OUTER BANKS REGIONAL

Hazard Mitigation Plan

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1 INTRODUCTION

Section 1 provides a general introduction to hazard mitigation and an introduction to the Outer Banks Regional Hazard Mitigation Plan. This section contains the following subsections:

1.1 Background
1.2 Purpose and Authority
1.3 Scope
1.4 References
1.5 Plan Organization

1.1 BACKGROUND

This document comprises a Hazard Mitigation Plan for the Outer Banks Region of North Carolina.

Each year in the United States, natural and human-caused hazards take the lives of hundreds of people and injure thousands more. Nationwide, taxpayers pay billions of dollars annually to help communities, organizations, businesses, and individuals recover from disasters. These monies only partially reflect the true cost of disasters because additional expenses incurred by insurance companies and non-governmental organizations are not reimbursed by tax dollars. Many natural hazards are predictable, and much of the damage caused by hazard events can be reduced or even eliminated.

Hazards are a natural part of the environment that will inevitably continue to occur, but there is much we can do to minimize their impacts on our communities and prevent them from resulting in disasters. Every community faces different hazards, has different resources to draw upon in combating problems, and has different interests that influence the solutions to those problems. Because there are many ways to deal with hazards and many agencies that can help, there is no one solution for managing or mitigating their effects. Planning is one of the best ways to develop a customized program that will mitigate the impacts of hazards while accounting for the unique character of a community.

A well-prepared hazard mitigation plan will ensure that all possible activities are reviewed and implemented so that the problem is addressed by the most appropriate and efficient solutions. It can also ensure that activities are coordinated with each other and with other goals and activities, preventing conflicts and reducing the costs of implementing each individual activity. This plan provides a framework for all interested parties to work together toward mitigation. It establishes the vision and guiding principles for reducing hazard risk and proposes specific mitigation actions to eliminate or reduce identified vulnerabilities.

In an effort to reduce the nation's mounting natural disaster losses, the U.S. Congress passed the Disaster Mitigation Act of 2000 (DMA 2000) to invoke new and revitalized approaches to mitigation planning. Section 322 of DMA 2000 emphasizes the need for state and local government entities to closely coordinate on mitigation planning activities and makes the development of a hazard mitigation plan a specific eligibility requirement for any local government applying for federal mitigation grant funds. These funds include the Hazard Mitigation Grant Program (HMGP), the Building Resilient Infrastructure and Communities (BRIC) program, and the Flood Mitigation Assistance (FMA) Program, all of which are administered by the Federal Emergency Management Agency (FEMA) under the Department of Homeland Security. Communities with an adopted and federally approved hazard mitigation plan thereby become pre-positioned and more apt to receive available mitigation funds before and after the next disaster strikes.

This plan was prepared in coordination with FEMA Region 4 and the North Carolina Division of Emergency Management (NCEM) to ensure that it meets all applicable federal and state planning requirements. A Local Mitigation Plan Review Tool, found in Appendix A, provides a summary of FEMA's current minimum standards of acceptability and notes the location within this plan where each planning requirement is met.

1.2 PURPOSE AND AUTHORITY

This plan was developed in a joint and cooperative manner by members of a Hazard Mitigation Planning Committee (HMPC) which included representatives of County and Town departments, federal and state agencies, citizens, and other stakeholders. This plan will ensure all jurisdictions in the Outer Banks remain eligible for federal disaster assistance including FEMA's HMGP, BRIC, and FMA programs.

This plan has been prepared in compliance with Section 322 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act or the Act), 42 U.S.C. 5165, enacted under Section 104 of the Disaster Mitigation Act of 2000, (DMA 2000) Public Law 106-390 of October 30, 2000, as implemented at CFR 201.6 and 201.7 dated October 2007.

This plan will be adopted by each participating jurisdiction in accordance with standard local procedures. Copies of adoption resolutions are provided in Section 9 Plan Adoption.

1.3 SCOPE

The planning area for the Outer Banks Region includes all incorporated municipalities and unincorporated areas in Currituck County and Dare County. All participating jurisdictions are listed below:

- Currituck County
- Dare County
- Town of Duck
- Town of Kill Devil Hills
- Town of Kitty Hawk
- Town of Manteo
- Town of Nags Head
- Town of Southern Shores

The Outer Banks Region followed the planning process prescribed by FEMA, and this plan was developed under the guidance of a planning committee comprised of County and Town staff; citizens; and other stakeholders. The HMPC conducted a risk assessment that identified and profiled hazards that pose a risk to the planning area, assessed the planning area's vulnerability to these hazards, and examined each participating jurisdiction's capabilities in place to mitigate them. The plan evaluates and prioritizes hazards for the planning area using a Priority Risk Index, as determined through the risk and vulnerability assessments. Hazards are categorized as "low," "moderate," or "high" priority, however, mitigation strategies are identified for all profiled hazards. The hazards profiled in this plan are:

- Drought
- Earthquake
- Excessive Heat
- Flooding (including Sea Level Rise)

- Hurricane & Coastal Hazards (including Erosion, Rip Current, and Nor'easters)
- Severe Winter Weather
- Tornadoes & Thunderstorms (including Lightning & Hail)
- Wildfire
- Hazardous Substances
- Radiological Emergency
- Cyber Threat
- Terrorism
- Infrastructure Failure

1.4 REFERENCES

The following FEMA guides and reference documents were used to prepare this document:

- FEMA 386-1: Getting Started: Building Support for Mitigation Planning. September 2002.
- FEMA 386-2: Understanding Your Risks: Identifying Hazards and Estimating Losses. August 2001.
- FEMA 386-3: Developing the Mitigation Plan. April 2003.
- FEMA 386-4: Bringing the Plan to Life. August 2003.
- FEMA 386-5: Using Benefit-Cost Review in Mitigation Planning. May 2007.
- FEMA 386-6: Integrating Historic Property and Cultural Resource Considerations into Hazard Mitigation Planning. May 2005.
- FEMA 386-7: Integrating Manmade Hazards into Mitigation Planning. September 2003.
- FEMA 386-8: Multijurisdictional Mitigation Planning. August 2006.
- FEMA 386-9: Using the Hazard Mitigation Plan to Prepare Successful Mitigation Projects. August 2008.
- FEMA National Fire Incident Reporting System 5.0: Complete Reference Guide. January 2008.
- FEMA. Integrating Hazard Mitigation into Local Planning: Case Studies and Tools for Community Officials. March 1, 2013.
- FEMA. Mitigation Ideas. A Resource for Reducing Risk to Natural Hazards. January 2013.
- FEMA Hazard Mitigation Assistance Program and Policy Guide. July 30, 2024.
- FEMA. Local Mitigation Plan Review Guide. October 1, 2011.
- FEMA. FP 206-21-0002. Local Mitigation Planning Policy Guide. April 19, 2023.
- FEMA. Local Mitigation Planning Handbook. May 2023.

Additional sources used in the development of this plan, including data compiled for the Hazard Identification and Risk Assessment, are listed in Appendix D.

1.5 PLAN ORGANIZATION

The Outer Banks Regional Hazard Mitigation Plan is organized into the following sections:

- Section 1: Introduction
- Section 2: Planning Process
- Section 3: Planning Area Profile
- Section 4: Risk Assessment

- Section 5: Capability Assessment
- Section 6: Mitigation Strategy
- Section 7: Mitigation Action Plans
- Section 8: Plan Maintenance
- Section 9: Plan Adoption
- Appendix A: Local Plan Review Tool
- Appendix B: Planning Process Documentation
- Appendix C: Mitigation Alternatives
- Appendix D: References

2 PLANNING PROCESS

Requirement §201.6(b): An open public involvement process is essential to the development of an effective plan. To develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:
1) An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;
2) An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia, and other private and nonprofit interests to be involved in the planning process; and
3) Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.
Requirement §201.6(c)(1): The plan shall include the following:
1) Documentation of the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

This section provides a review of the planning process followed for the development of the Outer Banks Regional Hazard Mitigation Plan. It consists of the following sub-sections:

2.1 Purpose and Vision
2.2 What's Changed in the Plan
2.3 Preparing the Plan
2.4 Hazard Mitigation Planning Committee
2.5 Meetings and Workshops
2.6 Involving the Public
2.7 Outreach Efforts
2.8 Involving the Stakeholders
2.9 Documentation of Plan Progress

2.1 PURPOSE AND VISION

As defined by FEMA, "hazard mitigation" means any sustained action taken to reduce or eliminate the long-term risk to life and property from a hazard event. Hazard mitigation planning is the process through which hazards are identified, likely impacts determined, mitigation goals set, and appropriate mitigation strategies determined, prioritized, and implemented.

The purpose of the Outer Banks Regional Hazard Mitigation Plan is to identify, assess, and mitigate hazard risk to better protect the people and property within Currituck County and Dare County from the effects of natural and human-caused hazards. This plan documents progress on existing hazard mitigation planning efforts, updates the previous plan to reflect current conditions in the Region including relevant hazards and vulnerabilities, increases public education and awareness about the plan and planning process, maintains grant eligibility for participating jurisdictions, maintains compliance with state and federal requirements for local hazard mitigation plans, and identifies and outlines strategies the Counties and participating jurisdictions will use to decrease vulnerability and increase resiliency.

During the development of the 2020 Outer Banks Regional Hazard Mitigation Plan, the Hazard Mitigation Planning Committee (HMPC) developed a vision for the planning area in terms of hazard mitigation planning by considering what the successful implementation of the plan would achieve, what

outcomes the plan would generate, and what the Outer Banks will look like in the near future. This vision statement, presented below, remains relevant to define and guide the planning process for this plan update and the planning area's approach to hazard mitigation.

The Outer Banks Region will maintain its unique quality of life and sense of place while planning and preparing for resilience in the face of future hazards. The Region will be prepared for and adaptable to hazards, and when confronted with disaster, the Region will recover stronger and smarter in a planned, balanced, sustainable manner that acknowledges the dynamic nature of hazard risks in a changing climate. Through innovation and collaboration, the Outer Banks Region will ensure a thriving, safe environment for residents and visitors.

2.2 WHAT'S CHANGED IN THE PLAN

All participating jurisdictions in this plan update were participants in the 2020 Outer Banks Regional Hazard Mitigation Plan, which was approved by FEMA on June 10, 2020.

This hazard mitigation plan update involved a comprehensive review and update of each section of the existing plan and an assessment of the success of the Counties and Towns in evaluating, monitoring and implementing the mitigation strategy outlined in their existing plans. Only the information and data still valid from the existing plans was carried forward as applicable into this update. The following requirements were addressed during the development of this regional plan:

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

Section 4.2 provides a comparison of the hazards addressed in the 2023 State of North Carolina HMP and the 2020 Outer Banks Regional plan and provides the final decision made by the HMPC as to which hazards should be included in the new 2025 Outer Banks Regional Hazard Mitigation Plan.

In addition to the specific changes in hazard analyses identified in Section 4.2, the following items were also addressed in this 2025 plan update:

- GIS was used, to the extent data allowed, to analyze the priority hazards as part of the vulnerability assessment.
- Assets at risk to identified hazards were identified by property type and values of properties based on current data in North Carolina Emergency Management's IRISK Database.
- An updated discussion on the effects of climate change and other future conditions was included in each hazard profile in the risk assessment.

- The discussion on growth and development trends was enhanced utilizing 2022 American Community Survey data and current land use plans.
- An effort was made to provide underserved communities and vulnerable populations with opportunities to participate in and contribute to the plan update process. Engagement opportunities were provided through the public survey, the plan website, and stakeholder coordination.
- Enhanced public outreach and agency coordination efforts were conducted throughout the plan update process in order to meet the more rigorous requirements of the 2017 CRS Coordinator's Manual, in addition to DMA requirements.

2.3 PREPARING THE PLAN

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

1. Planning Process
2. Risk Assessment
3. Mitigation Strategy
4. Plan Maintenance

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

Table 2.1 shows how the 10-step CRS planning process aligns with the four phases of hazard mitigation planning pursuant to the Disaster Mitigation Act of 2000.

Table 2.1 – Mitigation Planning and CRS 10-Step Process Reference Table

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

In addition to meeting DMA and CRS requirements, this plan also meets the recommended steps for developing a Community Wildfire Protection Plan (CWPP). Table 2.2 below outlines the recommended CWPP process and the CRS step and sections of this plan that meet each step.

Table 2.2 – Community Wildfire Protection Plan Process Reference

CWPP Process	CRS Step	Fulfilling Plan Section
Convene decision makers	Step 1	Section 2 – HMPC
Involve Federal agencies	Step 3	Section 2 – Involving Stakeholders
Engage interested parties (such as community representatives)	Step 1, 2, and 3	Section 2 – HMPC, Involving the Public, Involving Stakeholders
Establish a community base map	Step 4	Section 4 – Wildfire
Develop a community risk assessment, including fuel hazards, risk of wildfire occurrence, homes, business and essential infrastructure at risk, other community values at risk, local preparedness, and firefighting capability	Step 4 and 5	Section 4 – Wildfire Section 5 – Capability
Establish community hazard reduction priorities and recommendations to reduce structural ignitability	Step 6, 7, and 8	Section 6 – Mitigation Strategy Section 7 – Mitigation Action Plans
Develop an action plan and assessment strategy	Step 8 and 10	Section 7 – Mitigation Action Plans Section 8 – Plan Maintenance
Finalize the CWPP	Step 9	Section 9 – Plan Adoption

The process followed for the preparation of this plan, as outlined in Table 2.1 above, is as follows:

2.3.1 PHASE I – PLANNING PROCESS

Planning Step 1: Organize to Prepare the Plan

With the participating communities' commitment to participate in the DMA planning process, community officials worked to establish the framework and organization for development of the plan. An initial meeting was held with key community representatives to discuss the organizational aspects of the plan development process. The region's effort to reorganize and coordinate for the plan update was led by Dare County Emergency Management Director, Drew Pearson, and Currituck County Emergency Management Director, Mary Beth Newns. Consultants from WSP assisted by leading the region through the planning process and preparing the plan document.

Planning Step 2: Involve the Public

Public involvement in the development of the plan was sought using various methods, as detailed in Section 2.6.

Planning Step 3: Coordinate

The HMPC that was formed for the 2020 Outer Banks Regional Hazard Mitigation Plan was reconvened for this plan update. Membership was updated where necessary to ensure each community had adequate representation from staff and stakeholders. More details on the HMPC are provided in Section 2.4. Stakeholder coordination was incorporated into the formation of the HMPC and was also sought through additional outreach methods. These efforts are detailed in Section 2.8 and documentation of additional stakeholder outreach is provided in Appendix B.

Coordination with Other Community Planning Efforts and Hazard Mitigation Activities

In addition to stakeholder involvement, coordination with other community planning efforts was also seen as paramount to the success of this plan. Mitigation planning involves identifying existing policies, tools, and actions that will reduce a community's risk and vulnerability to hazards. Communities in the Outer

Banks Region use a variety of planning mechanisms, such as comprehensive plans, subdivision regulations, building codes, and ordinances to guide growth and development. Integrating existing planning efforts, mitigation policies, and action strategies into this plan establishes a credible and comprehensive plan that ties into and supports other community programs. As detailed in Table 2.3, the development of this plan incorporated information from existing plans, studies, reports, and initiatives as well as other relevant data from neighboring communities and other jurisdictions.

These and other documents were reviewed and considered, as appropriate, during the collection of data to support the planning process and plan development. Data from these sources was incorporated into the risk and vulnerability assessment and was used in determining the capability of each jurisdiction to implement certain mitigation strategies. The Risk Assessment is presented in Section 4 and the Capability Assessment can be found in Section 5.

Table 2.3 – Summary of Existing Studies and Plans Reviewed

Resource Referenced	Use in this Plan
Local Comprehensive Plans (Dare County Land Use Plan, Currituck County Land Use Plan, jurisdictional land use/comprehensive plans, etc.)	The Currituck and Dare County land use plans were referenced in the Planning Area Profile in Section 3. Other local comprehensive plans were incorporated into Mitigation Action Plans where applicable in Section 7 and referenced in the Capability Assessment in Section 5. They are also referenced in individual jurisdictional annexes.
Local Ordinances (Flood Damage Prevention Ordinances, Subdivision Ordinances, Zoning Ordinances, etc)	Local ordinances were referenced in the Capability Assessment in Section 5 and where applicable for updates or enforcement in Mitigation Action Plans in Section 7.
Dare County and Incorporated Jurisdictions and Currituck County and Incorporated Jurisdictions Flood Insurance Study (FIS) Reports, Revised 6/19/2020	The FIS reports were referenced in the preparation of the flood hazard profile in Section 4.
Outer Banks Regional Hazard Mitigation Plan, 2020	The previous plan served as the foundation for this plan update and was specifically referenced in compiling the Hazard Identification and Risk Assessment in Section 4, reporting on implementation of mitigation actions in Section 2, and developing the Mitigation Action Plans in Section 7.
Albemarle Regional Resilience Portfolio	This plan was referenced in the Capability Assessment in Section 5 and for development of the Mitigation Action Plans in Section 7.
Resilient Coastal Communities Program Resilience Strategies (Currituck County, Dare County, Duck, Kitty Hawk, Nags Head)	These plans were referenced in the Capability Assessment in Section 5 and for development of the Mitigation Action Plans in Section 7.
North Carolina State Hazard Mitigation Plan, 2023	The state hazard mitigation plan was primarily referenced in compiling the Hazard Identification and Risk Assessment in Section 4.

2.3.2 PHASE II – RISK ASSESSMENT

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

The HMPC completed a comprehensive effort to identify, document, and profile all hazards that have, or could have, an impact on the planning area. GIS was used to display, analyze, and quantify hazards and vulnerabilities. A draft of the risk and vulnerability assessment was made available on the plan website for the HMPC, stakeholders, and the public to review and comment.

The HMPC also conducted a capability assessment to review and document the planning area's current capabilities to mitigate risk from and vulnerability to hazards. By collecting information about existing government programs, policies, regulations, ordinances, and emergency plans, the HMPC could assess those activities and measures already in place that contribute to mitigating some of the risks and vulnerabilities identified. A more detailed description of the risk assessment process and the results are included in Section 4 Risk Assessment.

2.3.3 PHASE III – MITIGATION STRATEGY

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

WSP facilitated a discussion with the HMPC review and revise the planning goals and objectives and a comprehensive range of mitigation alternatives. The HMPC also discussed a method of selecting and defending recommended mitigation actions using a series of selection criteria. This information is included in Section 6 Mitigation Strategy.

Planning Step 8: Draft an Action Plan

A complete first draft of the plan was prepared based on input from the HMPC regarding the draft risk assessment and the goals and activities identified in Planning Steps 6 and 7. This draft was shared for HMPC, stakeholder, and public review and comment via the plan website. HMPC, public, and stakeholder comments were integrated into the final draft for the NCEM and FEMA Region 4 to review and approve, contingent upon final adoption by all participating jurisdictions.

2.3.4 PHASE IV – PLAN MAINTENANCE

Planning Step 9: Adopt the Plan

To secure buy-in and officially implement the plan, the plan will be reviewed and adopted by all participating jurisdictions. Resolutions will be provided in Section 9 Plan Adoption.

Planning Step 10: Implement, Evaluate and Revise the Plan

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. Up to this point in the planning process, the HMPC's efforts have been directed at researching data, coordinating input from participating entities, and developing appropriate mitigation actions. Section 8 Plan Maintenance provides an overview of the overall strategy for plan implementation and maintenance and outlines the method and schedule for monitoring, updating, and evaluating the plan. The Section also discusses incorporating the plan into existing planning mechanisms and how to address continued public involvement.

2.4 HAZARD MITIGATION PLANNING COMMITTEE

This hazard mitigation plan was developed under the guidance of a planning committee comprising representatives of County and Town departments, federal and state agencies, citizens, and stakeholders.

To form the HMPC, the Currituck County and Dare County Emergency Managers coordinated with County and Town officials to designate representatives for each jurisdiction. Each community was asked to designate a primary and secondary contact for the HMPC. Communities were also asked to identify local stakeholder representatives to participate on the HMPC alongside the County and Town officials to improve the integration of stakeholder input into the plan. Table 2.4 lists the membership of the HMPC, the agencies and jurisdictions that members represented, and members' attendance at meetings. Many of these representatives were involved in the development of the 2020 Hazard Mitigation Plan and have since participated in regular plan reviews and maintenance. For this plan update, an effort was made to involve additional stakeholders who could represent or coordinate with underserved communities and vulnerable populations.

Table 2.4 – Hazard Mitigation Planning Committee

Jurisdiction	Representative	Agency	Position/Title or *Stakeholder	HMPC Meeting Attendance			
				Mtg.1	Mtg.2	Mtg.3	Mtg.4
Currituck County	Jason Litteral, CFM	Currituck County Planning and Community Development Dept	Senior Planner	✓	✓	✓	✓
Currituck County	Jennie Turner, CFM, CZO	Currituck County Planning and Community Development Dept	Assistant Planning Director	✓			
Currituck County	Mary Newns	Currituck County Emergency Management	Emergency Management/ Communications Director	✓		✓	✓
Currituck County	Olivia Doherty	Currituck County Emergency Management	Deputy Emergency Management Coordinator	✓	✓	✓	✓
Currituck County	Lora Eddy	The Nature Conservancy	Coastal Engagement Coordinator*	✓			
Currituck County	Michael Strader	WithersRavenel	Director of Utilities	✓	✓	✓	✓
Currituck County	Tab Winborne	Tab Winborne Corporation	Home Builder*	✓		✓	
Currituck County	Carol Fraizer	Pilmoor UMC Food Pantry	Coordinator*	✓			✓
Currituck County	Anthony Dickinson	Farm Bureau Insurance Group	Agent*	✓	✓	✓	
Currituck County	Jason Summerton	Twiddy & Company, 4WD Area	Broker-in-Charge*				
Dare County	Drew Pearson	Dare County Emergency Management	Director	✓	✓	✓	✓
Dare County	Noah Gillam	Dare County Planning & Zoning	Director	✓	✓		✓
Dare County	James Wooten	Dare County Emergency Management	Emergency Management Planner	✓	✓	✓	✓
Dare County	Barton Grover	Dare County Planning & Zoning	Grants and Waterways Administrator	✓	✓	✓	✓
Dare County	Cory Tate	Dare County Planning & Zoning	Chief Building Inspector				
Dare County	John Finelli	Homeowners Association member and Planning Board	Citizen – Martin Point*	✓	✓	✓	
Dare County	Mike McGuire	N/A	Citizen – Hatteras Island (Avon)*	✓	✓		
Dare County	Mary Ellon Balance	Board of Education/Commissioners	Citizen – Hatteras Island (Hatteras)*		✓		
Dare County	Tom Amatucci	RWS Civic Association leader	Citizen – Hatteras Island (RWS)*	✓	✓		
Dare County	Shari Fiveash	OBX Room in the Inn	Executive Director*	✓	✓	✓	✓
Dare County	Donna Creef	Outer Banks Association of Realtors	CRS Consultant*	✓	✓		✓

Jurisdiction	Representative	Agency	Position/Title or *Stakeholder	HMPC Meeting Attendance			
				Mtg.1	Mtg.2	Mtg.3	Mtg.4
Duck	Joe Heard	Department of Community Development	Director	✓	✓	✓	✓
Duck	Sandy Cross	Department of Community Development	Permit Coordinator/CAMA LPO/CZO/CFM		✓	✓	✓
Duck	Kevin Wright	Duck Community & Business Alliance	Secretary/Treasurer*	✓	✓		✓
Duck	Walter Hancock	Barrier Island Station	General Manager*	✓			
Kill Devil Hills	Meredith Guns	Kill Devil Hills Planning & Inspections	Planning Director			✓	
Kill Devil Hills	Cameron Ray	Kill Devil Hills Planning & Inspections	Senior Planner		✓		✓
Kill Devil Hills	Doug Styons	N/A	Citizen & business owner, licensed land surveyor*	✓			
Kill Devil Hills	Mike O'Steen	N/A	Local business owner, professional engineer*				
Kill Devil Hills	Skip Jones	N/A	Local business owner*	✓	✓	✓	
Kitty Hawk	Rob Testerman	Kitty Hawk Planning & Inspections	Director	✓	✓	✓	✓
Kitty Hawk	Mike Talley	Kitty Hawk Fire Department	Fire Chief	✓	✓		✓
Kitty Hawk	Mark Bissel	Bissell Professional Group	Citizen and engineer*		✓	✓	
Manteo	Melissa Dickerson	Manteo Planning & Zoning	Planner	✓	✓	✓	✓
Manteo	Kevin Zorc	Manteo Fire Department	Emergency Manager / Fire Marshal	✓	✓	✓	✓
Nags Head	Kelly Wyatt	Nags Head Planning & Development	Director	✓	✓	✓	✓
Nags Head	Joe Costello	Nags Head Planning & Development	Deputy Planning Director	✓			✓
Nags Head	Shane Hite	Nags Head Fire Rescue	Deputy Fire Chief	✓		✓	
Nags Head	David Thompson	N/A	Planning Board member*	✓			
Nags Head	Megan Lambert	N/A	Business owner and Planning Board member*	✓		✓	
Southern Shores	Wes Haskett	Southern Shores Administration/ Planning & Code Enforcement	Deputy Town Manager/Planning Director	✓		✓	✓
Southern Shores	David Bradley	Southern Shores Planning & Code Enforcement	Permit Officer	✓	✓		
Southern Shores	Andy Ward	N/A	Planning Board member	✓			
Southern Shores	Tony DiBernardo	N/A	Planning Board Vice Chairperson	✓			

*Asterisk indicates that the representative is a citizen or outside stakeholder not affiliated with the local government

The HMPC led the planning and decision-making efforts throughout the planning process; however, other staff from the participating communities were involved in an advisory role to provide input and local data, review plan drafts, update the status of their respective mitigation actions, and otherwise support the HMPC in this plan update. These were not members of the HMPC. Additional County and Town staff that supported the HMPC are recognized in Table 2.5 below.

Table 2.5 – Additional Staff Supporting the Planning Process

Jurisdiction	Representative	Agency	Position/Title
Currituck County	Millicent Ott	Currituck County Planning and Community Development Dept	Planner II
Currituck County	Patrick Leary	Currituck County Planning and Community Development Dept	Planner I
Kitty Hawk	Mike Palkovics	Police Department	Police Chief
Manteo	Heather Dowdy	Town of Manteo	Finance Director
Manteo	Betty Selby	Town of Manteo	Mayor Pro Tem
Manteo	Josh Honston	Manteo Planning	Planner
Nags Head	Shane Hite	Nags Head Fire Department	Deputy Fire Chief
Nags Head	Ed Snyder	Nags Head Planning & Development	Code Enforcement

The formal HMPC meetings followed the 10 CRS Planning Steps. Agendas, minutes, and sign-in sheets for the HMPC meetings are provided in Appendix B. The meeting dates and topics discussed are summarized in Section 2.5 Meetings and Workshops. All HMPC meetings were open to the public.

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

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

For the Outer Banks Regional HMPC, "participation" meant the following:

- Providing facilities for meetings;
- Attending and participating in the HMPC meetings;
- Collecting and providing requested data (as available);
- Managing administrative details;
- Making decisions on plan process and content;
- Identifying mitigation actions for the plan;
- Reviewing and providing comments on plan drafts;
- Informing the public, local officials, and other interested parties about the planning process and providing opportunity for them to comment on the plan;
- Coordinating, and participating in the public input process; and
- Coordinating the formal adoption of the plan by local governing bodies.

Detailed summaries of HMPC meetings are provided under Section 2.5 Meetings and Workshops, including meeting dates, locations, and topics discussed. During the planning process, the HMPC members communicated through face-to-face meetings, email, and telephone conversations. This continued communication ensured that coordination was ongoing throughout the entire planning process

even though not all HMPC members could be present at every meeting. Additionally, draft documents were distributed via the plan website so that the HMPC members could easily access and review them and provide comments.

2.5 MEETINGS AND WORKSHOPS

The preparation of this plan required a series of meetings and workshops for facilitating discussion, gaining consensus, and initiating data collection efforts with local government staff, community officials, and other identified stakeholders. More importantly, the meetings and workshops prompted continuous input and feedback from relevant participants throughout the drafting stages of the plan.

Table 2.6 summarizes the key meetings and workshops held by the HMPC during the development of the plan. In many cases, routine discussions and additional meetings were held by local staff to accomplish planning tasks specific to their department or agency. For example, completing the Local Capability Self-Assessment or seeking approval of specific mitigation actions for their department or agency to undertake and include in their Mitigation Action Plan. These meetings were informal and are not documented here.

Public meetings are summarized in subsection 2.6.

Table 2.6 – Summary of HMPC Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 (Kickoff) – Dare County Group	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule.	April 22, 2024 2pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #1 (Kickoff) – Currituck County Group		April 23, 2024 2pm	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #2	1) Review Draft Hazard Identification & Risk Assessment (HIRA)	August 28, 2024 1pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #3 – Currituck County Group	1) Discuss changes in capability 2) Review and update plan goals and objectives 3) Report on status of actions from the 2020 plan 4) Discuss new mitigation action alternatives	October 21, 2024 2 pm	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #2 – Dare County Group		October 22, 2024 10 am	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #4 – Currituck County Group	2) Review the Draft Hazard Mitigation Plan 3) Solicit comments and feedback	January 28, 2025 11 am	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #4 – Dare County Group		January 28, 2025 3 pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo

2.6 INVOLVING THE PUBLIC

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

Public involvement in the development of the plan was sought using various methods including open public meetings, an interactive plan website, a public participation survey, and by making copies of draft plan documents available for public review online and at government offices. Additionally, all HMPC meetings were made open to the public.

All public meetings were advertised on the plan website, which was shared on local community websites, and on local community websites, where possible. Copies of meeting announcements are provided in Appendix B. The public meetings held during the planning process are summarized in Table 2.7.

Table 2.7 – Summary of Public Meetings

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1 (Kick-Off) – Dare County	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Explanation of mitigation 3) Review of the project schedule. 4) Review of hazard identification	April 22, 2024 5pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
Public Meeting #1 (Kick-Off) – Currituck County		April 23, 2024 5:30pm	Currituck County Public Safety Center, 125 College Way, Barco
Public Meeting #2 – Dare County	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Explanation of mitigation 3) Review of the project schedule 4) Review of preliminary risk & vulnerability assessment updates	August 28, 2024 5pm	Avon Volunteer Fire Department, 40159 Harbor Rd, Avon
Public Meeting #2 – Currituck County		August 29, 2024 11am	Corolla Public Library, 1123 Ocean Trail, Corolla
Public Meeting #3	1) Review draft Hazard Mitigation Plan 2) Solicit comments and feedback	January 28, 2025 5 pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo & Microsoft Teams

2.7 OUTREACH EFFORTS

The HMPC agreed to employ a variety of public outreach methods including established public information mechanisms and resources within the community. Table 2.8 details public outreach efforts employed during the preparation of this plan.

Table 2.8 – Public Outreach Efforts

Location	Date	Event/Message
Plan website	Ongoing	Meeting announcements, meeting materials, project timeline, mitigation planning resources, and contact information provided to request additional information and/or provide comments
County and Town social media pages	April 2024, August 2024, January 2025	Public Meeting announcements posted; Link to the plan website shared to expand reach; Requests for comments on the draft plan
County and Town websites	April 2024, August 2024, January 2025	Public Meeting announcements posted; Link to the plan website shared to expand reach; Requests for comments on the draft plan
Local news articles	April 2024	Four separate news articles provided information on the plan update, including public meeting announcements, public meeting summaries, a description of the planning process, and links or contact information for more information
Town newsletters	August 2024	Direct email to residents on email distribution lists sharing links to the plan website and public survey
Public survey	April – October 2024	Survey hosted online, made available via shareable link and shared on the plan website
Plan website – HIRA draft	October 2024	Draft HIRA made available for review and comment online
Plan website – Draft Plan	January 2025	Full draft plan made available for review and comment online

As detailed above, public involvement activities for this plan update included press releases, creation of a website for the plan, a public survey, and the collection of public and stakeholder comments on the draft plan. Documentation of these activities is provided in Appendix B.

A public outreach survey was made available in April 2024 and remained open for response through October 2024. The public survey requested public input into the Hazard Mitigation Plan planning process and the identification of mitigation activities to lessen the risk and impact of future hazard events. The survey is shown in Appendix B. The survey was available in hard copy at the first public meeting and online on the plan website. In total, 475 responses were received.

The following is a list of high-level summary results derived from survey responses:

- Responses were received from residents of all participating communities as well as individuals who live outside of the region but live or recreate in the region.
- 57% of people said they have experienced a hazard or disaster in the Outer Banks region. Of these respondents, 79% are highly concerned about future hazard events. Regardless of past experience, concern about hazard impacts are high across the region; 71% of all respondents rated their concern at 4 or 5 out of 5.
- People were asked to rate the risk of each hazard identified in the region. Hurricane, flood, coastal hazards, and severe weather were rated the highest risk hazards. Earthquake, radiological emergency, terrorism, and hazardous materials incidents were rated the lowest risk hazards.
- Regarding flood risk, 37% of people say their home is located in a floodplain, and another 10% of people say their home is outside of the floodplain but they still experience flooding.

- 60% of respondents have flood insurance. Of those who do not have flood insurance, 27% say that is because their home is elevated or otherwise protected.
- 57% of respondents have taken actions to protect their home or neighborhood from hazards. Many people have built or retrofitted their property to withstand winds and flooding and take steps to prepare their property prior to storms. Reported actions include fortified roofs, storm shutters, flood vents, structure and utility elevation, grading and digging ditches, trimming trees, securing outdoor items before storms, having a generator, and knowing evacuation routes.
- More than half of respondents do not know which government office to contact for more information on hazard risks and how to reduce vulnerability.
- All mitigation categories were rated as important, with most ranked as 1 or 2 out of 6 on a scale where 1 is most important and 6 is least important. The most preferred categories were prevention and emergency services. 329 people responded with steps the local government could take to reduce hazard risk. These responses were shared with the HMPC to assist in identifying new mitigation actions.

A complete summary of survey results is provided in Appendix B.

2.8 INVOLVING THE STAKEHOLDERS

As noted above, in addition to representatives of each participating jurisdiction, the Hazard Mitigation Planning Committee included a variety of stakeholders so that the committee would involve a variety of perspectives. Some residents and stakeholders were able to represent underserved communities and vulnerable populations. Stakeholders on the HMPC included representatives from the Nature Conservancy, insurance agencies, local businesses, and non-profits, and residents of highly vulnerable communities. Input from additional stakeholders, including neighboring communities, was solicited through an invitation to attend the public meetings and review the draft plan. Documentation and details of this effort are provided in Appendix B. Stakeholders could also participate in the public survey; however, whether or not stakeholders participated is unknown due to the anonymous nature of the survey.

2.9 DOCUMENTATION OF PLAN PROGRESS

Progress on the mitigation strategy developed in the previous plan is documented in this plan update. Table 2.9 below summarizes the status of mitigation actions from the previous plan. More details on carried forward actions are provided in Section 7: Mitigation Action Plans.

Table 2.9 – Status of Previous Mitigation Actions

Jurisdiction	Completed	Deleted	Carried Forward
Currituck County	3	0	32
Dare County	4	1	26
Town of Duck	0	1	28
Town of Kill Devil Hills	1	2	26
Town of Kitty Hawk	2	0	13
Town of Manteo	5	2	16
Town of Nags Head	4	1	20
Town of Southern Shores	1	9	14
Total	**20**	**16**	**175**

Table 2.10 on the following pages details all actions from the 2020 plan that have been marked as completed or deleted and thus removed from the updated mitigation action plan.

It should be noted that although some communities have few or no completed actions removed from their mitigation action plans, this does not convey that mitigation has not been completed. Many actions have been carried forward into this plan update that reflect ongoing implementation and progress achieved or that incorporate revisions to address new priorities.

Community capability continues to improve with the implementation of new plans, policies, and programs that help to promote hazard mitigation at the local level. The current state of local capabilities for the participating jurisdictions is captured in Section 5: Capability Assessment. The participating jurisdictions continue to demonstrate their commitment to hazard mitigation and have proven this by reconvening the HMPC to update this multi-jurisdictional plan and by continuing to involve the public in the hazard mitigation planning process.

Moving forward, information in this plan will be used to help guide and coordinate mitigation activities and decisions for local plans and policies in the future. Proactive mitigation planning will help reduce the cost of disaster response and recovery to communities and their residents by protecting critical community facilities, reducing liability exposure, and minimizing overall community impacts and disruptions. This plan identifies activities that can be undertaken by both the public and the private sectors to reduce safety hazards, health hazards, and property damage.

Table 2.10 – Completed and Deleted Actions from the 2020 Outer Banks Regional Hazard Mitigation Plan

2020 Action #	Description	2024 Status	Status Comments/Explanation
Currituck County			
CUR3	Encourage clustering of residential lots outside of hazard areas in subdivision design/review and discourage development intensity and infrastructure improvements in known hazard areas	Complete	This is somewhat addressed by ordinance language but will be reinforced by policies in the new Land Use Plan. *Imagine Currituck*, the new Land Use Plan, Adopted June 20, 2022, includes an Action for UDO AMENDMENT CC-ACT-29 "Prioritize preservation of open space near marshes and special flood hazard areas to allow for inland retreat of coastal marshes and wetlands." The new Imagine Currituck 2040 vision plan has been officially certified by DCM.
CUR5	Install back up generators at the Historic County Courthouse and the fuel farm.	Complete	The generator at the historic courthouse has been installed. A new fuel farm is under construction and will include a backup generator when complete.
CUR17	Secure funding, design, and construct an EOC/Public Safety Facility	Complete	The new Public Safety Building is complete and operational.
Dare County			
DAR3	Update Dare County's 2001 comprehensive stormwater management plan.	Complete	
DAR24	Complete commodity flow study to identify hazardous materials that are routinely transported across the region.	Complete	
DAR25	Coordinate with NC Floodplain Mapping on public dissemination of updated floodplain maps	Complete	
DAR26	Lobby State Legislators to require realtors to disclose flood zones.	Complete	
DAR27	Maintain or increase the number of flood insurance policies in place across Dare County when new flood hazard maps become effective and many properties are reclassified as Shaded X and/or X zone no longer requiring flood insurance associated with a federally insured mortgage.	Delete	This is a duplicate action. This effort is covered by DAR8.

2020 Action #	Description	2024 Status	Status Comments/Explanation
Town of Duck			
DCK18	Address drainage issues on NC 12 as applicable and provide funding for necessary stormwater improvements.	Delete	Engineering is ongoing to rectify localized drainage problems on parts of NC 12 and funding is being provided in the CIP annually. Stormwater improvements and retrofits recommended in the areas of NC12 and Wee Winks/Duck Church are budgeted with construction anticipated in 2025. Additional improvements and retrofits are anticipated in the area of Kitty Hawk Kites, Wings/NC Coast/Bob's Bait and Tackle, and Charles Jenkins Lane. Collaboration with NCDOT continues as needed. Additional related efforts are addressed under DCK18.
Town of Kill Devil Hills			
KDH2	Erosion and Sediment Control - Continue to enforce local and state regulations	Delete	This is an established capability. Planning Staff continues to permit Sedimentation and Erosion control permits and enforces all State regulations. Planning has three certified sedimentation inspectors.
KDH9	Add freeboard to the Flood Damage Prevention Ordinance for development in and outside the SFHA	Completed	The Flood Damage Prevention Ordinance higher regulatory standards are being enforced and Town continues to apply flood regulations in X and Shaded X zones.
KDH14	Wetlands Protection - Continue to utilize the zoning ordinance and the Land Use Plan to protect wetlands, implement and enforce CAMA AEC regulations and refer applicants to US Army Corps of Engineers for Section 404 wetlands.	Delete	This is an established capability. The Town continues to enforce protective regulations for estuarine shoreline and wetland areas and is investigating potential for a living shoreline in Public access areas particularly with improvements to the Baum Tract. Living shorelines are addressed in a new action item.
Town of Kitty Hawk			
KH2	Revise Town's Flood Damage Prevention Ordinance in conjunction with new maps to increase the required freeboard in AE zones and regulate elevation requirements in Shaded X zones	Completed	
KH12	Maintain post-disaster debris management contract with qualified provider.	Completed	

2020 Action #	Description	2024 Status	Status Comments/Explanation
Town of Manteo			
MAN 5	Generator for Town Hall for continued services during disasters. The Town stands up an EOC at Town Hall during events.	Completed	
MAN8	Cora Mae Basnight Bridge-water sewer line repair and replacement	Delete	Combined with MAN2
MAN9	Continue to encourage projects undertaken by Town Departments that will lessen the vulnerability of the Town and its residents to natural hazards.	Delete	This action was removed because it was not specific enough to track implementation progress.
MAN 10	Phase V stormwater improvements for west side of Highway 64	Completed	
MAN 16	Full replacement of waterfront lift station	Completed	
MAN 21	Generator for Water and Sewer Plant to power to full operational	Completed	Generator has been delivered and set in place, not yet connected.
MAN22	Develop new Town of Manteo Emergency Operations Plan to supersede Manteo Police Emergency Plan	Completed	
Town of Nags Head			
NGH4	Develop a long-term plan for shoreline management which includes the oceanfront and estuarine shoreline. This may include financing, permitting, ongoing project implementation (in coordination with Dare County and other Dare County municipalities), and monitoring of changing shoreline conditions.	Completed	The Town completed the Estuarine Shoreline Management Plan and it was adopted by the Board of Commissioners in February 2023.
NGH9	Purchase and install weather stations to track rainfall and weather in the Town that will be helpful in identifying changing weather patterns and future stormwater planning and modeling needs. Explore partnerships with agencies where this weather information would be relevant (i.e. NC Climate Center).	Completed	The town partnered with NC State Parks to install a weather station, funded through NC State Climate Office, in Jockey's Ridge State Park. Town has 3 other weather stations at Station 21, Town Hall, Water Plant

2020 Action #	Description	2024 Status	Status Comments/Explanation
NGH14	Pursue the installation of flood gauges, through partnership with Dare County and the State, that will notify citizens and Town officials of changing water levels.	Completed	The town partnered with the Coastal Studies Institute to install two new Honohu flood gauges in the Town of Nags Head. 13 water level data loggers installed in town.
NGH18	Consider incentives rewarding developers, property owners, and builders that set aside additional open space in perpetuity.	Delete	No action taken as of this date.
NGH21	Improve fire protection and access in Nags Head Woods with the installation of 'dry hydrants' and maintenance and improvements to Nags Head Woods Road.	Completed	The Nags Head Woods road is maintained by Nags Head Public Works and roadway material is added as needed to maintain an acceptable driving surface.
Town of Southern Shores			
SOS1	Enforcement of the Zoning Ordinance as a hazard mitigation tool	Delete	This is an established capability. The Planning and Code Enforcement Department continues to enforce the adopted Zoning Ordinance. Zoning Permits are issued for new development, changes in use, and new uses in order to ensure compliance.
SOS3	Continue enforcement of the Flood Damage Prevention Ordinance	Delete	This is an established capability. The Planning and Code Enforcement Department continues to enforce the Flood Damage Prevention Ordinance. Building permits are not issued unless plans demonstrate compliance with the established requirements
SOS4	Continue the enforcement of the NC State Fire Prevention Code, referenced by the Town Fire Code.	Delete	This is an established capability. The Town continues to enforce the Town Fire Code. The Town's Building Inspector conducts fire inspections of non-residential properties to ensure compliance. A full-time Building Inspector was hired in December 2020.
SOS5	Continue enforcing the Lot Disturbance provisions of the Zoning Ordinance	Delete	This is an established capability. The Planning and Code Enforcement Department continues to enforce the Lot Disturbance provisions of the Zoning Ordinance. No grading, filling, or other alteration of the topography or elevation of any unimproved lot, or demolition and clearing of improved property, nor any manmade change to any improved real estate resulting in the discharge of stormwater onto adjacent property and requiring a building permit, is undertaken without prior issuance of a lot disturbance permit

2020 Action #	Description	2024 Status	Status Comments/Explanation
SOS8	Continue enforcing Coastal Area Management Act (CAMA) regulations	Delete	This is an established capability. The Town continues to enforce CAMA regulations. The Town's Local Permit Officers continue to review and issue Minor Permits in accordance with CAMA.
SOS9	Continue enforcing the state Erosion and Sedimentation Control regulations	Delete	This is an established capability. When applicable, all new development must obtain a State-issued permit prior to issuance of a building/zoning permit.
SOS10	Identify factors that affect the severity of drought	Delete	This is an established capability. The Town continues to identify factors that affect the severity of drought.
SOS12	Modeling various "what-if" scenarios to estimate potential vulnerabilities in order to develop sea level rise mitigation priorities	Completed	The Town recently updated its CAMA Land Use Plan by adopting a Comprehensive Land Use Plan which includes scenarios showing the potential impacts of sea level rise. The Plan was adopted on July 2, 2024 and was certified by the N.C. Division of Coastal Management on September 13, 2024.
SOS13	Continue enforcement of the state building code, including wind load requirements	Delete	This is an established capability. The Planning and Code Enforcement Department continues to enforce the state building code, including wind load requirements. All building plans must demonstrate compliance prior to issuance of a building permit. The Building Inspector continues to conduct inspections during construction and no Certificate of Occupancy is issued unless all requirements are satisfied.
SOS15	Continue implementation of the Waterways and Beaches Ordinance	Delete	This is an established capability. The Planning and Code Enforcement Department continues to implement the Waterways and Beaches Ordinance. The Town Community Resource Officer and contracted lifeguard service conduct patrols of the beach to ensure compliance. All development along Town waterways is approved following demonstration of compliance. The Town continues to send Notices of Violation for canal obstructions.

3 PLANNING AREA PROFILE

This section provides a general overview of the current conditions in the Outer Banks region and its participating municipalities. It consists of the following sub-sections:

- 3.1 Geography and Environment
- 3.2 Population and Demographics
- 3.3 Historic Properties
- 3.4 Housing
- 3.5 Infrastructure
- 3.6 Current and Future Land Use
- 3.7 Employment and Industry

3.1 GEOGRAPHY AND ENVIRONMENT

The Outer Banks Region is located in the coastal plain of northeastern North Carolina. The region includes mainland areas as well as over 100 miles of barrier islands and peninsulas that separate the Atlantic Ocean from the Currituck Sound, Albemarle Sound, Pamlico Sound, Roanoke Sound, Croatan Sound, and mainland North Carolina.

The planning area includes Currituck County, Dare County, and the Towns of Duck, Kill Devil Hills, Kitty Hawk, Manteo, Nags Head, and Southern Shores. A location map is provided in Figure 3.1.

The planning area comprises a total land area of 645 square miles. The total land area of each participating jurisdiction is listed in Table 3.1.

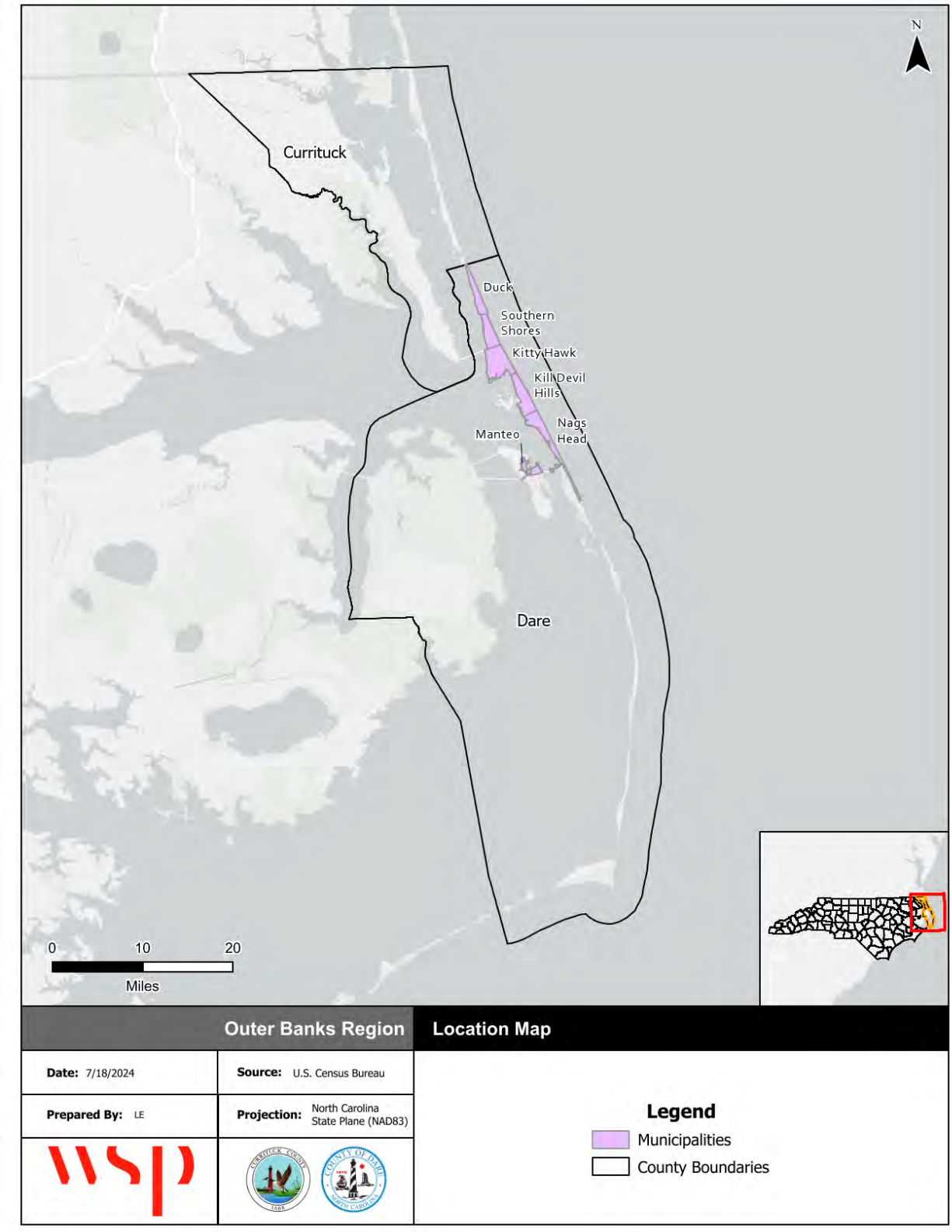
Table 3.1 – Total Land Area of Participating Jurisdictions

Jurisdiction	Total Land Area (sq.mi.)
Currituck County	**261.910**
Dare County	**383.229**
Town of Duck	2.417
Town of Kill Devil Hills	5.608
Town of Kitty Hawk	8.119
Town of Manteo	1.877
Town of Nags Head	6.618
Town of Southern Shores	3.946
Unincorporated Dare County	354.64
Region Total	**645.139**

Source: US Census Bureau, 2023 Geography Information

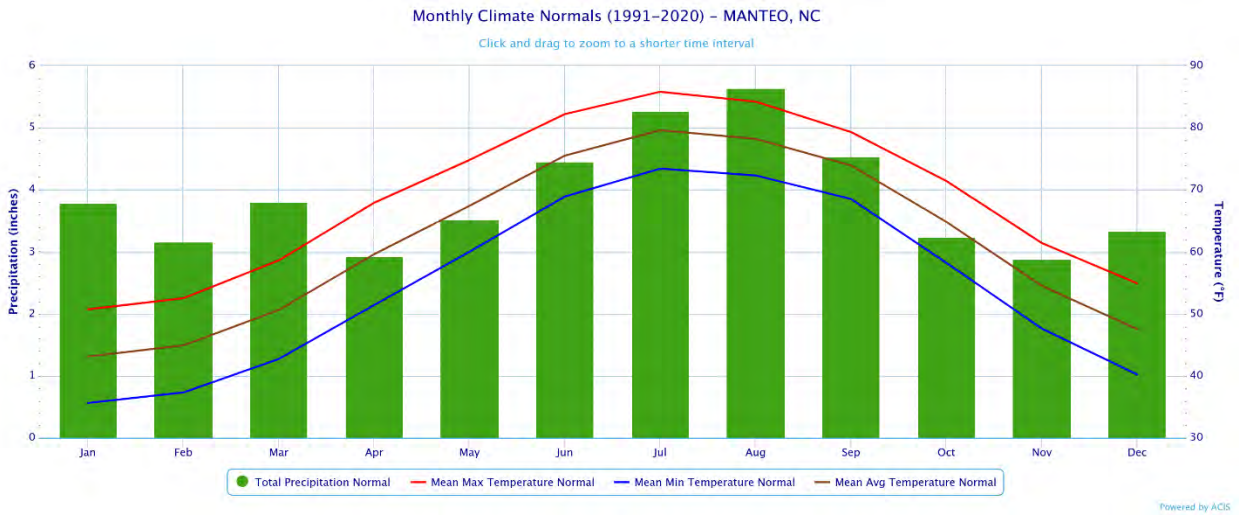
Currituck County is located in the Virginia Beach-Norfolk-Newport News, VA-NC Metropolitan Statistical Area (MSA). Dare County is located in the Kill Devil Hills, NC MSA. Both MSAs are located in the larger Virginia Beach-Norfolk, VA-NC Combined Statistical Area.

Figure 3.1 – Outer Banks Region and Participating Jurisdictions Location Map



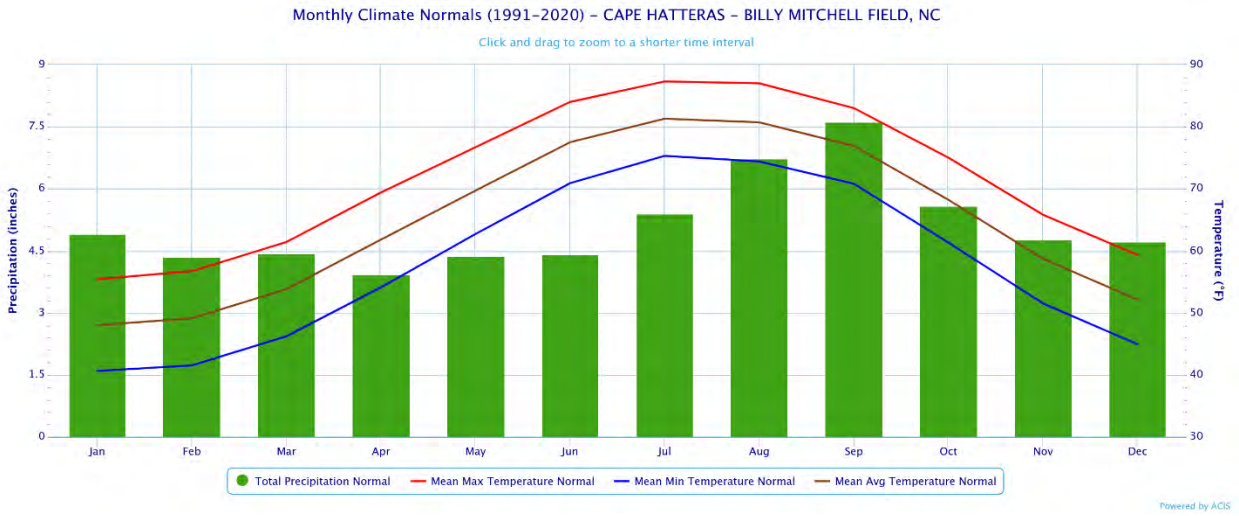
According to the Köppen climate classification system, the Outer Banks region has a humid subtropical climate characterized by mild winters and hot humid summers with significant precipitation even during the driest month. Based on data from 1991 through 2020, the region experiences an average annual high temperature of 68.6°F to 71.8°F and an average annual low of 54.7°F to 57.9°F. Average annual rainfall ranges from 46.6 to 61.2 inches and average annual snowfall is approximately 1.1 inches. Figure 3.2 and Figure 3.3 show the average monthly precipitation for the Manteo Airport weather station and the Billy Mitchell Field weather station, respectively, which approximate temperature and precipitation of the Region. Note that the two graphs use different scales for both precipitation and temperature.

Figure 3.2 – Average Monthly Precipitation



Source: Northeast RCC CLIMOD 2.

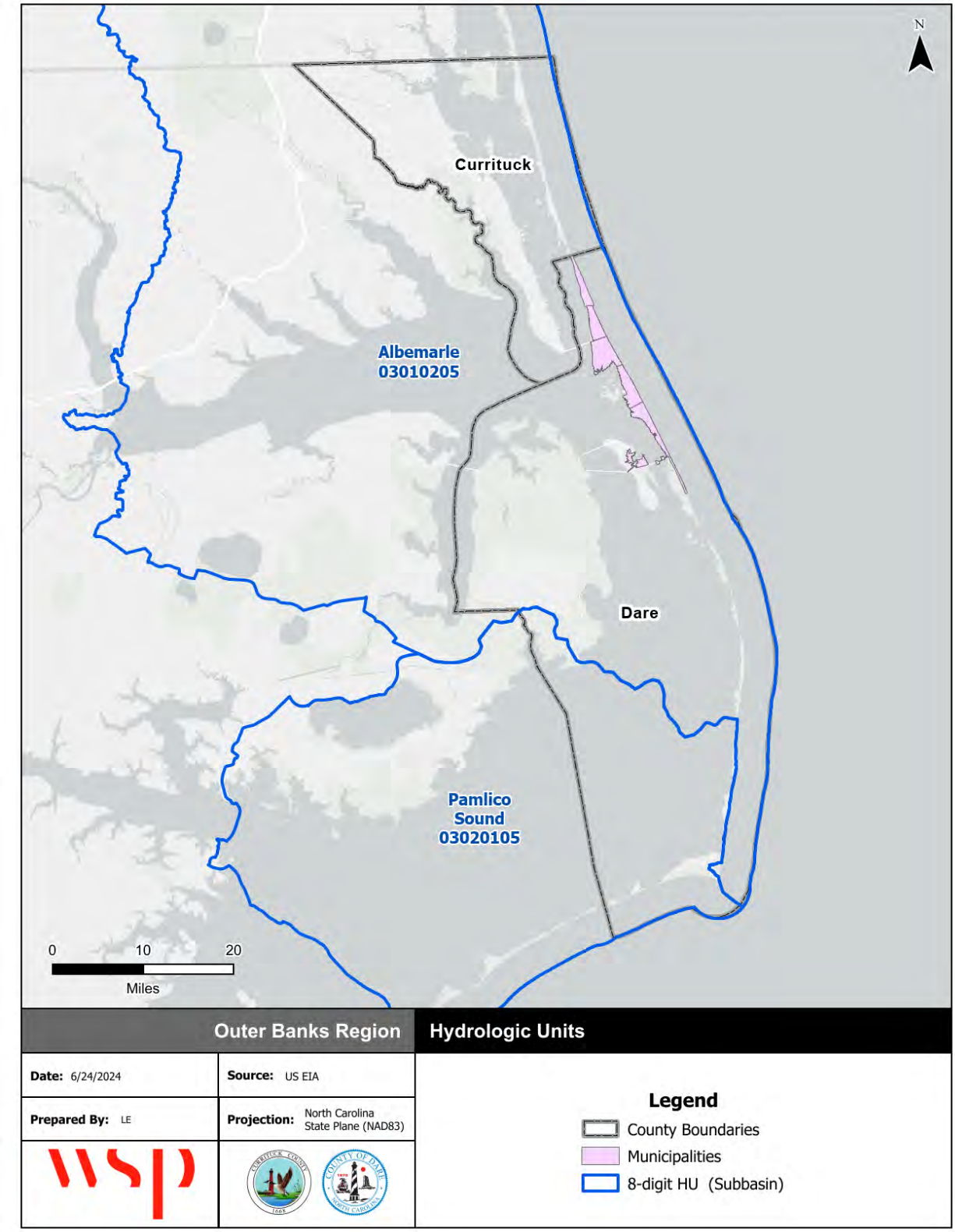
Figure 3.3 – Average Monthly Precipitation



Source: Northeast RCC CLIMOD 2.

As shown in the map of HUC-8 watersheds in Figure 3.4, most of the Outer Banks Region falls within the Albemarle watershed. The southern portion of the region, including Cape Hatteras, falls within the Pamlico Sound watershed. The coastal region also sits on the Currituck, Albemarle, and Pamlico Sounds, and has many other water features including lakes, bays, and rivers.

Figure 3.4 – HUC-8 Drainage Basins



THREATENED AND ENDANGERED SPECIES

The U.S. Fish and Wildlife Service maintains a regular listing of threatened species, endangered species, species of concern, and candidate species for counties across the United States. Dare County has 18 species that are listed with the U.S. Fish and Wildlife Services and Currituck County has 13, all of which are shared with Dare County. There are also two designated critical habitats which occur in Dare County. Table 3.2 below lists the species identified as threatened, endangered, or other classification and which county they can be found in.

Table 3.2 – Threatened and Endangered Species, Outer Banks Region

Group	Common Name	Scientific Name	Federal Status	County
Birds	Eastern Black Rail	Laterallus jamaicensis ssp. jamaicensis	Threatened	C, D
Birds	Piping Plover	Charadrius melodus	Threatened	C, D
Birds	Red-cockaded Woodpecker	Picoides borealis	Threatened	C, D
Birds	Roseate Tern	Sterna dougallii dougallii	Endangered	D
Birds	Rufa Red Knot	Calidris canutus rufa	Threatened	C, D
Flowering Plants	Seabeach amaranth	Amaranthus pumilus	Threatened	C, D
Flowering Plants	Sensitive Joint-vetch	Aeschynomene virginica	Threatened	D
Insects	Monarch Butterfly	Danaus Plexippus	Candidate	C, D
Mammals	Northern Long-Eared Bat	Myotis septentrionalis	Endangered	C, D
Mammals	Red Wolf	Canis rufus	Endangered; Experimental Population, Non-Essential	D
Mammals	Tricolored Bat	Perimyotis subflavus	Proposed Threatened	C, D
Mammals	West Indian Manatee	Trichechus manatus	Threatened	C, D
Reptiles	American Alligator	Alligator mississippiensis	Similarity of Appearance (Threatened)	D
Reptiles	Green Sea Turtle	Chelonia mydas	Threatened	C, D
Reptiles	Hawksbill Sea Turtle	Eretmochelys imbricata	Endangered	D
Reptiles	Kemp's Ridley Sea Turtle	Lepidochelys kempii	Endangered	C, D
Reptiles	Leatherback Sea Turtle	Dermochelys coriacea	Endangered	C, D
Reptiles	Loggerhead Sea Turtle	Caretta caretta	Threatened	C, D
Critical Habitat	Piping Plover	Charadrius melodus	Final	D
Critical Habitat	Rufa Red Knot	Calidris canutus rufa	Proposed	D

Source: U.S. Fish & Wildlife Service
Key: C = Currituck County; D = Dare County

PARKS, PRESERVE, AND CONSERVATION

The Outer Banks region is home to many parks, preserves, and other natural areas. There is one state park in the region, Jockey's Ridge State Park, located in Dare County. Also located in Dare County is the Cape

Hatteras National Seashore. Several other natural areas can be found within the two-county region and are detailed in Table 3.3 below.

Table 3.3 – Natural Areas, Outer Banks Region

County	Name
Dare County	Cape Hatteras National Seashore
	Jockey's Ridge State Park
	Buxton Woods Reserve
	Run Hill State Natural Area
	Alligator River National Wildlife Refuge
	Pea Island National Wildlife Refuge
	Roanoke Island Marshes Dedicated Nature Preserve
	Kitty Hawk Woods Coastal Reserve
	Nags Head Woods Preserve
	Dare Game Land
Currituck County	Currituck National Wildlife Refuge
	Currituck Banks Reserve
	Pine Island Audubon Sanctuary / Donal C. O'Brien Jr. Sanctuary
	North River Game Land and Dedicated Wildlife Preserve

Source: Dare County Parks & Recreation, NCDEQ, USFWS, National Park Service, NC Wildlife Resources Commission

WETLANDS

According to data from the U.S. Fish and Wildlife Service's National Wetlands Inventory, there are approximately 205,103 acres of estuarine and marine and freshwater wetlands in Dare County and about 82,183 acres of wetlands in Currituck County. These estimates do not include deepwater areas, ponds, lakes, or riverine areas. Wetlands and associated areas are shown by type in Figure 3.9 and Figure 3.10.

Natural and Beneficial Wetland Functions: The benefits of wetlands are hard to overestimate. They provide critical habitat for many plant and animal species that could not survive in other habitats. They are also critical for water management as they absorb and store vast quantities of storm water, helping reduce floods and recharge aquifers. Not only do wetlands store water like sponges, they also filter and clean water as well, absorbing toxins and other pollutants.

LAND COVER

The National Oceanographic and Atmospheric Administration's (NOAA) Coastal Change Analysis Program (C-CAP) tracks land cover change for the coastal regions of the U.S. Understanding how land cover has changed and is continuing to change is important information for any hazard mitigation planning effort. The information below is meant to serve as a general overview of how Dare and Currituck counties have changed overtime. A detailed discussion of development patterns can be found in each jurisdiction's annex.

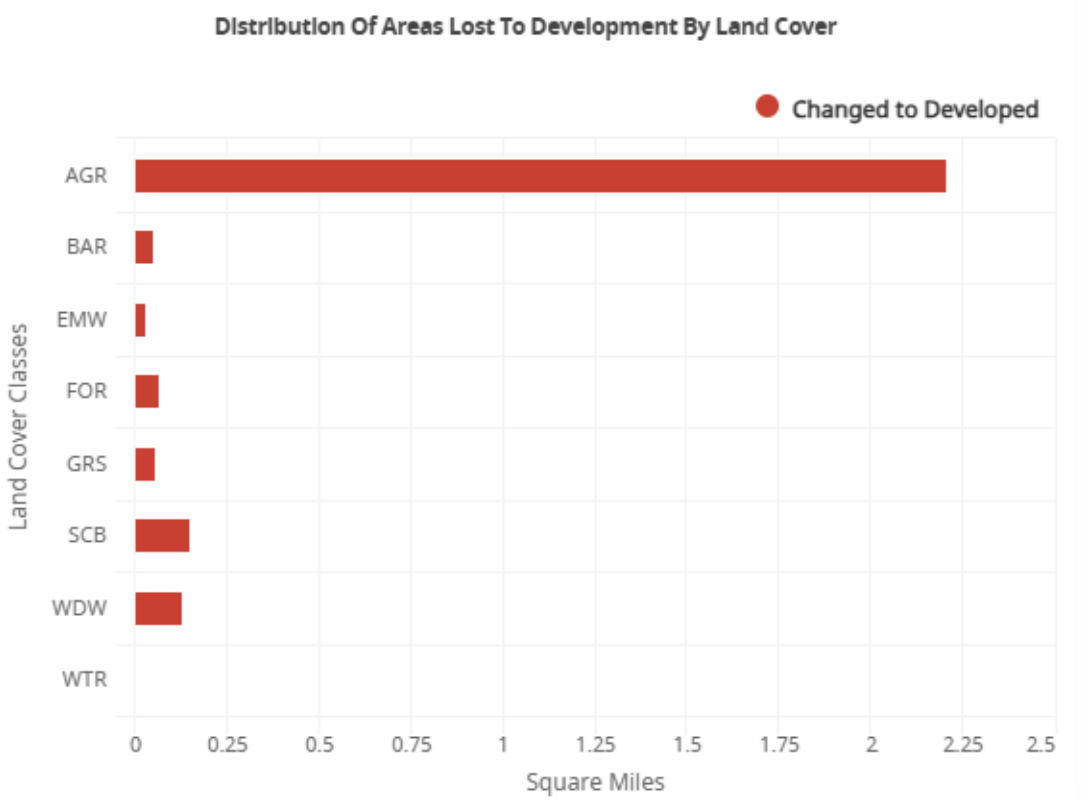
CURRITUCK COUNTY

In Currituck County, 3.69 percent of the land cover changed between 2001-2016. The largest net change in land is a loss of 2.06 square miles of agricultural land, or a 2.65 percent change.

During this time frame, the county experienced an 18 percent net increase in developed area and a 13 percent net increase in impervious surface. The county saw a 9.17 percent increase in High Intensity Developed land, a 10.93 percent increase in Low Intensity Developed land, and a 34.38 percent increase

in Open Space Developed land. In total, this amounted to an increase of 2.62 square miles of developed land. However, as of 2016, 96.8 percent of the county remained non-developed. Figure 3.5 illustrates the types of land that changed to developed during this time frame. Of the development gained in the county between 2001-2016, over 2.2 square miles were previously agricultural land.

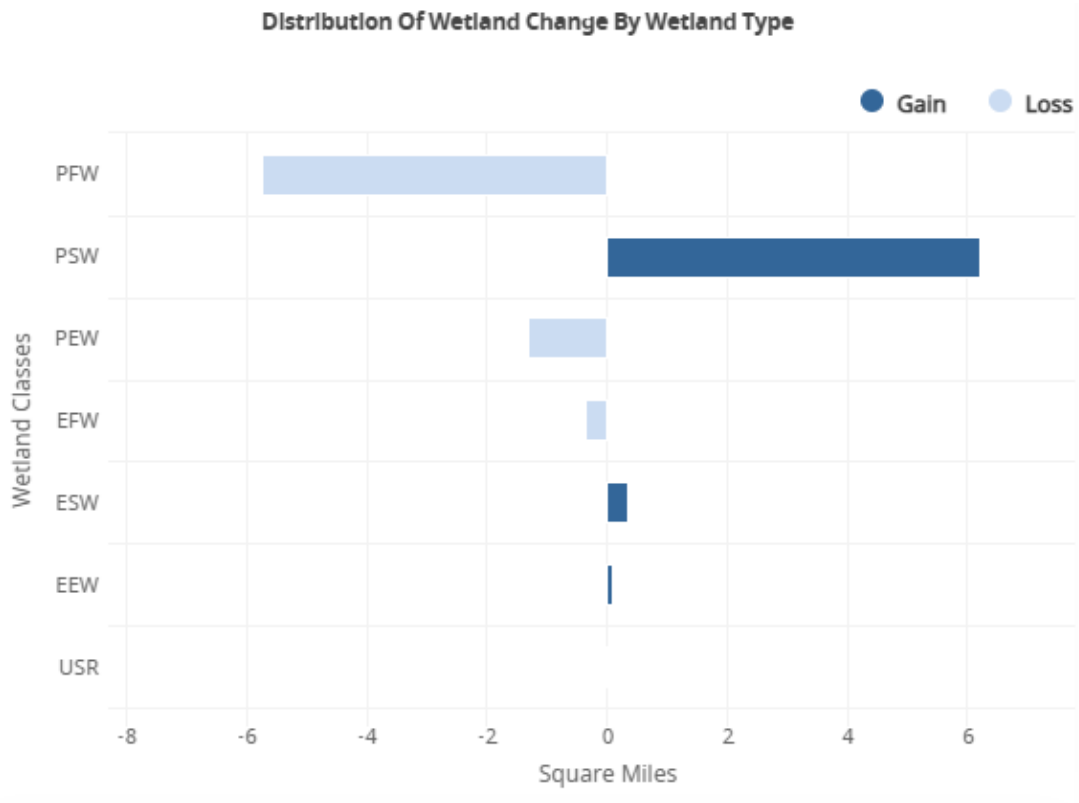
Figure 3.5 – Land Type Lost to Development, Currituck County



Source: NOAA C-CAP Atlas

As noted previously, wetlands are not only productive ecosystems, but they also play a vital role in protecting development and controlling erosion. While as of 2016, 26.8 percent of Currituck County was wetlands, 0.42 square miles of wetlands were lost between 2001-2016. Figure 3.6 shows a distribution of changes in wetland acreage from 2001-2016. Approximately 5.7 square miles of palustrine forested wetlands and 1.3 square miles of palustrine emergent wetlands were lost, but 6.2 square miles of palustrine scrub/shrub wetlands were gained.

Figure 3.6 – Wetland Change by Wetland Type, 2001-2016, Currituck County



A map of wetland coverage in Currituck County according to data from the National Wetlands Inventory is shown in Figure 3.9.

DARE COUNTY

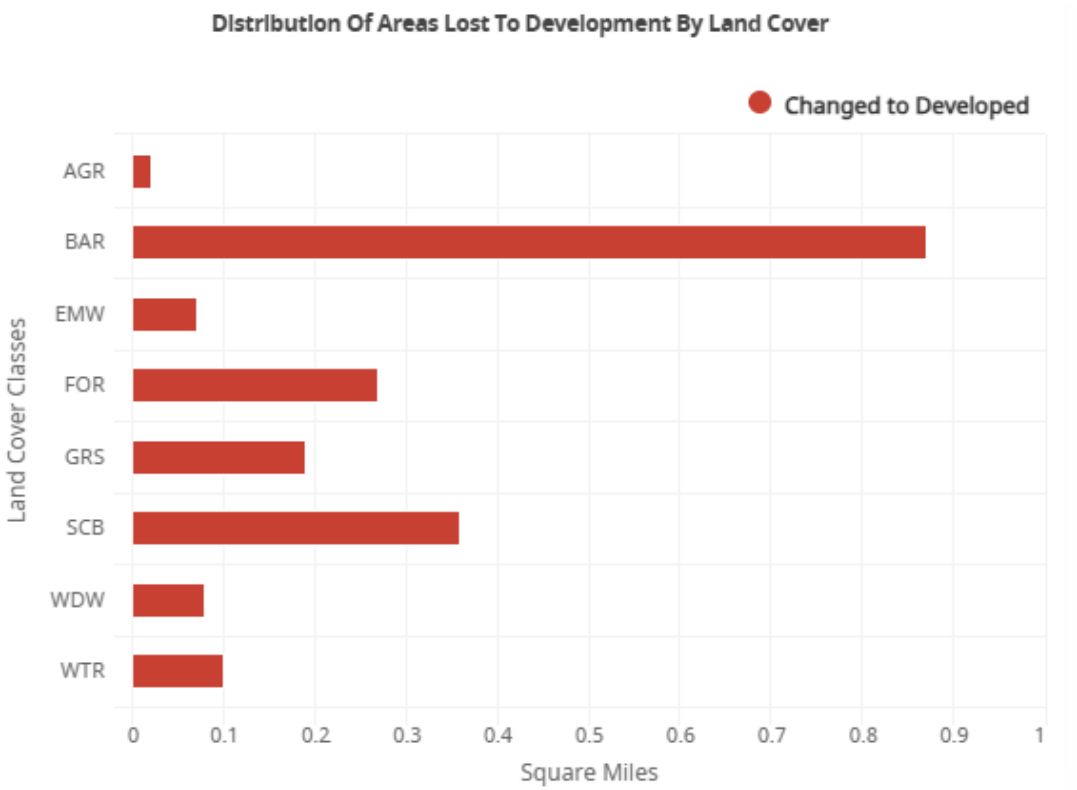
Between 2001 and 2016, 1.76 percent of the land cover in Dare County changed. The largest net change in land was a loss of 2.12 square miles of barren land, which was a 4.61 percent decrease. There was also a net increase of 2.1 square miles of open water. This could be due to land lost and converted to open water due to sea level change and might include the loss of wetlands.

The largest percent changes were increases in High Density Developed land and Open Space Developed land, with changes of 20.98 percent and 7.42 percent respectively. Overall, there was a 7.72 percent net increase in developed area and a 10.35 percent net increase in impervious surface area. More impervious surface increases chances for flooding and decreases overall water quality. Still, as of 2016, 98.2 percent of the county was non-developed land. Land lost to development tends to be permanent. Figure 3.7 illustrates the types of land that changed to developed land cover during this time frame.

As noted above, wetlands play a vital role in protecting development and controlling erosion. While as of 2016, 20.4 percent of Dare County was wetlands, 0.88 net square miles of wetlands were lost between 2001-2016. Figure 3.8 shows a distribution of changes in wetland acreage from 2001-2016. Over 10 square miles of palustrine forested wetlands were lost, but nearly 8 square miles of palustrine scrub/shrub wetlands were gained.

A map of wetland coverage in Dare County according to data from the National Wetlands Inventory is shown in Figure 3.10.

