and funding necessary to complete the tasks on or before the target date. Funding and staff required to meet all the short-term objectives is currently in place. Funding and staff required for the long-term objectives will be added as necessary, with grants complementing Town resources whenever possible.



Section IV – Monitoring, Evaluating, and Reporting Progress

A. PROCESS

An important aspect of hazard mitigation is the ongoing evaluation of a community's vulnerability to hazards and its capability to deal with them when they occur. The Hazard Mitigation Plan must be reviewed on a regular basis in order to assess its effectiveness in dealing with the hazards the Town has experienced and expects to experience. The procedure for this review will include monitoring the implementation of the mitigation policies as well as updating the vulnerability assessment and community capability assessment.

B. MONITORING OF POLICIES

In Section III – Mitigation Strategies and Policies, the responsible party, target completion date, and monitoring or evaluation indicator were established for each of the policies. (See Mitigation Action Plan) In each case, the responsible party listed is one of the Town's departments. It will be the responsibility of each department director to monitor the implementation of the policies under its jurisdiction on an annual basis and prepare a report to be reviewed by the Advisory Committee at its annual meeting. –This report should contain each policy, project(s) associated with implementation of the policy, progress made on implementation, and any comments or proposed revisions to the plan as a result of the findings.

C. UPDATING OF VULNERABILITY AND COMMUNITY CAPABILITY ASSESSMENTS

In addition to assessing the implementation of the action portion of the plan, the Town must also update the vulnerability assessment and community capability as needed. The Town of Knightdale has experienced significant growth in the last two (2) decades and expects to continue to grow in the future. The completion of two major transportation projects in the vicinity of the Town has brought more development, both residential and commercial, to the area. As development increases, so does the Town's vulnerability; and the Town's continued ability to deal with hazards will need to be addressed.



It will be the responsibility of the Advisory Committee to update the vulnerability assessment on an as-needed basis. If the Town continues to experience the growth it has enjoyed in recent years, the number of people and structures under the Town's jurisdiction will increase. Large increases in population and/or development should result in updates to the vulnerability assessment. In addition, widespread zoning changes which would allow for more dense development should be incorporated into the updates because they would increase the future vulnerability of the Town. Completion of any projects resulting in critical infrastructure or critical facilities should also be noted.

It will also be the responsibility of the Advisory Committee to update the community capability assessment on an as-needed basis. Major changes in staff and organizational capability or technical capability should be noted. In addition, revisions to any of the policies and programs utilized by the Town should be included. Any further revisions to the North Carolina Building Code and National Flood Insurance Program also need to be included as well as changes in legal capability, fiscal capability, and political climate.

Since the previous plan was adopted in 2004, the Town of Knightdale has undergone several major changes of significant note for these assessments regarding size, development standards and the provision of public services to the citizens of Knightdale, including the following:

1. Expanded its corporate limits from 3.88 square miles to 6.11 square miles.
2. Expanded its overall planning jurisdiction from 13.44 square miles to 20.95 square miles.
3. Increased its population from 7,325 citizens to 10,058 citizens.
4. Became a participant in the National Pollutant Discharge Elimination System (NPDES) Phase II in June of 2005, resulting in more stringent stormwater control ordinances.
5. Adopted new FEMA Digital Flood Insurance Rate Maps and associated Flood Damage Prevention Ordinance in May of 2006.
6. Merged its water and sewer utility system with the City of Raleigh's public utility system in May of 2006, transferring ownership, control and maintenance of the utility system to the City of Raleigh.
7. Adopted a completely revised Unified Development Ordinance in November of 2005 that is intended to guide the Town's development by



preserving the natural environment and mitigating the impact of natural hazards on the built environment.

D. PLAN MAINTENANCE REPORT

It will be the responsibility of the Planning Department to compile and maintain the monitoring reports and any updates to the vulnerability assessment and community capability assessment in order that the Advisory Committee may prepare a plan maintenance report to summarize the progress of the plan and recommend updates to the plan. This report should be prepared annually and submitted to the Town Manager as well as posted on the Town's website, the Town's electronic newsletter and in Town Hall for review and comment by the public. Any public comments on the report will be forwarded to the Planning Department. A notice of the posting of the report will be made in the Eastern Wake News, and included in the Town's E-View Weekly.

E. 2009 PROGRESS OVERVIEW

The Advisory Committee, with input from local government agencies, concerned citizens, and state and local officials, used the following process to give a comprehensive review and evaluation of each section of the previously approved Knightdale Hazard Mitigation Plan. The process included a comprehensive review of the 2007 North Carolina State Hazard Mitigation Plan to evaluate the consistency of the Knightdale Hazard Mitigation Plan with the State Plan.

The Advisory Committee followed the process specified in the Maintenance Section of the previously approved plan for monitoring, evaluating and updating the plan. As specified in that section, the Committee met on August 8, 2008 and addressed the following questions to assess the previously approved plan:

- Do the goals and objectives address current and expected conditions?
- Has the nature or magnitude of risk changed?
- Are current resources sufficient for implementing the plan?
- Are there implementation issues, such as technical, political, legal or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did the agencies and other partners participate in the planning process as proposed?



The answers to these questions were derived through consensus, and are contained in Appendix C to the mitigation plan update.

In addition, the Advisory Committee reviewed information contained in other relevant progress reporting documents, including the results of the Community Assistance Visit(s) (CAV) conducted by representatives of the National Flood Insurance Program on [date(s)], that evaluate whether the Town of Knightdale is adequately enforcing its floodplain management regulations. The results of the CAV(s) are contained in Appendix D to the mitigation plan update.

The Advisory Committee reviewed the risk assessment of the previously approved plan and made adjustments as indicated in the plan update document and as referenced in the Mitigation Plan Update Checklist. The following new plans, studies, reports, and technical information that have become available since the previously approved plan was adopted were reviewed and incorporated into the Plan Update:

- FEMA Digital Flood Insurance Rate Maps
- Town of Knightdale Unified Development Ordinance
- Flood Damage Prevention Ordinance
- NPDES Phase II Stormwater Control Ordinance.

The Advisory Committee also reviewed the Goal Section of the previously approved plan, and concluded that the goal statements continue to meet the mitigation needs of the Town of Knightdale OR no longer meet the mitigation needs of the Town of Knightdale and have been revised accordingly. The goal statements of the Mitigation Plan Update appear in the Goal Section of this document.

The Advisory Committee also reviewed the Mitigation Action Section of the previously approved plan, and identified the actions that had been completed. These actions, along with the date of completion, responsible party, funding source used, and outcome for mitigation appear in Section III, Part B to the Plan Update. Actions completed include the preparation and adoption of the original Hazard Mitigation Plan, presentation of the original Plan at a Public Meeting, the 2009 revision of the Plan, and updating the Emergency Response Plan. Ongoing accomplishments include keeping evacuation routes open during hazards,



maintaining the water supply system and sewer lift stations, requiring the disclosure of flood hazards in real estate transactions, monitoring areas that frequently flood and engaging in discussions with affected property owners, letting the public know that flood maps are available on paper in the Planning Department and online with Wake County's website, enforcing our Unified Development Ordinance standards for development in flood hazard areas, requiring floodproofing of structures requesting substantial improvements, requiring the burial of power lines for new development, and requiring new construction to comply with the wind section of the Building Code. Work on many of the other actions in Section III, Part B, has been hampered by the complete turnover in Town personnel associated with the Hazard Mitigation Plan between 2004 and 2009. Unfortunately, a transfer of knowledge concerning the Plan was not achieved and many of the actions beyond the regular day-to-day duties of Town personnel did not achieve much headway.

Actions that have been deleted or deferred, along with the reason for their deletion or deferment also appear in Section III Part B to the Plan Update. Actions determined to be still viable options for the community have been carried over into the Plan Update and are included on the Mitigation Action Section.



Section V – Revisions and Updates

A. REVISIONS TO PLAN

The evaluation of the Hazard Mitigation Plan's effectiveness will be an ongoing process. In addition to preparation of a plan maintenance report on an annual basis, the Town must also revise the Plan once every five (5) years. It will be the responsibility of the Advisory Committee to review the annual plan maintenance reports and make recommendations to the Town Council which will be presented by the Planning Director. The Council has the ability to authorize the revisions to the Plan.

Upon receipt of authorization from the Council, the Plan will be revised in accordance with current Hazard Mitigation legislation. The revised plan must be submitted to the North Carolina Emergency Management State Hazard Mitigation Officer and to FEMA for review and approval.

B. UPDATES TO PLAN

In the plan maintenance report, the Advisory Committee will recommend updates to the Plan. These updates can relate to policy implementation, changes in the community's vulnerability, and changes in the community's capability to mitigate damages of natural hazards. Likewise, new strategies and policies may need to be incorporated into the plan in order for the Town to better mitigate future disasters. Updates to the Plan will be made as they are necessary, along with the date, reason for the update, and person responsible for the update.

Updates to the plan must be adopted by Town Council in order to be enforceable. The adoption procedure for the updated plan will follow the same process that the adoption of the Plan followed. A Resolution of Adoption of the Update to the Hazard Mitigation Plan will be taken before the Town Council at a Public Hearing. Following the Public Hearing, the Resolution will be referred to the Planning Board who will make a recommendation back to Council for a final vote to adopt. All meetings will be open to the public for discussion.



Appendix A: Hazard Identification and Assessment

A. INTRODUCTION

Prior to updating the Hazard Mitigation Plan, it is vital to identify and reassess the hazards that could potentially affect the Town of Knightdale. According to FEMA and NCEM criteria for the development and updating of a Hazard Mitigation Plan, the following hazards must be addressed: Dam Failure, Drought/Heat Wave, Earthquakes, Flooding, Hurricane/Coastal Storms, Landslides/Debris Flow, Tornadoes/Severe Thunderstorms, Wildfires and Severe Winter Weather. Although Nor'easters affect North Carolina, most of the damage occurs in the form of beach erosion. Inland effects of Nor'easters are nearly identical to those of a Severe Winter Storm and are addressed as such.

The hazards were ranked according to the potential damage they could cause. The ranking of each hazard appears in the chart below.

Table A-1 - Hazard Ranking

Hazard	Rank	Comments
Dam Failure	Low	Not addressed in plan
Drought/Heat Wave	Moderate	Addressed in plan
Earthquakes	Low	Not addressed in plan
Flooding	Moderate	Addressed in plan
Hurricanes/Coastal Storms	Moderate	Addressed in plan
Landslides/Debris Flow	Very Low	Not addressed in plan
Tornadoes/Severe Thunderstorms	Moderate	Addressed in plan
Wildfires	Low	Not addressed in plan
Severe Winter Weather	Moderate	Addressed in plan

Of the nine (9) natural hazards identified, five (5) were given a composite ranking of moderate based on each hazard's likelihood of occurrence, likely magnitude, and potential impact. These hazards have impacted the Town of Knightdale in the past, and impacts from these hazards are expected to continue. These hazards, drought/heat wave, flooding, hurricanes/coastal storms, tornadoes/severe thunderstorms, and severe winter weather are addressed in the Hazard Mitigation Plan.



B. METHODOLOGY

The identification and assessment were performed according to the following steps:

- describe potential hazard,
- predict likelihood of occurrence,
- predict likely magnitude of hazard, and
- predict possible impacts from hazard.

A composite ranking was determined for each hazard upon completion of the assessment. This ranking was based on the hazard's likelihood of occurrence, likely magnitude, and potential impact.

1. Hazard Description

The description of each hazard includes a history of the hazard's presence in Knightdale. Hazard data for Wake County obtained from the National Climatic Data Center (NCDC), local historical evidence, and interviews with Town staff were used in the descriptions of the hazards. In addition, North Carolina Emergency Management (NCEM) categorized vulnerability for nine (9) hazards for in each county. Local historical information was solicited from the public.

2. Likelihood of Occurrence

The likelihood of occurrence of each hazard, based on regional data and local historical evidence, was predicted in accordance with the following chart:

Table A-2 - Likelihood Based on Frequency of Occurrence

Likelihood	Frequency of Occurrence
Highly Likely	Near 100% probability in the next year
Likely	Between 10 and 100% probability in the next year, or at least one chance in the next 10 years
Possible	Between 1 and 10% probability in the next year, or at least one chance in the next 100 years
Unlikely	Less than 1% probability in the next year, or less than one chance in the next 100 years

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.



3. Magnitude

The magnitude or intensity is a function of the amount of damage a hazard can cause. The magnitude or intensity of each hazard was estimated in accordance with standardized rating scales or general terms. Standardized rating scales applicable to some of the hazards are found in the individual hazard descriptions. Magnitude or intensity for hazards without standardized rating scales was estimated according to the table on the following page.

Table A-3 - Description of Magnitude

Magnitude	Description
Mild	Affects less than 10% of the Town and its ETJ
Moderate	Affects between 10% and 40% of the Town and its ETJ
Severe	Affects more than 40% of the Town and its ETJ

4. Level of Impact

The level of impact takes into account the impact on humans, impact on critical facilities, and impact on property. The level of impact was estimated in accordance with the following table:

Table A-4 - Level of Impact Based on Area, Injuries, Effect on Critical Facilities, and Property Damage

Level	Area Affected	Impact
Catastrophic	More than 50%	One or more deaths Complete shutdown of critical facilities for 30 days or more More than 50% of property is severely damaged
Critical	25 to 50%	Multiple severe injuries Complete shutdown of critical facilities for at least 2 weeks More than 25% of property is severely damaged
Limited	10 to 25%	Some injuries Complete shutdown of critical facilities for more than one week More than 10% of property is severely damaged
Negligible	Less than 10%	Minor injuries Minimal quality-of-life impact Shutdown of critical facilities and services for 24 hours or less Less than 10% of property is severely damaged

Source: *Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments*, NCEM, 2003



5. Composite Ranking

A composite ranking was determined for each hazard following completion of the assessments. This ranking was based on the hazard’s likelihood of occurrence, likely magnitude, and potential impact. Hazards with higher composite rankings and therefore, higher potential for damage, are addressed in the Hazard Mitigation Plan.

Table A-5 - Hazard Ranking Chart

Likelihood↓/Impact→	Catastrophic	Critical	Limited	Negligible
Highly Likely	Very High	High	High	Moderate
Likely	Very High	High	Moderate	Low
Possible	High	Moderate	Low	Low
Unlikely	Low	Low	Very Low	Very Low

C. IDENTIFICATION AND ASSESSMENT OF HAZARDS

1. Dam Failure

Although dam failure is a technological hazard, the occurrences of natural hazards such as severe storms and hurricanes that cause flooding are frequently the cause of dam failure. Any dam whose failure could potentially result in the loss of life is classified as high hazard. Wake County currently has 389 dams under the jurisdiction of the Department of Environment and Health, Dam Safety Division. Of those 389, 132 are classified as high hazard according to the 2008 Dam Inventory for the state. According to Town records, only one (1) high hazard dam is located within Knightdale’s jurisdiction.

According to dam safety records, no dams in Knightdale have failed, but records for Wake County show that two (2) dams have been breached since 2004. Dam failure is definitely possible, but it is unlikely.

The failure of a dam would result in damage only to the area immediately surrounding and downstream of the dam. Failure of any of the dams would result in damage to less than 10% of the Town. As a result, the magnitude or intensity of damage is categorized as mild.



A dam failure would likely affect less than 10% of the town and result in minimal damages to property, critical facilities, and quality of life and minor injuries. As a result, the level of impact is categorized as negligible.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of dam/levee failure is low. Dam/levee failure is not addressed by the Hazard Mitigation Plan.

2. Drought/Heat Wave

According to the National Oceanic and Atmospheric Administration (NOAA), a drought is a period of abnormally dry weather that persists long enough to produce a serious hydrologic imbalance (for example crop damage, water supply shortage, etc.). The severity of the drought depends upon the degree of moisture deficiency, the duration of the drought, and the size of the affected area.