Figure 3.7 – Land Type Lost to Development, 2001-2016, Dare County



Source: NOAA C-CAP Atlas

Figure 3.8 – Wetland Change by Wetland Type, 2001-2016, Dare County

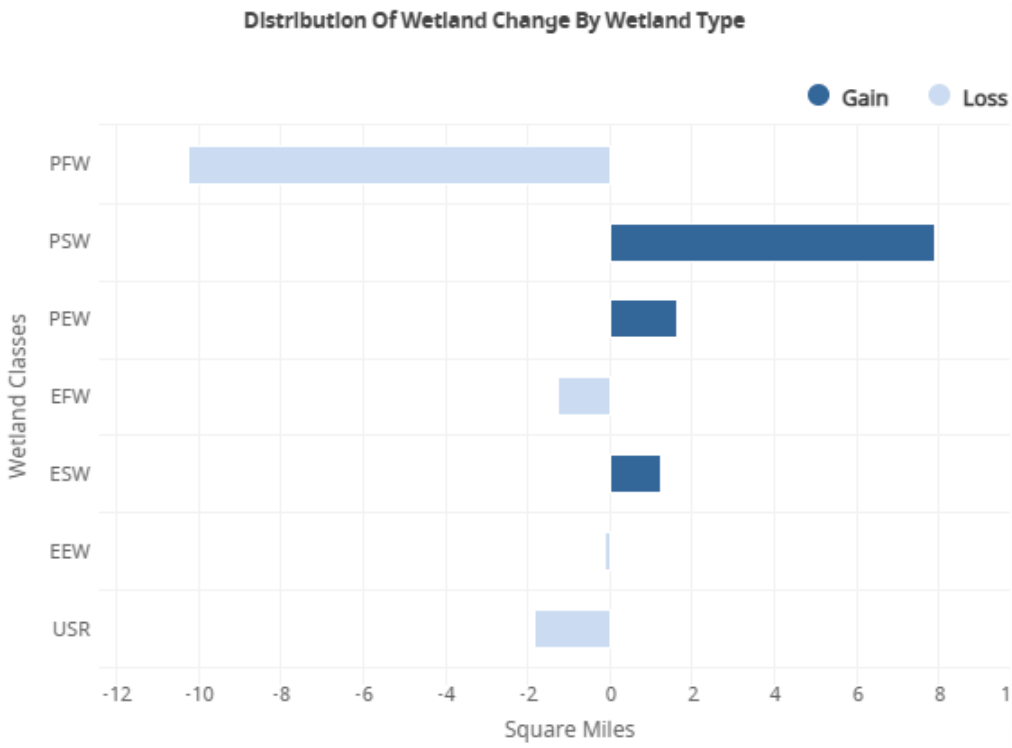


Figure 3.9 – Wetlands by Type in Currituck County

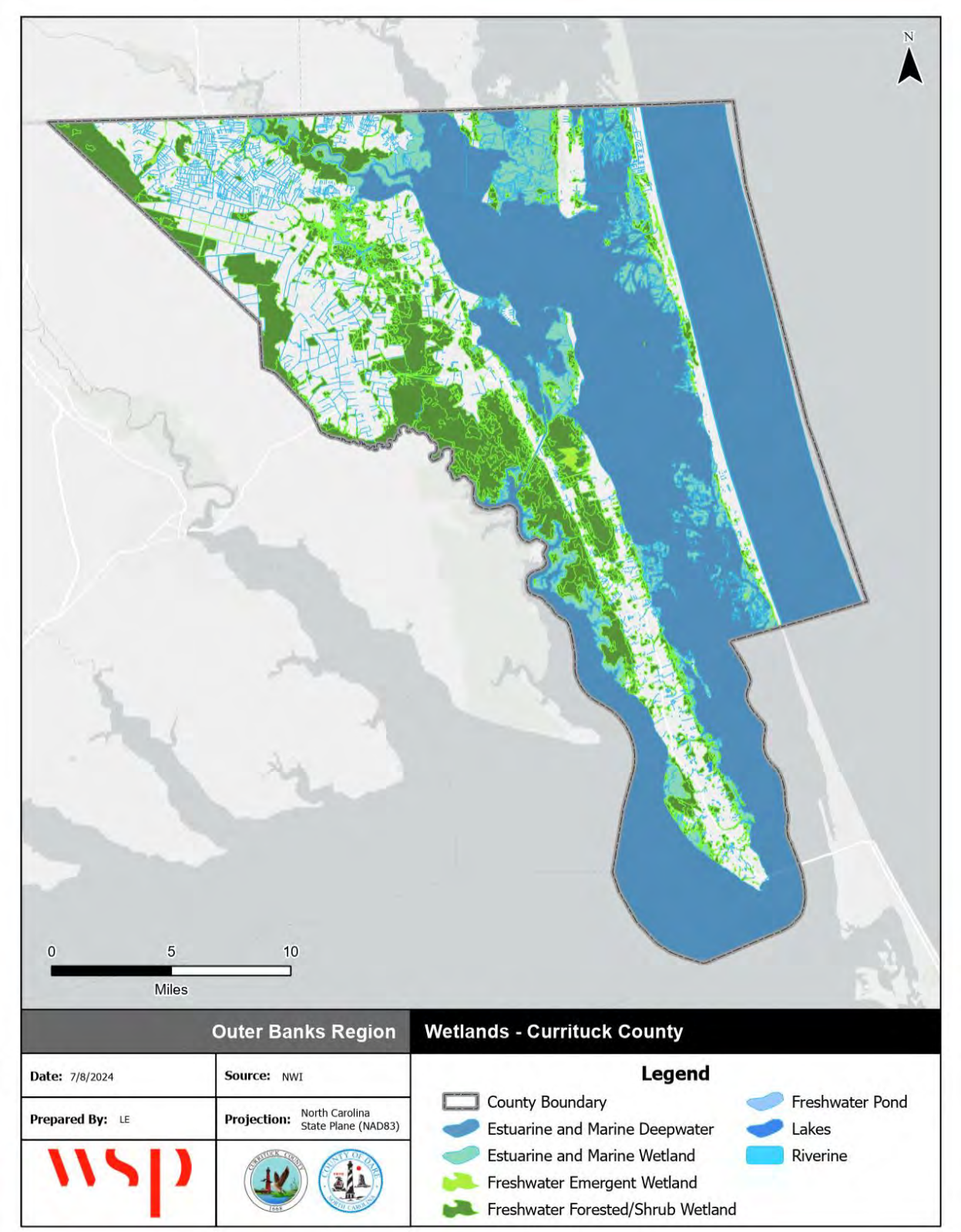
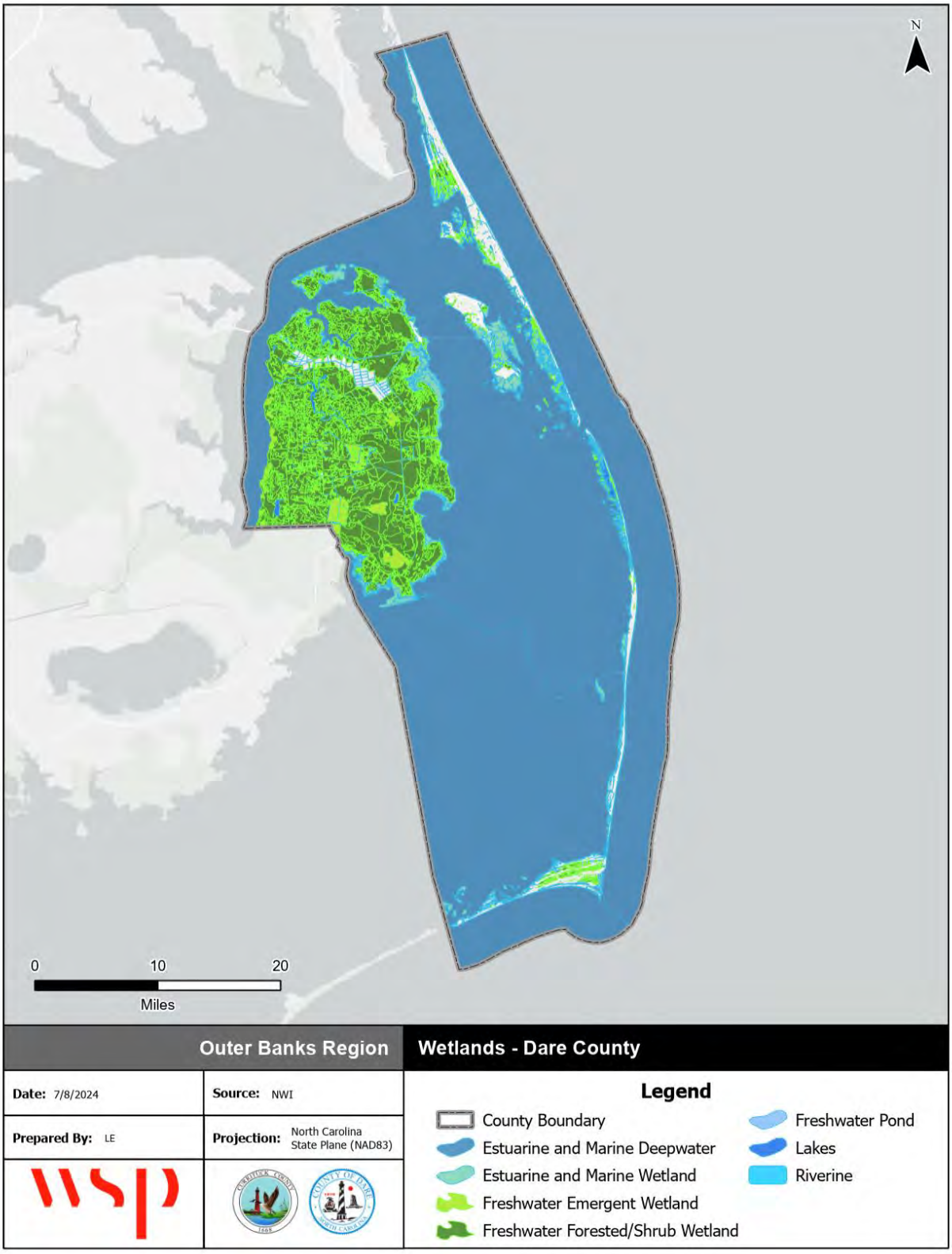


Figure 3.10 – Wetlands by Type in Dare County



3.2 POPULATION AND DEMOGRAPHICS

Currituck and Dare Counties and incorporated jurisdictions have experienced moderate population growth over the last decade. From 2010 to 2022, the Region's total population grew by over 14 percent, which equates to an average annual growth rate of about 1.2 percent. Overall population density in the Region increased from 89.1 persons per square mile in 2010 to 102.0 persons per square mile in 2022. All jurisdictions experienced growth between 2010 and 2022, with an average population increase across the Region of 24 percent. The Town of Duck grew by more than 85 percent, and all other towns grew by between 12.8 to 26.1 percent. Growth in unincorporated Dare County was marginal, at 2.3 percent, but growth in Currituck County exceeded 21.5 percent. Table 3.4 provides population counts from 2010, 2020 and 2022 for each of the participating jurisdictions. Figure 3.11 on the following page shows 2022 population density by census tract in persons per square mile.

Table 3.4 – Outer Banks Region Population Counts

Jurisdiction	2010 Census Population	2020 Census Population	2022 ACS Population Estimate	Total Change 2010-2022	% Change 2010-2022
Currituck County					
Currituck County	23,547	28,100	28,616	5,069	21.53%
Dare County					
Unincorporated Dare County	16,691	16,970	17,067	376	2.25%
Town of Duck	369	742	686	317	85.91%
Town of Kill Devil Hills	6,683	7,656	7,658	975	14.59%
Town of Kitty Hawk	3,272	3,689	3,690	418	12.78%
Town of Manteo	1,434	1,600	1,808	374	26.08%
Town of Nags Head	2,757	3,168	3,153	396	14.36%
Town of Southern Shores	2,714	3,090	3,098	384	14.15%
Subtotal Dare	**33,920**	**36,915**	**37,160**	**3,240**	**9.55%**
Region Total	**57,467**	**65,015**	**65,776**	**8,309**	**14.46%**

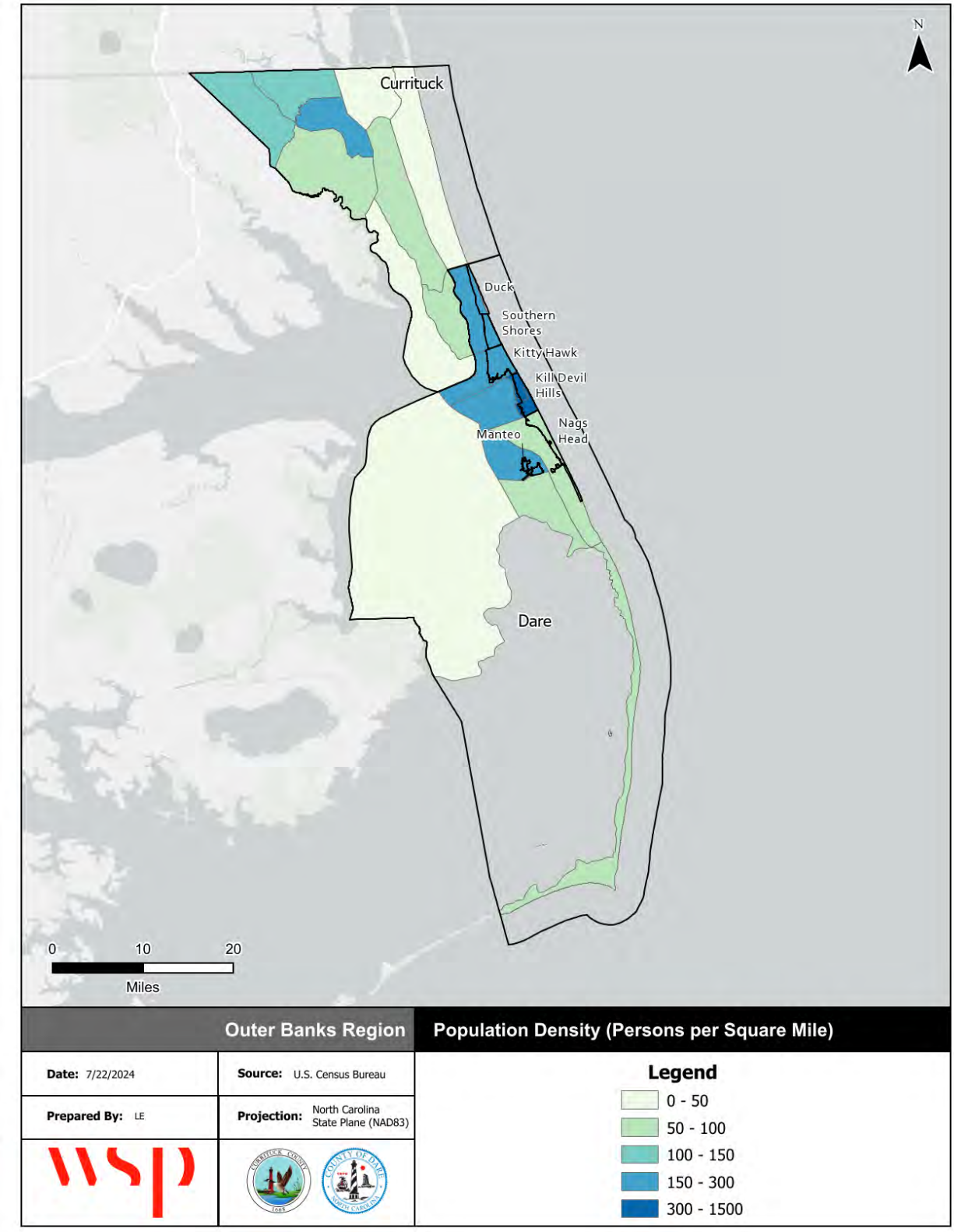
Source: US Census Bureau Decennial Census 2010, Decennial Census 2020; American Community Survey 2022 Annual Estimates

As the Outer Banks is a popular vacation destination, the population of the region fluctuates at any given time, depending on the season. Dare County alone estimates its daily population during peak summer months—June, July, and August—increases by anywhere between 225,000 and 300,000 additional residents. The Dare County 2022 Land Use Plan estimates the peak seasonal population reaches 320,707 people, including permanent residents.

In Currituck County, the seasonal population reaches about 50,000. A large influx in population can cause increased traffic. Additionally, visitors are not necessarily aware of the hazards that impact the region or the emergency procedures in place in the event of such hazards.

Additional discussion about how this influx of population impacts housing and economics in the region is included in subsequent sections.

Figure 3.11 – Population Density, 2022



According to 2022 American Community Survey 5-Year Estimates, the median age in the Outer Banks Region was over 45.3, which is older than the median age of the State of North Carolina (39.4) and of the United States (39.2). Of the population aged 25 years and over, more than 93.9 percent have a high school degree or higher and more than 35 percent have a bachelor's degree or higher. Approximately 6.8 percent of the Region's residents speak a language other than English at home, but only about 2.4 percent speak English less than very well. This information is further detailed by county in Table 3.5. The racial characteristics of the participating jurisdictions are presented in Table 3.6. Overall, over 87 percent of the population is White, 4.4% is Black, 3.2% is Asian or another race, and 5.1% identifies as two or more races. About 6% of the population in the region identifies as Hispanic or Latino.

Table 3.5 – Outer Banks Region Demographic Summary, 2022

County	Currituck	Dare
Median Age	42.5	48.1
Educational Attainment		
High school graduate or higher[1]	92.8%	94.9%
Bachelor's degree or higher[1]	27.1%	42.5%
Language Spoken at Home		
Speak language other than English[2]	4.7%	8.9%
Speak English less than "very well"[2]	2.0%	2.7%

Source: US Census Bureau, American Community Survey 2013-2017 5-Year Estimates; [1]Of the population aged 25 and older; [2]Of the population that speaks a language other than English at home

Table 3.6 – Racial Demographics of Outer Banks Region Jurisdictions, 2022

Jurisdiction	White, %	Black, %	Asian, %	Other Race, %	Two or More Races, %	Hispanic or Latino*, %
Currituck County	86.8	5.6	0.9	1.8	4.7	4.8
Dare County	87.9	3.1	0.5	3.2	5.4	7.1
Town of Duck	97.4	0.0	0..4	1.3	0.9	1.6
Town of Kill Devil Hills	81.7	1.8	1.1	5.8	9.5	12.7
Town of Kitty Hawk	88.4	0.0	0..2	6.1	5.3	3.6
Town of Manteo	79.4	12.2	O.7	4.8	3.0	4.3
Town of Nags Head	93.7	1..5	0.6	0.9	3.3	3.5
Town of Southern Shores	93.3	2.0	0.4	0.0	4.4	0.3
Region Average	**87.4**	**4.4**	**0.7**	**2.5**	**5.1**	**6.0**

Source: US Census Bureau, American Community Survey 2018-2022 5-Year Estimates
*Hispanic or Latino, of any race

POPULATION PROJECTIONS

According to the North Carolina Office of State Budget and Management (OSBM), Currituck County is projected to reach a population of 70,796 by 2050, which represents a 149% percent increase from the 2020 population estimate, and Dare County is projected to reach a population of 48,201 by 2050, which is a 30 percent increase from the 2020 population estimate. Several Dare County municipalities report local population projections in their land use plans. Population projections compiled from OSBM and local land use plans are shown in Table 3.7.

Table 3.7 – Population Estimates and Projections, 2010-2050

Community	2010	2015	2020	2025	2030	2035	2040	2045	2050
Currituck County	23,652	25,122	28,424	35,097	42,236	49,378	56,515	63,657	70,796

Community	2010	2015	2020	2025	2030	2035	2040	2045	2050
Dare County	33,954	35,228	37,137	37,817	38,588	40,193	42,430	45,137	48,201
Duck	-	-	410	425	441	457	474	492	510
Kill Devil Hills	-	-	7,012	7,092	7,172	7,265	9,536	11,807	14,078
Kitty Hawk	-	-	3,689	3,829	3,975	4,127	4,284	4,447	4,616
Manteo	1,434	-	1,600	1,690	1,785	1,885	1,991	2,103	2,222
Nags Head	2,757	2,825	3,137	3,244	3,320	3,375	3,443	3,511	3,582
Southern Shores	2,714	-	3,090	3,144	3,200	3,256	3,314	3,372	3,431

Source: North Carolina Office of State Budget and Management; municipal land use plans

Both Currituck County and Dare County, as well as the incorporated towns in Dare County, also project an increase in seasonal population. Currituck County estimates an increase of 3,780 people every five years. Dare County assumes a 1% increase countywide in visitors every year.

Permanent and seasonal population increases imply continued development, especially new housing construction. Locations of planned development and redevelopment are discussed in relation to future land use plans in Section 3.6.

3.3 HISTORIC PROPERTIES

As of July 10, 2024, Currituck County had 14 sites listed on the National Register of Historic Places and Dare County had 33 sites, detailed in Table 3.8. Of the 47 total listed sites in the region, six are Historic Districts. Listing on the National Register signifies that these structures and districts have been determined to be worthy of preservation for their historical or cultural values. In addition to these properties, there are three National Historic Landmarks in the Region, all located in Dare County.

Table 3.8 – National Register of Historic Places Listings in the Outer Banks Region

Ref#	Property Name	Status Date	Category	City
Currituck County				
09001104	Jarvisburg Colored School	12/11/2009	Building	Jarvisburg
12001156	Coinjock Colored School	1/9/2013	Building	Coinjock
15000238	Flyway Club	5/12/2015	Building	Knotts Island
72000959	Twin Houses	4/13/1972	Building	Shawboro
73001333	Currituck Beach Lighthouse	10/15/1973	Structure	Corolla
79001697	Currituck County Courthouse and Jail	5/10/1979	Building	Currituck
80002816	Currituck Shooting Club	5/28/1980	Building	Corolla
80002817	Whalehead Club	4/16/1980	Building	Corolla
80002818	Baum Site	12/8/1980	Site	Poplar Branch
80002819	Culong	2/1/1980	Building	Shawboro
80002820	Shaw House	4/17/1980	Building	Shawboro
98001210	Grandy School, (Former)	9/25/1998	Building	Grandy
99000911	Currituck Beach Lighthouse Complex (Boundary Increase)	1/12/2000	District	Corolla
100006454	Walker, Wilson, House & Walker-Snowden Store	4/30/2021	Building	Currituck
Dare County				
01000558	Ballance, Ellsworth and Lovie, House	5/25/2001	Building	Hatteras
03000339	Daniels, John T., House	5/1/2003	Building	Manteo
03000607	Bodie Island Light Station	7/4/2003	District	Nags Head

Ref#	Property Name	Status Date	Category	City
04001389	Midgett, Mattie, Store and House	12/23/2004	Building	Nags Head
04001392	Sea Foam Motel	12/23/2004	Building	Nags Head
05001544	Markham--Albertson--Stinson Cottage	1/13/2006	Building	Nags Head
09000847	Midgett, Rasmus, House	10/21/2009	Building	Waves
13000451	LANCING (shipwreck)	5/10/2013	Site	Buxton
13000780	E.M. CLARK (shipwreck and remains)	9/25/2013	Site	Cape Hatteras
13000781	DIXIE ARROW (shipwreck and remains)	9/25/2013	Site	Ocracoke
13000782	EMPIRE GEM (shipwreck and remains)	9/25/2013	Site	Cape Hatteras
15000541	LIGHT VESSEL 71 (shipwreck)	8/19/2015	Site	Buxton
15000805	U-85 (submarine) shipwreck and remains	11/12/2015	Site	Nags Head
15000806	U-701 (submarine) shipwreck and remains	11/12/2015	Site	Buxton
15000864	U-576 and BLUEFIELDS (shipwrecks & remains)	12/8/2015	Site	Hatteras
66000071	Wright Brothers National Memorial	10/15/1966	District	Kill Devil Hills
66000102	Fort Raleigh National Historic Site	10/15/1966	Site	Manteo
74002299	USS MONITOR	10/11/1974	Site	Cape Hatteras
75001253	Oregon Inlet Station	12/23/1975	Building	Rodanthe
76000164	Chicamacomico Life Saving Station	12/12/1976	Building	Rodanthe
77000997	Nags Head Beach Cottages Historic District	8/19/1977	District	Nags Head
78000266	Cape Hatteras Light Station	3/29/1978	District	Buxton
78000268	Hatteras Weather Bureau Station	2/17/1978	Building	Hatteras
78001942	Caffeys Inlet Lifesaving Station	1/30/1978	Building	Duck
79000251	Bodie Island Lifesaving/Coast Guard Station	2/9/1979	District	Nags Head
82001295	Meekins, Thedore S., House	12/17/1982	Building	Manteo
82004798	Creef, George Washington, House	8/12/1982	Building	Manteo
84000073	Kitty Hawk Life-Saving Station	10/11/1984	Building	Kitty Hawk
91001625	USS HURON	11/15/1991	Structure	Nags Head
92001835	First Colony Inn	1/21/1993	Building	Nags Head
93000997	Salvo Post Office	9/23/1993	Building	Salvo
99000062	Sam's Diner	1/27/1999	Building	Kill Devil Hills
100002802	C.S.S. CURLEW (side-wheel steamer)	8/31/2018	Structure	Mann's Harbor

Source: National Parks Service, National Register of Historic Places, July 2024

3.4 HOUSING

According to the 2018-2023 ACS 5-Year Estimates, there are 50,712 housing units in the Outer Banks Region, of which 53.6 percent are occupied. Approximately 18.2% of occupied units are renter-occupied. A high percentage of renters is an indicator of higher pre- and post-disaster vulnerability because, according to Cutter, et al. (2003), renters often do not have the financial resources of homeowners, are more transient, are less likely to have information about or access to recovery aid following a disaster and are more likely to require temporary shelter following a disaster. Higher rates of home ownership in some jurisdictions, including Currituck County, Duck, Nags Head, and Southern Shores may indicate that more residents in these areas are able to implement certain types of mitigation in their homes.

On average, median home value in the Outer Banks Region is over $350,000. Of the Region's owner-occupied housing units, 66.1 percent have a mortgage. Nearly 22 percent of householders moved into their current homes since the year 2018, and another 35 percent moved in between 2010 and 2017, which

indicates the growth the area has experienced. Due to their relatively new tenancy, many householders may be unfamiliar with some hazard risks of the region. Householders of 1.7 percent of occupied housing units have no vehicle available to them; these residents may have difficulty in the event of an evacuation.

Over 80 percent of housing units in the Outer Banks Region are detached single family homes. Approximately 6.7 percent of units are mobile homes, which can be more vulnerable to certain hazards, such as tornadoes and windstorms, especially if they aren't secured with tie downs.

Approximately 48 percent of all housing units in the region were built after 1990, and 27.4 percent were built between 1980 and 1989. While this housing stock is not particularly new, it is not very old, either. Age can indicate the potential vulnerability of a structure to certain hazards. For example, Currituck County first entered the National Flood Insurance Program in 1984 and Dare County in 1978. Therefore, based on housing age estimates at least 18.8 percent of housing in Currituck County and up to 26.7 percent of housing in Dare County was built before any floodplain development restrictions were required. Several jurisdictions did not enter the NFIP until years later; therefore, the actual percent of housing built without floodplain development restrictions may be higher.

The seasonal nature of the region is particularly evident in the housing market. With a population of 37,160 and 34,493 housing units, Dare County has nearly the same number of housing units as people. Currituck County has approximately 1.8 people per housing unit. This is still lower than the state average, which is approximately 2.1 people per housing unit.

Of all the housing units in the Outer Banks Region, over 46 percent are vacant. Of these vacant units, over 61 percent are for seasonal, recreational, or occasional use. Per the U.S. Census Bureau, these units are used or intended for use only in certain seasons throughout the year. Such units include those used for summer recreation such as beach cottages and can also include timeshares. The Town of Duck has a particularly high number of seasonal units, with 49 percent of all housing units in Duck categorized as seasonal. Table 3.9 and Table 3.10 provide further detail on housing in the region.

Table 3.9 – Housing Characteristics, Outer Banks, 2010 and 2022

Jurisdiction	Housing Units (2010)	Housing Units (2022)	Housing Units Percent Change (2010-2022)	Owner-Occupied, % (2022)[1]	Vacant Units, % (2022)[2]	Median Home Value (2022)
Currituck County						
Currituck County	14,453	16,219	12.2%	87.5	31.5	$314,100
Dare County						
Unincorporated Dare County	12,351	13,052	5.7%	78.1	40.5	--
Town of Duck	2,722	2,985	9.7%	87.4	89.6	$630,900
Town of Kill Devil Hills	6,617	7,008	5.9%	74.6	53.5	$337,100
Town of Kitty Hawk	3,196	3,316	3.8%	77.4	52.4	$456,400
Town of Manteo	1,353	1,476	9.1%	65.8	39.8	$375,900
Town of Nags Head	4,884	5,174	5.9%	80.7	69.2	$427,300
Town of Southern Shores	2,369	2,348	-0.9%	88.0	48.8	$587,800
Dare County	**33,492**	**34,493**	**3.0%**	**77.8**	**53.4**	**$386,600**
Region Total	**47,945**	**50,712**	**5.8%**	**81.8**	**46.4**	**--**

Source: U.S. Census Bureau 2010 Decennial Census, American Community Survey 2018-2022 5-Year Estimates
Note: 1) Owner-Occupied units reported as percent of occupied units; 2) Vacant units reported as a percent of the total number of housing units.

Table 3.10 – Season Housing Units, Outer Banks, 2022

Jurisdiction	Seasonal Units	Percent of All Units	Percent of Vacant Units
Currituck County			
Currituck County	3,504	21.6	68.6
Dare County			
Unincorporated Dare County	2,570	19.7	52.1
Town of Duck	1,462	49.0	54.7
Town of Kill Devil Hills	2,638	37.6	70.3
Town of Kitty Hawk	1,271	38.3	73.1
Town of Manteo	430	29.1	73.3
Town of Nags Head	1,635	31.6	45.7
Town of Southern Shores	879	37.4	76.7
Dare County Total	**10,885**	**31.6**	**59.1**
Region Total	**14,389**	**28.4**	**61.2**

Source: U.S. Census Bureau American Community Survey 2013-2017 5-Year Estimates

3.5 INFRASTRUCTURE

3.5.1 TRANSPORTATION

Many roadways run through the Outer Banks Region however no major interstates serve the region. Currituck County is served primarily by North Carolina Highway 168, which connects the county to Virginia (where it is State Route 168) and U.S. Route 158, which traverses the county from east to west, ending at Whalebone Junction in Nags Head. This is the primary route used to access the Outer Banks from the North. Dare County is served by U.S. Route 64, another east-west highway that connects mainland Dare County to Roanoke Island and further to the Outer Banks barrier island. This is the primary highway used to access the Outer Banks barrier island from the south or west. At Whalebone Junction, it meets Route 158. Once on the barrier island, the primary route is North Carolina Highway 12, which runs north-south from northern Currituck County to Hatteras.

Two ferry lines serve the region. One runs from mainland Currituck to Knotts Island but does not continue to the barrier island. Another runs, as an extension of Highway 12, between Ocracoke and Hatteras. However, to get to or from the mainland to Ocracoke, another ferry is necessary.

The Dare County Tourism Authority recommends flying to the Norfolk International Airport or Raleigh/Durham Airport to access the Outer Banks. There are two airports within the region, the Currituck Regional Airport, which only offers small, seasonal flights, and the Dare County Airport.

Both Currituck and Dare Counties have demand responsive public transit services. Currituck County's is provided by the Inter-County Public Transportation Authority (ICPTA) which also serves Pasquotank, Perquimans, Camden, and Chowan Counties, and Dare County's service is provided by the Dare County Transportation System. Both systems require two days' notice to schedule transportation and only run Monday through Friday. They are open to anyone and charge a fare of 3 to 4 dollars per one-way trip. Additionally, these systems provide "out of county" transportation to large medical centers.

3.5.2 UTILITIES

Electric power for the region is provided by various providers, including Dominion NC Power, Albemarle Electric Membership Corporation, Cape Hatteras Electric, and Tideland Electric. Water is provided by the individual counties. In Currituck County, natural gas is provided by Piedmont Natural Gas.

3.6 CURRENT AND FUTURE LAND USE

All communities in the Outer Banks Region updated their comprehensive land use plans within the last five years. A community's comprehensive plan and future land use map guide development decisions and indicate where growth can be expected to occur based on land suitability and the community's overall vision and priorities. This section summarizes current and future land use and growth and development trends in each participating jurisdiction.

CURRITUCK COUNTY

In Currituck County, land use, environment, and development regulations are the responsibility of the Planning and Zoning Division. In addition to creating and updating the Land Use Plan, the division is responsible for enforcing the Unified Development Ordinance. The County's "Imagine Currituck" 2040 Vision Plan was adopted in June 2022. Details on the new plan can be found on the "Imagine Currituck" website.

As of 2022, only 16 percent of the County's total acreage was developed, while 12 percent was conservation lands, 28 percent was agriculture, and 45 percent was undeveloped. Most developed land was residential. Figure 3.12 on the following page shows the existing land use in Currituck County.

FUTURE DEVELOPMENT

The Imagine Currituck 2040 Vision Plan uses a transect approach to planning, with six sectors, each with a different balance between protected and developed land. These sectors are:

- O-1: Preserved Lands
- O-2: Reserved Lands
- G-1: Low Density Growth
- G-2: Controlled Growth
- G-3: Mixed-Use Center and Corridors
- G-4: Village Center

The Future Land Use Map indicates that controlled growth is planned around mixed-use centers and corridors, with mostly low-density growth beyond those areas. Figure 3.13 shows Currituck County's Future Land Use Map.

Figure 3.12 – Existing Land Use, Currituck County

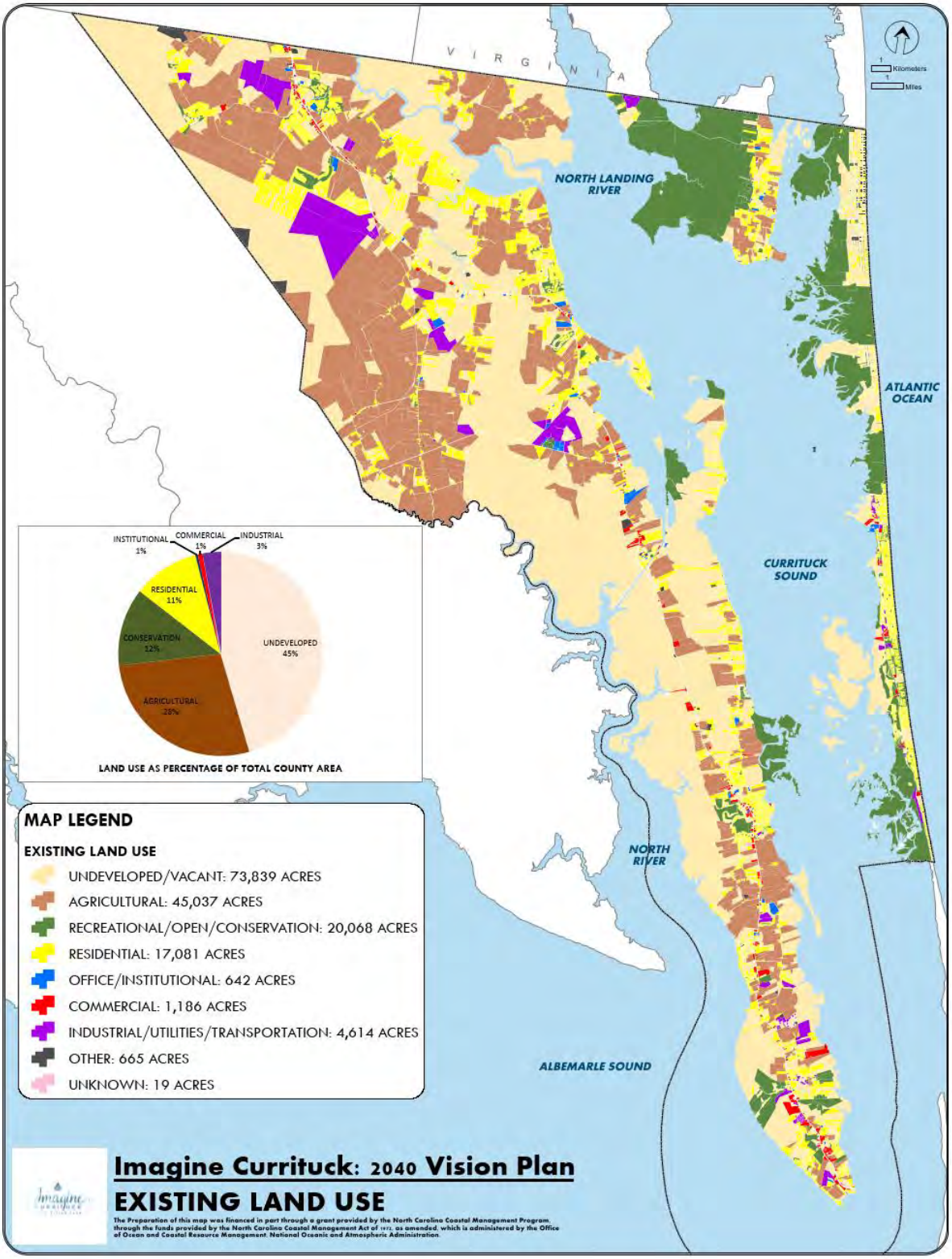
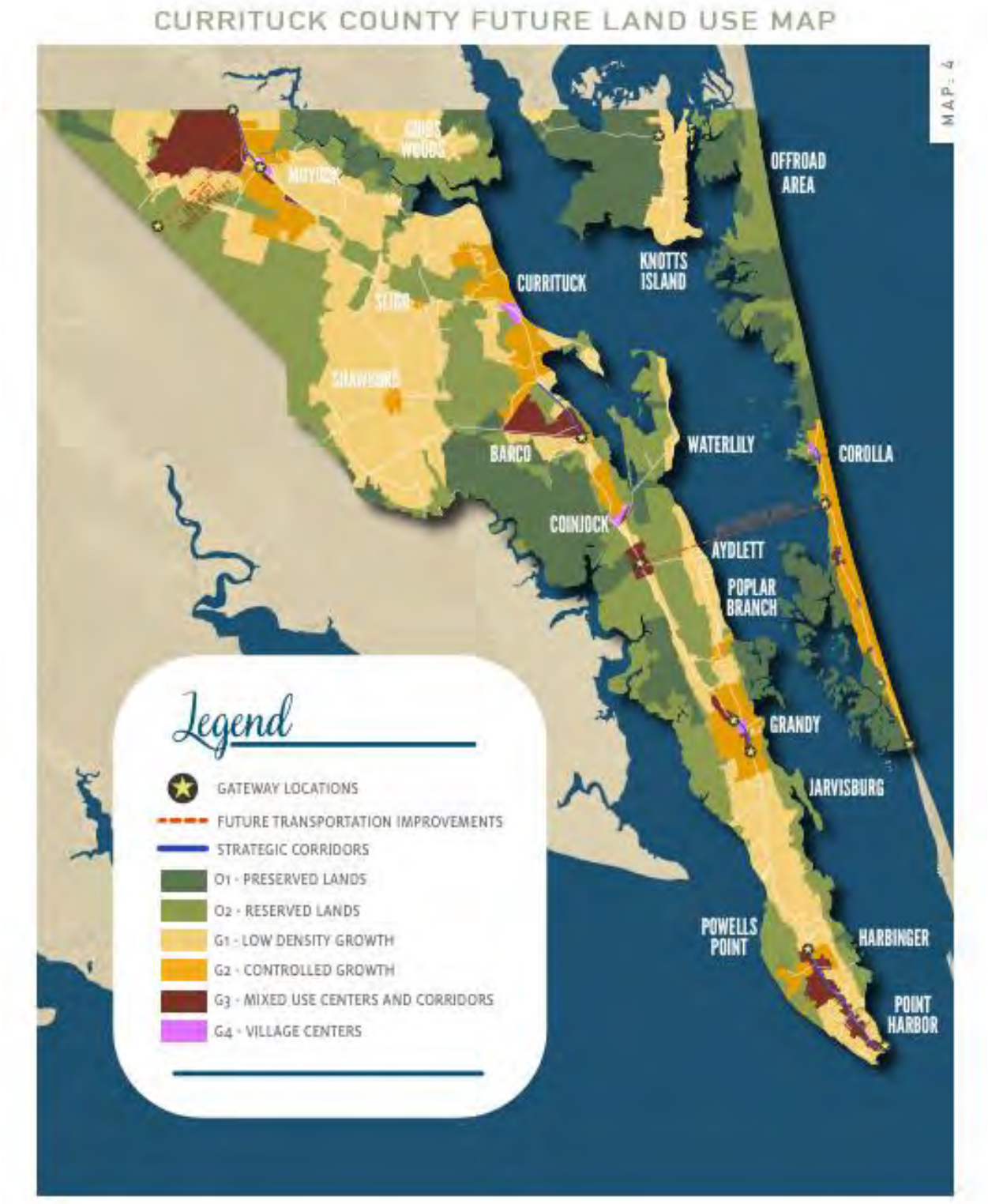


Figure 3.13 – Currituck County Future Land Use Map



DARE COUNTY

The Dare County Planning Department is responsible for land-use planning in the unincorporated areas of Dare County. The current land use plan was adopted in January 2024. The plan summarizes existing and future land use by acreage in each land use category for each unincorporated community. These summaries are shown in Figure 3.14 and Figure 3.15. In unincorporated Dare County there are over 156,000 acres of undeveloped public lands and over 13,000 acres of undeveloped private lands, while developed residential, commercial, and industrial land accounts for just over 9,000 acres.

Due to the unique geography of Dare County, all maps in the plan are divided by area. Figure 3.16 shows an example of the Hatteras area with general classifications for future land use in the county. Further information on land use planning in Dare County is available on the County's website.

Since the County has island geography and narrow strips of land, much of the development is located around the main transportation corridors. This resulted in the creation of multiple villages within unincorporated areas. There are 14 unincorporated "village" areas addressed in the 2022 Land Use Plan Update. These include Avon, Buxton, Frisco, Hatteras, Rodanthe, Waves, Salvo, Martin's Point, Colington, Manteo Out, Wanchese, Manns Harbor/Mashoes, East Lake and Stumpy Point. The County is currently divided into six land use categories.

Public land is undeveloped Federal, State, or County property. Institutional land use includes locations such as churches, hospitals, and schools. Most of the County is developed (over 90%) with 80 percent of the County land classified as public. Since most of the County is public land, there is competition for the remaining 20 percent. Much of the privately-owned land has already been developed.

FUTURE DEVELOPMENT

As mentioned in the 2022 Future Land Use Plan Update, the Community Village and the Residential future land use classifications account for the majority of unincorporated Dare County and will likely experience the most development over the next planning period. The majority of the development will be residential in nature although commercial and institutional uses may also occur as permitted by the Dare County zoning regulations. There is some re-development potential for some properties but that is difficult to predict. Development on Hatteras Island will most likely continue to outpace the development of the other areas of unincorporated Dare County especially with the completion of the bridge over Oregon Inlet in 2019 and the completion of the Rodanthe Bridge in 2022.

Figure 3.14 – Dare County Existing Land Use

Table 27—Acreage Calculations for Existing Uses

	Resd	Comm	Indus	Instu	Public	Undv	Oth Fed	TOTAL
Colington/ KDH Out	1,035	28	6	38	618	408	0	**2,133**
Martins Point	279	9	0	1	1	43	0	**333**
Rodanthe	226	25	0	53	86	130	0	**520**
Waves	148	104	0	3	79	95	0	**429**
Salvo	254	7	6	9	245	155	0	**676**
Avon	579	58	5	126	138	431	0	**1,337**
Buxton	579	98	9	3,092	873	379	0	**5,030**
Frisco	600	48	3	1,257	583	569	0	**3,060**
Hatteras	395	59	4	48	117	325	0	**948**
Manteo Out	1,411	43	28	775	1,878	1,085	0	**5,220**
Wanchese	1,122	45	99	208	1,136	3,190	0	**5,800**
Manns Harbor/ Mashoes	817	16	26	2,124	32,096	1,553	0	**36,632**
East Lake	1,094	1	24	25,160	39,323	3,825	23,898	**93,325**
Stumpy Point	372	4	3	56	34,305	1,078	22,076	**57,894**
TOTAL	**8,911**	**536**	**213**	**32,949**	**111,457**	**13,266**	**45,974**	**213,326**

Source: 2022 Dare County Land Use Plan

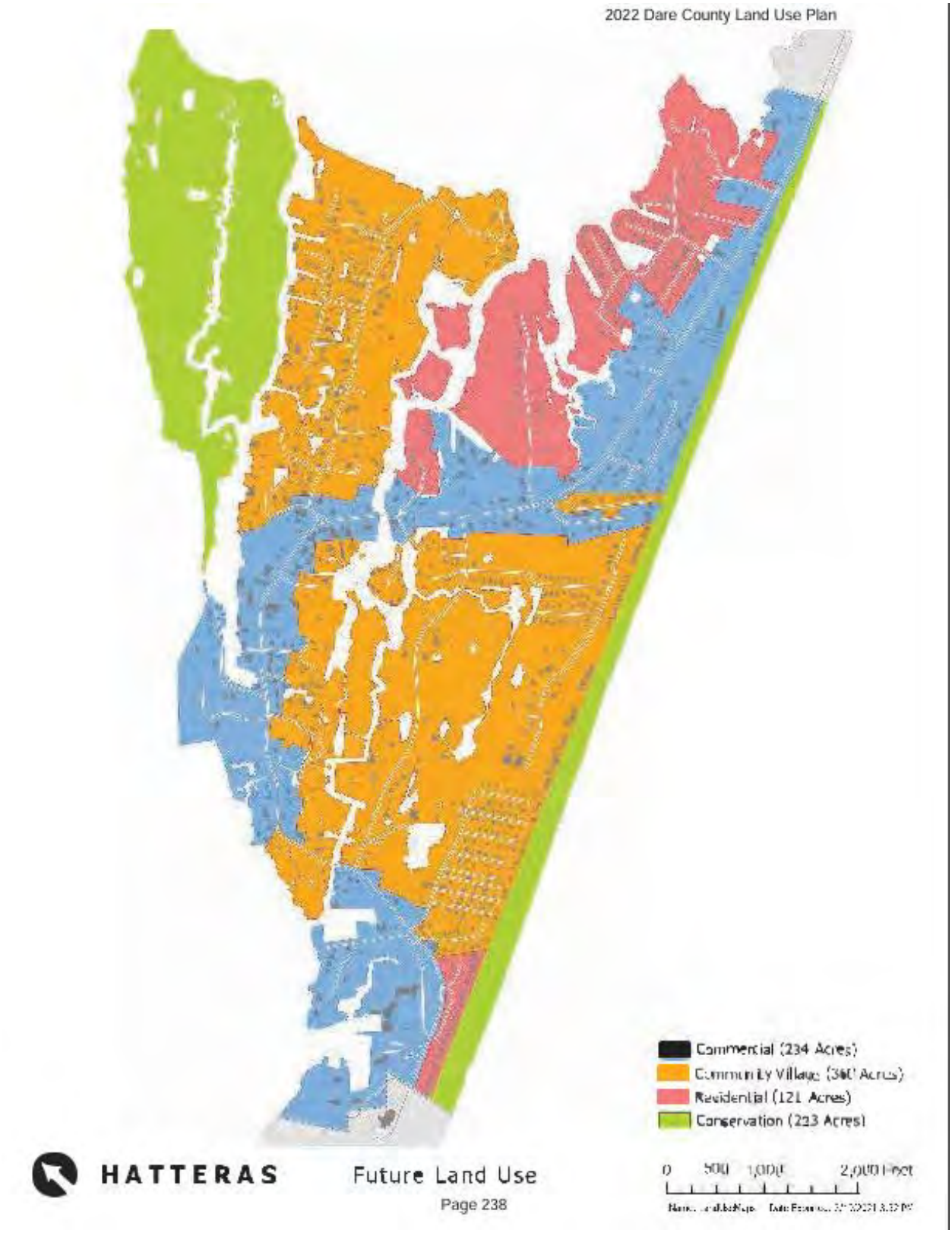
Figure 3.15 – Dare County Future Land Use

Table 38 – Individual Village Calculations for the FLUM Classifications

	Commercial	Community Village	Resd.	Cons	Limited Cons.	Other Federal	TOTAL
Colington	117	674	919	423	0	0	2,133
Martins Point	10	0	322	0	0	0	332
Rodanthe	252	0	263	5	0	0	520
Waves	227	0	148	54	0	0	429
Salvo	204	0	266	206	0	0	676
Avon	125	340	757	115	0	0	1,337
Buxton	411	0	501	3,062	1,056	0	5,030
Frisco	745	0	290	1,251	774	0	3,060
Hatteras	234	360	121	233	0	0	948
R Island	797	0	3,176	1,247	0	0	5,220
Wanchese	0	1,241	0	4,559	0	0	5,800
Manns Harbor	177	2,398	O	33,043	0		35,618
Mashoes	0	864	0	150	0	0	1,014
East Lake	0	1,145	0	64,665	3,617	23,896	93,323
Stumpy Point	61	1,451	0	34,285	0	22,076	57,873
TOTAL	**3,350**	**8,473**	**6,763**	**143,298**	**5,447**	**45,973**	**213,303**

Source: 2022 Dare County Land Use Plan

Figure 3.16 – Dare County Future Land Use Classification, Hatteras



Source: 2022 Dare County Land Use Plan

DUCK

Since the Town has island geography and narrow strips of land, much of the development is located around the main transportation corridors. Land use is split into six categories (not including rights-of-way and easements) since there is no agricultural, forestry, confined animal feeding, or industrially zoned properties in Duck. The current categories are shown below with their total acreage in Table 3.11. Acreages have been rounded to the nearest whole number as have percentages.

Table 3.11 – Land Use, Town of Duck

Land Use	Total Acres	Percent of Town (%)
Single Family Residential	838	65
Multi-Family Residential	77	6
Commercial/Mixed Use	68	5
Public	169	13
Common, Private, or Unspecified	71	6
Vacant Residential	67	5
Total	**1,290**	**100**

Source: 2021 Duck Comprehensive and CAMA Land Use Plan

Most of the Town is developed with 65 percent of the Town land classified as single family residential. The town is considered nearly entirely "built-out" and most residential and non-residential development is actually redevelopment of existing lots. While very limited, new development has occurred and a minimal number of undeveloped lots do exist.

FUTURE DEVELOPMENT

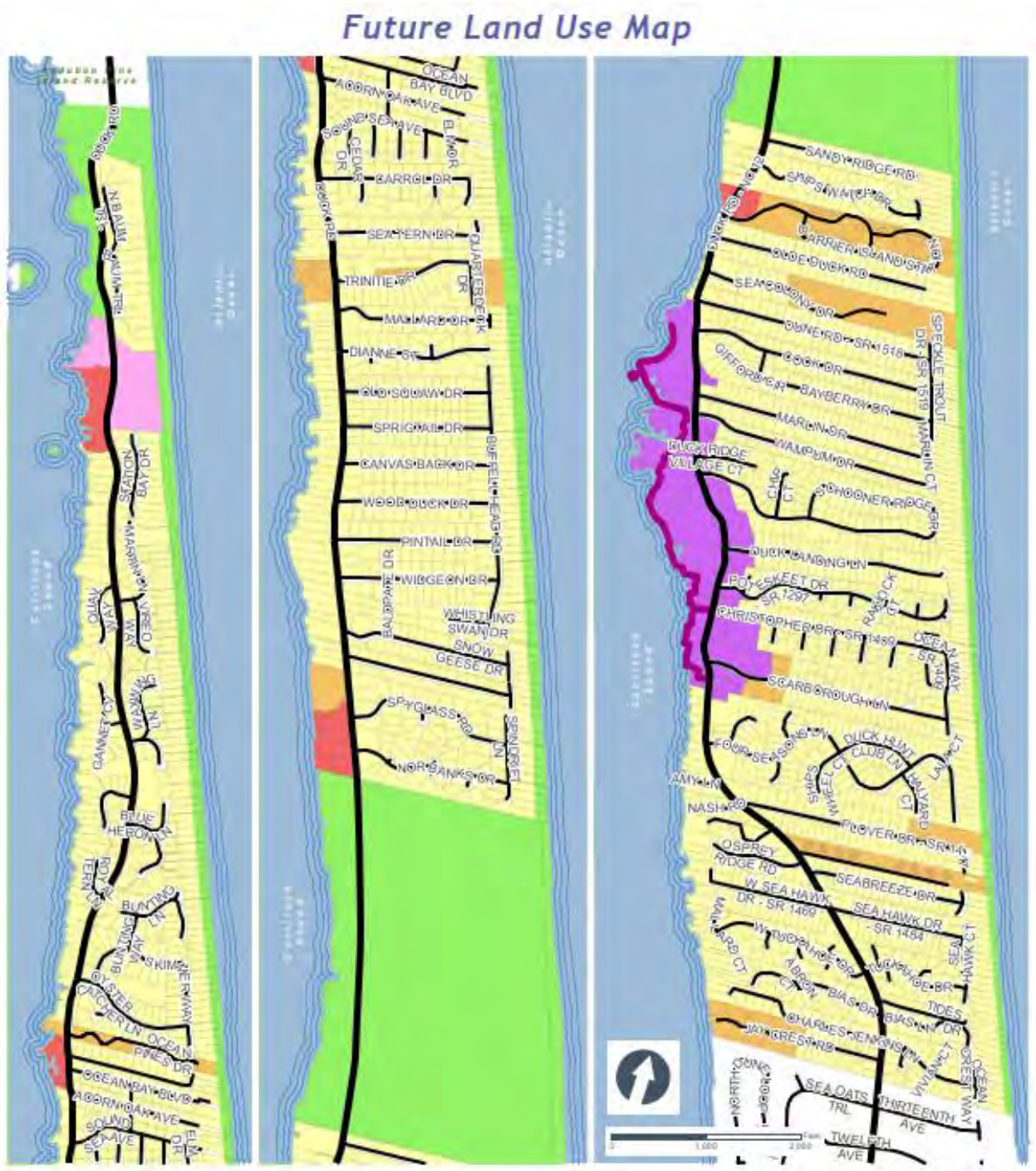
The permanent population is expected to be relatively steady in the coming years with some variation in the seasonal populations. As summarized in the Town's updated land use plan, the community balances its current uses in town, the environmental constraints, and scarcity of greenfield development opportunities. As a results, future land use and development looks very much like the present. Although the town recognizes limited opportunities for new development, there are still opportunities to enhance the public realm.

The Town has decided to create seven new future land use character areas for their future land use and development. These classifications are:

- Duck Village
- Commercial Recreation
- Resort Mixed Use
- Conservation & Civic
- Cottage Residential
- Compact Residential
- Boardwalk District

The Town of Duck's future land use map is shown in Figure 3.17.

Figure 3.17 – Town of Duck Future Land Use Map



Source: 2021 Duck Comprehensive and CAMA Land Use Plan
Duck Village (Purple), Commercial Recreation (Red), Resort Mixed Use (Pink), Conservation & Civic (Green), Cottage Residential (Yellow), Compact Residential (Orange), Boardwalk District (Purple line)

KILL DEVIL HILLS

Since the County has island geography and narrow strips of land, much of the development is located around the main transportation corridors, US 158 and NC 12. The Town classifies their land into eight different categories. These categories are shown below with their total acreage in Table 3.12. Acreages have been rounded to the nearest whole number as have percentages.

Table 3.12 – Land Use, Town of Kill Devil Hills

Land Use	Total Acres	Percent of Town (%)
Commercial	199	6
Industrial	33	1
Office and Institutional	596	19
Mixed Use	6	1
Multi-Family Residential	97	3
Single Family Residential	1,154	37
Recreational	87	3
Total Developed	*2,172*	*70*
Vacant/ Unimproved	941	30
Total	**3,113**	**100**

Source: Town of Kill Devil Hills 2020 CAMA Land Use Plan Update

Recreational parcels include public parks, open space, and public beach access. Undeveloped land falls under the vacant/unimproved category. Most of the Town is developed (70%) with 37 percent of land classified as single family residential.

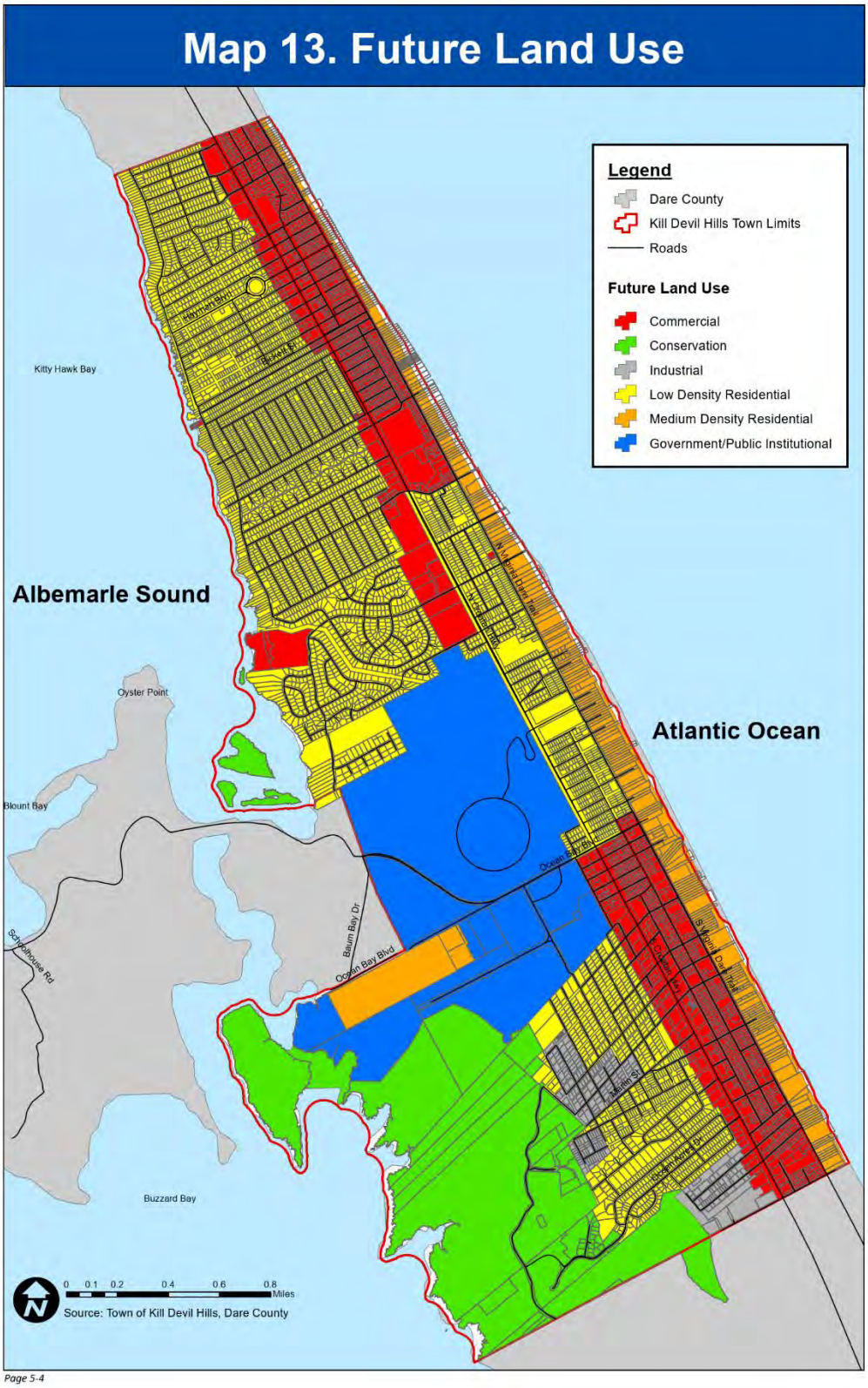
FUTURE DEVELOPMENT

Even though 30 percent of land in the Town is deemed vacant/unimproved, there is not much land available for development. However, re-development of some lots is an option when considering future development. Development will most likely continue to be located around the transportation corridors and will continue at a consistent pace. Future development within the Town will use a new classification system with six classes:

- Commercial
- Conservation
- Industrial
- Low Density Residential
- Medium Density Residential
- Government and Public Institutional

The Town of Kill Devil Hills' future land use map is shown in Figure 3.18.

Figure 3.18 – Town of Kill Devil Hills Future Land Use Map



Source: 2020 Town of Kill Devil Hills CAMA Land Use Plan Update

KITTY HAWK

The Town of Kitty Hawk Planning and Inspections Department is responsible for land-use planning in Kitty Hawk. Since the Town has island geography and narrow strips of land, much of the development is located around the main transportation corridors. A large portion of Kitty Hawk is considered vacant, parks or conservation (2,653 acres or 57%). The Town is currently divided into seven land use categories. These categories are shown below with their total acreage in Table 3.13. Percentages have been rounded to the nearest whole number.

Table 3.13 – Land Use, Town of Kitty Hawk

Land Use	Total Acres	Percent of County (%)
Commercial	483	5%
Institutional	72	1%
Residential	1,433	74%
Parks and Conservation	1,477	2%
RV Parks	16	0.2%
Vacant	1,176	19%
Other	25	0.2%
Total	**4,682**	**100**

Source: Town of Kitty Hawk 2023 CAMA CORE Land Use Plan Update

FUTURE DEVELOPMENT

According to the updated 2023 CAMA land use plan, Kitty Hawk currently has approximately 300 undeveloped residential parcels and 25 acres that could be potentially redeveloped. Based on the number of residential parcels and the potential for future redevelopment, the plan estimates that the population could increase by just over 1,100 people by 2055. It is expected that many parcels will be re-developed or modified. Areas with the future land use designation *Invest and Improve* will be the focus of any new development.

The updated land use plan considered future hazard and climate change. Two feet of sea level rise was factored into designations on the Future Land Use Map since most structures are built to last more than 50 years and two feet of sea level rise is likely to occur as early as 2065.

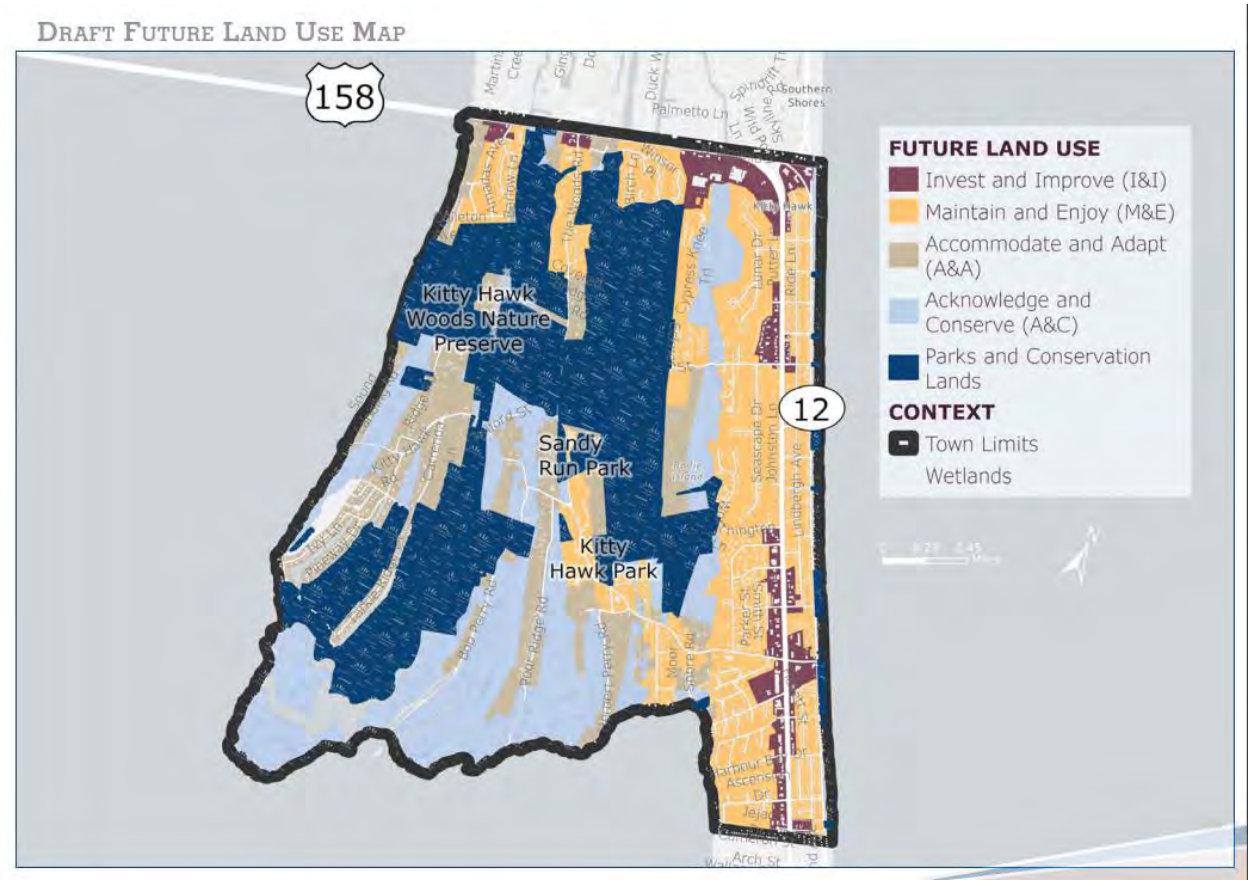
Future development within the Town will use a new classification system with six classes. These classes are:

- Invest and Improve
- Maintain and Enjoy
- Accommodate and Adapt
- Acknowledge and Conserve
- Parks and Conservation Land

Areas intended for future growth will likely include more intense and mixed-use designations, like commercial, office, attached residential, and resort growth.

The Town of Kitty Hawk's future land use map is shown in Figure 3.19.

Figure 3.19 – Town of Kitty Hawk Future Land Use Map



Source: Imagine Kitty Hawk 2050 Land Use Plan

MANTEO

The Town of Manteo Planning and Zoning Department is responsible for land-use planning.

Since the Town has island geography and narrow strips of land, much of the development is located around the main transportation corridors. Land use is split into five categories. The current categories are shown below with their total acreage in Table 3.14. Acreages have been rounded to the nearest whole number as have percentages.

Table 3.14 – Land Use, Town of Manteo

Land Use	Total Acres	Percent of Town (%)
Residential	319	28
Commercial, Service, Office & Mixed Use	77	7
Institutional	199	52
Total Developed/ "active"	*1,100*	
Conservation, Open Space and Parks	505	44
Vacant/Undeveloped	41	4
Total	**1,141**	**100**

Source: Town of Manteo 2024 CAMA Land Use Plan

A slight majority of the Town is developed (slightly more than 50%) with 28 percent of the Town land classified as residential. Almost half of the Town's land is devoted to open space and conservation. Much of this area is not buildable due to coastal and non-costal wetlands.

FUTURE DEVELOPMENT

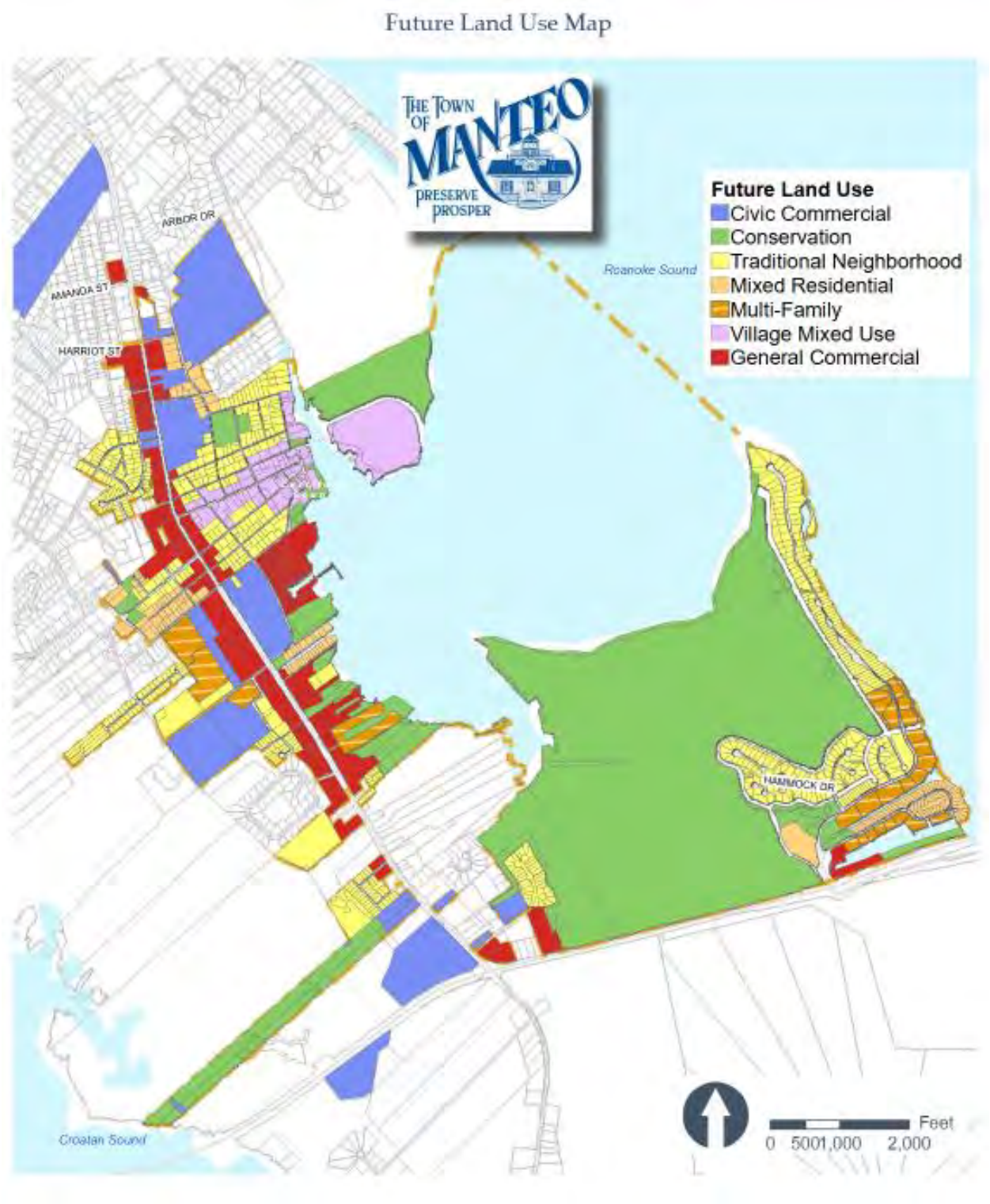
Much of Manteo's open space is not buildable due to coastal and non-costal wetlands. The remaining land is mostly built out with few undeveloped parcels remaining. As most of the developable land is already occupied, future land use categories generally align with existing land use. The largest category is conservation and open space. Current development trends are expected to continue into the coming years. The Town anticipates that there will be some re-development of properties and that no one area will see more concentrated development than another. The population is expected to grow in the coming years for both permanent and seasonal populations. Since there is little undeveloped land, and the Town wishes to protect fragile surrounding ecosystems, future development densification and re-development will shape the future land use. A future goal of the Town is to slow growth and prevent development in areas of high flood risk.

The Town has seven land use character areas for their future land use and development map. These classifications are:

- Conservation and Open Space
- Traditional Neighborhood
- Mixed Residential
- Multi-Family Residential
- General Commercial
- Village Mixed Use
- Civic Commercial

Figure 3.20 on the following page shows the future land use of the Town of Manteo as envisioned in the 2024 Town of Manteo Comprehensive Plan.

Figure 3.20 – Town of Manteo Future Land Use Map



Source: 2024 Town of Manteo Comprehensive Plan

NAGS HEAD

Since the Town has island geography and narrow strips of land, much of the development is located around the main transportation corridors. Land use is split into thirteen categories. The current categories are shown below with their total acreage in Table 3.15. Percentages have been rounded to the nearest whole number.

Table 3.15 – Land Use, Town of Nags Head

Land Use	Total Acres	Percent of Town (%)
Single Family Residential	1,385	36%
Multi-Family	94	2%
Hotel/Motel/ Cottage Court	43	1%
Property Owner's Association	22	1%
Commercial	215	6%
Commercial Services	24	1%
Institutional/ Community Services	92	2%
Religious	28	1%
Recreation	235	6%
Miscellaneous	20	1%
Total Developed	*2,185*	*57%*
Washout	39	1%
Conservation	1,152	30%
Vacant	466	12%
Total	**3,815**	**100%**

Source: Town of Nags Head 2021 Comprehensive Plan

Washout areas are where land has been washed out by the ocean and is now unable to be built on. Most of the Town is developed (57%) with 36 percent of the Town land classified as single family residential and almost a third of the town classified as conservation land including natural and recreational open space (30%).

FUTURE DEVELOPMENT

The Town anticipates that it will continue to grow as a low density, single family residential community and hopes to preserve open space. With updated character areas, the Town intends to direct commercial development away from residential areas to maintain low density residential neighborhoods. Nags Head chose to directly relate their land use designations to their character areas. The future land use map uses thirteen land classifications that are like the current classifications. They are as follows:

- Residential
- Oceanfront residential
- Planned unit development residential
- Oceanfront historic residential
- Oceanfront mixed use
- Neighborhood commercial
- Beach Road historic commercial
- General commercial
- Commercial services

- Waterfront commercial recreation
- Institutional/community services
- Conservation
- Recreation

There are currently no specified locations for major development or redevelopment in the town other than the currently undeveloped parcels.

The Town of Nags Head's future land use map is shown in Figure 3.21 on the following page shows the future land use of the Town of Nags Head as envisioned in the Focus 2021 Comprehensive Plan. Activity nodes indicate areas that may experience infill or redevelopment.

The Town of Nags Head's future land use map is shown in Figure 3.21.

Figure 3.21 – Town of Nags Head Future Land Use Map

Source: Town of Nags Head Comprehensive and CAMA Land Use Plan

SOUTHERN SHORES

Since the Town has island geography and narrow strips of land, much of the development is located around the main transportation corridors. Most of the land within Town limits is devoted to detached residential uses. These single-family land uses make up more than half of the incorporated land area. Nearly one third of land is considered open space, parks, conservation, beaches, or vacant. Much of this area is not buildable due to the presence of coastal and non-coastal wetlands, and other environmentally sensitive areas.

The Town is currently divided into five land use categories. These categories are shown below with their total acreage in Table 3.16. Percentages are rounded to the nearest whole number.

Table 3.16 – Land Use, Town of Southern Shores

Land Use	Total Acres	Percent of Town (%)
Residential	1,410	63
Commercial, Service, & Office	38	2
Institutional	28	1
Parks	311	14
Total Developed	*1,787*	*80*
Vacant/Undeveloped	432	19
Total	**2,219**	**100**

Source: Town of Southern Shores 2024 CAMA Land Use Plan Update

Most of the Town is developed (80%) with most of the land falling under the residential category (63%).

FUTURE DEVELOPMENT

Most of the land within Southern Shores' corporate limits is built-out with low-density residential development, with few significant undeveloped parcels remaining. There are some land use conflicts caused by flood hazards, water quality, and soil septic limitations. According to the 2024 land use plan, the community's satisfaction with the current balance of uses in town, the scarcity of greenfield development opportunities, and environmental constraints, the future of Southern Shores looks very much like the present. Development will continue at the current rate for the coming years. It is expected that many parcels will be re-developed. There is no room to expand the Town because of its geographic location (between the Atlantic Ocean, Currituck Sound, and the Towns of Kitty Hawk and Duck). There is not one area that will see the majority of development. Future development within the Town will be based on the following classifications:

- Residential
- Recreational
- Municipal/Education
- Commercial
- Conservation/Open Space

The Town of Southern Shores' future land use map is shown in Figure 3.22.

Figure 3.22 – Town of Southern Shores Future Land Use Map

Source: 2024 Town of Southern Shores Comprehensive CAMA Land Use Plan

3.7 EMPLOYMENT AND INDUSTRY

The Outer Banks region is best known as a coastal tourist destination. Every year the region sees an influx of visitors during the summer months from across the state and the country. VisitNC estimates that in 2020, visitors to Currituck County spent $375.4 million and visitors to Dare County spent $1.41 billion, together accounting for approximately 9 percent of the State's share of visitor spending. The region's reliance on tourism could have serious negative consequences in the case of a hazard event that damages or destroys the region's rental properties, beaches, and other major tourist attractions.

WAGES AND EMPLOYMENT

Per the 2018-2022 American Community Survey 5-Year Estimates, the median household income for the Outer Banks Region was about $86,381, which is over 24 percent higher than the state's median household income. However, approximately 7.5% of the population is considered to be living below the poverty level. Moreover, about 11.5 percent of people under 18 years of age are living below the poverty level.

Table 3.17 shows employment statistics for all participating jurisdictions. Table 3.18 shows occupation statistics for all participating jurisdictions.

Table 3.17 – Employment Statistics for Outer Banks Region, 2022

Jurisdiction	Population in Labor Force	Percent Employed* (%)	Percent Unemployed* (%)	Percent Not in Labor Force* (%)	Unemployment Rate (%)
Currituck County	**15,831**	**62.6**	**1.9**	**33.3**	**2.9**
Dare County	**20,301**	**59.9**	**3.7**	**35.9**	**5.9**
Duck	288	46.6	0.5	52.9	1.0
Kill Devil Hills	4,699	65.8	3.7	29.9	5.4
Kitty Hawk	2,089	61.4	5.3	33.3	7.9
Manteo	901	55.9	4.1	39.9	6.8
Nags Head	1,528	53	1.1	45.9	2.0
Southern Shores	1,470	46.2	7.5	46.3	13.9
Region Total	**36,132**	**61.3**	**2.8**	**34.6**	**4.4**

Source: U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates

Note: This table reports only the civilian labor force. The labor force in armed services accounted for 0.4% of the population 16 and over across the region. Population employed, population unemployed, and population not in labor force are reported as a percent of the total population aged 16 years and older.

Note: Due to their small population sizes, the margin of error is high for many estimates for the incorporated towns.

Table 3.18 – Percent of Employed Population by Occupation for Outer Banks, 2022

Occupation	Management, business, science and arts (%)	Service (%)	Sales and Office (%)	Natural Resources, Construction, and Maintenance (%)	Production, transportation, and material moving (%)
Currituck County	**37.9**	**16.7**	**20.0**	**14.5**	**10.8**
Dare County	**40.7**	**15.7**	**23.5**	**11.8**	**8.3**
Duck	55.8	5.3	28.8	3.2	7.0
Kill Devil Hills	35.9	15.4	27.7	10.7	10.3
Kitty Hawk	40.5	19.2	18.4	12.8	9.2
Manteo	33.9	18.0	30.8	7.4	9.9

Occupation	Management, business, science and arts (%)	Service (%)	Sales and Office (%)	Natural Resources, Construction, and Maintenance (%)	Production, transportation, and material moving (%)
Nags Head	35.4	11.7	35.4	6.1	11.2
Southern Shores	54.8	10.6	19.6	8.1	7.0
Region Total	**39.3**	**16.2**	**21.8**	**13.2**	**9.6**

Source: U.S. Census Bureau, 2018-2022 American Community Survey 5-Year Estimates

Across the Region as a whole, major industry sectors in 2022 included Educational Services, and Health Care and Social Assistance (17.4 percent of employment on average); Professional, Scientific, and Management, and Administrative and Waste Management Services (13.4 percent of employment); Retail Trade (13.0 percent of employment); Arts, Entertainment, and Recreation, and Accommodation and Food Services (12.0 percent of employment); and Construction (10.1 percent of employment).