There are four different types of droughts:

Meteorological - when precipitation is lower than normal for a specific location.

Agricultural - when the soil moisture content does not meet the needs of a particular crop.

Hydrological - when surface and subsurface water supplies are below normal.

Socioeconomic - when physical water shortage begins to affect people.

Meteorologists predict drought by monitoring precipitation compared to historically established normal data. Several drought indices are used to categorize the severity of the drought. The Palmer Drought Severity Index has been widely used by the U.S. Department of Agriculture to determine when to grant emergency drought assistance. It predicts drought by assessing soil moisture. The National Drought Mitigation Center is using a newer index, the Standardized Precipitation Index, to monitor moisture supply conditions. It is less complex than the Palmer scale and its ability to assess drought conditions for different time scales allows for earlier prediction of drought.

According to FEMA, heat wave is characterized by temperatures 10 degrees or more above the average high temperature for the region that last for several weeks. The National Weather Service (NWS) has devised the Heat Index to



describe how hot it actually feels. The Heat Index takes into account the effect of relative humidity as well as the air temperature. Extreme heat can result in serious health conditions. They include:

- Heat cramps: characterized by painful spasms usually in muscles of legs and abdomen and heavy sweating.
- Heat exhaustion: characterized by heavy sweating, weakness, clammy and cold skin, fainting and vomiting.
- Heat stroke or sun stroke: characterized by high body temperature (106 degrees F or higher), hot dry skin, rapid and strong pulse, and possible unconsciousness.

The following table lists the danger categories for heat disorders as a function of heat index.

Table A-6 - Danger Categories for Heat Disorders

Danger Category	Heat Index	Possible Heat Disorders
Extreme danger	130F or higher	Heat stroke or sun stroke likely.
Danger	105 – 129F	Sunstroke, muscle cramps, heat exhaustion likely. Heat stroke possible with prolonged exposure.
Extreme caution	90 – 104 F	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure.
Caution	80-89 F	Fatigue possible with prolonged exposure.

Source: NWS Southern Region Headquarters Heat Wave website, National Weather Service

Review of historical data from the NCDC showed that North Carolina has experienced several droughts and heat waves in recent history. Descriptions of these events follow. The present worth cost of damages is included in parentheses.

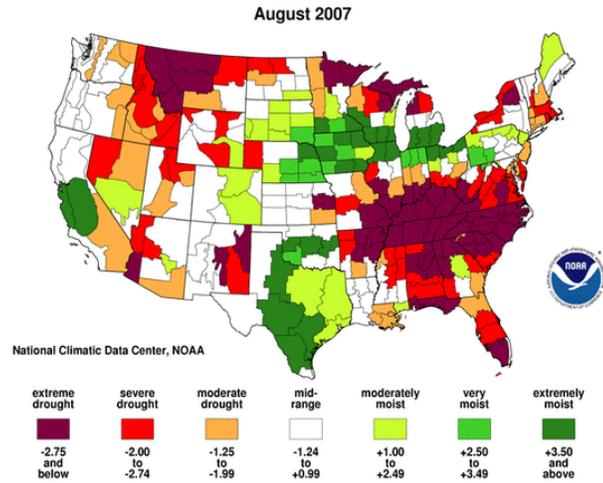
- Drought/Heat Wave June-September 1980. Affected central and eastern U.S. Damages/costs to agriculture and related industries estimated to be \$20.0 (48.4) billion. Number of deaths estimated to be 10,000 (includes heat stress-related deaths).



- Southeast Drought/Heat Wave-Summer 1986. Severe summer drought in parts of the southeastern U.S. Damages/costs to agriculture estimated to be \$1.0-\$1.5 (1.8-2.6) billion. Number of deaths estimated to be 100.
- Drought/Heat Wave-Summer 1988. Drought in central and eastern U.S. Damages/costs to agriculture and related industries estimated at \$40.0 (61.6) billion. Number of deaths estimated to be 5,000 to 10,000 deaths (includes heat stress-related deaths).
- Drought/Heat Wave-Summer 1993. Affected Southeastern U.S. Damages/costs to agriculture estimated at \$1.0 (1.3) billion. Number of deaths estimated to be at least 16. North Carolina had hottest July on record, 2nd hottest summer on record, and 2nd driest summer on record (records date back to 1895). Disaster areas declared for 89 of 100 counties. Crop losses estimated at \$165 million in North Carolina.
- Southern Drought/Heat Wave-Summer 1998. Severe drought and heat wave from Texas/Oklahoma eastward to the Carolinas. Damages/costs to agriculture and ranching estimated at \$6.0-\$9.0 billion (6.6-9.9). Number of deaths estimated to be at least 200. According to Palmer Scale, central North Carolina experienced a moderate drought. July and August were also hotter than normal for North Carolina.
- Drought/Heat Wave Spring-Summer 2000. Severe drought and persistent heat over south-central and southeastern states. Damages/costs to agriculture and related industries estimated at over \$4.0 (4.2) billion. Number of deaths estimated at 140 nationwide. According to Palmer scale, central North Carolina experienced a moderate drought.
- Widespread Drought Spring through early Fall 2002. Moderate to Extreme drought over large portions of 30 states, including the western states, the Great Plains, and much of the eastern U.S. Damages/costs estimated at over \$10.0 billion. No deaths reported. For the month of July, 39% of the contiguous U.S. experienced moderate or severe drought. All of NC experienced drought; drought in piedmont was extreme, in mountains was severe, and in coastal plain was severe or moderate.
- Great Plains and Eastern Drought: Entire year 2007 (see following graphic). Severe drought with periods of extreme heat over most of the southeast and portions of the Great Plains, Ohio Valley, and Great Lakes area, resulting in major reductions in crop yields, along with very low stream-flows and lake levels. Includes states of ND, SD, NE, KS, OK, TX, MN, WI, IA,



MO, AR, LA, MS, AL, GA, NC, SC, FL, TN, VA, WV, KY, IN, IL, OH, MI, PA, NY.
 Preliminary estimate of well over \$5.0 billion in damage/costs; some deaths reported due to heat but not beyond typical annual averages.



According to NCDC data, there have been eight (8) moderate to severe droughts/heat waves in North Carolina since 1980. As a result, drought/heat wave is characterized as likely for Knightdale.

Drought/heat wave typically affects large areas such as entire states or whole regions of the country. As a result, the occurrence of a severe drought/heat wave could affect a large area of the Town, therefore the magnitude or intensity of damage is categorized as moderate.

Although a drought/heat wave would likely affect a large portion of the Town, the impact to critical facilities is expected to be limited. Impact to property, particularly agricultural impacts, could be considerable but would not be expected to affect more than 25% of the Town. For an extended drought/heat wave, minor injuries could be expected as well as considerable restrictions being place on the use of potable water. As a result, the impact due to drought/heat wave could range from limited to negligible.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of drought/heat wave is moderate. Typically, drought/heat wave mitigation is handled on a large scale by state agencies; however, within the last few years the City of Raleigh Public Utilities Department has merged its water distribution and sewage collection systems with the Town of Knightdale's systems as well as several other northeastern, eastern and southeastern Wake County towns. Consequently, the Town of Knightdale through the City of Raleigh can



undertake some measures to mitigate the effects of an extended drought; therefore, drought and heat waves are addressed in the Hazard Mitigation Plan.

3. Earthquakes

FEMA defines an earthquake as a sudden, rapid shaking of the Earth caused by the breaking and shifting of rock beneath the Earth's surface. This shaking can cause buildings and bridges to collapse; disrupt gas, electric, and phone service; and sometimes trigger landslides, avalanches, flash floods, fires, and huge, destructive ocean waves (tsunamis). Buildings with foundations resting on unconsolidated landfills, old waterways, or other unstable soil are most at risk. Buildings or trailers and manufactured homes not tied to a reinforced foundation anchored to the ground are also at risk since they can be shaken off their mountings during an earthquake. When an earthquake occurs in a populated area, it may cause deaths and injuries and extensive property damage. Earthquakes can occur at any time of the year.

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. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale. It is a 12-level scale based on direct and indirect measurements of seismic effects.

Table A-7 - Modified Mercalli Scale of Earthquake Intensity

Scale	Intensity	Description of Effects	Maximum Acceleration (mm/sec)	Corresponding Richter Scale
I	Instrumental	Detected only on seismographs	<10	
II	Feeble	Some people feel it	<25	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	<50	
IV	Moderate	Felt by people walking	<100	

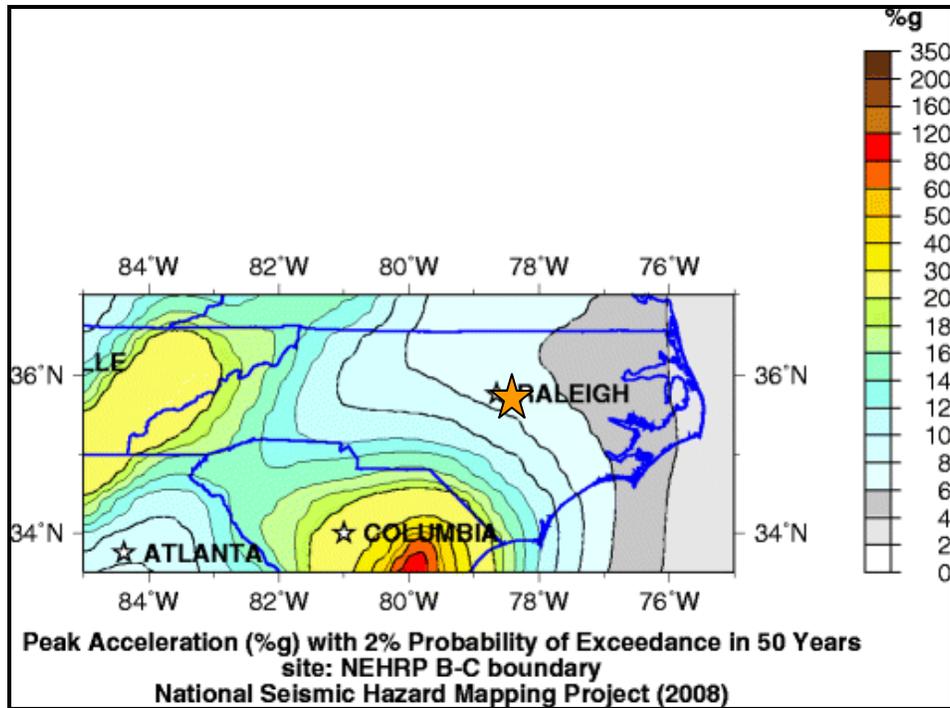


V	Slightly Strong	Sleepers awake; church bells ring	<250	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<500	<5.4
VII	Very Strong	Mild alarm; walls crack; plaster falls	<1000	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	<2500	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<5000	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7500	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<9800	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>9800	>8.1

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.

Approximately two-thirds of North Carolina is subject to earthquakes with the western and southeast region most vulnerable to a very damaging earthquake (see following map). Knightdale only maintains a 2% probably of seeing a peak acceleration of six (6) to eight (8) millimeters/second from an earthquake in the next 50 years which is the lowest scale of "1" that will not be felt, but only recorded on a seismograph.



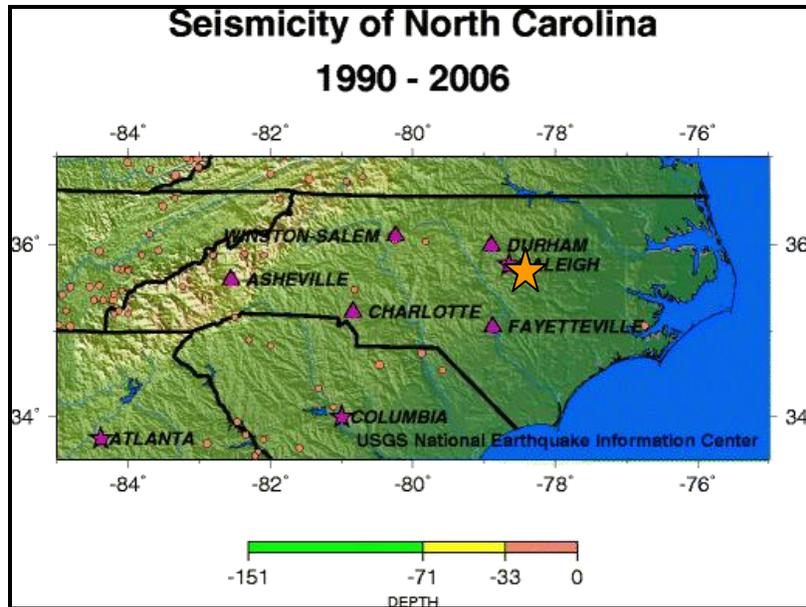


The most notable earthquake in the Carolinas was the Charleston quake of 1886 which was felt over 1000 miles away in Illinois. This earthquake caused considerable damage in both Charlotte and Raleigh. Other notable earthquakes that have caused damage in North Carolina occurred in 1735 (centered in Bath), 1811 (centered near New Madrid, Missouri), and 1916 (centered in Waynesville). Subsequent minor earthquakes have caused damage in North Carolina in 1926, 1928, 1957, 1959, 1971, 1973 and 1976.

According to the North Carolina Geological Survey (NCGS), one known major fault is located in southwestern Wake County. This fault identified by NCGS is described as ancient and inactive. NCEM has categorized the risk for earthquakes in Wake County as low.

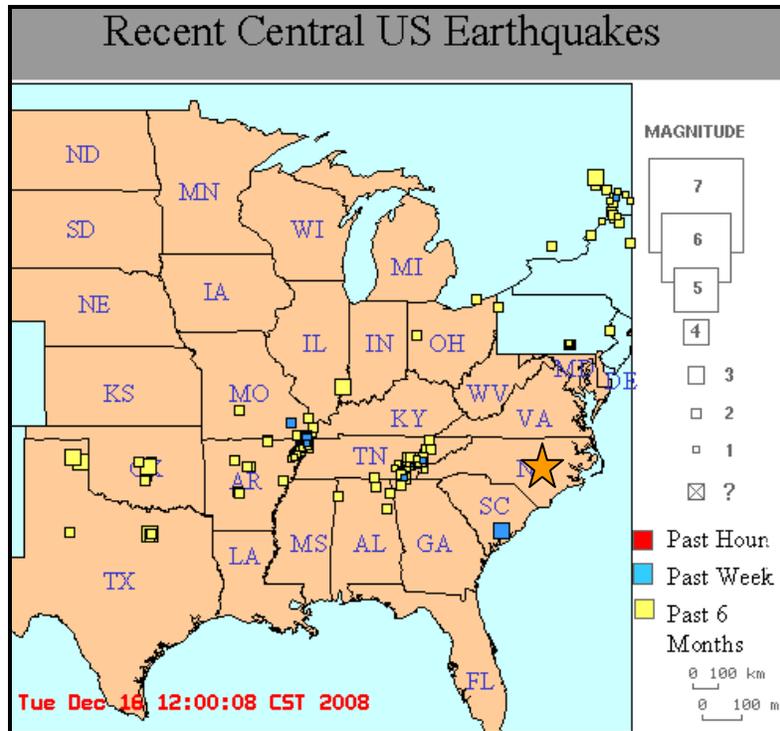
According to a review of USGS earthquake data between 1698 and 2008, no earthquakes centered near Knightdale have been recorded. More recently, between 1990 and 2006, the closest earthquake occurred near Greensboro, but was very minor and shallow (see following seismicity map).





A review of specific data in the previous 6 months as of December 16, 2008 (see following graphic) revealed that the most recent earthquake activity in North Carolina was a magnitude 1.9 quake near Robbinsville, NC on June 21, 2008—over 300 miles away. The closest out of state occurrence was a magnitude 3.6 near Summerville, in the southern part of South Carolina on December 16, 2008. The occurrence of an earthquake is categorized as unlikely. Earthquakes are not addressed by the Hazard Mitigation Plan.