Dare County accounts for most of its own employment, as approximately 89.5 percent of workers worked in their county of residence as of 2022. In Currituck County, however, only 33.5 percent of workers worked within the county. Another 20.5 percent worked outside of the county of residence, but within the state. Notably, 46 percent of workers in Currituck County worked outside their state of residence. This is likely due to Currituck County's proximity to Virginia and the Norfolk and Virginia Beach area.

Table 3.19 summarizes the major employers in Currituck and Dare Counties from AccessNC as of the 2nd quarter of 2024.

Table 3.19 – Major Employers, Outer Banks Region

Employer	Sector	Employment Range
Currituck County		
Currituck County Board of Education	Educational Services	500-999
County of Currituck	Public Administration	500-999
H2OBX LLC	Arts, Entertainment, and Recreation	250-499
Food Lion	Retail Trade	100-249
Twiddy & Company of Duck Inc.	Real Estate and Rental and Leasing	100-249
Resort Realty of the Outer Banks Inc.	Real Estate and Rental and Leasing	100-249
Academi Training Center	Educational Services	100-249
Brindley Beach Inc.	Real Estate and Rental and Leasing	100-249
Dare County		
Dare County Board of Education	Educational Services	500-999
County of Dare	Public Administration	500-999
Outer Banks Hospital/ECU Health	Health Care and Social Assistance	250-499
Professional Enterprises of Hatteras	Real Estate and Rental and Leasing	250-499
Carolina Designs Realty Inc	Real Estate and Rental and Leasing	250-499
Food Lion	Retail Trade	250-499
N C Department of Transportation	Public Administration	250-499
Wal-Mart Associates Inc	Retail Trade	100-249
Twiddy And Company of Duck Inc	Real Estate and Rental and Leasing	100-249
Propel Peo Inc	Administrative and Support and Waste Management and Remediation Services	100-249

Source: ACCESSNC Employer Profile

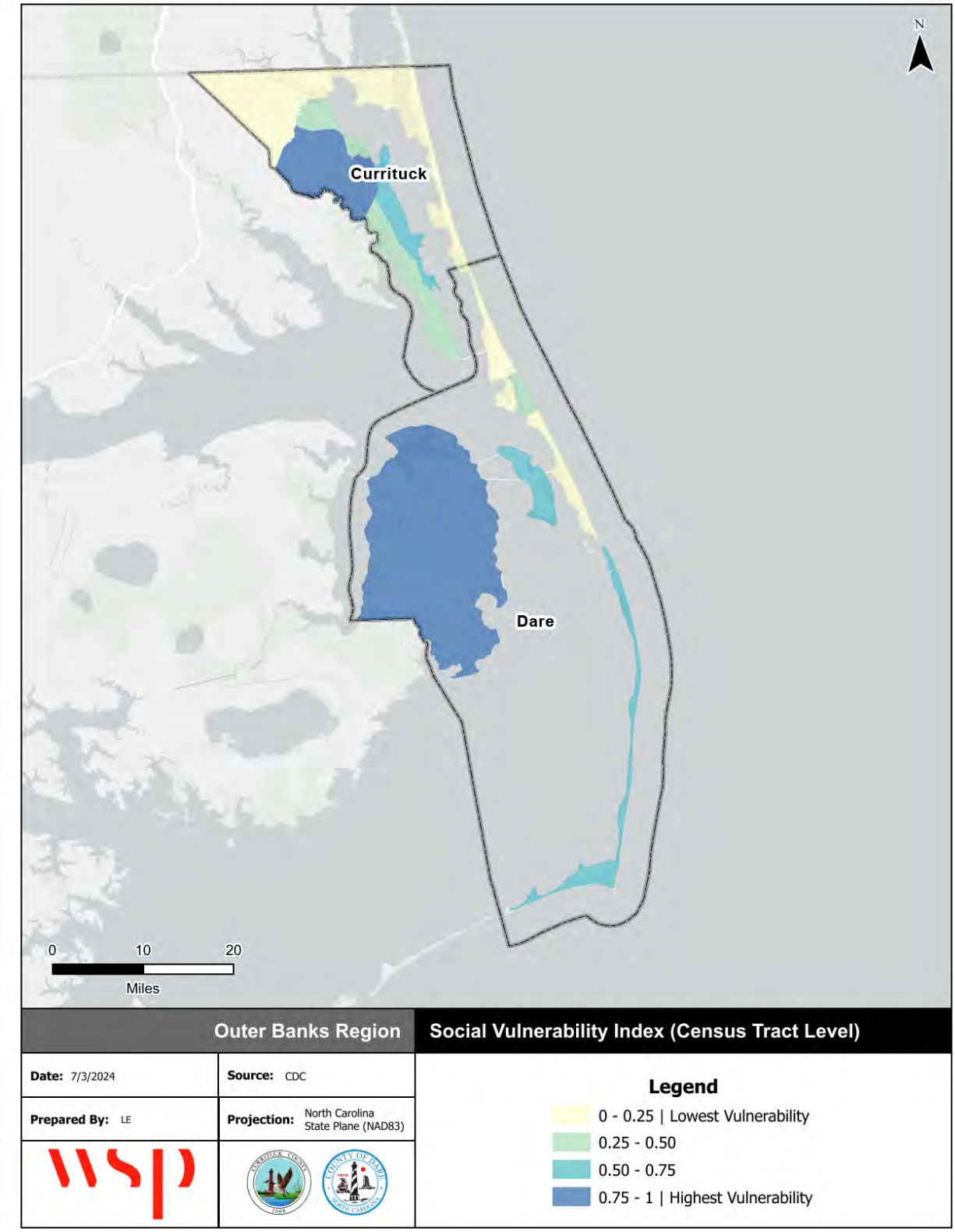
3.8 SOCIAL VULNERABILITY

Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human caused threats, such as toxic chemical spills. That is to say that even if different groups share similar exposure to a hazard, some groups may have a greater capacity to anticipate, cope, and recover from a disaster than others. Social vulnerability often refers to the population characteristics that have historically put certain groups of people at varying risk when they are exposed to the impacts of a hazard event (Cutter, 2003; Berke et al., 2019). Common and determining characteristics include age, gender, income, race, and ethnicity, and language capacity (Cutter et al., 2003; Berke et al., 2015). However, additional characteristics can include social networks, education, cultural knowledge, and political power (Otto et al., 2017). Social vulnerability considerations were included in this plan update to identify areas across the County that might be more vulnerable to hazard impacts based on a number of factors.

The Centers for Disease Control and Prevention (CDC) has developed a social vulnerability index (SVI) to measure the resilience of communities when confronted by external stresses such as natural or human-caused disasters or disease outbreaks. The CDC's SVI indicates the relative vulnerability within census tracts based on 15 social factors: poverty, unemployment, income, education, age, disability, household composition, minority status, language, housing type, and transportation access. Higher social vulnerability is an indicator that a community may be limited in its ability to respond to and recover from hazard events. Therefore, using this SVI information can help the Region and jurisdictions to prioritize pre-disaster aid, allocate emergency preparedness and response resources, and plan for the provision of recovery support. Results are presented via a score ranging from 0 (lowest vulnerability) to 1 (highest vulnerability).

The overall SVI scores reported for Currituck County and Dare County were 0.0862 and 0.2071, respectively, which indicates a low level of overall vulnerability. When viewed by Census tract, some areas of relatively higher social vulnerability are apparent in central Currituck County near Barco and on mainland Dare County. Areas with medium to high social vulnerability include Roanoke Island, the unincorporated barrier island communities of Dare County, and south-central mainland Currituck County along the sound. Based on this data, communities with medium or high social vulnerability are Currituck County, Dare County, and Manteo. Figure 3.23 displays CDC SVI data for the Outer Banks Region by Census tract.

Figure 3.23 – Social Vulnerability Index by Census Tract, 2022



4 RISK ASSESSMENT

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

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

44 CFR Subsection D §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community. Plans approved after October 1, 2008 must also address NFIP insured structures that have been repetitively damaged by floods. The plan should describe vulnerability in terms of:
A) The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas;
(B): An estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate; and
(C): Providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

4.1 OVERVIEW

This section describes the Hazard Identification and Risk Assessment process for the development of the Outer Banks Regional Hazard Mitigation Plan. It describes how the region met the following requirements from the 10-step planning process:

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

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

This hazard risk assessment covers all of Currituck and Dare Counties, including unincorporated areas and all incorporated jurisdictions participating in this plan.

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

Data collected through this process has been incorporated into the following sections of this plan:

- **Section 4.2**: **Hazard Identification** identifies the natural and human-caused hazards that threaten the planning area.
- **Section 4.3: Risk Assessment Methodology and Assumptions** describes how the risk and vulnerability assessment was conducted and presented.
- **Section 4.4: Asset Inventory** details the population, buildings, and critical facilities at risk within the planning area.
- **Section 4.5**: **Hazard Profiles, Analysis, and Vulnerability** discusses the threats to the planning area, describes previous occurrences of hazard events and the likelihood of future occurrences, and assesses the planning area's exposure to each hazard profiled; considering assets at risk, critical facilities, and future conditions.
- **Section 4.6: Conclusions on Hazard Risk** summarizes the results of the Priority Risk Index and defines each hazard as a Low, Medium, or High-Risk hazard.

4.2 HAZARD IDENTIFICATION

To identify the full range of hazards relevant to the planning area, the HMPC began with a review of the lists of hazards identified in the 2020 Outer Banks Regional Hazard Mitigation Plan and the 2023 State Hazard Mitigation Plan. This review of hazards is summarized in Table 4.1. The HMPC used this process to ensure consistency across hazard mitigation planning efforts. All hazards listed below were evaluated for inclusion in this plan update, and, where appropriate, the hazard list in this plan was updated to be consistent with the State Hazard Mitigation Plan.

Table 4.1 – Full Range of Hazards Evaluated

Hazard	Included in 2023 State HMP?	Included in 2020 Outer Banks Regional HMP?
Coastal Hazards (Erosion, Rip Current, and Sea Level Rise)	Yes, with Hurricanes and Coastal Hazards and Flooding	Yes
Drought	Yes	Yes
Earthquake	Yes	Yes
Extreme Heat	Yes	Yes
Flood	Yes (including sea level rise)	Yes
Hurricane and Tropical Storm	Yes (including coastal hazards and nor'easters)	Yes
Severe Weather (Thunderstorm Winds, Lightning, and Hail)	Yes	Yes
Severe Winter Storm	Yes	Yes
Tornado	Yes, with Tornadoes/Thunderstorms	Yes
Wildfire	Yes	Yes
Dam Failures	Yes	No
Geological Hazards (Landslide and Sinkholes)	Yes	No
Infectious Disease	Yes	No
Hazardous Materials Incident	Yes	Yes

Hazard	Included in 2023 State HMP?	Included in 2020 Outer Banks Regional HMP?
Radiological Emergency	Yes	Yes
Cyber Threat	Yes	Yes
Terrorism	Yes	Yes
Transportation Infrastructure Failure	No	Yes
Civil Disturbance	Yes	No
Electromagnetic Pulse	Yes	No
Food Emergency	Yes	No

The HMPC evaluated the above list of hazards using existing hazard data, past disaster declarations, local knowledge, and information from the 2023 State Hazard Mitigation Plan and the 2020 Outer Banks Regional Hazard Mitigation Plan to determine the significance of these hazards to the planning area. Significance was measured in general terms and focused on key criteria such as frequency and resulting damage, which includes deaths and injuries, as well as property and economic damage.

One significant resource in this effort was the National Oceanic and Atmospheric Administration's (NOAA) National Center for Environmental Information (NCEI) Storm Events Database, which contains an archive by county of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. The database also provides a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. The database contains records of tornado events since 1950, thunderstorm wind and hail events since 1955, and all other tracked event types since 1996. NCEI receives storm data from the National Weather Service (NWS), which receives their information from a variety of sources, which include but are not limited to county, state and federal emergency management officials, local law enforcement officials, SkyWarn spotters, NWS damage surveys, newspaper clipping services, the insurance industry and the general public, among others. Due to its reliance on reporting from a variety of sources, the accuracy of NCEI data can be limited. It is not a comprehensive database of all storm and weather events that have occurred. However, it still provides a good starting point for assessing the occurrence of various hazard events in the planning area.

The NCEI Storm Events database contains 715 records of severe weather events that occurred in Currituck and Dare Counties in the 28-year period from 1996 through 2023. Table 4.2 summarizes these events.

Table 4.2 – NCEI Severe Weather Reports for Currituck and Dare Counties, 1996 – 2023

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
Blizzard	2	$0	$0	0	0
Coastal Flood	48	$18,885,000	$0	0	0
Cold/Wind Chill	4	$0	$0	0	0
Drought	6	$0	$0	0	0
Excessive Heat	4	$0	$0	0	0
Flash Flood	27	$0	$0	0	0
Flood	14	$500,000	$0	0	0
Frost/Freeze	4	$0	$0	0	0
Hail	70	$0	$0	0	0
Heat	4	$0	$0	0	0
Heavy Rain	31	$0	$0	0	0
Heavy Snow	6	$0	$0	0	0

Type	# of Events	Property Damage	Crop Damage	Deaths	Injuries
High Surf	9	$0	$0	5	0
High Wind	67	$601,000	$0	0	0
Hurricane	44	$381,213,000	$136,880,000	2	0
Ice Storm	0	$0	$0	0	0
Lightning	15	$614,000	$0	4	6
Rip Current	30	$0	$0	28	0
Strong Wind	3	$11,000	$0	0	0
Storm Surge/Tide	15	$55,950,000	$0	0	0
Thunderstorm Wind	168	$796,000	$0	0	9
Tornado	20	$1,397,000	$0	0	6
Tropical Storm	55	$19,884,000	$0	0	0
Wildfire	0	$0	$0	0	0
Winter Storm	57	$22,500,000	$0	0	0
Winter Weather	34	$0	$0	0	0
Total:	**715**	**$502,301,000**	**$136,880,000**	**39**	**21**

Source: National Center for Environmental Information Events Database, accessed June 2024
Note: Losses reflect totals for all impacted areas for each event.

The HMPC also researched past events that resulted in a federal and/or state emergency or disaster declaration for Currituck and Dare Counties to identify significant hazards. Two types of disaster declarations are provided in the Stafford Disaster Relief and Emergency Assistance Act of 1988: emergency declarations and major disaster declarations. If a disaster is so severe that both the local and state government capacities are exceeded, a federal emergency or disaster declaration allows for the provision of federal assistance.

- Emergency declarations: When federal assistance is needed, the President of the United States can declare an emergency for any occasion or disaster. Emergency declarations aide State and local efforts in providing emergency services that help protect human lives.
- Major disaster declarations: When a local government's capacity has been surpassed, a state disaster declaration may be issued, allowing for the provision of state assistance. Federal and/or state disaster declarations may be granted when the Governor certifies that the combined local, county, and state resources are insufficient and the situation is beyond their recovery capabilities.

Records of designated counties for FEMA emergency declarations and major disaster declarations start in 1964. Since then, Currituck and Dare Counties have been designated in 15 major disaster declarations and 13 emergency declarations. Not all events impacted the entire region; several declarations list only Dare County. Emergency and disaster declarations for the Outer Banks Region are detailed in Table 4.3.

Table 4.3 – FEMA Emergency and Disaster Declarations, Currituck and Dare Counties

County*	Declaration Type	Disaster #	Declaration Date	Incident Type	Event Title
C, D	EM	3586	10/1/2022	Hurricane	Hurricane Ian
C, D	EM	3534	8/2/2020	Hurricane	Hurricane Isaias
C, D	DR	4487	3/25/2020	Biological	COVID-19 Pandemic
C, D	EM	3471	3/13/2020	Biological	COVID-19
C, D	DR	4465	10/4/2019	Hurricane	Hurricane Dorian
C, D	EM	3423	9/3/2019	Hurricane	Hurricane Dorian
D	DR	4412	1/31/2019	Hurricane	Tropical Storm Michael

County*	Declaration Type	Disaster #	Declaration Date	Incident Type	Event Title
D	DR	4393	9/14/2018	Hurricane	Hurricane Florence
C, D	EM	3401	9/10/2018	Hurricane	Hurricane Florence
C, D	DR	4285	10/10/2016	Hurricane	Hurricane Matthew
C, D	EM	3380	10/7/2016	Hurricane	Hurricane Matthew
C, D	DR	4019	8/31/2011	Hurricane	Hurricane Irene
C, D	EM	3327	8/25/2011	Hurricane	Hurricane Irene
C	DR	1969	4/19/2011	Severe Storm(s)	Severe Storms, Tornados, and Flooding
C, D	EM	3314	9/1/2010	Hurricane	Hurricane Earl
D	DR	1608	10/7/2005	Hurricane	Hurricane Ophelia
C, D	EM	3254	9/14/2005	Hurricane	Hurricane Ophelia
C, D	EM	3222	9/5/2005	Hurricane	Hurricane Katrina Evacuation
C, D	DR	1490	9/18/2003	Hurricane	Hurricane Isabel
C, D	DR	1292	9/16/1999	Hurricane	Hurricane Floyd Major Disaster Declarations
C, D	EM	3146	9/15/1999	Hurricane	Hurricane Floyd Emergency Declarations
D	DR	1291	9/9/1999	Hurricane	Hurricane Dennis
C, D	EM	3141	9/1/1999	Hurricane	Hurricane Dennis
C, D	DR	1240	8/27/1998	Hurricane	Hurricane Bonnie
D	DR	1200	1/15/1998	Severe Storm(s)	Severe Storms and Flooding
D	DR	1003	9/10/1993	Hurricane	Hurricane Emily
D	EM	3110	3/17/1993	Snowstorm	Severe Snowfall & Winter Storm
C, D	DR	818	12/2/1988	Tornado	Severe Storms & Tornados

Source: FEMA Disaster Declarations Summary, updated June 19, 2024

*C = Currituck, D = Dare

Using the above information and additional discussion, the HMPC evaluated each hazard's significance to the planning area to decide which hazards to include in this plan update. Some hazard titles have been updated to be consistent with the State Hazard Mitigation Plan. Table 4.4 summarizes the determination made for each hazard.

Table 4.4 – Hazard Evaluation Results

Hazard	Included in this plan update?	Explanation for Decision
Flooding	Yes	The 2020 Outer Banks plan identified flooding as a high priority hazard. Per the 2023 State plan, Dare County is one of four counties in the state with over 1,000 repetitive loss properties. Flooding is a significant component of hurricanes, which have resulted in most of the region's past disaster declarations. In keeping with the 2023 State plan, sea level rise is included with the flood hazard.
Hurricanes and Coastal Hazards	Yes	The 2020 Outer Banks plan identified these as high priority hazards. In keeping with the 2023 State plan, these hazards have been combined for analysis. The region is vulnerable to hurricane winds, rains, and storm surge as well as nor'easters, erosion, and rip currents. Most of the region's past disaster declarations have been for hurricanes. Flood related risks are evaluated in the flood hazard profile.

Hazard	Included in this plan update?	Explanation for Decision
Severe Winter Weather	Yes	The 2020 Outer Banks plan and 2023 State plan addressed this hazard, and the region identified it as a high priority hazard.
Excessive Heat	Yes	The 2020 Outer Banks plan and the 2023 State plan addressed this hazard. The region identified heat as a high priority hazard.
Earthquakes	Yes	The 2020 Outer Banks plan and the 2023 State plan addressed this hazard. Earthquake is a low priority hazard but still merits study.
Wildfires	Yes	The 2020 Outer Banks plan identified wildfire as a high priority hazard.
Dam Failures	No	The 2020 Outer Banks plan did not identify any dams in Currituck or Dare Counties. NC Dam Inventory does not list dams in either county. Similarly, the USACE's National Levee Database does not identify any USACE or non-USACE levees in the region.
Drought	Yes	The 2020 Outer Banks plan addressed this hazard and rated drought as a moderate priority. The 2023 State plan shows that drought occurrence is lowest in the northeastern region of the state, but it is still a relevant hazard to the planning area.
Tornadoes & Thunderstorms (including Lightning and Hail)	Yes	The 2020 Outer Banks plan and 2023 State plan addressed these hazards. NCEI reports 343 severe weather-related events since 1996. The region has received two major disaster declarations for tornados.
Geological Hazards (Sinkhole, Landslide)	No	The 2023 State plan addressed this hazard but notes that risk is concentrated in the western portions of the state. The 2020 Outer Banks plan found minimal risk and did not identify sinkholes or landslide for inclusion in the risk assessment. USGS data does not indicate any geological basis for sinkhole risk in the region.
Infectious Disease	No	The State HMP reports the entire State is at risk, but vulnerability is low across all but two impact categories. There has been a past disaster declaration resulting from the Covid-19 pandemic, but the HMPC indicated that County Health Departments already plan effectively for infectious disease management.
Hazardous Substances	Yes	The 2023 State plan addresses this hazard, and the 2020 Outer Banks plan identified hazardous materials incidents as a moderate-high priority hazard. The HMPC indicated that the risk assessment should also evaluate the risk of offshore spills.
Radiological Emergency	Yes	The 2023 State plan addresses this hazard. A small portion of northern Currituck County is within the Ingestion Pathway Zone of Surry Power Station, located in Surry, Virginia.
Terrorism	Yes	The 2020 Outer Banks plan addressed this hazard. There have not been any instances of terrorism in Currituck or Dare Counties. However, the HMPC felt this threat warrants inclusion in the plan.
Civil Disturbance	No	The 2023 State plan reports that risk is highest in areas with large population groupings or gatherings. There is no history of civil disturbances in the region.

Hazard	Included in this plan update?	Explanation for Decision
Cyber Threat	Yes	The 2020 Outer Banks plan rated cyber threat as a moderate risk. Cyber hazards are profile in the 2023 State plan, and the HMPC felt this hazard should continue to be evaluated for the region.
Electromagnetic Pulse	No	The region considers this hazard more appropriately addressed at the State level.
Food Emergency	No	The region considers this hazard more appropriately addressed at the State level.
Infrastructure Failure	Yes	This threat is not addressed in the State plan. Infrastructure vulnerability is evaluated relative to each natural hazard that may impact it. However, the HMPC also wanted to continue to consider transportation infrastructure failure that may occur due to damages unrelated to other hazards. The HMPC broadened this hazard to include other types of infrastructure.

The final list of hazards included in this plan are as follows:

- Drought
- Earthquake
- Excessive Heat
- Flooding (including Sea Level Rise)
- Hurricane & Coastal Hazards (including Erosion, Rip Current, and Nor'easters)
- Tornadoes & Thunderstorms (including Lightning & Hail)
- Severe Winter Weather
- Wildfire
- Hazardous Substances
- Radiological Emergency
- Cyber Threat
- Terrorism
- Infrastructure Failure

4.3 RISK ASSESSMENT METHODOLOGY AND ASSUMPTIONS

The Disaster Mitigation Act of 2000 requires that the HMPC evaluate the risks associated with each of the hazards identified in the planning process. Each hazard was evaluated to determine its probability of future occurrence and potential impact. A vulnerability assessment was conducted for each hazard to determine its potential to cause significant human and/or economic losses. A consequence analysis was also completed for each hazard.

Each hazard is profiled in the following format:

HAZARD DESCRIPTION

This section provides a description of the hazard, including discussion of its speed of onset and duration, as well as any secondary effects followed by details specific to the Outer Banks region.

LOCATION

This section includes information on the hazard's physical extent, with mapped boundaries where applicable.

EXTENT

This section includes information on the hazard extent in terms of magnitude, describe how the severity of the hazard can be measured. Where available, the most severe event on record used as a frame of reference.

HISTORICAL OCCURRENCES

This section contains information on historical events, including the location and consequences of all past events on record within or near the Outer Banks Region.

PROBABILITY OF FUTURE OCCURRENCE

This section gauges the likelihood of future occurrences based on past events and any existing data on current or future trends. The historical frequency is determined by dividing the number of events observed by the number of years on record and multiplying by 100. This provides the percent chance of the event happening in any given year according to historical occurrence (e.g. 10 winter storm events over a 30-year period equates to a 33 percent chance of experiencing a severe winter storm in any given year).

CLIMATE CHANGE

Where applicable, this section discusses how climate change may or may not influence the risk posed by the hazard on the planning area in the future. Resources on climate change projections and potential impacts include the Fourth National Climate Assessment, the Fifth National Climate Assessment, and the North Carolina State Climate Office.

VULNERABILITY ASSESSMENT

This section quantifies, to the extent feasible using best available data, assets at risk to natural hazards and potential loss estimates. People, properties and critical facilities, and environmental assets that are vulnerable to the hazard are identified. Future development is also discussed in this section, including how exposure to the hazard may change in the future or how development may affect hazard risk.

The vulnerability assessments followed the methodology described in the FEMA publication Understanding Your Risks—Identifying Hazards and Estimating Losses (August 2001). The vulnerability assessment first describes the total vulnerability and values at risk and then discusses vulnerability by hazard. Data used to support this assessment included the following:

- Geographic Information System (GIS) datasets, including building footprints, topography, aerial photography, and transportation layers, from local and state resources;
- Hazard layer GIS datasets from state and federal agencies;
- Descriptions of inventory and risks provided by the 2023 State Hazard Mitigation Plan; and
- Descriptions of inventory and risks from the 2020 Outer Banks Regional Hazard Mitigation Plan.
- Exposure and vulnerability estimates provided by the North Carolina Emergency Management (NCEM) IRISK database.

Two distinct risk assessment methodologies were used in the formation of the vulnerability assessment: a quantitative analysis that relies upon best available data and technology and a qualitative analysis that relies on local knowledge and rational decision making.

Vulnerability can be quantified in those instances where there is a known, identified hazard area, such as a mapped floodplain. In these instances, the numbers and types of buildings subject to the identified hazard can be counted and their values tabulated. Where hazard risk cannot be distinctly quantified and modeled, other information can be collected in regard to the hazard area, such as the location of critical facilities, historic structures, and valued natural resources (e.g., an identified wetland or endangered species habitat). Together, this information conveys the vulnerability of that area to that hazard. The quantitative analysis for this plan update involved the use of NCEM's IRISK database, which provides modeled damage estimates for earthquake, flood, wind, and wildfire hazards.

NCEM's IRISK database incorporates county building footprint and parcel data. Footprints with an area less than 500 square feet were excluded from the analysis. To determine if a building is in a hazard area, the building footprints were intersected with each of the mapped hazard areas. If a building intersects two or more hazard areas (such as the 1-percent-annual-chance flood zone and the 0.2-percent-annual-chance flood zone), it is counted as being in the hazard area of highest risk. The parcel data provided building value and year built. Building value was used to determine the value of buildings at risk. Year built was used to determine if the building was constructed prior to or after the community had joined the NFIP and had an effective FIRM and building codes enforced.

Census blocks and Summary File 1 from the 2020 Census were used to determine population at risk. This included the total population, as well as the vulnerable elderly and children age groups. To determine population at risk, the census blocks were intersected with the hazard area. To better determine the actual number of people at risk, the intersecting area of the census block was calculated and divided by the total area of the census block to determine a ratio of area at risk. This ratio was applied to the population of the census block. For example, a census block has a population of 400 people. Five percent of the census block intersects the 1-percent-annual-chance flood hazard area. The ratio estimates that 20 people are then at risk within the 1-percent-annual-chance flood hazard area (5% of the total population for that census block).

Certain assumptions are inherent in any risk assessment. For this plan, three primary assumptions were discussed by the HMPC from the beginning of the risk assessment process: (1) that the best readily available data would be used, (2) that the hazard data selected for use is reasonably accurate for mitigation planning purposes, and (3) that the risk assessment will be regional in nature with local, municipal-level data provided where appropriate and practical.

Key methodologies and assumptions made for specific hazards analysis are described in their respective profiles.

PRIORITY RISK INDEX

The conclusions drawn from the hazard profiling and vulnerability assessment process can be used to prioritize all potential hazards to the Outer Banks region. The Priority Risk Index (PRI) was applied for this purpose because it provides a standardized numerical value so that hazards can be compared against one another (the higher the PRI value, the greater the hazard risk). PRI values are obtained by assigning varying degrees of risk to five categories for each hazard (probability, impact, spatial extent, warning time, and duration). Each degree of risk was assigned a value (1 to 4) and a weighting factor as summarized in Table 4.5.

The results of the PRI scoring are provided in each hazard profile and in Section 4.6 Conclusions on Hazard Risk.

Table 4.5 – Priority Risk Index

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

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

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

The purpose of the PRI is to categorize and prioritize all potential hazards for the Outer Banks planning area as high, moderate, or low risk. The summary hazard classifications generated through the PRI allow for the prioritization of the high and moderate hazard risks for mitigation planning purposes.

4.4 ASSET INVENTORY

4.4.1 POPULATION

NCEM's IRISK database provided the asset inventory used for this vulnerability assessment. Population data in IRISK is pulled from the 2020 Census and includes a breakdown of population into two subpopulations considered to be a greater risk than the general population, the elderly and children. Table 4.6 details the population counts by jurisdiction used for the vulnerability assessment.

Table 4.6 – Population Counts by Jurisdiction, 2020

Jurisdiction	2020 Census Population	Elderly (Age 65 and Over)	Children (Age 5 and Under)
Currituck			
Currituck County	31,343	5,390	1,596
Dare			
Dare County (Unincorporated Area)	24,369	4,752	1,150
Town of Duck	1,722	582	53
Town of Kill Devil Hills	7,588	1,298	260
Town of Kitty Hawk	3,903	861	137
Town of Manteo	1,360	220	80
Town of Nags Head	3,178	1,084	70
Town of Southern Shores	2,536	858	78
Subtotal Dare	**44,656**	**9,655**	**1,828**
Region Total	**75,999**	**15,045**	**3,424**

Source: NCEM IRISK Database; 2020 Decennial Census

4.4.2 PROPERTY

Building counts were also provided by the IRISK database. These values were generated using locally-provided building footprint and parcel data as well as data generated by NCEM in 2010. The methodology for generating the building asset inventory is described in greater detail in Section 4.3. The IRISK building inventory reflects a 2.4% increase in total building count and a 4.1% increase in total exposed building value since the development of the 2020 plan. However, the exposure reflected in IRISK is likely an underestimate of actual present-day exposure because the region has experienced more growth and redevelopment than is reflected in these estimates. The Planning Area Profile in Section 3 describes the growth that has occurred since 2010 and provides a means of estimating the degree to which exposure and vulnerability may have increased.

Table 4.7 – Building Counts and Values by Jurisdiction

Jurisdiction	Building Count	Building Value
Currituck		
Currituck County	17,685	$3,350,427,837
Dare		
Dare County (Unincorporated Area)	14,019	$2,398,251,498
Town of Duck	2,409	$737,531,039
Town of Kill Devil Hills	6,033	$977,172,103
Town of Kitty Hawk	2,862	$640,242,261
Town of Manteo	943	$283,065,661
Town of Nags Head	4,868	$1,105,653,993
Town of Southern Shores	2,513	$685,764,229
Subtotal Dare	**33,647**	**$6,827,680,784**
Region Total	**51,332**	**$10,178,108,621**

Source: NCEM IRISK Database

To supplement the asset inventory and provide a clearer picture of the current asset exposure in the Outer Banks Region, current parcel data was evaluated to identify recent development since NCEM's IRISK database was last updated. The building footprint layer from IRISK was compared to current parcel data; any parcels with an improved value that did not already have a building in IRISK were appended the property inventory. This information is not incorporated into the risk assessment, which was prepared using IRISK. However, this summary of recent development provides some context to understand the degree to which the IRISK exposure and vulnerability numbers differ from current conditions.

Table 4.8 provides a summary of estimated property exposure in each participating community.

Table 4.8 – Current Improved Parcels, as of June 2024

Jurisdiction	Improved Parcel Count	Total Improved Value
Currituck County		
Currituck County	21,739	$5,072,341,006
Dare County		
Unincorporated Dare County	14,805	$2,899,953,848
Duck	2,530	$800,986,995
Kill Devil Hills	6,680	$1,230,546,630
Kitty Hawk	3,083	$748,719,370
Manteo	1,106	$335,489,696
Nags Head	5,125	$1,227,680,160
Southern Shores	2,749	$803,338,742
Region Total	**57,817**	**$13,119,056,447**

Source: County parcel data, retrieved June 2024; IRISK database building footprints

4.4.3 CRITICAL FACILITIES

The IRISK database also identifies Critical Infrastructure and Key Resources (CIKR) buildings. Critical infrastructure are assets, systems, networks, and functions that would have a debilitating impact on security, the economy, or public health and safety if disrupted. Key resources are public or private resources essential to operation of the economy and the government. These properties are detailed in Table 4.9.

Table 4.9 – Critical Infrastructure and Key Resources by Type and Jurisdiction

Jurisdiction	Food and Agriculture	Banking and Finance	Chemical & Hazardous	Commercial	Communications	Critical Manufacturing	EM	Healthcare	Government Facilities	Defense Industrial Base	Nuclear Reactors, Materials and Waste	Postal and Shipping	Transportation Systems	Energy	Emergency Services	Water	Total
Currituck County	443	186	0	715	4	206	24	0	104	0	0	0	0	2	7	25	**1,716**
Dare County (Unincorporated Area)	23	14	0	581	0	106	11	0	106	1	1	1	54	5	10	14	**927**
Town of Duck	1	4	0	69	1	4	0	0	2	0	0	0	6	0	2	1	**90**
Town of Kill Devil Hills	1	11	0	254	4	47	10	0	13	0	1	0	32	4	1	5	**383**
Town of Kitty Hawk	9	39	0	417	0	108	9	0	12	0	0	0	57	12	9	9	**681**
Town of Manteo	1	5	0	107	3	5	4	0	20	0	0	0	20	0	1	0	**166**
Town of Nags Head	6	27	0	855	12	48	48	0	39	0	0	0	12	9	12	24	**1,092**
Town of Southern Shores	0	6	0	54	3	48	3	0	6	0	0	0	21	0	9	3	**153**
Total	**484**	**292**	**0**	**3,052**	**27**	**572**	**109**	**0**	**302**	**1**	**2**	**1**	**202**	**32**	**51**	**81**	**5,208**

Source: NCEM Risk Management Tool

Using the existing CIKR inventory and local data, the HMPC and community staff refined and supplemented the IRISK asset inventory with a current list of critical facilities. These assets are considered community lifelines, which are defined by FEMA as the buildings and infrastructure that enable the continuous operation of critical business and government functions and are essential to human health and safety or economic security. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. These critical facilities are a priority for mitigation planning and were examined against known hazard areas, where possible, in this risk assessment.

Critical facilities are summarized by FEMA lifeline category in Table 4.10 and shown in Figure 4.1 and Figure 4.2. More detailed maps of critical facilities are provided in the community annexes.

Table 4.10 – Critical Facilities, Outer Banks Region

Jurisdiction	Facility Type								Total
	Communications	Energy	Food, Hydration, Shelter	Hazardous Materials	Health and Medical	Safety and Security	Transportation	Water Systems	
Currituck County	30	3	62	0	3	23	3	35	159
Unincorporated Dare County	0	1	7	0	2	30	5	17	62
Duck	3	0	0	0	1	4	0	1	9
Kill Devil Hills	0	2	7	0	1	2	0	8	20
Kitty Hawk	2	3	0	0	4	6	0	21	36
Manteo	0	0	8	0	4	3	1	1	17
Nags Head	1	2	2	0	3	8	0	9	25
Southern Shores	3	0	1	0	0	8	0	2	14
Region Total	**39**	**11**	**87**	**0**	**18**	**84**	**9**	**94**	**342**

Figure 4.1 – Critical Facilities, Currituck County

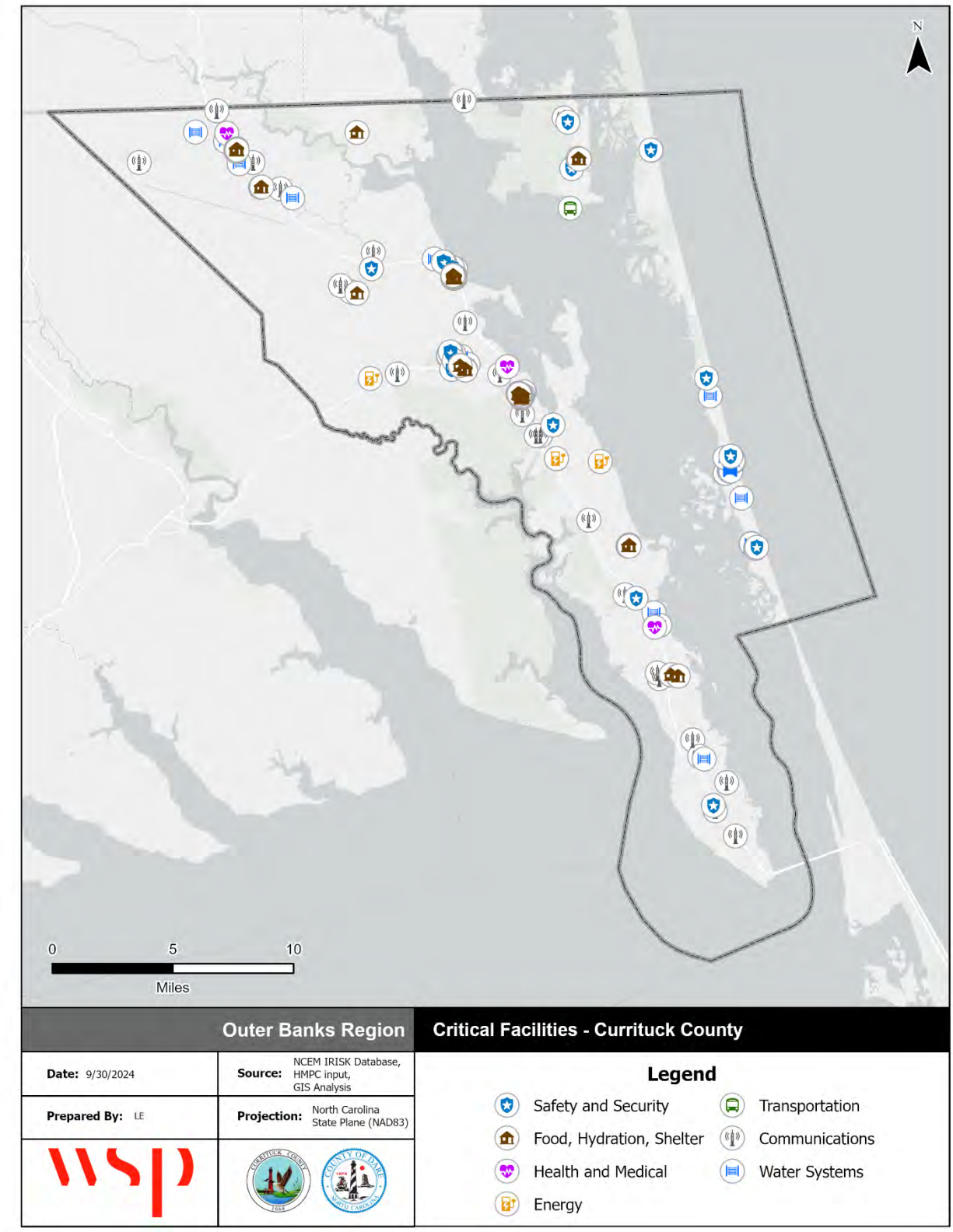
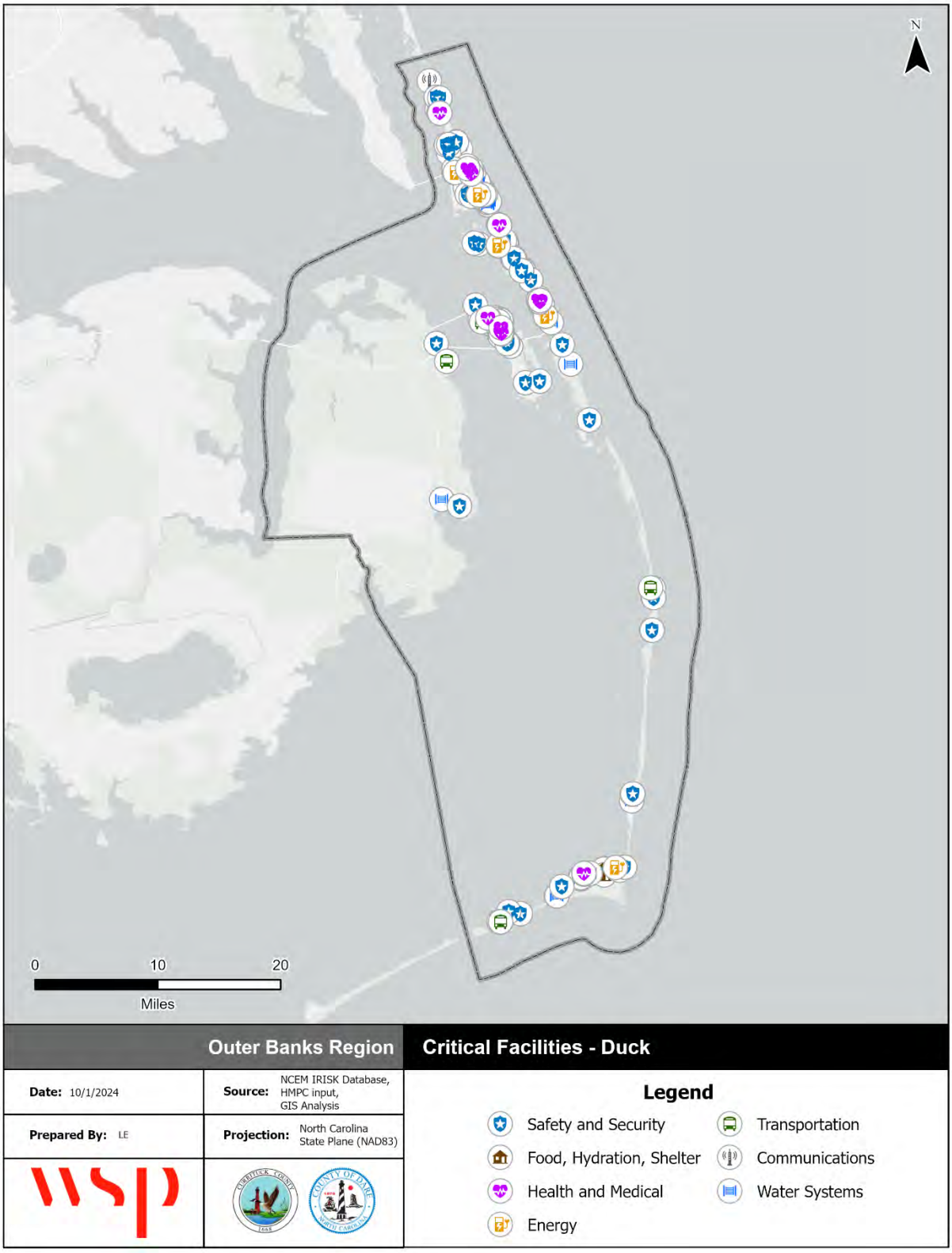


Figure 4.2 – Critical Facilities, Dare County



4.4.4 HISTORIC AND CULTURAL RESOURCES

Sites and structures of historic and cultural significance were identified using GIS data from the North Carolina State Historic Preservation Office (NCHPO) and are summarized in Table 4.11. This list includes 35 buildings, one historic district, and one additional site identified based on stakeholder input. Note that two sites are listed by NCHPO as either destroyed or moved from their original site.

Table 4.11 – Historic and Cultural Resources

Site ID	Site Name	Description	Year Listed
Currituck County			
CK0001	Currituck Beach Lighthouse	1875 red brick lighthouse; 158 ft high	1973
CK0003	Twin Houses	Two 1797 2-story frame Federal houses joined	1972
CK0005	Whalehead Club	1922-1925 Arts & Crafts/Art Nouveau detail frame hunting lodge; now wildlife museum	1980
CK0006	Culong	1812 gable front Federal	1980
CK0008	Shaw House	1880 Italianate w/cupola	1980
CK0009	Currituck Shooting Club (Gone)	Late 19th C. rustic complex, shingled complex, private hunting club	1980
CK0040	Grandy School	1908 1-story weatherboard & shingle frame school	1998
CK0055	Jarvisburg Colored School	1886-1894 frame school	2009
CK0096	Currituck County Courthouse and Jail	1820 2-story brick jail, 1860s, 1897, 1952 brick courthouse	1979
CK0104	Wilson Walker House and Walker-Snowden Store	c. 1876 2-story side gable T-shaped frame house, 1895 1 1/2-story 6-bay side gable frame store & 1850s outbuildings	2021
CK0106	Currituck Beach Lighthouse Complex Boundary Expansion	1873-1939 lighthouse, keeper's house, suport buildings	2000
CK0165	Coinjock Colored School (Original site)	1919 1-story frame Rosenwald School	2013
CK0300	Flyway Club	1928-30 2-story frame farm building and 1960 frame 2-story lodge	2015
Dare County			
DR0001	Bodie Island Light Station	1872 brick 164-foot lighthouse	2003
DR0002	Bodie Island Lifesaving/Coast Guard Station	1878 (altered) and 1925 lifesaving/Coast Guard complex	1979
DR0003	Caffey's Inlet Lifesaving Station	1917 Shingle Style frame lifesaving station	1978
DR0004	Cape Hatteras Light Station (Current site)	1870 brick lighthouse 208 ft, spiral daymark	1978
DR0006	Chicamacomico Lifesaving Station	1874; 1911 Shingle style 1 1/2-story lifesaving station	1976
DR0008	Fort Raleigh National Historic Site	Site of earliest English colonizing attempts in North America & only direct link w/ Elizabethan era exploration	1966
DR0009	Hatteras Weather Bureau Station	1901 1 1/2-story frame office/residence	1978

Site ID	Site Name	Description	Year Listed
DR0011	Nags Head Beach Cottage Row Historic District	Early 20th C. shingled beach cottages	1977
DR0012	Oregon Inlet Station	1897; 1933; 1970 Coast Guard station	1975
DR0014	Wright Brothers National Memorial (NHL)	1932 grey granite obelisk	1966
DR0015	George Washington Creef House	19th C. Victorian 2-story frame house	1982
DR0020	Theodore S. Meekins House	1910-1912 2-story Queen Anne style frame house	1982
DR0021	Kitty Hawk Lifesaving Station (Original site)	1911 shingled lifesaving station	1984
DR0022	First Colony Inn	1932 2 1/2-story frame inn	1993
DR0023	Salvo Post Office (Original site)	c. 1910 small 1-story frame post office building	1993
DR0024	Sam's Diner	c. 1940 porcelin panels/steel trim diner by Kullman Co.	1999
DR0186	Ellsworth and Lovie Ballance House	1915 2-story board and batten frame house	2001
DR0273	Wright Brothers National Memorial Visitor Center (NHL)	1960 Modernist building by Mitchell/Giurgola (NHL)	2001
DR0286	John T. Daniels House	c. 1900 2-story frame house	2003
DR0506	Sea Foam Motel	1948 brick tourist motel	2004
DR0574	Mattie Midgett Store and House	1914 2-story shingled store; 1933 2-story shingled house	2004
DR0605	Markham-Albertson-Stinson Cottage (Gone)	c. 1916 soundside frame cottage over water	2006
DR0606	Rasmus Midgett House	c. 1860; 1890; 1899 2-story frame house	2009
N/A	Elizabethan Gardens*	--	--

Source: North Carolina State Historic Preservation Office, 10/1/2024

Note: Elizabethan Gardens is not included on the National Register of Historic Places or recognized by NCHPO but was included in this inventory based on stakeholder input.

4.5 HAZARD PROFILES, ANALYSIS, AND VULNERABILITY

4.5.1 DROUGHT

HAZARD BACKGROUND

Drought is a deficiency in precipitation over an extended period. It is a normal, recurrent feature of climate that occurs in virtually all climate zones. The duration of a drought varies widely. There are cases when drought develops relatively quickly and lasts a very short period of time, exacerbated by extreme heat and/or wind, and there are other cases when drought spans multiple years, or even decades. Studying the paleoclimate record is often helpful in identifying when long-lasting droughts have occurred. Common types of drought are detailed below in Table 4.12.

Table 4.12 – Drought Classifications

Type	Details
Meteorological Drought	Meteorological Drought is based on the degree of dryness (rainfall deficit) and the length of the dry period.
Agricultural Drought	Agricultural Drought is based on the impacts to agriculture by factors such as rainfall deficits, soil water deficits, reduced ground water, or reservoir levels needed for irrigation.
Hydrological Drought	Hydrological Drought is based on the impact of rainfall deficits on the water supply such as stream flow, reservoir and lake levels, and ground water table decline.
Socioeconomic Drought	Socioeconomic drought is based on the impact of drought conditions (meteorological, agricultural, or hydrological drought) on supply and demand of some economic goods. Socioeconomic drought occurs when the demand for a good exceeds supply as a result of a weather-related deficit in water supply.

Source: National Drought Mitigation Center

The wide variety of disciplines affected by drought, its diverse geographical and temporal distribution, and the many scales drought operates on make it difficult to develop both a definition to describe drought and an index to measure it. Many quantitative measures of drought have been developed in the United States, depending on the discipline affected, the region being considered, and the particular application. Several indices developed by Wayne Palmer, as well as the Standardized Precipitation Index, are useful for describing the many scales of drought.

The U.S. Drought Monitor provides a summary of drought conditions across the United States and Puerto Rico. Often described as a blend of art and science, the Drought Monitor map is updated weekly by combining a variety of data-based drought indices and indicators and local expert input into a single composite drought indicator.

The **Palmer Drought Severity Index** (PDSI) devised in 1965, was the first drought indicator to assess moisture status comprehensively. It uses temperature and precipitation data to calculate water supply and demand, incorporates soil moisture, and is considered most effective for unirrigated cropland. It primarily reflects long-term drought and has been used extensively to initiate drought relief. It is more complex than the Standardized Precipitation Index (SPI) and the Drought Monitor.

The **Standardized Precipitation Index** (SPI) is a way of measuring drought that is different from the Palmer Drought Severity Index (PDSI). Like the PDSI, this index is negative for drought, and positive for wet conditions. But the SPI is a probability index that considers only precipitation, while Palmer's indices

are water balance indices that consider water supply (precipitation), demand (evapotranspiration) and loss (runoff).

In addition to the calculated indices, the North Carolina Drought Management Advisory Council's (DMAC) Technical Drought Advisory Team compiles drought-related information each week including stream flows, groundwater and reservoir levels, wildfire activity, and crop conditions and send recommendations to the U.S. Drought Monitor for North Carolina's drought conditions.

The State of North Carolina has a Drought Assessment and Response Plan as an Annex to its Emergency Operations Plan. This plan provides the framework to coordinate statewide response to a drought incident.

Warning Time: 1 – More than 24 hours

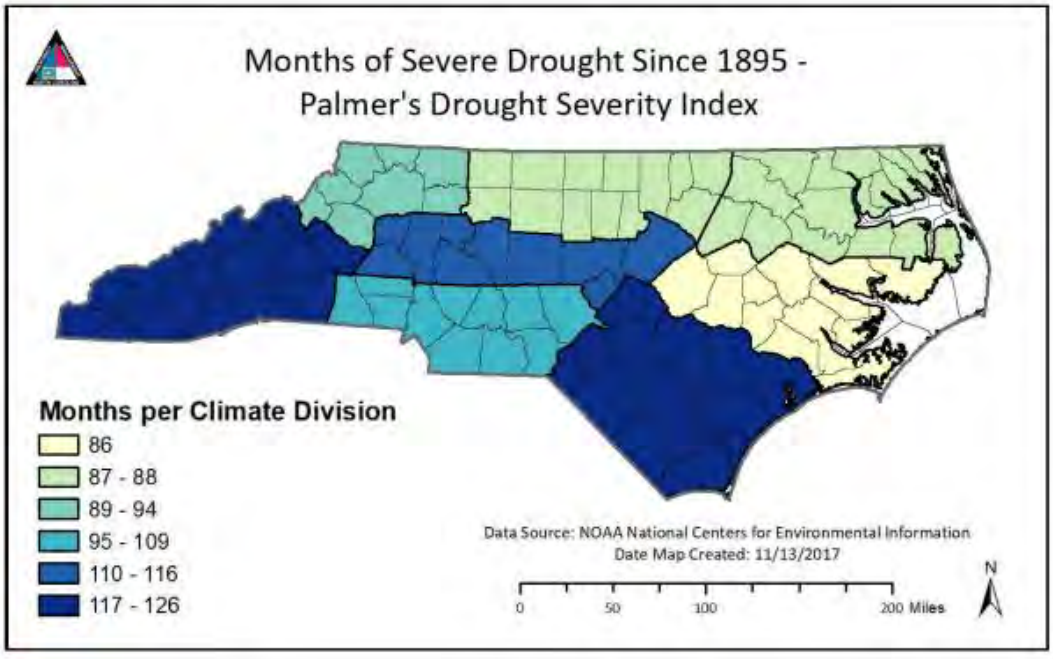
Duration: 4 – More than one week

LOCATION

Typically, the National Weather Service looks at drought and extreme heat as episodes that impact a widespread forecast "zone," and therefore it is not common to pinpoint a specific location within a planning area that is more susceptible to these hazards than others. From this viewpoint, each county is considered uniformly at risk to drought and extreme heat. However, the most significant financial losses are likely to occur in areas that are primarily agricultural. Areas with water-dependent recreational economies are also at higher risk.

Figure 4.3 shows the Palmer Drought Severity Index (PDSI) summary map for North Carolina since 1895. PDSI drought classifications are based on observed drought conditions and range from -0.5 (incipient dry spell) to -4.0 (extreme drought). As can be seen, northern North Carolina has historically not seen as many significant long-term droughts as the western and southeastern regions of the state. Specifically, the Outer Banks Region was in severe drought for 87-88 months during the identified timeframe.

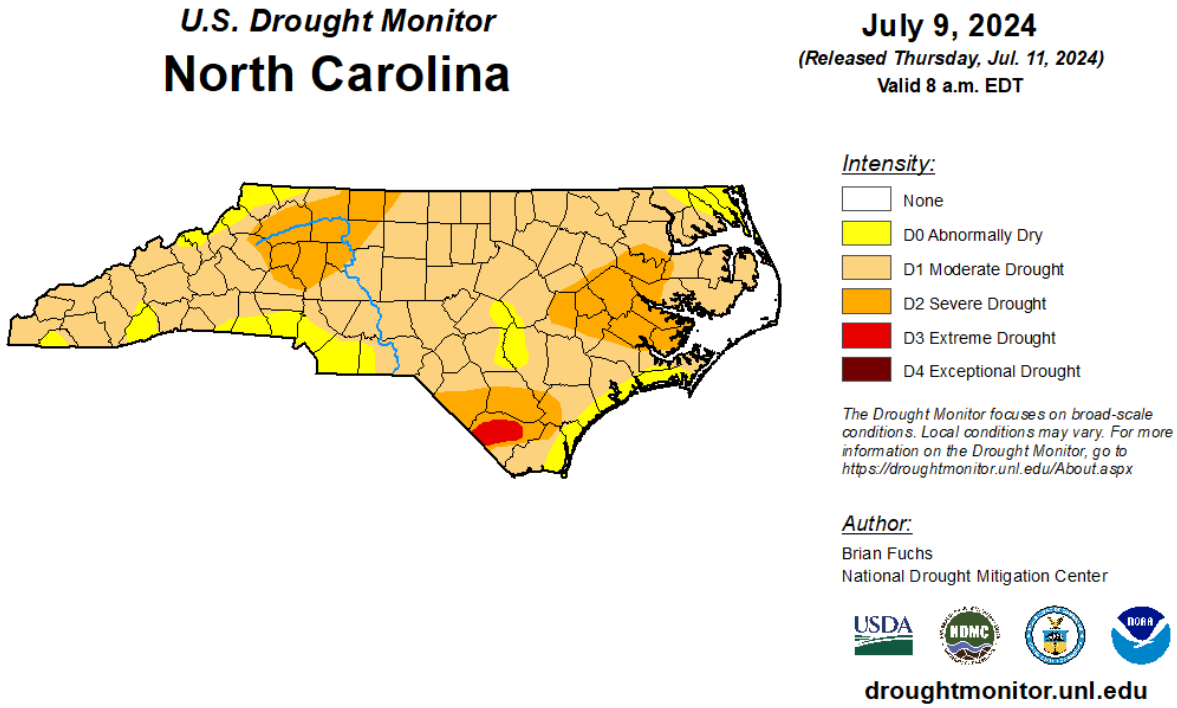
Figure 4.3 – PDSI Months of Severe Drought Since 1895



Source: State of North Carolina 2023 Hazard Mitigation Plan

Figure 4.4 shows the U.S. Drought Monitor's drought ratings for North Carolina as of February 22, 2024; as of that date, neither Currituck County nor Dare County were experiencing abnormally dry (D0) conditions. This map illustrates the regional nature of drought when it occurs.

Figure 4.4 – US Drought Monitor for Week of July 9, 2024



Source: U.S. Drought Monitor

Spatial Extent: 4 – Large

EXTENT

Drought extent can be defined in terms of intensity, using the U.S. Drought Monitor scale. The Drought Monitor Scale measures drought episodes with input from the Palmer Drought Severity Index, the Standardized Precipitation Index, the Keetch-Byram Drought Index, soil moisture indicators, and other inputs as well as information on how drought is affecting people. Figure 4.5 details the classifications used by the U.S. Drought Monitor. A category of D2 (severe) or higher on the U.S. Drought Monitor Scale can typically result in crop or pasture losses, water shortages, and the need to institute water restrictions.

The Outer Banks Region is susceptible to any of the levels of drought on the U.S. Drought Monitor scale. The most severe period of drought since 2000 occurred in the summer of 2011 and reached extreme drought across 100% of Dare County and 15% of Currituck County.

Impact: 1 – Minor

Figure 4.5 – US Drought Monitor Classifications

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

Source: US Drought Monitor

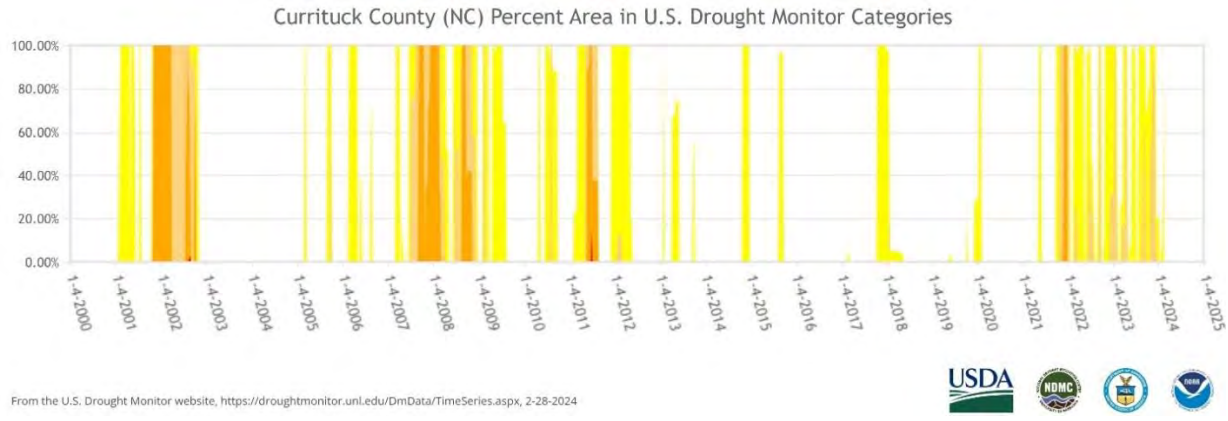
HISTORICAL OCCURRENCES

The U.S. Drought Monitor provides historical data on droughts in both Currituck and Dare Counties. The following figures show historical periods where each county was considered in some level of drought condition. The color key shown in Figure 4.5 indicates the intensity of the drought. According to the U.S. Drought Monitor, between January 1, 2000 and December 31, 2023, Currituck County was in some level of drought condition 35% of the time, or 443 of 1,252 weeks. Most this time was spent in "abnormally dry" or "moderate" drought conditions; Currituck County recorded four weeks in "extreme" drought:

- Week of July 5, 2011 – 14.94% of county in extreme drought
- Week of August 20, 2002 – 2.28% of county in extreme drought
- Week of August 27, 2002 – 2.41% of county in extreme drought
- Week of March 12, 2002 – 0.65% of county in extreme drought

The 2002 drought lasted 55 weeks, between the weeks of October 16, 2001 and October 29, 2002.

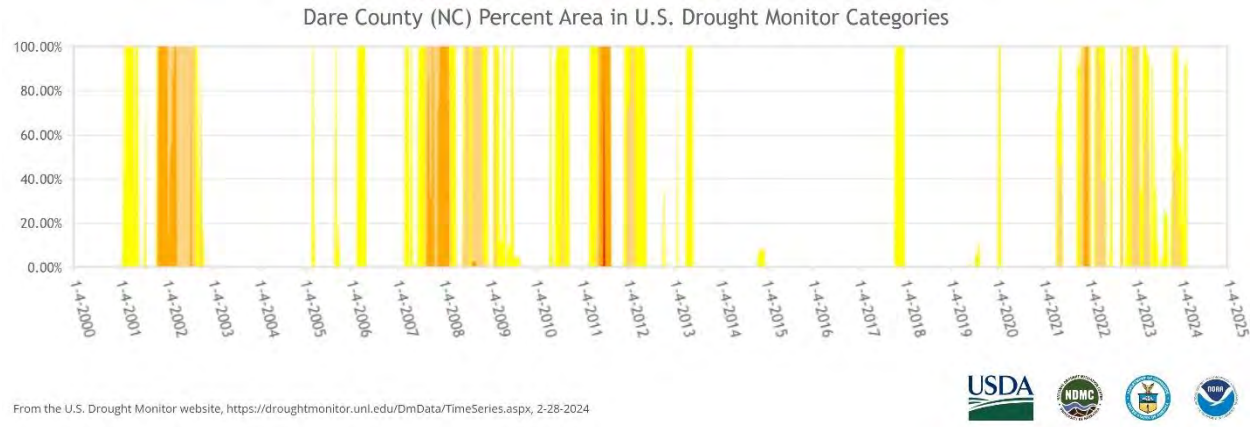
Figure 4.6 – US Drought Monitor Historical Trends – Currituck County 2000-2023



Source: U.S. Drought Monitor

According to the U.S. Drought Monitor, between January 1, 2000 and December 31, 2023, Dare County was in some level of drought condition 33% of the time, or 418 of 1252 weeks. The majority of this time was spent in "abnormally dry" or "moderate" drought conditions; Dare County recorded one instance, during the week of July 5, 2011, where 100% of the land area was considered in "extreme drought." This corresponded to a larger drought event lasting from March through August of 2011.

Figure 4.7 – US Drought Monitor Historical Trends – Dare County 2000-2023



Source: U.S. Drought Monitor

The National Drought Mitigation Center's Drought Impact Reporter Dashboard summarizes drought-related media reports starting in 2005. The following narratives were compiled from the Dashboard search results for Dare and Currituck Counties:

- In 2010, Dare County was among several North Carolina Counties declared to be natural disaster areas by the U.S. Department of Agriculture due to drought and high temperatures. The declaration permitted farmers, ranchers, and other agricultural producers to apply for low-interest emergency loans from the Farm Service Agency.
- In the late summer of 2011, a wildfire burning in the Great Dismal Swamp National Wildlife Refuge moved into North Carolina and parts of Currituck County. Local news reported that drought conditions, winds, and availability of fuel has allowed the fire to spread easily and burn deep into the soil.
- During the winter of 2020, abnormal dryness along the coast of North Carolina led the state Drought Management Advisory Council to strongly recommend the implementation of drought response actions for affected areas including Dare and Currituck Counties.
- The U.S. Forest Service implemented burn bans in the Counties in Summer 2019 and Fall 2021 due to dry conditions.

PROBABILITY OF FUTURE OCCURRENCE

Based on historical occurrences, the probability that the Region will experience some level of drought is likely, with Dare County in drought 40 percent of the time during the period from 2000 through 2023 and Currituck County in drought 35 percent of the time during that same period. However, the probability of extreme drought is much lower, with only one instance of extreme drought in Dare County and four instances of extreme drought in Currituck County. Overall, drought in the Outer Banks can be considered possible.

Probability: 2 – Possible

CLIMATE CHANGE

The Fourth National Climate Assessment reports that average and extreme temperatures are increasing across the country and average annual precipitation is decreasing in the Southeast.[1] Heavy precipitation events are becoming more frequent, meaning that there will likely be an increase in the average number of consecutive dry days. As temperature is projected to continue rising, evaporation rates are expected to increase, resulting in decreased surface soil moisture levels. Together, these factors suggest that drought will increase in intensity and duration in the Southeast.

The Fifth National Climate Assessment upholds the climate trends reported in the Fourth Assessment and presents additional patterns in the Southeast that exacerbate climate risk and impacts. These patterns include population growth, high proportion of the population with health issues or underlying health conditions, and a large, climate-dependent agricultural sector.[2]

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

This assessment of vulnerability to drought in the Outer Banks region is based on historical occurrences of drought in the planning area and generalized concerns regarding potential drought consequences. Agricultural vulnerability was estimated using data from the USDA Risk Management Agency crop insurance claims, specifically past claims related to drought.

PEOPLE

Drought can affect people's physical and mental health. For those economically dependent on a reliable water supply, drought may cause anxiety or depression about economic losses, reduced incomes, and other employment impacts. Conflicts may arise over water shortages. People may be forced to pay more for water, food, and utilities affected by increased water costs.

Drought may also cause health problems due to poorer water quality from lower water levels. If accompanied by extreme heat, drought can also result in higher incidents of heat stroke and even loss of human life.

PROPERTY

Drought is unlikely to cause damages to the built environment. However, in areas with shrinking and expansive soils, drought may lead to structural damages. Drought may cause severe property loss for the agricultural industry in terms of crop and livestock losses. The USDA's Risk Management Agency (RMA) maintains a database of all paid crop insurance claims. Between 2007-2023, the sum of claims paid for crop damage as a result of drought in Currituck County was $1,341,285, or an average of $78,899 in losses every year. There were $419,314 in recorded losses in Dare County, or an average of $24,666 in losses every year, though losses only occurred in four years. Table 4.13 summarizes the crop losses due to drought in reported in the RMA system.

[1] https://nca2018.globalchange.gov/chapter/19/

[2] https://nca2023.globalchange.gov/chapter/22/

Table 4.13 – Crop Losses Resulting from Drought, 2007-2023, Outer Banks

Year	Determined Acres	Indemnity Amount
Currituck County		
2007	948.60	$84,250.00
2008	1,590.10	$75,505.00
2009	388.90	$18,154.00
2010	703.08	$33,932.00
2011	3,055.63	$240,606.00
2013	699.40	$55,230.00
2014	123.80	$1,534.00
2015	947.37	$71,537.10
2016	156.60	$18,449.50
2017	395.70	$17,466.00
2019	572.90	$35,798.00
2020	3,563.52	$263,431.50
2022	2,772.14	$273,899.45
2023	3,635.98	$151,493.00
Subtotal Currituck	*19,553.17*	*$1,341,285.55*
Dare County		
2016	156.60	$18,449.50
2019	637.29	$97,611.15
2022	1,909.29	$254,797.00
2023	310.11	$48,484.00
Subtotal Dare	*3,013.28*	*$419,314.65*
Region Total	**22,566.45**	**$1,760,600.20**

Source: USDA Risk Management Agency

ENVIRONMENT

Drought can affect local wildlife by shrinking food supplies and damaging habitats. Sometimes this damage is only temporary, and other times it is irreversible. Wildlife may face increased disease rates due to limited access to food and water. Increased stress on endangered species could cause extinction.

Drought conditions can also provide a substantial increase in wildfire risk. As plants and trees die from a lack of precipitation, increased insect infestations, and diseases—all of which are associated with drought—they become fuel for wildfire. Long periods of drought can result in more intense wildfires, which bring additional consequences for the economy, the environment, and society. Drought may also increase likelihood of wind and water erosion of soils.

CONSEQUENCE ANALYSIS

Table 4.14 summarizes the potential negative consequences of drought.

Table 4.14 – Consequence Analysis – Drought

Category	Consequences
Public	Can cause anxiety or depression about economic losses, conflicts over water shortages, reduced incomes, fewer recreational activities, higher incidents of heat stroke, and fatality.

Category	Consequences
Responders	Impacts to responders are unlikely. Exceptional drought conditions may impact the amount of water immediately available to respond to wildfires.
Continuity of Operations (including Continued Delivery of Services)	Drought would have minimal impacts on continuity of operations due to the relatively long warning time that would allow for plans to be made to maintain continuity of operations.
Property, Facilities and Infrastructure	Drought has the potential to affect water supply for residential, commercial, institutional, industrial, and government-owned areas. Drought can reduce water supply in wells. Utilities may be forced to increase rates.
Environment	Environmental impacts include strain on local plant and wildlife; increased probability of erosion and wildfire.
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs. Businesses that depend on farming may experience secondary impacts. Extreme drought has the potential to impact local businesses in landscaping, recreation and tourism, and public utilities.
Public Confidence in the Jurisdiction's Governance	When drought conditions persist with no relief, local or State governments must often institute water restrictions, which may impact public confidence.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes drought hazard risk by jurisdiction. Probability, warning time, duration and spatial extent are inherent to the hazard and are consistent across all jurisdictions. Most damages that result from drought are to crops and other agriculture-related activities as well as water-dependent recreation industries. The magnitude of the impacts is typically greater in unincorporated areas; thus, impacts could be higher in Currituck County, which has also experienced more crop losses due to drought. In developed areas, the magnitude of drought is less severe, with lawns and local gardens affected and potential impacts on local water supplies during severe, prolonged drought.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	2	2	4	1	4	2.5	M
Dare County	2	1	4	1	4	2.2	M
Duck	2	1	4	1	4	2.2	M
Kill Devil Hills	2	1	4	1	4	2.2	M
Kitty Hawk	2	1	4	1	4	2.2	M
Manteo	2	1	4	1	4	2.2	M
Nags Head	2	1	4	1	4	2.2	M
Southern Shores	2	1	4	1	4	2.2	M

4.5.2 EARTHQUAKE

HAZARD BACKGROUND

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

In some coastal areas, earthquakes can cause an additional risk of tsunamis. Per NOAA, a tsunami is a series of waves, which can have tens to hundreds of miles between crests, caused by a large and sudden displacement of the ocean from an earthquake or undersea volcanic eruption. Tsunamis radiate outward in all directions from the disturbance and can cause dangerous coastal flooding and currents for several hours to days when they reach the coast. Much like earthquakes, scientists cannot accurately predict when a tsunami will occur, but NOAA's Tsunami Warning Centers monitor seismic and water-level networks to detect tsunamis and issue warnings.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

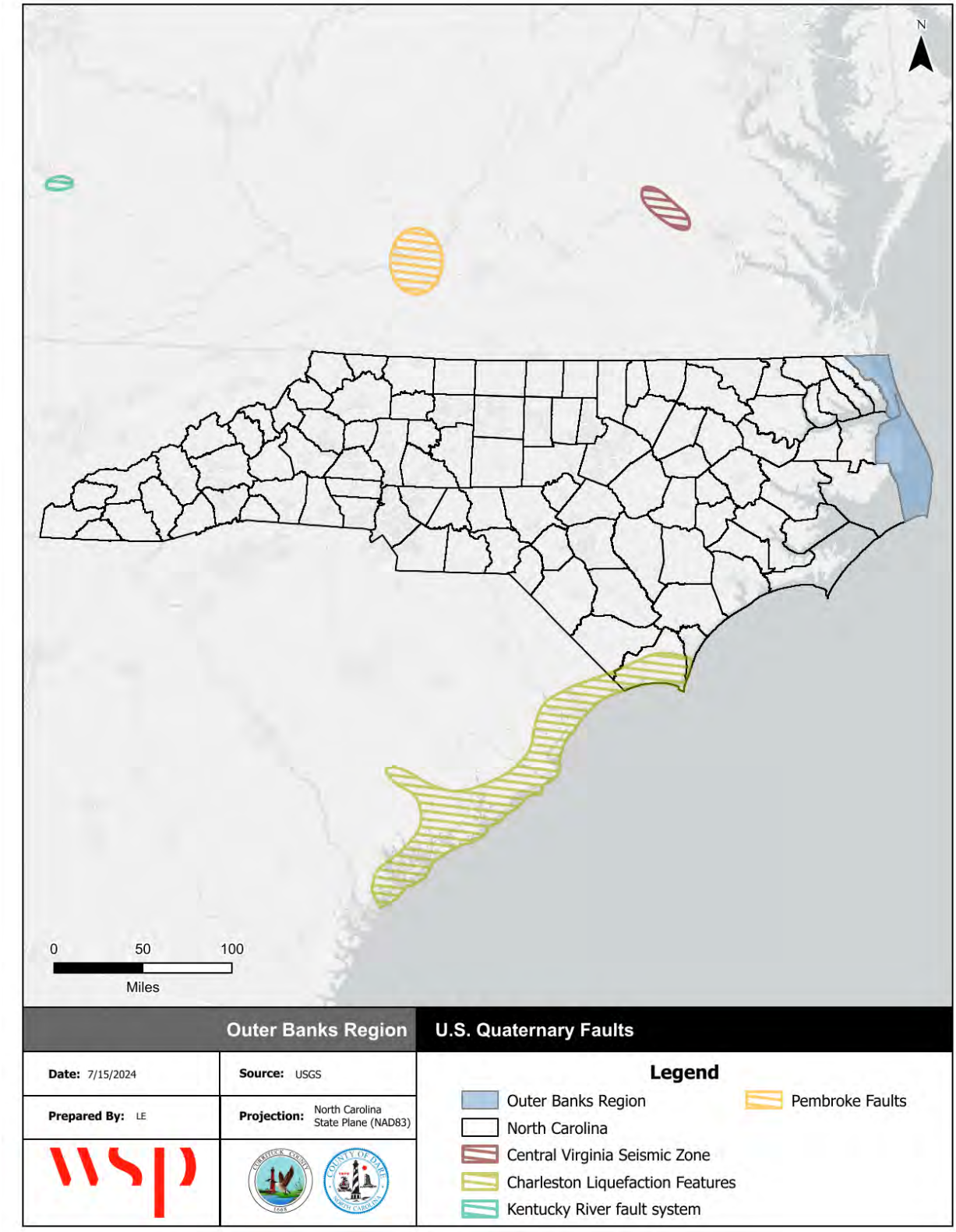
LOCATION

Figure 4.8 reflects the Quaternary faults that present an earthquake hazard for the Outer Banks planning area based on data from the United State Geological Survey (USGS) Earthquake Hazards Program.

All of North Carolina is subject to earthquakes, with the western and southern region most vulnerable to a damaging earthquake. The state is affected by both the Charleston Fault in South Carolina and New Madrid Fault in Tennessee. Both of these faults have generated earthquakes measuring greater than 8.0 on the Richter Scale during the last 200 years. In addition, there are several smaller fault lines in eastern Tennessee and throughout North Carolina that could produce less severe shaking.

Spatial Extent: 4 – Large

Figure 4.8 – US Quaternary Faults



Source: USGS Earthquake Hazards Program

EXTENT

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. A detailed description of the Richter Scale is given in Table 4.15. The Richter scale is usually used by the news media when reporting the magnitude of earthquakes and is the scale most familiar to the public. However, intensity scales can provide a more meaningful measure of earthquake severity because intensity refers to the effects actually experienced in a given place. The scale currently used in the U.S. is the Modified Mercalli Intensity (MMI) scale. The MMI scale does not have a mathematical basis; instead it is an arbitrary ranking in which MMI values are assigned to specific sites after an earthquake based on observed impacts. Figure 4.9 shows descriptions for levels of earthquake intensity on the MMI scale. Seismic shaking is typically the greatest cause of losses to structures during earthquakes.

Table 4.15 – Richter Scale

Magnitude	Effects
Less than 3.5	Generally, not felt, but recorded.
3.5 – 5.4	Often felt, but rarely causes damage.
5.4 – 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1 – 6.9	Can be destructive in areas up to 100 kilometers across where people live.
7.0 – 7.9	Major earthquake. Can cause serious damage over larger areas.
8.0 or greater	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: 2023 North Carolina State Hazard Mitigation Plan

Figure 4.9 – Modified Mercalli Intensity (MMI) Scale

Intensity	Shaking	Description/Damage
I	Not felt	Not felt except by a very few under especially favorable conditions.
II	Weak	Felt only by a few persons at rest,especially on upper floors of buildings.
III	Weak	Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
IV	Light	Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V	Moderate	Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
VI	Strong	Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight.
VII	Very strong	Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
VIII	Severe	Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned.
IX	Violent	Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
X	Extreme	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent.

Source: USGS Earthquake Hazards Program

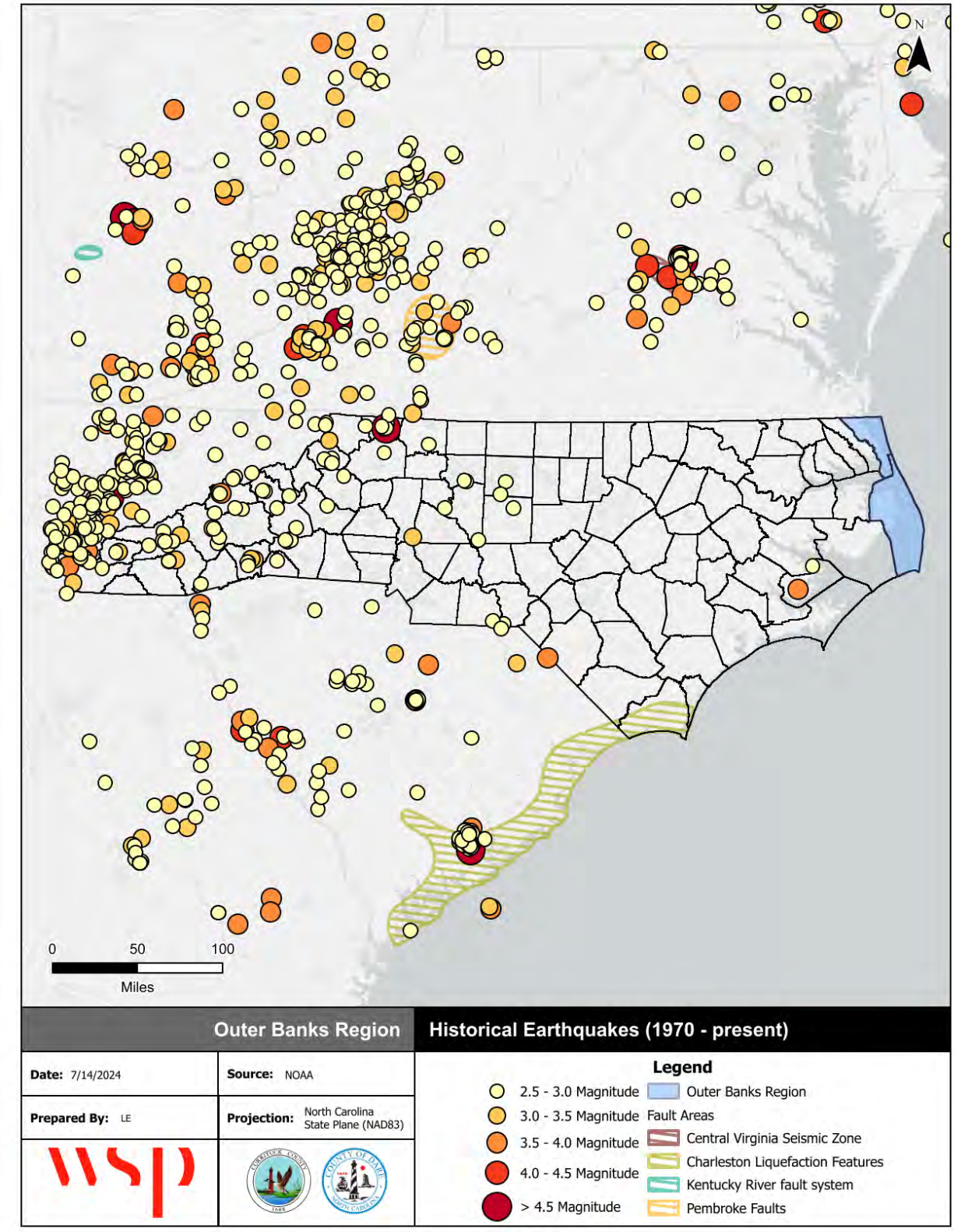
Tsunamis can be measured based on their size, speed, and number of waves, but tsunamis are generally described by their heights at the shore and the maximum runup of the tsunami waves on the land. NOAA developed and deployed DART – Deep-Ocean Assessment and Reporting of Tsunamis. DART is a tsunamograph that provides accurate, real-time data on tsunamis. There is an intensity scale – the New Tsunami Intensity Scale, which was introduced in 2001 by Papadopoulos and Umamura – but it is rarely used today.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

The USGS Earthquake Hazards Program maintains a database of all historical earthquakes of a magnitude 2.5 and greater. These events are illustrated in Figure 4.10, which shows historical earthquakes by magnitude in relation to the Outer Banks Region, North Carolina, and the Quaternary Faults identified by USGS. This includes events from 1970 to 2024.

Figure 4.10 – Historical Earthquakes by Magnitude, 1970-2024



Source: USGS Earthquakes Hazard Program

The above map documents all earthquakes that have occurred within North Carolina but given the long distances across which earthquake impacts can be felt, these events do not encompass all earthquakes that have affected North Carolina. USGS maintains a "Did You Feel It?" (DYFI) database to collect information from people who felt an earthquake and create maps that show what people experienced and the extent of damage. However, there are no records in the past 50 years of any felt earthquake impacts in the Outer Banks region.

According to NOAA's Global Historical Tsunami Database[3], 109 definite or probable tsunamis have occurred in the U.S. since 1700, of which 31 reported tsunamis caused at least 1 death or $1 million in damage. None of these damaging tsunamis have impacted the Atlantic Coast.

PROBABILITY OF FUTURE OCCURRENCE

Ground motion is the movement of the earth's surface due to earthquakes or explosions. It is produced by waves generated by a sudden slip on a fault or sudden pressure at the explosive source and travels through the earth and along its surface. Ground motion is amplified when surface waves of unconsolidated materials bounce off of or are refracted by adjacent solid bedrock. The probability of ground motion is depicted in USGS earthquake hazard maps by showing, by contour values, the earthquake ground motions (of a particular frequency) that have a common given probability of being exceeded in 50 years.

Figure 4.11 reflects the seismic hazard for the Outer Banks based on the national USGS map of peak acceleration with two percent probability of exceedance in 50 years. To produce these estimates, the ground motions being considered at a given location are those from all future possible earthquake magnitudes at all possible distances from that location. The ground motion coming from a particular magnitude and distance is assigned an annual probability equal to the annual probability of occurrence of the causative magnitude and distance. The method assumes a reasonable future catalog of earthquakes, based upon historical earthquake locations and geological information on the recurrence rate of fault ruptures. When all the possible earthquakes and magnitudes have been considered, a ground motion value is determined such that the annual rate of its being exceeded has a certain value. Therefore, for the given probability of exceedance, two percent, the locations shaken more frequently will have larger ground motions.

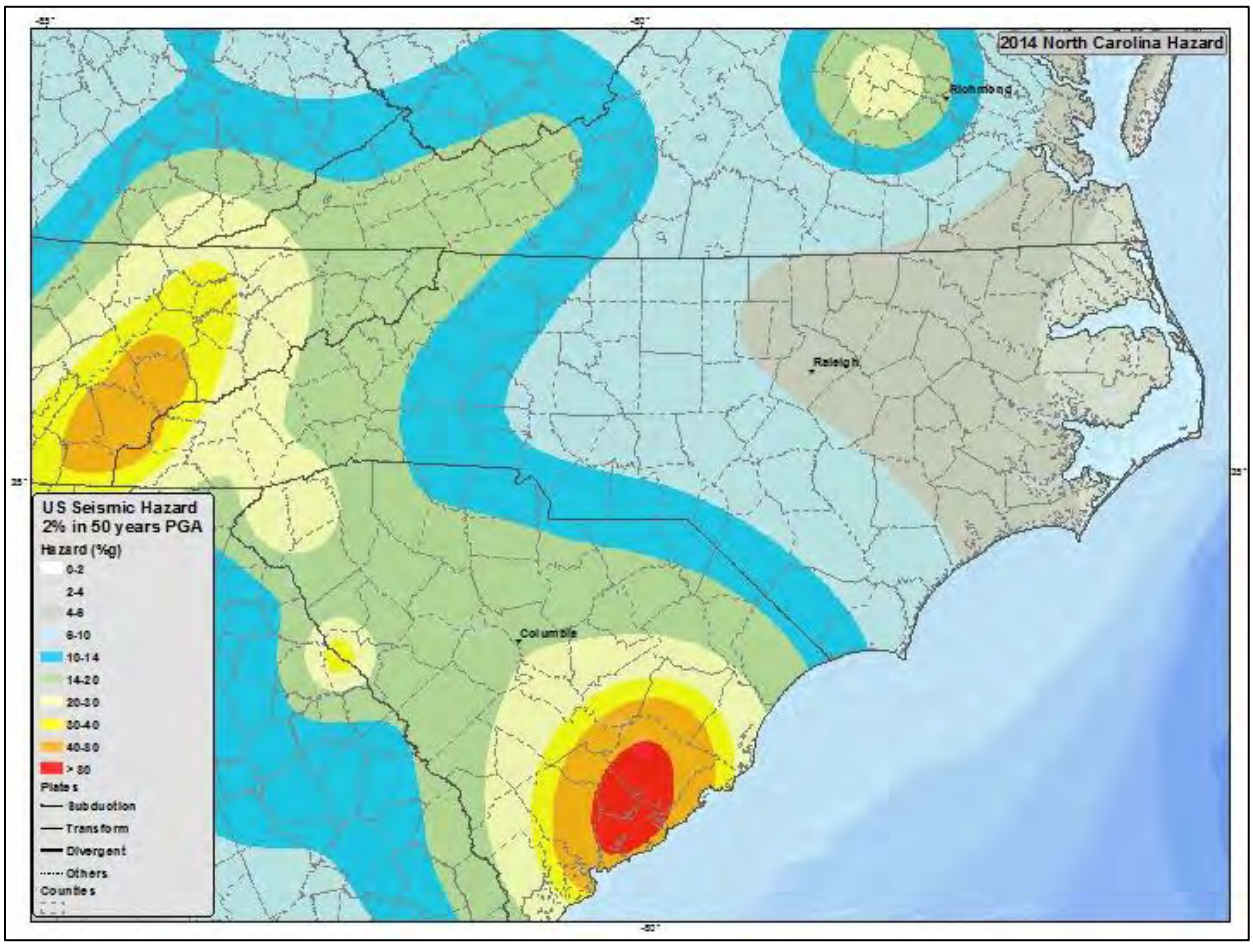
The Outer Banks are located within the light gray zone representing a very low peak acceleration of 0.02 to 0.04 g. Based on this data, it can be reasonably assumed that an earthquake affecting the Outer Banks is unlikely.

An assessment done by the National Tsunami Hazard Mitigation Program ranks the likelihood of a tsunami event on the Atlantic Coast as very low to low. Distant tsunamis may pose a threat to all U.S. coasts, but the hazard is greatest for coastlines near subduction zones, like those around the Pacific and Caribbean, where tsunamis can be generated by large earthquakes and associated landslides. The U.S. East and Gulf Coasts are not near subduction zones, and earthquakes are not as large or as frequent as in other regions. The most likely sources of tsunamis on these coasts are underwater landslides and meteotsunamis, which are tsunamis generated by air pressure disturbances from fast moving weather systems.

Probability: 1 – Unlikely

[3] National Geophysical Data Center / World Data Service: NCEI/WDS Global Historical Tsunami Database. NOAA National Centers for Environmental Information. doi:10.7289/V5PN93H7 [July 11, 2024]

Figure 4.11 – Seismic Hazard Information for North Carolina



Source: USGS Earthquake Hazards Program

CLIMATE CHANGE

Scientists are beginning to believe there may be a connection between climate change and earthquakes. Changing ice caps and sea-level redistribute weight over fault lines, which could potentially have an influence on earthquake occurrences. However, currently no studies quantify the relationship to a high level of detail, so recent earthquakes should not be linked with climate change. While not conclusive, early research suggest that more intense earthquakes and tsunamis may eventually be added to the adverse consequences that are caused by climate change.

VULNERABILITY ASSESSMENT

PEOPLE

Earthquake events in the Outer Banks are unlikely to produce more than mild ground shaking; therefore, injury or death is unlikely. Objects falling from shelves generally pose the greatest threat to safety. Tsunamis are unlikely to occur in any magnitude that would threaten public safety.

Table 4.16 and Table 4.17 detail the population estimated to be at risk from a 250-year earthquake and a 500-year earthquake, respectively, according to the NCEM IRISK database.

Table 4.16 – Estimated Population Impacted by 250-Year Earthquake

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	0	0%	5,390	0	0%	1,596	0	0%
Dare									
Unincorporated Dare County	24,369	0	0%	4,752	0	0%	1,150	0	0%
Town of Duck	1,722	0	0%	582	0	0%	53	0	0%
Town of Kill Devil Hills	7,588	0	0%	1,298	0	0%	260	0	0%
Town of Kitty Hawk	3,903	0	0%	861	0	0%	137	0	0%
Town of Manteo	1,360	0	0%	220	0	0%	80	0	0%
Town of Nags Head	3,178	0	0%	1,084	0	0%	70	0	0%
Town of Southern Shores	2,536	0	0%	858	0	0%	78	0	0%
Subtotal Dare	**44,656**	**0**	**0%**	**9,655**	**0**	**0%**	**1,828**	**0**	**0%**
Region Total	**75,999**	**0**	**0%**	**15,045**	**0**	**0%**	**3,424**	**0**	**0%**

Source: NCEM Risk Management Tool

Table 4.17 – Estimated Population Impacted by 500-Year Earthquake

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	7,077	22.6%	5,390	1,217	22.6%	1,596	360	22.6%
Dare									
Unincorporated Dare County	24,369	716	2.9%	4,752	196	4.1%	1,150	47	4.1%
Town of Duck	1,722	0	0.0%	582	0	0.0%	53	0	0.0%
Town of Kill Devil Hills	7,588	67	0.9%	1,298	13	1.0%	260	3	1.2%
Town of Kitty Hawk	3,903	36	0.9%	861	9	1.0%	137	1	0.7%
Town of Manteo	1,360	44	3.2%	220	7	3.2%	80	3	3.8%
Town of Nags Head	3,178	37	1.2%	1,084	14	1.3%	70	1	1.4%
Town of Southern Shores	2,536	2	0.1%	858	1	0.1%	78	0	0.0%
Subtotal Dare	**44,656**	**902**	**2.0%**	**9,655**	**240**	**2.5%**	**1,828**	**55**	**3.0%**
Region Total	**75,999**	**6,489**	**8.5%**	**15,045**	**1457**	**9.7%**	**3,424**	**415**	**12.1%**

Source: NCEM Risk Management Tool

PROPERTY

In a severe earthquake event, buildings can be damaged by the shaking itself or by the ground beneath them settling to a different level than it was before the earthquake (subsidence). Buildings can even sink into the ground if soil liquefaction occurs. If a structure or infrastructure (a building, road, etc.) is built across a fault, the ground displacement during an earthquake could seriously damage it.

Earthquakes damages to infrastructure can result in secondary hazards. For example, fires can be started by broken gas lines and power lines. Fires can be a serious problem, especially if the water lines that feed the fire hydrants have been damaged as well.

The Outer Banks region has not been impacted by an earthquake with more than a moderate intensity, so damage to the built environment is unlikely. Similarly, tsunamis are unlikely to occur in any magnitude that would damage the built environment.

Table 4.18 through Table 4.19 detail the estimated buildings impacted from varying magnitudes of earthquake events.

Table 4.18 – Estimated Buildings Impacted by 250-Year Earthquake Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	2	0%	$0	1	0%	$7	0	0%	$0	1	0%	$7
Dare													
Unincorporated Dare County	14,019	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Duck	2,409	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Kill Devil Hills	6,033	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Kitty Hawk	2,862	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Manteo	943	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Nags Head	4,868	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Town of Southern Shores	2,513	0	0%	$0	0	0%	$0	0	0%	$0	0	0%	$0
Subtotal Dare	**2,513**	**0**	**0%**	**$0**	**0**	**0%**	**$0**	**0**	**0%**	**$0**	**0**	**0%**	**$0**
Region Total	**54,133**	**0**	**0%**	**$0**	**1**	**0%**	**$7**	**0**	**0%**	**$0**	**1**	**0%**	**$7**

Source: NCEM Risk Management Tool

Table 4.19 – Estimated Buildings Impacted by 500-Year Earthquake Event

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	3,591	20.3%	$11,018	1,413	8.0%	$52,225	153	0.9%	$15,190	5,157	29.2%	$78,434
Dare													
Unincorporated Dare County	14,019	530	3.8%	$1,133	249	1.8%	$5,462	75	0.5%	$3,724	854	6.1%	$10,319
Town of Duck	2,409	0	0.0%	$0	26	1.1%	$195	3	0.1%	$162	29	1.2%	$357
Town of Kill Devil Hills	6,033	43	0.7%	$507	93	1.5%	$3,424	6	0.1%	$813	142	2.4%	$4,744
Town of Kitty Hawk	2,862	29	1.0%	$119	37	1.3%	$1,103	7	0.2%	$386	73	2.6%	$1,608
Town of Manteo	943	24	2.5%	$156	45	4.8%	$1,205	16	1.7%	$801	85	9.0%	$2,162
Town of Nags Head	4,868	37	0.8%	$1,032	79	1.6%	$4,038	9	0.2%	$300	125	2.6%	$5,370
Town of Southern Shores	2,513	2	0.1%	$32	15	0.6%	$337	1	0.0%	$36	18	0.7%	$405
Subtotal Dare	**33,647**	**665**	**2.0%**	**$2,979**	**544**	**1.6%**	**$15,764**	**117**	**0.3%**	**$6,222**	**1,326**	**3.9%**	**$24,965**
Region Total	**51,332**	**4,256**	**8.3%**	**$13,997**	**1,957**	**3.8%**	**$67,989**	**270**	**0.5%**	**$21,412**	**6,483**	**12.6%**	**$103,399**

Source: NCEM Risk Management Tool

ENVIRONMENT

An earthquake is unlikely to cause substantial impacts to the natural environment in the Outer Banks. Impacts to the built environment (e.g. ruptured gas line) could damage the surrounding environment. However, this type damage is unlikely based on historical occurrences.

CONSEQUENCE ANALYSIS

Table 4.20 summarizes the potential negative consequences of earthquake.

Table 4.20 – Consequence Analysis - Earthquake

Category	Consequences
Public	The public may experience some shaking or fallen objects but are not expected to experience threats to health or safety from an earthquake.
Responders	As minimal damages to structures or infrastructure are expected, responders are not expected to be impacted by earthquakes.
Continuity of Operations (including Continued Delivery of Services)	Continuity of operations should easily be maintained. Disruption of communications or utility lines could occur that may cause service interruptions.
Property, Facilities, and Infrastructure	Damage to facilities and infrastructure is not likely to occur from low intensity shaking that could be expected from an earthquake in this region.
Environment	The likelihood of an earthquake causing environmental damages is very low. Secondary impacts from significant shaking could include hazardous materials release or fire, but these impacts are unlikely.
Economic Condition of the Jurisdiction	Local economy and finances are unlikely to be adversely affected.
Public Confidence in the Jurisdiction's Governance	Earthquakes in the region would likely be low intensity if they occur. Therefore, public confidence is unlikely to be affected by an earthquake.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes earthquake hazard risk by jurisdiction. All characteristics of earthquake risk are uniform across the planning area.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All jurisdictions	1	1	4	4	1	1.9	L

4.5.3 EXCESSIVE HEAT

HAZARD BACKGROUND

Per information provided by FEMA, in most of the United States extreme heat is defined as a long period (2 to 3 days) of high heat and humidity with temperatures above 90 degrees. As temperatures rise, our bodies naturally cool down by sweating. In extreme heat, the body must work extra hard to maintain a normal temperature, which can lead to death by overwork of the body. and sweating might not be enough to cool down. When this happens, a person's body temperature rises faster than it can cool itself. Additionally, when the humidity is high, as is common during extreme heat events in North Carolina, evaporative cooling through sweating becomes less effective. Heat-related illnesses occur when the body overheats from exposure to high temperatures and in severe cases can cause damage to the brain and other vital organs[4]. Heat-related illnesses can also arise from moderate to vigorous physical activity in hot situations.

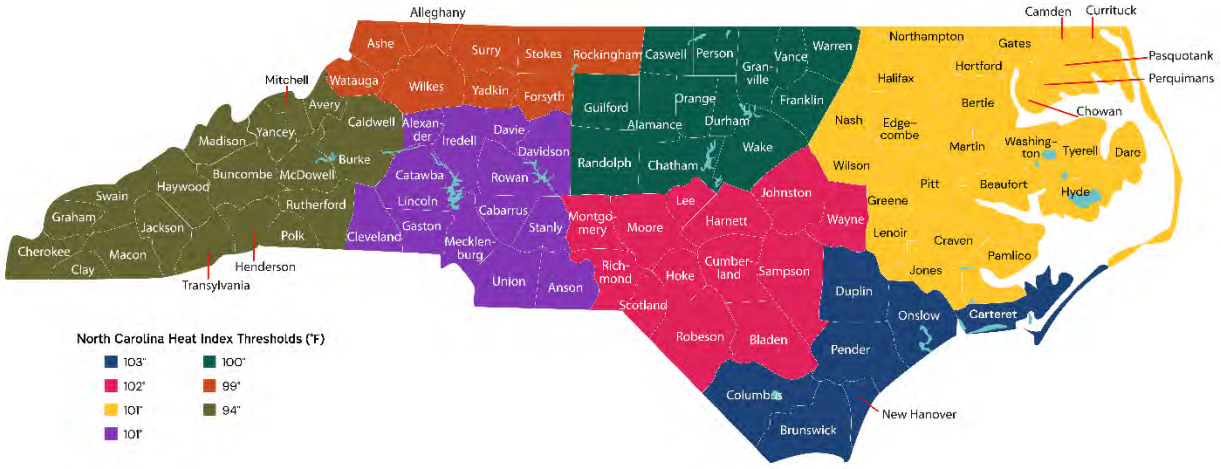
Extreme heat often results in the highest annual number of deaths among all weather-related disasters. On average, the number of extreme heat days has been increasing each year, putting residents at a higher risk of heat-related illnesses. In 2023, more people in the United States died of heat-related illness than any year on record[5]. Per Ready.gov, older adults, children, and people with certain illnesses and chronic conditions are at greater risk from extreme heat; and humidity increases the feeling of heat.

The National Weather Service (NWS) uses the heat index, also known as apparent temperature, to determine when to issue health alerts. The heat index is a measure of how hot it really feels when the relative humidity is considered along with the actual air temperature. In most areas of the country, the NWS generally issues alerts "when the heat index is expected to exceed 105°F -110°F for at least two consecutive days," but they also work with local partners to determine the most appropriate conditions for a specific geography[6,7].

In North Carolina, the Department of Health and Human Services (DHHS) uses regional temperature thresholds to activate its Heat Health Alert System. The regional thresholds recognize that an area's typical climate conditions and relevant local factors, such as the proportion of the population engaged in outdoor work, can impact how heat affects the local population. DHHS sends heat alerts to county health departments and Heat Health Alert System subscribers when the daily maximum heat index is forecasted to meet or exceed the heat index threshold for their region. In the Outer Banks Region, that threshold is 101°F, as shown in Figure 4.12.

[4] www.cdc.gov/disasters/extremeheat/heat_guide.html.
[5] https://apnews.com/article/record-heat-deadly-climate-change-humidity-south-11de21a526e1cbe7e306c47c2f12438d
[6] https://www.weather.gov/safety/heat-index
[7] https://www.weather.gov/safety/heat-ww

Figure 4.12 – North Carolina Heat Index Thresholds



Source: https://climate.ncsu.edu/heat_toolkit/thresholds/

The most dangerous place to be during an extreme heat incident is in a permanent home, with little or no air conditioning. Those at greatest risk for heat-related illness include people 65 years of age and older, young children, people with chronic health problems such as heart disease, people who are obese, people who are socially isolated, and people who are on certain medications, such as tranquilizers, antidepressants, sleeping pills, or drugs for Parkinson's disease. However, even young and healthy individuals are susceptible if they participate in strenuous physical activities during hot weather or are not acclimated to hot weather. Table 4.21 lists typical symptoms and health impacts of exposure to extreme heat.

Table 4.21 – Typical Health Impacts of Extreme Heat

Heat Index (HI)	Disorder
80-90° F (HI)	Fatigue possible with prolonged exposure and/or physical activity
90-105° F (HI)	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and/or physical activity
105-130° F (HI)	Heatstroke/sunstroke highly likely with continued exposure

Source: National Weather Service Heat Index Program, www.weather.gov/os/heat/index.shtml

The National Weather Service has a system in place to initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat determines whether advisories or warnings are issued. A common guideline for issuing excessive heat alerts is when the maximum daytime Heat Index is expected to equal or exceed 105 degrees Fahrenheit (°F) and the night time minimum Heat Index is 80°F or above for two or more consecutive days. A heat advisory is issued when temperatures reach 105°F and a warning is issued at 115°F.

Impacts of extreme heat are not only focused on human health, as prolonged heat exposure can have devastating impacts on infrastructure as well. Prolonged high heat exposure increases the risk of

pavement deterioration, as well as railroad warping or buckling. High heat also puts a strain on energy systems and consumption, as air conditioners are run at a higher rate and for longer; extreme heat can also reduce transmission capacity over electric systems.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

LOCATION

The entire planning area is susceptible to high temperatures and incidents of extreme heat.

Spatial Extent: 4 – Large

EXTENT

The extent of extreme heat can be defined by the maximum apparent temperature reached. Apparent temperature is a function of ambient air temperature and relative humidity and is reported as the heat index. The National Weather Service Forecast Office in Raleigh sets the following criteria for heat advisory and excessive heat warning:

- **Heat Advisory** – Heat Index of 105°F to 109°F for 3 hours or more. Can also be issued for lower values 100°F to 104°F for heat lasting several consecutive days
- **Excessive Heat Watch** – Potential for heat index values of 110°F or hotter within 24 to 48 hours. Also issued during prolonged heat waves when the heat index is near 110°F
- **Excessive Heat Warning** – Heat Index of 110°F or greater for any duration

Based on data from the North Carolina Climate Office, from January 1893 through January 2019, the highest temperature recorded in Dare County was 103°F in Manteo, which occurred in August 1942.

Impact: 2 – Limited

HISTORICAL OCCURRENCES

According to the National Oceanic and Atmospheric Administration (NOAA), 2017 was North Carolina's hottest year on record; that record stretches back 123 years to 1895.

The NCEI reports four heat incidents occurring in the Outer Banks; these incidents caused no injuries, fatalities, property damage or crop damage. The following event narratives are provided in the NCEI Storm Events Database:

July 21, 2011 – An extended period of excessive heat and humidity occurred across most of northeast North Carolina from July 21st to July 23rd. High temperatures ranged from 96 to 103°F during the afternoons, with heat index values ranging from 110 to 119°F. Overnight lows only fell into the lower 70s to lower 80s.

July 5, 2012 – High Pressure centered just to the west of the Middle Atlantic Region produced hot and humid weather over northeast North Carolina from July 5th through 8th. High temperatures ranged from the mid-90s to lower 100s, and low temperatures ranged from the mid-70s to lower 80s across the area.

September 3, 2020 – Intense heat and humidity combined to produce heat index values of 110 degrees or higher during the afternoon hours of September 2nd and 3rd. Heat index values peaked at around 113 degrees.

August 15, 2023 – A three-day heatwave ended with excessive heat being observed across Eastern NC. The heatwave began on Sunday, August 13th, with heat indices of 105 to 10°F. This pattern continued on Monday, August 14th with similar values. The heat and humidity intensified on Tuesday, August 15th ahead of a cold front that would move into Eastern NC. Widespread heat indices of 110 to 115°F were

recorded, with some places even higher than 115°F for a short time. The heatwave broke with the cold front moving in and producing widespread showers and thunderstorms during the evening hours. Dare Bomb Range soil monitor RAWS heat index peaked at 120°F.

Heat index records maintained by the North Carolina Climate Office indicate that the Region regularly experiences heat index temperatures above 100°F. Table 4.22 and Table 4.23 provide counts of heat index values by threshold recorded from 2000-2023 at the Dare County Airport weather station (KMQI) and from 2004-2023 at the First Flight Airport weather station (KFFA), respectively, used as indicators for the Outer Banks overall. Counts are provided as the number of hours in a given year where the heat index reached or exceeded 100°F.

Table 4.22 – Historical Heat Index Counts, Dare County Airport (KMQI) 2001-2023

Year	Heat Index Value				Total
	100-104˚F	105-109˚F	110-114˚F	≥115˚F	
2001	43	3	0	0	46
2002	69	61	14	5	149
2003	43	15	0	1	59
2004	42	45	7	1	95
2005	57	70	27	17	171
2006	60	23	15	3	101
2007	42	22	8	11	83
2008	18	3	0	0	21
2009	33	0	0	0	33
2010	117	49	20	11	197
2011	50	15	2	0	67
2012	53	21	0	0	74
2013	8	1	0	0	9
2014	5	1	0	0	6
2015	37	10	0	0	47
2016	84	49	6	2	141
2017	28	7	0	0	35
2018	16	0	0	0	16
2019	29	12	0	0	41
2020	44	9	1	0	54
2021	9	0	0	0	9
2022	36	2	0	0	38
2023	34	4	1	0	39
Sum	**957**	**422**	**101**	**51**	**1531**
Average	**42**	**18**	**4**	**2**	**67**

Source: North Carolina Climate Office, Heat Index Climatology Tool

Table 4.23 – Historical Heat Index Counts, First Flight Airport (KFFA) 2004-2023

Year	Heat Index Value				Total
	100-104˚F	105-109˚F	110-114˚F	≥115˚F	
2004	0	0	0	0	0
2005	31	19	3	0	53
2006	86	47	18	9	160
2007	35	14	7	6	62

Year	Heat Index Value				Total
	100-104˚F	105-109˚F	110-114˚F	≥115˚F	
2008	34	10	2	0	46
2009	17	0	0	0	17
2010	65	31	13	0	109
2011	7	5	0	0	12
2012	22	1	0	0	23
2013	2	0	0	0	2
2014	13	0	0	0	13
2015	53	35	6	0	94
2016	117	95	40	29	281
2017	30	4	0	0	34
2018	4	0	0	0	4
2019	28	5	0	0	33
2020	38	2	0	0	40
2021	7	0	0	0	7
2022	20	0	0	0	20
2023	14	2	0	0	16
Sum	**623**	**270**	**89**	**44**	**1026**
Average	**31**	**14**	**4**	**2**	**51**

Source: North Carolina Climate Office, Heat Index Climatology Tool

PROBABILITY OF FUTURE OCCURRENCE

Data was gathered from the North Carolina State Climate Office's Heat Index Climatology Tool using the Dare County Airport and the First Flight Airport weather stations as approximations for the Outer Banks. Based on 23 and 20 years of available data, respectively, the Region averages 51-67 hours per year with heat index temperatures above 100°F. Heat index temperatures surpassed 100°F every year except for 2004 at the First Flight Airport; this occurred for at least 6 hours per year at the Dare County Airport station and at least 2 hours per year at the First Flight Airport station. Climate projections and observations from the State Climate Office of North Carolina, discussed below, indicate that extreme heat will continue to be a problem in the Outer Banks Region, with more days with maximum temperatures over 95 degrees F and more warm nights with minimum temperatures above 70 degrees F.

Probability: 4 – Highly Likely

CLIMATE CHANGE

Research shows that average temperatures will continue to rise in the Southeast United States and globally, directly affecting the Outer Banks region in North Carolina. Per the Fifth National Climate Assessment, "The number of extreme warm days (above 95°F) is expected to continue increasing with every increment of global warming," and that "heatwaves in the Southeast are happening more frequently and are occurring during a longer heat season, with some cities also showing increasing trends in their duration and intensity." The number of days over 95°F in the Outer Banks region is expected to increase by between 10 and 20 days annually, as shown in Figure 4.13.

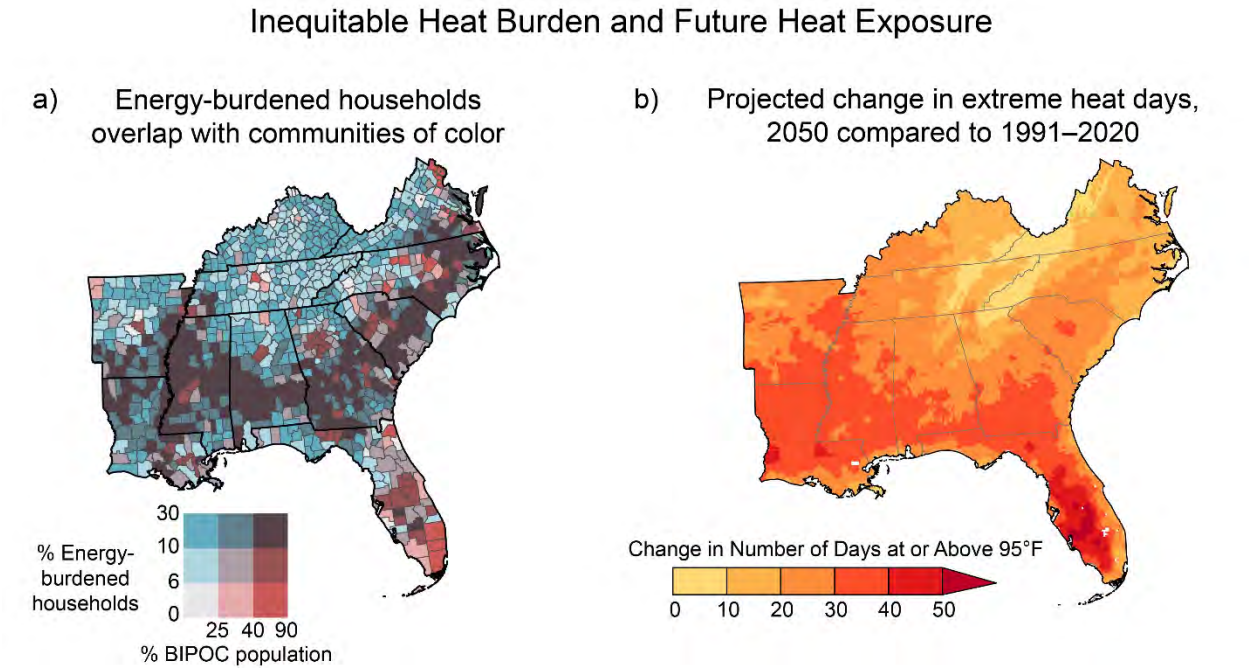
The Fifth National Climate Assessment also notes that warm nights (minimum temperatures at or above 70°F) in the southeast have increased the most compared to all other continental U.S. regions.

The State Climate Office of North Carolina's County-specific climate projections, which are based on the Fifth National Climate Assessment, indicate that Currituck County has averaged 4 days per year with

maximum temperatures over 95°F. By the 2060s, that number is projected to increase to 15-22 days per year. Dare County has averaged 2 days per year with temperatures above 95°F and is projected to experience 9-13 days per year with these highs by the 2060s.

The same dataset shows that in Currituck County, warm nights may increase from 56 nights per year historically to 86-98 nights per year by the 2060s, and in Dare County, warm nights may increase from 72 nights per year historically to 102-113 nights per year by the 2060s.

Figure 4.13 – Projected Change in Number of Days Over 95˚F



Source: USGCRP, 2023: Fifth National Climate Assessment

VULNERABILITY ASSESSMENT

PEOPLE

Extreme heat can cause heat stroke and even loss of human life. The elderly and the very young are most at risk to the effects of heat. People who are isolated are also more vulnerable to extreme heat. Table 4.6 in Section 4.4.1 provides an estimated count of elderly individuals and children living in each community, according to the 2020 Census. About 20 percent of the region's population are elderly (age 65 and over) and about 5 percent of the population are children (age 5 and under). Table 4.24 shows the proportion of each community's population that are elderly and children. In Duck, Kitty Hawk, Nags Head, and Southern Shores, more than a quarter of the population is considered to have increased vulnerability to extreme heat.

Table 4.24 – Vulnerable Population Counts and Percentages by Jurisdiction, 2020

Jurisdiction	Elderly (Age 65 and Over), Count	Elderly (Age 65 and Over), %	Children (Age 5 and Under), Count	Children (Age 5 and Under), %
Currituck				
Currituck County	5,390	17%	1,596	5%

Jurisdiction	Elderly (Age 65 and Over), Count	Elderly (Age 65 and Over), %	Children (Age 5 and Under), Count	Children (Age 5 and Under), %
Dare				
Dare County (Unincorporated Area)	4,752	20%	1,150	5%
Town of Duck	582	34%	53	3%
Town of Kill Devil Hills	1,298	17%	260	3%
Town of Kitty Hawk	861	22%	137	4%
Town of Manteo	220	16%	80	6%
Town of Nags Head	1,084	34%	70	2%
Town of Southern Shores	858	34%	78	3%
Subtotal Dare	**9,655**	**22%**	**1,828**	**4%**
Region Total	**15,045**	**20%**	**3,424**	**5%**

Source: U.S. Census Bureau, 2020 Decennial Census, via NC Risk Management Tool

Higher nighttime temperatures, referenced in the Fifth National Climate Assessment, interfere with the natural cooling of human bodies and the built environment which can impact human health significantly.

The Fifth National Climate Assessment also discusses equity issues surrounding heat exposure in the southeast region. While the region relies on air-conditioning especially in the warm months, the prevalence of air-conditioning access varies with racial background and economic status. The region also has high rates of energy insecurity with households paying the highest energy bills in the U.S. Because of this, extreme heat will result in disproportionate human health risks to low- and moderate-income households as well as communities of color.

PROPERTY

Extreme heat is unlikely to cause significant damages to the built environment. However, road surfaces can be damaged as asphalt softens, and concrete sections may buckle under expansion caused by heat. Train rails may also distort or buckle under the stress of head induced expansion. Power transmission lines may sag from expansion and if contact is made with vegetation the line may short out causing power outages. Additional power demand for cooling also increases power line temperature adding to heat impacts.

Extreme heat can also cause agricultural losses. Between 2007-2023, the sum of claims paid for crop damage due to heat in Currituck County was $52,284.20, or an average of $3,075.54 in losses every year. There were no losses reported in Dare County. Table 4.13 summarizes the crop losses due to drought in reported in the RMA system.

Table 4.25 – Crop Losses Resulting from Heat, 2007-2023

Year	Determined Acres	Indemnity Amount
Currituck		
2010	44.12	$3,563.00
2012	429.60	$28,829.00
2020	213.52	$15,399.20
2022	101.36	$4,493.00
Total	**788.60**	**$52,284.20**

Source: USDA Risk Management Agency

ENVIRONMENT

Animals are vulnerable to heat disorders similar to humans, including mortality. Vegetation growth can be stunted by heat, or plants may be killed if temperatures rise above their tolerance extremes.

CONSEQUENCE ANALYSIS

Table 4.26 summarizes the potential negative consequences of extreme heat.

Table 4.26 – Consequence Analysis - Extreme Heat

Category	Consequences
Public	Extreme heat may cause illness and/or death.
Responders	Consequences may be greater for responders if their work requires exertion and/or wearing heavy protective gear.
Continuity of Operations (including Continued Delivery of Services)	Continuity of operations is not expected to be impacted by extreme heat because warning time for these events is long.
Property, Facilities and Infrastructure	Minor impacts may occur, including possible damages to road surfaces and power lines.
Environment	Environmental impacts include strain on local plant and wildlife, including potential for illness or death.
Economic Condition of the Jurisdiction	Farmers may face crop losses or increased livestock costs.
Public Confidence in the Jurisdiction's Governance	Extreme heat is unlikely to impact public confidence.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes extreme heat hazard risk by jurisdiction. In Duck, Kitty Hawk, Nags Head, and Southern Shores, more than a quarter of the population is considered to have increased vulnerability to extreme heat. These communities were assigned a higher impact rating. Other characteristics of extreme heat risk do not vary significantly by jurisdiction.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	4	2	4	1	3	3.0	H
Dare County	4	2	4	1	3	3.0	H
Duck	4	3	4	1	3	3.3	H
Kill Devil Hills	4	2	4	1	3	3.0	H
Kitty Hawk	4	2	4	1	3	3.0	H
Manteo	4	2	4	1	3	3.0	H
Nags Head	4	3	4	1	3	3.3	H
Southern Shores	4	3	4	1	3	3.3	H

4.5.4 FLOODING

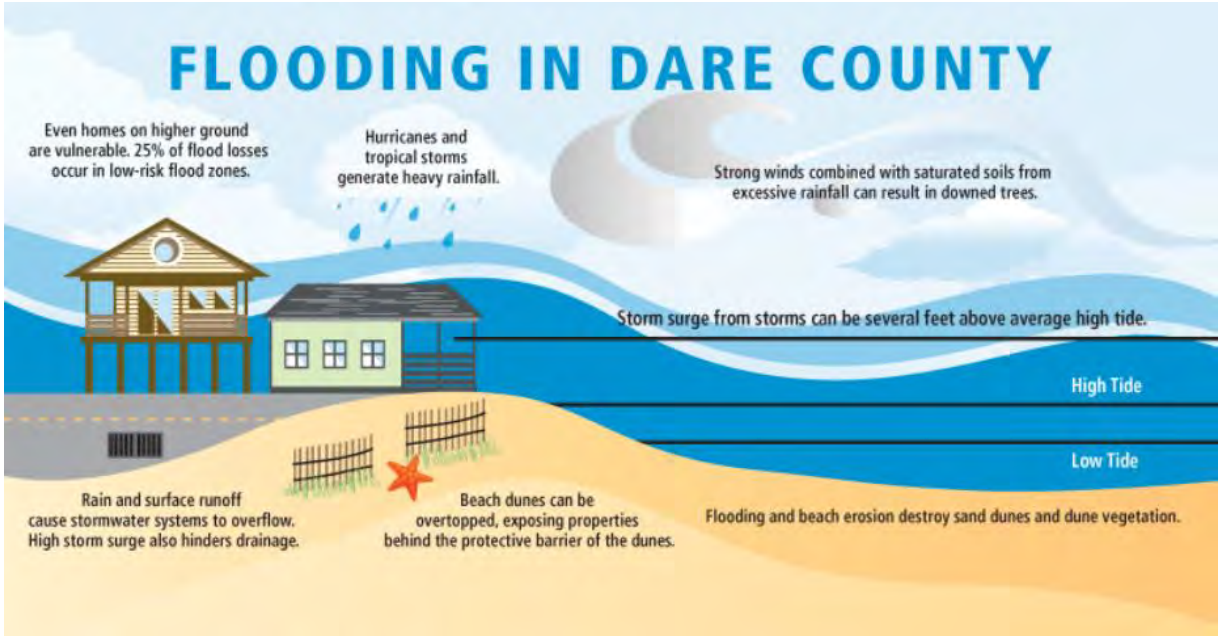
HAZARD BACKGROUND

Flooding is defined by the rising and overflowing of water onto normally dry land. As defined by FEMA, a flood is a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties. Flooding can result from an overflow of inland waters or an unusual accumulation or runoff of surface waters from any source.

Flooding causes more damage in the United States than any other severe weather related event, an average of $5 billion a year. Approximately 90 percent of presidentially declared disasters result from flood-related natural hazard events. Taken as a whole, more frequent, localized flooding problems that do not meet federal disaster declaration thresholds ultimately cause the majority of damages across the United States.

Figure 4.14 from the Dare County Planning Department summarizes flood related risks that are relevant to Dare County and Currituck County.

Figure 4.14 – Flood Related Risks in the Outer Banks Region



Source: Dare County Planning Department

SOURCES AND TYPES OF FLOODING:

The Outer Banks region can experience coastal flooding and storm surge, sea level rise, and localized stormwater flooding. Each of these types of flooding are described below, based on data from Flood Insurance Study (FIS) reports, Flood Insurance Rate Maps (FIRMs), NOAA, and the HMPC.

COASTAL FLOODING

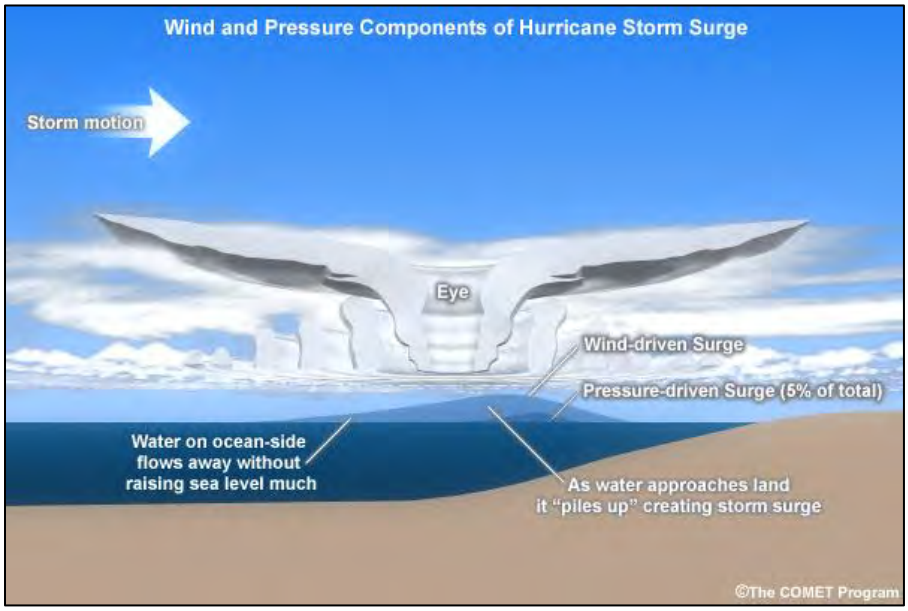
All lands bordering the coast along the Atlantic Ocean and in low-lying coastal plains are susceptible to tidal effects and flooding. Coastal land such as sand bars, barrier islands and deltas provide a buffer zone that helps protect human life and real property relative to the sea much as floodplains provide a buffer zone along rivers and other bodies of water. Coastal floods usually occur because of abnormally high

tides, storm surge, wind-driven waves, and heavy rains associated with tropical storms and hurricanes. Nor'easters have also been found to cause storm surge in both Dare and Currituck Counties.

Storm surge is water that is pushed toward the shore by the force of the winds swirling around the storm as shown in Figure 4.15. This advancing surge combines with the normal tides to create the storm tide, which can increase the mean water level to heights impacting roads, homes and critical infrastructure. In addition, wind driven waves are superimposed on the storm tide. This rise in water level can cause severe flooding in coastal areas, particularly when the storm tide coincides with the normal high tides.

The maximum potential storm surge for a location depends on several different factors. Storm surge is a complex phenomenon because it is sensitive to the slightest changes in storm intensity, forward speed, size (radius of maximum winds-RMW), angle of approach to the coast, central pressure (minimal contribution in comparison to the wind), and the shape and characteristics of coastal features such as bays and estuaries. Other factors which can impact storm surge are the width and slope of the continental shelf and the depth of the ocean bottom. A narrow shelf, or one that drops steeply from the shoreline and subsequently produces deep water close to the shoreline, tends to produce a lower surge but higher and more powerful storm waves. The Outer Banks region has a narrow continental shelf, with mile-deep waters generally only 20-30 miles off the coast.

Figure 4.15 – Components of Hurricane Storm Surge



Source: NOAA/The COMET Program

Wind-driven surge generated in the Atlantic Ocean and pushed into Pamlico and Albemarle Sounds and other waters is a primary source of flooding in the Outer Banks region. The wave action associated with storm surge can be even more damaging than the high water. The areas susceptible to surge flooding are summarized from each county's FIS as follows:

Currituck County: Surge moves from the Albemarle Sound into the North River and Currituck Sound.

Dare County: Surge moves from the Albemarle and Pamlico Sounds into the Alligator River, Croatan Sound, Currituck Sound, Davis Channel, East Lake, Old House Channel, Roanoke Sound, and South Lake.

During storm events in the Outer Banks, storm surge does not only occur on the Atlantic coast. It is not unusual for storm surge inundation to occur on the sound side of Outer Banks communities, as mentioned

in the FIS. Sound side storm surge flooding can occur on the Currituck, Albemarle, and Pamlico Sounds. This was demonstrated in October 2019 when Tropical Storm Michael entered the sound and led to rapid sound side flooding equivalent to flood levels seen during Hurricane Matthew.

The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model is a computerized numerical model developed by the National Weather Service to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features. The model creates outputs for all different storm simulations from all points of the compass. Each direction has a MEOW (maximum envelope of water) for each category of storm (1-5), and all directions combined result in a MOMs (maximum of maximums) set of data. SLOSH model surge maps are meant to represent a worst case scenario of surge for each storm category. Previously, the HMPC indicated that SLOSH mapping underestimated soundside flooding. However, in the last five years, NOAA has updated modeling in the NC basin, which provides improved evaluation of potential soundside storm surge.

NOAA SLOSH maps are provided under the Extent section below to illustrate potential storm surge inundation resulting from each category of hurricane.

SEA LEVEL RISE

Sea level rise is the increase in sea levels as a result of atmospheric and oceanic warming which causes water expansion as well as ice melt from ice sheets and glaciers. Global sea level rise is likely caused by a combination of these two mechanics and can be exasperated on the local level by factors such as erosion and subsidence. The rate of sea level rise has varied throughout geologic history, and studies have shown that global temperature and sea level are strongly correlated.

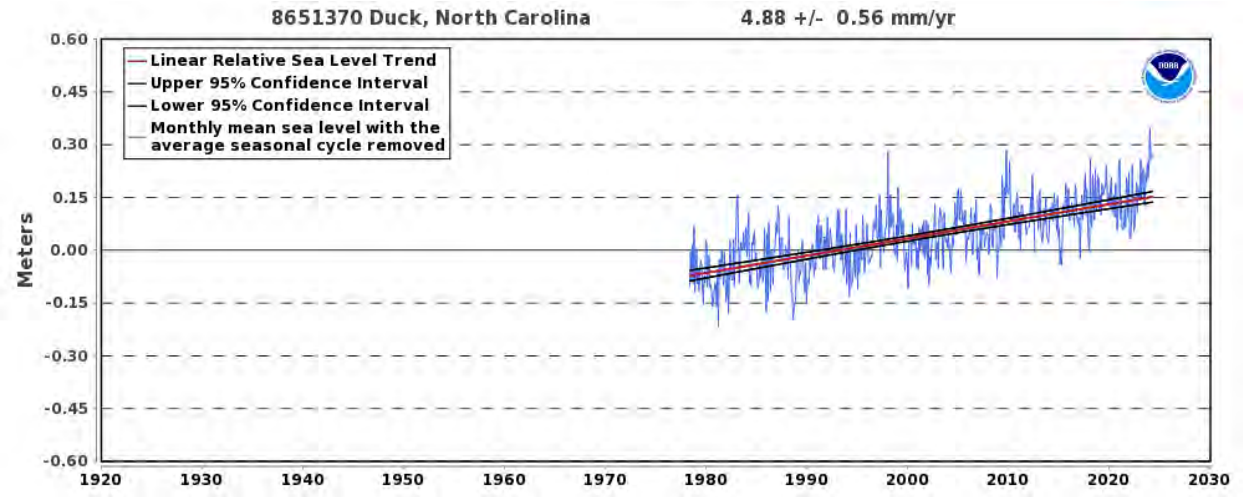
Historic trends in local MSL are best determined from tide gauge records. The Center for Operational Oceanographic Products and Services (CO-OPS) has been measuring sea level for over 150 years, with tide stations operating on all U.S. coasts. Changes in Mean Sea Level (MSL), either a sea level rise or sea level fall, have been computed at 128 long-term water level stations using a minimum span of 30 years of observations at each location. These measurements have been averaged by month to remove the effect of higher frequency phenomena (e.g. storm surge) to compute an accurate linear sea level trend. Stations in Duck, NC and Oregon Inlet Marina, NC provide data and projections relevant to the Outer Banks region.

Figure 4.16 and Figure 4.17 show the monthly mean sea level at NOAA's Duck, NC and Oregon Inlet Marina, NC stations, respectively, without the regular seasonal fluctuations due to coastal ocean temperatures, salinities, winds, atmospheric pressures, and ocean currents. The linear relative sea level trend is also shown, including its 95% confidence interval. The plotted values are relative to the most recent Mean Sea Level datum established by CO-OPS.

At the Duck, NC station, the relative sea level trend is 4.88 mm/year with a 95% confidence interval of +/- 0.56 mm/year based on monthly mean sea level data from 1978 to 2023 which is equivalent to a change of 1.60 feet in 100 years. The 2020 Outer Banks plan reported a trend of 4.62 mm/year; therefore, the trend estimate has increased by 0.16 mm/year in the last five years.

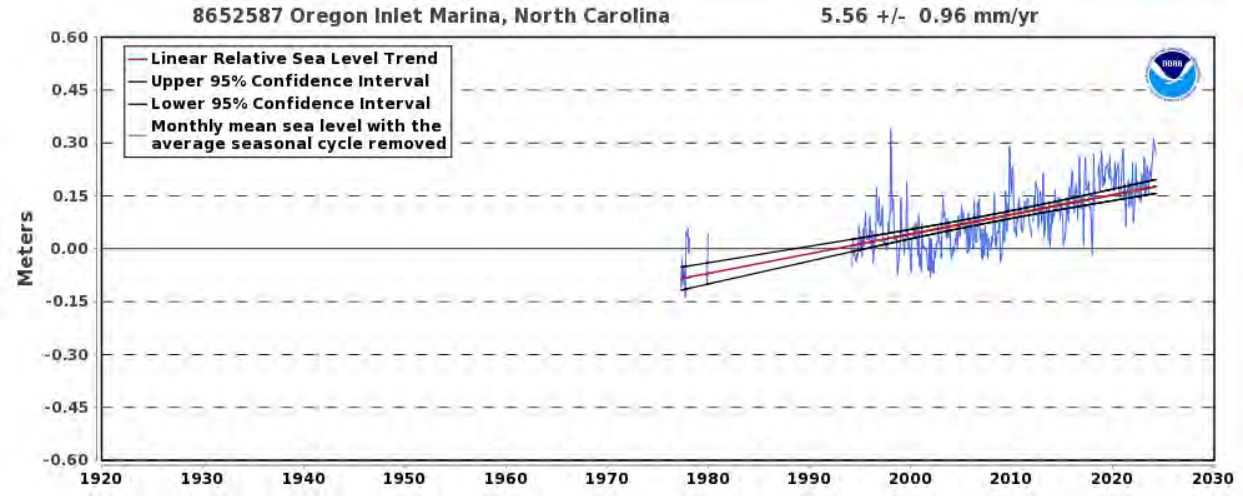
At the Oregon Inlet Marina, NC station, the relative sea level trend is 5.56 mm/year with a 95% confidence interval of +/- 0.96 mm/year based on monthly mean sea level data from 1977 to 2023 which is equivalent to a change of 1.82 feet in 100 years. The 2020 Outer Banks plan reported a trend of 4.69 mm/year; therefore, the trend estimate has increased by 0.87 mm/year in the last five years.

Figure 4.16 – Mean Sea Level Trends, Duck, NC



Source: NOAA Tides and Currents, July 2024

Figure 4.17 – Mean Sea Level Trends, Oregon Inlet Marina, NC



Source: NOAA Tides and Currents, July 2024

Warning Time: 1 – More than 24 hours

Duration: 4 – More than one week

LOCALIZED FLOODING

Localized flooding in the Outer Banks region consists of flash flooding and stormwater flooding caused by intense rainfall. All land in the region, including land outside of the mapped floodplain, is susceptible to localized flooding. Between 20 and 25% of all repetitive loss properties are located outside of the 1-percent-annual-chance floodplain.. In fact, communities in the Outer Banks have taken to using the slogan, “Low Risk is not No Risk” to emphasize this fact. Most of the Outer Banks Region, except for a small portion of northern Currituck County, has coastal FIRMs that only account for flood risk from storm surge events. However, the entire region is still susceptible to flooding from rainfall. The HMPC noted the importance of educating the public of these risks and encouraging property owners in moderate

and low risk flood zones outside the SFHA to purchase flood insurance to protect against these other sources of flooding.

Flash flooding occurs when water levels rise at an extremely fast rate as a result of intense rainfall over a brief period, possibly from slow-moving intense storms and sometimes combined with saturated soil or impermeable surfaces. Flash flooding can happen in floodplains and in areas not associated with floodplains. Flash flood hazards caused by surface water runoff are most common in urbanized areas, where greater population density generally equates to more impervious surface (e.g., pavement and buildings) which increases the amount of surface water generated.

Flash flooding is a dangerous form of flooding which can reach full peak in only a few minutes. Rapid onset allows little or no time for protective measures. Flash flood waters move at very fast speeds and can tear out trees, scour channels, and destroy buildings and bridges. Flash flooding can result in higher loss of life, both human and animal, than slower developing river and stream flooding.

Stormwater flooding is smaller scale flooding separate from coastal or riverine flooding that can occur anywhere in a community, including areas outside of the mapped floodplain. It can occur as the result of significant amounts of rainfall over a longer time frame. This flooding, sometimes called "nuisance flooding," often occurs in low-lying areas after a heavy rain and can occur as a result of excessive runoff from increased impervious surface area, poor drainage, inadequate drainage infrastructure, clogged culverts, or obstructed drainageways, among other causes. Additionally, rain and surface runoff can cause stormwater systems to overflow. As rain falls for extended periods of time, the ground becomes saturated, and rain accumulates faster than the soils can absorb it. In the Outer Banks, this type of stormwater flooding is further complicated by the region's low elevations, flat topography, and high groundwater table. In areas of particularly flat topography, rain can pond and leave behind areas of standing water even when flood waters have subsided.

While localized flooding does not involve the destructive wave energy of coastal flooding, it is nonetheless a chronic problem that can cause significant damage. The repetitive damage caused by such flooding can add up. Sewers may back up, yards can be inundated, and homes, businesses and vehicles can be flooded. Drainage and sewer systems not designed to carry the capacity currently needed to handle increased storm runoff can cause water to back into basements and damage mechanical systems. These impacts, and other localized flooding impacts, can create public health and safety concerns.

Flash and localized flooding may be attributed to the following issues:

- **Inadequate Capacity –** An undersized/under capacity pipe system can cause water to back-up behind a structure which can lead to areas of ponded water and/or overtopping of banks.
- **Clogged Inlets** – Debris covering the asphalt apron and the top of grate at catch basin inlets may contribute to an inadequate flow of stormwater into the system. Debris within the basin itself may also reduce the efficiency of the system by reducing the carrying capacity.
- **Blocked Drainage Outfalls** – Debris blockage or structural damage at drainage outfalls may prevent the system from discharging runoff, which may lead to a back-up of stormwater within the system.
- **Improper Grade** – Poorly graded asphalt around catch basin inlets may prevent stormwater from entering the catch basin as designed. Areas of settled asphalt may create low spots within the roadway that allow for areas of ponded water.
- **High Groundwater Tables and Natural Topography** – The unique topography of portions of the barrier island creates a natural "bowl" in which water collects in low-lying areas between the primary dune system and sound side features such as the maritime forest. Additionally, the high groundwater table means that there is limited storage for rainfall in these areas, and ponding can easily occur after periods of frequent or prolonged rainfall.

FLOODING AND FLOODPLAINS

A floodplain, as shown in Figure 4.18 and Figure 4.19, is flat or nearly flat land adjacent to a stream, river, or body of water that experiences occasional or periodic flooding. In riverine floodplains, it includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows, and the flood fringe, which are areas covered by the flood, but which do not experience a strong current. Floodplains are made when floodwaters exceed the capacity of the main channel or escape the channel by eroding its banks. When this occurs, sediments (including rocks and debris) are deposited that gradually build up over time to create the floor of the floodplain. Floodplains generally contain unconsolidated sediments, often extending below the bed of the stream. In coastal floodplains, zones are distinguished by wave heights.

Floodplain boundaries are designated and routinely updated through cooperation between local governments, states and the FEMA. Flood Insurance Study (FIS) findings are shown on Flood Insurance Rate Maps (FIRMs) and describe various flood hazard zones based on flood height exceedance return periods. Flood hazard zone designations depend on local conditions and map issue dates, but all will show the 100-year or base flood elevation (1-percent annual chance flood), as well as some areas of the 500-year floodplain (0.2-percent annual chance flood).

Figure 4.18 – Characteristics of a Riverine Floodplain

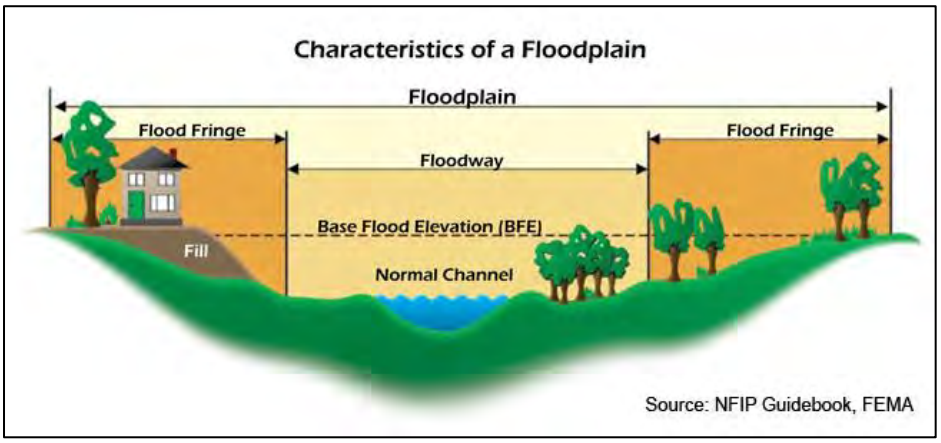
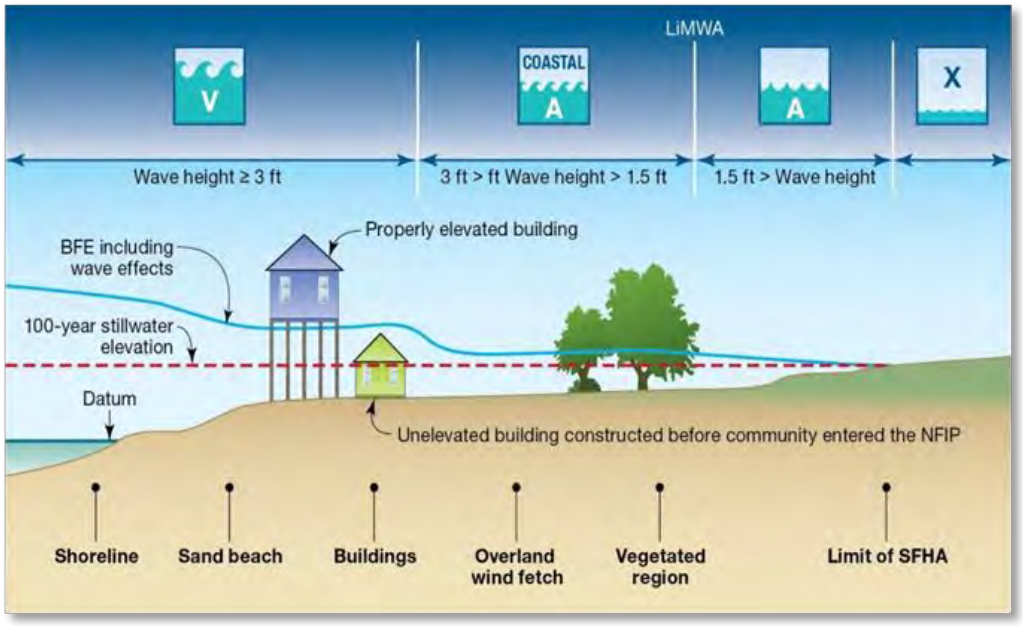


Figure 4.19 – Characteristics of a Coastal Floodplain



Source: FEMA

In its common usage, the floodplain most often refers to that area that is inundated by the "100-year flood," or 1-percent-annual-chance flood, as it is the flood that has a one percent chance in any given year of being equaled or exceeded. The "500-year flood" is the flood that has a 0.2 percent chance of being equaled or exceeded in any given year. Flooding can also occur outside of mapped floodplains, especially local stormwater flooding, as discussed above.

The 1-percent-annual-chance flood, which is the minimum standard used by most federal and state agencies, is used by the National Flood Insurance Program (NFIP) as the standard for floodplain management and to determine the need for flood insurance. Participation in the NFIP requires adoption and enforcement of a local floodplain management ordinance which is intended to prevent unsafe development in the floodplain, thereby reducing future flood damages. Participation in the NFIP allows for the federal government to make flood insurance available within the community as a financial protection against flood losses. Since floods have an annual probability of occurrence, have a known magnitude, depth and velocity for each event, and in most cases, have a map indicating where they will likely occur, they are in many ways often the most predictable and manageable hazard.

Warning Time: 3 – 6 to 12 hours

Duration: 3 – Less than 1 week

LOCATION

COASTAL FLOODING

Regulated floodplains are illustrated on FIRMs, which are the official maps for a community on which FEMA has delineated both the Special Flood Hazard Areas (SFHAs) and the risk premium zones applicable to the community. SFHAs represent the areas subject to inundation by the 1-percent-annual-chance flood event. Table 4.27 summarizes the flood insurance zones identified by the Digital FIRMs (DFIRMs).

Table 4.27 – Mapped Flood Insurance Zones within the Outer Banks

Zone	Description
A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas, no depths or base flood elevations are shown within these zones.
AE	AE Zones, also within the 100-year flood limits, are defined with BFEs that reflect the combined influence of stillwater flood elevations and wave effects less than 3 feet. The AE Zone generally extends from the landward VE zone limit to the limits of the 100-year flood from coastal sources, or until it reaches the confluence with riverine flood sources. The AE Zones also depict the SFHA due to riverine flood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no wave effects. The Coastal AE Zone is differentiated from the AE Zone by the Limit of Moderate Wave Action (LiMWA) and includes areas susceptible to wave action between 1.5 to 3 feet.
AO	Areas subject to inundation by 1-percent-annual-chance shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown in this zone. Mandatory flood insurance purchase requirements and floodplain management standards apply.
VE	Zone VE is the flood insurance rate zone that corresponds to the 1% annual chance coastal floodplains that have additional hazards associated with storm waves. Whole-foot Base Flood Elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.
0.2% Annual Chance (Shaded Zone X)	Moderate risk areas within the 0.2-percent-annual-chance floodplain, areas of 1-percent-annual-chance flooding where average depths are less than 1 foot, areas of 1-percent-annual-chance flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 1-percent-annual-chance flood by a levee. No BFEs or base flood depths are shown within these zones. (Zone X (shaded) is used on new and revised maps in place of Zone B.)
Zone X (Unshaded)	Minimal risk areas outside the 1-percent and 0.2-percent-annual-chance floodplains. No BFEs or base flood depths are shown within these zones. Zone X (unshaded) is used on new and revised maps in place of Zone C.

Figure 4.20 and Figure 4.21 reflect the current effective FIRM flood zones for Currituck County and Dare County, respectively. The current effective FIS and FIRM date for both counties is June 19, 2020; however, most of the FIRM panels for Currituck County are dated December 21, 2018. NCEM's IRISK database references the current effective FIRMs for estimated vulnerability to flooding. However, these FIRMs show a significant decrease in high-risk zones compared to the previous 2006 FIRMs for Currituck County and Dare County. The HMPC has expressed concerns that the changes presented in the current effective FIRMs greatly underestimate risk.

The HMPC indicated that the previous 2005/2006 FIRMs are a more accurate depiction of flood risk. Therefore, the SFHA according to the 2005/2006 FIRMs is mapped in Figure 4.22 and Figure 4.23 to illustrate locations most at risk of flooding.

Flooding can occur anywhere in the Outer Banks. Flood risk is not limited to the 1%-annual-chance floodplain.