Courtesy: University of Memphis Center for Earthquake Research & Information

Though unlikely, the occurrence of an earthquake centered near Knightdale could result in damage to a significant portion of the Town. As a result, the magnitude or intensity of damage is categorized as severe.

An earthquake centered near Knightdale could likely affect a significant portion of the town and result in serious injuries and property damage and disruption of critical services for a period of time. As a result, the level of impact is categorized as critical.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of an earthquake is low. Earthquakes are not addressed in the Hazard Mitigation Plan.

4. Flooding

According to the National Oceanic and Atmospheric Administration (NOAA), flooding is a localized hazard that is generally the result of excessive precipitation. Floods can be generally considered in two categories: flash floods, the product of heavy localized precipitation in a short time period over a given location; and general floods, caused by precipitation over a longer time period



and over a given river basin. Of all the natural hazards addressed by FEMA, flooding seems to have the largest impact. Flooding causes more damage in the United States than any other severe weather related event, an average of \$5 billion a year.

There are several factors that worsen the impacts of flooding. They include: excessive amounts of impermeable surfaces; steeply sloped watersheds; constrictions such as grading or filling in the floodplain; obstructions such as bridges or culverts; debris from the watershed which can be carried by flood waters; contamination including soil, oil, fertilizer, animal waste, and untreated sewage; soil saturation following extended periods of precipitation; and flood velocity.

Flood events are usually described according to their probability of occurrence. Historical data has been used to determine the rainfall depth and intensity that signify storms of different return periods: 2-year, 10-year, 25-year, 50-year, 100-year, and 500-year. A 100-year flood will occur, on average, once every 100 years. It is possible to have more than one 100-year floods in the same year or even 100-year floods in successive years. The 100-year flood is often used to define flood-prone areas, and floodplain mapping is typically based on the 100-year flood. Additionally, most flood-related structures such as dams are designed to meet 100-year flood conditions.

The Town of Knightdale participates in the National Flood Insurance Program (NFIP). NCEM defines the NFIP in the following terms: "Administered by the Federal Insurance Administration, the National Flood Insurance Program makes federally subsidized flood insurance available to property owners in communities that participate in the program. Participating communities must adopt and enforce floodplain management ordinances that meet the criteria established by FEMA". FEMA conducts Flood Insurance Studies (FISs) that incorporate historical flood data and known flooding problems to determine flood hazards. These hazards are mapped on Flood Insurance Rate Maps (FIRMs). FIRMs are available for the entire jurisdictional area of Knightdale. Flood data from these maps appears on Map B-3, All Hazards Map, in Appendix B.

Floodplain areas are categorized on the Flood Insurance Rate Maps (FIRMs) as described in Table A-8 on the following page.



Table A-8 - Description of Floodplain Areas by Zone

Zone A	The 100-year or base floodplain. There are 6 types of A zones:	
	A	The base floodplain mapped by approximate methods, i.e., Base Flood Elevations (BFEs), are not determined. This is often called an un-numbered A zone or an approximate A zone.
	A1-30	These are known as numbered A zones (e.g. A7 or A14). This is the base floodplain where the FIRM shows a BFE (old format).
	AE	The base floodplain where base flood elevations are provided. AE zones are now used on new format FIRMs instead of A1-A30 zones.
	AO	The base floodplain with sheet flow, ponding, or shallow flooding. Base flood depths (feet above ground) are provided.
	AH	Shallow flooding base floodplain. BFEs are provided.
	A99	Area to be protected from base flood by levees or Federal flood protection systems under construction. BFEs are not determined.
	AR	The base floodplain that results from the de-certification of a previously accredited flood protection system that is in the process of being restored to provide a 100-year or greater level of protection.
Zone V and VE	V	The coastal area subject to a velocity hazard (wave action) where BFEs are not determined on the FIRM.
	VE	The coastal area subject to a velocity hazard (wave action) where BFEs are provided on the FIRM.
Zone B and Zone X	Areas of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. B zones are also used to designate base floodplains of lesser hazards, such as areas protected by levees from the 100-year flood, or shallow flooding areas with average depths of less than 1 foot or drainage areas less than 1 square mile.	
Zone C and Zone X	Area of minimal flood hazard, usually depicted on FIRMs as exceeding the 500-year flood level. Zone C may have ponding and local drainage problems that do not warrant a detailed study or designation as base floodplain. Zone X is the area determined to be outside the 500-year flood.	
Zone D	Area of undetermined but possible flood hazards.	

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.



Review of historical data from NCDC showed that Wake County has experienced 51 flooding events since January 1, 1999. The majority of these events were flash floods as opposed to general floods. Countywide flooding was noted for nine (9) of the 51 flood events. The most severe general flooding that has occurred in the vicinity of Knightdale was due to Hurricane Floyd in 1999. The slow-moving hurricane dumped significant precipitation over the entire Eastern portion of North Carolina, causing general flooding from the Piedmont to the coast. NCDC data quantifies property damage due to flooding at \$250 million during this time period.

FEMA keeps records of structures that are frequently impacted by flooding. These structures are called repetitive loss structures. Repetitive loss structures have suffered flood damage on two or more occasions over a 10-year period ending on the date when a second claim is made, in which the cost to repair the flood damage, on average, equals or exceeds 25% of the market-value of the structure at the time of each flood loss event. A repetitive loss structure is important to the NFIP, since structures that flood frequently put a strain on the flood insurance fund. A review of FEMA data for Knightdale shows that there are no repetitive loss structures within the Town's jurisdiction.

NCEM has characterized the vulnerability to flooding in Wake County as highly likely. Historical data shows that flooding has occurred in Knightdale, the most severe associated with Hurricane Floyd in 1999. The Hurricane Floyd flooding event was listed as countywide with the most recent countywide flooding recorded on June 14, 2006. There are no flooding events listed as specific to Knightdale; however, the likelihood of occurrence is characterized as likely.

Flooding would not impact a large portion of the Town of Knightdale. Knightdale's current Unified Development Ordinance limits development within the floodplain and requires any residential or commercial structure to be elevated to at least two (2) feet above the freeboard level. This limits losses due to flooding, and therefore the impact due to flooding is characterized as mild.

Flooding would result in some damages, though critical facilities are not expected to be impacted for more than a week. None of the Town's critical structures are located within the floodplain. Damage to property is not expected to affect more



than 25% of the Town's land area. As a result, the level of impact is categorized as limited.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of flooding is moderate. Flooding is a natural hazard whose impacts have been mitigated with some success through development ordinances, buyouts, and other programs. Flooding is addressed in the Hazard Mitigation Plan.

5. Hurricanes and Coastal Storms

According to NCEM, hurricanes are cyclonic storms that originate in tropical ocean waters. Hurricanes that impact North Carolina form in the so-called Atlantic Basin, from the west coast of Africa westward into the Caribbean Sea and Gulf of Mexico. They generally form between June 1 and November 30, with a peak around mid-September. A weather system with winds at or exceeding 39 mph is designated as a tropical storm, which is given a name and closely monitored by the NOAA National Hurricane Center in Miami, Florida. When winds are at or exceed 74 mph, the tropical storm is upgraded to hurricane status.

Hurricane intensity is measured using the Saffir-Simpson Scale, shown below. This scale categorizes hurricane intensity based on maximum sustained winds, minimum barometric pressure and storm surge potential. Heavy rainfall is not one of the criteria for categorizing the storms. The highest-category hurricane to affect Wake County was Hurricane Fran in 1995 which was a category 3.



Table A-9 - Saffir-Simpson Scale

Saffir-Simpson Category	Maximum sustained wind speed			Minimum surface pressure	Storm surge	
	mph	meters/ sec	knots		feet	meters
1	74-96	33-42	64-83	Greater than 980	3-5	1.0-1.7
2	97-111	43-49	84-96	979-965	6-8	1.8-2.6
3	112-131	50-58	97-113	964-945	9-12	2.7-3.8
4	132-155	59-69	114-135	944-920	13-18	3.9-5.6
5	156+	70+	136+	Less than 920	19+	5.7+

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.

The damage incurred as a result of hurricanes has been well documented. The table on the following page shows hurricane damage by Saffir-Simpson category.



Table A-10 - Hurricane Damage by Category

Cat.	Level	Description	Example
1	MINIMAL	Damage primarily to shrubbery, trees, foliage, and unanchored homes. No real damage to other structures	Hurricane Jerry (1989)
2	MODERATE	Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Some damage to roofing materials of buildings; some window and door damage. No major damage to buildings.	Hurricane Bob (1991)
3	EXTENSIVE	Foliage torn from trees; large trees blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed	Hurricane Gloria (1985)
4	EXTREME	Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes	Hurricane Andrew (1992)
5	CATASTROPHIC	Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes.	Hurricane Camille (1969)

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.

Although the coast is at greater risk for damage from hurricanes, inland areas such as Knightdale have felt the effects of hurricanes, too. Recent historical data obtained from NCEM shows that 3 hurricanes have hit Wake County in the past 10 years. Hurricanes, Dennis and Floyd hit in 1999, followed by Isabel in 2003. Data for damages caused by these storms follows:



Table A-11 - Hurricane Damage Data

Name	Date	Description
Dennis	9/4/1999	Category 2 6-8 inches of rain in Triangle Never hit coast of NC
Floyd	9/15/1999	Category 2 15-20 inches of rain in Eastern NC 21 deaths in Central NC Livestock losses, infrastructure damage Widespread flooding 3 rd costliest hurricane in US 20 th deadliest hurricane in US (56 deaths)
Isabel	9/18/2003	Category 2 40 deaths Considerable damage on NC coast Widespread power outages \$7.3 million in property damage

NCEM has characterized the probability of occurrence of a hurricane in Wake County as low, but review of hurricane data indicates that hurricanes have impacted Wake County numerous times within the past decade. According to a review of NCDC hurricane data, hurricanes have affected Knightdale and are expected to continue to do so. The occurrence of a hurricane is categorized as likely.

High winds associated with a hurricane could result in moderate damage to Knightdale. Flooding is not as much of an issue since the majority of development is not within the floodplain. As a result, the magnitude or intensity of damage is categorized as moderate.

A hurricane could impact as much as 25% of the town and result in some injuries and property damage and the disruption of critical services for as much as a week. As a result, the level of impact is categorized as limited.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of hurricanes/coastal storms is moderate. Hurricanes/coastal storms are addressed in the Hazard Mitigation Plan.

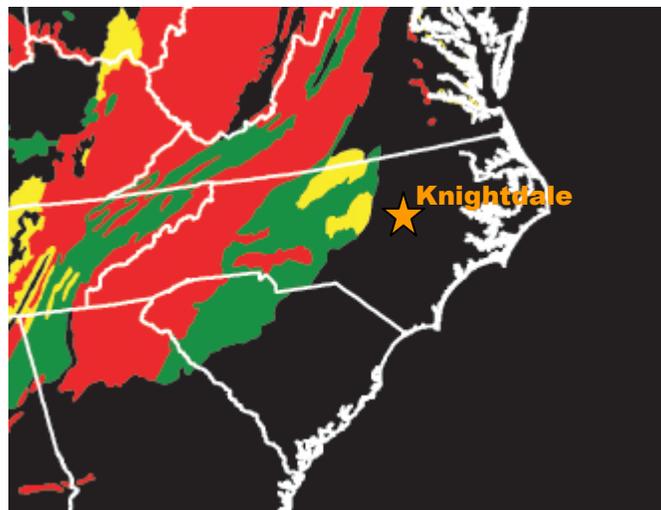


6. Landslides/Debris Flow

According to the United States Geological Survey (USGS), landslides and debris flows are major geologic hazards that occur in all 50 states, causing an average of \$3.5 billion (2005 dollars) in damages and resulting in an average of more than 25 – 50 fatalities each year. Landslides are especially troubling because they often occur with other natural hazards, such as earthquakes, volcanoes and floods. In the eastern United States, landslides are common throughout the mountainous Appalachian region and New England, predominantly from sliding of clay-rich soils.

The USGS identifies landslide incidence/susceptibility for the eastern United States by (1) classifying geographic areas by high, medium, or low landslide incidence and (2) evaluating geologic formations in these areas by high, medium, or low susceptibility to landsliding. Susceptibility to landsliding is defined by the USGS as the probable degree of response of geologic formations to natural or artificial cutting, loading of slopes, or to unusually high precipitation. Generally, it is assumed that unusually high precipitation or changes in existing conditions can initiate landslide movement in areas where rocks and soils have experienced numerous landslides in the past.

NCEM has characterized the vulnerability to landslides in Wake County as low as evidenced by the adjacent graphic from the USGS. Although North Carolina has experienced landslides, they have occurred in the mountainous region of the state. There have been no reported landslides in Wake County or Knightdale. The occurrence of a landslide is characterized as unlikely.



A landslide in Knightdale could result in little damage to the entire Town. As a result, the magnitude or intensity of damage is categorized as mild.



A landslide in Knightdale would likely affect the only a small portion of the Town and result in minor injuries, minor damages to property and no disruption of critical services. As a result, the level of impact is categorized as negligible.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of landslide is very low. Landslides are not addressed in the Hazard Mitigation Plan.

7. Tornadoes/Severe Thunderstorms

According to the National Weather Service, a severe thunderstorm is a thunderstorm that produces tornadoes, hail 0.75 inches or more in diameter, or winds of 50 knots (58 mph) or more. The identification and assessment of tornadoes as a natural hazard cannot be fully addressed without addressing severe thunderstorms also. Severe thunderstorms are frequent occurrences in North Carolina. NCDC data for Wake County shows that 120 severe thunderstorms have been reported in the last decade since January 1, 1999. These thunderstorms resulted in a combined total of 8 injuries, \$316 thousand in property damage, and \$5,000 in crop damage. Of the 120 storms, 114 affected other communities in Wake County, and the remaining six (6) were categorized as affecting not just Knightdale, but all of Wake County. Hail in excess of 0.75 inches diameter was reported 119 times in Wake County, five (5) of those times occurring in Knightdale in the same time period. The damages caused by severe thunderstorms are minimal in comparison with other natural hazards, but the fact that tornadoes are frequently spawned by severe thunderstorms increases the potential damage due to the storms.

The National Weather Service defines a tornado as a violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. A condensation funnel *does not need to reach to the ground* for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even without a condensation funnel.

The intensity, path length and width of tornadoes are rated according to a scale developed by T. Theodore Fujita and Allen D. Pearson. Tornadoes classified as F0-F1 are considered weak tornadoes, those classified as F2-F3 are considered strong, while those classified as F4-F5 are considered violent.



Table A-12 - Fujita-Pearson Tornado Scale

F-Scale	Damage	Winds (mph)	Path Length (miles)	Mean Width (miles)
F0	Light	40-72	<1	<0.01
F1	Moderate	73-112	1-3.1	0.01-0.03
F2	Considerable	113-157	3.2-9.9	0.04-0.09
F3	Severe	158-206	10-31	0.1-0.31
F4	Devastating	207-260	32-99	0.32-0.99
F5	Incredible	261-318	100	1.0
F6	Inconceivable	319-379	Unknown	Unknown

Source: Keeping Natural Hazards From Becoming Disasters, A Mitigation Planning Guidebook for Local Governments, NCEM, 2003.

Review of NCDC Data since January 1, 1999 indicates that three (3) tornadoes have been reported in Wake County during that time period, and none of them affected Knightdale. All three (3) were classified as F0. No crop damage was reported due to tornadoes.

According to NCEM, tornado potential for Wake County is characterized as high. The likelihood of occurrence for tornadoes/severe thunderstorms is classified as likely.