Spatial Extent: 3 – Moderate

Figure 4.20 – FEMA Flood Hazard Areas in Currituck County, 2018 Effective FIRM

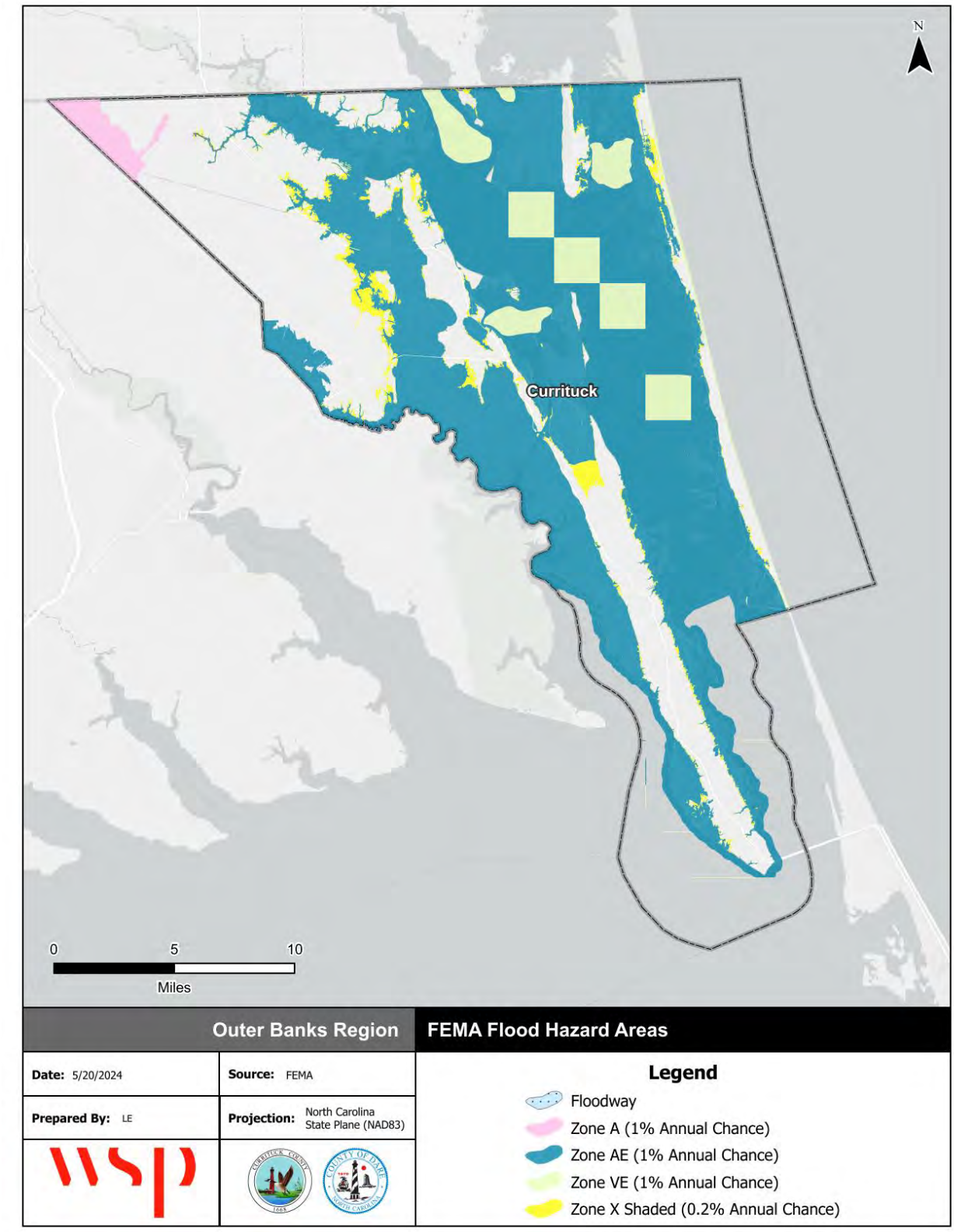


Figure 4.21 – FEMA Flood Hazard Areas in Dare County, 2020 Effective FIRM

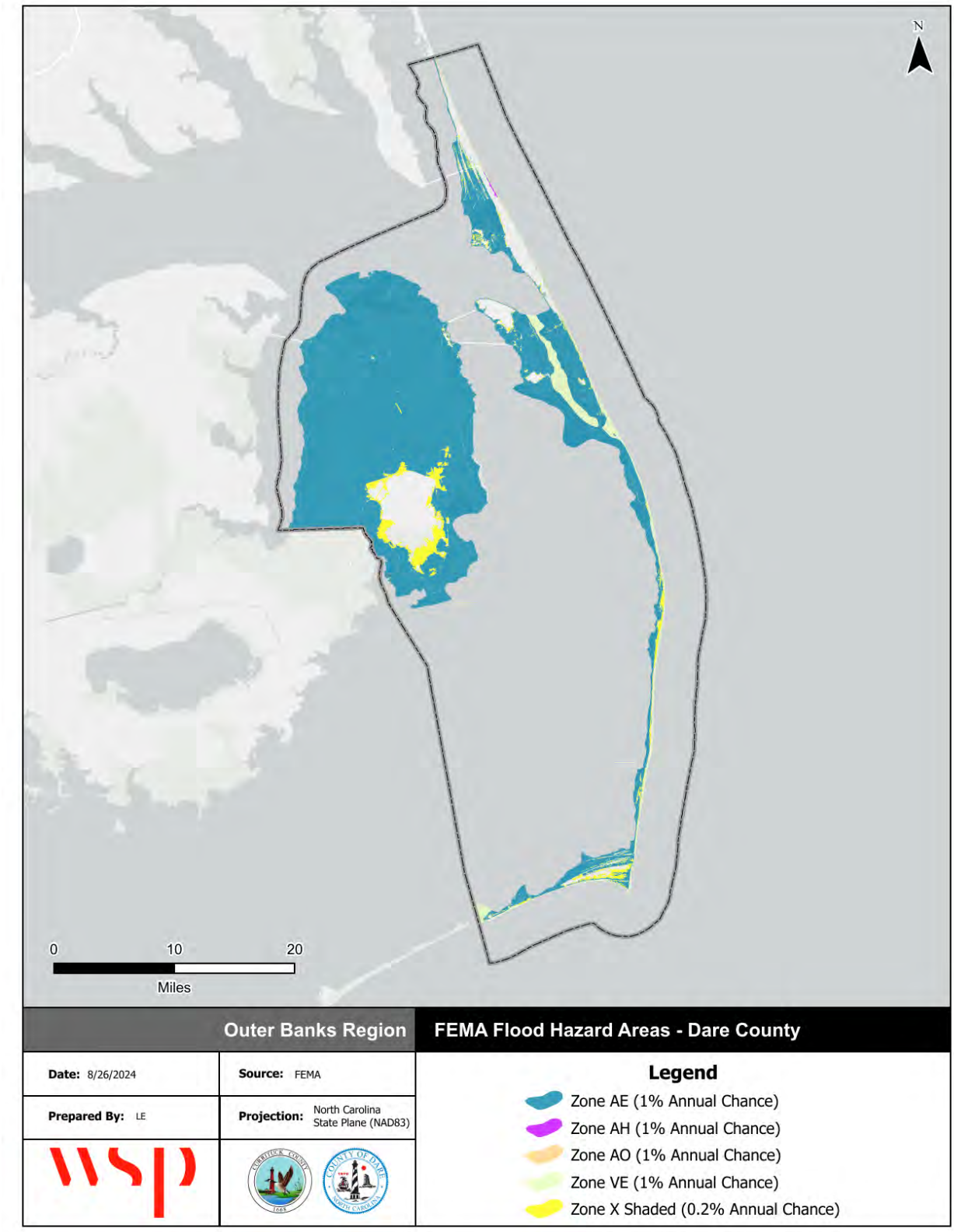


Figure 4.22 – FEMA Flood Hazard Areas in Currituck County, 2005 FIRM

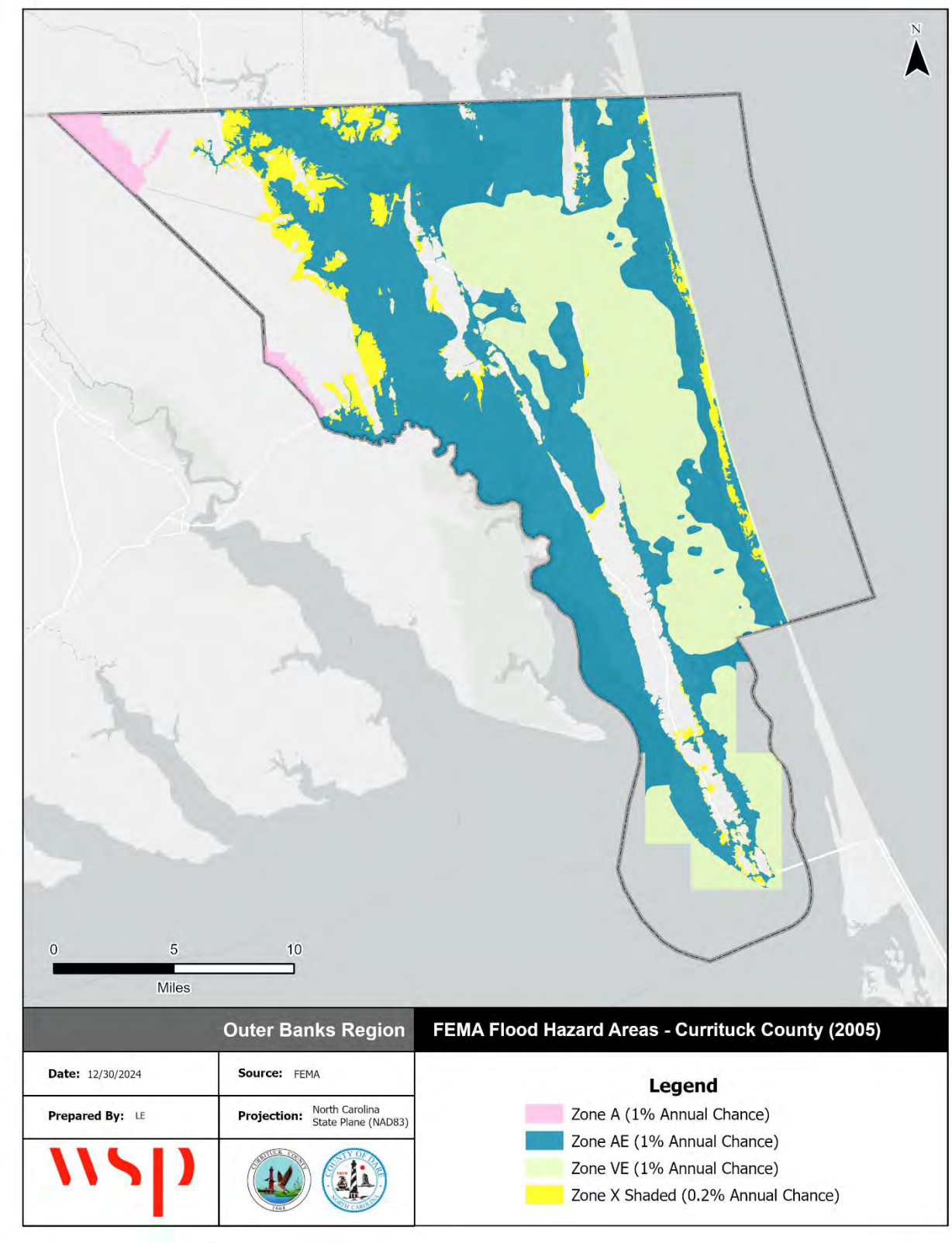
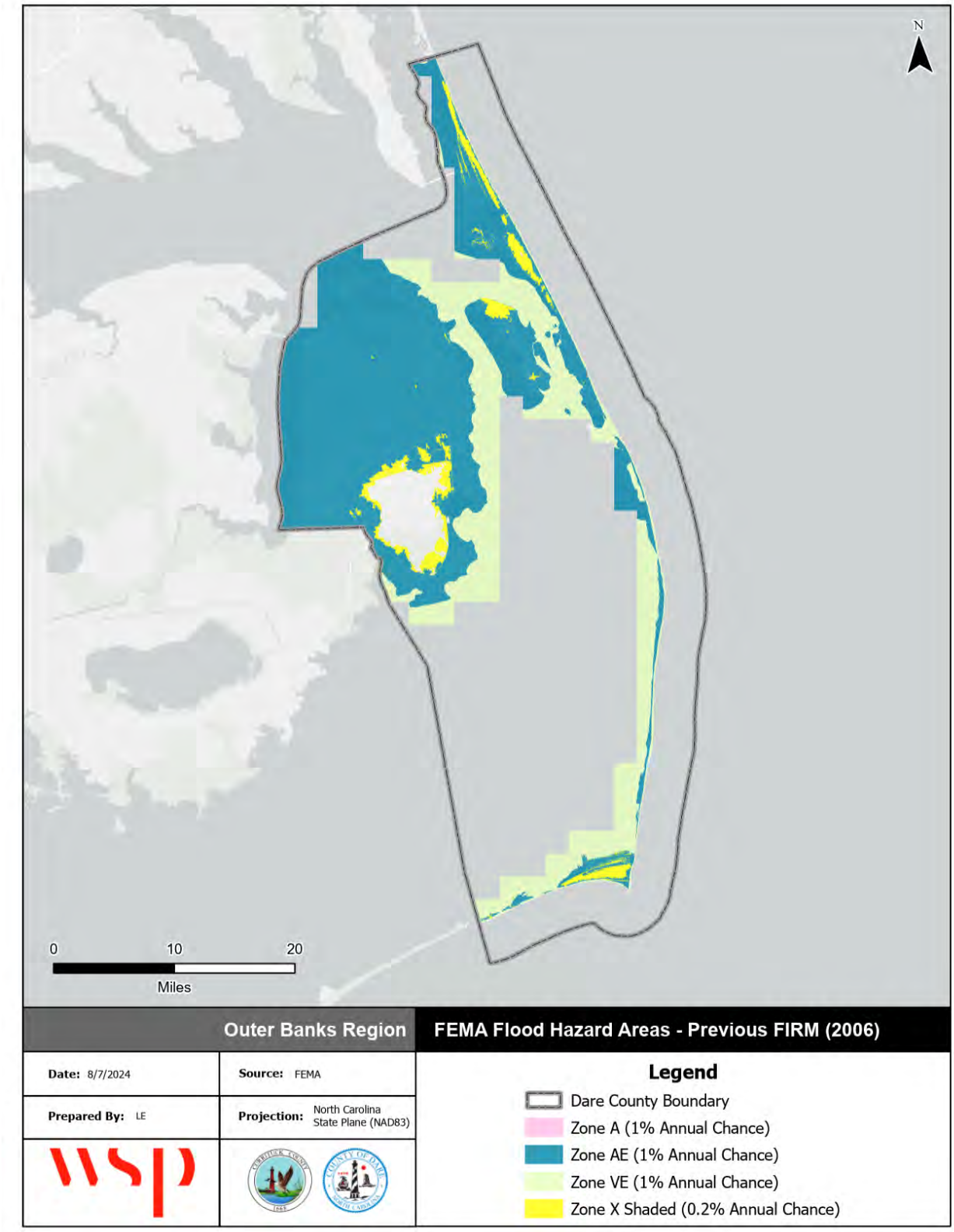


Figure 4.23 – FEMA Flood Hazard Areas in Dare County, 2006 FIRM

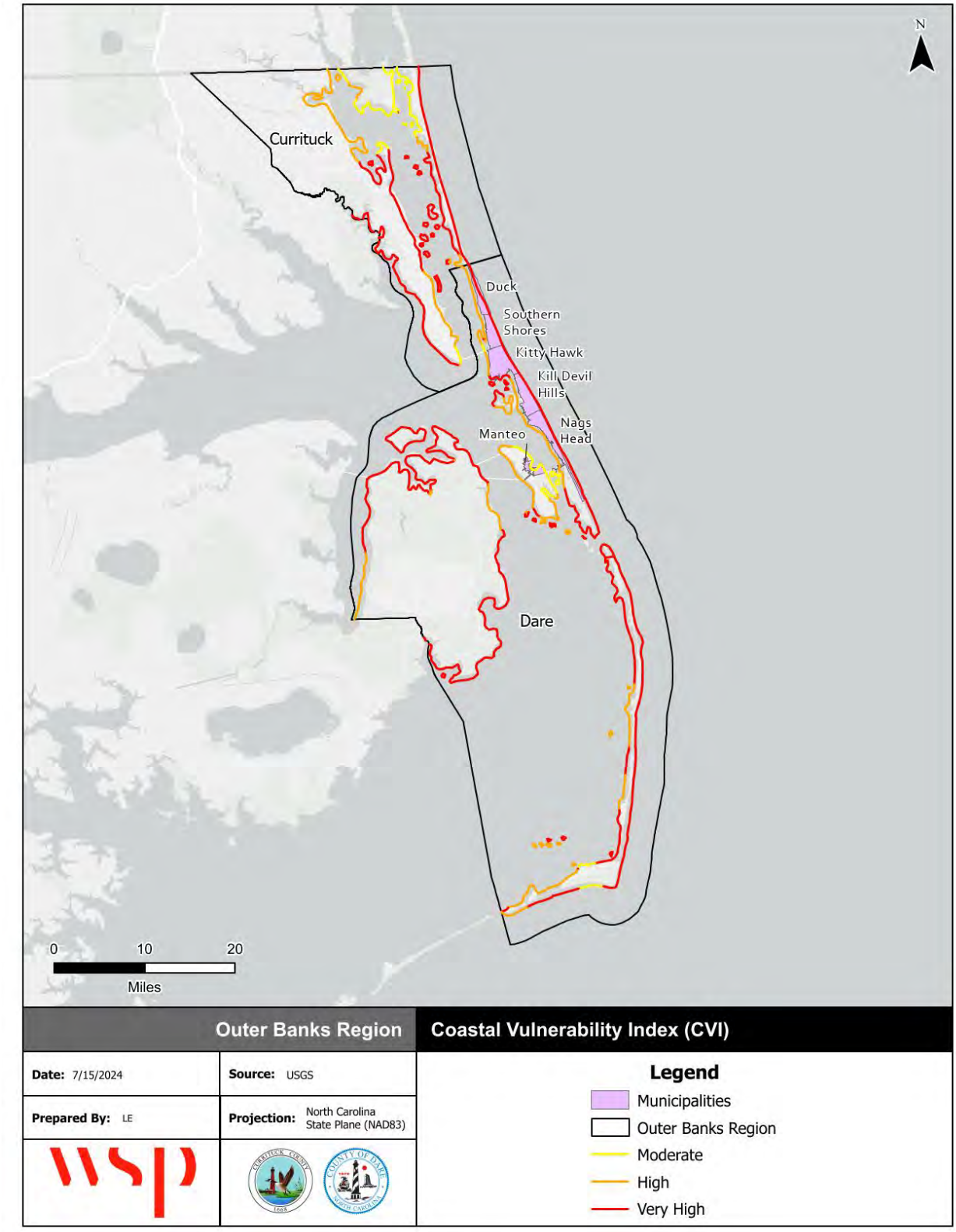


SEA LEVEL RISE

Sea level rise can affect any coastal areas in the Outer Banks region. The Coastal Vulnerability Index (CVI), developed by United States Geological Survey (USGS), provides a preliminary overview of the relative susceptibility of the United States coast to sea level rise. The CVI is based on geomorphology, regional coastal slope, tide range, wave height, relative sea level rise, and shoreline erosion and acceleration rates. For each study area, each variable is scored on a 1-5 scale based on defined parameters, where "1" indicates low contribution to coastal vulnerability and "5" indicates high contribution to vulnerability. These scores are then aggregated into a single index through a mathematical formula. The resulting index gives an overview of where physical changes may occur due to sea-level rise.

Figure 4.24 shows the CVI for the Outer Banks region. The entire ocean coastline from northern Currituck County to the tip of Cape Hatteras is rated very high on the CVI. Waterfront areas throughout the remainder of the region, including the rest of the Atlantic coast as well as along the Currituck, Albemarle, and Pamlico Sounds, are rated moderate to very high on the CVI.

Figure 4.24 – Coastal Vulnerability Index, Outer Banks Region



Source: USGS Coastal Change Hazards Portal

EXTENT

Flood extent can be defined by the amount of land in the floodplain and the potential magnitude of flooding as measured by flood depth and velocity. FEMA Flood Insurance Studies define the probability of flooding by flood events of a magnitude which are expected to be equaled or exceeded once on the average during a specific time period, or recurrence interval.

According to the 2005/2006 FIRMs, approximately 70% of Currituck County and 50% of Dare County fall within the SFHA. Under the current effective FIRMs, nearly 59% of Currituck County and 30% of Dare County are in the SFHA. Acreage of Zone AE increased in Currituck County but decreased in Dare County. Acreage of Zone VE decreased dramatically in both counties. The shaded Zone X also decreased in both counties.

Table 4.28 provides a summary by county of the region's total area by flood zone on the 2005/2006 DFIRM and current effective FIRMs. Figure 4.25 and Figure 4.26 show the depth of flooding predicted from a 1% annual chance flood. Figure 4.27 and figure show the flood depth for both counties based on the current effective DFIRMs.

Table 4.28 – Flood Zone Acreage in the Outer Banks by County

Flood Zone	2005/2006 FIRMs		Current Effective FIRMs	
	Acreage	Percent of Total	Acreage	Percent of Total
Currituck County				
Zone A	4,294.32	1.51%	3,327.68	1.17%
Zone AE	123,599.50	43.44%	147,151.79	51.71%
Zone VE	70,531.84	24.79%	16,472.99	5.79%
Zone X (500-year)	15,108.54	5.31%	6,880.05	2.42%
Zone X (Unshaded)	51,271.99	18.02%	76,803.35	26.99%
Open Water	19,716.44	6.93%	33,934.38	11.92%
Subtotal	**284,522.63**	--	**284,570.23**	--
Dare County				
Zone A	25.20	0.00%	-	-
Zone AE	268,267.60	34.13%	229,324.15	29.13%
Zone AO	-	-	344.00	0.04%
Zone AH	-	-	118.75	0.02%
Zone VE	126,595.90	16.11%	10,433.14	1.33%
Zone X (500-year)	20,904.54	2.66%	11,618.71	1.48%
Zone X (Unshaded)	21,814.31	2.78%	33,579.20	4.27%
Open Water	348,447.40	44.33%	501,800.65	63.74%
Subtotal	**786,054.95**	--	**787,218.59**	--
Outer Banks Region Total				
Zone A	4,319.52	0.40%	3,327.68	0.31%
Zone AO	-	-	344.00	0.03%
Zone AH	-	-	118.75	0.01%
Zone AE	391,867.10	36.60%	376,475.93	35.13%
Zone VE	197,127.74	18.41%	26,906.13	2.51%
Zone X (500-year)	36,013.08	3.36%	18,498.76	1.73%
Zone X (Unshaded)	73,086.30	6.83%	110,382.55	10.30%
Open Water	368,163.84	34.39%	535,735.02	49.99%
Total	**1,070,577.58**	--	**1,071,788.83**	--

Figure 4.25 – Flood Depth, 1%-Annual-Chance Flood, 2005 FIRM, Currituck County

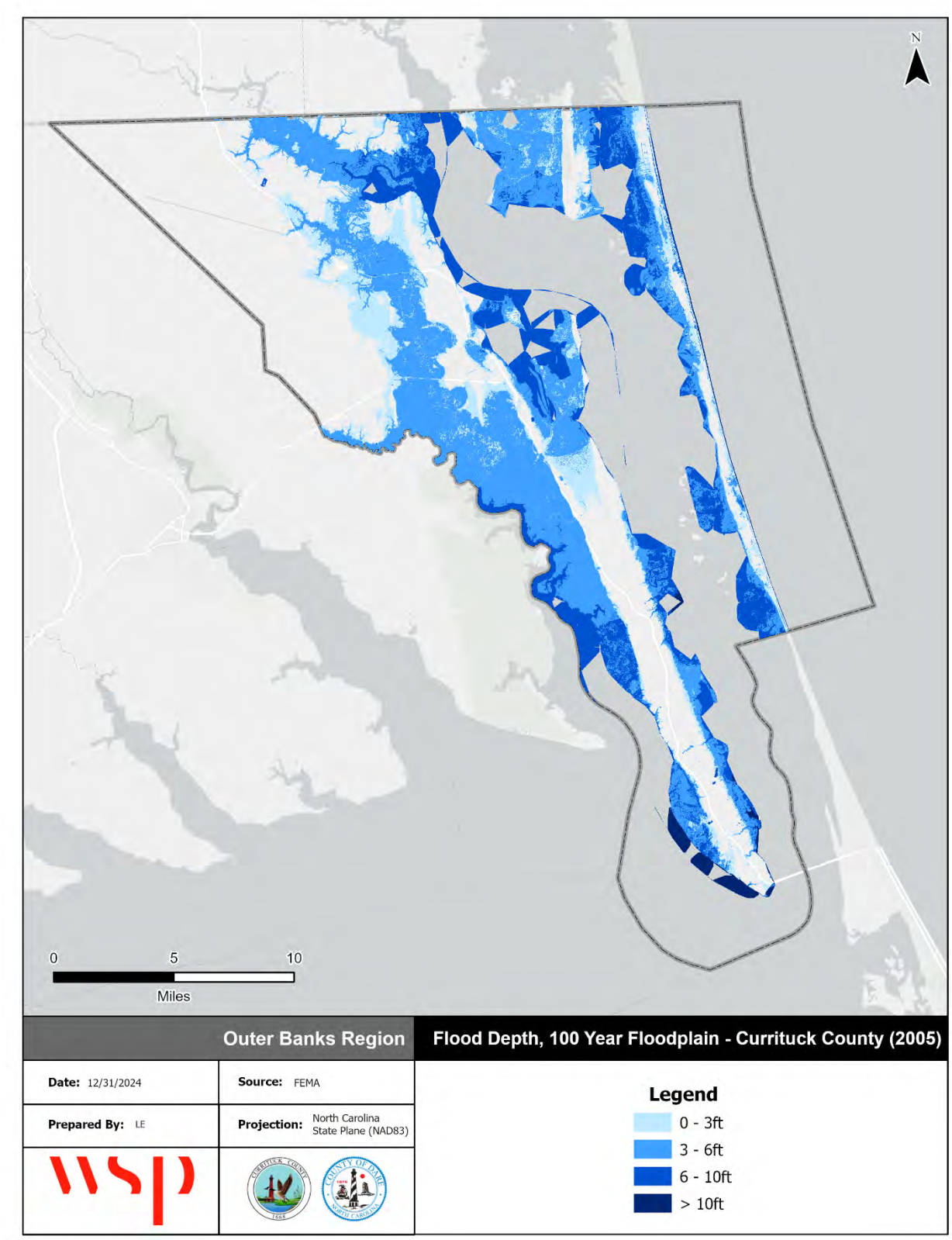


Figure 4.26 – Flood Depth, 1%-Annual-Chance Flood, 2006 FIRM, Dare County

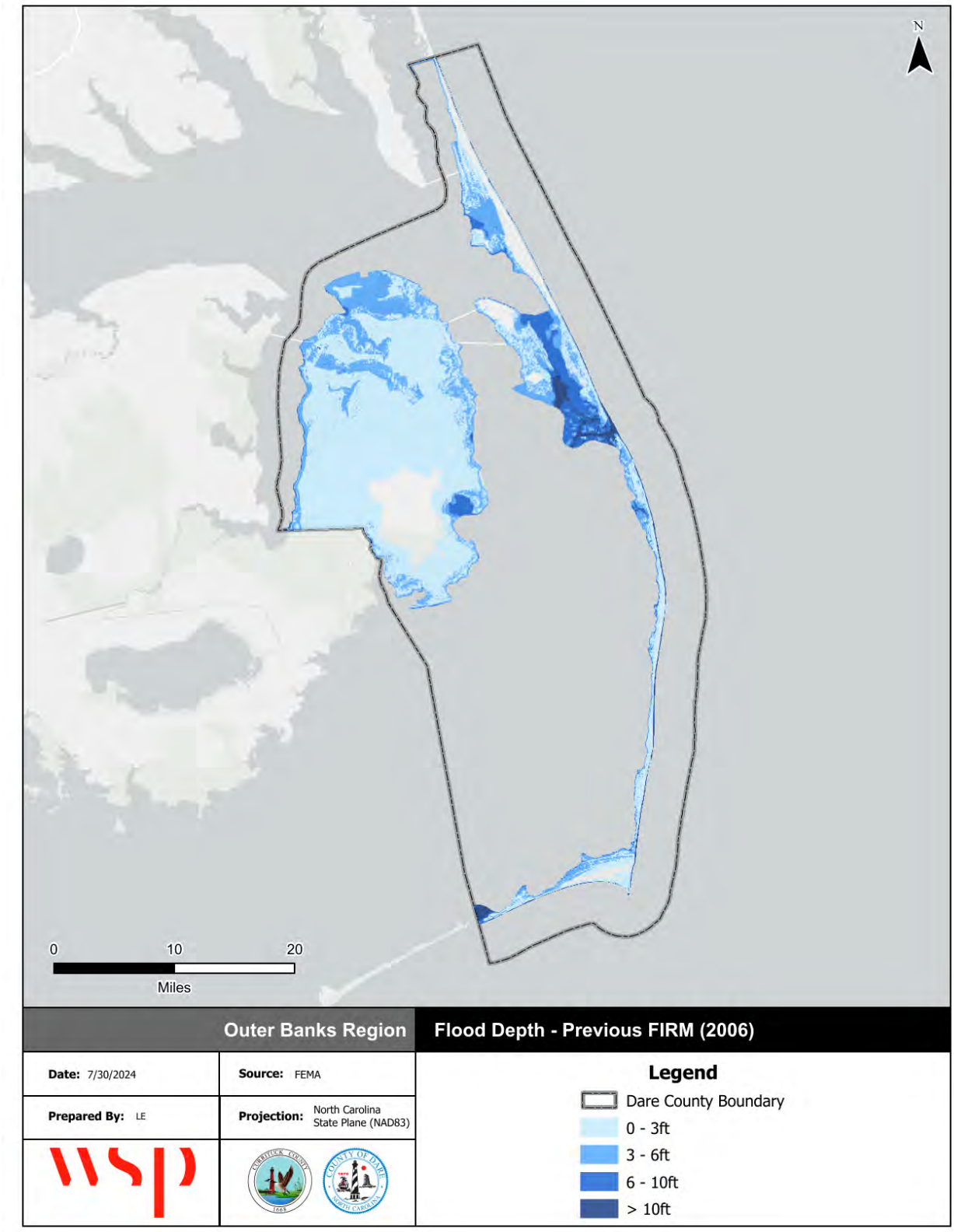


Figure 4.27 – Flood Depth, 1%-Annual-Chance Flood, 2018 DFIRM, Currituck County

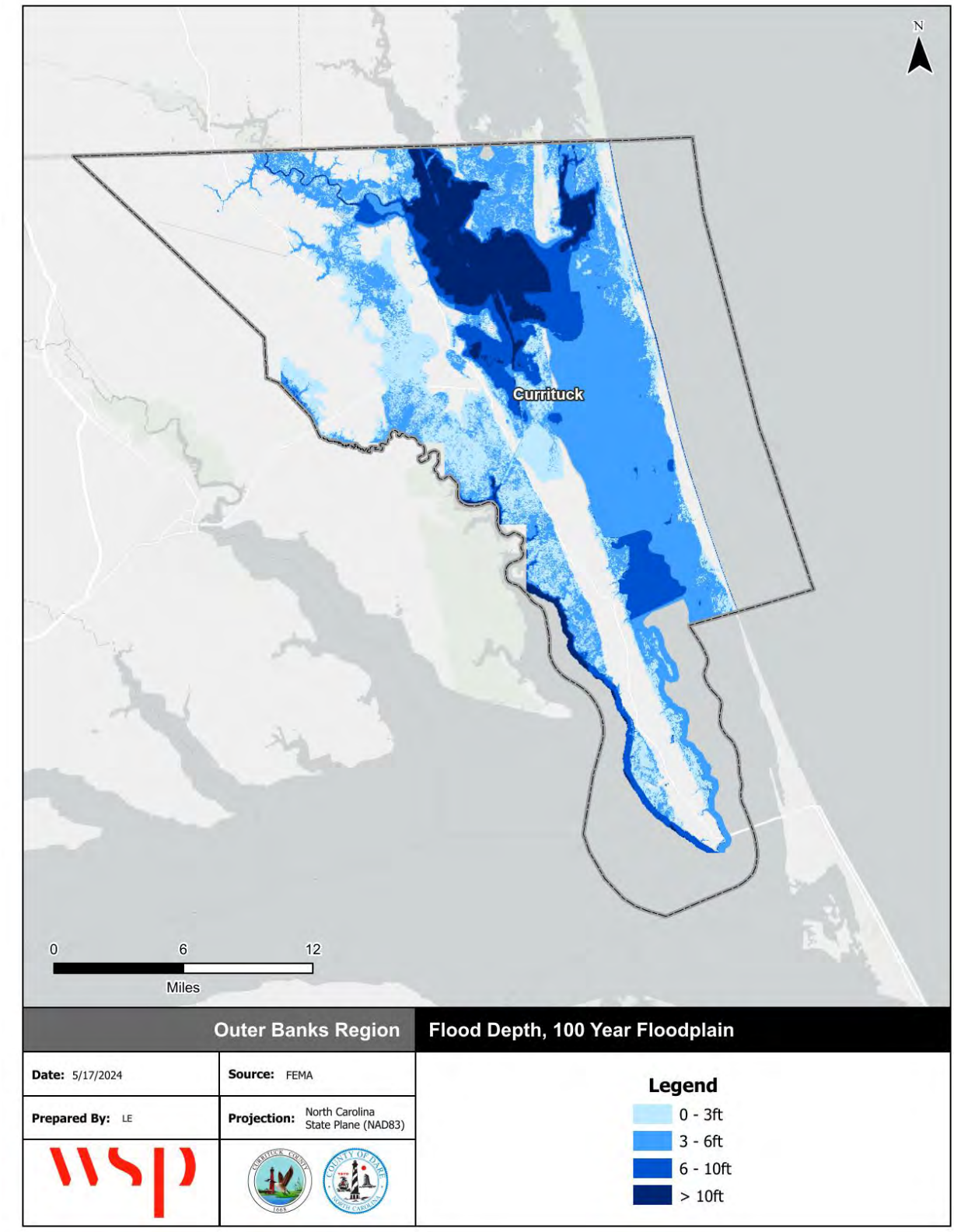
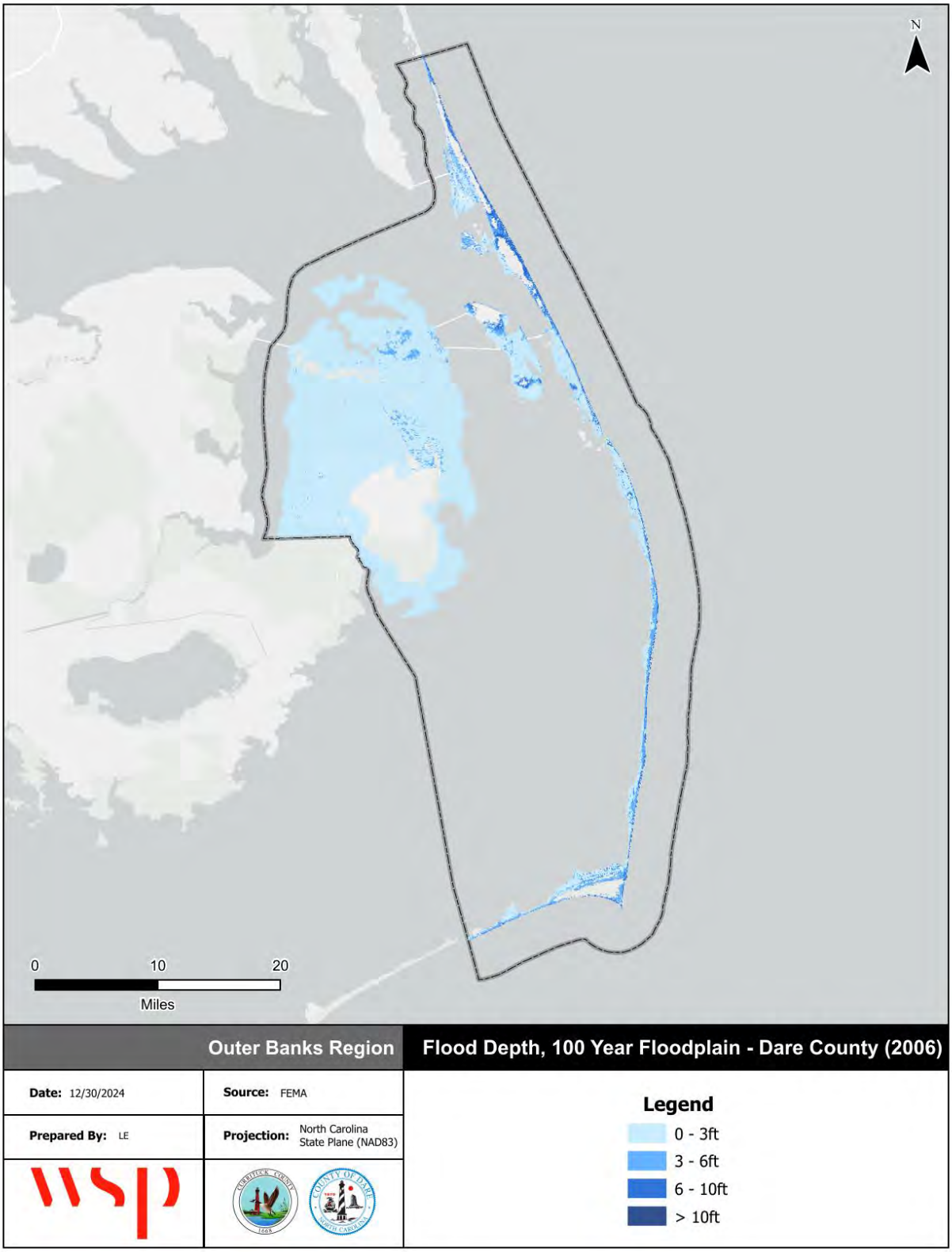


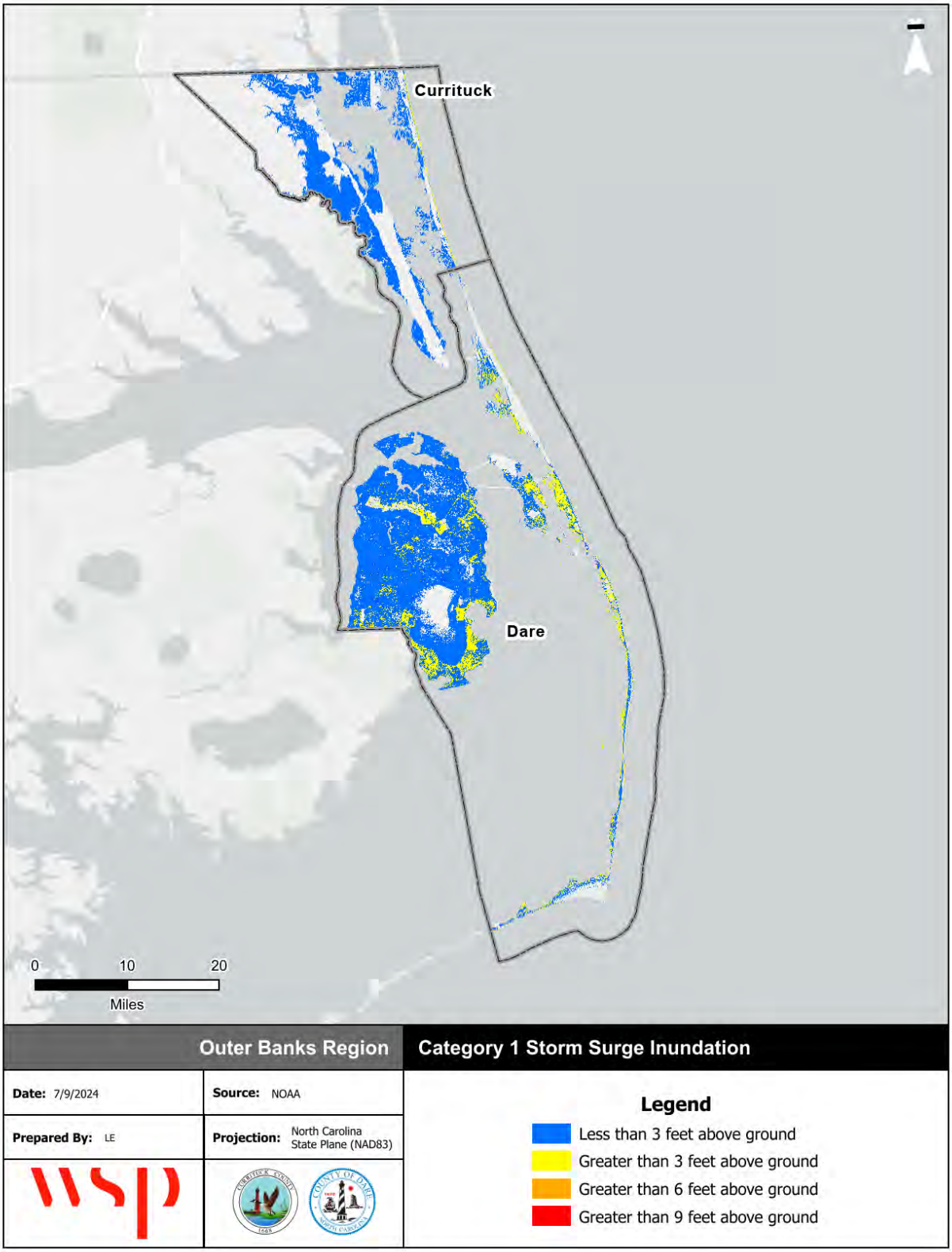
Figure 4.28 – Flood Depth, 1%-Annual-Chance Flood, 2020 DFIRM, Dare County



More than half of the planning area is within areas of high flood risk, as defined by the SFHA on FEMA's 2006 Flood Insurance Rate Maps as vulnerable to the 1-percent-annual-chance flood event. However, while the 1-percent-annual-chance flood is the basis for floodplain management under the NFIP, that does not mean that properties outside the SFHA are not at risk of flooding. Floods of other magnitudes may occur. The remainder of the planning areas is subject to moderate and low flood risk. Low risk is not no risk; areas outside the SFHA may still be flooded by heavy rain events and/or more severe coastal floods.

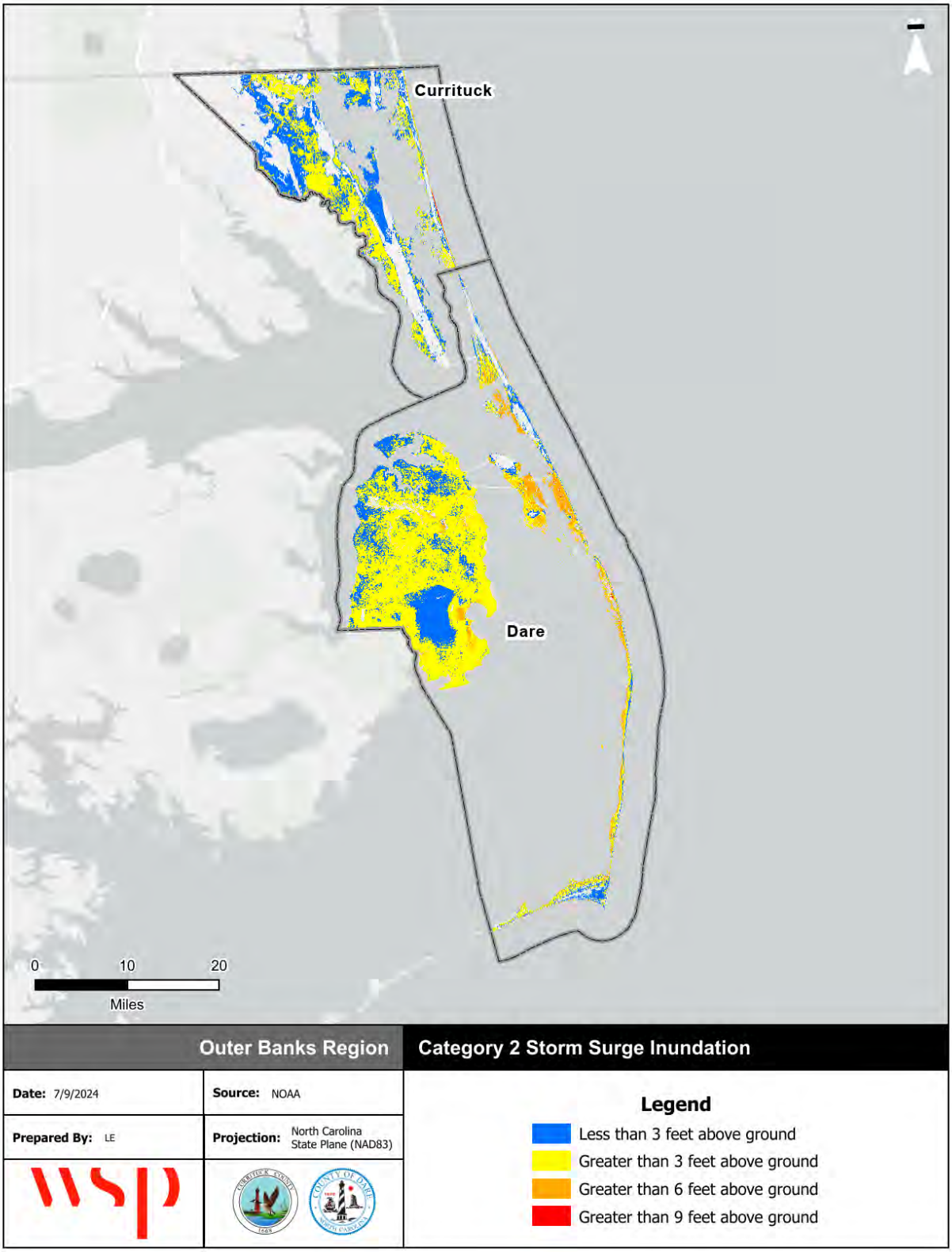
Storm surge affects areas along coastal and sound-side shorelines and further inland depending on the height of the surge. Figure 4.29 through Figure 4.33 show the estimated extent of surge by storm category according to NOAA's SLOSH model. Note that the SLOSH inundation results do not illustrate the storm surge that will occur from any given storm but rather the full potential extent of surge from all possible storms. However, SLOSH does not account for freshwater contribution, so it may underestimate total flooding that could results from a hurricane or tropical storm.

Figure 4.29 – Category 1 Storm Surge Inundation



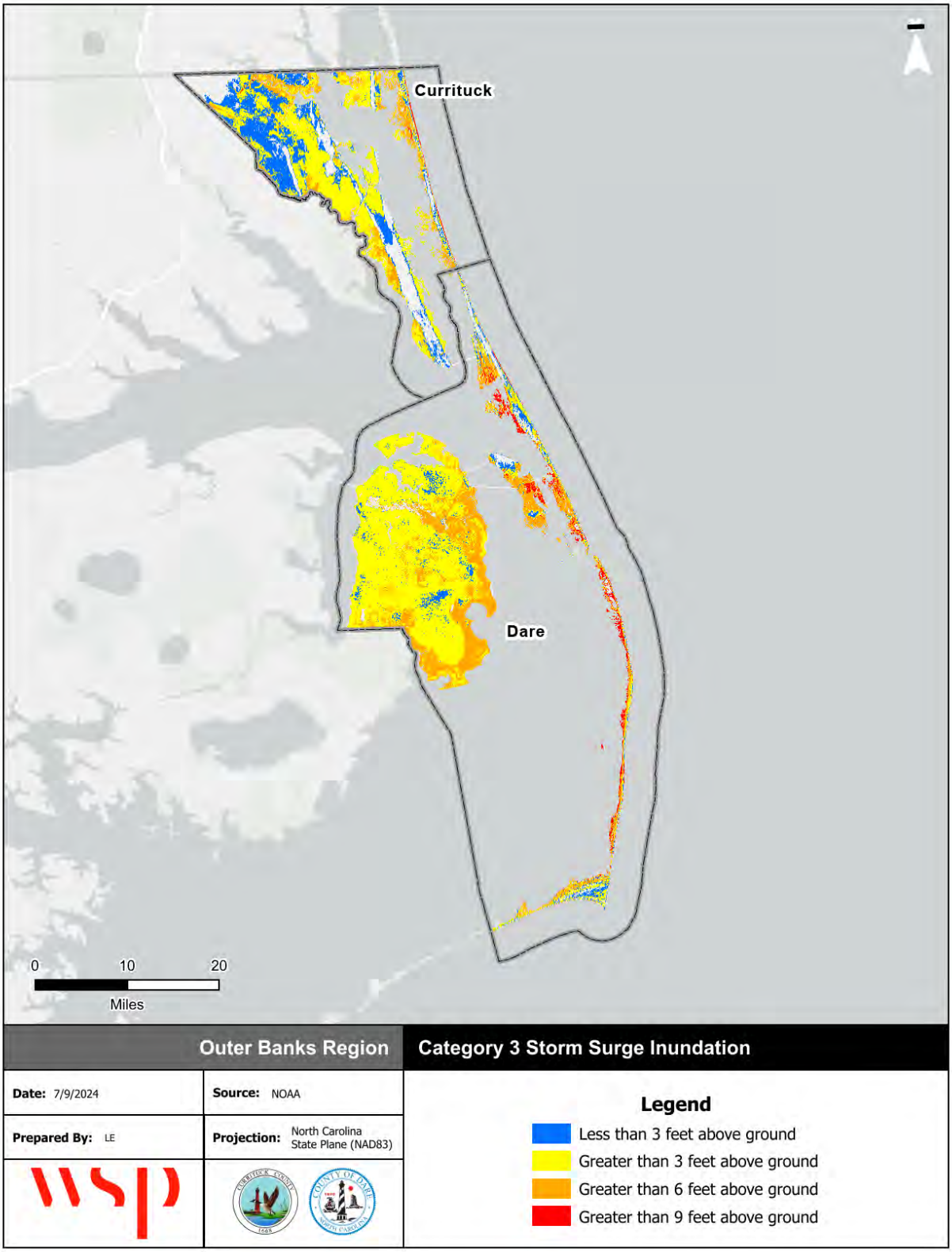
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 4.30 – Category 2 Storm Surge Inundation



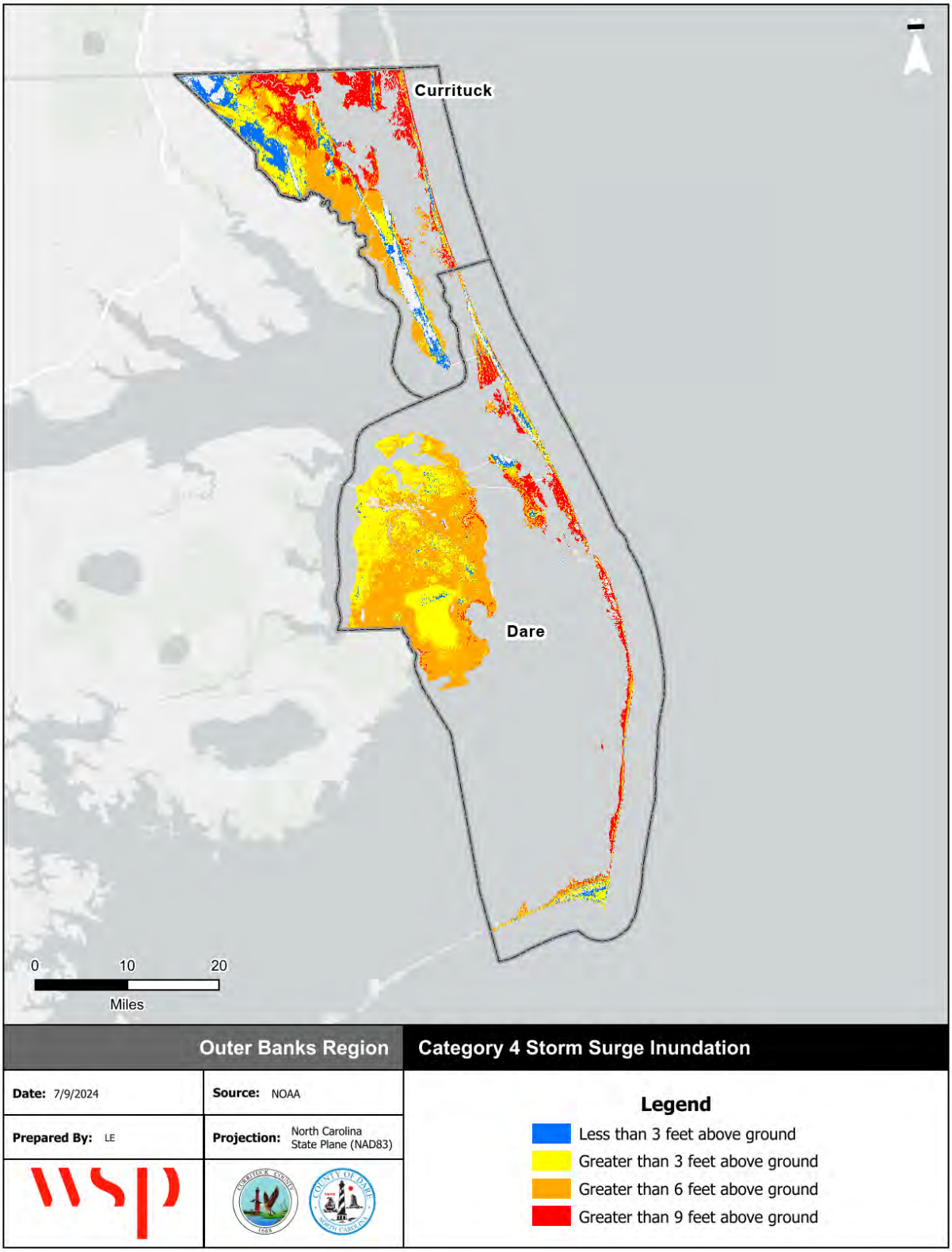
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 4.31 – Category 3 Storm Surge Inundation



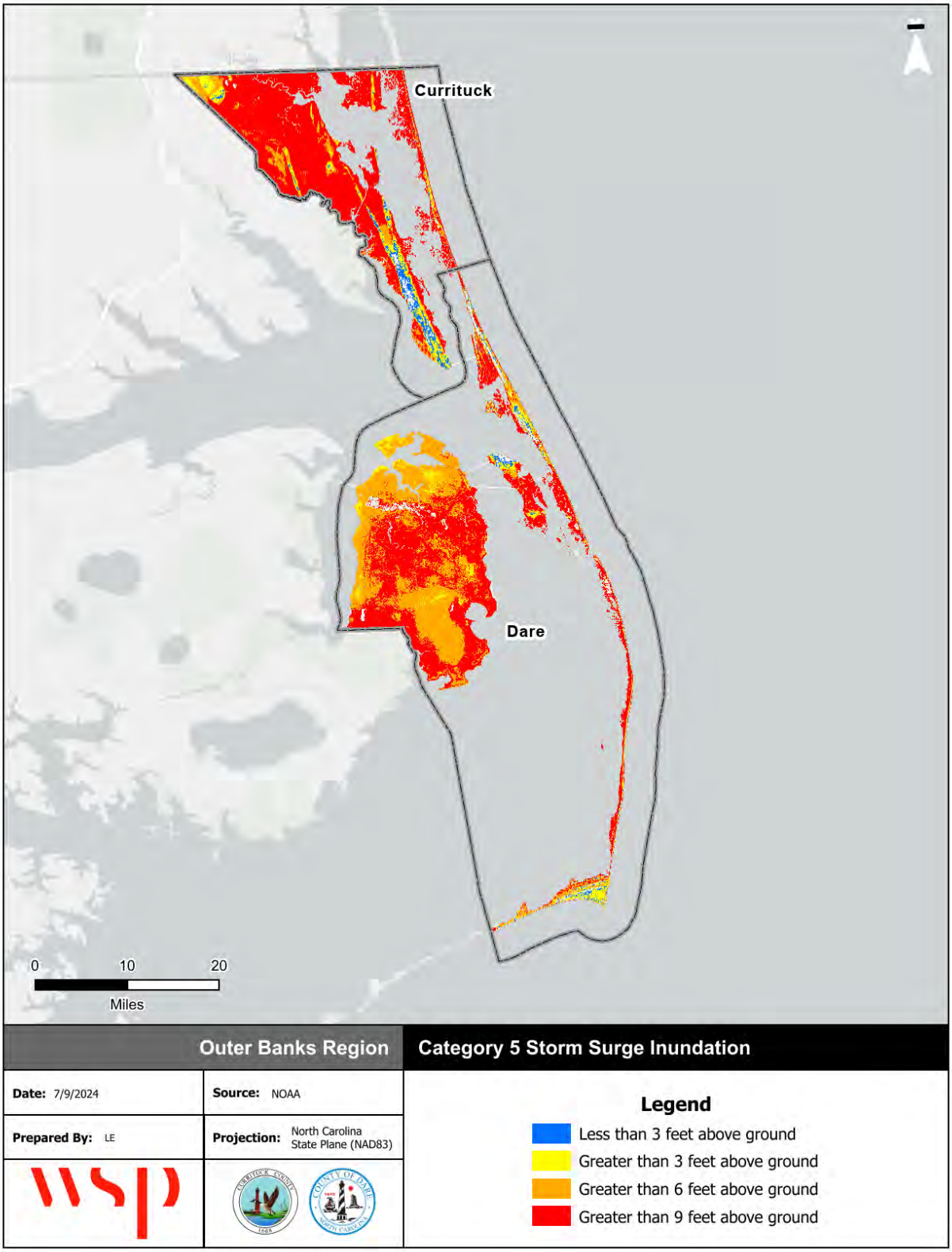
Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 4.32 – Category 4 Storm Surge Inundation



Source: NOAA National Storm Surge Hazard Maps – Version 2

Figure 4.33 – Category 5 Storm Surge Inundation

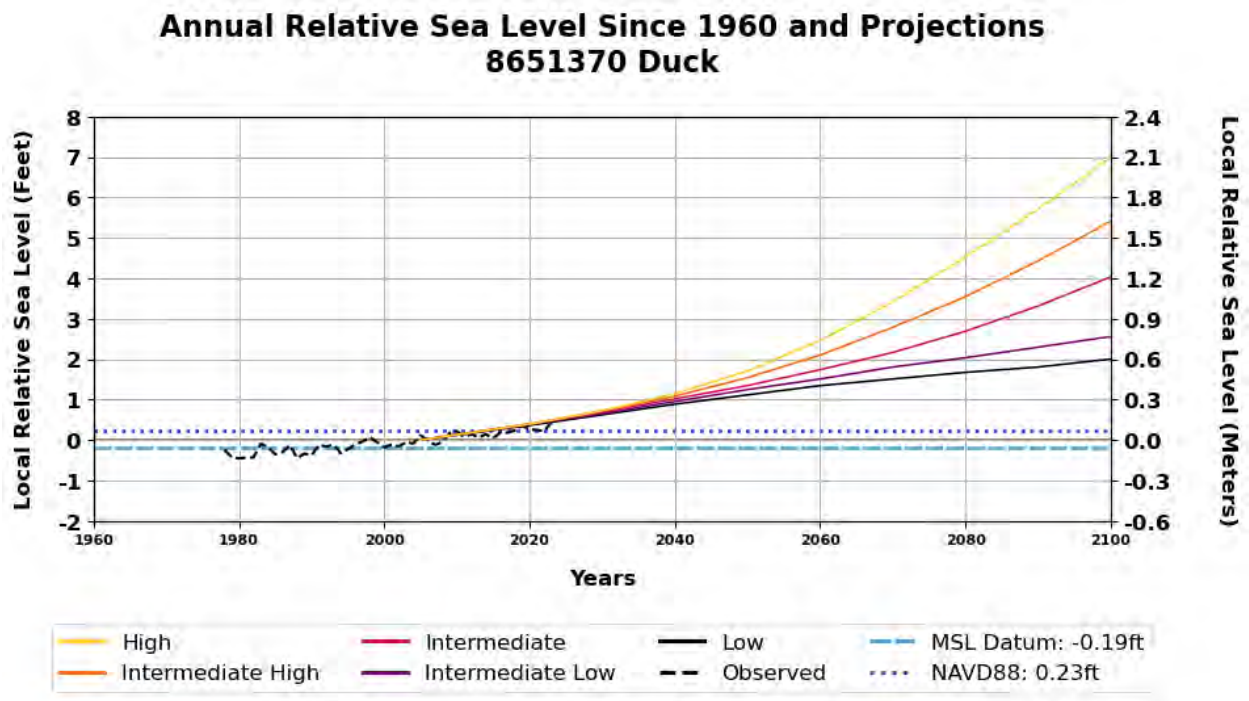


Source: NOAA National Storm Surge Hazard Maps – Version 2

SEA LEVEL RISE

Sea level rise is measured by the number of feet of relative rise and the areas that such rise would inundate. Projections for sea level rise at the Duck, NC tidal gauge station are shown in Figure 4.34. These projections are provided by NOAA and were released in 2022 by a U.S. interagency task force in preparation for the Fifth National Climate Assessment. Relative sea level rise projections are similar for the Oregon Inlet Marina, NC station. Under the intermediate scenario, the region could experience about 1.75 feet of sea level rise by 2060, 2.75 feet by 2080, and over 4 feet by 2100.

Figure 4.34 – Relative Sea Level Rise Projections, Duck, NC

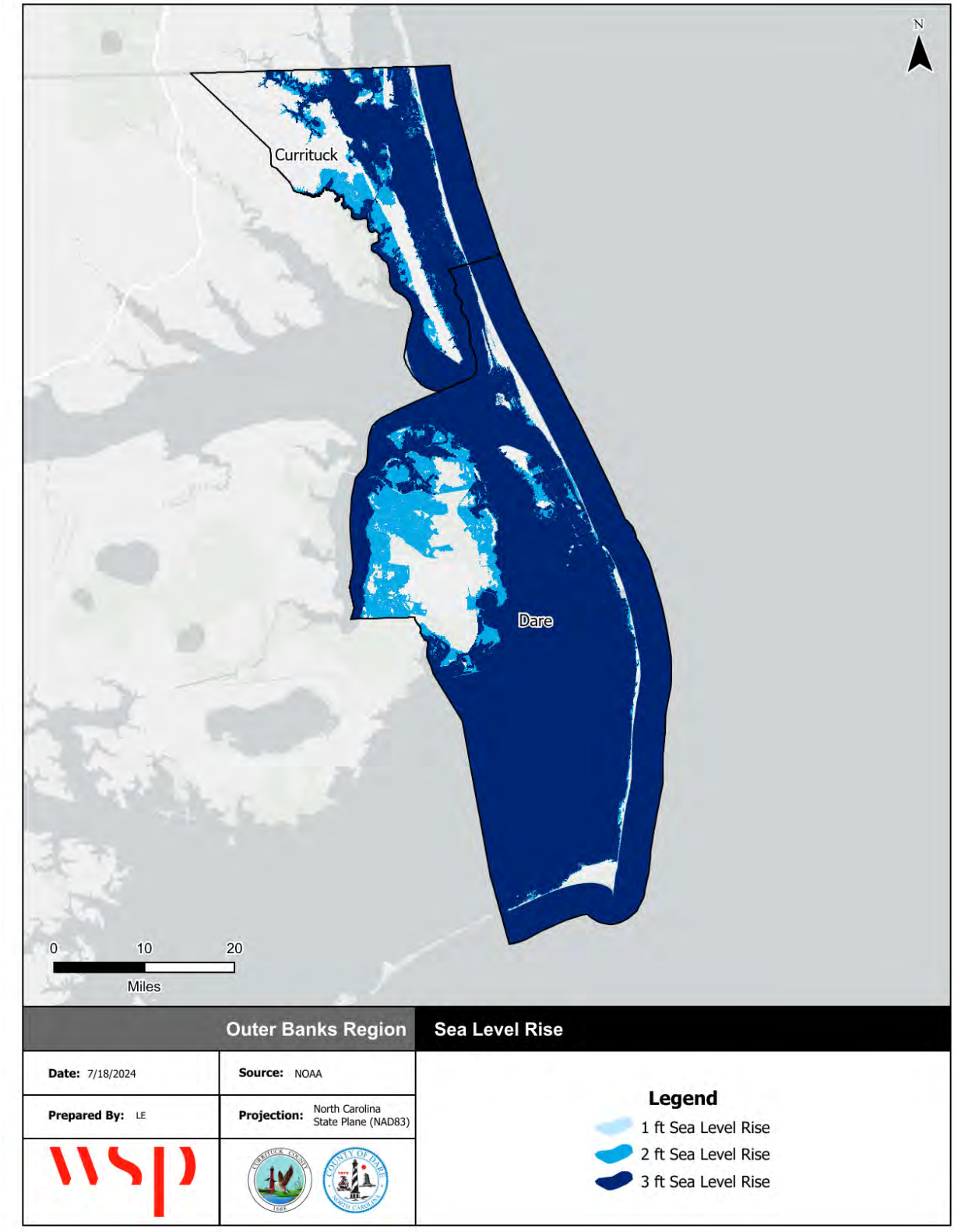


The estimated inundation extents of 1 foot, 2 feet, and 3 feet of sea level rise are shown in Figure 4.35. The sea level rise estimate map shows inundation above mean higher high water (the average of each day's higher high tide line). Sea level rise will likely affect the Atlantic coastline as well as the land adjacent to the Currituck, Albemarle, and Pamlico sounds. Much of southern Dare County could be inundated. Additionally, sea level rise will likely increase future risk of flooding from the other flood hazards discussed in this plan, as more land will have a lower elevation relative to sea level. For example, with much of the barrier islands and wetlands inundated, inland areas will lose their natural protection and may become susceptible to coastal flooding with velocity wave action.

Sea level rise is a slow onset hazard, and the effects of sea level rise have not yet been fully felt. However, sea level rise has already begun to cause "clear sky" or "nuisance" flooding, which is brought on by high tidewaters rather than storm or rain events. Tidal flooding causes temporary inundation of low-lying areas during high-tide events. While tidal flooding is not caused by sea level rise itself, tidal flooding rates are steadily increasing, and daily highest tides surpass fixed elevations increasingly frequently, due in part to sea level rise. According to NOAA, annual occurrences of high tide flooding have increased 5- to 10-fold since the 1960s. Sea level rise may cause flooding to occur more frequently and last for longer durations of time.

Impact: 3 – Critical

Figure 4.35 – Estimated Extent of 1 Foot, 2 Feet, and 3 Feet of Sea Level Rise on the Outer Banks Region



Source: NOAA Sea Level Rise Viewer

HISTORICAL OCCURRENCES

Table 4.29 details the historical occurrences of flooding identified from 1996 through 2023 by NCEI Storm Events database. It should be noted that only those historical occurrences listed in the NCEI database are shown here. Other, unrecorded events may have occurred within the planning area during this timeframe. The HMPC felt that these counts were a considerable underestimate of actual occurrences. Additionally, the HMPC decided not to include the reported property damage estimates from these events because the estimates for these events are significantly lower than actual losses and the HMPC did not want to misrepresent the severity of flood risk to the Region.

Table 4.29 – NCEI Records of Flooding by County and Event Type, 1996-2023

Type	Event Count	Deaths/Injuries
Currituck		
Coastal Flood	23	0/0
Flash Flood	10	0/0
Flood	9	0/0
Heavy Rain	26	0/0
Dare		
Coastal Flood	25	0/0
Flash Flood	17	0/0
Flood	5	0/0
Heavy Rain	1	0/0
Total	**116**	**0/0**

Source: NCEI

According to NCEI, 116 recorded flood events affected the planning area from 1996 to 2023 causing an estimated $19,385,000 in property damage, with no fatalities, injuries, or crop damage recorded.

Table 4.30 provides a summary of this historical information by location. It is important to note that many of the events attributed to a zone are countywide or cover large portions of the planning area. Similarly, though some events have associated starting location identified, the event may have covered a larger area including multiple jurisdictions. For example, Southern Shores is not listed as an event location yet has certainly experienced past flooding. Still, this list provides an indication of areas that may be particularly flood prone. Again, the HMPC decided not to include the reported property damage estimates from these events because the estimates are significantly lower than actual losses.

Table 4.30 – Summary of Historical Flood Occurrences by Location, 1996-2023

Location	Event Count
Currituck	
Corolla	2
Countywide	1
Currituck	10
Currituck Co Airport	2
Eastern Currituck (Zone)	19
Grandy	4
Knotts Island	3
Moyock	10
Point Harbor	4
Poplar Branch	2

Location	Event Count
Sligo	3
Snowden	3
Tulls	1
Western Currituck (Zone)	4
Subtotal Currituck	**68**
Dare	
Buxton	2
Cape Hatteras	2
Duck	2
Eastern Dare (Zone)	19
Frisco	1
Hatteras Island (Zone)	4
Kill Devil Hills	2
Kill Devil Hills Arp	6
Kitty Hawk	2
Manteo	1
Nags Head	2
Northern Outer Banks (Zone)	3
Rodanthe	3
Subtotal Dare	**48**
Region Total	**116**

Source: NCEI

The following event narratives are provided in the NCEI Storm Events Database and illustrate the impacts of flood events on the region:

January 27, 1998 – A Nor'easter produced heavy rain and strong winds across northeast North Carolina on Tuesday, January 27th and Wednesday, January 28th. Rainfall totals generally ranged from 2 to 4 inches. This rainfall caused street flooding and flooding of poor drainage areas throughout the region.

September 17, 2003 – Hurricane Isabel made landfall early in the afternoon on September 18th as a category two hurricane across Core Banks in extreme eastern Carteret county. Isabel moved north northwest near 20 mph across eastern North Carolina during the afternoon. Areas mainly near and east of the storm center experienced significant wind and storm surge effects. Major ocean overwash and beach erosion occurred along the North Carolina Outer Banks where waves up to 20 feet accompanied a 6 to 8 foot storm surge. Almost 350 million dollars in damage occurred in Dare county alone where several thousand homes and businesses, several piers, and sections of Highway 12 were damaged or washed away.

November 22, 2006 – An intense low-pressure system off the North Carolina coast combined with an upper level cutoff low to provide very strong winds, heavy rains of 4 to 8 inches, and moderate to severe coastal flooding during times of high tide. Tidal departures were 4 to 5 feet above normal during the event. Route 12 was flooded with overwash in many areas. Significant coastal flooding was reported across Outer Banks Dare county, mainly for areas north of Buxton. Water levels of 4 to 6 feet above normal reported with significant beach erosion and ocean overwash. Several homes from Rodanthe to Nags Head were severely damaged with several condemned.

November 3, 2007 – The extratropical remnant low pressure of former Hurricane Noel moved northeast well offshore of the Carolina coast on November 2nd. Although the center of the low remained well off

the coast, strong winds and moderate coastal flooding occurred across eastern North Carolina. Wind gusts of 40 to 60 mph were reported along the coast from Cape Lookout north. Water level rises of 3 to 4 feet above normal produced coastal flooding along the northern Outer Banks. Ocean overwash and coastal flooding was reported from Cape Hatteras north along the Outer Banks. Eight single family dwellings in Nags Head reported property damage. Eight ocean front properties on the north end of Rodanthe sustained severe beach erosion and some damage. Thirty-three private beach accesses were damaged near Nags Head. Highway 12 near Rodanthe was flooded with 4 to 5 feet of water closing the road for several hours. Total reported property damage for Dare county was estimated to be 72,000 dollars.

November 12, 2009 - An intense Nor'easter produced moderate to severe coastal flooding across much of the Outer Banks, causing over $11.5 million in damages. Significant ocean over-wash and coastal flooding developed over the northern Outer Banks. The large waves from the storm continued to batter the Outer Banks for several days after the storm system moved away.

Several streets, homes and businesses were flooded in low lying areas of Currituck County close or directly exposed to the Currituck Sound. Moyock experienced the heaviest flooding due to rising Sound waters, with 3 flooded neighborhoods and flood waters entering some homes. The peak tide height at Duck was 7.20 feet, which was 3.22 feet above the astronomical tide. Numerous streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Atlantic Ocean, especially in the Corolla and Carova Beach areas. There was also severe beach erosion and loss of protective dunes. Areas from Buxton north to Duck had several episodes of coastal flooding, mainly during the high tide cycle. Overall 4 homes were destroyed, 61 had major damage and 465 had minor damage. Highway 12 was severely flooded and destroyed near Rodanthe due to the ocean over-wash.

October 4, 2015 – Large breaking waves due to strong onshore winds and large swells from distant Hurricane Joaquin produced significant beach erosion, ocean over wash and coastal flooding. There was also some flooding for sound side areas of Hatteras Island due to high water levels in the Pamlico Sound. 51 residences and businesses had minor to moderate damage producing 590,000 dollars in damages.

October 8-9, 2016 – Hurricane Matthew moved northeast offshore of the North Carolina coast late on October 8th through October 9th. Widespread heavy rain developed on October 8th and continued through early on October 9th as Matthew approached and moved offshore of the coast. Rainfall ranged from 7 to 11 inches in the Outer Banks, and was reported at 10.73 inches at Point Harbor, leading to numerous creeks and streams to be out of their banks and causing significant flash flooding. Numerous roads were impassable or closed for several days, and many homes and businesses were impacted. In Kill Devil Hills and Nags Head, water was 2 to 3 feet deep on roads and several homes and businesses flooded with up to 2 feet of water in some.

March 4, 2018 – Strong low pressure passed just to the north of eastern North Carolina on March 2nd then continued to deepen while only slowly moving offshore March 3rd and 4th. This system produced very strong west winds as it passed just to the north of the area and then gusty north winds for several days as it lingered well to the northeast. These winds produced high water levels over the eastern portion of the Pamlico Sound producing significant sound-side flooding of Outer Banks Dare County. Water levels reached 2 to 3 feet above ground level in spots flooding and closing some roads. Water reached a few residences and businesses with up to one foot of inundation reported. Areas most impacted extended from Rodanthe south to Hatteras Village including beach front property in the Avon area. Many sand dunes, some up to 30 feet, were destroyed. Ocean over-wash flooded portions of Highway 12 with water 2 to 3 feet deep with over 1 foot of sand and debris, closing it for long periods of time.

The Outer Banks region has also experienced extensive flooding from storm surge related to hurricanes, tropical storms, and nor'easters. Table 4.31 summarizes all recorded storm surge events from NCEI between 1999 and 2023. These events caused over $55 million in property damage. Narrative records on storm surge impacts are provided below.

Table 4.31 – Recorded Storm Surge Events in the Outer Banks Region, 1999-2023

Date	Location	Deaths/ Injuries	Reported Property Damage
3/6/2001	Manteo	0/0	$0
4/10/2003	Eastern Currituck (Zone)	0/0	$0
3/10/2004	Eastern Dare (Zone)	0/0	$10,000
4/3/2005	Eastern Dare (Zone)	0/0	$0
4/15/2005	Eastern Dare (Zone)	0/0	$50,000
5/6/2005	Eastern Dare (Zone)	0/0	$0
9/9/2007	Eastern Dare (Zone)	0/0	$0
7/20/2008	Eastern Dare (Zone)	0/0	$0
10/19/2008	Eastern Dare (Zone)	0/0	$10,000
9/2/2010	Eastern Dare (Zone)	0/0	$380,000
8/26/2011	Western Dare (Zone)	0/0	$1,000,000
8/26/2011	Eastern Dare (Zone)	0/0	$40,000,000
10/28/2012	Eastern Dare (Zone)	0/0	$13,000,000
6/6/2013	Eastern Dare (Zone)	0/0	$0
7/3/2014	Eastern Dare (Zone)	0/0	$1,500,000
	Total	**0/0**	**$55,950,000**

Source: NCEI

March 6, 2001 – Strong northwest winds of 40 mph caused soundside flooding of the causeway in Manteo, on Highway 12 in the town of Waves and flooding in Collington Harbor. These strong winds persisted for nearly 24 hours allowing the Pamlico Sound to cause soundside flooding.

March 10, 2004 – Significant overwash was reported north of Rodanthe during the late evening hours on the 10th continuing into the early morning hours on the 11th, resulting in the closure of Highway 12. Several homes near Kill Devil Hills received minor damage from flooding.

April 3, 2005 – Moderate sound-side flooding occurred across northern portions of the Outer Banks near Oregon Inlet during the early morning hours of Sunday, April 3rd. Highway 12 was closed for several hours with one foot of water reported over the road.

May 6, 2005 – An unseasonable and strong Nor'easter buffeted the North Carolina coast with damaging wind gusts, torrential rain, high surf, and coastal flooding. Winds were sustained as high as 45 to 55 mph with wind gusts to 80 mph across coastal counties of Eastern North Carolina. Water levels rose four to six feet above normal along Pamlico Sound. Storm total rainfall amounts ranged from 4 to 7 inches. During the peak of storm, the Diamond buoy reported 20 foot waves. Moderate beach erosion was reported along the Outer Banks. In Dare County, the public reported sound-side flooding with one foot of water on Highway 12 near Frisco.

August 26, 2011 – Hurricane Irene made landfall during the morning of the 27th, near Cape Lookout, as a large category 1 hurricane on the Saffir/Simpson Hurricane Wind Scale. Due to the large size of the hurricane, strong damaging winds, major storm surge, and flooding rains were experienced across much of eastern North Carolina. Wind gusts from 60 to 70 mph resulted in a 5 foot sound-side storm surge in Manteo. In eastern Dare County, wind gusts from 63 to 88 mph resulted in extensive structural damage. The highest surge was 7 to 10 feet on the sound-side from Buxton to Rodanthe and the highest ocean-side surge of 9.5 feet was recorded at Hatteras Village. The storm surge resulted in extensive damage to structures along the coast along with many dune breaches and damage to Highway 12.

October 28, 2012 – Hurricane Sandy was one of the largest hurricanes on record to affect eastern North Carolina. The main impacts were from a sound-side storm surge of 4 to 6 feet along portions of the Outer

Banks and southern portions of the Pamlico Sound, and an ocean-side surge along the Dare County Outer Banks from Hatteras north to Kitty Hawk. Damages from surge were estimated near 13 million dollars with the main damages occurring along U.S. 158 north of Oregon Inlet in Kitty Hawk where Highway 12 was destroyed and had to be closed. 58 homes were left uninhabitable with eight completely destroyed from Hatteras north to Rodanthe. The highest storm surge measured, 3.94 feet, was recorded sound-side at the USCG Station in Hatteras on the 29th. An NWS storm surge team estimated the highest surge, 8.5 feet, ocean-side at Buxton. Large breaking waves on top of the surge resulted in moderate to major beach erosion and over-wash along the coast from Duck to Hatteras. A large section of Highway 12 north of Rodanthe was closed due to extensive Damage to the road, caused by wave action and ocean over-wash.

August 28, 2016 – Hurricane Hermine caused extensive flooding in villages on Hatteras Island with storm surge of 4 feet above normal time. Estimated damages were $5.4 million.

October 11, 2018 – Hurricane Michael reached North Carolina as a tropical storm. Wind gusts of 74 mph were observed in Kitty Hawk. $7 million in damage occurred from 2 to 4 feet of above ground soundside flooding, with the biggest impacts in Manteo, Kitty Hawk, and Kill Devil Hills.

September 6, 2019 – Hurricane Dorian made landfall as a Category 1 storm on Cape Hatteras where 101 mph winds were recorded. Storm surge of 4-7 feet impacted Hatteras Island villages. Over $14.8 million in damages were sustained across Dare County.

SEA LEVEL RISE

As noted in Figure 4.16 and Figure 4.17, relative sea level has been rising an estimated 4.88 mm/year at the Duck, NC station and 4.62 mm/year at the Oregon Inlet Marina, NC station.

PROBABILITY OF FUTURE OCCURRENCE

By definition, SFHAs are those areas that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. Properties located in the SFHA have a 26 percent chance of flooding over the life of a 30-year mortgage. The Shaded X Zone indicates areas that are estimated to be inundated by the flood event having a 0.2-percent chance of being equaled or exceeded in any given year. The SFHA and the Shaded X zone indicate areas of high and moderate risk according to FEMA guidelines; however, this does not mean that flood risk is limited to these areas. There is also potential for other magnitudes of flood events to impact these and other areas in the region.

While exposure to flood hazards varies across jurisdictions, all jurisdictions have high risk flood hazard areas and the entire planning area faces some level of flood risk. Based on past occurrences and HMPC input concerning known risk areas and additional flood hazard sources beyond the coastal flood as depicted on FIRMs, the likelihood of flooding is considered highly likely for all jurisdictions.

Sea level rise is also highly likely to occur; however, projections vary on the extent of future sea level rise.

Probability: 4 – Highly Likely

CLIMATE CHANGE

The potential for flooding can change and increase. Various land use changes and changes to land surface can result in changes to the floodplain and flood prone areas. For example, an increase in impervious surface can create localized flooding problems inside and outside of natural floodplains by altering or confining natural drainage channels. These changes are often created by human activity. However, changes in precipitation frequency and intensity can also result in changes to flood magnitudes and probabilities. For example, what we currently define as the 1-percent-annual-chance flood may occur more frequently in the future.

Per the 2023 North Carolina Hazard Mitigation Plan, changing climate and weather patterns, environmental conditions, and urban and rural development may affect the frequency and intensity of flooding. Historical data and climate projections provided by the State Climate Office of North Carolina on the North Carolina Resilience Exchange website indicate that days with extreme precipitation (2 inches or more of precipitation) are expected to increase in Currituck and Dare County. Dare County already averages 25 days per decade of extreme precipitation and this number is likely to increase to 31 days per decade by the 2060s. Currituck County averages 15 days of extreme precipitation per decade, which will increase to 18-19 days per decade by the 2060s. This increased likelihood of extreme precipitation events due to climate change will result in greater risks of flash flooding and impacts from stormwater runoff.

Sea level rise is a direct result of global climate change, and sea level rise projections are based on greenhouse gas emission scenarios and associated impacts on global temperature change. Regional estimates of relative sea level change account for changes in ocean currents, temperature and salinity, ice melt and its impacts, and localized changes in ground level due to subsidence or uplift. Given the variation in emissions scenarios and the numerous variables that affect sea level rise, these projections contain substantial variability but are nonetheless important to consider when planning for coastal areas because they indicate where flooding can be expected should actual sea level rise meet estimated levels.

VULNERABILITY ASSESSMENT

The following section provides an assessment of vulnerability to flooding by jurisdiction and flood return period.

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to flooding was estimated using data from the NCEM's IRISK database, which was compiled in NCEM's Risk Management Tool.

As a subset of the building vulnerability analysis, exposure of pre-FIRM structures was estimated. Table 4.32 below provides the NFIP entry date for each participating jurisdiction, which was used to determine which buildings were constructed pre-FIRM. Pre-FIRM structures were built prior to the adoption of flood protection building standards and are therefore assumed to be at greater risk to the flood hazard.

Table 4.32 – NFIP Entry Dates

Jurisdiction	NFIP Entry Date
Town of Duck	10/06/78
Town of Kill Devil Hills	05/04/73
Town of Kitty Hawk	10/01/83
Town of Manteo	01/05/83
Town of Nags Head	11/10/72
Town of Southern Shores	05/13/72
Currituck County	11/01/84
Unincorporated Dare County	10/06/78

Source: Federal Emergency Management Agency Community Status Book Report: Communities Participating in the National Flood Program, August 2013

Pre-FIRM structures are those built before a community's NFIP entry date, while those built after the entry date are post-FIRM. However, because only year built data was available for buildings rather than exact construction dates, the following methodology was used to estimate the number of pre-FIRM

buildings. If the NFIP entry date for a given community is between January and June, buildings constructed the same year as the entry date are considered to be post-FIRM (e.g., if the NFIP entry date is 02/01/1991, buildings constructed in 1990 and before are pre-FIRM. Buildings constructed from 1991 to the present are post-FIRM.). If the NFIP entry date is between July and December, then the following year applies for the year- built cut-off (e.g., if the NFIP entry date is 12/18/2007, buildings constructed in the year 2007 and before are pre-FIRM, 2008 and newer are post-FIRM).

Effective FEMA DFIRM data was used to determine the flood hazard areas for all IRISK flood vulnerability estimates.

In addition to vulnerability estimates presented here, the Outer Banks is also vulnerable to flood impacts associated with sea level rise. Due to sea level rise projected throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion. The population and assets projected to be exposed to coastal risks as well as human pressures on coastal ecosystems will increase significantly in the coming decades due to population growth, economic development, and urbanization (IPCC, 2014). The Outer Banks region is particularly vulnerable to the effects of sea level rise, due to its coastal location, subtropical environment, low topography, and tourism economy.

For more information on flood hazard vulnerability, the South Atlantic Coastal Study from the U.S. Army Corps of Engineers (USACE) South Atlantic Division provides an assessment of coastal hazard risks and vulnerability. Back bay areas of Currituck County and areas along the Outer Banks and eastern peninsula in Dare County were identified as having high exposure, and Dare County has one of the highest projections of future risk in North Carolina, with economic damage projections nearly tripling between existing and future conditions. The SACS North Carolina Appendix report estimates future risk at nearly $125 million for Dare County and over $20 million for Currituck County.

PEOPLE

Flood events pose many threats to public health and safety. While such problems are often not reported, three general types of health hazards accompany floods: physical hazards from the water itself, environmental hazards in the aftermath of the flood, and long-term psychological hazards. These common health and safety hazards are detailed below:

- **Contaminated water**: Floodwaters carry anything that was on the ground that the upstream runoff picked up, including dirt, oil, animal waste, and lawn, farm and industrial chemicals. Pastures and areas where farm animals are kept or where their wastes are stored can contribute polluted waters to the receiving streams. Floodwaters also saturate the ground, which leads to infiltration into sanitary sewer lines, or wastewater treatment plants may be flooded or over loaded. When wastewater treatment plants are flooded, there is nowhere for the sewage to flow. Infiltration and lack of treatment can lead to overloaded sewer lines that can back up into low-lying areas and homes. Even when it is diluted by flood waters, raw sewage can be a breeding ground for bacteria such as E.coli and other disease causing agents. Private sewer and septic systems may also introduce pollutants into floodwaters. Private wells may become contaminated through infiltration of polluted water. Given the many potential sources of contamination, direct or indirect contact with floodwaters poses a significant health risk for contraction of infectious disease.
- **Debris**: During a flood, debris carried by floodwaters can cause physical injury from impact. During the recovery process, people may often need to clear debris out of their properties but may encounter dangers such as sharp materials or rusty nails that pose a risk of tetanus.
- **Unsafe food**: If floodwaters come into contact with food items, that food may no longer be safe for consumption due to the potential contaminants in the floodwaters. Foods stored in cardboard, plastic bags, jars, bottles, and paper packaging may all be subject to contamination. Even if foods don't come

into direct contact with floodwaters, the introduction of mold and mildew from flooding may cause foods to spoil faster. Additionally, power outages may cause refrigerated and frozen foods to spoil.