Historically, the majority of tornadoes in Wake County have been classified as weak (F0 or F1). Only one (1) F4 tornado has ever occurred in Wake County since records have been kept (November, 1988), and it resulted in two (2) deaths, 105 injuries and \$250 million in property damage. Therefore, the type of tornado expected to hit Knightdale in the future is F0 or F1. A F0 or F1 tornado would result in limited damage to Knightdale. Path lengths for F0 and F1 tornadoes are typically less than 3 miles, and the mean width does not exceed 0.03 miles. The magnitude of damage for a weak tornado would be characterized as mild.



Likewise, hail and wind damage from severe thunderstorms would be characterized as mild.

Tornadoes/severe thunderstorms have the potential to have some substantial impacts, resulting in damages property, injuries, and the possible shutdown of critical facilities. As a result, the level of impact is categorized as limited.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of tornadoes/severe thunderstorms is moderate. Tornadoes/severe thunderstorms are addressed by the Hazard Mitigation Plan.

8. Wildfires

A wildfire is an uncontrolled burning of grasslands, brush or woodlands. The potential for wildfire depends upon surface fuel characteristics, recent climate conditions, current meteorological conditions and fire behavior. Hot, dry summers and dry vegetation increase susceptibility to fire in the fall, a particularly dangerous time of year for wildfire.

As development has spread into areas which were previously rural, new residents have been relatively unaware of the hazards posed by wildfires and have used highly flammable material for constructing buildings. This has not only increased the threat of loss of life and property, but has also resulted in a greater population of people less prepared to cope with wildfire hazards.

In North Carolina, wildfire potential has been assessed using state Forest Service records for the period 1950-1993. According to NCEM, wildfire potential for Wake County is characterized as moderate. Historical data shows that only 6 13 wildfires were reported in North Carolina since 1993, and none of those were in Wake County. However, it should be noted that seven (7) of those 13 wildfires have now occurred within the last two (2) years, which may suggest a correlation to the most recent state-wide drought. Nonetheless, the occurrence of a wildfire is categorized as unlikely.

A wildfire in Knightdale would likely result in damage to the limited areas of the Town. As a result, the magnitude or intensity of damage is categorized as mild.



A wildfire in Knightdale would likely affect less than 10% of the Town. Neither loss of life nor disruption of critical services would be expected. As a result, the level of impact is categorized as negligible.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of a wildfire is very low. Wildfires are not addressed by the Hazard Mitigation Plan.

9. Severe Winter Weather

Severe winter storms can result in several hazardous weather conditions, including heavy snow, blizzards, freezing rain, sleet and extreme cold. The entire state of North Carolina has a likelihood of experiencing severe winter weather. In the Piedmont, cold air damming contributes to freezing rain and ice storm events. These events occur at least as often as moderate or severe snow events in this region. According to reports by Gail Hartfield of NWS, cold air damming occurs when a thin layer of cold air becomes trapped against the eastern slopes of the Appalachian Mountains. Warmer air lies above the cold air, and when precipitation falls through both layers, freezing rain and sleet result.

The most frequent impacts from severe winter storms are power outages and impassable roads. Trees, downed due to the weight of ice and snow, contribute to both of these impacts. Falling trees and limbs result in property damage, downed power lines, and impassable roads.

Severe winter weather is given a moderate level of vulnerability by the NCEM. Review of NCDC data shows that 18 snow and ice events have been reported in Wake County since Jan 1999. 14 were characterized as "winter storms", three (3) as "winter weather" and one (1) as "heavy snow". No data on property damage, loss of life, or structural damage was noted in the NCDC reports. As a result, the occurrence of a severe winter storm is categorized as likely.

A severe winter storm in Knightdale would likely result in property damage to limited areas of the Town. As a result, the magnitude or intensity of damage is categorized as mild.

A severe winter storm in Knightdale could likely affect 10% of the Town. Disruption of critical services for over 24 hours would be possible, particularly if



power outages are widespread or ice accumulation on roads leads to traffic gridlock and blocked arterials as occurred with the winter weather event of 12/26/2004. As a result, the level of impact is categorized as limited.

Based on probability of occurrence, magnitude, and level of impact, the hazard ranking of severe winter storm is moderate. Severe winter weather is addressed in the Hazard Mitigation Plan.



Appendix B: Vulnerability Assessment

A. HISTORY

Knightdale is one of twelve municipalities located within Wake County, North Carolina. It was named after Mr. Henry Haywood Knight, a prominent resident of the area who donated land to the Norfolk and Southern Railroad Company in order to bring a railroad to the crossroads near his property. The railroad was constructed shortly after 1904, and economic activity increased as a result. The Town received its articles of official incorporation from the North Carolina Legislature on March 9, 1927. Growth was slow until the 1960s when new businesses began to locate along US64. The widening of US64 in the 1970s, along with the growth of the Research Triangle region, accelerated Knightdale's population growth. With the more recent completion of the US64 Bypass and the extension of Interstate 540, Knightdale is currently the 4th fastest growing municipality in the state and by internal estimates has passed the threshold of 10,000 in total population.

B. GEOGRAPHY

Knightdale is located approximately six miles east of downtown Raleigh. The historic town center of Knightdale is situated on the ridge between the Neuse River and Buffalo Creek. Mingo Creek and major portions of Mark's Creek, Poplar Creek, and Beaver Dam Creek are within the current jurisdiction of the Town. The Corporate Limits currently contain 6.19 square miles. The area of the Town's ETJ includes an additional 14.77 square miles to make the total area under Knightdale's current jurisdiction 20.96 square miles.

C. SOILS

The soils within the Knightdale planning area are primarily of the Cecil and Wedowee classifications. The Cecil class is found mainly within the western area of Knightdale, while the Wedowee class is predominant in the central and eastern parts of town. According to Natural Resource Conservation Data soil descriptions, Cecil and Wedowee soils consist of very deep, well drained moderately permeable soils on ridges and side slopes of the Piedmont uplands. Slope is dominantly less than 25 percent but ranges from 0 to 60 percent.



D. POPULATION TRENDS

Population within Knightdale has been increasing at a considerable rate over the past 40 years according to US Census Data. The population for the Town (Corporate Limits only) has increased as shown on the following page.

**Table B-1 - Town of Knightdale (Corporate Limits)
Population Data, 1960-2007**

Year	Population	Increase from Previous Count	% Increase from Previous Count
1960 Census	622	-	-
1970 Census	815	193	31.0%
1980 Census	985	170	20.9%
1990 Census	1884	899	91.3%
2000 Census	5958	4074	216.2%
2007 Official State Estimate	9813	3855	64.7%

Although Census reports do not have population counts explicitly for the ETJ of Knightdale; use of housing unit, vacancy rate and average household size data suggest that the population of the Town's current ETJ is estimated to be 2,662. This brings the population within the current jurisdiction of Knightdale to approximately 12,475. Between 1990 and 2007, Knightdale's population (within the corporate limits) has increased from 1,884 to 9,813, an average annual population growth of 10.35%. Since an ample supply of potable water and sewage treatment are available due to the recent merger of the Town's systems with the City of Raleigh, the Town expects the population to continue growing at a rate of approximately 7-8% through 2025.

E. CURRENT DEVELOPMENT

The Wake County Property Appraiser's office prepared a report detailing current development and zoning within Knightdale's ETJ. The report, dated November 13, 2003, contained type and use, zoning, property values, parcel acreages,



commercial building square footages, residential building values, and commercial building values for all of the 3,931 parcels currently under the Town’s jurisdiction.

Over half of the land within the Town’s jurisdiction is currently classified as vacant. Of developed properties, the tax values are broken down into 67% residential and 33% commercial according to the most recent reports from the Wake County Department of Revenue. The following table shows land use data for all property within the ETJ.

Table B-2 - Land Use within Knightdale’s Jurisdiction

Type of Development	Number of Parcels	Acreage	Percentage of Total
Single Family Residential	4,603	3,223	24.0%
Multi-family Residential	25	100	0.7%
Mobile Home Parks	12	163	1.2%
Total Residential	4,640	3,486	25.9%
Public Right-of-Way	n/a	1,260	9.4%
Vacant / Farm	1,283	6,702	50.0%
Commercial	175	441	3.3%
Industrial	7	590	4.4%
Public / Institutional	111	789	5.9%
Other	12	147	1.1%
Total	6,228	13,415	100%

Almost 70% of land within the Town’s jurisdiction is zoned for residential use. The following table shows current zoning for all properties within the Town’s ETJ.

Table B-3 - Zoning within Knightdale’s Jurisdiction

Zoning	Number of Parcels Or Parcel Portions Due to Split Zoning	Acreage	Percentage of Total
RR-1	200	842	6.9%
GR-3	1,679	3,130	25.8%
GR-8	3,563	3,483	28.7%
UR-12	328	935	7.7%
Total Residential	5,770	8,390	69.1%



RMX	137	764	6.3%
NMX	194	768	6.3%
TC	32	21	0.2%
Total Mixed Use	363	1,553	12.8%
HB	221	727	6.0%
MI	43	1,002	8.2%
OSP	134	479	3.9%
Totals Less Right-of-Way	6,531	12,155	100%

Zoning categories RR-1 (Rural Residential), GR-3 (General Residential), GR-8 (General Residential) and UR-12 (Urban Residential) are exclusively residential. Zoning categories RMX (Residential Mixed Use), NMX (Neighborhood Mixed Use) and TC (Town Center) are mixed use zones that may contain a combination of residential, office and business uses. The three (3) zoning classifications for non-residential development are HB (Highway Business), MI (Manufacturing & Industrial) and OSP (Open Space Preserve).

F. WATER RESOURCES AND SANITARY SEWER SERVICE

On May 1, 2006, the Town of Knightdale merged its water and sewer systems with the City of Raleigh. Falls Lake is the drinking water supply for the City of Raleigh with a capacity of 100 million gallons per day (mgd) allocated for drinking water. The City of Raleigh is the sole entity that is permitted to use Falls Lake water for drinking water.

The City of Raleigh Public Utilities Department provides water and sanitary sewer service to over 167,000 metered customers and a service population of approximately 410,000 people in Raleigh, Garner, Wake Forest, Rolesville, Knightdale, Wendell and Zebulon areas. The Department is also developing its reuse water system to provide an alternative water resource for demands not requiring potable water quality.

The City of Raleigh owns and operates the water and sanitary sewer systems in the Town of Knightdale. The water system consists of supply, treatment, storage and transmission facilities and currently serves approximately 4,000 customers.

The sanitary sewer system consists of two interceptor lines, Mingo Creek and Beaverdam Creek. The sanitary sewer system also includes 11 pump stations: Hodge Road, Lockhart School, Pebblebrook, Square D, Kelly's Wil-Ros, Flowers



Street, Faison Drive, Harper Street, Langston Ridge, Riverview Commons and Poplar Creek Village. Septic tanks within Knightdale's ETJ are permitted by the Wake County Department of Public Health. Current Town policy discourages septic tank use for new construction.

G. CRITICAL FACILITIES

The Town of Knightdale has many facilities that have been designated as critical. Some of the critical facilities are necessary for daily operations of the Town and health and safety of the public. Others are designated as critical because significant damage or total destruction of the facilities would result in significant, possibly long-term impacts to the Town's residents or the environment.

The health and safety of the public is the highest priority during disaster situations, and the ability of Police, Fire, EMS, and Public Works employees to perform their duties is vital. According to the Town of Knightdale Emergency Response Plan, emergency response workers are typically housed in one (1) of four (4) facilities: Town Hall, the Public Safety Center, the Public Works facility, and Wellington Nursing Home. These locations are among the most critical.

Critical infrastructure is of high priority. Evacuation routes must be kept open, and town streets must be passable as soon as possible following a disaster to allow for quick response by the emergency team. An adequate potable water supply is necessary for public health and safety. Sanitary sewer pump stations are designated as critical because their failure could result in the significant release of raw sewage and subsequent impacts to adjacent waterways. The water booster pump station and all the sanitary sewer lift stations have emergency generators to supply electrical power in case of a power outage. These generators are maintained by the City of Raleigh Public Utilities Department.

County buildings, to include the East Wake Library and five schools, are designated as critical because of the long-term impacts that significant damage or destruction could have on the community.

Nursing homes and day cares are designated as critical because of the special evacuation procedures necessary for elderly residents and children. In addition, the Wellington Nursing Home serves as a housing facility for emergency



response workers. These facilities are all privately owned. Current values for the structures are included in Table B-6 below.

A survey of National Register of Historic Places data showed that four properties within Knightdale’s jurisdiction are listed on the Register. These properties are designated as critical because of their historical significance. These properties are privately owned. Current values for the structures are included in Table B-6 below.

The table below gives each facility name and location as well as current or proposed replacement cost and comments. Number of people associated with the critical facilities, both public and private, appears in Table B-6, Vulnerability to All Hazards, Current and Future Conditions.

Table B-4 - Critical Facilities

Name	Location	Replacement Cost¹	Comment
Public Safety & Town Facilities			
Public Safety Center	967 Steeple Square Court	\$1,286,337	Emergency Shelter; Housing for Emergency Response Workers; equipped with generators
Town Hall	950 Steeple Square Court	\$2,051,557	Equipped with generators; Housing for Emergency response workers
Public Works Facility	306 Robertson Street	\$332,994	Housing for Emergency response workers
Recreation Center	101 Lawson Ridge Road		Possible location for staging and distribution of supplies



Name	Location	Replacement Cost¹	Comment
Infrastructure			
500,000 gallon water tank	7429 Knightdale Blvd.	\$1,500,000 ²	
1,000,000 gallon water tank	7429 Knightdale Blvd.	\$3,000,000 ²	
Water booster pump station	Knightdale Blvd.	\$500,000 ²	Equipped w/ emergency generators and SCADA system
Water booster pump station	Forestville Road	\$500,000 ²	Equipped with emergency generators and SCADA system
Existing sanitary sewer pump stations	See above section	\$1,500,000 ²	All equipped with emergency generators
Proposed sanitary sewer pump stations	See above section	\$500,000 ²	All will be equipped w/ emergency generators and SCADA system
Knightdale Blvd.			Evacuation route
US 64/264 Bypass			Evacuation route
Interstate 540			Evacuation route
Town-owned Streets			Approx. 41.7 miles
County Facilities			
East Wake Library	946 Steeple Square Court	\$2,471,472	
Forestville Road Elem. School	100 Lawson Ridge Road	\$15,920,627	
Hodge Road Elem. School	2128 Mingo Bluff	\$10,557,663	
Knightdale Elem. School	109 Ridge Street	\$10,554,481	
Lockhart Elem. School	1320 Smithfield Road	\$9,711,653	
Knightdale High School	Forestville Road	\$33,000,000 ³	Emergency shelter



Name	Location	Replacement Cost¹	Comment
Nursing Homes			
Wellington Nursing Home	1000 Tandal Place	\$3,125,354	Possible Housing for Emergency Response workers
Day Cares			
Angelica's Childcare Center	1305 Oak Crest Drive	\$236,640	
Cora's Caring Hands	106 Thomas Place	\$113,690	
Forestville Elementary Before/After School Care	100 Lawson Ridge Road	\$15,920,627	
Grace's 1,2,3 Child Care	304 Aquamarine Lane	\$99,576	
Grow-N-Learn Child Care Center	1002 Mulford Court	\$1,197,785	
Jenette's Quality Care	111 Satterwhite Dr.	\$96,420	
Kid's Palace Home Child Care	942 Widewaters Parkway	\$274,069	
Kids Educational Center IV, Inc.	7106 Forestville Road	\$634,351	
La Bella Papillon Academy, LLC	7114 Knightdale Blvd., Suite A	\$638,234	
Little People Daycare	902 Widewaters Parkway	\$179,675	
Lockhart Elementary Before and After School Program	1320 N. Smithfield Road	\$9,711,653	
Ma Ma Jo's Day Care	301 Park Avenue	\$134,580	
Kids Education Center Inc.	4605 Old Faison Rd.	\$494,280	
Cathy Lee Day Care	529 Bethlehem Road	\$601,142	
The Growing Child Unlimited, Inc.	1005 Big Oak Court	\$1,853,948	
Kindercare Learning Center #814	200 Forest Drive	\$688,831	



Name	Location	Replacement Cost ¹	Comment
Historical Properties			
N.G. House Store	221 N. First Avenue	\$194,279	
Henry H. Knight Farm	7045 Knightdale Blvd.	\$204,558	
Midway Plantation	1900 Amethyst Ridge Drive	\$419,686	
Beaver Dam Plantation	7081 Forestville Road	\$139,299	

Notes:

¹ Actual property tax values obtained from Wake County Revenue Department, 12/31/08, unless otherwise noted

² Replacement costs obtained from City of Raleigh Public Utilities Department

³ Estimated construction costs from Wake County Board of Education

In addition to the critical facilities listed above, the Town of Knightdale owns the following vehicles that are used by its Emergency Response team.

Table B-5 - Emergency Vehicles

Department	Vehicle Type	Quantity	Replacement Cost
Fire	Engine 131	1	\$325,000
Fire	Engine 132	1	\$375,000
Fire	Engine 134	1	\$325,000
Fire	Truck 135	1	\$700,000
Fire	Pickup Truck 138	1	\$28,000
Fire	Jeep C-130	1	\$22,000
Police	Sport Utility	4	\$160,000
Police	Patrol Vehicle	16	\$560,000
Police	Unmarked Cars	6	\$210,000

H. REPETITIVE LOSS STRUCTURES

One indicator of the vulnerability of a community is the number of structures that have suffered damage repeatedly due to natural hazards. FEMA defines repetitive loss structures as properties for which two or more flood insurance



claims of at least \$1,000 each have been paid within any 10-year period since 1978. The Town of Knightdale requested Repetitive Loss Data from NCEM and was informed that there were no properties which were classified as repetitive loss structures in the Town's jurisdiction.

I. FUTURE DEVELOPMENT TRENDS

Historically, development in Knightdale has been rural in nature, with low densities and limited commercial and industrial activity. A change in the development trend in Knightdale has already occurred. From 2007 to 2008, the tax base for the Town has changed from 76% residential and 24% commercial to 67% residential and 33% commercial. Despite the sluggish housing economy there are still several large tract residential subdivisions still under way; however, the majority of development in Knightdale has shifted to commercial, medical office and apartment projects to serve the population which has already grown to a significant level. According to Planning Department staff, the trend toward non-residential development is expected to continue in the short term while single-family residential is expected pick back up within the next 3-5 years. Though subject to minor changes through the process of rezoning, current zoning data is the best indicator of the type of development the Town will experience in the future. With the adoption of the Town's new Unified Development Ordinance, the Town's jurisdiction has been proactively zoned to reflect the desired build out suggested by the 2027 Comprehensive Plan. Nearly 70% of the land in Knightdale's jurisdiction is currently zoned for residential development. As a result, future development is predicted to be predominantly residential; however non-residential property values are targeted by the Town Council and Town staff to reach 40% of the Town's future tax base.

J. SCHEDULED INFRASTRUCTURE AREAS

Future development within Knightdale will continue be spurred by the completion of several infrastructure projects recently completed or currently underway. These include transportation, water, and wastewater projects.

Of all the recent and proposed infrastructure projects, the two that have had the greatest impact on development within Knightdale's jurisdiction are transportation projects. The US64/264 Bypass serves Raleigh, Knightdale, and Wendell and connects US 64 and 264 to the Raleigh I-440 Beltline. Completion of



the Bypass has removed a considerable volume of through traffic from Business US64/Knightdale Blvd. and allowed Business US64 to function as a local arterial rather than a regional highway. The Eastern Wake Expressway (I-540) or Raleigh Outer Loop runs perpendicular to the US64/264 Bypass with two interchanges in Knightdale's planning jurisdiction as well as part of a future third interchange. It provides easier access from Knightdale to Durham, Raleigh-Durham International Airport and Research Triangle Park, making Knightdale more attractive to developers seeking land for commercial, residential, and industrial projects.

The Town will continue to discourage development relying on the use of septic tanks; however, construction of sanitary sewer lift stations and extension of sewer outfalls and waterlines will allow for new development. Recently completed water projects have included a second feeder line from the City of Raleigh and booster pump station along Forestville Road, as well as the completion of a water main loop connecting Old Faison, Bethlehem, Old Ferrell and Smithfield roads. Sanitary sewer projects include outfall lines along Beaver Dam and Poplar creeks as well as pump stations along Poole Road at Clark's Branch and the Neuse River.

K. VULNERABILITY TO ALL HAZARDS

Of the five (5) hazards identified during the hazard analysis, four (4) are non-geographic in nature. Hurricanes/Coastal Storms, Drought/Heat Wave and Severe Winter Weather have the potential to affect the entire Town while tornadoes/severe thunderstorms would impact smaller, yet not geographically predictable areas. Only flooding can be geographically defined.

The following table shows the community's vulnerability to all hazards with regards to property and people. The current values are based on Wake County's type and use data for existing development. Projected values are based on draft data compiled by CAMPO's Triangle Regional Model for buildout in the year 2030. Projected non-residential building and values are impossible to determine and have been intentionally left blank.



Table B-6 - Vulnerability to All Hazards, Current and Future Projections

Type of Development	Current Number of Buildings ¹	Current Value ¹	Current Number of People ²	Projected Number of Buildings ³	Projected Value ⁴	Projected Number of People ⁵
Undeveloped	1,283 parcels with 1,248 buildings	(\$333,685,336) (land value) \$21,833,434 bldg value	N/A			
Single-Family Residential	4,618	\$587,105,266	12,475	24,859	\$3,157,093,000	67,119
Multi-Family Residential	92	\$48,421,711	1,500			
Commercial	217	\$156,194,995	2,575			8,509
Industrial	18	\$10,859,881	125			
Other (includes Mobile Home Parks)	20	\$2,667,713	500			
Public & Institutional	125	\$75,679,551	5,200			
Total⁶	6,338	\$902,762,551	22,375	24,859	\$3,157,093,000	75,628

Notes:

¹ Parcel data and actual property tax values obtained from Wake County Property Appraiser's office, 12/31/08.

² Population figures assume 2.7 persons per household for single-family and 1.9 persons per household for multi-family. These were the average household sizes according to the 2000 U.S. Census. -Numbers for major commercial and industrial employers estimated from County Business Patterns by Zip Code. Numbers for public facilities from Town and Wake County records.

³ Projected number of housing units (combines single-family and multi-family units) from CAMPO's Triangle Regional Model draft for 2030.

⁴ Projected value assumes structure value of \$127,000 for all new residences. This is the current average residential structure cost.

⁵ Projected residential population and projected number of employees (includes all business types) from CAMPO's Triangle Regional Model draft for 2030.

⁶ Total does not include data for undeveloped properties.



L. VULNERABILITY TO FLOODING

Flooding is the only hazard addressed in the plan whose impacts can be defined geographically. Mitigation strategies to restrict development in these geographical areas can be very effective tools in preventing natural hazards from having disastrous effects. The Town of Knightdale participates in the National Flood Insurance Program. As a result, Flood Insurance Rate Maps (FIRMs) are available. These maps indicate areas that would be expected to flood during a 100-year storm. According to FIRM maps for Wake County dated May 2, 2006 832.7 acres within Knightdale's jurisdiction lies within the floodplain. This is approximately six percent (6%) of the Town's jurisdiction.

To date, little development has occurred in flood hazard areas within Knightdale's jurisdiction, and this is substantiated by the lack of repetitive loss structures as noted above. As upland property becomes scarce, development within areas more prone to flooding may appear attractive, but Town ordinances and policies have been established to restrict development within floodplains. The existing Town ordinances related to development are described in Appendix C – Community Capability Assessment. Future vulnerability to flooding is not expected to increase significantly due to restrictive development ordinances in flood prone areas.

The following table shows the community's vulnerability to flooding with regards to property and people. The current values are based on Wake County's type and use data for existing development. The data in the table reflects all properties that are affected by the floodplain, although the existing structures on these properties may or may not be built within the floodplain. Existing floodplain and development ordinances do not permit construction in the flood hazard areas unless the structure exceeds the Base Flood Elevation (BFE) by a minimum of two (2) feet. Therefore, the projected values assume that no development will occur in areas susceptible to flooding.



Table B-7 - Vulnerability to Flooding, Current and Future Projections

Type of Development	Current Number of Buildings¹	Current Value¹	Current Number of People²	Projected Number of Buildings³	Projected Value⁴	Projected Number of People⁵
Undeveloped	98 parcels with 19 structures	(\$82,150,613) (land value) \$1,262,360 bldg value	N/A			
Single-Family Residential	165	\$23,224,071	445 ⁵	0	0	0
Multi-Family Residential	36	\$14,591,989	550 ⁵	0	0	0
Commercial	1	\$86,010	5	0	0	0
Industrial	2	\$1,221,151	50	0	0	0
Other (includes Mobile Home Parks)	5	\$1,499,837	250	0	0	0
Public / Institutional	7	\$20,503,490	2,550	0	0	0
Total⁶	216	\$61,126,548	3,850	0	0	0

Notes:

¹ Parcel data and actual property tax values obtained from Wake County Property Appraiser's office, 12/31/08.

² Numbers for major commercial and industrial employers estimated from County Business Patterns by Zip Code. Numbers for public facilities from Town and Wake County records.

³ Projections assume full development according to current zoning and include data for any projects currently approved by Planning Department.

⁴ Projected value assumes structure value of \$127,000 for all new residences. This is the current average residential structure cost.

⁵ Projected population figures assume 2.7 persons per household for single-family and 1.9 persons per household for multi-family. These were the average household sizes according to the 2000 U.S. Census.

⁶ Total does not include data for undeveloped properties.



M. MAPPING

An important part of the vulnerability assessment was the preparation of maps to show current conditions, future development conditions, critical facilities, and hazard areas. Six (6) maps were produced in order to show current and future vulnerability for the Town.

Map B-1, Base Map, shows the current ETJ and Town limits, major roads, the Neuse River, and existing development.

Map B-2, Critical Facilities Map, adds all public safety, critical infrastructure, and county-owned buildings to the Base Map.

Map B-3, All Hazards Map, adds floodplain data from Wake County FIRM Maps dated May 2, 2006, to the Base Map. Hurricanes/coastal storms, drought/heat wave, tornadoes/severe thunderstorms and severe winter weather are not depicted on the map because they are not geographically defined.

Map B-4, Current Vulnerability Map, combines the Critical Facilities Map with the All Hazards Map.

Map B-5, Current Zoning Map, shows the current zoning within the Town of Knightdale's jurisdiction.

Map B-6, Future Vulnerability Map, combines the Current Zoning Map with the critical facilities data and the floodplain data.



Appendix C – Community Capability Assessment

A. INTRODUCTION

The Community Mitigation Capability Assessment details the Town of Knightdale’s ability to attend to threats from natural disasters. The following sections detail and examine the Town’s capabilities from several areas:

- Staff and organizational capability
- Technical capability
- Policy and Program capability
- Legal authority
- Fiscal capability
- Political capability

The assessment was conducted to provide insight on how the Town of Knightdale currently mitigates potential disasters, highlighting those measures that currently exist. By doing so, the Town is able to identify potential shortfalls or weaknesses that may need to be addressed. This assessment serves as the foundation of an effective Pre-Disaster Mitigation Plan. It not only helps establish goals and objectives for the Town by assessing the existing capabilities of the Town, but also ensures that those goals and objectives are realistically achievable given the local conditions.

B. STAFF AND ORGANIZATIONAL CAPABILITY

The Town of Knightdale is fortunate to have a highly trained staff to implement technical aspects and policies and programs identified in the subsequent sections of the capabilities assessment. Although limited due to the numbers of staff persons, the Town employees are capable of promoting the mitigation process and educating the public about potential natural hazards.

The local government of Knightdale is comprised of the following:

- *Mayor and Five Member Town Council:* The Mayor and Town Council are responsible for serving the people of Knightdale and improving the quality of life. These duties include approving new ordinances and policies that guide the growth of the Town.
- *Land Use Review Board:* The Land Use Review Board serves as an advisory board to the Mayor and Town Council in the areas of planning, site design, and planning specific ordinance and plan revisions; and is responsible for granting relief from ordinance requirements and hearing appeals to decisions made by the Town in its capacity also as the Board of Adjustment.



- *Parks and Recreation Advisory Board:* The Parks and Recreation Advisory Board serves as an advisory board to the Mayor and Town Council in matters relating to parks, greenways, opens space, and other recreational opportunities in the Town.
- *Town Manager:* The Town Manager serves on behalf of the Mayor and Town Council and manages the Town's finances and services. The Town Manager also directs and supervises the administration of all the Town offices, boards, commissions and agencies.
- *Engineering Department:* The Engineering Department is responsible for reviewing all stormwater infrastructure plans as well as ensuring that specified building setbacks and conditions of building occupancy are met.
- *Planning Department:* The Planning Department is responsible for the administration and enforcement of all land use regulations and policies, including zoning, subdivision, and floodplain management, as well as developing and implementing plans to guide the growth of the Town.
- *Parks and Recreation Department:* The Parks and Recreation Department maintains the park system and administers the recreational programs of the Town.
- *Public Works Department:* The Public Works Department is responsible for maintaining and inspecting all public stormwater infrastructure, seasonal leaf pick-up, and maintenance of Town-owned streets within the Town of Knightdale.
- *Public Safety Department:* The Public Safety Department is comprised of the Town's Police and Fire Departments. These departments are cross trained in fire and police work, as well as other emergency response needs to ensure that the first person on the scene is capable of providing assistance.
- *Wake County Assistance:* The Town of Knightdale depends on Wake County for assistance in the fields of Building Code Inspections and Sediment/Erosion Control.
- *City of Raleigh Assistance:* The City of Raleigh owns and operates the water and sanitary sewer systems in the Town of Knightdale. The water system consists of supply, treatment, storage and transmission facilities and currently serves approximately 4,000 customers.

C. TECHNICAL CAPABILITY

The Town of Knightdale has the basic technological capabilities to help mitigate and respond to natural disasters.

- *Geographic Information Systems:* The Town of Knightdale has a GIS System that is used to collect, manage, analyze and display spatially referenced data. This data includes local zoning designations and land use characteristics including floodzone data.



- *Internet Capabilities:* The Town of Knightdale is connected to the internet for most employees. This enables the Town to research current mitigation information and monitor approaching hazards. The Town also has an active website and electronic newsletter that are utilized to provide information to residents and visitors about the Town, including contact information, development regulations, and even severe weather bulletins.
- *Telecommunications:* The Town of Knightdale utilizes Mobile Phone and Direct Connect service for its vital personnel, including department heads, public works and public safety personnel. This enables instant communication in case landlines are lost due to a disaster.

D. POLICY AND PROGRAM CAPABILITY

The Town of Knightdale has many existing policies and programs in place to help assist in mitigating future disasters. This assessment will provide an overview of each policy or program, evaluate its effectiveness and provide the rationale for that evaluation. As Town plans and policies are updated or introduced for the first time, the Town's Hazard Mitigation Plan is being incorporated by reference, particularly in plan and policy sections that have been revised as a direct result of the hazard identification/risk assessment and mitigation strategy development processes.

UNIFIED DEVELOPMENT ORDINANCE

The Town of Knightdale's Unified Development Ordinance (UDO) is a combination of all land development regulations that apply to the Town, including, zoning, subdivision, stormwater, floodplain, and signs. The Hazard Mitigation Plan was consulted when the UDO was completely re-written in 2005, specifically for expanding upon the old UDO Article 20 "Flood Damage Prevention, Stream Protection, Drainage and Erosion" to create the new UDO Chapter 6 "Environmental Protection", ensuring that established strategies involving the UDO are being addressed.