- **Mosquitos and animals**: After most of the water has receded, stagnant pools can become breeding grounds for mosquitoes, which may carry infectious diseases such as West Nile virus or St. Louis encephalitis. Wild animals such as snakes or rodents may carried by floodwaters or lose their habitat and seek shelter in buildings. Snakes may also be swimming in floodwaters seeking higher ground. People may be at risk for bites or disease if they come in contact with these animals or animal carcasses.
- **Mold and mildew**: Areas of a building that were exposed to excessive moisture can breed mold and mildew. Molds can start to grow in only 24 to 48 hours and will continue to grow without steps to dry out and disinfect the affected surface. Some molds are allergens, while others can produce harmful mycotoxins. Exposure to mold can cause respiratory problems; nasal and sinus congestion; eye, nose, and throat irritation; aches and pains; and effects on the nervous system. Infants, children, immunocompromised individuals, elderly adults, pregnant women, and individuals with respiratory conditions are all at higher risk.
- **Reentering a flooded building**: Health hazards may occur when heating ducts in a forced air system are not properly cleaned after inundation. When the furnace or air conditioner is turned on, the sediments left in the ducts are circulated throughout the building and breathed in by the occupants. If the public water systems lose pressure, public water supplies may be contaminated, and a boil order may be issued to protect people and animals from contaminated water.
- **Mental stress**: Long-term psychological impacts can result after having been through a flood and seeing one's home damaged and personal belongings destroyed. The cost and labor needed to repair a flood-damaged home can also put a severe strain on people, especially individuals who were unprepared and uninsured. There is also a long-term problem for those who know that their homes can be flooded again. The resulting stress on floodplain residents takes its toll in the form of aggravated physical and mental health problems.

Floods can also result in fatalities. Individuals face particularly high risk when driving through flooded streets. According to NCEI records, however, there have been no deaths in the Outer Banks caused by flood events.

Sea level rise will lead to increased flooding and the associated harms to humans, such as illness or injury from health-related hazards or injury or death from driving into flooded waters and drowning.

Table 4.33 through Table 4.37 detail the population at risk from various flood events, according to data from the NCEM IRISK database. Note that this analysis is based on the current effective DFIRM which the HMPC considers an underestimate of flood risk. Therefore, actual population at risk is likely higher.

Table 4.33 – Population Impacted by the 10-Year Flood Event

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	1,421	4.5%	5,390	244	4.5%	1,596	72	4.5%
Dare									
Unincorporated Dare County	24,369	1,920	7.9%	4,752	374	7.9%	1,150	91	7.9%

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Town of Duck	1,722	4	0.2%	582	1	0.2%	53	0	0.0%
Town of Kill Devil Hills	7,588	34	0.4%	1,298	6	0.5%	260	1	0.4%
Town of Kitty Hawk	3,903	175	4.5%	861	39	4.5%	137	6	4.4%
Town of Manteo	1,360	44	3.2%	220	7	3.2%	80	3	3.8%
Town of Nags Head	3,178	62	2.0%	1,084	21	1.9%	70	1	1.4%
Town of Southern Shores	2,536	4	0.2%	858	1	0.1%	78	0	0.0%
Subtotal Dare	**44,656**	**2,243**	**5.0%**	**9,655**	**449**	**4.7%**	**1,828**	**102**	**5.6%**
Region Total	**75,999**	**3,664**	**4.8%**	**15,045**	**693**	**4.6%**	**3,424**	**174**	**5.1%**

Source: NCEM Risk Management Tool

Table 4.34 – Population Impacted by the 25-Year Flood Event

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	3,177	10.1%	5,390	546	10.1%	1,596	162	10.2%
Dare									
Unincorporated Dare County	24,369	3,196	13.1%	4,752	623	13.1%	1,150	151	13.1%
Town of Duck	1,722	11	0.6%	582	4	0.7%	53	0	0.0%
Town of Kill Devil Hills	7,588	61	0.8%	1,298	10	0.8%	260	2	0.8%
Town of Kitty Hawk	3,903	342	8.8%	861	75	8.7%	137	12	8.8%
Town of Manteo	1,360	73	5.4%	220	12	5.5%	80	4	5.0%
Town of Nags Head	3,178	90	2.8%	1,084	31	2.9%	70	2	2.9%
Town of Southern Shores	2,536	20	0.8%	858	7	0.8%	78	1	1.3%
Subtotal Dare	**44,656**	**3,793**	**8.5%**	**9,655**	**762**	**7.9%**	**1,828**	**172**	**9.4%**
Region Total	**75,999**	**6,970**	**9.2%**	**15,045**	**1,308**	**8.7%**	**3,424**	**334**	**9.8%**

Source: NCEM Risk Management Tool

Table 4.35 – Population Impacted by the 50-Year Flood Event

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	3,647	11.6%	5,390	627	11.6%	1,596	186	11.7%
Dare									
Unincorporated Dare County	24,369	4,003	16.4%	4,752	781	16.4%	1,150	189	16.4%
Town of Duck	1,722	17	1.0%	582	6	1.0%	53	1	1.9%
Town of Kill Devil Hills	7,588	88	1.2%	1,298	15	1.2%	260	3	1.2%
Town of Kitty Hawk	3,903	430	11.0%	861	95	11.0%	137	15	10.9%
Town of Manteo	1,360	105	7.7%	220	17	7.7%	80	6	7.5%
Town of Nags Head	3,178	115	3.6%	1,084	39	3.6%	70	3	4.3%
Town of Southern Shores	2,536	31	1.2%	858	10	1.2%	78	1	1.3%
Subtotal Dare	**44,656**	**4,789**	**10.7%**	**9,655**	**963**	**10.0%**	**1,828**	**218**	**11.9%**
Region Total	**75,999**	**8,436**	**11.1%**	**15,045**	**1,590**	**10.6%**	**3,424**	**404**	**11.8%**

Source: NCEM Risk Management Tool

Table 4.36 – Population Impacted by the 100-Year Flood Event

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	4,174	13.3%	5,390	718	13.3%	1,596	213	13.3%
Dare									
Unincorporated Dare County	24,369	6,154	25.3%	4,752	1,200	25.3%	1,150	290	25.2%
Town of Duck	1,722	53	3.1%	582	18	3.1%	53	2	3.8%
Town of Kill Devil Hills	7,588	178	2.3%	1,298	30	2.3%	260	6	2.3%
Town of Kitty Hawk	3,903	861	22.1%	861	190	22.1%	137	30	21.9%
Town of Manteo	1,360	154	11.3%	220	25	11.4%	80	9	11.3%

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Town of Nags Head	3,178	425	13.4%	1,084	145	13.4%	70	9	12.9%
Town of Southern Shores	2,536	88	3.5%	858	30	3.5%	78	3	3.8%
Subtotal Dare	**44,656**	**7,913**	**17.7%**	**9,655**	**1,638**	**17.0%**	**1,828**	**349**	**19.1%**
Region Total	**75,999**	**12,087**	**15.9%**	**15,045**	**2,356**	**15.7%**	**3,424**	**562**	**16.4%**

Source: NCEM Risk Management Tool

Table 4.37 – Population Impacted by the 500-Year Flood Event

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Currituck County	31,343	5,054	16.1%	5,390	869	16.1%	1,596	257	16.1%
Dare									
Unincorporated Dare County	24,369	10,541	43.3%	4,752	2,056	43.3%	1,150	497	43.2%
Town of Duck	1,722	89	5.2%	582	30	5.2%	53	3	5.7%
Town of Kill Devil Hills	7,588	286	3.8%	1,298	49	3.8%	260	10	3.8%
Town of Kitty Hawk	3,903	1,184	30.3%	861	261	30.3%	137	42	30.7%
Town of Manteo	1,360	336	24.7%	220	54	24.5%	80	20	25.0%
Town of Nags Head	3,178	664	20.9%	1,084	226	20.8%	70	15	21.4%
Town of Southern Shores	2,536	182	7.2%	858	62	7.2%	78	6	7.7%
Subtotal Dare	**44,656**	**13,282**	**29.7%**	**9,655**	**2,738**	**28.4%**	**1,828**	**593**	**32.4%**
Region Total	**75,999**	**18,336**	**24.1%**	**15,045**	**3,607**	**24.0%**	**3,424**	**850**	**24.8%**

Source: NCEM Risk Management Tool

PROPERTY

Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems, may be damaged or destroyed by flood waters. The increased number of flood days and general encroachment of shoreline associated with sea level rise will likely cause additional flood-related property damage, although it is unclear exactly what this will look like. Homes, businesses, and vehicles will be susceptible to increased water damage. Homes within the areas

that may be inundated will potentially be uninhabitable. Additionally, rising seas, and associated increased flood days, can overwhelm and undermine the effectiveness of stormwater drainage system and other infrastructure, such as roads and bridges.

Properties within the SFHA are estimated to have a one percent probability of being exposed to flooding equaling or exceeding the base flood during any given year. Mortgage lenders require that owners of properties with federally backed mortgages located within SFHAs purchase and maintain flood insurance policies on their properties. Consequently, newer and recently purchased properties in the community are typically insured against flooding. Regardless of insurance status, pre-FIRM properties, those built before the community's first FIRM, may be more vulnerable to flood damage because they were built prior to the enforcement of flood damage prevention regulations. These properties may be a priority for mitigation.

Table 4.38 provides counts of critical facilities by FEMA lifeline located in the SFHA, according to the 2006 FIRMs. Details on critical facility vulnerability can be found in each community's annex to this plan.

Table 4.38 – Critical Facility Exposure to 1%-Annual-Chance Flood by Flood Zone

Facility Type	Critical Facility Count by SFHA Flood Zone		Total Facilities at Risk
	Zone AE	Zone VE	
Communications	8	0	8
Energy	1	0	1
Food, Hydration, Shelter	11	0	11
Health and Medical	6	0	6
Safety and Security	37	3	40
Transportation	5	1	6
Water Systems	37	7	44
Total	**105**	**11**	**116**

Table 4.39 summarizes critical facility exposure to storm surge by FEMA lifeline and storm category according to NOAA SLOSH inundation mapping. Facilities are counted according the lowest category storm that could cause impacts based on inundation extent. There are 23 critical facilities that do not fall within any storm surge inundation area. Note that this exposure analysis does not account for facility finished floor elevation. A facility might be located within an estimated storm surge extent without being damaged by flooding.

Table 4.39 – Critical Facility Exposure to Storm Surge by Storm Category

FEMA Lifeline	Storm Intensity				
	Category 1	Category 2	Category 3	Category 4	Category 5
Communications	5	6	12	8	5
Energy	1	3	4		1
Food, Hydration, Shelter	1	5	18	52	9
Health and Medical		5	5	3	2
Safety and Security	13	24	13	19	9
Transportation	1	3	2		1
Water Systems	12	18	26	14	19
Total	**33**	**64**	**80**	**96**	**46**

Table 4.40 lists critical facilities exposed to flooding from sea level rise. There are two facilities exposed to one foot of sea level rise and one more facility exposed to two feet of sea level rise. All three of these facilities are in Currituck County. An additional five facilities in unincorporated Dare County are exposed to three feet of sea level rise. Note that this exposure analysis does not account for facility finished floor elevation. A facility might be located within an estimated sea level rise extent without being damaged by flooding.

Table 4.40 – Critical Facility Exposure to Sea Level Rise

FEMA Lifeline	Facility Type/Description	Address
1 Foot Sea Level Rise		
Transportation	FERRY DOCK	173 Courthouse Rd
Transportation	FERRY DIVISION	153 Ferry Dock Rd
2 Foot Sea Level Rise		
Communications	Communications Tower	574 Poyners Rd
3 Foot Sea Level Rise		
Safety and Security	Fessenden Center (POD, shelter, etc), Dare County Public Services	46830 NC Hwy 12
Transportation	RWS Emergency Ferry Terminal / Helo Landing Pad	23170 Myrna Peters Rd
Water Systems	Treatment Plant	53282 NC 12 Hwy
Water Systems	Treatment Plant	53282 NC 12 Hwy
Water Systems	Treatment Plant	359 Water Plant Rd

Table 4.41 through Table 4.45 on the following pages detail the property at risk and loss estimates from various flood events, according to data from the NCEM IRISK database. Actual property at risk may be higher due to development that has occurred since the analysis for the IRISK dataset was performed. Additionally, given that these estimates are based on the current effective FIRM, which the HMPC considers an underestimation of risk, actual building damages from the 1%-annual-chance flood event would likely be higher.

Table 4.41 – Buildings Impacted by the 10-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck															
Currituck County	17,685	466	2.6%	725	4.1%	$7,173,496	0	0.0%	$132,583	0	0.0%	$12,815	725	4.1%	$7,318,894
Dare															
Unincorporated Dare County	14,019	555	4.0%	1,039	7.4%	$2,979,599	8	0.1%	$117,629	5	0.0%	$125,772	1,052	7.5%	$3,222,999
Town of Duck	2,409	3	0.1%	5	0.2%	$32,893	1	0.0%	$5,237	0	0.0%	$0	6	0.2%	$38,129
Town of Kill Devil Hills	6,033	14	0.2%	26	0.4%	$47,798	0	0.0%	$0	0	0.0%	$0	26	0.4%	$47,798
Town of Kitty Hawk	2,862	70	2.4%	119	4.2%	$466,100	0	0.0%	$0	0	0.0%	$0	119	4.2%	$466,100
Town of Manteo	943	15	1.6%	26	2.8%	$79,068	2	0.2%	$6,894	0	0.0%	$0	28	3.0%	$85,962
Town of Nags Head	4,868	60	1.2%	89	1.8%	$570,904	1	0.0%	$4,463	0	0.0%	$0	90	1.8%	$575,367
Town of Southern Shores	2,513	0	0.0%	4	0.2%	$40,743	0	0.0%	$0	0	0.0%	$0	4	0.2%	$40,743
Subtotal Dare	**33,647**	**717**	**2.1%**	**1,308**	**3.9%**	**$4,217,105**	**12**	**0.0%**	**$134,223**	**5**	**0.0%**	**$125,772**	**1,325**	**3.9%**	**$4,477,098**
Region Total	**51,332**	**1,183**	**2.3%**	**2,033**	**4.0%**	**$4,973,185**	**12**	**0.0%**	**$134,223**	**5**	**0.0%**	**$125,772**	**2,050**	**4.0%**	**$5,233,178**

Source: NCEM Risk Management Tool

Table 4.42 – Buildings Impacted by the 25-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck															
Currituck County	17,685	898	5.1%	1,621	9.2%	$3,200,049	15	0.1%	$12,436	1	0.0%	$4,449	1,637	9.3%	$3,216,934
Dare															
Unincorporated Dare County	14,019	922	6.6%	1,730	12.3%	$5,018,570	17	0.1%	$172,009	5	0.0%	$140,783	1,752	12.5%	$5,331,362
Town of Duck	2,409	6	0.2%	15	0.6%	$153,959	2	0.1%	$35,719	0	0.0%	$0	17	0.7%	$189,678
Town of Kill Devil Hills	6,033	26	0.4%	46	0.8%	$90,277	0	0.0%	$0	0	0.0%	$0	46	0.8%	$90,277
Town of Kitty Hawk	2,862	153	5.3%	233	8.1%	$828,295	1	0.0%	$8	0	0.0%	$0	234	8.2%	$828,302
Town of Manteo	943	23	2.4%	43	4.6%	$188,796	6	0.6%	$47,818	0	0.0%	$0	49	5.2%	$236,614
Town of Nags Head	4,868	74	1.5%	128	2.6%	$893,305	2	0.0%	$11,116	1	0.0%	$5,894	131	2.7%	$910,315
Town of Southern Shores	2,513	1	0.0%	19	0.8%	$84,639	0	0.0%	$0	0	0.0%	$0	19	0.8%	$84,639
Subtotal Dare	**33,647**	**1,205**	**3.6%**	**2,214**	**6.6%**	**$7,257,841**	**28**	**0.1%**	**$266,670**	**6**	**0.0%**	**$146,677**	**2,248**	**6.7%**	**$7,671,187**
Region Total	**51,332**	**2,103**	**4.1%**	**3,835**	**7.5%**	**$10,457,890**	**43**	**0.1%**	**$279,106**	**7**	**0.0%**	**$151,126**	**3,885**	**7.6%**	**$10,888,121**

Source: NCEM Risk Management Tool

Table 4.43 – Buildings Impacted by the 50-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck															
Currituck County	17,685	1,002	5.7%	1,861	10.5%	$4,500,957	21	0.1%	$35,555	1	0.0%	$8,274	1,883	10.6%	$4,544,786
Dare															
Unincorporated Dare County	14,019	1,123	8.0%	2,166	15.5%	$6,743,625	38	0.3%	$295,860	5	0.0%	$148,915	2,209	15.8%	$7,188,400
Town of Duck	2,409	6	0.2%	23	1.0%	$315,776	2	0.1%	$111,052	0	0.0%	$0	25	1.0%	$426,828
Town of Kill Devil Hills	6,033	36	0.6%	67	1.1%	$140,166	0	0.0%	$0	0	0.0%	$0	67	1.1%	$140,166
Town of Kitty Hawk	2,862	186	6.5%	293	10.2%	$1,214,755	2	0.1%	$4,952	0	0.0%	$0	295	10.3%	$1,219,706
Town of Manteo	943	32	3.4%	61	6.5%	$375,918	9	1.0%	$264,041	0	0.0%	$0	70	7.4%	$639,959
Town of Nags Head	4,868	86	1.8%	163	3.3%	$1,228,133	5	0.1%	$20,998	1	0.0%	$10,969	169	3.5%	$1,260,100
Town of Southern Shores	2,513	4	0.2%	30	1.2%	$112,036	0	0.0%	$0	0	0.0%	$0	30	1.2%	$112,036
Subtotal Dare	**33,647**	**1,473**	**4.4%**	**2,803**	**8.3%**	**$10,130,409**	**56**	**0.2%**	**$696,903**	**6**	**0.0%**	**$159,884**	**2,865**	**8.5%**	**$10,987,195**
Region Total	**51,332**	**2,475**	**4.8%**	**4,664**	**9.1%**	**$14,631,366**	**77**	**0.2%**	**$732,458**	**7**	**0.0%**	**$168,158**	**4,748**	**9.2%**	**$15,531,981**

Source: NCEM Risk Management Tool

Table 4.44 – Buildings Impacted by the 100-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck															
Currituck County	17,685	1,114	6.3%	2,129	12.0%	$7,173,496	41	0.2%	$132,583	2	0.0%	$12,815	2,172	12.3%	$7,318,894
Dare															
Unincorporated Dare County	14,019	1,610	11.5%	3,313	23.6%	$26,606,656	177	1.3%	$7,071,694	30	0.2%	$686,073	3,520	25.1%	$34,364,423
Town of Duck	2,409	10	0.4%	72	3.0%	$2,582,730	6	0.2%	$305,005	0	0.0%	$0	78	3.2%	$2,887,736
Town of Kill Devil Hills	6,033	69	1.1%	134	2.2%	$1,542,563	5	0.1%	$113,317	0	0.0%	$0	139	2.3%	$1,655,880
Town of Kitty Hawk	2,862	320	11.2%	583	20.4%	$7,104,907	25	0.9%	$918,415	0	0.0%	$0	608	21.2%	$8,023,321
Town of Manteo	943	50	5.3%	90	9.5%	$597,249	14	1.5%	$703,816	0	0.0%	$0	104	11.0%	$1,301,065
Town of Nags Head	4,868	192	3.9%	586	12.0%	$11,056,782	31	0.6%	$1,082,657	4	0.1%	$407,646	621	12.8%	$12,547,085
Town of Southern Shores	2,513	15	0.6%	86	3.4%	$734,718	2	0.1%	$326,452	0	0.0%	$0	88	3.5%	$1,061,170
Subtotal Dare	**33,647**	**2,266**	**6.7%**	**4,864**	**14.5%**	**$50,225,605**	**260**	**0.8%**	**$10,521,356**	**34**	**0.1%**	**$1,093,719**	**5,158**	**15.3%**	**$61,840,680**
Region Total	**51,332**	**3,380**	**6.6%**	**6,993**	**13.6%**	**$57,399,101**	**301**	**0.6%**	**$10,653,939**	**36**	**0.1%**	**$1,106,534**	**7,330**	**14.3%**	**$69,159,574**

Source: NCEM Risk Management Tool

Table 4.45 – Buildings Impacted by the 500-Year Flood Event

Jurisdiction	All Buildings	Number of Pre-FIRM Buildings at Risk		Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck															
Currituck County	17,685	1,253	7.1%	2,575	14.6%	$43,634,661	106	0.6%	$4,704,550	8	0.0%	$256,784	2,689	15.2%	$48,595,995
Dare															
Unincorporated Dare County	14,019	2,297	16.4%	5,670	40.4%	$131,461,880	433	3.1%	$27,649,156	77	0.5%	$5,422,998	6,180	44.1%	$164,534,034
Town of Duck	2,409	15	0.6%	119	4.9%	$6,265,406	13	0.5%	$1,097,247	2	0.1%	$843,481	134	5.6%	$8,206,134
Town of Kill Devil Hills	6,033	85	1.4%	215	3.6%	$4,044,482	7	0.1%	$372,179	0	0.0%	$0	222	3.7%	$4,416,661
Town of Kitty Hawk	2,862	406	14.2%	801	28.0%	$15,254,725	51	1.8%	$2,506,662	5	0.2%	$275,924	857	29.9%	$18,037,311
Town of Manteo	943	92	9.8%	189	20.0%	$3,170,738	51	5.4%	$3,017,788	1	0.1%	$28,944	241	25.6%	$6,217,470
Town of Nags Head	4,868	257	5.3%	926	19.0%	$24,401,311	68	1.4%	$4,011,402	5	0.1%	$889,294	999	20.5%	$29,302,006
Town of Southern Shores	2,513	34	1.4%	177	7.0%	$2,358,059	7	0.3%	$738,270	0	0.0%	$0	184	7.3%	$3,096,330
Subtotal Dare	**33,647**	**3,186**	**9.5%**	**8,097**	**24.1%**	**$186,956,601**	**630**	**1.9%**	**$39,392,704**	**90**	**0.3%**	**$7,460,641**	**8,817**	**26.2%**	**$233,809,946**
Region Total	**51,332**	**4,439**	**8.6%**	**10,672**	**20.8%**	**$230,591,262**	**736**	**1.4%**	**$44,097,254**	**98**	**0.2%**	**$7,717,425**	**11,506**	**22.4%**	**$282,405,941**

Source: NCEM Risk Management Tool

Historic and cultural assets were also evaluated for their vulnerability to flooding using a spatial overlay analysis. The results of this analysis are summarized below by hazard.

COASTAL FLOODING

There are 19 sites that are vulnerable to the 1% annual chance flood event and 4 more sites vulnerable to the 0.2% annual chance flood event, all located in Dare County. These sites are listed in Table 4.46.

Table 4.46 – Historic and Cultural Sites Exposed to the 1% and 0.2% Flood Event

Site ID	Site Name	Flood Zone
DR0001	Bodie Island Light Station	AE
DR0002	Bodie Island Lifesaving/Coast Guard Station	VE
DR0003	Caffey's Inlet Lifesaving Station	AE
DR0004	Cape Hatteras Light Station (Current site)	X SHADED
DR0006	Chicamacomico Lifesaving Station	AE
DR0008	Fort Raleigh National Historic Site	X SHADED
DR0009	Hatteras Weather Bureau Station	AE
DR0011	NAGS HEAD BEACH COTTAGE ROW HISTORIC DISTRICT	VE
DR0012	Oregon Inlet Station	AE
DR0014	Wright Brothers National Memorial (NHL)	X SHADED
DR0015	George Washington Creef House	AE
DR0020	Theodore S. Meekins House	AE
DR0021	Kitty Hawk Lifesaving Station (Original site)	VE
DR0022	First Colony Inn	AE
DR0023	Salvo Post Office (Original site)	AE
DR0024	Sam's Diner	AE
DR0186	Ellsworth and Lovie Ballance House	VE
DR0273	Wright Brothers National Memorial Visitor Center (NHL)	X SHADED
DR0286	John T. Daniels House	AE
DR0506	Sea Foam Motel	VE
DR0574	Mattie Midgett Store and House	AE
DR0605	Markham-Albertson-Stinson Cottage (Gone)	AE
DR0606	Rasmus Midgett House	AE
N/A	Elizabethan Gardens	VE

All but six of the identified cultural and historic resources are vulnerable to storm surge flooding. Table 4.47 lists sites vulnerable to storm surge by the lowest category storm event that would be expected to impact each site, according to NOAA SLOSH data.

Table 4.47 – Critical Facilities Exposed to Storm Surge Flooding by Storm Category

Site ID	Site Name	Minimum Storm Category with Impacts
Currituck County		
CK0001	Currituck Beach Lighthouse	2
CK0165	Coinjock Colored School (Original site)	2
CK0009	Currituck Shooting Club (Gone)	3
CK0005	Whalehead Club	4
CK0096	Currituck County Courthouse and Jail	4
CK0104	Wilson Walker House and Walker-Snowden Store	4

Site ID	Site Name	Minimum Storm Category with Impacts
CK0300	Flyway Club	4
CK0003	Twin Houses	5
CK0008	Shaw House	5
CK0040	Grandy School	5
CK0106	Currituck Beach Lighthouse Complex Boundary Expansion	5
Dare County		
DR0001	Bodie Island Light Station	1
DR0003	Caffey's Inlet Lifesaving Station	1
DR0006	Chicamacomico Lifesaving Station	1
DR0009	Hatteras Weather Bureau Station	1
DR0022	First Colony Inn	1
DR0023	Salvo Post Office (Original site)	1
DR0186	Ellsworth and Lovie Ballance House	1
DR0574	Mattie Midgett Store and House	1
DR0606	Rasmus Midgett House	1
N/A	Elizabethan Gardens	1
DR0012	Oregon Inlet Station	2
DR0015	George Washington Creef House	2
DR0020	Theodore S. Meekins House	2
DR0024	Sam's Diner	2
DR0286	John T. Daniels House	2
DR0273	Wright Brothers National Memorial Visitor Center (NHL)	3
DR0004	Cape Hatteras Light Station (Current site)	4
DR0011	NAGS HEAD BEACH COTTAGE ROW HISTORIC DISTRICT	4
DR0506	Sea Foam Motel	4
DR0021	Kitty Hawk Lifesaving Station (Original site)	5

SEA LEVEL RISE

None of the identified cultural or historic assets in the region are located within the estimated extent of one or two feet of sea level rise. One asset, the Bodie Island Light Station in Nags Head, is vulnerable to three feet of sea level rise. Other assets may be vulnerable to greater levels of sea level rise, but additional sea level rise extents were not evaluated.

FUTURE FLOOD RISK

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. Using FEMA's standard FVA methodology, the planning team identified areas vulnerable to an additional one, two, and three feet of flooding above the base flood elevation and compared the asset inventory of current improved parcels to these flood exposure areas. This analysis was completed using the 2006 FIRMs and the current effective FIRMs as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRMs is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table 4.48 summarizes exposure under each freeboard scenario using the 2006 FIRMs as a baseline, and Table 4.49 summarizes exposure using the current effective FIRMs as a baseline.

Table 4.48 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**31,244**	**$6,998,021,089**	**$3,985,707,852**	**$10,983,728,941**
Agriculture	82	$3,766,533	$3,766,533	$7,533,066
Commercial	1074	$354,158,342	$354,158,342	$708,316,685
Education	17	$55,424,707	$55,424,707	$110,849,414
Government	336	$105,034,367	$105,034,367	$210,068,734
Industrial	136	$213,405,486	$320,108,229	$533,513,715
Religious	70	$28,199,692	$28,199,692	$56,399,384
Residential	29529	$6,238,031,962	$3,119,015,981	$9,357,047,943
+1 Foot Freeboard	**35,248**	**$8,014,372,733**	**$4,648,504,907**	**$12,662,877,639**
Agriculture	109	$5,082,213	$5,082,213	$10,164,427
Commercial	1262	$426,020,868	$426,020,868	$852,041,735
Education	19	$65,897,213	$65,897,213	$131,794,426
Government	353	$114,799,300	$114,799,300	$229,598,600
Industrial	166	$318,759,062	$478,138,593	$796,897,655
Religious	85	$33,319,362	$33,319,362	$66,638,724
Residential	33254	$7,050,494,715	$3,525,247,357	$10,575,742,072
+2 Foot Freeboard	**37,721**	**8,626,294,801**	**5,021,187,099**	**13,647,481,900**
Agriculture	121	$6,211,795	$6,211,795	$12,423,591
Commercial	1373	$504,788,591	$504,788,591	$1,009,577,182
Education	23	$91,128,548	$91,128,548	$182,257,096
Government	373	$125,077,526	$125,077,526	$250,155,052
Industrial	197	$326,575,448	$489,863,172	$816,438,620
Religious	94	$35,722,042	$35,722,042	$71,444,084
Residential	35540	$7,536,790,850	$3,768,395,425	$11,305,186,276
+3 Foot Freeboard	**39,457**	**$9,021,753,513**	**$5,252,251,948**	**$14,274,005,462**
Agriculture	123	$6,300,821	$6,300,821	$12,601,643
Commercial	1439	$534,805,825	$534,805,825	$1,069,611,650
Education	26	$104,864,361	$104,864,361	$209,728,722
Government	389	$130,457,319	$130,457,319	$260,914,638
Industrial	209	$335,116,458	$502,674,686	$837,791,144
Religious	95	$36,089,142	$36,089,142	$72,178,284
Residential	37176	$7,874,119,587	$3,937,059,794	$11,811,179,381

Table 4.49 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**24,674**	**$5,981,841,102**	**$3,421,228,703**	**$9,403,069,806**
Agriculture	59	$2,611,675	$2,611,675	$5,223,350
Commercial	946	$309,170,944	$309,170,944	$618,341,888
Education	11	$48,230,865	$48,230,865	$96,461,730
Government	299	$98,971,990	$98,971,990	$197,943,980
Industrial	120	$190,959,420	$286,439,130	$477,398,551
Religious	54	$19,711,990	$19,711,990	$39,423,980
Residential	23,185	$5,312,184,218	$2,656,092,109	$7,968,276,327
+1 Foot Freeboard	**30,786**	**$7,224,954,134**	**$4,095,634,856**	**$11,320,588,990**
Agriculture	82	$3,910,729	$3,910,729	$7,821,458
Commercial	1,127	$373,412,477	$373,412,477	$746,824,955
Education	13	$52,924,107	$52,924,107	$105,848,214
Government	320	$104,236,920	$104,236,920	$208,473,840
Industrial	141	$204,021,718	$306,032,577	$510,054,294
Religious	68	$23,787,909	$23,787,909	$47,575,818
Residential	29,035	$6,462,660,274	$3,231,330,137	$9,693,990,411
+2 Foot Freeboard	**34,794**	**$8,123,711,182**	**$4,630,875,614**	**$12,754,586,796**
Agriculture	117	$5,942,583	$5,942,583	$11,885,166
Commercial	1,254	$432,421,149	$432,421,149	$864,842,298
Education	17	$74,567,589	$74,567,589	$149,135,178
Government	347	$118,286,962	$118,286,962	$236,573,924
Industrial	178	$238,579,273	$357,868,909	$596,448,182
Religious	77	$29,663,219	$29,663,219	$59,326,438
Residential	32,804	$7,224,250,407	$3,612,125,204	$10,836,375,611
+3 Foot Freeboard	**39,030**	**$9,102,436,562**	**$5,274,162,360**	**$14,376,598,922**
Agriculture	166	$8,691,245	$8,691,245	$17,382,490
Commercial	1,402	$497,848,712	$497,848,712	$995,697,424
Education	24	$99,754,566	$99,754,566	$199,509,132
Government	364	$122,530,586	$122,530,586	$245,061,172
Industrial	206	$340,562,909	$510,844,363	$851,407,272
Religious	92	$35,937,232	$35,937,232	$71,874,464
Residential	36,776	$7,997,111,312	$3,998,555,656	$11,995,666,969

REPETITIVE LOSS ANALYSIS

A repetitive loss property is a property for which two or more flood insurance claims of more than $1,000 have been paid by the NFIP within any 10-year period since 1978. A severe repetitive loss property is classified as such if it has four or more separate claim payments of more than $5,000 each (including building and contents payments) or two or more separate claim payments (building only) where the total of the payments exceeds the current value of the property. Repetitive loss properties and severe repetitive loss properties are a priority for mitigation because they have a known flood risk and are a drain on the NFIP.

According to February 2024 NFIP records, there are a total of 1,932 repetitive loss properties within the Outer Banks Region, of which 1,748 are residential and 121 are commercial or non-residential. Only 1,036 repetitive loss properties, less than 54% of the total in the region, are insured. The number of

insured repetitive loss properties has decreased in the last five years, which could be attributed to the new FIRMs which reduced the SFHA acreage in the region and potentially removed the mandatory purchase requirement for some property owners. There are 243 properties on the list classified as severe repetitive loss properties.

Table 4.50 summarizes repetitive loss properties by jurisdiction as identified by FEMA through the NFIP. Figure 4.36 shows the general areas where repetitive losses have occurred throughout the region.

Table 4.50 – Repetitive Loss Properties by Jurisdiction, February 2024

Jurisdiction	RL Property Count	Occupancy Type		Total Losses	% Insured	SRL Count
		Residential	Commercial			
Currituck County	195	192	3	633	56.9%	32
Dare County	945	827	118	3,163	51.1%	125
Duck	15	12	3	38	75%	1
Kill Devil Hills	159	152	7	493	52.8%	15
Kitty Hawk	304	291	13	993	67.4%	36
Manteo	47	31	16	119	83.0%	5
Nags Head	252	228	24	1,064	38.5%	29
Southern Shores	15	15	0	32	53.3%	0
Total	**1,932**	**1,748**	**121**	**6,535**	**53.60%**	**243**

Source: FEMA/ISO, February 2024

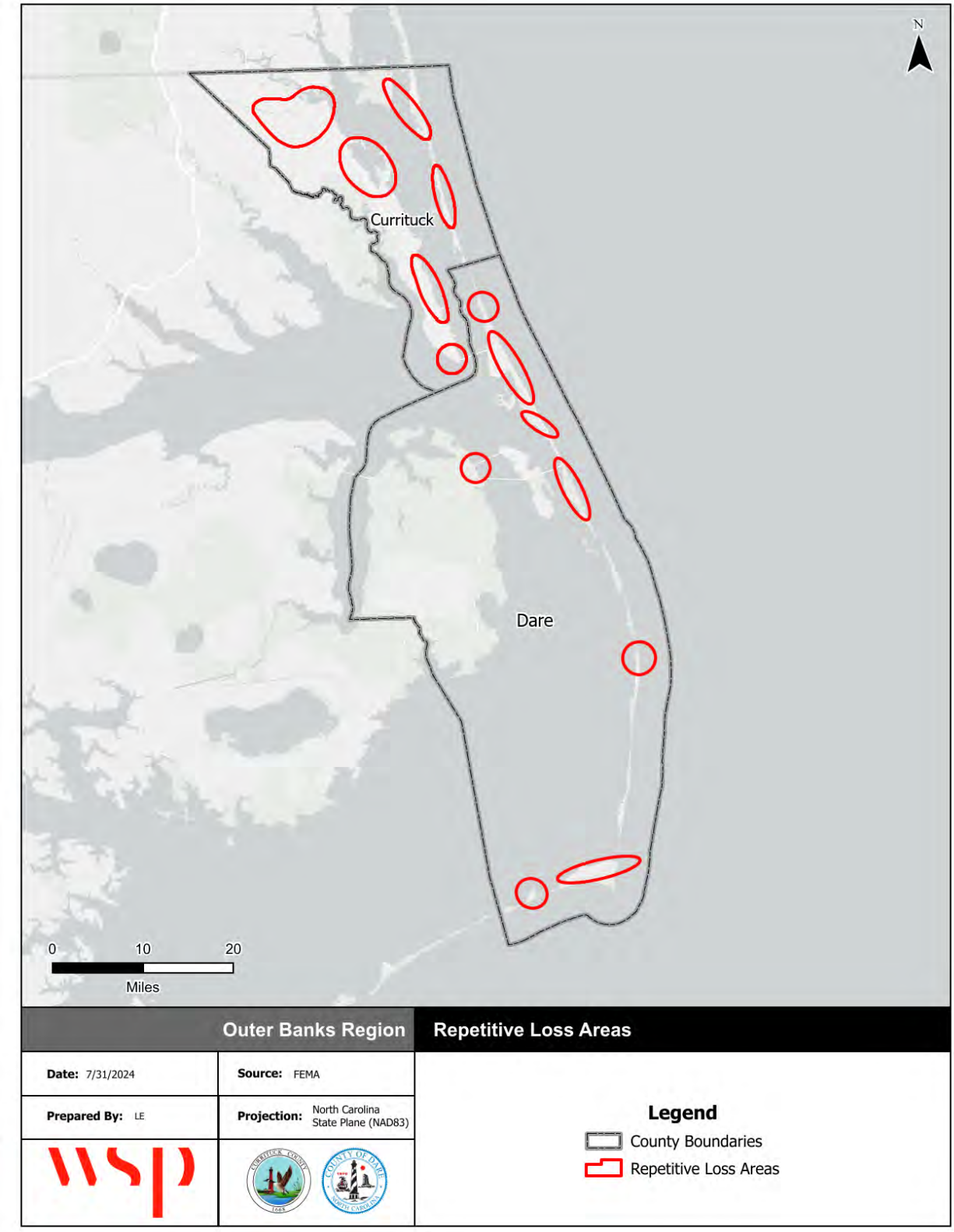
RL = Repetitive Loss; SRL = Severe Repetitive Loss

A review of the date of loss of repetitive loss claims provides insight as to which past flood events were particularly damaging in the region. Per this data, Table 4.51 lists the events that resulted in the most claims for repetitive loss properties in each participating community.

Table 4.51 – Events Resulting in the Most Flood Insurance Claims for Repetitive Loss Properties

Community	Event	Date	Claims
Currituck County (Corolla, Currituck)	Hurricane Matthew	October 7, 2016	75
Currituck County (Grandy)	Tropical Storm Michael	October 11, 2018	15
Dare County (Hatteras, Avon)	Hurricane Dorian	September 5, 2019	409
Dare County (Buxton, Frisco)	Tropical Storm	September 21, 2023	128
Dare County (Rodanthe, Salvo, Waves)	Hurricane Arthur	July 3, 2014	109
Duck	Hurricane Matthew	October 8, 2016	10
Kill Devil Hills	Hurricane Isabel	September 17, 2003	70
Kitty Hawk	Hurricane Sandy	October 28, 2012	154
Manteo	Tropical Storm Michael	October 10, 2018	34
Nags Head	Nor'easter	November 11, 2009	210
Southern Shores	Tropical Storm Michael	October 10, 2018	8

Figure 4.36 – Repetitive Loss Areas



ENVIRONMENT

During a flood event, chemicals and other hazardous substances may end up contaminating local water bodies. Flooding kills animals and in general disrupts the ecosystem. Snakes and insects may also make their way to the flooded areas.

Floods can also cause significant erosion, which can alter streambanks and deposit sediment, changing the flow of waterbodies and potentially reducing their drainage capacity.

Sea level rise can have numerous negative consequences on the environment including increased erosion and associated impacts. Another concern is the inundation of normally dry land, which could lead to the loss of marshes and wetlands and the positive benefits associated with those areas. These areas buffer against waves and storm surge, protect from erosion and even encourage accretion, and provide natural wildlife habitats. Sea level rise may also lead to saltwater intrusion as the groundwater table may also rise, potentially leading to contaminated drinking and agriculture water.

CONSEQUENCE ANALYSIS

Table 4.52 summarizes the potential detrimental consequences of flood.

Table 4.52 – Consequence Analysis - Flood

Category	Consequences
Public	Localized impacts could be severe. Flooding is likely to displace people from their homes. Water can become polluted such that if consumed, diseases and infection can be easily spread. Sea level rise may exacerbate public health risks associated with flooding. Additionally, sea level rise may cause psychological stress from loss of home, economy, and culture.
Responders	First responders are at risk when attempting to rescue people from flooding. They are subject to the same health hazards as the public. Flood waters may prevent access to areas in need of response or the flood may prevent access to the critical facilities themselves which may prolong response time. Impacts to responders are expected to be limited.
Continuity of Operations (including Continued Delivery of Services)	Floods can severely disrupt normal operations, especially when there is a loss of power. Damage to facilities in flooded areas may require temporary relocation of some operations. Localized disruption of roads, facilities, and/or utilities caused by incident may postpone delivery of some services. Sea level rise may also interrupt continuity of operations, such as delivery of services, by causing more regular, chronic flooding.
Property, Facilities and Infrastructure	Buildings and infrastructure, including transportation and utility infrastructure, may be damaged or destroyed by flooding. Sea level rise can damage property as flooding becomes more regular in the short term and as sea levels continue to rise in the long term. Sea level rise can also compromise infrastructure such as drainage systems and roads.
Environment	Flooding may release chemicals and other hazardous substances that can contaminate local water bodies. Wildlife deaths are possible. Localized impacts could be severe for areas affected by flooding or associated HazMat releases. Sea level rise can lead to increased erosion, saltwater intrusion, and inundation of wetlands and previous dry land.

Category	Consequences
Economic Condition of the Jurisdiction	Local economy and finances will be adversely affected, possibly for an extended period of time. Roads, bridges, farms, houses and automobiles can sustain costly damages. Response and recovery operations can be expensive. It may take years for affected communities to be re-built and business to return to normal.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery are not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes flood hazard risk by jurisdiction. Due to the coastal geography of the region, flood risk due to storm surge, high tide flooding, flash flooding, and stormwater flooding is uniform across the region. All included jurisdictions are exposed to a high risk of flooding according to the 2006 FIRM, and because other sources of flooding and other levels of flooding may occur beyond these areas, the HMPC determined that the spatial extent of flooding is large for all jurisdictions. All communities also face a uniform probability of flooding.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	4	3	4	3	3	3.5	H
Dare County	4	3	4	3	3	3.5	H
Duck	4	3	4	3	3	3.5	H
Kill Devil Hills	4	3	4	3	3	3.5	H
Kitty Hawk	4	3	4	3	3	3.5	H
Manteo	4	3	4	3	3	3.5	H
Nags Head	4	3	4	3	3	3.5	H
Southern Shores	4	3	4	3	3	3.5	H

4.5.5 HURRICANES & COASTAL HAZARDS

HAZARD BACKGROUND

This hazard profile includes hurricanes, nor'easters, coastal erosion, and rip currents.

HURRICANES AND NOR'EASTERS

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

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

The greatest potential for loss of life related to a hurricane is from the storm surge, which is discussed in Section 4.5.4. Damage during hurricanes may also result from spawned tornados, which are discussed in Section 4.5.6, and inland flooding associated with heavy rainfall that usually accompanies these storms, which is discussed in Section 4.5.4.

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal temperature gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves increase and can cause serious damage to coastal areas as the storm moves northeast.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

COASTAL EROSION

Coastal erosion is the wearing away and transportation of material away from one section of shoreline and deposited offshore or in another section of shoreline. Coastal erosion impacts both oceanfront and estuarine shorelines. Erosion can be caused by large storms, flooding, strong wave action, sea level rise, and human activities—such as land uses that over-develop the shoreline, alterations to the shoreline or dunes, and hard shoreline stabilization structures like breakwaters and seawalls—that wear away the beaches and estuarine shorelines along the coast. Erosion undermines and often destroys homes, businesses, and public infrastructure and can have long-term economic and social consequences. According to NOAA, coastal erosion is responsible for approximately $500 million per year in coastal property loss in the United States, including damage to structures and loss of land.

Coastal erosion has both natural causes and causes related to human activities. Gradual coastal erosion and accretion results naturally from the impacts of tidal longshore currents. Severe coastal erosion can occur over a short period when the region is impacted by hurricanes, tropical storms and other weather systems. Sand is continually removed by longshore currents in some areas, but it is also continually replaced by sand carried in by the same type of currents. Structures such as piers or sea walls, jetties, and navigational inlets may interrupt the movement of sand. Sand can become "trapped" in one place by these types of structures. The currents will, of course, continue to flow, though depleted of sand trapped elsewhere. With significant amounts of sand trapped in the system, the continuing motion of currents (now deficient in sand) results in erosion. In this way, human construction activities that result in the unnatural trapping of sand have the potential to result in significant coastal erosion.

Erosion rates and potential impacts are highly localized. Severe storms can remove wide beaches, along with substantial dunes, in a single event. In undeveloped areas, high recession rates are not likely to cause significant concern, but in some heavily populated locations, one or two feet of erosion may be considered catastrophic (NOAA, 2014).

Estuaries are partially enclosed, coastal water bodies where freshwater meats saltwater from the ocean. Estuarine coastlines can experience erosion through short-term processes, such as tides, storms, wind, and boat wakes, as well as long-term processes, such as sea level rise. Many variables determine the rate of estuarine erosion including shoreline type, geographic location and size of the associated estuary, the type and abundance of vegetation, and the frequency and intensity of storms. Estuarine erosion is problematic as more development occurs along estuarine shorelines.

Warning Time: 1 – More than 24 hours

Duration: 4 – More than 1 week

RIP CURRENT

Rip currents are powerful, narrow channels of seaward flowing water along the coast, extending from the shoreline to outside the surf zone. Rip currents form when there are variations in wave breaking along the beach due to the flow of water from areas with more wave breaking and corresponding higher wave setup to areas with less wave breaking and corresponding lower wave setup.

The NWS describes three major types of rip currents:

- **Bathymetrically-controlled rip currents** are those that occur at relatively fixed locations due to sandbars, submarine canyons and ridges, reefs, or other offshore features. These rip currents can be referred to as channelized or focused. Channelized currents are the most documented and well understood and occur in deep channels through shallow sandbars. Channelized rip currents are typically between 5 to 100 yards wide, 3 to 10 feet deep, and anywhere from 50 to 500 yards apart.

Focused rip currents can occur along flat featureless beaches and appear as offshore directed plumes of turbulent water and sediment. These rip currents may last for days, weeks, or months.

- **Structurally-controlled rip currents** occur adjacent to man-made structures such as groins, jetties, and piers and natural features like rock outcrops.
- **Hydrodynamically-controlled rip currents** occur solely as a result of wave and current interactions, typically from waves originating from two different sources approaching the beach from different directions. These rip currents are transient and may only last for several minutes.

General warning of rip current risk may be provided by lifeguards or available via the NWS, but there is often little to no warning for individuals regarding specific rip current sites. Some rip currents may last for days while others may only last for minutes.

Warning Time: 4 – Less than six hours

Duration: 2 – Less than 24 hours

LOCATION

HURRICANES AND NOR'EASTERS

Hurricane winds and nor'easters can impact the entire Outer Banks region.

Spatial Extent: 4 – Large

COASTAL EROSION

Coastal erosion can occur along any shoreline in the region, including oceanfront and estuarine areas, and affects all jurisdictions. Erosion is likely to be frequent and severe along the Atlantic coast, but erosion of estuarine shorelines may be just as severe; however, data on rates of erosion along estuarine shorelines is very limited. Though estuarine erosion is not monitored as closely as ocean erosion, the amount of estuarine shoreline in the region is far greater. The estuarine coastline in the Outer Banks region includes areas within the Pamlico and Albemarle Sounds, including the Currituck Sound. The western coast of the barrier island directly abuts these estuaries, as does Roanoke Island and the eastern coast of the mainland. Table 4.53 details shoreline length in the region per the North Carolina Division of Coastal Management.

Table 4.53 – Shoreline Length

County	Estuarine Shoreline	Ocean Shoreline
Currituck	1,100 miles	20 miles
Dare	946 miles	110 miles

Source: NC Division of Coastal Management Estuarine Shoreline Mapping Project, 2012; HMPC input

Erosion impacts on infrastructure are also a major concern in the Outer Banks Region. Due to concerns regarding erosion, flooding, and sea level rise projections, and the increasing vulnerability of N.C. 12 to these hazards, in 2021, Dare County formed the N.C. 12 Task Force with members from Hyde County, the Cape Hatteras National Seashore, the Pea Island Wildlife Refuge, and the North Carolina Department of Transportation. The N.C. 12 Task Force identified hot spots, areas of high vulnerability along N.C. 12, and developed short- and long-term solutions for these hot spots. Hot spots within the planning area include the following:

- Northern Pea Island/Old Sandbag Area aka Canal Zone
- Pea Island Visitor Center
- Rodanthe S Curves

- Avon
- Buxton
- Frisco/Hatteras Village

The Canal Zone and Pea Island Visitor Center hotpots were among those considered most critical due to the frequency and regularity of impacts and that loss of these areas results in lost access to all points further south.

Spatial Extent: 3 – Moderate

RIP CURRENT

Rip currents can occur along any oceanfront or area that experiences breaking waves. These areas are present in every jurisdiction except Manteo. Although rip currents occur as highly localized events, the HMPC felt a larger spatial extent was appropriate given that risk warnings are issued for entire coastlines.

Spatial Extent: 3 – Moderate

EXTENT

HURRICANES AND NOR'EASTERS

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

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

Hurricane intensity is further classified by the Saffir-Simpson Scale, detailed in Table 4.54, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

Table 4.54 – Saffir-Simpson Scale

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

Source: National Hurricane Center

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds and barometric pressure, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes and, while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. Table 4.55 describes the damage that could be expected for each category of hurricane. Damage during hurricanes may also result from spawned tornados, storm surge, and inland flooding associated with heavy rainfall that usually accompanies these storms. Tornadoes are discussed in Section 4.5.6; flooding and storm surge are discussed in Section 4.5.4.

Table 4.55 – Hurricane Damage Classifications

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

Source: National Hurricane Center; Federal Emergency Management Agency

Located on the coast, both Dare and Currituck counties are susceptible to every category of hurricane.

Impact: 4 – Catastrophic

COASTAL EROSION

Erosion can be measured as a rate of change from a known previous condition. The North Carolina Division of Coastal Management (DCM) developed a Long-Term Average Annual Erosion Rate Update Study in 1979, which was most recently updated in 2019 based on updated shoreline measurements from 2016. Per this study, the average blocked erosion rate value increased slightly, relative to the average calculated in the previous 2011 DCM study. This data is used to develop DCM's erosion rate maps and setback factors, which are used to regulate development and which serve as another way to summarize expected erosion. DCM's setback factors were last updated and approved by the Coastal Resources Commission in 2019. Shoreline change rates and Setback Factors can be found in the North Carolina 2019 Oceanfront Setback Factors & Long-Term Average Annual Erosion Rate Update Study: Methods Report, dated January 16, 2019 and made available on the NC DEQ website.

Erosion rates can vary significantly across the region due to several factors including fetch, shoreline orientation, and soil composition. To account for these variations, long-term erosion can also be measured by land cover changes and increases in open water. While a small fraction of the shoreline may exhibit

accretion over a short period of time, cumulative impacts can still indicate an overall loss of estuarine coastline and marsh habitat. Table 4.56 provides data from the NOAA Coastal Change Analysis Program (C-CAP) showing land cover changes in the Region from 1996 to 2016.

Table 4.56 – Land Cover Changes, 1996-2010

Land Cover Type	Currituck County		Dare County	
	Net Change (sq. mi.)	Change (%)	Net Change (sq. mi.)	Change (%)
High Intensity Developed	0.63	34.44	1.18	20.98
Low Intensity Developed	1.07	14.85	0.5	3.12
Open Space Developed	2.11	51.6	0.28	7.42
Grassland	0.38	30.35	-0.21	-12.53
Agriculture	-2.32	-2.97	-0.18	-2.22
Forested	-0.64	-3.99	-0.39	-4.15
Scrub/Shrub	-0.46	-11.52	-0.29	-9.05
Woody Wetland	0.48	0.48	-2.4	-1.01
Emergent Wetland	-1.23	-2.86	1.52	1.83
Barren Land	-0.19	-4.02	-2.12	-4.61
Open Water	0.17	0.06	2.1	0.18

Source: https://coast.noaa.gov/digitalcoast/data/ccapregional.html

The C-CAP data indicates net increases in open water and net decreases in forested land, scrub/shrub land, and barren land, which includes sandy beaches. Additionally, both counties saw an increase in development. Increases in developed land likely result in increased impervious surfaces, which may increase stormwater runoff, alter drainage patterns, and further exacerbate erosion and flood issues.

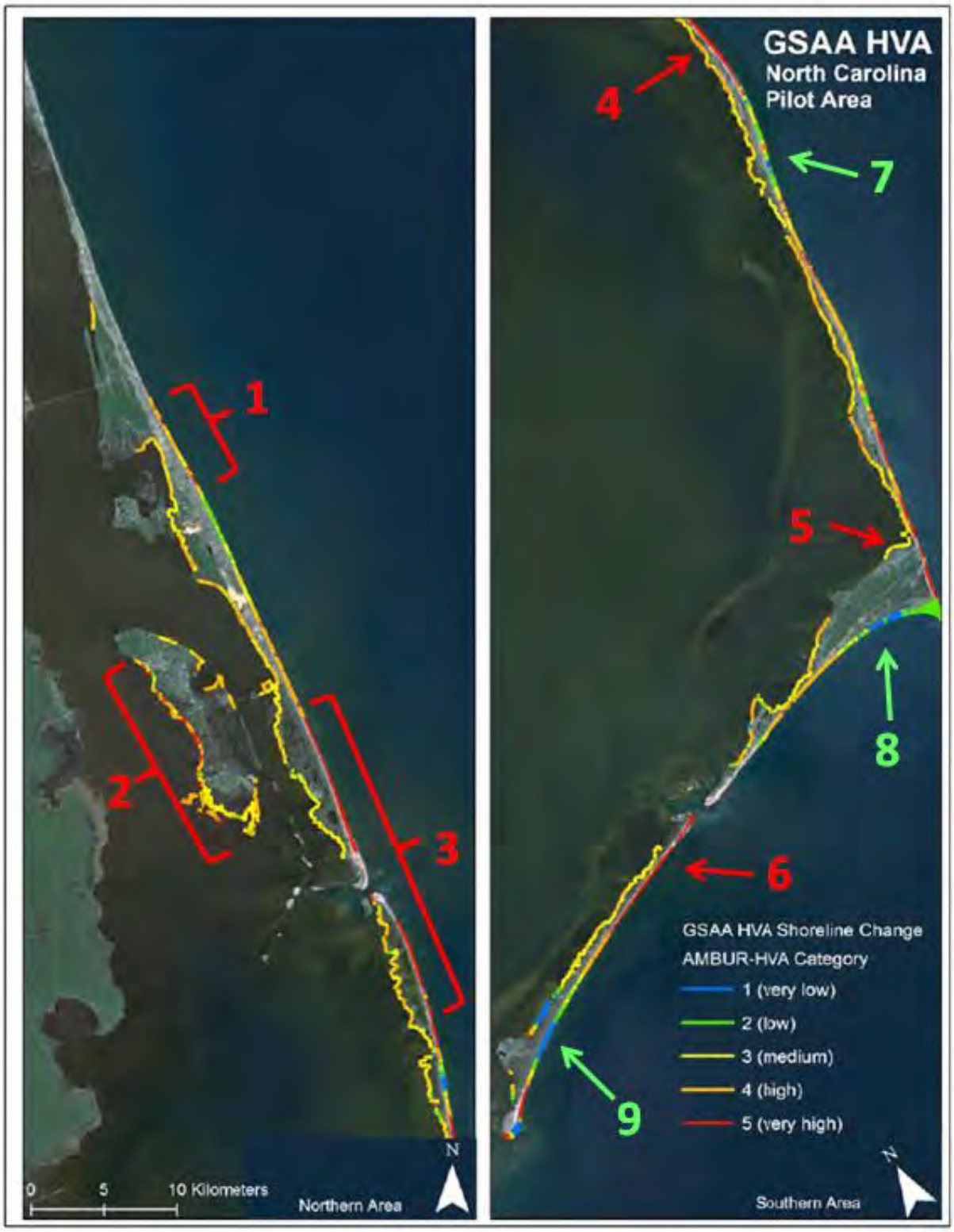
Another way to measure expected oceanfront erosion is by the North Carolina Division of Coastal Management's erosion rate maps and setback factors, which are used to regulate development. Per NC DEQ, "North Carolina's oceanfront construction setback factors are calculated using the long-term (approximately 50 years) average annual shoreline change rates for the purpose of establishing oceanfront construction Setback Factors and Ocean Erodible Areas of Environmental Concern, which were initially established by the Coastal Resources Commission (CRC) under the Coastal Area Management Act (CAMA) in 1979." Setback factors were last updated and approved by the Coastal Resources Commission in 2019. Shoreline change rates and Setback Factors can be found in the North Carolina 2019 Oceanfront Setback Factors & Long-Term Average Annual Erosion Rate Update Study: Methods Report, dated January 16, 2019 and made available on the NC DEQ website.

Estuarine erosion rates were measured as part of the development of the Hazard Vulnerability Assessment (HVA), a coastal hazard assessment tool created through the Governor's South Atlantic Alliance (GSAA). Per analysis by Corbett and Walsh, this data indicates long-term erosion on most estuarine shorelines and several hotspots of erosion, including the southern and western portions of Roanoke Island and stretches of coastline near Rodanthe and Buxton, shown in Figure 4.37.

Erosion may cause property and infrastructure damage but is unlikely to cause injury or death.

Impact: 2 – Limited

Figure 4.37 – Shoreline Erosion Rates in Southern Dare County



Source: Corbett and Walsh. GSAA Hazard Vulnerability Assessment Results

RIP CURRENT

One measure of rip currents is the flow speed of the current. Per NWS, channelized rip currents typically flow about 1-2 feet per second and can reach up to 8 feet per second. Rip currents do not have a steady flow but can experience rip pulses for short periods of time during which flows can suddenly accelerate to more than double their normal speed. Despite these measurable features, rip currents are not typically measured and recorded in these ways. Another way to consider the magnitude of a rip current is by its impacts. The HMPC is most concerned with rip currents causing deaths, injuries, or property damages.

The National Weather Service Forecast Offices provides rip current warnings as part of surf zone and beach forecasts. Forecasts for the Outer Banks are provided by the Newport-Morehead City Office and the Wakefield Office. Rip current risk levels carry the following descriptions, given as warnings to beach-goers:

- Low: Life threatening rip currents often occur in the vicinity of inlets, groins, jetties, and piers. Always supervise those who cannot swim and remember to heed the advice of the local beach patrol and flag warning systems.
- Moderate: Swim near a lifeguard. Remember to heed the advice of the local beach patrol and flag warning systems.
- High: The surf is dangerous for all levels of swimmers. Remember to heed the advice of the local beach patrol and flag warning systems.

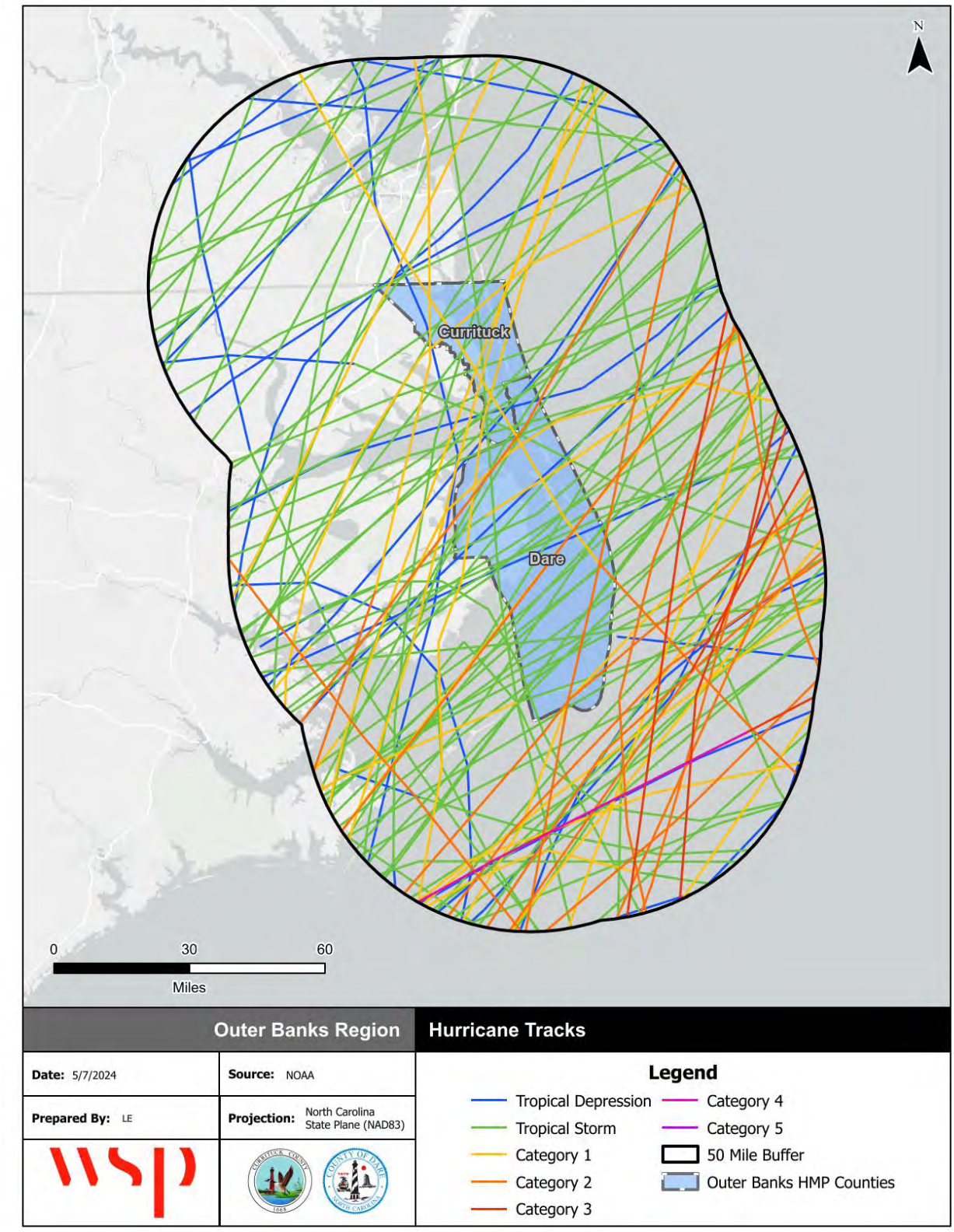
Impact: 3 – Critical

HISTORICAL OCCURRENCES

HURRICANES AND NOR'EASTERS

According to the Office of Coastal Management's Tropical Cyclone Storm Segments data, which is a subset of the International Best Track Archive for Climate Stewardship (IBTrACS) dataset, 104 hurricanes and tropical storms have passed within 50 miles of the Outer Banks Region since 1900. These storm tracks are shown in Figure 4.38. The date, storm name, storm category, and maximum wind speed of each event are detailed in Table 4.57.

Figure 4.38 – Tropical Cyclone Tracks Passing within 50 Miles of the Outer Banks Region, 1900-2021



Source: NOAA Office of Coastal Management

Table 4.57 – Tropical Cyclone Tracks Passing within 50 Miles of the Outer Banks Region, 1900-2021

Date	Storm Name	Max Storm Category*	Max Wind Speed (mph)
Unnamed	10/13/1900	Extratropical Storm	40
Unnamed	7/11/1901	Category 1	81
Unnamed	9/18/1901	Tropical Storm	40
Unnamed	6/29/1907	Extratropical Storm	58
Unnamed	5/29/1908	Category 1	75
Unnamed	7/31/1908	Category 1	81
Unnamed	9/1/1908	Tropical Storm	52
Unnamed	8/28/1910	Extratropical Storm	46
Unnamed	10/20/1910	Tropical Storm	63
Unnamed	6/15/1912	Extratropical Storm	40
Unnamed	5/17/1916	Extratropical Storm	46
Unnamed	8/24/1918	Category 1	75
Unnamed	8/26/1924	Category 2	104
Unnamed	9/17/1924	Extratropical Storm	46
Unnamed	9/30/1924	Extratropical Storm	69
Unnamed	12/2/1925	Extratropical Storm	75
Unnamed	9/12/1930	Category 1	92
Unnamed	9/16/1932	Extratropical Storm	58
Unnamed	8/23/1933	Category 2	104
Unnamed	9/16/1933	Category 2	109
Unnamed	9/3/1934	Tropical Storm	46
Unnamed	9/8/1934	Category 1	92
Unnamed	9/6/1935	Tropical Storm	58
Unnamed	9/18/1936	Category 2	98
Unnamed	7/31/1937	Tropical Storm	63
Unnamed	10/11/1942	Extratropical Storm	52
Unnamed	9/14/1944	Category 3	121
Unnamed	10/20/1944	Extratropical Storm	52
Unnamed	6/26/1945	Category 1	75
Unnamed	7/6/1946	Tropical Storm	52
Unnamed	10/10/1946	Extratropical Storm	40
Unnamed	9/25/1947	Extratropical Storm	40
Unnamed	8/24/1949	Category 2	104
Barbara	8/14/1953	Category 1	92
Unnamed	5/29/1954	Tropical Storm	46
Carol	8/31/1954	Category 2	109
Connie	8/12/1955	Category 2	98
Ione	9/19/1955	Category 2	104
Flossy	9/27/1956	Extratropical Storm	58
Unnamed	10/18/1956	Extratropical Storm	52
Helene	9/27/1958	Category 4	138
Cindy	7/10/1959	Tropical Storm	46
Unnamed	8/2/1959	Tropical Storm	46
Brenda	7/30/1960	Tropical Storm	63

Date	Storm Name	Max Storm Category*	Max Wind Speed (mph)
Donna	9/12/1960	Category 2	98
Unnamed	9/14/1961	Tropical Storm	40
Alma	8/28/1962	Category 1	75
Cleo	9/1/1964	Tropical Storm	46
Dora	9/14/1964	Tropical Storm	58
Isbell	10/16/1964	Category 1	75
Doria	9/16/1967	Tropical Storm	63
Gladys	10/20/1968	Category 1	81
Camille	8/20/1969	Tropical Storm	52
Gerda	9/9/1969	Category 1	81
Doria	8/27/1971	Tropical Storm	63
Agnes	6/22/1972	Tropical Storm	52
Hallie	10/27/1975	Tropical Storm	52
Bret	7/1/1981	Tropical Storm	58
Dennis	8/20/1981	Tropical Storm	69
Subtrop: Unnamed	6/19/1982	Subtropical Storm	69
Diana	9/14/1984	Tropical Storm	58
Gloria	9/27/1985	Category 2	104
Kate	11/22/1985	Tropical Storm	52
Charley	8/18/1986	Category 1	81
Bob	8/19/1991	Category 2	109
Danielle	9/25/1992	Tropical Storm	63
Emily	8/31/1993	Category 3	115
Allison	6/6/1995	Extratropical Storm	46
Arthur	6/19/1996	Tropical Storm	46
Bertha	7/13/1996	Category 1	75
Josephine	10/8/1996	Extratropical Storm	52
Danny	7/24/1997	Tropical Storm	46
Bonnie	8/27/1998	Category 1	86
Earl	9/4/1998	Extratropical Storm	58
Dennis	9/4/1999	Tropical Storm	69
Floyd	9/16/1999	Category 2	104
Irene	10/18/1999	Category 2	109
Helene	9/24/2000	Tropical Storm	46
Gustav	9/11/2002	Tropical Storm	63
Kyle	10/12/2002	Tropical Storm	46
Isabel	9/18/2003	Category 2	104
Alex	8/3/2004	Category 2	98
Charley	8/14/2004	Tropical Storm	69
Gaston	8/31/2004	Tropical Storm	40
Ophelia	9/15/2005	Category 1	81
Alberto	6/14/2006	Extratropical Storm	40
Ernesto	9/1/2006	Extratropical Storm	46
Barry	6/3/2007	Extratropical Storm	46
Gabrielle	9/9/2007	Tropical Storm	58

Date	Storm Name	Max Storm Category*	Max Wind Speed (mph)
Cristobal	7/20/2008	Tropical Storm	52
Irene	8/27/2011	Category 1	86
Andrea	6/7/2013	Extratropical Storm	46
Arthur	7/4/2014	Category 2	98
Colin	6/7/2016	Extratropical Storm	52
Hermine	9/3/2016	Extratropical Storm	69
Julia	9/20/2016	Tropical Depression	30
Matthew	10/9/2016	Category 1	81
Not Named	8/29/2017	Tropical Storm	37
Michael	10/12/2018	Tropical Storm	55
Dorian	9/6/2019	Category 2	85
Nestor	10/20/2019	Tropical Storm	40
Arthur	5/18/2020	Tropical Storm	45
Fay	7/9/2020	Tropical Storm	40
Claudette	6/21/2021	Tropical Storm	40

*Reports the most intense category that occurred within 50 miles of the Outer Banks Region, not for the storm event overall.

Source: Office of Coastal Management, 2024

The above list of storms is not an exhaustive list of hurricanes that have affected the Outer Banks Region. Several storms, including Hurricane Sandy, have passed further than 50 miles away from the Outer Banks Region yet had strong enough wind or rain impacts to affect the region. Storms with hurricane and tropical storm force winds that impacted the Outer Banks Region are recorded in NCEI across four zones: Eastern Dare, Western Dare, Eastern Currituck, and Western Currituck. During the 25-year period from 1999 through 2023, NCEI records 77 hurricane and tropical storm reports across 25 unique storms and 34 separate days. These events are summarized in Table 4.58 by storm. All death, injury, and damage records were combined from all zones. Where property damage estimates were broken out by type, NCEI reports only the value of wind-related damages.

Table 4.58 – Recorded Hurricane and Tropical Storm Winds in Currituck and Dare Counties, 1999-2023

Date	Storm	Deaths/ Injuries	Property Damage	Crop Damage
8/30 – 9/1/1999	Hurricane Dennis	0/0	$12,010,000	$0
9/14 – 9/15/1999	Hurricane Floyd	0/0	$4,300,000	$4,300,000
10/16 – 10/17/1999	Hurricane Irene	0/0	$8,000	$0
9/10/2002	Tropical Storm Gustav	0/0	$57,000	$0
9/17 – 9/18/2003	Hurricane Isabel	0/0	$347,700,000	$0
8/3/2004	Hurricane Alex	0/0	$2,500,000	$0
8/14/2004	Tropical Storm Charley	0/0	$125,000	$50,000
9/13/2005	Hurricane Ophelia	0/0	$100,000	$0
8/31/2006	Tropical Storm Ernesto	0/0	$60,000	$0
9/5 – 9/6/2008	Tropical Storm Hanna	0/0	$30,000	$0
9/2 – 9/3/2010	Hurricane Earl	0/0	$172,000	$0
8/26 – 8/27/2011	Hurricane Irene	0/0	$16,000,000	$15,500,000
10/28/2012	Hurricane Sandy	0/0	$1,000,000	$0
6/6/2013	Tropical Storm Andrea	0/0	$0	$0
7/3 – 7/4/2014	Hurricane Arthur	0/0	$680,000	$0

Date	Storm	Deaths/ Injuries	Property Damage	Crop Damage
9/2/2016	Hurricane Hermine	0/0	$5,415,000	$0
10/8/2016	Hurricane Matthew	0/0	$0	$0
9/13/2018	Hurricane Florence	0/0	$0	$0
10/11/2018	Hurricane Michael	0/0	$0	$0
9/5 – 9/6/2019	Hurricane Dorian	0/0	$150,000	$0
8/4/2020	Hurricane Isaias	0/0	$500,000	$0
7/8/2021	Tropical Storm Elsa	0/0	$20,000	$0
9/30/2022	Hurricane Ian	0/0	$0	$0
8/31/2023	Hurricane Idalia	0/0	$0	$0
9/22/2023	Tropical Storm Ophelia	0/0	$0	$0
	Total	**0/0**	**$390,827,000**	**$19,850,000**

Source: NCEI

The HMPC felt that the damage estimates reported by NCEI were underreported and diminished the severity of the hazard, particularly in light of personal experiences with these particular storms. Additionally, the HMPC wanted to include nor'easters that have also caused significant damage to the Region. Because of this, Dare County provided damage reports compiled from community data following noteworthy storms. The data, summarized in Table 4.59, represents damages attributed to wind and water, which explains some variation from NCEI. Note that this data does not include impacts to Currituck County.

Table 4.59 – Dare County Storm Damage Reports

Date	Storm	Property Damage
9/17 – 9/18/2003	Hurricane Isabel	$3,320,000
9/13/2005	Hurricane Ophelia	$19,500
8/31/2006	Tropical Storm Ernesto	$44,500
11/22/2006	Thanksgiving Storm, 2006	$2,073,400
11/2/2007	Hurricane Noel	$72,500
10/18 – 10/19/2008	Oct 2008 Coastal Storm	$1,687,800
11/11 – 11/14/2009	November 2009 Nor'easter	$5,788,174
9/2 – 9/3/2010	Hurricane Earl	$536,600
8/26 – 8/27/2011	Hurricane Irene	$53,975,960
10/28/2012	Hurricane Sandy	$13,221,440
7/3 – 7/4/2014	Hurricane Arthur	$2,167,750
10/3 – 10/5/2015	October 2015 Coastal Storm	$591,000
9/2/2016	Hurricane Hermine	$5,517,030
10/8/2016	Hurricane Matthew	$42,602,709
9/13/2018	Hurricane Florence	$502,500
3/2 – 3/6/2018	March 2018 Coastal Storm	$4,318,265
10/11/2018	Hurricane Michael	$7,306,538
9/6/2019	Hurricane Dorian	$14,754,644
8/4/2020	Tropical Storm Isaias	$9,193
	Total	**$143,745,626**

Source: Dare County

The following event narratives come from both NCEI and Dare County Damage Reports.

August 30 – September 1, 1999 – Hurricane Dennis, a minimal Category II Hurricane approached the coast of North Carolina on August 30th. When the storm was 75 miles south of Cape Hatteras it was downgraded to a Category I Hurricane and then to a tropical storm when it was 105 miles west of Cape Hatteras. The beach erosion and storm tide effects of Hurricane Dennis were on the Outer Banks. The hurricane approached eastern North Carolina during one of the highest astronomical tides of the month. The dune structure on Hatteras Island was breeched in numerous locations. That included the loss of a 3000-thousand-foot-long section of Highway 12 just north of Buxton and a new inlet along the Core Banks. Dennis also swallowed six homes along the northern Outer Banks in Rodanthe. The town of Nags Head estimated their dune loss at $16.5 million.

Ocean storm surges were 3 to 4 feet above normal. Many reported this was the highest water levels they had ever seen. The most damaging winds were found along the Outer Banks. For almost a week after Tropical Storm Dennis made landfall, associated rain fell on our inland counties. This allowed most of the rivers to rise above flood stage which set the stage for the next hurricane, Hurricane Floyd and its associated record flooding. The greatest rainfall occurred over Carteret, southern Craven, Outer Banks Hyde, and Outer Banks Dare County. Doppler radar estimates were near 6 to 8 inches with isolated areas of 8 to 10.

September 14-15, 1999 – Hurricane Floyd caused massive record flooding across inland sections of eastern North Carolina. At one time Floyd was classified as a category 4 hurricane on the Saffir/Simpson scale and will likely be categorized as one of the nation's most costly hurricanes in the 20th century. By the evening of September 14th, the entire North Carolina coast was under a hurricane watch and at midnight up-graded to a hurricane warning. That same night the first outer rainbands began affecting eastern North Carolina and in turn, reports of flooding began filtering into the National Weather Service office in Morehead City/Newport (MHX). At least 40 official shelters were open across the county warning area. Hurricane Floyd made landfall on the morning of September 16th near North Topsail Beach as a category 2 hurricane. The eye moved northeast over Jacksonville, New Bern, Washington, Plymouth and continued over the eastern shores of Virginia. As the hurricane moved over the eastern coast of North Carolina, it accelerated and weakened. The peak offshore wind report was 96 mph at Duck Pier.

Severe weather and rainfall preceded landfall. By Wednesday night September 16th, 20 tornado warnings had been issued with over half being verified. Estimates were near 6 to 10 inches with isolated areas of 12 to 15 inches. Extreme flooding was experienced across most counties. Unbelievable numbers of homes were covered with water and over half a million customers throughout the county warning area were without power. Unofficially the flooding from Hurricane Floyd has been compared to a 500-year flood.

September 17-18, 2003 – Hurricane Isabel made landfall early in the afternoon on September 18th as a category two hurricane across Core Banks in extreme eastern Carteret county. Isabel moved north northwest near 20 mph across eastern North Carolina during the afternoon. Areas mainly near and east of the storm center experienced significant wind and storm surge effects. Major ocean overwash and beach erosion occurred along the North Carolina Outer Banks where waves up to 20 feet accompanied a 6 to 8-foot storm surge. Almost 350 million dollars in damage occurred in Dare county alone where several thousand homes and businesses, several piers, and sections of Highway 12 were damaged or washed away.