2027 COMPREHENSIVE PLAN

The Town of Knightdale's 2027 Comprehensive Plan, approved in 2003, is a guide for the future growth of the Town. The Plan components include a review of existing conditions and provide objectives and action items for future growth in the areas of Utilities, Transportation, Community Services, Community Design, Parks and Recreation, and Open Space. In April of 2009, the Town established a Comprehensive Plan Update Committee to oversee needed revisions to the 2027 Comprehensive Plan. Again, the Hazard Mitigation Plan is being used as a reference document to ensure that established strategies involving the comprehensive plan are being addressed.



BUILDING CODES

The Town of Knightdale utilizes the approved State of North Carolina Building Code, which prescribes the minimum standards for building construction. This ensures structures are built to standards that have a high wind resistance and developed within flood-proofing measures.

NATIONAL FLOOD INSURANCE PROGRAM

The National Flood Insurance Program provides flood insurance to individuals in communities that are members of the program. The Town of Knightdale has adopted and enforces floodplain management and development regulations, which are a prerequisite for participating members.

TOWN OF KNIGHTDALE EMERGENCY OPERATIONS PLAN

The Town of Knightdale's Public Safety Department has an Emergency Operations Plan in place that details the actions needed to be taken when various emergencies occur. This plan was updated in October 2007, using the Hazard Mitigation Plan as a reference document to ensure that established strategies involving the Emergency Operation Plan were being addressed, and included updates based on required NIMS training completed by all Town employees.

TOWN OF KNIGHTDALE DISASTER RESPONSE PLAN

The Town of Knightdale Public Works Department is currently in the process of developing a Disaster Response Plan as a direct result of the strategies outlined in the Hazard Mitigation Plan. This local response plan is being coordinated with and developed in addition to the county-wide response plan administered by Wake County.

CITY OF RALEIGH WATER CONSERVATION TASK FORCE

The City of Raleigh strongly encourages conservation of its finished water. The City's Water Conservation Task Force (WCTF) reviewed the City's water conservation plan and developed recommendations to improve the plan based on experiences gained from the 2002 and 2005 droughts. The task force produced a water conservation recommendation that requires alternate-day irrigation throughout the year, and Stages 1 and 2 water conservation rules to be implemented by the City as needed during a drought or other water supply shortages. The WCTF presented its final report and recommendations to the City Council in May 2006. The recommendations were approved and adopted as a City ordinance. The water conservation rules apply to customers in Raleigh and in the towns that receive water from the Capital City: Garner, Rolesville, Wake Forest, Knightdale, Wendell and Zebulon.



Table C-1 - Inventory of Local Ordinances Relevant to Pre-Disaster Mitigation

TITLE	SECTION	PURPOSE/DESCRIPTION	EFFECTIVENESS	RATIONALE
Unified Development Ordinance	Chapter 8, Tree Protection and Landscaping	Provides standards for landscaping, replacements for large trees that are removed and buffering of lots to reduce radiant heat and conserve energy, provide shade, reduce impervious surfaces, control stormwater runoff and beautify the Town.	MODERATE	Assists in controlling stormwater runoff, and provides relief from high winds and heat. Conversely, large trees that are weak may become dangerous during high wind storms.
Unified Development Ordinance	Chapter 7, Open Space	Requires new subdivisions to provide both passive and active recreation areas that are accessible for public enjoyment. Areas that cannot be readily accessed remain as undisturbed open space and may not be counted toward recreation requirements.	MODERATE	Open Space helps reduce impervious surface, and much of the floodplain areas are left as open space, which ensures that the area will not be developed and damaged from future flooding events.
Unified Development Ordinance	Chapter 6, Environmental Protection	Controls development in floodplain by restricting activities, alterations in floodplains in order to protect lives and property and minimize rescue and relief efforts. Provides specific standards for Sediment and Erosion Control (Section 6.2), Post Construction Stormwater Management (Section 6.3), Illicit Discharges and Connections to the Stormwater System (Section 6.4) and Flood Damage Prevention (Section 6.5).	HIGH	Ensures the protection of floodplains. By providing standards for construction in a floodplain, it minimizes the potential for damage should flooding occur.



Unified Development Ordinance	Chapter 10, Parking Standards	Provides standards for parking lot design, including landscaping, shade trees, and parking space maximums.	MODERATE	Assists in keeping the amount of impervious surface in check by establishing maximum numbers of parking stalls allowed per development type. If maximums are to be exceeded, compensation must be made by utilizing pervious paving materials, adding more landscaping, etc.; thereby helping control stormwater runoff.
2027 Comprehensive Plan	Chapter 4 Community Services, Section VI. Objectives and Action Items	<p>Provides objectives and action items to direct the planning and implementation strategies related to community services, such as public safety:</p> <ul style="list-style-type: none"> • Action 4.1 calls for elevated water storage to maximize operations, and provide emergency reserves in case of disaster. • Action 4.10 provides criteria for locating new fire stations, ensuring that response times are kept at a minimum. • Action 4.11 provides standard that all structures or fire hydrants within corporate limits shall be located within 1.5 miles of a fire station. • Action 4.12 calls for the Town to implement utility related ordinances to the UDO, including provisions for water conservation, drought management, among others. 	MODERATE	The Comprehensive Plan recommends actions to be taken that will improve the response of fire response teams, ensure reserves in water for disasters, and improve the existing Ordinance requirements relating to utilities. However, these recommendations are only guidelines and need to be codified to improve their effectiveness to mitigate future disasters.



<p>2027 Comprehensive Plan</p>	<p>Chapter 6, Parks and Recreation Master Plan</p>	<p>Provides objectives and action items to direct the planning and implementation strategies related to the parks, recreation, open space and greenway system in the Town:</p> <ul style="list-style-type: none"> • Provides provisions for open space to be used as passive parks. These spaces include protect natural areas, such as wetlands, steep slopes and floodplains in their natural configuration and conditions. • Action 6.3 recommends the Town actively pursue land acquisition for future park development. 	<p>LOW</p>	<p>Identifies the need to preserve natural areas such as floodplains, and suggests that the Town should proactively pursue land acquisition for future park needs, but offers no means to accomplish these tasks.</p>
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<p>2027 Comprehensive Plan</p>	<p>Chapter 7, Open Space and Greenway Master Plan</p>	<ul style="list-style-type: none"> • Identifies the natural conditions in the Town, such as soils, vegetation, wildlife and watershed areas. • Targets areas for open space and greenway acquisition, including creek and river buffers. • Promotes the Neuse River Greenway, the Mingo Creek Greenway and the Mark's Creek Greenway. • Prescribes Type 1 and Type 2 greenway trail types for areas that are environmentally sensitive. These design types include no facility development and limited development for low-impact uses, respectively. • Prescribes Type 3, unpaved trail development, greenway trail types for areas that experience frequent flooding but are located outside of the floodplain areas. • Provides Design Guidelines for trails that are environmentally sensitive. • Identifies possible funding sources to help implement the goals and actions prescribed within the Open Space and Greenway Master Plan. • Provides methods for protection of Greenways, such as Zoning regulations, tax incentives and Subdivision exactions. 	<p>MODERATE</p>	<p>The Open Space and Greenway Master Plan recommends many means to mitigate natural disasters, primarily flood related. The development of greenways along creeks and river floodplains limit the development that can occur there, and the damage that development could experience in the event of a disaster. It also promotes the preservation of other natural environmental areas by dedicating it as opens space. This decreases impervious areas and helps protect the water quality and ecosystem in the area. The guidelines need to be codified in order to be very effective in mitigating disasters.</p>
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2027 Comprehensive Plan	Chapter 7, Open Space and Greenway Master Plan, Summary Action Plan	<p>Recommended Actions Include:</p> <ol style="list-style-type: none"> 1. Encourage protection of streamside trees and vegetation. 2. Implement buffers along stream corridors and acquire and/or protect parcels in water recharge areas. 3. Restore natural areas, by protecting streambanks and complete streambank stabilization projects. 4. Reduce Flood Damages by removing or relocating repetitively damages structures from the floodway and limiting construction in the floodway by increasing buffers along streams. 5. Work to minimize impervious surfaces and to improve infiltration. 6. Acquire, restore, and/or construct wetlands. 7. Manage riparian zones and natural areas. 8. Provide technical assistance to property owner to minimize impervious surfaces. 9. Conduct annual stream maintenance to maintain stream channel conveyance. 	MODERATE	<p>The Action Plan from the Open Space and Greenway Master Plan recommends many means to mitigate natural disasters, primarily flood related. The development of greenways along creeks and river floodplains limit the development that can occur there, and the damage that development could experience in the event of a disaster. It also promotes the preservation of other natural environmental areas by dedicating it as opens space. This decreases impervious areas and helps protect the water quality and ecosystem in the area. The guidelines need to be codified in order to be very effective in mitigating disasters.</p>
2027 Comprehensive Plan	Chapter 8, Transportation Master Plan	Endorses the Greenway Trail System	LOW	<p>The Transportation Plan reinforces the importance of the greenway system, but does little to mitigate future damages from potential disaster.</p>



2027 Comprehensive Plan	Chapter 9, Public Utilities Master Plan	Identifies the Neuse River drainage basin and the nine sub-basins that exist in the Town of Knightdale, as well as the existing and projected utilities of the Town. Provides objectives and actions to guide development of the Town’s Utilities.	LOW	The Utilities Plan identifies drainage basins within the Town and prescribes utility improvements, such as new wastewater facilities, to handle future growth. However, the Plan is not an effective mitigation tool.
2027 Comprehensive Plan	Chapter 10, Implementation Strategy (see appendix #)	<p>Offers strategies to implement the Action Items outlined in the Comprehensive Plan in two primary areas: Growth Management Strategy and Unified Development Ordinance Revisions. Specifically, this Chapter offers the following:</p> <ul style="list-style-type: none"> • Community Character and Land Use <ol style="list-style-type: none"> 1. Preserve and enhance Tree Canopy by adopting a Tree Protection Ordinance, planting requirements, conservation subdivision regulations, encourage tree planting programs. (Strategy 1). 2. Enhance community appearance by implementing additional open-space dedication requirements (Strategy 2). • Open Space <ol style="list-style-type: none"> 1. Establish a funding source to acquire open space (Strategy 1) 2. Adopt Model Conservation Subdivision Ordinance (Strategy 2). • Water and Sewer <ol style="list-style-type: none"> 1. Adopt Uniform Natural Resource Protection Standards and Incentives (Strategy 2) • Unified Development Ordinance Modifications 	MODERATE	The Implementation Strategy is very helpful at identifying how the goals of the Comprehensive Plan can be achieved. It identifies strategies and the authority to make the changes, and establishes a timeframe for completing them. Many strategies identified will help the community mitigate future disasters, however, the Town must meet these recommendations in order to effectively mitigate future damages.



<p>City of Raleigh Water Conservation Task Force</p>	<p>Water Stage Restrictions</p>	<ul style="list-style-type: none"> ▪ Stage 1 restrictions generally provide for designated irrigation one day per week for those using automatic or non-automatic irrigation systems and garden hose attached sprinklers. Water customers may water on two designated days a week if they are physically holding a garden hose. In past applications, water use has dropped by 19 percent. ▪ Stage 1A restrictions prohibited lawn and landscape irrigation except by hand held hose or low volume drip irrigation. Customers also could not wash their vehicles except at commercial car wash facilities. Furthermore, the City will stop issuing permits that allowed for the watering of new lawns for 45 days. In past applications, water use has dropped by 24 percent. ▪ Stage 2 restrictions prohibit the use of public water for irrigation, among other things. In past applications, water use has dropped by 42 percent. 	<p>MODERATE</p>	<p>Although there are plans to expand the area's potable water supply, water use restrictions serve to remind the public that this resource needs to be conserved not only in times of definite drought, but at all times, since a drought may come about at any moment.</p>
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E. LEGAL CAPABILITIES

Local governments in North Carolina have a wide range of tools available to them for implementing programs, policies and actions that mitigate loss of life and property from future disasters. The four broad types of powers granted by the State to local communities such as Knightdale are Regulation, Acquisition, Taxation and Spending.

North Carolina is a Dillon's Rule state, meaning the legal capabilities of the Town of Knightdale are subject to constraints placed upon it by the State, which are broadly covered in Section 160A of the General Statutes of North Carolina. In simpler terms, local governments can only exercise the powers that the State grants upon them. This section will assess the enabling legislation that exists in North Carolina to allow local communities to implement hazard mitigation tools and techniques.

GENERAL POLICE POWER

All of the legal authority available to communities is derived from general police powers, which are designed to protect public health, safety and welfare. This general power enables local officials to enact and enforce ordinances and to define and abate nuisances. Preparing for disasters, and creating a disaster resistant community, clearly meets the criteria of protecting public health, safety and welfare.

BUILDING CODES AND INSPECTION

Building codes and inspections provide the Town the means to ensure that structures are built to minimum standards. The legal authority to establish building codes and inspections enables the Town to require buildings to be constructed with a high wind resistance, and that they meet flood-proofing measures when applicable. Likewise, inspections play an important part in mitigation. Not only does it ensure that the structure was built in accordance with the code requirements, it also enables communities to inspect structures after a disaster, and to determine whether the structure is habitable, or if substantial damage has been done to the building.

LAND USE PLANNING

The General Statutes also allow communities to regulate the location, density, type and timing of development within the Town. This broad power is the basis for this plan, as well as the Town's 2027 Comprehensive Plan and provides a guide for how development should occur. It is the impetus of the Town's Unified Development Ordinance.

ACQUISITION

Acquisition is an important tool for mitigating effects of disasters. North Carolina General Statutes provide Town's the ability to acquire land. The ability of Towns to acquire land that is susceptible to natural hazards, such as flooding, is the most effective means to mitigate future damages. By purchasing properties that have a high likelihood of flooding, the Town can



remove any existing or future development from occurring there, and ensure that future floods will not result in the loss of life or personal property at that site in the future.

TAXATION

Taxation can be a powerful mitigation tool as a development guide. This can be accomplished through tax abatements to encourage development to integrate mitigation measures into the process of building new developments and retrofitting existing properties in the floodplain.

F. FISCAL CAPABILITIES

The Town of Knightdale has a limited fiscal capability to implement hazard mitigation strategies. The Town's operating budget of \$9,649,200 for Fiscal Year 2008-2009 includes the Town's General Fund Expenditures and Capital Improvement Projects. Little, if any, money is available to implement mitigation programs, other than regulatory policies.

Fortunately, there are a number of grants for mitigation activities to assist the Town in mitigating disasters. The North Carolina Division of Emergency Management has a listing of over 300 government funding sources for mitigation and disaster assistance. They can be accessed on the NCEM Mitigation website at www.nccrimecontrol.org by clicking on the "Grants" section. Most notable are the following:

EMERGENCY MANAGEMENT PERFORMANCE GRANT (EMPG)

EMPG provides funds to assist State and local governments to sustain and enhance all-hazards emergency management capabilities. It provides an all-hazards approach to preparedness, including the development of a comprehensive program of planning, training, and exercises, sets the stage for an effective and consistent response to any threatened or actual disaster or emergency, regardless of the cause.

HAZARD MITIGATION GRANT PROGRAM (HMGP)

The Federal Disaster Assistance Act (Stafford Act) provides funds authorized by the federal government and made available by FEMA for a cost-share program to states. The HMGP provides 75% of the funds while the states provide 25% of the funds for mitigation measures through the post-disaster planning process. The Division of Emergency Management administers the program in this state. The state share may be met with cash or in-kind services. The program is available only for areas affected by a Presidentially-declared disaster.

HAZARDOUS MATERIALS EMERGENCY PREPAREDNESS GRANT PROGRAM (HMEP)

The Hazardous Materials Emergency Preparedness (HMEP) Grants Program provides financial and technical assistance to enhance State, Territorial, Tribal, and local hazardous materials emergency planning and training. The HMEP Grant Program distributes funds to emergency responders for hazmat training and to Local Emergency Planning Committees (LEPC's) for hazmat planning.