Wind damage was more significant across Hyde, Washington, Tyrell, Martin, and the Outer Banks counties where wind gusts of around 100 mph occurred. Hurricane force winds resulted in structural damage to homes. Numerous trees and power lines were downed across these areas resulting in a loss of electricity for several weeks in some locations. The highest sustained wind speed recorded was 73 mph at Duck. The highest gusts recorded were 97 mph at Elizabeth City, 92 mph at Duck, and 74 mph at Elizabeth City. Mandatory evacuations were ordered for parts of Currituck county, with approximately several thousand persons evacuated and housed in numerous shelters across coastal northeast North

Carolina. The unusually large wind field uprooted many thousands of trees, downed many power lines, damaged hundreds of houses, and snapped thousands of telephone poles and cross arms. Hundreds of roads, including major highways, were blocked by fallen trees. Local power companies reported many thousands of customers were without power. Duck water levels peaked at 7.8 feet MLLW before data was lost. Abd the lowest sea level pressure recorded was 984 mb at Duck. Isabel will be remembered for the greatest wind and storm surge in the region since Hazel in 1954, and the 1933 Chesapeake-Potomac Hurricane. Also, Isabel will be remembered for the extensive power outages in northeast North Carolina, and permanent change to the landscape from all the fallen trees and storm surge.

According to the Dare County preliminary damage report from September 19, 2003, Dare County suffered significant property damage and erosion from wave action during the storm. The hardest hit area was Hatteras Village, which was initially inaccessible by road due to a breech on NC 12. An aerial survey, and brief ground assessment indicated extensive damage to properties. Numerous homes and businesses were moved off of their foundations, or totally destroyed. Some residents reported four feet of ocean water in homes located well off of the oceanfront.

November 11-14, 2009 – The nor'easter that lingered over the Outer Banks in November 2009 resulted in coastal property damage, flooding of roadways and ground elevation structures, and extensive beach erosion. Most of the oceanfront damage from Duck south to Buxton was caused by wave action and loss of protective dunes. Flooding of roadways and ground elevation structures was due to a combination of heavy rains, and ocean overwash. Portions of NC 12 north of Rodanthe buckled due to loss of protective dunes over the extended days of punishing high tides. Hatteras village experienced soundside flooding but fortunately was spared property damage. Some scouring of dunes occurred in the Frisco area but also without property loss

Three residences in Kill Devil Hills and Nags Head were destroyed in this storm and an additional 312 structures, mostly residences, were damaged. Most of the damaged residences were single family rental properties, with generally minor damage to heat pumps, decks, stairs, and pools. The residences with major damage include those that remained in the tide and those that sustained major structural damage. Seventy one of the structures with both minor and major damage were uninhabitable. Two motels in Buxton sustained major damage and several other businesses and town properties reported minor damage.

August 26-27, 2011 – Hurricane Irene made landfall during the morning of the 27th, near Cape Lookout, as a large category 1 hurricane on the Saffir/Simpson Hurricane Wind Scale. Due to the large size of the hurricane, strong damaging winds, major storm surge, and flooding rains were experienced across much of eastern North Carolina. Several destructive tornados occurred during the evening of the 26th associated with the hurricane.

Across Eastern Dare County, maximum wind gusts from 63 to 88 mph were recorded resulting in numerous trees and power-lines down with extensive power outages and structural damage. The highest surge was 7 to 10 feet on the sound-side from Buxton to Rodanthe and the highest ocean-side surge of 9.5 feet was recorded at Hatteras Village. In Currituck, a 3 to 4-foot surge was observed on the eastern shore of the county adjacent to the Currituck Sound. Surge resulted in extensive damage, flooding of structures, and caused many dune breaches and damage to Highway 12. Mandatory evacuations were ordered for all visitors and residents on the 24th and 25th.

Much of Dare County suffered significant soundside flooding from storm surge, with some areas reporting up to five feet of water in structures. Many vehicles were also flooded. Minor oceanfront and oceanside damage was reported, but no area of the county was spared from damage.

September 2, 2016 – Hurricane Hermine made landfall in the Big Bend area of Florida during the early morning hours on September 2nd, and moved northeast along the Southeastern United States on the 2nd. Hermine weakened slightly to Tropical Storm strength and crossed through Eastern North Carolina during

the late evening on September 2nd, and exited off the North Carolina coast near Duck during the morning of September 3rd.

Tropical Storm Hermine produced significant impacts across the Outer Banks. Strong north winds developed during the morning and early afternoon of September 3rd as Hermine moved northeast of the region. Winds of 60 to 70 mph were common over Hatteras Island with a peak gust of 84 mph recorded at the Duck Pier. These strong winds led to structural damage to several homes and businesses as well as sporadic power outages across North Carolina. These strong winds also pushed water from the Pamlico sound onshore leading to moderate to major sound-side storm surge of 2 to 4 feet above ground level. This storm surge flooded many homes and businesses with significant damage to some. The highest surge values of 3 to 4 feet were observed between Buxton and Hatteras Village. On the ocean side moderate beach erosion and ocean over wash was observed damaging roads and a few homes. Very heavy rain led to some flash flooding over the Hatteras Village area and an EF0 tornado also damaged a couple cabins in the Hatteras Village community. Overall damage was estimated at 5.4 million dollars over the Outer Banks with most of this caused by storm surge flooding.

October 8, 2016 – Hurricane Matthew affected all areas of Dare County, causing significant and wide spread flooding -mostly from heavy rains, wide spread damage due to high winds, and wide spread power outages. Many areas that are not normally flooded experienced flooding due to the amount of rain brought by the storm. Roughly 13% of improved properties countywide suffered some level of property damage as a result of this storm. The areas with the highest concentration of properties suffering major damage were Frisco and Hatteras Village, where a significant number of properties suffered major damage from severe soundside flooding and flooding from excessive rainfall. Water levels in some living areas in Hatteras village were reported at 5 feet and above and most commercial properties suffered major flood damage. Some marinas also suffered damage to their infrastructure.

Damage throughout the rest of the county was attributed to wind, which included missing shingles and siding, and water, both surge and excessive rainfall. In the Town of Manteo, areas that typically do not see flooding were flooded due to the amount of rain that fell. In Nags Head, commercial businesses on NC 12 from Bonnett Street to Eighth Street and in the Gallery Row area were hit particularly hard. Portions of NC 12 were covered with over three feet of water. Water dependent structures such as piers, docks, and bulkheads experienced heavy damage and in some cases were completely destroyed.

August 4, 2020 – Tropical Storm Isaias caused limited, minor storm-related property damage as a result of high winds and soundside flooding from storm surge. Sustained tropical storm force winds over a period of approximately 6 hours caused water levels to rise in the sounds throughout the county. Damage was reported in only three districts. The storm surge caused minor flooding in soundside areas of the county. Most of the flooding that occurred did not reach residential properties and was limited to the flooding of yards. There was one instance where water did reach the ground level interior of a residential property in Stumpy Point. High winds caused limited damage to docks, siding, and shingles.

As noted in several of these event narratives, in addition to wind impacts, the Outer Banks region has experienced storm surge and flooding from hurricane and tropical storm events.

COASTAL EROSION

As DCM's shoreline change data shows, erosion is occurring along the coast of the Outer Banks. Per an examination of event narratives in NCEI records for hurricanes, tropical storms, storm surges, and coastal floods, many events that have occurred in the Outer Banks region between 1999 and 2023 caused erosion. Table 4.60 below summarizes these events.

Table 4.60 – NCEI Events with Erosion Effects, 1999-2023, Outer Banks Region

Location	Event Name	Start Date	Event Type	Reported Property Damage
Eastern/Western Dare (Zone)	Hurricane Dennis	8/30/1999	Hurricane	$0
Eastern Dare (Zone)	Hurricane Floyd	9/14/1999	Hurricane	$0
Eastern Dare (Zone), Eastern Currituck (Zone)	Hurricane Isabel	9/17/2003	Hurricane	$347,000,000
Western Dare (Zone)	Tropical Storm Ernesto	8/31/2006	Tropical Storm	$10,000
Eastern Dare (Zone)	--	11/22/2006	Coastal Flood	$2,100,000
Eastern Dare (Zone)	--	5/7/2007	Coastal Flood	$30,000
Eastern Dare (Zone)	Tropical Storm Gabrielle	9/9/2007	Storm Surge	$0
Eastern Dare (Zone)	--	11/3/2007	Coastal Flood	$72,000
Eastern Dare (Zone), Eastern/ Western Currituck (Zone)	Tropical Storm Hanna	9/5/2008	Tropical Storm	$30,000
Eastern Currituck (Zone)	Unnamed Nor'easter	11/12/2009	Coastal Flood	$5,000,000
Eastern/Western Dare (Zone)	Hurricane Earl	9/2/2010	Tropical Storm, Storm Surge	$547,000
Eastern Dare (Zone)	Hurricane Sandy	10/28/2012	Tropical Storm, Storm Surge	$14,000,000
Eastern/Western Dare (Zone)	Tropical Storm Andrea	6/6/2013	Tropical Storm, Storm Surge	$0
Eastern Dare (Zone)	--	10/4/2015	Coastal Flood	$590,000
Eastern Currituck (Zone), Eastern Dare (Zone)	Tropical Storm Hermine	9/2/2016	Tropical Storm	$5,410,000
Eastern Dare (Zone)	Hurricane Matthew	10/8/2016	Hurricane	$0
Northern Outer Banks (Zone), Hatteras Island (Zone)	--	11/6/2021	Coastal Flood	$0

Source: NCEI

Note: Damages are reported for the entire event and are not necessarily erosion related.

Recorded incidents of erosion in the Outer Banks region include the following:

August 30-September 1, 1999 – For most counties, Hurricane Dennis left relatively little in its wake, however on the Outer Banks, erosion and the storm tide effects were extreme. Unfortunately, the hurricane approached eastern North Carolina during one of the highest astronomical tides of the month. The dune structure on Hatteras Island was breeched in numerous locations.

September 19, 2003 – Hurricane Isabel made landfall early in the afternoon on September 19th as a category two hurricane. Major ocean overwash and beach erosion occurred along the Outer Banks, where waves of up to 20 feet accompanied a 6 to 8-foot storm surge.

November 22, 2006 – Strong low pressure developed off the southeast United States coast on November 20th. This low then slowly lifted north to the North Carolina coast on Wednesday November 22nd. The storm system produced heavy rain of 4 to 8 inches, very strong winds of 40 to 60 mph, and significant coastal flooding across eastern North Carolina as it approached the region. Significant coastal flooding was reported across Dare County, mainly for areas north of Buxton. Water levels of 4 to 6 feet above normal reported with significant beach erosion and ocean overwash.

November 12, 2009 – An intense Nor'easter produced moderate to severe coastal flooding across much of the Currituck Outer Banks. The peak tide height at Duck was 7.20 feet above MLLW, which was 3.22 feet above the astronomical tide. Numerous streets, homes and businesses were flooded in low lying areas of the county close or directly exposed to the Atlantic Ocean, especially in the Corolla and Carova Beach areas. There was also severe beach erosion and loss of protective dunes.

October 8, 2016 – Hurricane Matthew moved northeast offshore of the North Carolina coast late on October 8th through October 9th. Strong winds of 40 to 60 mph inland and 60 to 80 mph along the coast occurred as Matthew passed offshore mainly during the evening of October 8th through the morning of the 9th. Storm surge inundation on the ocean side was generally 1 to 3 feet above ground producing significant beach erosion.

November 6, 2021 – A coastal storm formed off the Southeastern U.S. coast during the weekend of November 6-8th, and in tandem with 'King' tides, or high astronomical tides, produced water level rises of up to 2 to 4 feet above ground level for areas of Eastern NC, along with ocean overwash and severe erosion on the Outer Banks. In addition to the coastal flooding, high winds were recorded over 60 mph in some locations, and storm force winds over the coastal waters.

In addition to storm events reported in NCEI, news reports in recent years have highlighted the vulnerability of the Outer Banks to erosion. Per the National Park Service, seven homes in Rodanthe have collapsed in the past four years. Per reporting in March 2024 by The Washington Post, Rodanthe has some of the most rapid rates of erosion and relative sea level rise on the East Coast, and at least a dozen more houses are at risk of collapsing into the ocean. Debris from collapsed houses can be carried long distances along the coast and present hazards to people and other structures.

RIP CURRENT

Rip currents are listed in NCEI's storm events database only when they cause a drowning, near-drowning, result in one or more rescues, or cause damage to watercraft. Table 4.61 lists all rip current events recorded by NCEI for the Outer Banks Region during the 25-year period between 1999-2023. In total, 30 rip current events and associated deaths were reported.

Table 4.61 – NCEI Records of Rip Currents, 1999-2023, Outer Banks Region

Location	Date	Time	Deaths	Injuries	Reported Property Damage
Rodanthe	6/22/2002	1733	1	0	$0
(Hat)Cape Hatteras	9/4/2003	1700	1	0	$0
Nags Head	8/5/2004	1500	1	0	$0
Corolla	9/22/2004	0815	1	0	$0
Corolla	9/23/2004	1100	1	0	$0
Kill Devil Hills	5/27/2005	1400	1	0	$0
Nags Head	6/22/2005	1430	1	0	$0
Rodanthe	9/22/2006	1130	1	0	$0
Hatteras Village	7/1/2007	1130	1	0	$0
Hatteras Village	7/24/2009	1600	1	0	$0
Rodanthe	9/18/2009	1350	1	0	$0
Nags Head	6/20/2012	1300	1	0	$0
Buxton	7/25/2012	1745	1	0	$0
Frisco	6/26/2013	1500	1	0	$0
Eastern Dare (Zone)	6/4/2016	1200	0	0	$0
Frisco	7/22/2016	1420	1	0	$0

Location	Date	Time	Deaths	Injuries	Reported Property Damage
Rodanthe	9/9/2016	1338	2	0	$0
Salvo	10/2/2016	1006	1	0	$0
Avon	10/13/2016	1600	1	0	$0
Buxton	10/19/2016	1630	1	0	$0
Frisco	6/6/2017	1230	1	0	$0
Buxton	9/9/2017	1700	1	0	$0
Frisco	6/6/2018	0900	1	0	$0
Eastern Dare (Zone)	6/28/2018	1628	1	0	$0
Rodanthe	10/1/2018	1000	1	0	$0
Hatteras Island (Zone)	9/1/2019	1625	1	0	$0
Hatteras Island (Zone)	9/28/2019	1350	1	0	$0
Duck	9/30/2019	1522	1	0	$0
Nags Head	10/3/2019	1400	1	0	$0
Northern Outer Banks (Zone)	7/3/2020	0200	1	0	$0
		Total	**30**	**0**	**$0**

Source: NCEI

The following narratives detail selected events reported in the table above:

September 4, 2003 – Dare County Emergency Management reported a rip current drowning of a Maryland man near Cape Hatteras. Swells generated from Hurricane Fabian, which was 875 miles southeast of the Outer Banks, caused heavy surf and rip currents across the entire North Carolina coast.

May 27, 2005 – Two swimmers at the Ramada Plaza in Kill Devil Hills were pulled away from the shore by a strong rip current during the mid afternoon. One man drowned.

July 25, 2012 – Two people swimming near the Cape Hatteras Light House were pulled out to sea by a rip current. They were found face down in the surf and rescued. One woman died.

June 6, 2017 – A 17 year old male died from a rip current off Frisco. The victim was last seen going into the water on a boogie board urging others to come back toward shore but succumbed to the rip current himself. His body was recovered the next morning, on June 7th.

October 1, 2018 – The initial call came in around 10:00 a.m. of two swimmers in trouble in Rodanthe. The victim's friend started CPR, which was continued by local paramedics. Efforts to revive the Baldwinsville, New York man were unsuccessful, and the victim died in the surf zone due to a rip current.

The National Weather Service has also tracked surf zone fatalities since 2010, including deaths caused by rip current, high surf, sneaker waves, and other causes. Data is available by location starting in 2010. Fatalities reported in the Outer Banks Region between 2010-2024 are listed below.

Table 4.62 – Surf Zone Fatalities, 2010-2024

Year	Cause	Count	Locations
2024	Rip Current	1	Nags Head
2022	Unknown	1	Kill Devil Hills
2020	Unknown	1	Duck
2020	Rip Current	1	Kitty Hawk
2019	Rip Current	3	Duck, Cape Hatteras
2019	Unknown	1	Nags Head
2018	High Surf	4	Kitty Hawk Beach, Kill Devil Hills, Duck, Southern Shores

Year	Cause	Count	Locations
2018	Rip Current	3	Frisco Day, Avon, Rodanthe
2018	Unknown	1	Buxton
2017	Rip Current	3	Corolla, Hatteras Point (Buxton)
2016	Rip Current	7	Corolla, Rodanthe, Salvo, Buxton, Frisco
2015	Unknown	1	Duck
2012	Rip Current	2	Nags Head, Buxton

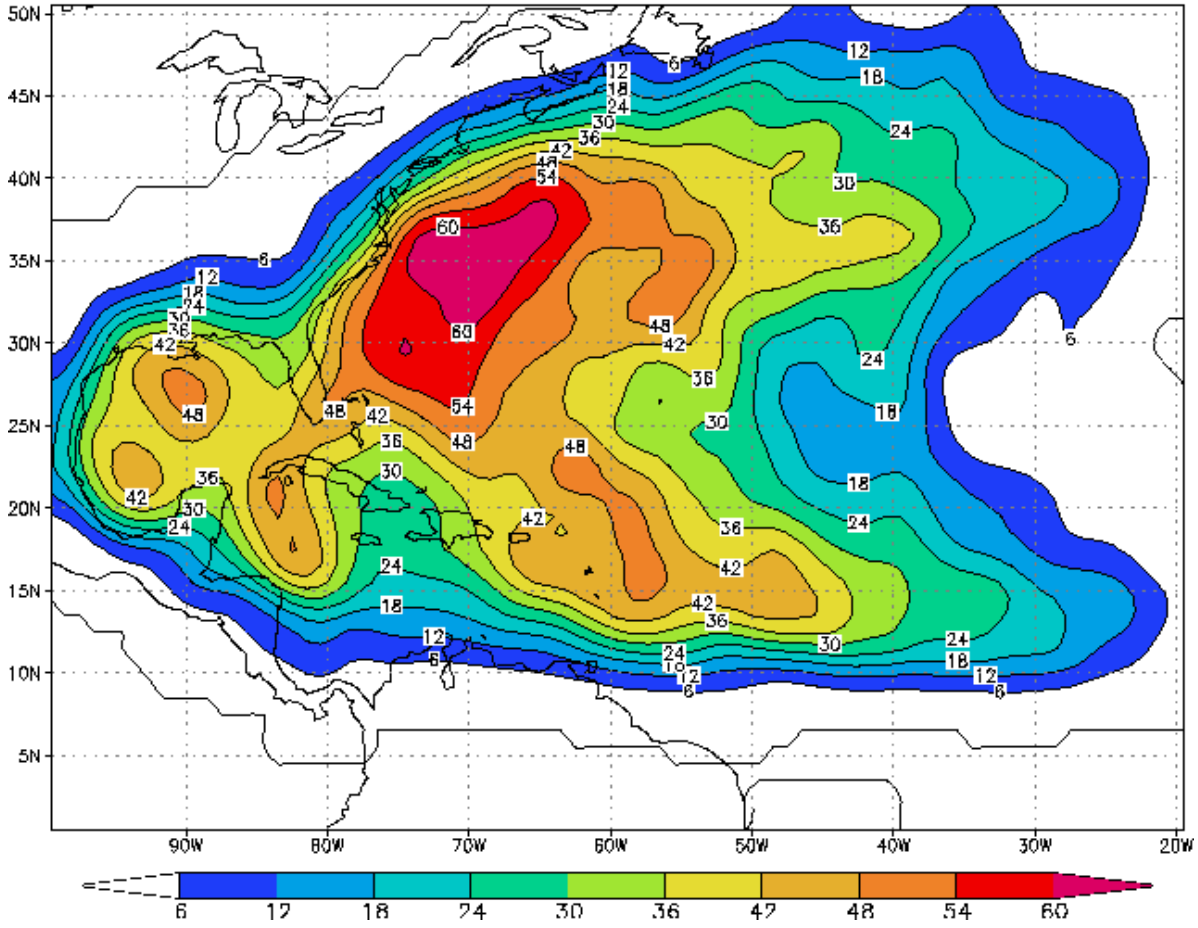
Source: National Weather Service

The Town of Nags Head started tracking statistics on drownings in 2014; since that time, 17 drowning deaths have occurred in Nags Head. While the specific cause of these deaths is not tracked, some are assumed to be attributed to rip currents.

PROBABILITY OF FUTURE OCCURRENCE

Figure 4.39 shows, for any particular location, the chance of a hurricane or tropical storm affecting the area sometime during the Atlantic hurricane season. The figure was created by the National Oceanic and Atmospheric Administration's (NOAA) Hurricane Research Division, using data from 1944 to 1999 and shows the number of times a storm or hurricane was located within approximately 100 miles of a given spot in the Atlantic basin. Per this data, there has historically been approximately a 42-48% chance of a hurricane occurring near the Outer Banks Region in any given year.

Figure 4.39 – Empirical Probability of a Named Hurricane or Tropical Storm



Source: National Oceanic and Atmospheric Administration, Hurricane Research Division

On average, North Carolina experiences a hurricane approximately once every two years. Per historical records, in the 25-year period from 1999 through 2023, the Outer Banks Region was impacted by 25 separate hurricane and tropical storm events. Based on these historical data, it can be reasonably concluded that there is at least a 50 to 75 percent chance of a hurricane or tropical storm impacting the Region in any given year.

Hazards previously discussed, such as sea level rise, and coastal and estuarine erosion, can amplify impacts of hurricanes and related hazards, such as coastal and sound side storm surge.

Probability: 3 – Likely

Erosion and accretion are natural processes that are likely to continue to occur along both ocean and estuarine shorelines. The likelihood of significant instances of erosion will likely be tied to the occurrence of hurricane, tropical storm, and nor'easter events. According to NCEI, 17 events caused reported erosion in the region over the 25-year span between 1999-2023. This equates to a 68 percent annual chance of significant erosion. Additionally, drawing from the likelihood of hurricanes, tropical storms, and Nor'easters, erosion is likely to occur.

Probability: 3 – Likely

Rip currents are ongoing phenomena that are always occurring along ocean surf zones. Rip currents are guaranteed to continue occurring, however, of concern to the HMPC is the probability of rip currents resulting in death, injury, or property damages. NCEI and Town records indicate there have been at least 30 deaths due to rip currents over a 25-year period from 1999 through 2023. This equates over 100 percent annual probability of significant rip current impacts.

Probability: 4 – Highly Likely

CLIMATE CHANGE

North Carolina's coastal location makes it a prime target for hurricane landfalls, and changing climate and weather conditions may increase the number and frequency of future hurricane events. Hurricanes and other coastal storms may result in increased flooding, injuries, deaths, and extreme property loss. According to the US Government Accountability Office, national storm losses from changing frequency and intensity of storms is projected to increase anywhere from $4-6 billion in the near future.

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

As a result of changes to the frequency and intensity of tropical storms and heavy rainfall events, erosion typically caused by these storms could be expected to occur more frequently. Coastal erosion is also expected to increase as a result of sea level rise.

Research on the impacts of climate change on rip currents are limited; however, the climate change factors that affect coastal erosion may also impact rip currents. Erosion and accretion result in changes to coastal bathymetry, which affects the location of rip currents. As large-scale erosion events occur more frequently, the location of rip currents may become more unpredictable.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Property at risk to hurricanes was estimated using data from the NCEM IRISK database, which was compiled in NCEM's Risk Management Tool. The vulnerability data displayed below reflects loss estimates for wind-related damages. Hurricanes may also cause substantial damages from flooding related to heavy rains and storm surge, which is addressed in Section 4.5.4 Flood.

For more information on hurricane vulnerability, the South Atlantic Coastal Study from the U.S. Army Corps of Engineers (USACE) South Atlantic Division provides an assessment of coastal hazard risks and vulnerability. Back bay areas of Currituck County and areas along the Outer Banks and eastern peninsula in Dare County were identified as having high exposure, and Dare County has one of the highest projections of future risk in North Carolina, with economic damage projections nearly tripling between existing and future conditions. The SACS North Carolina Appendix report estimates future risk at nearly $125 million for Dare County and over $20 million for Currituck County.

PEOPLE

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

Erosion is unlikely to have any direct impact on the health or safety of individuals. However, it may cause indirect harm by weakening structures and by changing landscapes in ways that increase risk of other hazard impacts. For example, erosion of dune systems causes areas protected by those dunes to face higher levels of risk.

Rip currents pose a direct risk to human health and safety. Individuals who do not know how to recognize and avoid or escape rip currents are at risk of drowning. Since 1999, NCEI records 28 fatalities attributed to rip currents in the Region.

PROPERTY

General damages to property are both direct (what the winds associated with hurricanes physically destroy) and indirect, which focuses on additional costs, damages and losses attributed to secondary hazards spawned by the hurricane, or due to the damages caused by the storm. Depending on the size and strength of the hurricane, associated winds are capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize structures' resistance to damage.

Secondary impacts of damage due to hurricane winds often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These impacts of a hurricane put tremendous strain on a community. In the immediate aftermath of a hurricane, the focus is on emergency services.

Table 4.63 through Table 4.67 detail buildings at risk and provide damage estimates across all jurisdictions for the 25-, 50-, 100-, 300-, and 700-year hurricane wind events. All scenarios impacted the same number of buildings but with varying severity of damage.

The damage estimates for the 100-year hurricane wind event totals $1,270,060,296, which equates to a loss ratio of 12.5 percent. The loss ratio is the damage estimate divided by the total potential exposure (i.e., total of improved and contents value for all buildings in the planning area), displayed as a percentage of value at risk. FEMA considers loss ratios greater than 10% to be significant and an indicator a community may have more difficulties recovering from an event.

Table 4.63 – Buildings at Risk from 25-Year Hurricane Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$24,126,742	1,449	8.2%	$5,472,658	179	1.0%	$425,659	16,608	93.9%	$30,025,059
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$38,424,921	644	4.6%	$2,175,194	152	1.1%	$807,710	13,247	94.5%	$41,407,825
Town of Duck	2,409	2,105	87.4%	$8,168,961	53	2.2%	$133,197	4	0.2%	$100,723	2,162	89.7%	$8,402,881
Town of Kill Devil Hills	6,033	5,380	89.2%	$5,983,774	309	5.1%	$2,767,233	18	0.3%	$82,608	5,707	94.6%	$8,833,615
Town of Kitty Hawk	2,862	2,501	87.4%	$4,262,277	179	6.3%	$804,446	11	0.4%	$17,983	2,691	94.0%	$5,084,707
Town of Manteo	943	764	81.0%	$8,879,098	124	13.1%	$816,719	29	3.1%	$145,431	917	97.2%	$9,841,248
Town of Nags Head	4,868	4,268	87.7%	$25,243,809	293	6.0%	$3,360,247	30	0.6%	$385,569	4,591	94.3%	$28,989,625
Town of Southern Shores	2,513	2,436	96.9%	$5,075,822	33	1.3%	$58,719	7	0.3%	$18,511	2,476	98.5%	$5,153,052
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$96,038,662**	**1,635**	**4.9%**	**$10,115,755**	**251**	**0.7%**	**$1,558,535**	**31,791**	**94.5%**	**$107,712,953**
Region Total	**51,332**	**44,885**	**87.4%**	**$120,165,404**	**3,084**	**6.0%**	**$15,588,413**	**430**	**0.8%**	**$1,984,194**	**48,399**	**94.3%**	**$137,738,012**

Source: NCEM Risk Management Tool

Table 4.64 – Buildings at Risk from 50-Year Hurricane Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$83,410,719	1,449	8.2%	$12,935,226	179	1.0%	$1,388,826	16,608	93.9%	$97,734,771
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$126,973,210	644	4.6%	$6,326,385	152	1.1%	$2,988,980	13,247	94.5%	$136,288,575
Town of Duck	2,409	2,105	87.4%	$28,665,690	53	2.2%	$408,190	4	0.2%	$246,813	2,162	89.7%	$29,320,693
Town of Kill Devil Hills	6,033	5,380	89.2%	$38,142,291	309	5.1%	$12,808,030	18	0.3%	$1,249,002	5,707	94.6%	$52,199,323
Town of Kitty Hawk	2,862	2,501	87.4%	$12,602,005	179	6.3%	$2,322,590	11	0.4%	$89,258	2,691	94.0%	$15,013,853
Town of Manteo	943	764	81.0%	$26,080,846	124	13.1%	$2,373,358	29	3.1%	$890,598	917	97.2%	$29,344,801
Town of Nags Head	4,868	4,268	87.7%	$100,729,126	293	6.0%	$9,752,559	30	0.6%	$1,673,623	4,591	94.3%	$112,155,307
Town of Southern Shores	2,513	2,436	96.9%	$15,720,752	33	1.3%	$191,748	7	0.3%	$63,707	2,476	98.5%	$15,976,208
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$348,913,920**	**1,635**	**4.9%**	**$34,182,860**	**251**	**0.7%**	**$7,201,981**	**31,791**	**94.5%**	**$390,298,760**
Region Total	**51,332**	**44,885**	**87.4%**	**$432,324,639**	**3,084**	**6.0%**	**$47,118,086**	**430**	**0.8%**	**$8,590,807**	**48,399**	**94.3%**	**$488,033,531**

Source: NCEM Risk Management Tool

Table 4.65 – Buildings at Risk from 100-Year Hurricane Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$244,543,000	1,449	8.2%	$27,737,666	179	1.0%	$3,742,511	16,608	93.9%	$276,023,177
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$324,260,588	644	4.6%	$15,512,965	152	1.1%	$8,346,279	13,247	94.5%	$348,119,832
Town of Duck	2,409	2,105	87.4%	$84,678,939	53	2.2%	$1,095,113	4	0.2%	$577,554	2,162	89.7%	$86,351,606
Town of Kill Devil Hills	6,033	5,380	89.2%	$115,328,828	309	5.1%	$27,436,454	18	0.3%	$3,753,387	5,707	94.6%	$146,518,669
Town of Kitty Hawk	2,862	2,501	87.4%	$36,496,835	179	6.3%	$6,325,484	11	0.4%	$356,819	2,691	94.0%	$43,179,138
Town of Manteo	943	764	81.0%	$58,902,065	124	13.1%	$5,733,864	29	3.1%	$2,953,744	917	97.2%	$67,589,673
Town of Nags Head	4,868	4,268	87.7%	$226,733,723	293	6.0%	$21,903,999	30	0.6%	$4,083,163	4,591	94.3%	$252,720,885
Town of Southern Shores	2,513	2,436	96.9%	$48,811,042	33	1.3%	$538,045	7	0.3%	$208,230	2,476	98.5%	$49,557,316
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$895,212,020**	**1,635**	**4.9%**	**$78,545,924**	**251**	**0.7%**	**$20,279,176**	**31,791**	**94.5%**	**$994,037,119**
Region Total	**51,332**	**44,885**	**87.4%**	**$1,139,755,020**	**3,084**	**6.0%**	**$106,283,590**	**430**	**0.8%**	**$24,021,687**	**48,399**	**94.3%**	**$1,270,060,296**

Source: NCEM Risk Management Tool

Table 4.66 – Buildings at Risk from 300-Year Hurricane Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$791,808,918	1,449	8.2%	$82,663,684	179	1.0%	$15,340,136	16,608	93.9%	$889,812,738
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$1,001,827,399	644	4.6%	$51,780,725	152	1.1%	$25,673,814	13,247	94.5%	$1,079,281,938
Town of Duck	2,409	2,105	87.4%	$343,595,786	53	2.2%	$5,289,417	4	0.2%	$2,827,816	2,162	89.7%	$351,713,019
Town of Kill Devil Hills	6,033	5,380	89.2%	$266,254,175	309	5.1%	$53,016,434	18	0.3%	$9,160,033	5,707	94.6%	$328,430,642
Town of Kitty Hawk	2,862	2,501	87.4%	$168,995,934	179	6.3%	$30,552,660	11	0.4%	$2,152,067	2,691	94.0%	$201,700,661
Town of Manteo	943	764	81.0%	$103,944,053	124	13.1%	$12,263,497	29	3.1%	$7,546,875	917	97.2%	$123,754,426
Town of Nags Head	4,868	4,268	87.7%	$415,761,393	293	6.0%	$41,947,287	30	0.6%	$8,415,759	4,591	94.3%	$466,124,439
Town of Southern Shores	2,513	2,436	96.9%	$246,181,529	33	1.3%	$3,374,636	7	0.3%	$1,620,540	2,476	98.5%	$251,176,705
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$2,546,560,269**	**1,635**	**4.9%**	**$198,224,656**	**251**	**0.7%**	**$57,396,904**	**31,791**	**94.5%**	**$2,802,181,830**
Region Total	**51,332**	**44,885**	**87.4%**	**$3,338,369,187**	**3,084**	**6.0%**	**$280,888,340**	**430**	**0.8%**	**$72,737,040**	**48,399**	**94.3%**	**$3,691,994,568**

Source: NCEM Risk Management Tool

Table 4.67 – Buildings at Risk from 700-Year Hurricane Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$1,222,437,283	1,449	8.2%	$140,776,361	179	1.0%	$28,259,247	16,608	93.9%	$1,391,472,891
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$1,328,472,789	644	4.6%	$75,657,812	152	1.1%	$39,750,650	13,247	94.5%	$1,443,881,251
Town of Duck	2,409	2,105	87.4%	$484,691,776	53	2.2%	$8,674,606	4	0.2%	$4,433,713	2,162	89.7%	$497,800,096
Town of Kill Devil Hills	6,033	5,380	89.2%	$414,250,034	309	5.1%	$82,053,054	18	0.3%	$16,232,324	5,707	94.6%	$512,535,411
Town of Kitty Hawk	2,862	2,501	87.4%	$261,402,873	179	6.3%	$50,096,193	11	0.4%	$3,572,443	2,691	94.0%	$315,071,509
Town of Manteo	943	764	81.0%	$143,774,461	124	13.1%	$20,915,288	29	3.1%	$13,656,593	917	97.2%	$178,346,343
Town of Nags Head	4,868	4,268	87.7%	$605,997,629	293	6.0%	$64,700,017	30	0.6%	$13,691,971	4,591	94.3%	$684,389,616
Town of Southern Shores	2,513	2,436	96.9%	$383,344,077	33	1.3%	$6,178,715	7	0.3%	$3,278,484	2,476	98.5%	$392,801,277
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$3,621,933,639**	**1,635**	**4.9%**	**$308,275,685**	**251**	**0.7%**	**$94,616,178**	**31,791**	**94.5%**	**$4,024,825,503**
Region Total	**51,332**	**44,885**	**87.4%**	**$4,844,370,922**	**3,084**	**6.0%**	**$449,052,046**	**430**	**0.8%**	**$122,875,425**	**48,399**	**94.3%**	**$5,416,298,394**

Source: NCEM Risk Management Tool

Property damage due to erosion typically only results in conjunction with large storm events which also bring wind and water damages. These events can cause scour and weaken foundations, which may undermine affected buildings' structural integrity. Buildings collapsing into the ocean as a result of erosion and other coastal forces cause not only property damages associated with the loss of the building, but also clean up costs and potential damages to other structures. An interagency work group co-led by the North Carolina Department of Environmental Quality and the National Park Service's Cape Hatteras National Seashore has developed ideas to address the vulnerability of oceanfront structures along eroding beaches. Ideas from the interagency work group are discussed in the Capability Assessment in Section 5.

Erosion impacts on infrastructure are also a major concern in the Outer Banks Region, particularly along N.C. 12 through Dare County. Efforts by the N.C. 12 Task Force to develop short- and long-term solutions for hot spot areas are discussed in the Capability Assessment in Section 5.

Rip current is unlikely to result in any property damages, though it may result in indirect damages to watercrafts by pushing them into jetties or sandbars.

ENVIRONMENT

Hurricane winds can cause massive damage to the natural environment, uprooting trees and other debris within the storm's path. Animals can either be killed directly by the storm or impacted indirectly through changes in habitat and food availability caused by high winds, storm surge and intense rainfall. Endangered species can be dramatically impacted. Forests can be completely defoliated by strong winds.

Erosion can change the shape and characteristics of coastal shorelines and riverine floodplains. Eroded material may clog waterways and decrease drainage capacity. Erosion can also negatively impact water quality by increasing sediment loads in waterways.

CONSEQUENCE ANALYSIS

Table 4.68 summarizes the potential consequences of hurricane winds and coastal hazards.

Table 4.68 – Consequence Analysis - Hurricane and Coastal Hazards

Category	Consequences
Public	Impacts from hurricane winds include injury or death, loss of property, outbreak of diseases, mental trauma and loss of livelihoods. Residential, commercial, and public buildings, as well as critical infrastructure such as transportation, water, energy, and communication systems may be damaged or destroyed, resulting in cascading impacts on the public. Erosion is unlikely to impact public health and safety. Rip currents may cause injuries or fatalities.
Responders	Impacts to responders and response capabilities may occur during severe storms. If properly trained, responders are unlikely to be impacted by rip currents. Erosion is unlikely to require immediate response or rescue operations.
Continuity of Operations (including Continued Delivery of Services)	Damage to facilities/personnel from wind may require temporary relocation of some operations. Operations may be interrupted by power outages. Disruption of roads and/or utilities may postpone delivery of some services. Regulatory waivers may be needed locally. Fulfillment of some contracts may be difficult. Impact may reduce deliveries. Erosion and rip tides would not impact public continuity of operations.

Category	Consequences
Property, Facilities and Infrastructure	Structural damage to buildings may occur; loss of glass windows and doors by high winds and debris; loss of roof coverings, partial wall collapses, and other damages requiring significant repairs are possible in a major (category 3 to 5) hurricane. Erosion can result in property damage if it is severe enough or if scour occurs that undermines the integrity of structural foundations. Rip current is unlikely to damage property.
Environment	Hurricanes can devastate wooded ecosystems and remove the foliage from tree canopies, and they can drastically change habitats such that the indigenous animal populations suffer. Foods can be taken away as high winds will often strip fruits, seeds and berries from bushes and trees. Secondary impacts may occur; for example, high winds and debris may damage an above-ground fuel tank, resulting in a chemical spill. Erosion can increase sediment loads in waterbodies and change riverine and coastal topography. Rip current will not have severe environmental consequences.
Economic Condition of the Jurisdiction	Local economy and finances may be adversely affected, possibly for an extended period of time, depending on damages. Intangible impacts, including business interruption and additional living expenses, may also occur. Rip current and severe erosion can negatively impact tourist economies. Beach nourishment projects to counter erosion are extremely costly.
Public Confidence in the Jurisdiction's Governance	Public confidence may be affected by a major storm event requiring substantial response and long-term recovery effort. Erosion and rip current are unlikely to affect public confidence.

HAZARD SUMMARY BY JURISDICTION

The following tables summarizes hurricane and coastal hazard risk by jurisdiction.

HURRICANES AND NOR'EASTERS

Due to its coastal geography, the entire Outer Banks region is uniformly likely to experience winds from hurricanes and nor'easters. Certain areas may be particularly vulnerable to winds. For example, Currituck County and unincorporated areas of Dare County have higher proportion of mobile homes, which are more susceptible to damages from wind. However, coastal storms have the potential to be catastrophic across all jurisdictions. Other components of risk are uniform across the planning area.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	3	4	4	1	3	3.3	H
Dare County	3	4	4	1	3	3.3	H
Duck	3	4	4	1	3	3.3	H
Kill Devil Hills	3	4	4	1	3	3.3	H
Kitty Hawk	3	4	4	1	3	3.3	H
Manteo	3	4	4	1	3	3.3	H
Nags Head	3	4	4	1	3	3.3	H
Southern Shores	3	4	4	1	3	3.3	H

COASTAL EROSION

Risk to coastal erosion is uniform across most of the region. Jurisdictions with more frequented beaches could currently be experiencing a slower rate of erosion due to mitigation efforts. Still, severe erosion that causes building damages can occur in any jurisdiction with oceanfront property. Less is known about estuarine erosion rates and impacts.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	3	3	3	2	3	2.9	M
Dare County	3	3	3	2	3	2.9	M
Duck	3	3	3	2	3	2.9	M
Kill Devil Hills	3	3	3	2	3	2.9	M
Kitty Hawk	3	3	3	2	3	2.9	M
Manteo	3	2	3	2	3	2.6	M
Nags Head	3	3	3	2	3	2.9	M
Southern Shores	3	3	3	2	3	2.9	M

RIP CURRENT

Rip current risk is largely uniform across the region, except for Manteo, which does not have any oceanfront and therefore has no rip current risk. Due to the geography and tourist-based economy of the region, all other jurisdictions have similar risk. Jurisdictions with more frequented beaches may have more population at risk. However, other components of risk are uniform for all areas.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	4	3	3	4	2	3.3	H
Dare County	4	3	3	4	2	3.3	H
Duck	4	3	3	4	2	3.3	H
Kill Devil Hills	4	3	3	4	2	3.3	H
Kitty Hawk	4	3	3	4	2	3.3	H
Manteo	0	0	0	0	0	0.0	N/A
Nags Head	4	3	3	4	2	3.3	H
Southern Shores	4	3	3	4	2	3.3	H

4.5.6 TORNADOES & THUNDERSTORMS

HAZARD BACKGROUND

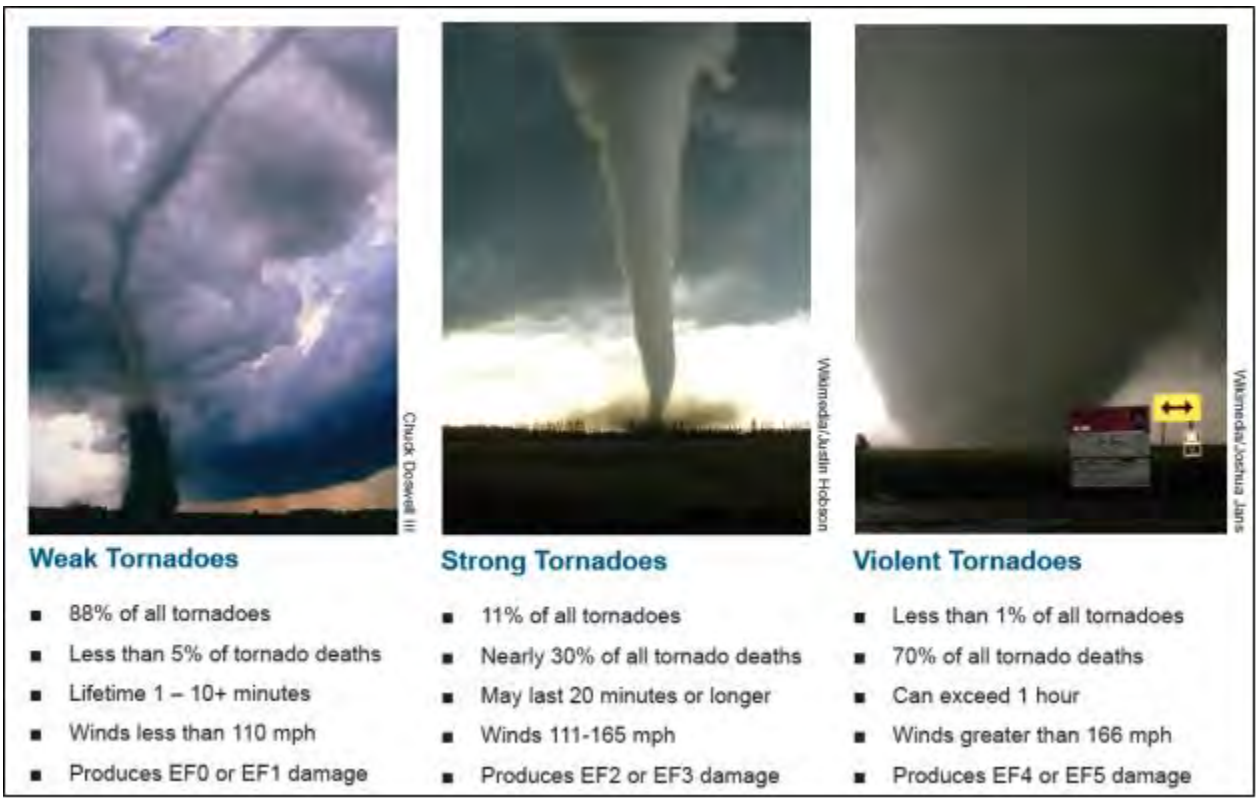
TORNADOES

According to the Glossary of Meteorology (AMS 2000), a tornado is "a violently rotating column of air, pendant from a cumuliform cloud or underneath a cumuliform cloud, and often (but not always) visible as a funnel cloud." Tornados can appear from any direction. Most move from southwest to northeast, or west to east. Some tornados have changed direction or even backtracked.

Tornados are commonly produced by land falling tropical cyclones. Those making landfall along the Gulf coast traditionally produce more tornados than those making landfall along the Atlantic coast. Tornados that form within hurricanes are more common in the right front quadrant with respect to the forward direction but can occur in other areas as well. According to the NHC, about 10% of the tropical cyclone-related fatalities are caused by tornados. Tornados are more likely to be spawned within 24 hours of landfall and are usually within 30 miles of the tropical cyclone's center.

Tornados have the potential to produce winds in excess of 200 mph (EF5 on the Enhanced Fujita Scale) and can be very expansive – some in the Great Plains have exceeded two miles in width. Tornados associated with tropical cyclones, however, tend to be of lower intensity (EF0 to EF2) and much smaller in size than ones that form in the Great Plains. Figure 4.40 provides a description and breakdown of tornadoes by severity. Violent tornadoes, as described below, are unlikely in the Outer Banks region.

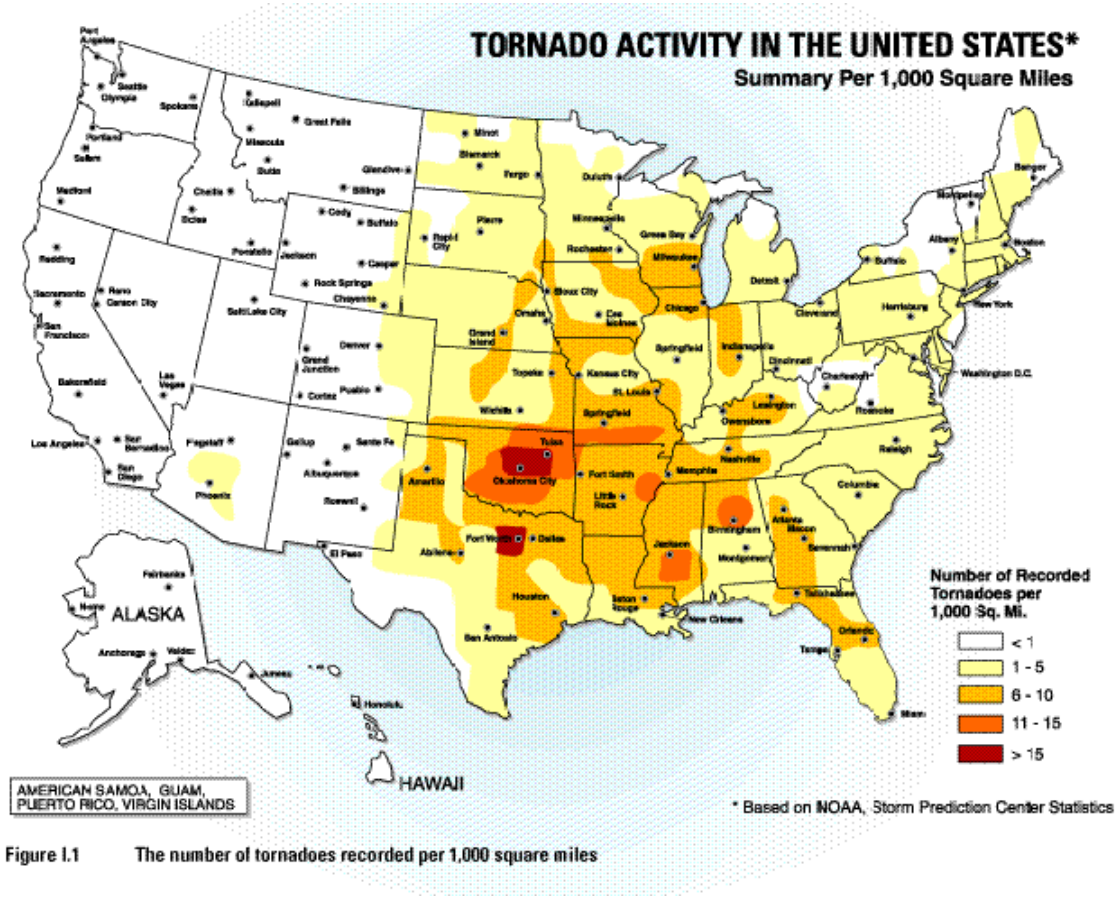
Figure 4.40 – Tornadoes by Severity



Source: NOAA National Weather Service

Figure 4.41 shows tornado activity in the United States based on the number of recorded tornados per 1,000 square miles. North Carolina has averaged 1 to 5 tornados per 1,000 square miles.

Figure 4.41 – Tornado Activity in the U.S.



Source: American Society of Civil Engineers

THUNDERSTORM WINDS

Thunderstorms result from the rapid upward movement of warm, moist air. They can occur inside warm, moist air masses and at fronts. As the warm, moist air moves upward, it cools, condenses, and forms cumulonimbus clouds that can reach heights of greater than 35,000 ft. As the rising air reaches its dew point, water droplets and ice form and begin falling the long distance through the clouds towards earth's surface. As the droplets fall, they collide with other droplets and become larger. The falling droplets create a downdraft of air that spreads out at earth's surface and causes strong winds associated with thunderstorms.

There are four ways in which thunderstorms can organize: single cell, multi-cell cluster, multi-cell lines (squall lines), and supercells. Supercell thunderstorms are most frequently associated with severe weather phenomena, but thunderstorms most frequently organize into clusters or lines. Warm, humid conditions are favorable for the development of thunderstorms.

Thunderstorms are responsible for the development and formation of many severe weather phenomena, posing great hazards to the population and landscape. Damage that results from thunderstorms is mainly inflicted by downburst winds, large hailstones, and flash flooding caused by heavy precipitation; flood risk is discussed in Section 4.5.4. Stronger thunderstorms can produce tornados and waterspouts.

LIGHTNING

Lightning is a sudden electrical discharge released from the atmosphere that follows a course from cloud to ground, cloud to cloud, or cloud to surrounding air, with light illuminating its path. Lightning's unpredictable nature causes it to be one of the most feared weather elements.

All thunderstorms produce lightning, which often strikes outside of the area where it is raining and is known to fall more than 10 miles away from the rainfall area. When lightning strikes, electricity shoots through the air and causes vibrations creating the sound of thunder. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Nationwide, lightning kills 75 to 100 people each year. Lightning strikes can also start building fires and wildland fires, and damage electrical systems and equipment.

HAIL

According to the NOAA, hail is precipitation that is formed when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere causing them to freeze. The raindrops form into small frozen droplets and then continue to grow as they come into contact with super-cooled water which will freeze on contact with the frozen rain droplet. This frozen rain droplet can continue to grow and form hail. As long as the updraft forces can support or suspend the weight of the hailstone, hail can continue to grow.

At the time when the updraft can no longer support the hailstone, it will fall down to the earth. For example, a ¼" diameter or pea sized hail requires updrafts of 24 mph, while a 2 ¾" diameter or baseball sized hail requires an updraft of 81 mph. The largest hailstone recorded in the United States was found in Vivian, South Dakota on July 23, 2010; it measured eight inches in diameter, almost the size of a soccer ball. While soccer-ball-sized hail is the exception, but even small pea sized hail can do damage.

Hailstorms in North Carolina cause damage to property, crops, and the environment, and kill and injure livestock. In the United States, hail causes more than $1 billion in damage to property and crops each year. Much of the damage inflicted by hail is to crops. Even relatively small hail can shred plants to ribbons in a matter of minutes. Vehicles, roofs of buildings and homes, and landscaping are the other things most commonly damaged by hail. Hail has been known to cause injury to humans; occasionally, these injuries can be fatal.

While conditions for thunderstorms, lightning, hail, and tornadoes may be anticipated within a few hours, the severity of conditions is difficult to predict. The onset of thunderstorms with hail is generally rapid. The watch or warning time for a given storm is usually a few hours. There is no warning time for any given lightning strike. Regardless of severity, storms generally pass within a few hours.

Warning Time: 4 – Less than six hours

Duration: 1 – Less than six hours

LOCATION

TORNADOES

Tornados and thunderstorms can occur anywhere in the region. Tornados typically impact a small area, but damage may be extensive. Tornado locations are completely random, meaning risk to tornado isn't increased in one area of the county versus another. Tornados can be spawned by tropical cyclones; however, these tornados typically occur up to 2 days before and as many as 3 days after landfall of the tropical cyclone.

Spatial Extent: 2 – Small

THUNDERSTORM WINDS

Thunderstorm winds, lightning, and hail events do not have a defined vulnerability zone. The average single cell thunderstorm is approximately 15 miles in diameter and lasts less than 30 minutes at a single location. However, thunderstorms can travel intact for distances exceeding 600 miles, especially when organized into clusters or lines. Any given thunderstorm event may be expected to impact a large portion of the Outer Banks region.

Spatial Extent: 3 – Moderate

LIGHTNING AND HAIL

The scope of lightning and hail is generally defined to the footprint of its associated thunderstorm. However, large-scale hail tends to occur in a more localized area within the storm, and lightning strikes and associated damages are highly localized. It should be noted that while lightning is most often affiliated with severe thunderstorms, it may also strike outside of heavy rain and might occur as far as 10 miles away from any rainfall. The entire Outer Banks region is uniformly exposed to each of these hazards.

Spatial Extent: 1 – Negligible

EXTENT

TORNADOES

Prior to February 1, 2007, tornado intensity was measured by the Fujita (F) scale. This scale was revised and is now the Enhanced Fujita (EF) scale. Both scales are sets of wind estimates (not measurements) based on damage. The EF scale provides more damage indicators (28) and associated degrees of damage, allowing for more detailed analysis with better correlation between damage and wind speed. It is also more precise because it considers the materials affected and the construction of structures damaged by a tornado. Table 4.5 shows the wind speeds associated with the Enhanced Fujita scale ratings and the damage that could result at different levels of intensity.

Table 4.69 – Enhanced Fujita Scale

EF Number	3 Second Gust (mph)	Damage
0	65-85	**Light damage**. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over.
1	96-110	**Moderate damage**. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.
2	111-135	**Considerable damage**. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
3	136-165	**Severe damage**. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.

EF Number	3 Second Gust (mph)	Damage
4	166-200	**Devastating damage**. Well-constructed houses and whole frame houses completely leveled; cars thrown, and small missiles generated.
5	Over 200	**Incredible damage**. Strong frame houses leveled off foundations and swept away; automobile-sized missiles fly through the air in excess of 100 m; high-rise buildings have significant structural deformation; incredible phenomena will occur.

The most intense tornado to pass through the Outer Banks Region was an F3 in September 1952. However, the most damaging tornados on record for the region were an F2 in July 1978, which caused a fatality, four injuries, and an estimated $250,000 in damages, and an F2 in March 1987, which caused seven injuries and an estimated $2.5 million in damages. Most tornadoes that occur in the region are EF1 or lesser magnitude, causing limited damages.

Impact: 3 – Critical

THUNDERSTORM WINDS

The magnitude of a thunderstorm event can be defined by the storm's maximum wind speed and its impacts. NCEI divides wind events into several types including High Wind, Strong Wind, Thunderstorm Wind, Tornado, and Hurricane. For this severe weather risk assessment, High Wind, Strong Wind and Thunderstorm Wind data was collected. Tornado is discussed above, and Hurricane Wind is addressed as a separate hazard. The following definitions come from the NCEI Storm Data Preparation document.

High Wind – Sustained non-convective winds of 40mph or greater lasting for one hour or longer or winds (sustained or gusts) of 58 mph for any duration on a widespread or localized basis.

Strong Wind – Non-convective winds gusting less than 58 mph, or sustained winds less than 40 mph, resulting in a fatality, injury, or damage.

Thunderstorm Wind – Winds, arising from convection (occurring within 30 minutes of lightning being observed or detected), with speeds of at least 58 mph, or winds of any speed (non-severe thunderstorm winds below 58 mph) producing a fatality, injury or damage.

The strongest recorded thunderstorm wind event in the region occurred on March 8, 2005 in Dare County with an estimated gust of 109 mph. The event caused $200,000 in recorded property damage.

Impact: 2 – Limited

LIGHTNING

Lightning is measured by the Lightning Activity Level (LAL) scale, created by the National Weather Service to define lightning activity into a specific categorical scale. The LAL is a common parameter that is part of fire weather forecasts nationwide.

Table 4.70 – Lightning Activity Level Scale

Lightning Activity Level Scale	
LAL 1	No thunderstorms
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground lightning strikes in a five-minute period
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a five-minute period

Lightning Activity Level Scale	
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a five-minute period
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a five-minute period
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag warning

Source: National Weather Service

With the right conditions in place, the entire county is susceptible to each lightning activity level as defined by the LAL. Most lightning strikes cause limited damage to specific structures in a small area, very few injuries or fatalities, and minimal disruption to quality of life.

Impact: 1 – Minor

HAIL

The NWS classifies hail by diameter size, and corresponding everyday objects to help relay scope and severity to the population. Table 4.71 indicates the hailstone measurements utilized by the NWS.

Table 4.71 – Hailstone Measurement Comparison Chart

Average Diameter	Corresponding Household Object
.25 inch	Pea
.5 inch	Marble/Mothball
.75 inch	Dime/Penny
.875 inch	Nickel
1.0 inch	Quarter
1.5 inch	Ping-pong ball
1.75 inch	Golf ball
2.0 inch	Hen egg
2.5 inch	Tennis ball
2.75 inch	Baseball
3.00 inch	Teacup
4.00 inch	Grapefruit
4.5 inch	Softball

Source: National Weather Service

The Tornado and Storm Research Organization (TORRO) has further described hail sizes by their typical damage impacts. Table 4.72 describes typical intensity and damage impacts of the various sizes of hail.

Table 4.72 – Tornado and Storm Research Organization Hailstorm Intensity Scale

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Hard Hail	5-9	0.2-0.4	Pea	No damage
Potentially Damaging	10-15	0.4-0.6	Mothball	Slight general damage to plants, crops
Significant	16-20	0.6-0.8	Marble, grape	Significant damage to fruit, crops, vegetation

Intensity Category	Diameter (mm)	Diameter (inches)	Size Description	Typical Damage Impacts
Severe	21-30	0.8-1.2	Walnut	Severe damage to fruit and crops, damage to glass and plastic structures, paint and wood scored
Severe	31-40	1.2-1.6	Pigeon's egg > squash ball	Widespread glass damage, vehicle bodywork damage
Destructive	41-50	1.6-2.0	Golf ball > Pullet's egg	Wholesale destruction of glass, damage to tiled roofs, significant risk of injuries
Destructive	51-60	2.0-2.4	Hen's egg	Bodywork of grounded aircraft dented, brick walls pitted
Destructive	61-75	2.4-3.0	Tennis ball > cricket ball	Severe roof damage, risk of serious injuries
Destructive	76-90	3.0-3.5	Large orange > softball	Severe damage to aircraft bodywork
Super Hailstorms	91-100	3.6-3.9	Grapefruit	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open
Super Hailstorms	>100	4.0+	Melon	Extensive structural damage. Risk of severe or even fatal injuries to persons caught in the open

Source: Tornado and Storm Research Organization (TORRO), Department of Geography, Oxford Brookes University
Notes: In addition to hail diameter, factors including number and density of hailstones, hail fall speed and surface wind speeds affect severity.

The average hailstone size recorded between 1999 and 2023 in the Outer Banks Region was a little under 1" in diameter; the largest hailstones recorded were 1.75", recorded on six separated occasions, none of which caused any damage, injuries, or fatalities.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

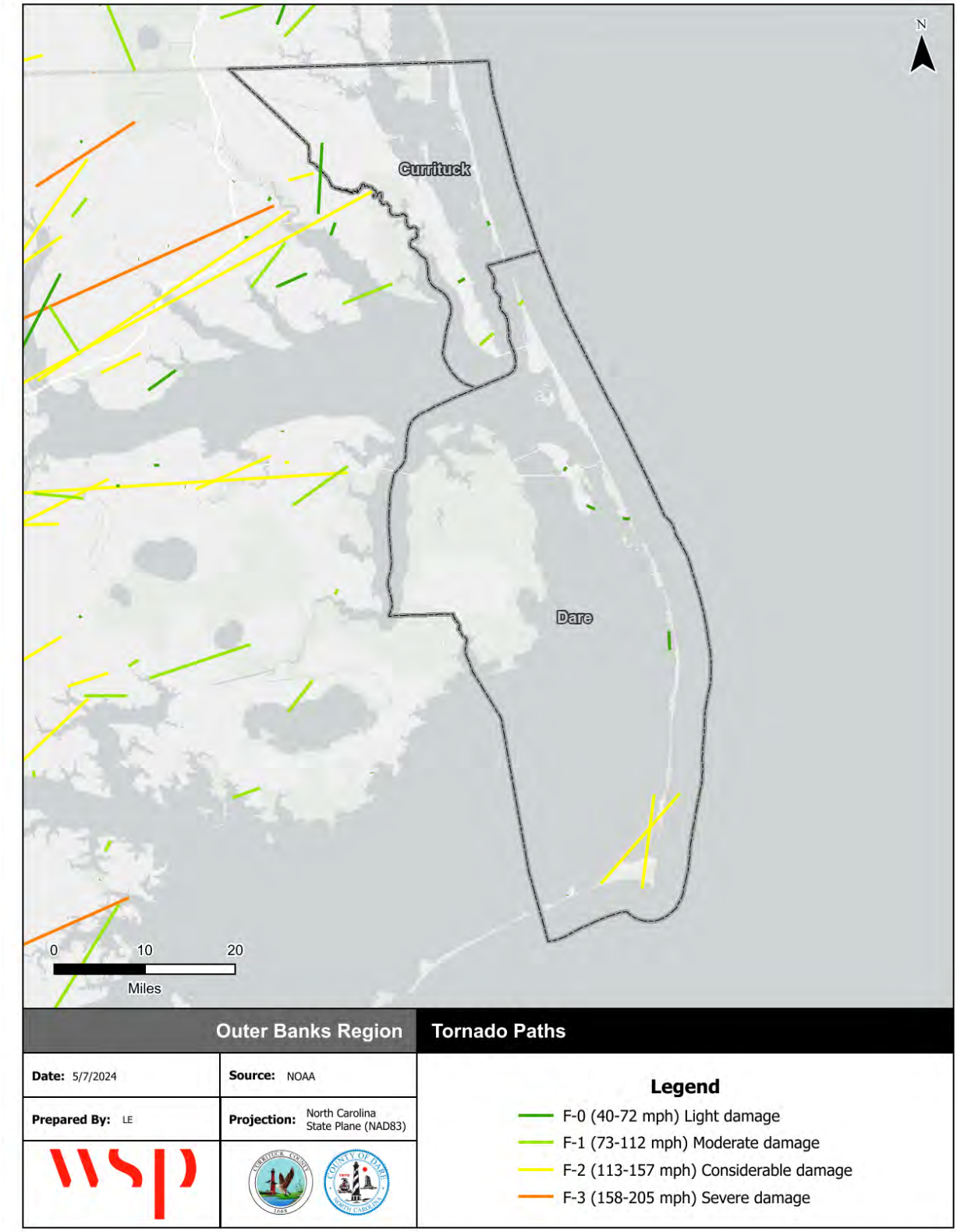
TORNADOES

Figure 4.42 reflects the tracks of past tornadoes that passed through the Outer Banks Region from 1950 through 2023 according to data from the NOAA/NWS Storm Prediction Center. There were 50 tornadoes that tracked through the region during this time. These tornadoes caused 24 injuries and 1 fatality. Table 4.73 summarizes these past tornadoes by magnitude.

Table 4.73 – Past Tornadoes in the Outer Banks Region, 1950-2023

Magnitude	Count	Related Injuries and Fatalities
F0/EF0	31	7
F1/EF1	14	3
F2/EF2	4	14
F3/EF3	1	0
Total	**50**	**24**

Figure 4.42 – Tornado Paths Through the Outer Banks Region, 1950-2023



NCEI storm reports were reviewed from 1996 through 2023 to assess whether recent trends vary from the longer historical record. No variation was found. According to NCEI, the Outer Banks region experienced 20 tornado incidents between 1996 and 2023, causing 6 injuries and $1,397,000 in property damage. Table 4.74 details past tornados in the Outer Banks region during this period.

Table 4.74 – Recorded Tornados in the Outer Banks Region, 1996-2023

Location	Date	Time	Magnitude	Deaths	Injuries	Property Damage	Crop Damage
Buxton	1/19/1996	1316	F0	0	0	$30,000	$0
Nags Head	9/17/1996	0255	F0	0	1	$0	$0
Frisco	10/8/1996	0720	F0	0	0	$10,000	$0
Corolla	7/24/2000	1257	F0	0	0	$0	$0
Rodanthe	5/28/2001	1233	F0	0	0	$5,000	$0
Avon	8/26/2002	0805	F0	0	0	$10,000	$0
Moyock	6/7/2003	1955	F0	0	2	$25,000	$0
Nags Head	8/14/2004	1715	F1	0	0	$225,000	$0
Frisco	6/14/2006	1340	F0	0	0	$0	$0
Rodanthe	7/15/2007	0706	EF0	0	0	$0	$0
Harbinger	4/16/2011	2030	EF1	0	0	$40,000	$0
Duck	4/16/2011	2035	EF1	0	0	$767,000	$0
Wanchese	7/30/2012	0940	EF0	0	0	$0	$0
Wanchese	7/30/2012	1001	EF0	0	0	$0	$0
Rodanthe	8/19/2012	1319	EF0	0	0	$0	$0
Jarvisburg	4/25/2014	1928	EF0	0	0	$15,000	$0
Manteo	5/11/2015	1610	EF0	0	0	$5,000	$0
Cape Hatteras	9/3/2016	0002	EF0	0	3	$250,000	$0
Gregory	5/5/2017	0708	EF0	0	0	$5,000	$0
Poplar Branch	8/1/2021	1114	EF0	0	0	$10,000	$0
Total				**0**	**6**	**$1,397,000**	**$0**

Source: NCEI

Specific incidents with some noted impact are summarized below according to records in NCEI:

June 7, 2003 – An F0 tornado downed numerous trees and stripped some siding off houses. Any structural damage was from falling trees and debris. Two injuries occurred when a large tree fell on a house and collapsed the roof of the one-story building.

August 14, 2004 – Tropical Storm Charley moved northeast across the Coastal Plains of Eastern North Carolina during the afternoon hours on August 14th. Five weak tornados were reported across the area associated with Charley with damage reported. The most significant damage related to a tornado occurred along the Outer Banks in Nags Head, where an F1 tornado damaged 20 structures and caused $225,000 in damages.

April 16, 2011 – One of the largest tornado outbreaks ever observed across eastern North Carolina occurred during the afternoon and evening. Several powerful super-cell thunderstorms developed ahead of an approaching cold front. Conditions ahead of the front were favorable for tornados with a moderately unstable atmosphere combined with strong winds that veered with height. In Duck, the tornado developed

near the sound in the Four Seasons subdivision, then moved northeast across the community of Duck before exiting into the ocean. The tornado was estimated to be an EF1 with winds around 90 mph. About 75 structures were damaged mostly minor to roofs and siding. Several large pines were toppled and damaged homes.

September 3, 2016 – Hurricane Hermine weakened slightly to Tropical Storm strength and crossed through Eastern North Carolina during the late evening on September 2nd and exited off the North Carolina coast near Duck during the morning of September 3rd. Rain-bands associated with Hermine produced three tornados. In Cape Hatteras, a weak tornado briefly touched down at the Hatteras Sands RV resort near Hatteras Village in Dare County, North Carolina, The EF0 tornado had winds estimated at 80 mph, a path width of 25 yards and path length of 100 yards. The tornado damaged or destroyed approximately 5 travel trailers and camping cabins, some which were not attached to the ground. Three injuries were reported from this tornado.

August 1, 2021 – A tornado touched down along the intersection of the Currituck Sound adjacent to the Currituck Club golf course. The tornado tracked south southeast along the 7th and 8th holes of the golf course and uprooted large trees and snapped numerous limbs. The tornado lifted shortly before crossing the intersection of Hunt Club Drive and Trumpeter Swan Court, but not before knocking down several large trees and ripping some shingles off of a house on Trumpeter Swan Court.

THUNDERSTORM WINDS

Between January 1, 1996 and December 31, 2023, the NCEI recorded 238 separate incidents of high winds, strong winds, and thunderstorm winds, occurring on 144 separate days. Of these events, 85 caused property damage. Wind gusts with property damage recorded averaged $16,565 in damage. These events caused $1,408,000 in recorded property damage, 9 injuries and no fatalities or crop damage. The recorded gusts averaged 61.48 mph, with the highest gusts recorded at 109 mph. Gusts of this speed were recorded only once in the Region, during a storm on March 8, 2005. Only two of these wind events caused injuries. One occurred in July 1997 in when thunderstorm wind blew off a section of roof from waterfront shops causing one minor injury. The second occurred during a storm in April 1999 when a circus tent was blown over, injuring eight circus workers.

Incidents with recorded damages are detailed in Table 4.75.

Table 4.75 – Recorded Wind Events with Property Damages in the Outer Banks, 1996-2023

Location	Date	Time	Wind Speed (mph)	Deaths/ Injuries	Property Damage
Coinjock	5/11/1996	1900	-	0/0	$10,000
Maple	5/3/1997	1115	-	0/0	$2,000
Maple	7/18/1997	1540	-	0/0	$1,000
Western Currituck (Zone)	7/24/1997	1400	-	0/0	$3,000
Duck	7/24/1997	1420	58	0/1	$50,000
Rodanthe	8/18/1997	1545	-	0/0	$10,000
Moyock	6/3/1998	2045	-	0/0	$5,000
Manteo Airport	4/11/1999	1415	104	0/8	$230,000
Currituck	7/24/1999	1620	-	0/0	$2,000
Rodanthe	5/27/2000	2330	-	0/0	$100,000
Eastern Currituck (Zone)	5/29/2000	900	69	0/0	$20,000
Eastern Dare (Zone)	3/13/2001	330	63	0/0	$10,000
Moyock	5/13/2002	2100	-	0/0	$2,000

Location	Date	Time	Wind Speed (mph)	Deaths/ Injuries	Property Damage
Grandy	6/14/2002	1627	-	0/0	$2,000
Corolla	8/24/2002	1623	-	0/0	$2,000
Eastern Currituck (Zone)	4/10/2003	400	46	0/0	$5,000
Western Currituck (Zone)	4/10/2003	400	46	0/0	$5,000
Moyock	8/17/2003	1540	58	0/0	$2,000
Currituck	8/17/2003	1610	58	0/0	$1,000
Moyock	8/18/2003	1415	58	0/0	$2,000
Jarvisburg	6/25/2004	1543	58	0/0	$2,000
Poplar Branch	10/15/2004	1045	60	0/0	$5,000
Countywide	3/8/2005	1226	109	0/0	$200,000
Point Harbor	3/8/2005	1235	58	0/0	$2,000
Coinjock	7/28/2006	2007	58	0/0	$2,000
Moyock	8/4/2006	1740	58	0/0	$2,000
Aydlett	8/8/2006	1330	58	0/0	$2,000
Eastern Currituck (Zone)	11/3/2007	430	54	0/0	$1,000
Currituck Co Airport	5/11/2008	1853	58	0/0	$3,000
Grandy	5/11/2008	1905	58	0/0	$2,000
Snowden	1/7/2009	1105	58	0/0	$2,000
Snowden	9/28/2009	1955	58	0/0	$2,000
Knotts Is	9/28/2009	2010	58	0/0	$2,000
Aydlett	7/20/2010	1640	58	0/0	$2,000
Grandy	7/20/2010	1645	58	0/0	$2,000
Knotts Is	4/28/2011	1636	58	0/0	$2,000
Aydlett	6/25/2012	1800	58	0/0	$2,000
Currituck	6/29/2012	2340	58	0/0	$2,000
Snowden	6/30/2012	2230	58	0/0	$2,000
Snowden	7/1/2012	10	58	0/0	$2,000
Snowden	8/15/2012	1600	58	0/0	$3,000
Waterlily	4/25/2014	1937	58	0/0	$2,000
Snowden	6/19/2014	1745	58	0/0	$10,000
Buffalo City	2/16/2016	1006	77	0/0	$10,000
Eastern Currituck (Zone)	10/8/2016	1800	70	0/0	$250,000
Western Currituck (Zone)	10/8/2016	1800	62	0/0	$250,000
Snowden	5/5/2017	715	58	0/0	$2,000
Jarvisburg	5/22/2017	1530	58	0/0	$2,000
Snowden	5/27/2017	2110	58	0/0	$5,000
Eastern Currituck (Zone)	3/2/2018	400	58	0/0	$25,000
Western Currituck (Zone)	3/2/2018	400	58	0/0	$25,000
Mayock	6/23/2018	1827	58	0/0	$2,000
Eastern Currituck (Zone)	10/11/2018	1830	63	0/0	$10,000
Western Currituck (Zone)	10/11/2018	1830	58	0/0	$5,000
Currituck	4/15/2019	402	58	0/0	$2,000
Mayock	4/19/2019	2015	58	0/0	$5,000

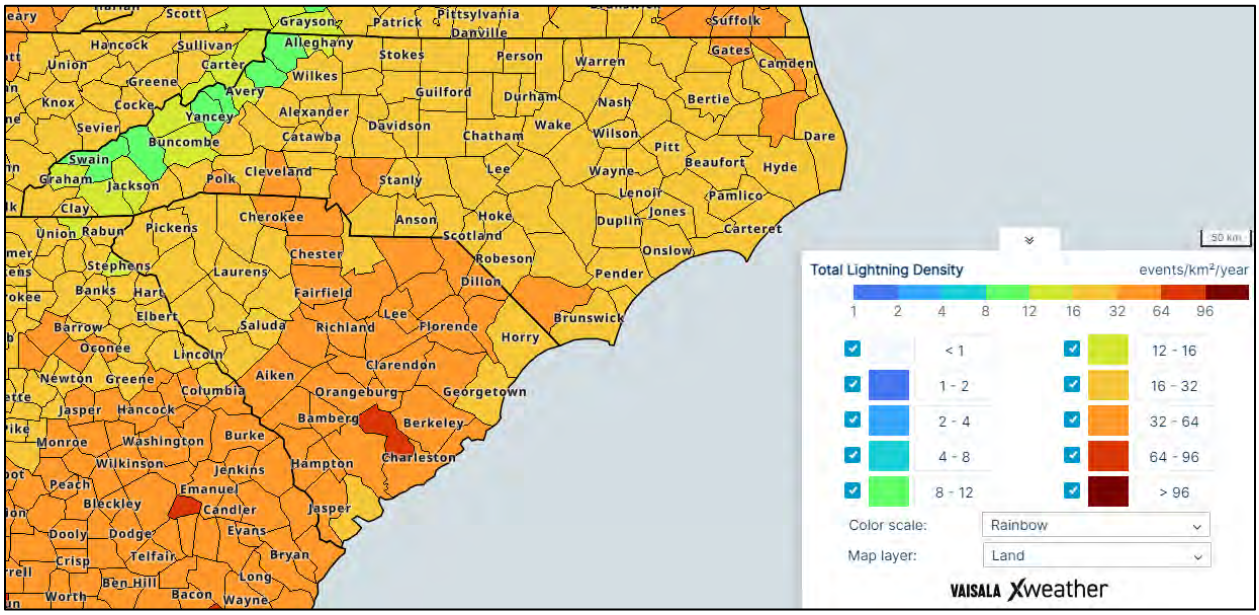
Location	Date	Time	Wind Speed (mph)	Deaths/ Injuries	Property Damage
Poplar Branch	5/31/2019	1230	58	0/0	$1,000
Shawboro	6/20/2019	1639	58	0/0	$2,000
Knotts Is	6/20/2019	1658	58	0/0	$3,000
Jarvisburg	6/20/2019	1700	58	0/0	$2,000
Mayock	7/23/2019	1238	58	0/0	$1,000
Tulls	7/23/2019	1345	58	0/0	$2,000
Snowden	8/9/2019	1710	58	0/0	$2,000
Mayock	8/15/2019	1630	58	0/0	$1,000
Mayock	8/20/2019	1800	58	0/0	$3,000
Mayock	11/1/2019	11	58	0/0	$3,000
Western Currituck (Zone)	4/13/2020	1016	58	0/0	$2,000
Western Currituck (Zone)	4/13/2020	1030	64	0/0	$1,000
Snowden	4/18/2020	1010	58	0/0	$10,000
Point Harbor	4/30/2020	1440	58	0/0	$5,000
Waterlily	6/22/2020	1640	58	0/0	$1,000
Jarvisburg	3/28/2021	1645	58	0/0	$2,000
Snowden	4/9/2021	1814	58	0/0	$1,000
Mayock	5/4/2021	1845	58	0/0	$2,000
Grandy	5/4/2021	1920	58	0/0	$2,000
Tulls	8/1/2021	1000	58	0/0	$2,000
Waterlily	8/1/2021	1055	58	0/0	$1,000
Corolla	8/1/2021	1119	58	0/0	$2,000
Powells PT	8/1/2021	1207	58	0/0	$2,000
Grandy	8/4/2021	620	64	0/0	$20,000
Mamie	5/4/2022	1755	58	0/0	$1,000
Maple	4/30/2023	1630	58	0/0	$3,000
Knotts Is	4/30/2023	1650	59	0/0	$1,000
Tulls	7/3/2023	1445	58	0/0	$2,000
Poplar Branch	7/19/2023	1614	58	0/0	$15,000
Total				**0/9**	**$1,408,000**

Source: NCEI

LIGHTNING

According to the Vaisala Interactive Global Lightning Density Map, shown in Figure 4.43, the Outer Banks Region is located in an area that experiences 16 to 32 lightning flashes per square kilometer per year. Future lightning occurrences may exceed these figures.