HOMELAND SECURITY

Assists local and state partners in the securing of federal funding to address North Carolina's ability to prevent, protect, respond and recover to all hazards, both man-made and natural. The NCEM Homeland Security Branch coordinates the implementation of the State Homeland Security Program with local, state, federal and private partners.

INDIVIDUAL ASSISTANCE

Individual Assistance ensures that individuals and families have access to the full range of State and Federal programs made available in the aftermath of a disaster and develop and maintain partnerships with State, Federal and voluntary organizations that deliver resources to disaster victims.

PUBLIC ASSISTANCE PROGRAM (PA)

The Public Assistance provides federal aid to communities to help save lives and property in the immediate aftermath of a disaster and to help rebuild damaged facilities. Grants cover eligible costs associated with the repair, replacement, and restoration of facilities owned by state or local governments and nonprofit organizations. The Public Assistance program is administered by FEMA.

SMALL BUSINESS ADMINISTRATION DISASTER ASSISTANCE PROGRAM

This program provides loans to businesses affected by Presidentially declared disasters. The program provides direct loans to businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible. Nonprofit organizations are also eligible. The SBA administers the Disaster Assistance Program.

COMMUNITY DEVELOPMENT BLOCK GRANTS (CDBG)

The CDBG program provides grants to entitlement communities (metropolitan cities and urban counties) for post-disaster hazard mitigation and recovery following a presidential declaration of a Major Disaster of Emergency. Funds can be used for activities such as acquisition, rehabilitation or reconstruction of damaged properties and facilities and redevelopment of disaster-affected areas. Funds may also be used for emergency response activities, such as debris clearance and demolition and extraordinary increases in the level of necessary public services. HUD provides funds for the CDBG and the Division of Community Assistance administers the program in each state.

G. POLITICAL CAPABILITIES

The Town of Knightdale is very supportive of mitigation efforts. This support is evident from the elected officials, the residents of the Town, and the developers who are helping the Town grow. All parties understand the importance of development in a manner that respects the natural constraints that exist, and the role the Town plays in ensuring that future development remain at a low risk from possible disasters. This attitude toward mitigation measures is expected to continue in the future, even as Mayors and Council Members change.



Appendix D – Documentation of Planning Process

The planning process for the Hazard Mitigation Plan was documented in accordance with Federal Emergency Management Association requirements. Documentation relative to the Advisory Committee and Public Meeting #1 is included in this Appendix.

ADVISORY COMMITTEE

Advisory Committee Documentation includes meeting agendas from all meetings held during the update process as well as the introductory slide presentation that was used to bring all Advisory Committee members up to date concerning the Plan Update process.





TOWN OF KNIGHTDALE

www.ci.knightdale.nc.us

Hazard Mitigation Plan Update Advisory Committee

950 Steeple Square Court
Knightdale, NC 27545
(v) 919.217.2243
(f) 919.217.2249

AGENDA

Hazard Mitigation Plan Update Advisory Committee

Knightdale Public Safety Building Training Room
967 Steeple Square Court
Knightdale, NC 27545

Meeting # 2 - Friday September 5, 2008 9:00 A.M.

- I. Call to Order
- II. Review of Minutes from August Meeting
- III. Mitigation Strategies and Policies Update
 - a. Report on Existing Strategies
 - b. Update Mitigation Action Goals/Objectives
- IV. Planning Process
 - a. Identify Hazards – Scoring of Hazards
 - b. Assess Vulnerability
 - c. Assess Capability
- V. Adjournment





TOWN OF KNIGHTDALE

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Hazard Mitigation Plan Update Advisory Committee

950 Steeple Square Court
Knightdale, NC 27545
(v) 919.217.2243
(f) 919.217.2249

AGENDA

Hazard Mitigation Plan Update Advisory Committee

Knightdale Town Hall Council Chambers
950 Steeple Square Court
Knightdale, NC 27545

Meeting # 3 – Tuesday, November 25, 2008 9:00 A.M.

- I. Call to Order
- II. Review of Minutes from September Meeting
- III. Mitigation Strategies and Policies Update
 - Specific Assignment Hand Out to Update Mitigation Action Goals/Objectives Table
- IV. Adjournment



Town of Knightdale Hazard Mitigation Plan Update

Advisory Committee
August 8, 2008

Town of Knightdale Planning Department



What is Hazard Mitigation

- Mitigation is defined as “sustained action taken to reduce or eliminate long-term risk to people and their property from hazards and their effects.”
- Mitigation Planning is a collaborative process whereby hazards affecting the community are identified, vulnerability to hazards assessed, and consensus reached on how to minimize or eliminate the effects of these hazards.
- “To be proactive instead of reactive.”

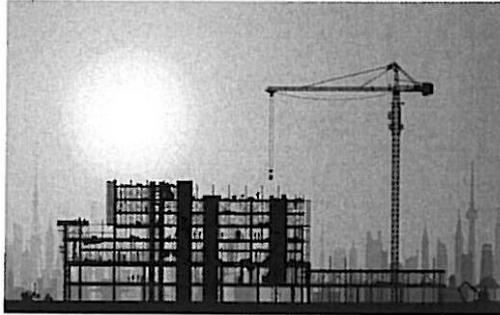


Town of Knightdale Planning Department



Purpose of Hazard Mitigation Plan Update

- The plan must be updated to reflect changes in development, progress in local mitigation efforts, and changes in priorities.



Town of Knightdale Planning Department



Purpose of Hazard Mitigation Plan Update

- **MONEY!!!!**
 - The Town must have an updated Hazard Mitigation Plan in order to be eligible to receive State and Federal assistance funding for Hazard Mitigation Planning and Disaster Assistance.

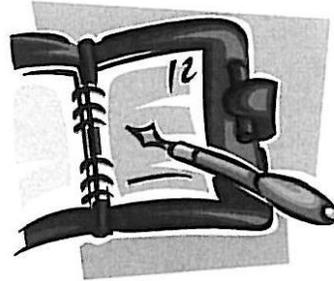


Town of Knightdale Planning Department



Purpose of Hazard Mitigation Plan Update

- A plan update is **NOT** an addendum to the existing plan. It stands on its own as a complete and current plan.



Town of Knightdale Planning Department



Plan Update Timeline

- Local Mitigation Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs.
 - NCEM proposes a 14 month update timeline.
 - The Town of Knightdale Plan must be approved by FEMA and adopted by the Town by August 26, 2009.



Town of Knightdale Planning Department



Plan Update Timeline

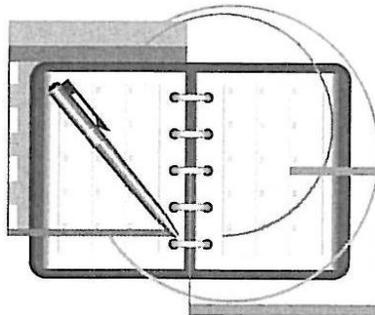
Step	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
Planning Process	O	O	O	O	O	O	X		
Risk Assess.	O	O	O	X					
Identify Hazards	O	O	X						
Assess Vulnerability	O	O	O	X					
Mitigation Strategy			O	OV	O	X			
Plan Maintenance			O	O	X				
Submission to NCEM							X		

Town of Knightdale Planning Department



Meeting Schedule

- First Friday of each Month?
 - What works for the most people?



Town of Knightdale Planning Department



Planning Process Overview

- Hazard Identification and Assessment – Page A1.
 - Please review the rank of hazards in accordance with methodology provided on pages A1-A4.
 - If you feel that a particular hazard warrants a higher ranking, please note and bring it to the September meeting. (Think Drought)
 - The Planning Staff will update the Hazard Damage Data sections of each hazard.

Town of Knightdale Planning Department



Planning Process Overview

- Vulnerability Assessment – Page B1.
 - CORPUD – Please provide a brief overview of the Knightdale System (Page B-4) and update of critical infrastructure (B-6)
 - Knightdale Public Safety – update of emergency vehicle quantities and replacement costs (B-7)
 - The Planning Staff will update all maps and demographic data.
 - Can CORPUD provide shapefiles of water/sewer infrastructure in Knightdale?

Town of Knightdale Planning Department



Planning Process Overview

- Community Capability Assessment –
Page C1
 - Please review this section and provide updates where applicable for the September meeting.

Town of Knightdale Planning Department



Planning Process Overview

- Subsequent Steps:
 - Advisory Committee will review the Values and Goals in the initial plan and update accordingly (September)
 - Public Meeting (November)
 - Update Mitigation Strategies based upon revised goals and assign duties for implementation/monitoring (November/December).
 - Town Council Presentation (December/January).

Town of Knightdale Planning Department



Mitigation Strategies and Policies Update

- The updated plan must demonstrate that progress has been made to implement the Mitigation Action Strategies stated in the initial plan during the past five years. (Pages III-2 through III-6)
- Assign actions and report back at September meeting.

Town of Knightdale Planning Department



Annual Meetings

- After the update process, the Advisory Committee shall meet on an annual basis to review the plan and evaluate the effectiveness of the mitigation actions and note when certain actions have been completed.
 - The meeting dates should coincide with the date of plan adoption.

Town of Knightdale Planning Department



Adjournment

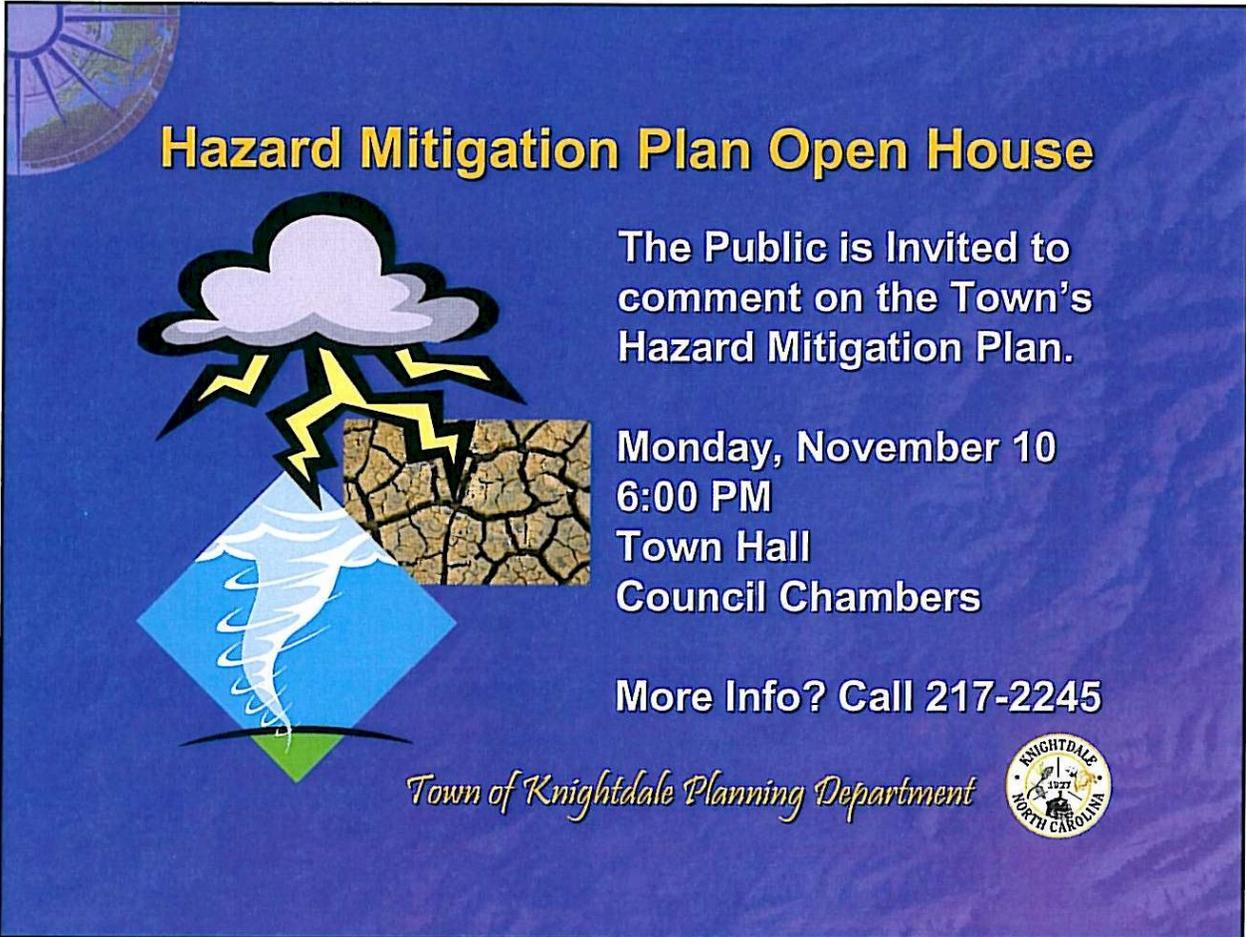
- Thank you for your participation and effort in the update process!

Town of Knightdale Planning Department



PUBLIC MEETING #1

In order to solicit public comment, a public meeting was held at Knightdale's Town Hall on November 10, 2008. The purpose of this meeting was to explain the Hazard Mitigation Plan Update process and to ask the public to assist us in the reassessment of Knightdale's vulnerability to the various natural hazards. Documentation relative to this meeting includes advertisements from the local public television station, the local newspaper and the Town's electronic newsletter, as well as a copy of the meeting presentation, sign-in sheet and hazard ranking worksheets that each participant was asked to fill out.



Hazard Mitigation Plan Open House

The Public is Invited to comment on the Town's Hazard Mitigation Plan.

Monday, November 10
6:00 PM
Town Hall
Council Chambers

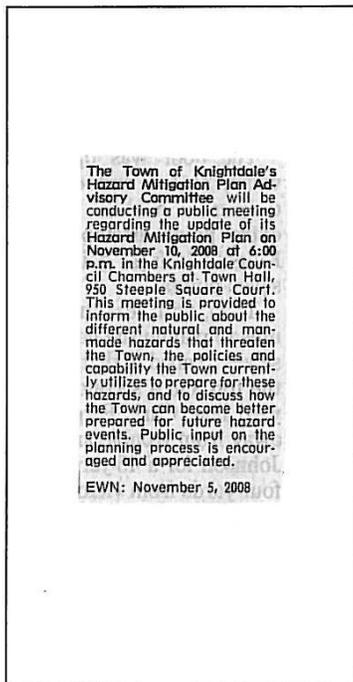
More Info? Call 217-2245

Town of Knightdale Planning Department



AFFIDAVIT OF PUBLICATION

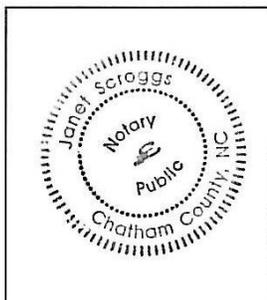
NORTH CAROLINA.
Wake County.) Ss.



Before the undersigned, a Notary Public of Chatham County North Carolina, duly commissioned and authorized to administer oaths, affirmations, etc., personally appeared Deborah McCullers, who, being duly sworn or affirmed, according to law, doth depose and say that she is Billing Manager-Legal Advertising of Eastern Wake News a corporation organized and doing business under the Laws of the State of North Carolina, and publishing a newspaper known as Eastern Wake News, in the City of Zebulon, Wake County and State aforesaid, the said newspaper in which such notice, paper, document, or legal advertisement was published was, at the time of each and every such publication, a newspaper meeting all of the requirements and qualifications of Section 1-597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Section 1-597 of the General Statutes of North Carolina, and that as such she makes this affidavit; that she is familiar with the books, files and business of said corporation and by reference to the files of said publication the attached advertisement for TOWN OF KNIGHTDALE was inserted in the aforesaid newspaper on dates as follows: 11/05/08

Account Number: 21722430

The above is correctly copied from the books and files of the aforesaid Corporation and publication.



Deborah McCullers

Deborah McCullers, Billing Manager-Legal Advertising
Wake County, North Carolina

Sworn or affirmed to, and subscribed before me, this 07 day
of NOVEMBER, 2008 AD, by Deborah McCullers.

In Testimony Whereof, I have hereunto set my hand and
affixed my official seal, the day and year aforesaid.

Janet Scroggs
Janet Scroggs, Notary Public

My commission expires 14th of March 2009



From: Seth Lawless
To: All Town Employees
Cc:
Subject: eViews Weekly Update

Sent: Fri 11/7/2008 8:47 AM



- » Home
- » Mayor & Council
- » Administration
- » Finance
- » Parks & Recreation
- » Planning
- » Public Safety
- » Public Works
- » News
- » Links of Interest
- » Area Organizations
- » Employment
- » Photographs
- » Town Directory

eViews Weekly Update The Town of Knightdale's Electronic Newsletter

Friday - November 7th, 2008

» Town Hall News

NEW The next Town Council meeting is Wednesday, November 18th at 7 pm. At the November 3rd meeting, Council:

Presented the Employee of the Quarter Award to Town Clerk and Human Resources Director Suzanne Yeatts,

Announced that the Christmas Parade will be held on Saturday, December 6th,

Conducted a public hearing on proposed changes to the Unified Development Ordinance that regulate Commercial Indoor Storage in the Rural Residential (RR1) District,

Approved expansion of the extra territorial jurisdiction to approximately 4400 acres previously under Wake County land use regulations,

Received a report on the progress of the wastewater collection system being constructed on Poole Rd.,

Join the Eastern Wake Crimestoppers, or keep this number handy to report a crime or suspicious activity. 366-CRIME. Cash rewards paid and callers remain anonymous.

Planning:

NEW on Saturday, October 4th, the Town Code Enforcement Officer conducted a sweep of illegal signs. The Town will continue to ask for voluntary compliance to the sign regulations that keep Knightdale looking good for residents and visitors alike; however, occasional enforcement sweeps like the one on the 4th may continue if signs are placed in rights-of way.

NEW The Town of Knightdale's Hazard Mitigation Plan Advisory Committee will be conducting a public meeting regarding the update of its Hazard Mitigation Plan on November 10, 2008 at 6:00 p.m. in the Knightdale Council Chambers at Town Hall, 950 Steeple Square Court. This meeting is provided to inform the public about the different natural and manmade hazards that threaten the Town, the policies and capability the Town currently utilizes to prepare for these hazards, and to discuss how the Town can become better prepared for future hazard events. Public input on the planning process is encouraged and appreciated.

NEW The Planning and Engineering subcommittee will meet at 6:00 p.m. on November 10, 2008 in the Knightdale Town Hall Conference Room.



Town of Knightdale Hazard Mitigation Plan Update

Public Open House
November 10, 2008

Town of Knightdale Planning Department



What is Hazard Mitigation?

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Town of Knightdale Planning Department



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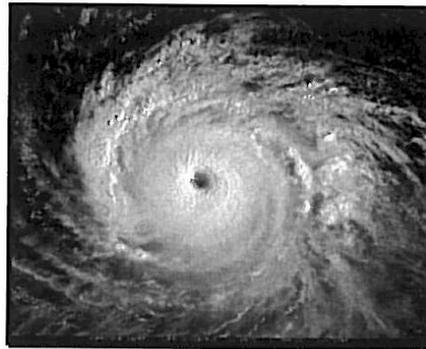


Town of Knightdale Planning Department



What is Hazard Mitigation?

- “To be proactive instead of reactive.”

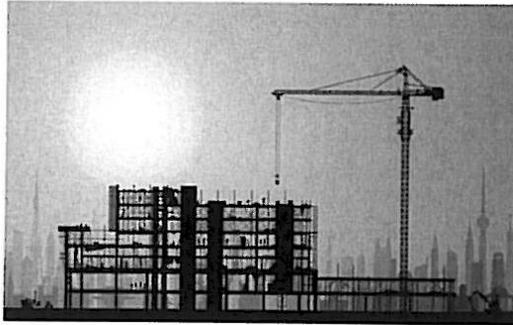


Town of Knightdale Planning Department



Purpose of Hazard Mitigation Plan Update

- The plan must be updated to reflect changes in development, progress in local mitigation efforts, and changes in priorities.



Town of Knightdale Planning Department



Purpose of Hazard Mitigation Plan Update

- **MONEY!!!!**
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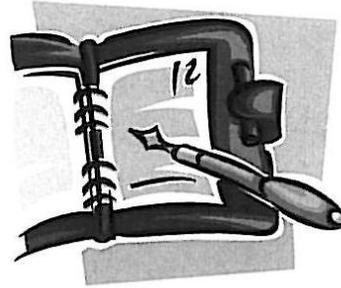


Town of Knightdale Planning Department



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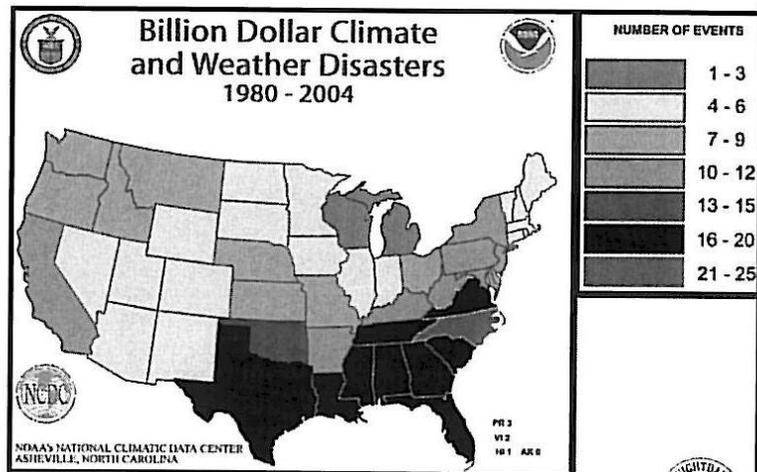


Town of Knightdale Planning Department



Why a Plan?

North Carolina has more Billion Dollar Climate and Weather Disasters than any other state in the nation.



Town of Knightdale Planning Department



Why a Plan?



To qualify for state and federal assistance.

Otherwise, local funds must cover all costs.



Town of Knightdale Planning Department



Plan Update Timeline

- **Local Mitigation Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs.**

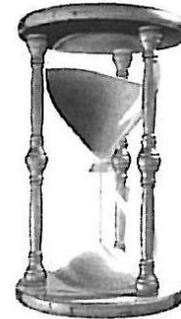


Town of Knightdale Planning Department



Plan Update Timeline

The Town of Knightdale Plan must be approved by FEMA and adopted by the Town by August 26, 2009.

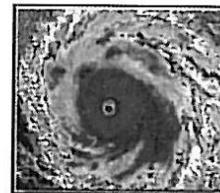


Town of Knightdale Planning Department



Hazards Identified by the Town in 2004

- Flooding
 - Hurricanes
 - Tornadoes
 - Severe Thunderstorms
 - Winter Storms / Freezes
- Advisory Committee Suggests We Need to Add:*
- Drought / Heat Wave



Town of Knightdale Planning Department



Low-Priority Hazards for Knightdale in 2004

- Dam / Levee Failure
- Earthquakes
- Landslides
- Nor'easters
- Riverine / Coastal Erosion
- Tsunamis
- Volcanoes
- Wildfires



Town of Knightdale Planning Department



Do you Agree?

Please take a moment to fill out the short survey (Assessment Sheet) and give us your impressions of how hazards should be ranked for Knightdale.

If you have questions, please ask a staff member.

Town of Knightdale Planning Department



Thanks for Your Time

This slide show will repeat momentarily.



Town of Knightdale Planning Department



GUEST #1

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure	U	MI	N	Very Low
Drought / Heat Wave	L	SV	L	Moderate
Earthquakes	P	MI	N	Low
Flooding	P	MI	N	Low
Hurricanes / Coastal Storms	HL	SV	CR	High
Landslides	U	MI	N	Very Low
Nor'easters	L	MI	L	Moderate
Riverine / Coastal Erosion	U	MI	N	Very Low
Tornadoes / Severe Thunderstorms	HL	MO	CR	High
Tsunamis	U	MI	N	Very Low
Volcanoes	U	MI	N	Very Low
Wildfires	P	MI	L	Low
Winter Storms/ Freezes	L	MO	L	Moderate

Frequency Measures:

- HL = Highly Likely (Near 100% Probability in the next year)
- L = Likely (At least one chance in the next 10 years)
- P = Possible (At least one chance in the next 100 years)
- U = Unlikely (Not likely at all in the next 100 years)

Magnitude Measures:

- MI = Mild (Affects less than 10% of the area of the Town)
- MO = Moderate (Affects 10-40% of the area of the Town)
- SV = Severe (Affects more than 40% of the area of the Town)

Impact Measures:

- CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)
- CR = Critical (Severe Injuries, > 25% of properties severely damaged)
(Critical Facilities inoperable for up to 2 weeks)
- L = Limited (Few Injuries, > 10% of properties severely damaged)
(Critical Facilities inoperable for up to a week)
- N = Negligible (Minor Injuries, <10% of properties severely damaged)
(Critical Facilities inoperable for less than 24 hours)



GUEST #2

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure	U	M	CT	Low
Drought / Heat Wave	P	MO	CR	Moderate
Earthquakes	U	M	CR	Low
Flooding	P	MO	CR	Moderate
Hurricanes / Coastal Storms	L	SV	CR	High
Landslides	U	M	CR	Low
Nor'easters	U	M	CT	Low
Riverine / Coastal Erosion	P	MO	L	Low
Tornadoes / Severe Thunderstorms	L	SV	CR	High
Tsunamis	U	M	CT	Low
Volcanoes	U	M	CT	Low
Wildfires	U	M	CR	Low
Winter Storms/ Freezes	L	SV	L	Moderate

Frequency Measures:

HL = Highly Likely (Near 100% Probability in the next year)

L = Likely (At least one chance in the next 10 years)

P = Possible (At least one chance in the next 100 years)

U = Unlikely (Not likely at all in the next 100 years)

Magnitude Measures:

MI = Mild (Affects less than 10% of the area of the Town)

MO = Moderate (Affects 10-40% of the area of the Town)

SV = Severe (Affects more than 40% of the area of the Town)

Impact Measures:

CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)

CR = Critical (Severe Injuries, > 25% of properties severely damaged)
(Critical Facilities inoperable for up to 2 weeks)

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(Critical Facilities inoperable for up to a week)

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(Critical Facilities inoperable for less than 24 hours)



GUEST #3

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure	P	MI	L	Low
Drought / Heat Wave	L	MO	L	Moderate
Earthquakes	P	MI	L	Low
Flooding	L	MI	L	Moderate
Hurricanes / Coastal Storms	L	SV	L	Moderate
Landslides	U	MI	L	Very Low
Nor'easters	HL	SV	N	Moderate
Riverine / Coastal Erosion	HL	MI	L	High
Tornadoes / Severe Thunderstorms	HL	MI	CR	High
Tsunamis	U	MI	N	Very Low
Volcanoes	U	MI	N	Very Low
Wildfires	P	MI	L	Low
Winter Storms/ Freezes	L	MI	N	Low

Frequency Measures:

HL = Highly Likely (Near 100% Probability in the next year)

L = Likely (At least one chance in the next 10 years)

P = Possible (At least one chance in the next 100 years)

U = Unlikely (Not likely at all in the next 100 years)

Magnitude Measures:

MI = Mild (Affects less than 10% of the area of the Town)

MO = Moderate (Affects 10-40% of the area of the Town)

SV = Severe (Affects more than 40% of the area of the Town)

Impact Measures:

CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)

CR = Critical (Severe Injuries, > 25% of properties severely damaged)
(Critical Facilities inoperable for up to 2 weeks)

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(Critical Facilities inoperable for up to a week)

N = Negligible (Minor Injuries, <10% of properties severely damaged)
(Critical Facilities inoperable for less than 24 hours)



GUEST #4

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure	P	MI	N	Low
Drought / Heat Wave	HL	MI	N	Moderate
Earthquakes	P	MI	N	Low
Flooding	L	MO	L	Moderate
Hurricanes / Coastal Storms	P	MO	N	Low
Landslides	U	MI	N	Very Low
Nor'easters	P	MO	N	Low
Riverine / Coastal Erosion	U	MI	N	Very Low
Tornadoes / Severe Thunderstorms	HL	MO	L	High
Tsunamis	U	MO MI	N	Very Low
Volcanoes	U	MO MI	N	Very Low
Wildfires	L	MO	L	Moderate
Winter Storms/ Freezes	L	SV	L	Moderate

Frequency Measures:

HL = Highly Likely (Near 100% Probability in the next year)

L = Likely (At least one chance in the next 10 years)

P = Possible (At least one chance in the next 100 years)

U = Unlikely (Not likely at all in the next 100 years)

Magnitude Measures:

MI = Mild (Affects less than 10% of the area of the Town)

MO = Moderate (Affects 10-40% of the area of the Town)

SV = Severe (Affects more than 40% of the area of the Town)

Impact Measures:

CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)

CR = Critical (Severe Injuries, > 25% of properties severely damaged)
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(Critical Facilities inoperable for up to a week)

N = Negligible (Minor Injuries, <10% of properties severely damaged)
(Critical Facilities inoperable for less than 24 hours)



GUEST #5

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure	U	MI	L	Very Low
Drought / Heat Wave	HL	SV	L	High
Earthquakes	P	MO	L	Low
Flooding	P	MI	L	Low
Hurricanes / Coastal Storms	L	SV	CR	High
Landslides	U	MI	N	Very Low
Nor'easters	U	MI	N	Very Low
Riverine / Coastal Erosion	U	MI	N	Very Low
Tornadoes / Severe Thunderstorms	HL	SV	CT	Very High
Tsunamis	U	MI	N	Very Low
Volcanoes	U	MI	N	Very Low
Wildfires	P	MI	L	Low
Winter Storms/ Freezes	L	MO	L	Moderate

Frequency Measures:

HL = Highly Likely (Near 100% Probability in the next year)

L = Likely (At least one chance in the next 10 years)

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U = Unlikely (Not likely at all in the next 100 years)

Magnitude Measures:

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MO = Moderate (Affects 10-40% of the area of the Town)

SV = Severe (Affects more than 40% of the area of the Town)

Impact Measures:

CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)

CR = Critical (Severe Injuries, > 25% of properties severely damaged)
(Critical Facilities inoperable for up to 2 weeks)

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(Critical Facilities inoperable for up to a week)

N = Negligible (Minor Injuries, <10% of properties severely damaged)
(Critical Facilities inoperable for less than 24 hours)



PLANNING
DEPT.

Composite Community Rank

HAZARD ASSESSMENT SHEET

Hazard	Frequency (Enter HL, L, P or U)	Magnitude (Enter MI, MO or SV)	Area of Impact (Enter CT, CR, L or N)	Staff Use
Dam/ Levee Failure				Low
Drought / Heat Wave				Moderate *
Earthquakes				Low
Flooding				Moderate *
Hurricanes / Coastal Storms				High *
Landslides				Very Low
Nor'easters				Low
Riverine / Coastal Erosion				Low
Tornadoes / Severe Thunderstorms				High *
Tsunamis				Very Low
Volcanoes				Very Low
Wildfires				Low
Winter Storms/ Freezes				Moderate *

Frequency Measures:

- HL = Highly Likely (Near 100% Probability in the next year)
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Magnitude Measures:

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Impact Measures:

- CT = Catastrophic (Deaths, > 50% of properties severely damaged)
(Critical Facilities inoperable for up to a month)
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* Moderate + High
to be
addressed
in
plan