Figure 4.43 - Total Lightning Density (2016-2023)



Source: Vaisala Interactive Global Lightning Density Map

NCEI maintains records of lightning strikes that cause injuries, deaths, or property damage. NCEI records 15 lightning strikes reported between 1996 and 2023 in the Outer Banks region. Of these, 10 strikes caused property damage totaling over $614,000. Of this total, $500,000 of property damage is from a single event in August 2023 when lightning struck a house in Duck causing a major fire. Four lightning strikes directly caused fatalities, and two caused injuries. As these are only the events with reported impacts on people and property, it is certain that additional lightning incidents have occurred in the Outer Banks region. Table 4.76 details NCEI-recorded lightning strikes from 1996 through 2023.

Table 4.76 – Recorded Lightning Strikes in the Outer Banks Region, 1996-2023

Location	Date	Time	Fatalities	Injuries	Property Damage
Moyock	5/6/1996	200	0	0	$30,000
Manteo	4/3/2002	2115	0	0	$10,000
Colington	8/24/2002	1800	0	0	$12,000
Hatteras	8/24/2002	2000	1	4	$0
Buxton	9/5/2002	1510	0	0	$20,000
Moyock	8/18/2003	1415	0	0	$2,000
Rodanthe	6/20/2008	1430	0	2	$0
Duck	7/27/2009	1600	1	0	$0
Currituck	8/6/2009	1230	0	0	$2,000
Kitty Hawk	7/21/2012	1910	0	0	$10,000
Corolla	7/10/2014	630	0	0	$25,000
Knotts Is	7/31/2016	1510	1	0	$0
Mayock	7/23/2017	1931	0	0	$3,000
Kitty Hawk	8/23/2019	1350	1	0	$0
Duck	8/10/2023	1705	0	0	$500,000
		Total	**4**	**6**	**$614,000**

Source: NCEI

The following are a selection of narrative descriptions recorded in NCEI for lightning events that occurred in the Outer Banks Region:

August 24, 2002 – Lightning struck 5 people attempting to dig a vehicle out of the sand. One woman was killed, and 4 others were injured, one seriously. Another lightning strike on the same day caused $12,000 in property damages.

September 5, 2002 – Five homes here struck by lightning in and around Buxton as well as near Kitty Hawk. Property damage from fires occurred with several of the buildings.

June 20, 2008 – Scattered thunderstorms developed over eastern North Carolina during the afternoon hours north of a stalled frontal boundary. A few of the storms became severe producing large hail. Two people struck by lightning just south of Rodanthe. One person had to be revived by emergency medical technicians.

July 27, 2009 – Thunderstorms crossing the northern Outer Banks produced a lightning strike that killed a man in Southern Shores.

July 21, 2012 – Very unstable air developed over eastern North Carolina as a front was stalled to the north. Scattered to numerous showers and thunderstorms developed in the afternoon as an upper level disturbance approached from the northwest. A few of these storms became severe producing damaging winds into the early evening hours. Dare county 911 reported several homes struck by lightning in Duck and Kitty Hawk, actual damage estimates unknown.

July 31, 2016 – Scattered severe thunderstorms in advance of a frontal boundary produced damaging winds and a lightning death across portions of northeast North Carolina. A five-year-old boy was struck by lightning and killed near a vehicle at Carova Beach.

August 23, 2019 – The police in Kitty Hawk, NC said that on August 23rd, 2019 around 1:50 PM LST in the 3800 block of North Virginia Dare Trail, in Kitty Hawk, a man was struck by lightning while near shore in the water, throwing a frisbee with friends. After the strike he was face down in the water, and his friends brought him in and performed CPR until a lifeguard arrived. The man was transported to a hospital and died several weeks later.

August 10, 2023 – Lightning struck a home in Duck, resulting in a major house fire.

Ten of the 15 incidents recorded by the NCEI included property damage, which was mostly recorded as fire damage ignited by lightning. The highest rate of property damage recorded for a single incident was $500,000.

In addition to these events, the Town of Nags Head Fire Department has tracked losses related lightning strikes back to 2013, summarized in Table 4.77 below.

Table 4.77 - Property Damages Caused by Lightning Strikes, Tracked by Town of Nags Head

Year	Damages Caused by Lightning Strikes
2022	$140,000.00
2021	$30,000.00
2018	$20,000.00
2015	$400.00
2014	$2,500.00
2013	$3,500.00

HAIL

NCEI records 70 separate hail incidents across 48 days between January 1, 1999 and December 31, 2023 in the Outer Banks Region. None of these events were reported to have caused property damage, fatality, injury, or crop damage. The largest diameter hail recorded in the region was 1.75" and was recorded on six separate occasions; the average hail size across all reported events was a little under one inch in diameter.

Table 4.78 – Summary of Hail Occurrences by County

Location	Number of Occurrences	Average Hail Diameter
Currituck	28	1.0104"
Dare	42	0.8993"

The following narratives provide detail on select hailstorms from the above list of NCEI recorded events:

May 25, 2004 – Dare County 911 Center reported half dollar size hail at the intersection of Routes 64 and 264 near Mann's Harbor.

March 28, 2005 – Several severe thunderstorms produced large hail across northeastern portions of the area during the morning hours of March 28th.

April 22, 2009 – A cold front crossed eastern North Carolina during the morning of April 22, 2009. A strong upper level disturbance was also crossing the region, and this combined with the front to produce isolated severe thunderstorms along the immediate coast.

May 11, 2016 – Scattered thunderstorms develop south of a front across eastern North Carolina during the evening of May 11, 2016. Some of the storms became strong producing dime sized hail. Dime sized hail reported in Manteo.

May 4, 2022 – Public estimated one inch hail at a business in Grandy.

PROBABILITY OF FUTURE OCCURRENCE

TORNADOES

In the 25-year span from 1999 through 2023, the Outer Banks region experienced 17 separate tornado incidents over 15 separate days. This correlates to a 68 percent annual probability that the region will experience a tornado somewhere in its boundaries. None of these past tornado events were a magnitude EF2 or greater; the probability of a stronger tornado is much lower. Probability is assumed to be uniform across the county.

Probability: 3 – Likely

THUNDERSTORMS

Based on historical occurrences recorded by NCEI for the 28-year period from 1996 through 2023, the Outer Banks Region averages 8.5 thunderstorm wind events per year. Over this same period, 15 lightning events were reported as having caused death, injury, or property damage, which equates to an average of 0.5 damaging lightning strikes per year.

The average hailstorm in the Outer Banks region occurs in the afternoon and has a hail stone with a diameter of just under one inch. Over the 28-year period from 1996 through 2023, the region experienced 70 reported hail incidents, averaging 1.5 reported incidents per year somewhere in the planning area. This equates to a 100% chance that the region will experience a hail incident in any given year.

Based on these historical occurrences, there is a 100% chance that the Outer Banks will experience severe weather each year. The probability of a damaging impacts is highly likely.

Probability: 4 – Highly Likely

CLIMATE CHANGE

According to the National Aeronautics and Space Administration (NASA), thunderstorm events in the future are likely to become more frequent in the southeast as a result of weather extremes. Thunderstorm potential is measured by an index that NASA created called the Convective Available Potential Energy (CAPE) index. This measures how warm and moist the air is, which is a major contributing factor in thunderstorm/tornado formation. NASA projects that by the period of 2072-2099, the CAPE in the southeastern United States will increase dramatically. Parts of North Carolina are in an area that will likely experience the greatest increase in CAPE in the United States and all of the state is likely to experience at least some increase. This indicates that there will potentially be even more frequent thunderstorms in the state going forward.

According to NOAA and NWS, the number of annual tornado days is decreasing, but the number of tornadoes that occur on tornado days is increasing. Research suggests there is a greater risk of more off-season tornadoes in a warmer future climate, which could mean more tornadic activity at a time of year when people are least expecting it. Results are inconclusive for whether tornadoes frequency could change during the traditional severe weather season. Based on studies from NASA's Earth Observatory, meteorologists are unsure why some thunderstorms generate tornados and others don't, beyond knowing that they require a certain type of wind shear. Tornadoes spawn from approximately one percent of thunderstorms, usually supercell thunderstorms that are in a wind shear environment that promotes rotation. Some studies show a potential for a decrease in wind shear in mid-latitude areas. Many tornadoes along the coast are spawned by tropical cyclones; therefore, climate change impacts on tropical cyclones may affect tornado activity in the Outer Banks region. The potential influence of climate change on tornadoes will continue to be revisited over time.

VULNERABILITY ASSESSMENT

PEOPLE

People and populations exposed to the elements are most vulnerable to tornadoes and thunderstorms. A common hazard associated with wind events is falling trees and branches. Risk of being struck by lightning is greater in open areas, at higher elevations, and on the water. Lightning can also cause cascading hazards, including power loss. Loss of power could critically impact those relying on energy to service, including those that need powered medical devices. Additionally, the ignition of fires is always a concern with lightning strikes.

The availability of sheltered locations such as basements, buildings constructed using wind- and hail-resistant materials and methods, and public storm shelters, all reduce the exposure of the population. Individuals who work outdoors may face increased risk during severe weather events.

Individuals living in mobile homes are also more vulnerable to tornado and thunderstorm events due to the lack of shelter locations and the vulnerability of the housing unit to damages. According to the 2022 American Community Survey (ACS), 3,374 housing units (6.7%) in the Outer Banks region are mobile homes. Based on an estimated average of 2.4 persons per household from the 2022 ACS, there are approximately 8,098 people in the Outer Banks region living in mobile homes. Table 4.79 summarizes estimates of mobile home units in the Outer Banks region by community as of 2022.

Table 4.79 – Mobile Home Units in the Outer Banks Region, 2022

County	Mobile Home Units	Total Housing Units	Percent of Housing
Currituck County	1,821	16,219	11.2%
Dare County (unincorporated)*	1,387	12,186	11.4%
Duck	0	2,985	0.0%
Kill Devil Hills	62	7,008	0.9%
Kitty Hawk	28	3,316	0.8%
Manteo	35	1,476	2.4%
Nags Head	41	5,174	0.8%
Southern Shores	0	2,348	0.0%
Total	**3,374**	**50,712**	**6.7%**

Source: American Community Survey 2018-2022 5-Year Estimates

*Estimated as the total Dare County estimate less the incorporated community estimates.

Note: The mobile home unit estimates for the incorporated communities in Dare County may not be accurate because the margin of error for these estimates ranges from 91% to over 100% of the estimates. Some estimates shown here have been revised based on HMPC input regarding existing housing units.

Since 1996, the NCEI records four fatalities and six injuries attributed to lightning in the Outer Banks. NCEI records 9 injuries and no fatalities attributed to wind events in the Outer Banks. There are no injuries or fatalities attributed to hail.

Since 1950, one fatality and 24 injuries are attributed to tornados in the Outer Banks Region; these injuries were the result of tornados rated as low as EF0, illustrating the destructive power of tornados and the dangers they pose to exposed populations without proper shelter.

PROPERTY

Damages to property from tornadoes can be both direct (what the tornado physically destroys) and indirect (additional costs, damages, and losses attributed to secondary hazards spawned by the tornado, or due to the damages caused by the tornado). Depending on the size of the tornado and its path, a tornado is capable of damaging and eventually destroying almost anything. Construction practices and building codes can help maximize the resistance of the structures to damage.

Secondary impacts of tornado damage often result from damage to infrastructure. Downed power and communications transmission lines, coupled with disruptions to transportation, create difficulties in reporting and responding to emergencies. These indirect impacts of a tornado put tremendous strain on a community. In the immediate aftermath, the focus is on emergency services.

Since 1950, damaging tornados in the Outer Banks region are directly responsible for $5.78 million worth of damage to property, according to NCEI data. This equates to an annualized loss of $79,178.

Property damage caused by lightning usually occurs in one of two ways – either by direct damages through fires ignited by lightning, or by secondary impacts due to power loss. According to data collected on lightning strikes in the Outer Banks, the majority of recorded property damage was due to structure or vehicle fires. During the 28-year span between 1996 to 2023, NCEI reported $614,000 in property damage caused by lightning, including one event with $500,000 in damages. Therefore, annualized property losses from lightning are approximately $40,933; or, $8,143, not including the outlier.

General damages to property from hail are direct, including destroyed windows, dented cars, and building, roof and siding damage in areas exposed to hail. Hail can also cause enough damage to cars to

cause them to be totaled. The level of damage is commensurate with both a material's ability to withstand hail impacts, and the size of the hailstones that are falling. Construction practices and building codes can help maximize the resistance of the structures to damage. Large amounts of hail may need to be physically cleared from roadways and sidewalks, depending on accumulation. Hail can cause other cascading impacts, including power loss.

During the 28-year span between January 1, 1996 and December 31, 2023 in the Outer Banks Region, NCEI reported no property damage due to hail, however this does not mean damage is not possible in the future. It should be noted that property damage due to hail is usually insured loss, with damages covered under most major comprehensive insurance plans. Because of this, hail losses are notoriously underreported by the NCEI. It is difficult to find an accurate repository of hail damages in the Region, thus the NCEI is still used to form a baseline.

When strong enough, wind events can cause significant direct damage to buildings and infrastructure. NCEM's IRISK database estimates damages from tornadoes and thunderstorms by storm magnitude. Table 4.80 through Table 4.83 detail the estimated buildings impacted and losses incurred from tornado events of magnitudes ranging from EF0 to EF3. Damages from increasing magnitudes of thunderstorm wind events are detailed in Table 4.84 through Table 4.87. Note that all of these tables provide an estimate of building damages should all exposed property be impacted by an event of the stated magnitude. Actual damages resulting from a tornado or thunderstorm event of each magnitude would be lower because any one event would impact only a portion of the region. These tables should only be used to understand the range of damage potential relative to storms of varying degrees of severity.

Table 4.80 – Estimated Buildings Impacted by EF0 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	15,377	86.9%	$178,328,825	1,468	8.3%	$36,511,676	183	1.0%	$7,533,903	17,028	96.3%	$222,374,403
Dare													
Unincorporated Dare County	14,019	12,795	91.3%	$139,889,481	667	4.8%	$11,067,229	153	1.1%	$4,046,015	13,615	97.1%	$155,002,725
Town of Duck	2,409	2,316	96.1%	$43,149,006	76	3.2%	$1,657,168	7	0.3%	$228,052	2,399	99.6%	$45,034,226
Town of Kill Devil Hills	6,033	5,634	93.4%	$50,505,590	312	5.2%	$10,353,998	18	0.3%	$2,554,498	5,964	98.9%	$63,414,086
Town of Kitty Hawk	2,862	2,597	90.7%	$29,105,180	188	6.6%	$7,001,890	11	0.4%	$304,849	2,796	97.7%	$36,411,919
Town of Manteo	943	764	81.0%	$11,900,936	125	13.3%	$3,480,108	29	3.1%	$2,514,397	918	97.3%	$17,895,440
Town of Nags Head	4,868	4,484	92.1%	$59,191,744	302	6.2%	$8,324,261	32	0.7%	$1,183,249	4,818	99.0%	$68,699,253
Town of Southern Shores	2,513	2,454	97.7%	$40,866,617	33	1.3%	$1,049,745	7	0.3%	$814,833	2,494	99.2%	$42,731,194
Subtotal Dare	**33,647**	**31,044**	**92.3%**	**$374,608,554**	**1,703**	**5.1%**	**$42,934,399**	**257**	**0.8%**	**$11,645,893**	**33,004**	**98.1%**	**$429,188,843**
Region Total	**51,332**	**46,421**	**90.4%**	**$552,937,379**	**3,171**	**6.2%**	**$79,446,075**	**440**	**0.9%**	**$19,179,796**	**50,032**	**97.5%**	**$651,563,246**

Source: NCEM Risk Management Tool

Table 4.81 – Estimated Buildings Impacted by EF1 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	15,377	86.9%	$1,292,316,655	1,468	8.3%	$243,208,378	183	1.0%	$40,426,085	17,028	96.3%	$1,575,951,118
Dare													
Unincorporated Dare County	14,019	12,795	91.3%	$1,027,084,972	667	4.8%	$78,375,396	153	1.1%	$24,026,165	13,615	97.1%	$1,129,486,533
Town of Duck	2,409	2,316	96.1%	$317,562,334	76	3.2%	$11,865,765	7	0.3%	$1,835,961	2,399	99.6%	$331,264,060
Town of Kill Devil Hills	6,033	5,634	93.4%	$370,626,461	312	5.2%	$69,834,686	18	0.3%	$11,200,656	5,964	98.9%	$451,661,802
Town of Kitty Hawk	2,862	2,597	90.7%	$212,152,299	188	6.6%	$41,305,118	11	0.4%	$2,138,419	2,796	97.7%	$255,595,835
Town of Manteo	943	764	81.0%	$86,142,861	125	13.3%	$21,985,706	29	3.1%	$11,392,412	918	97.3%	$119,520,979
Town of Nags Head	4,868	4,484	92.1%	$435,123,981	302	6.2%	$53,306,444	32	0.7%	$7,236,560	4,818	99.0%	$495,666,985
Town of Southern Shores	2,513	2,454	97.7%	$301,659,057	33	1.3%	$6,669,086	7	0.3%	$3,682,626	2,494	99.2%	$312,010,769
Subtotal Dare	**33,647**	**31,044**	**92.3%**	**$2,750,351,965**	**1,703**	**5.1%**	**$283,342,201**	**257**	**0.8%**	**$61,512,799**	**33,004**	**98.1%**	**$3,095,206,963**
Region Total	**51,332**	**46,421**	**90.4%**	**$4,042,668,620**	**3,171**	**6.2%**	**$526,550,579**	**440**	**0.9%**	**$101,938,884**	**50,032**	**97.5%**	**$4,671,158,081**

Source: NCEM Risk Management Tool

Table 4.82 – Estimated Buildings Impacted by EF2 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	15,377	86.9%	$2,390,736,487	1,468	8.3%	$563,343,807	183	1.0%	$123,144,538	17,028	96.3%	$3,077,224,832
Dare													
Unincorporated Dare County	14,019	12,795	91.3%	$1,933,863,610	667	4.8%	$173,664,046	153	1.1%	$78,094,463	13,615	97.1%	$2,185,622,120
Town of Duck	2,409	2,316	96.1%	$607,121,528	76	3.2%	$27,817,938	7	0.3%	$6,643,547	2,399	99.6%	$641,583,013
Town of Kill Devil Hills	6,033	5,634	93.4%	$710,188,520	312	5.2%	$156,638,264	18	0.3%	$30,837,989	5,964	98.9%	$897,664,772
Town of Kitty Hawk	2,862	2,597	90.7%	$407,496,528	188	6.6%	$96,647,759	11	0.4%	$7,411,157	2,796	97.7%	$511,555,444
Town of Manteo	943	764	81.0%	$167,975,354	125	13.3%	$50,300,235	29	3.1%	$32,064,479	918	97.3%	$250,340,068
Town of Nags Head	4,868	4,484	92.1%	$832,241,445	302	6.2%	$129,336,445	32	0.7%	$23,816,549	4,818	99.0%	$985,394,439
Town of Southern Shores	2,513	2,454	97.7%	$573,033,653	33	1.3%	$16,056,059	7	0.3%	$10,347,862	2,494	99.2%	$599,437,574
Subtotal Dare	**33,647**	**31,044**	**92.3%**	**$5,231,920,638**	**1,703**	**5.1%**	**$650,460,746**	**257**	**0.8%**	**$189,216,046**	**33,004**	**98.1%**	**$6,071,597,430**
Region Total	**51,332**	**46,421**	**90.4%**	**$7,622,657,125**	**3,171**	**6.2%**	**$1,213,804,553**	**440**	**0.9%**	**$312,360,584**	**50,032**	**97.5%**	**$9,148,822,262**

Source: NCEM Risk Management Tool

Table 4.83 – Estimated Buildings Impacted by EF3 Tornado

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	15,377	86.9%	$2,814,159,063	1,468	8.3%	$724,529,993	183	1.0%	$189,883,453	17,028	96.3%	$3,728,572,509
Dare													
Unincorporated Dare County	14,019	12,795	91.3%	$2,270,104,490	667	4.8%	$218,082,364	153	1.1%	$122,238,478	13,615	97.1%	$2,610,425,332
Town of Duck	2,409	2,316	96.1%	$721,001,621	76	3.2%	$36,033,844	7	0.3%	$10,567,300	2,399	99.6%	$767,602,764
Town of Kill Devil Hills	6,033	5,634	93.4%	$850,694,604	312	5.2%	$215,082,091	18	0.3%	$46,882,379	5,964	98.9%	$1,112,659,074
Town of Kitty Hawk	2,862	2,597	90.7%	$496,294,655	188	6.6%	$129,497,373	11	0.4%	$11,715,128	2,796	97.7%	$637,507,157
Town of Manteo	943	764	81.0%	$210,696,505	125	13.3%	$68,806,093	29	3.1%	$48,952,430	918	97.3%	$328,455,027
Town of Nags Head	4,868	4,484	92.1%	$991,268,446	302	6.2%	$177,368,492	32	0.7%	$37,352,657	4,818	99.0%	$1,205,989,595
Town of Southern Shores	2,513	2,454	97.7%	$671,448,277	33	1.3%	$21,189,330	7	0.3%	$15,793,040	2,494	99.2%	$708,430,647
Subtotal Dare	**33,647**	**31,044**	**92.3%**	**$6,211,508,598**	**1,703**	**5.1%**	**$866,059,587**	**257**	**0.8%**	**$293,501,412**	**33,004**	**98.1%**	**$7,371,069,596**
Region Total	**51,332**	**46,421**	**90.4%**	**$9,025,667,661**	**3,171**	**6.2%**	**$1,590,589,580**	**440**	**0.9%**	**$483,384,865**	**50,032**	**97.5%**	**$11,099,642,105**

Source: NCEM Risk Management Tool

Table 4.84 – Estimated Buildings Impacted by 25-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$28,559,500	1,449	8.2%	$6,213,483	179	1.0%	$785,705	16,608	93.9%	$35,558,688
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$15,978,310	644	4.6%	$742,749	152	1.1%	$275,938	13,247	94.5%	$16,996,997
Town of Duck	2,409	2,105	87.4%	$8,168,961	53	2.2%	$133,197	4	0.2%	$100,723	2,162	89.7%	$8,402,881
Town of Kill Devil Hills	6,033	5,380	89.2%	$5,983,774	309	5.1%	$2,767,233	18	0.3%	$82,608	5,707	94.6%	$8,833,615
Town of Kitty Hawk	2,862	2,501	87.4%	$4,262,277	179	6.3%	$804,446	11	0.4%	$17,983	2,691	94.0%	$5,084,707
Town of Manteo	943	764	81.0%	$2,497,101	124	13.1%	$281,108	29	3.1%	$48,114	917	97.2%	$2,826,323
Town of Nags Head	4,868	4,268	87.7%	$10,678,506	293	6.0%	$1,514,948	30	0.6%	$173,338	4,591	94.3%	$12,366,792
Town of Southern Shores	2,513	2,436	96.9%	$5,064,713	33	1.3%	$58,317	7	0.3%	$18,511	2,476	98.5%	$5,141,541
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$52,633,642**	**1,635**	**4.9%**	**$6,301,998**	**251**	**0.7%**	**$717,215**	**31,791**	**94.5%**	**$59,652,856**
Region Total	**51,332**	**44,885**	**87.4%**	**$81,193,142**	**3,084**	**6.0%**	**$12,515,481**	**430**	**0.8%**	**$1,502,920**	**48,399**	**94.3%**	**$95,211,544**

Source: NCEM Risk Management Tool

Table 4.85 – Estimated Buildings Impacted by 50-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$93,390,220	1,449	8.2%	$14,691,987	179	1.0%	$2,083,974	16,608	93.9%	$110,166,180
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$45,084,223	644	4.6%	$2,139,366	152	1.1%	$897,345	13,247	94.5%	$48,120,934
Town of Duck	2,409	2,105	87.4%	$28,665,690	53	2.2%	$408,190	4	0.2%	$246,813	2,162	89.7%	$29,320,693
Town of Kill Devil Hills	6,033	5,380	89.2%	$17,848,780	309	5.1%	$6,239,803	18	0.3%	$331,816	5,707	94.6%	$24,420,400
Town of Kitty Hawk	2,862	2,501	87.4%	$12,602,005	179	6.3%	$2,322,590	11	0.4%	$89,258	2,691	94.0%	$15,013,853
Town of Manteo	943	764	81.0%	$8,937,422	124	13.1%	$858,031	29	3.1%	$204,241	917	97.2%	$9,999,694
Town of Nags Head	4,868	4,268	87.7%	$34,666,456	293	6.0%	$3,845,713	30	0.6%	$579,709	4,591	94.3%	$39,091,878
Town of Southern Shores	2,513	2,436	96.9%	$15,720,752	33	1.3%	$191,748	7	0.3%	$63,707	2,476	98.5%	$15,976,208
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$163,525,328**	**1,635**	**4.9%**	**$16,005,441**	**251**	**0.7%**	**$2,412,889**	**31,791**	**94.5%**	**$181,943,660**
Region Total	**51,332**	**44,885**	**87.4%**	**$256,915,548**	**3,084**	**6.0%**	**$30,697,428**	**430**	**0.8%**	**$4,496,863**	**48,399**	**94.3%**	**$292,109,840**

Source: NCEM Risk Management Tool

Table 4.86 – Estimated Buildings Impacted by 100-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$164,375,188	1,449	8.2%	$22,516,196	179	1.0%	$3,449,195	16,608	93.9%	$190,340,579
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$87,840,960	644	4.6%	$4,082,396	152	1.1%	$1,757,250	13,247	94.5%	$93,680,606
Town of Duck	2,409	2,105	87.4%	$50,974,888	53	2.2%	$693,494	4	0.2%	$380,711	2,162	89.7%	$52,049,093
Town of Kill Devil Hills	6,033	5,380	89.2%	$31,894,645	309	5.1%	$9,359,791	18	0.3%	$699,873	5,707	94.6%	$41,954,309
Town of Kitty Hawk	2,862	2,501	87.4%	$22,042,279	179	6.3%	$3,957,036	11	0.4%	$195,491	2,691	94.0%	$26,194,806
Town of Manteo	943	764	81.0%	$15,822,249	124	13.1%	$1,478,199	29	3.1%	$461,130	917	97.2%	$17,761,578
Town of Nags Head	4,868	4,268	87.7%	$61,324,644	293	6.0%	$6,287,267	30	0.6%	$1,023,940	4,591	94.3%	$68,635,851
Town of Southern Shores	2,513	2,436	96.9%	$28,468,529	33	1.3%	$331,719	7	0.3%	$119,938	2,476	98.5%	$28,920,185
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$298,368,194**	**1,635**	**4.9%**	**$26,189,902**	**251**	**0.7%**	**$4,638,333**	**31,791**	**94.5%**	**$329,196,428**
Region Total	**51,332**	**44,885**	**87.4%**	**$462,743,382**	**3,084**	**6.0%**	**$48,706,098**	**430**	**0.8%**	**$8,087,528**	**48,399**	**94.3%**	**$519,537,007**

Source: NCEM Risk Management Tool

Table 4.87 – Estimated Buildings Impacted by 300-Year Thunderstorm Winds

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	14,980	84.7%	$439,618,421	1,449	8.2%	$50,027,365	179	1.0%	$8,789,621	16,608	93.9%	$498,435,407
Dare													
Unincorporated Dare County	14,019	12,451	88.8%	$254,863,428	644	4.6%	$10,900,046	152	1.1%	$5,619,385	13,247	94.5%	$271,382,858
Town of Duck	2,409	2,105	87.4%	$135,414,635	53	2.2%	$1,759,488	4	0.2%	$908,427	2,162	89.7%	$138,082,550
Town of Kill Devil Hills	6,033	5,380	89.2%	$90,538,050	309	5.1%	$20,215,931	18	0.3%	$2,444,415	5,707	94.6%	$113,198,396
Town of Kitty Hawk	2,862	2,501	87.4%	$59,387,565	179	6.3%	$10,249,480	11	0.4%	$665,500	2,691	94.0%	$70,302,545
Town of Manteo	943	764	81.0%	$41,515,662	124	13.1%	$3,897,650	29	3.1%	$1,847,770	917	97.2%	$47,261,082
Town of Nags Head	4,868	4,268	87.7%	$160,403,250	293	6.0%	$15,339,069	30	0.6%	$2,747,355	4,591	94.3%	$178,489,675
Town of Southern Shores	2,513	2,436	96.9%	$82,268,987	33	1.3%	$904,338	7	0.3%	$381,963	2,476	98.5%	$83,555,288
Subtotal Dare	**33,647**	**29,905**	**88.9%**	**$824,391,577**	**1,635**	**4.9%**	**$63,266,002**	**251**	**0.7%**	**$14,614,815**	**31,791**	**94.5%**	**$902,272,394**
Region Total	**51,332**	**44,885**	**87.4%**	**$1,264,009,998**	**3,084**	**6.0%**	**$113,293,367**	**430**	**0.8%**	**$23,404,436**	**48,399**	**94.3%**	**$1,400,707,801**

Source: NCEM Risk Management Tool

ENVIRONMENT

Tornados can cause massive damage to the natural environment, uprooting trees and other debris within the tornado's path. This is part of a natural process, however, and the environment will return to its original state in time. The main environmental impact from thunderstorm wind is damage to trees or crops. Wind events can also bring down power lines, which could cause a fire and result in even greater environmental impacts.

Lightning may result in the ignition of wildfires. This is often part of a natural process, however, and the environment will return to its original state in time.

Hail can cause extensive damage to the natural environment, pelting animals, trees and vegetation with hailstones. In some cases, melting hail can increase flash flood risk.

CONSEQUENCE ANALYSIS

Table 4.88 summarizes the potential negative consequences of tornadoes and thunderstorms.

Table 4.88 – Consequence Analysis – Tornadoes and Thunderstorms

Category	Consequences
Public	Injuries; fatalities
Responders	Injuries; fatalities; potential impacts to response capabilities due to storm impacts
Continuity of Operations (including Continued Delivery of Services)	Potential impacts to continuity of operations due to storm impacts; delays in providing services
Property, Facilities and Infrastructure	Thunderstorms, lightning, and hail present the possibility of structure fire ignition; potential for disruptions in power and communications infrastructure; and destruction and/or damage to any exposed property, especially windows, cars and siding. The weakest tornados, EF0, can cause minor roof damage, while strong tornados can destroy frame buildings and even damage steel reinforced concrete structures. Buildings are vulnerable to direct impact from tornados and also from wind borne debris. Mobile homes are particularly susceptible to damage during tornados and thunderstorms.
Environment	Potential fire ignition from lightning; hail and wind damage to wildlife and foliage
Economic Condition of the Jurisdiction	Temporary business interruptions are possible, but thunderstorms and tornadoes are unlikely to causes any sustained impact on the local economy.
Public Confidence in the Jurisdiction's Governance	Public confidence is not likely to be affected by thunderstorms and tornadoes.

HAZARD SUMMARY BY JURISDICTION

The following tables summarize tornado and thunderstorm hazard risk by jurisdiction. The impact of these severe weather hazards may vary by jurisdiction based on each community's property exposure. Communities with a higher proportion of mobile homes may be disproportionately impacted by thunderstorm winds and tornadoes. While mobile home units do not comprise a significant proportion of any jurisdiction's housing mix, mobiles homes make up 10 percent of occupied housing in Currituck

County and 7 percent in unincorporated Dare County. Therefore, these communities may face more severe impacts from wind. Other elements of severe weather risk do not vary by jurisdiction.

TORNADO

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	3	3	1	4	1	2.5	M
Dare County	3	3	1	4	1	2.5	M
Duck	3	2	1	4	1	2.2	M
Kill Devil Hills	3	2	1	4	1	2.2	M
Kitty Hawk	3	2	1	4	1	2.2	M
Manteo	3	2	1	4	1	2.2	M
Nags Head	3	2	1	4	1	2.2	M
Southern Shores	3	2	1	4	1	2.2	M

THUNDERSTORM WIND

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	4	3	3	4	1	3.2	H
Dare County	4	3	3	4	1	3.2	H
Duck	4	2	3	4	1	2.9	M
Kill Devil Hills	4	2	3	4	1	2.9	M
Kitty Hawk	4	2	3	4	1	2.9	M
Manteo	4	2	3	4	1	2.9	M
Nags Head	4	2	3	4	1	2.9	M
Southern Shores	4	2	3	4	1	2.9	M

LIGHTNING

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All jurisdictions	4	1	1	4	1	2.2	M

HAIL

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All jurisdictions	4	1	1	4	1	2.2	M

4.5.7 SEVERE WINTER WEATHER

HAZARD BACKGROUND

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

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

Ice storms are defined as storms with significant amounts of freezing rain and are a result of cold air damming (CAD). CAD is a shallow, surface-based layer of relatively cold, stably-stratified air entrenched against the eastern slopes of the Appalachian Mountains. With warmer air above, falling precipitation in the form of snow melts, then becomes either super-cooled (liquid below the melting point of water) or re-freezes. In the former case, super-cooled droplets can freeze on impact (freezing rain), while in the latter case, the re-frozen water particles are ice pellets (or sleet). Sleet is defined as partially frozen raindrops or refrozen snowflakes that form into small ice pellets before reaching the ground. They typically bounce when they hit the ground and do not stick to the surface. However, it does accumulate like snow, posing similar problems and has the potential to accumulate into a layer of ice on surfaces. Freezing rain, conversely, usually sticks to the ground, creating a sheet of ice on the roadways and other surfaces. All of the winter storm elements – snow, low temperatures, sleet, ice, etcetera – have the potential to cause significant hazard to a community. Even small accumulations can down power lines and trees limbs and create hazardous driving conditions. Furthermore, communication and power may be disrupted for days.

Advancements in meteorology and forecasting usually allow for mostly accurate forecasting a few days in advance of an impending storm. Most storms have a duration of a few hours; however, impacts can last a few days after the initial incident until cleanup is completed.

Warning Time: 1 – More than 24 hours

Duration: 3 – Less than one week

LOCATION

Severe winter storms are usually a countywide or regional hazard, impacting the entire county at the same time. The risk of a severe winter storm occurring is uniform across the region.

Spatial Extent: 4 – Large

EXTENT

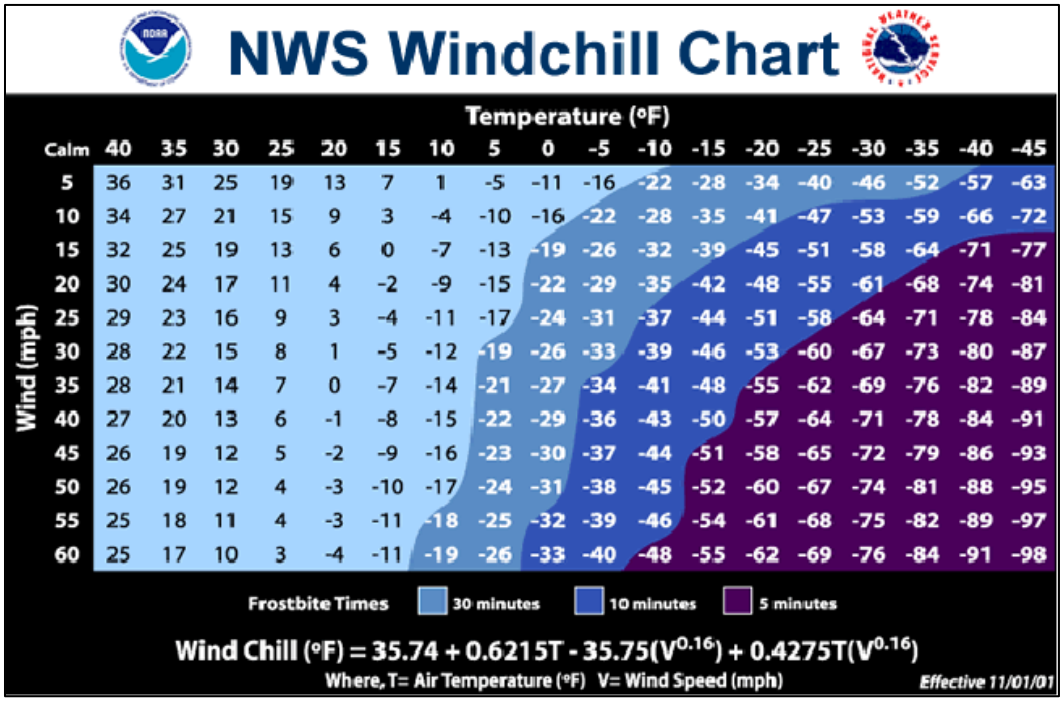
The National Oceanic and Atmospheric Administration (NOAA) uses the Regional Snowfall Index (RSI) to assess the societal impact of winter storms in the six easternmost regions in the United States. The index makes use of population and regional differences to assess the impact of snowfall. For example, areas which receive very little snowfall on average may be more adversely affected than other regions, resulting in a higher severity.

Table 4.89 – Regional Snowfall Index (RSI) Values

Category	RSI Value	Description
1	1-3	Notable
2	3-6	Significant
3	6-10	Major
4	10-18	Crippling
5	18+	Extreme

Severe winter storms often involve a mix of hazardous weather conditions. The magnitude of an event can be defined based on the severity of each of the involved factors, including precipitation type, precipitation accumulation amounts, temperature, and wind. The NWS Wind Chill Temperature Index, shown in Figure 4.44, provides a formula for calculating the dangers of winter winds and freezing temperatures.

Figure 4.44 – NWS Wind Chill Temperature Index



Source: http://www.nws.noaa.gov/om/winter/windchill.shtml

Per the National Centers for Environmental Information, the greatest snowfall amount recorded in Dare County was 13.7 inches, recorded on March 3, 1980 at the Hatteras weather station. The greatest snowfall for Currituck County was 7.5 inches, recorded on December 27, 2010.

Impact: 1 – Minor

The entirety of North Carolina is susceptible to winter storm and freeze events. Some ice and winter storms may be large enough to affect several states, while others might affect limited, localized areas. The degree of exposure typically depends on the normal expected severity of local winter weather. The Outer Banks generally receives smaller scale severe winter weather conditions during the winter months. Given the atmospheric nature of the hazard, the entire County has uniform exposure to a winter storm.

HISTORICAL OCCURRENCES

To get a full picture of the range of impacts of a severe winter storm, data for the following weather types as defined by the National Weather Service (NWS) Raleigh Forecast Office and tracked by NCEI were collected:

- **Blizzard** – A winter storm which produces the following conditions for 3 consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile.
- **Cold/Wind Chill** – Period of low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined advisory conditions of 0°F to -14°F with wind speeds 10 mph (9 kt) or greater.
- **Extreme Cold/Wind Chill** – A period of extremely low temperatures or wind chill temperatures reaching or exceeding locally/regionally defined warning criteria, defined as wind chill -15°F or lower with wind speeds 10 mph (9 kt) or greater.
- **Frost/Freeze** – A surface air temperature of 32°F or lower, or the formation of ice crystals on the ground or other surfaces, for a period of time long enough to cause human or economic impact, during the locally defined growing season.
- **Heavy Snow** – Snow accumulation meeting or exceeding 12 and/or 24-hour warning criteria of 3 and 4 inches, respectively.
- **Ice Storm** – Ice accretion meeting or exceeding locally/regionally defined warning criteria of ¼ inch or greater resulting in significant, widespread power outages, tree damage and dangerous travel. Issued only in those rare instances where just heavy freezing rain is expected and there will be no "mixed bag" precipitation meaning no snow, sleet or rain.
- **Sleet** – Sleet accumulations meeting or exceeding locally/regionally defined warning criteria of ½ inch or more.
- **Winter Storm** – A winter weather event that has more than one significant hazard and meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria for at least one of the precipitation elements. Defined by NWS Raleigh Forecast Office as snow accumulations 3 inches or greater in 12 hours (4 inches or more in 24 hours); Freezing rain accumulations ¼ inch (6 mm) or greater; Sleet accumulations ½ inch (13 mm) or more. Issued when there is at least a 60% forecast confidence of any one of the three criteria being met.
- **Winter Weather** – A winter precipitation event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria.

Table 4.90 summarizes winter storm related events by type as reported in NCEI for 1993 through 2023. Severe winter weather did not cause any reported damage, injuries, or fatalities, though these types of impacts are possible in future events. No cold/wind chill, extreme cold/wind chill, or sleet events were recorded. Table 4.91 details all reported events.

Table 4.90 – Reported Severe Winter Storm Events in the Outer Banks Region, 1999-2023

Event Type	Number of Recorded Incidents	Total Deaths	Total Injuries	Reported Property Damage	Reported Crop Damage
Currituck County					
Winter Storm	17	0	0	$0	$0
Winter Weather	15	0	0	$0	$0

Event Type	Number of Recorded Incidents	Total Deaths	Total Injuries	Reported Property Damage	Reported Crop Damage
Frost/Freeze	3	0	0	$0	$0
Blizzard	1	0	0	$0	$0
Dare County					
Winter Storm	9	0	0	$0	$0
Winter Weather	4	0	0	$0	$0
Frost/Freeze	1	0	0	$0	$0
Heavy Snow	4	0	0	$0	$0
Region Total	**54**	**0**	**0**	**$0**	**$0**

Source: NCEI

Table 4.91 – Severe Winter Storm Incidents in the Outer Banks, 1999-2023

Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
12/3/2000	Winter Storm	0	0	$0	$0
1/2/2002	Winter Storm	0	0	$0	$0
1/3/2002	Winter Storm	0	0	$0	$0
1/23/2003	Winter Storm	0	0	$0	$0
1/23/2003	Winter Storm	0	0	$0	$0
11/30/2003	Frost/Freeze	0	0	$0	$0
1/9/2004	Winter Storm	0	0	$0	$0
1/9/2004	Winter Weather	0	0	$0	$0
1/25/2004	Winter Storm	0	0	$0	$0
1/25/2004	Winter Storm	0	0	$0	$0
2/15/2004	Winter Storm	0	0	$0	$0
2/16/2004	Winter Weather	0	0	$0	$0
3/23/2004	Frost/Freeze	0	0	$0	$0
4/6/2004	Frost/Freeze	0	0	$0	$0
12/19/2004	Winter Weather	0	0	$0	$0
12/20/2004	Winter Weather	0	0	$0	$0
12/26/2004	Winter Storm	0	0	$0	$0
1/19/2005	Winter Weather	0	0	$0	$0
2/20/2006	Winter Weather	0	0	$0	$0
1/28/2007	Winter Weather	0	0	$0	$0
11/21/2008	Winter Weather	0	0	$0	$0
1/20/2009	Winter Weather	0	0	$0	$0
1/20/2009	Heavy Snow	0	0	$0	$0
1/30/2010	Winter Storm	0	0	$0	$0
12/16/2010	Winter Weather	0	0	$0	$0
12/25/2010	Winter Storm	0	0	$0	$0
12/26/2010	Heavy Snow	0	0	$0	$0
1/22/2011	Heavy Snow	0	0	$0	$0
2/9/2011	Winter Storm	0	0	$0	$0
2/10/2011	Heavy Snow	0	0	$0	$0
1/25/2013	Winter Weather	0	0	$0	$0
1/21/2014	Winter Storm	0	0	$0	$0

Date	Event Type	Deaths	Injuries	Property Damage	Crop Damage
1/28/2014	Winter Storm	0	0	$0	$0
1/28/2014	Winter Storm	0	0	$0	$0
2/11/2014	Winter Storm	0	0	$0	$0
3/3/2014	Winter Weather	0	0	$0	$0
2/16/2015	Winter Storm	0	0	$0	$0
2/24/2015	Winter Storm	0	0	$0	$0
2/25/2015	Winter Weather	0	0	$0	$0
1/22/2016	Winter Weather	0	0	$0	$0
2/12/2016	Winter Weather	0	0	$0	$0
2/12/2016	Winter Storm	0	0	$0	$0
4/5/2016	Frost/Freeze	0	0	$0	$0
1/7/2017	Winter Storm	0	0	$0	$0
1/3/2018	Blizzard	0	0	$0	$0
1/4/2018	Winter Storm	0	0	$0	$0
1/17/2018	Winter Storm	0	0	$0	$0
1/17/2018	Winter Storm	0	0	$0	$0
2/20/2020	Winter Weather	0	0	$0	$0
1/28/2021	Winter Weather	0	0	$0	$0
1/21/2022	Winter Storm	0	0	$0	$0
1/28/2022	Winter Weather	0	0	$0	$0
	Total	**0**	**0**	**$0**	**$0**

Source: NCEI

Narratives from selected winter storm related events as reported in NCEI are summarized below:

January 23, 2003 - The storm dumped the highest amounts of snow east of highway 17 across the area known as the Outer Banks, where 8 to 12 inches of snow fell with isolated amounts up to 14 inches, including the counties of eastern Carteret, Dare and, and Hyde counties. This was the largest one-day snowfall on the Outer Banks in over a decade. Corolla received 4" of snow. Local law enforcement agencies reported numerous accidents and most, if not all, schools were closed due to road conditions.

December 26, 2004 – A winter storm produced one to as much as five inches of snow across the coastal areas of northeast North Carolina. The snow caused hazardous driving conditions, which resulted in numerous accidents. 4.5” of snow were reported in Moyock.

January 20, 2009 – Rain developed over eastern North Carolina after midnight on Jan 20th and changed to snow around 9 am over the northern part of the county and continue into the late evening hours. Over the southern half of the county the rain changed to snow during the late morning hours and continued into the late evening. Snow accumulated 2 to 5 inches across Dare County, and up to 2 inches in Currituck County.

December 25-26, 2010 – Strong low pressure moved northeast just offshore of the North Carolina coast. As the low approached the region areas of rain developed and as cold air spread the rain gradually turned to snow. Snowfall amounts were generally between five and eleven inches across Currituck County, where Moyock reported 10.0 inches of snow. In Dare County, widespread snow developed during the morning hours and continued into the early evening. Total snow accumulations across the county ranged from 2 to 4 inches north of Oregon Inlet to less than 1 inch south of Oregon Inlet.

January 28, 2014 – Sleet and freezing rain began during the early afternoon of January 28th over southern Dare County. As the precipitation spread north it became all snow north of Oregon Inlet toward evening.

The precipitation ended during the late morning of January 29th. Total snow accumulations ranged from 5 to 8 inches north to around 1 inch of sleet and snow south. There was also up to 0.25 inches of freezing rain over the southern sections. Roads were icy during and several days after the event.

January 3-4, 2018 - Strong low pressure tracking northward just off the East Coast produced between three inches and twelve inches of snow across northeast North Carolina. In addition to the winter weather very strong winds occurred along the coast with minor coastal flooding along the Outer Banks. Snowfall totals ranged between three inches and eight inches across the county. Very strong north to northwest winds of 35 to 50 mph affected the area, producing blowing snow and poor visibilities. Knotts Island reported 7.5 inches of snow.

February 20, 2020 - Low pressure tracking from the Gulf Coast States east northeast and off the Southeast Coast produced snowfall totals between one half inch and three inches across northeast North Carolina.

January 28, 2022 - Rapidly intensifying low pressure lifting northward just off the Mid Atlantic coast produced snowfall totals between one half inch and three inches across portions of northeast North Carolina.

Dare County has received one emergency declaration since 1968 for an incident related to severe winter storms, and Currituck County received none. As a state, North Carolina received eight disaster declarations related to severe winter storms during this timeframe.

Table 4.92 – Emergency & Disaster Declarations in Dare County due to Severe Winter Storms

Disaster Number	Date	Disaster Type	Incident Start	Incident End
3110	1993	Severe Snow and Winter Storm	3/13/1993	3/17/1993

Source: FEMA, August 7, 2024

PROBABILITY OF FUTURE OCCURRENCE

NCEI records 54 severe winter storm related events during the 25-year period from 1999 through 2023, which equates to an average of 2.1 events per year or more than 100 percent likelihood of an occurrence in any given year.

Probability: 4 – Highly Likely

CLIMATE CHANGE

According to the 2023 North Carolina Hazard Mitigation Plan, there is uncertainty associated with climate change impacts on future severe winter storms. Global temperature rise could cause shorter and warmer winters in many areas; however, the likelihood of dangerously low temperatures may increase due to continuing trends of temperature extremes. Warmer winters, however, mean that precipitation that would normally fall as snow may begin to fall as rain or freezing rain instead

VULNERABILITY ASSESSMENT

PEOPLE

Winter storms are considered deceptive killers because most deaths are indirectly related to the storm event. The leading cause of death during winter storms is from automobile or other transportation accidents due to poor visibility and/or slippery roads. Additionally, exhaustion and heart attacks caused by overexertion may result from winter storms.

Power outages during very cold winter storm conditions can also create potentially dangerous situations. Elderly people account for the largest percentage of hypothermia victims. In addition, if the power is out

for an extended period, residents are forced to find alternative means to heat their homes. The danger arises from carbon monoxide released from improperly ventilated heating sources such as space or kerosene heaters, furnaces, and blocked chimneys. House fires also occur more frequently in the winter due to lack of proper safety precautions when using an alternative heating source.

PROPERTY

According to reported data of storm impacts recorded by the NCEI, between 1999 and 2023 the Outer Banks Region did not experience any reported property damage as a result of severe winter weather.

ENVIRONMENT

Winter storm events may include ice or snow accumulation on trees which can cause large limbs, or even whole trees, to snap and potentially fall on buildings, cars, or power lines. This potential for winter debris creates a dangerous environment to be outside in; significant injury or fatality may occur if a large limb snaps while a local resident is out driving or walking underneath it.

CONSEQUENCE ANALYSIS

Table 4.93 summarizes the potential negative consequences of severe winter storm.

Table 4.93 – Consequence Analysis - Severe Winter Storm

Category	Consequences
Public	Localized impact expected to be severe for affected areas and moderate to light for other less affected areas.
Responders	Adverse impact expected to be severe for unprotected personnel and moderate to light for trained, equipped, and protected personnel.
Continuity of Operations (including Continued Delivery of Services)	Localized disruption of roads and/or utilities caused by incident may postpone delivery of some services.
Property, Facilities and Infrastructure	Localized impact to facilities and infrastructure in the areas of the incident. Power lines and roads most adversely affected.
Environment	Environmental damage to trees, bushes, etc.
Economic Condition of the Jurisdiction	Local economy and finances may be adversely affected, depending on damage.
Public Confidence in the Jurisdiction's Governance	Ability to respond and recover may be questioned and challenged if planning, response, and recovery not timely and effective.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes severe winter storm hazard risk by jurisdiction. Severe winter storm risk does not vary substantially by jurisdiction because these events are typically regional in nature and there are no characteristics of the jurisdictions that cause significant variation in risk.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
All jurisdictions	4	1	4	1	3	2.7	M

4.5.8 WILDFIRE

HAZARD BACKGROUND

A wildfire is an uncontained fire that spreads through the environment. Wildfires have the ability to consume large areas, including infrastructure, property, and resources. When massive fires, or conflagrations, develop near populated areas, evacuations possibly ensue. Not only do the flames impact the environment, but the massive volumes of smoke spread by certain atmospheric conditions also impact the health of nearby populations. There are three general types of fire spread that are recognized.

- **Ground fires** – burn organic matter in the soil beneath surface litter and are sustained by glowing combustion.
- **Surface fires** – spread with a flaming front and burn leaf litter, fallen branches and other fuels located at ground level.
- **Crown fires** – burn through the top layer of foliage on a tree, known as the canopy or crown fires. Crown fires, the most intense type of fire and often the most difficult to contain, need strong winds, steep slopes and a heavy fuel load to continue burning.

Generally, wildfires are started by humans, either through arson or carelessness. Fire intensity is controlled by both short-term weather conditions and longer-term vegetation conditions. During intense fires, understory vegetation, such as leaves, small branches, and other organic materials that accumulate on the ground, can become additional fuel for the fire. The most explosive conditions occur when dry, gusty winds blow across dry vegetation.

Warning Time: 4 – Less than six hours

Duration: 3 – Less than one week

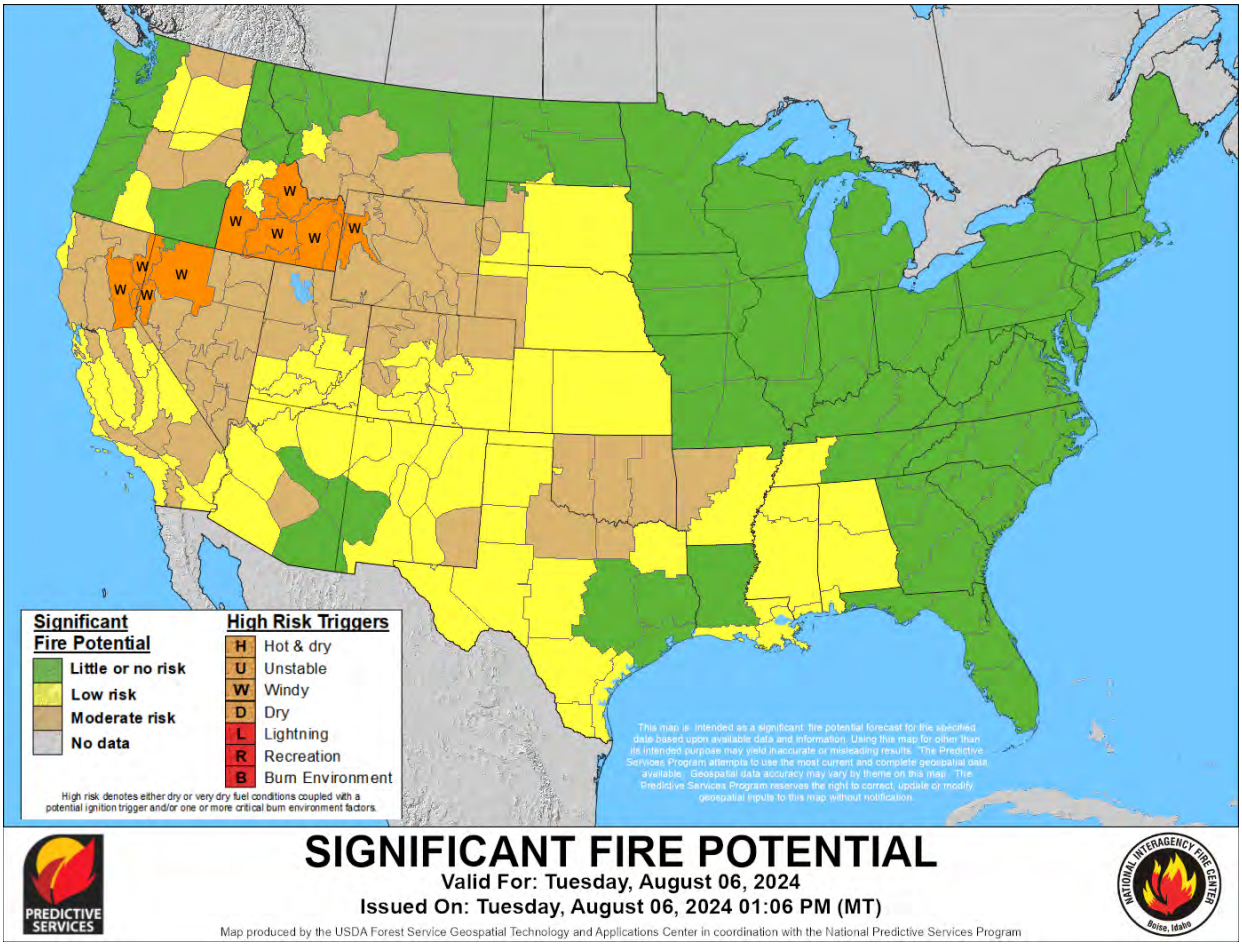
Weather plays a major role in the birth, growth and death of a wildfire. Weather conditions favorable to wildfire include drought, which increases flammability of surface fuels, and winds, which aid a wildfire's progress. The combination of wind, temperature, and humidity affects how fast wildland fires can spread. Rapid response can contain wildfires and limit their threat to property. The Outer Banks Region experiences a variety of wildfire conditions found in the Keetch-Byram Drought Index, which is described in Table 4.94.

Table 4.94 – Keetch-Byram Drought Index Fire Danger Rating System

KBDI	Description
0-200	Soil and fuel moisture are high. Most fuels will not readily ignite or burn. However, with sufficient sunlight and wind, cured grasses and some light surface fuels will burn in sports and patches.
200-400	Fires more readily burn and will carry across an area with no gaps. Heavier fuels will still not readily ignite and burn. Also, expect smoldering and the resulting smoke to carry into and possibly through the night.
400-600	Fire intensity begins to significantly increase. Fires will readily burn in all directions exposing mineral soils in some locations. Larger fuels may burn or smolder for several days creating possible smoke and control problems.
600-800	Fires will burn to mineral soil. Stumps will burn to the end of underground roots and spotting will be a major problem. Fires will burn through the night and heavier fuels will actively burn and contribute to fire intensity.

In support of forecasting for fire weather, the NWS Fire Weather Program emerged in response to a need for weather support to large and dangerous wildfires. This service is provided to federal and state land management agencies for the prevention, suppression, and management of forest and rangeland fires. As shown in Figure 4.45 on the following page, the NWS Wildland Fire Potential for August 6th, 2024 shows the state of North Carolina at "little or no risk" for fire potential based on weather conditions at the time. This data provides a point in time measurement and does not reflect long term risk; it is meant to illustrate the tools available to support identification of wildfire risk. Lower fire potential is expected in August, as the region is typically more humid during and soon after hurricane season. Drier weather through the winter could elevate wildfire risk.

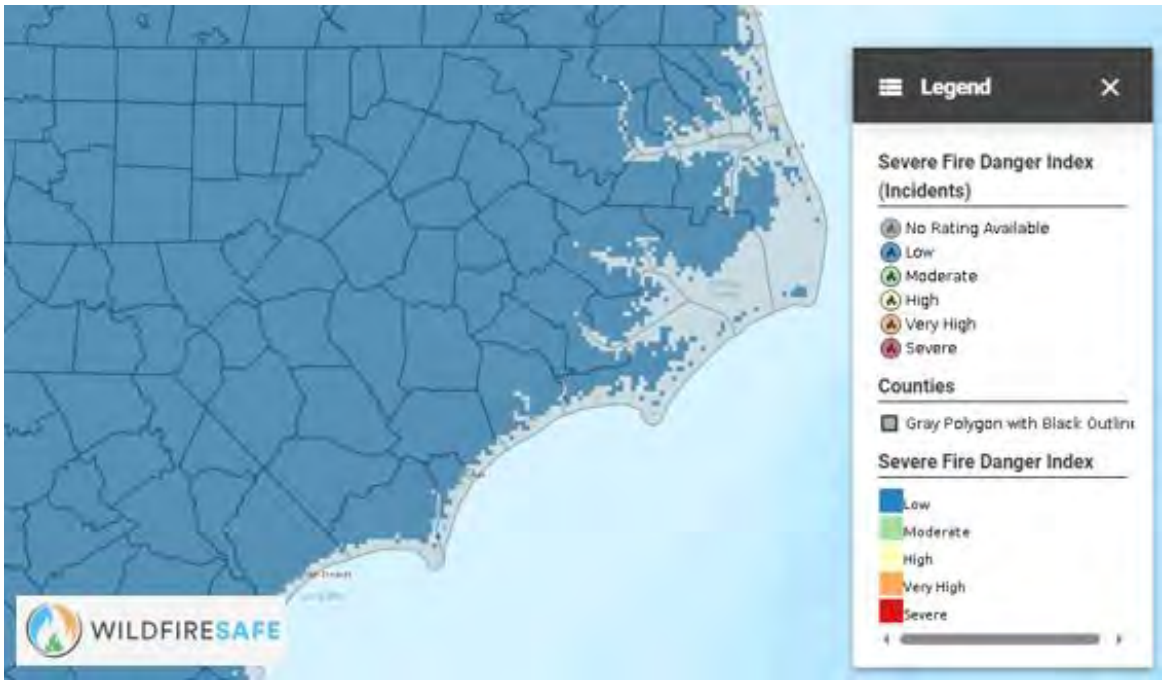
Figure 4.45 – U.S. Wildland Fire Outlook



Source: National Weather Service

The WildfireSAFE platform was created through the United States Forest Service and pulls directly from the Wildland Fire Assessment System. The severe fire danger index for August 7th, 2024 is shown in Figure 4.46 along with current fire incidents. The severe fire weather potential forecast for Currituck County and Dare County at this time was low with no fire incidents being reported in the area.

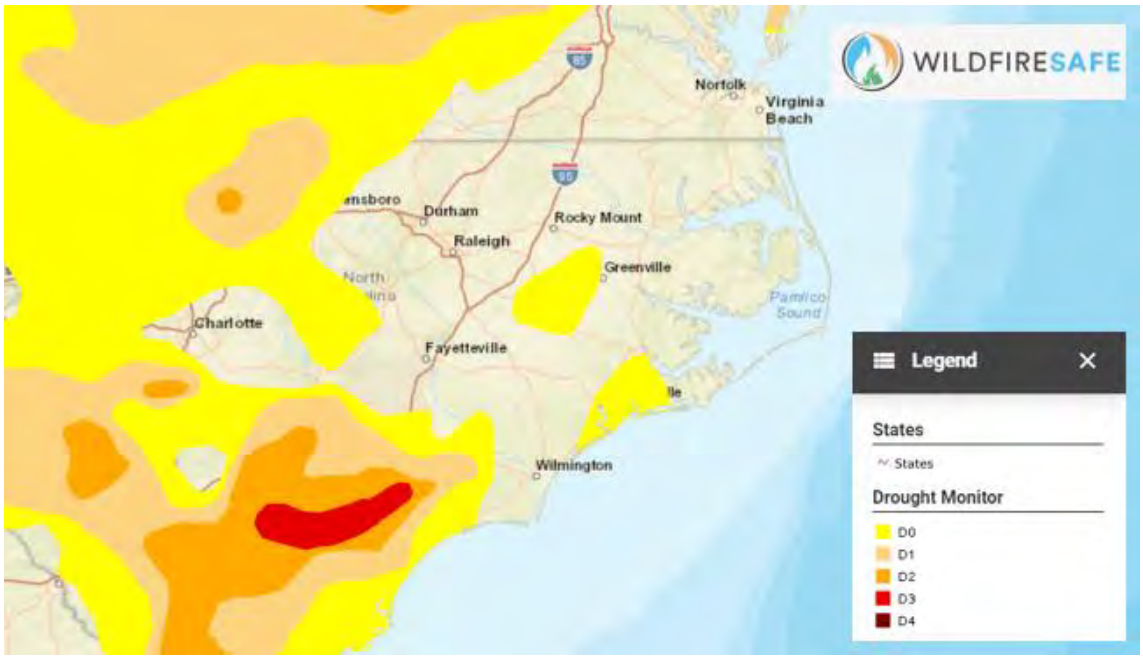
Figure 4.46 – Severe Fire Danger Index, August 2024



Source: USFS WildfireSAFE

The WildfireSAFE platform collects data from the U.S. Drought Monitor and maps parts of the U.S. that are currently in drought. As shown in Figure 4.47, neither Currituck County nor Dare County were experiencing any level of drought on August 7th, 2024 while other regions within the state of North Carolina were experiencing low to moderate degrees of drought making them more susceptible to wildfires.

Figure 4.47 - Drought Monitor, August 2024



Source: USFS WildfireSAFE

LOCATION

The location of wildfire risk can be defined by the acreage of Wildland Urban Interface (WUI). The WUI is described as the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels, and thus demarcates the spatial extent of wildfire risk. The WUI is essentially all the land in the region that is not heavily urbanized. The expansion of residential development from urban centers out into rural landscapes increases the potential for wildland fire threat to public safety and the potential for damage to forest resources and dependent industries. Population growth within the WUI substantially increases the risk of wildfire.

Based on data from the Southern Wildfire Risk Assessment (SWRA), it is estimated that 88.9% of the Region's population lives within the WUI. WUI population and acres by housing density category are shown in Table 4.95. Figure 4.48 maps the WUI. Maps for each town are provided in the jurisdictional annexes.

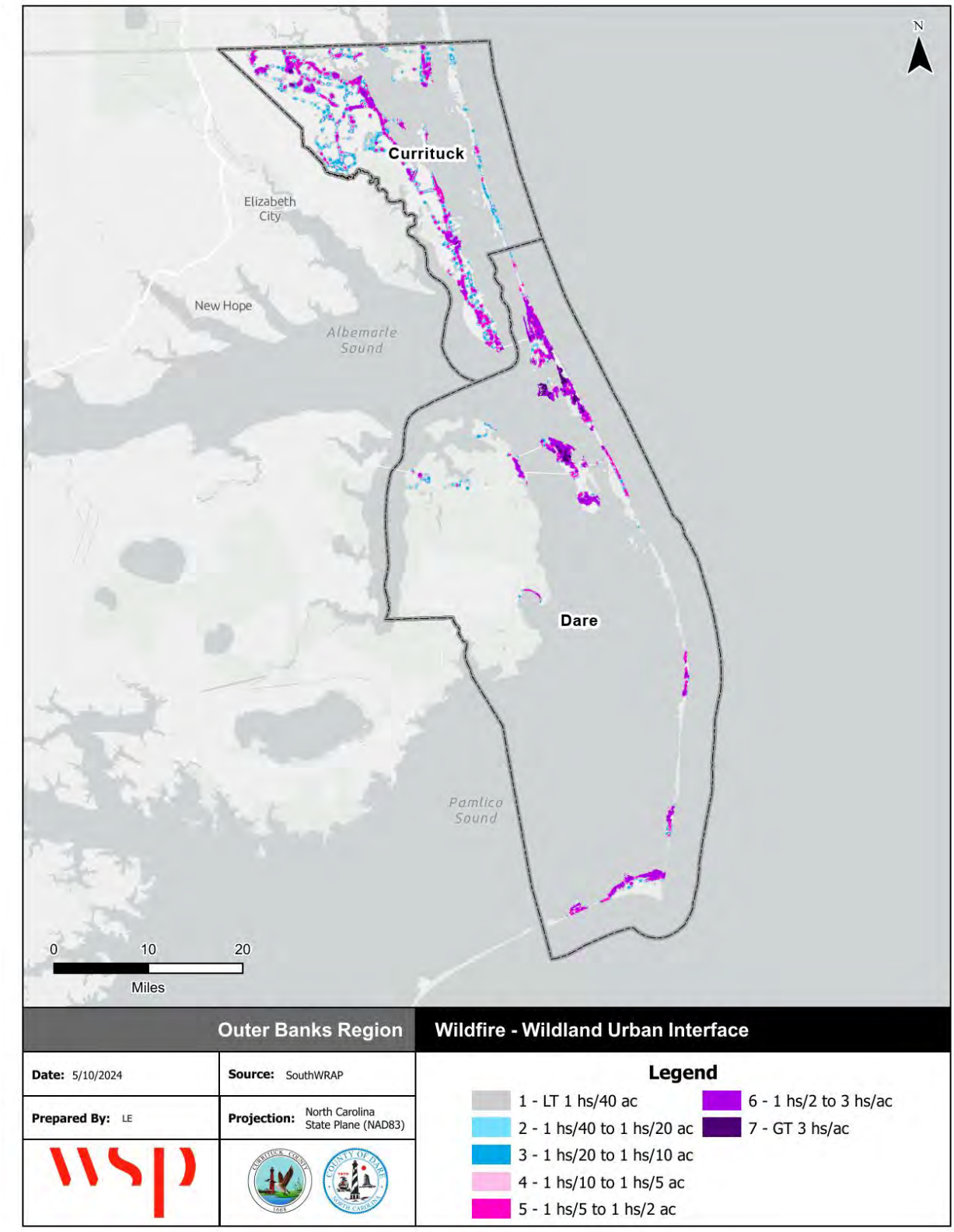
Table 4.95 – Wildland Urban Interface, Population and Acres

	Housing Density	WUI Population	Percent of WUI Population	WUI Acres	Percent of WUI Acres
	LT 1hs/40ac	208	0.4 %	14,151	16.1 %
	1hs/40ac to 1hs/20ac	310	0.6 %	8,520	9.7 %
	1hs/20ac to 1hs/10ac	968	1.9 %	12,732	14.5 %
	1hs/10ac to 1hs/5ac	2,016	3.9 %	12,670	14.4 %
	1hs/5ac to 1hs/2ac	6,848	13.4 %	17,275	19.6 %
	1hs/2ac to 3hs/1ac	29,030	56.8 %	20,334	23.1 %
	GT 3hs/1ac	11,756	23.0 %	2,373	2.7 %
	Total	**51,136**	**100.0 %**	**88,055**	**100.0 %**

Source: Southern Wildfire Risk Assessment

Spatial Extent: 3 – Moderate

Figure 4.48 – Wildland Urban Interface, Outer Banks Region



Source: Southern Wildfire Risk Assessment

EXTENT

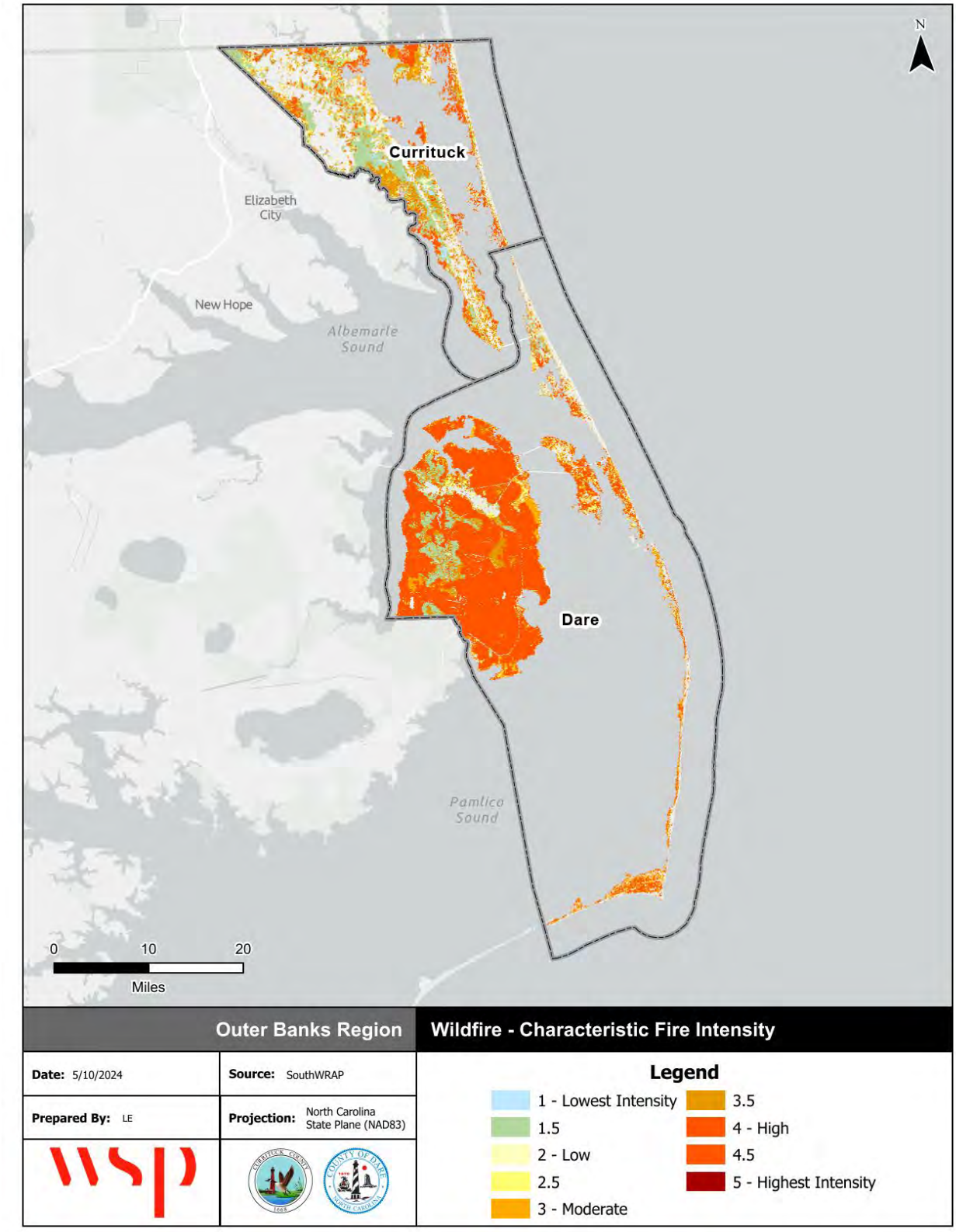
Wildfire extent can be defined by the fire's intensity and measured by the Characteristic Fire Intensity Scale, which identifies areas where significant fuel hazards which could produce dangerous fires exist. Fire Intensity ratings identify where significant fuel hazards and dangerous fire behavior potential exist based on fuels, topography, and a weighted average of four percentile weather categories. The Fire Intensity Scale consists of five classes, as defined by Southern Wildfire Risk Assessment. Figure 4.49 shows the potential fire intensity within the WUI across the Region. Maps for each town are provided in the jurisdictional annexes.

Table 4.96 – Fire Intensity Scale

Class	Description
1, Very Low	Very small, discontinuous flames, usually less than 1 foot in length; very low rate of spread; no spotting. Fires are typically easy to suppress by firefighters with basic training and non-specialized equipment.
2, Low	Small flames, usually less than two feet long; small amount of very short-range spotting possible. Fires are easy to suppress by trained firefighters with protective equipment and specialized tools.
3, Moderate	Flames up to 8 feet in length; short-range spotting is possible. Trained firefighters will find these fires difficult to suppress without support from aircraft or engines, but dozer and plows are generally effective. Increasing potential for harm or damage to life and property.
4, High	Large Flames, up to 30 feet in length; short-range spotting common; medium range spotting possible. Direct attack by trained firefighters, engines, and dozers is generally ineffective, indirect attack may be effective. Significant potential for harm or damage to life and property.
5, Very High	Very large flames up to 150 feet in length; profuse short-range spotting, frequent long-range spotting; strong fire-induced winds. Indirect attack marginally effective at the head of the fire. Great potential for harm or damage to life and property.

Source: Southern Wildfire Risk Assessment

Figure 4.49 – Characteristic Fire Intensity, Outer Banks Region



Source: Southern Wildfire Risk Assessment

Table 4.97 shows the amount and percentage of land area susceptible to each level of the fire intensity scale by acre. Over 32% of the Region is susceptible to Class 4 and 4.5 high intensity fires, which pose significant harm or damage to life and property. Another 11.6 percent of the Region may experience Class 3 fire intensities, which have potential for harm to life and property but are easier to suppress with dozer and plows. The remainder of the Region is either non-burnable (41.6%) or would face a Class 1 or Class 2 Fire Intensity, which are easily suppressed.

Impact: 2 – Limited

Table 4.97 – Fire Intensity Scale

	Class	Acres	Percent
	Non-Burnable	232,371.37	41.68%
	1 Lowest Intensity	3,394.85	0.61%
	1.5	49,148.53	8.82%
	2 Low	8,185.78	1.47%
	2.5	18,159.64	3.26%
	3 Moderate	28,402.52	5.09%
	3.5	36,432.99	6.53%
	4 High	116,802.17	20.95%
	4.5	64,638.68	11.59%
	5 Highest Intensity	0.00	0.00%
	Total	**557,536.54**	**100.00%**

Source: Southern Wildfire Risk Assessment & GIS analysis
Note: This data was adjusted from SWRA estimates to exclude 922,098 acres of water area from the non-burnable area estimate.

HISTORICAL OCCURRENCES

The North Carolina Forest Service (NCFS) began keeping records of fire occurrence on private and state-owned lands in 1928. Within the last 10 years, North Carolina has averaged nearly 4,300 fires per year and 14,000 acres burned annually.

Table 4.98 lists past occurrences of wildfire in the Outer Banks Region since 2009 as provided by the North Carolina Forest Service (NCFS) in September 2024. This data only accounts for occurrences within unincorporated areas of Currituck and Dare Counties, which fall under the NCFS jurisdiction, as well as larger events in incorporated areas where local fire departments requested NCFS support for fire suppression.

Table 4.98 – Records for Wildfire in Outer Banks, 2009-2023

Year	Number of Fires			Acreage Burned		
	Dare	Currituck	Region Total	Dare	Currituck	Region Total
2009	52	46	98	72.80	196.60	269.40
2010	43	36	79	15.10	18.20	33.30
2011	45	60	105	11.40	42.30	53.70
2012	22	24	46	315.10	6.80	321.90
2013	25	31	56	22.60	27.90	50.50
2014	9	18	27	1.90	6.40	8.30

Year	Number of Fires			Acreage Burned		
	Dare	Currituck	Region Total	Dare	Currituck	Region Total
2015	14	39	53	1.78	10.59	12.37
2016	9	31	40	255.62	15.08	270.70
2017	4	24	28	34.74	34.42	69.16
2018	3	24	27	0.05	5.38	5.43
2019	5	28	33	0.64	11.06	11.7
2020	13	27	40	3.38	39.82	43.2
2021	8	18	26	0.86	7.5	8.36
2022	10	32	42	1.37	14.16	15.53
2023	3	21	24	7.59	528.45	536.04
Total	**265**	**459**	**724**	**744.93**	**964.66**	**1,709.59**

Source: NC Forest Service

The Outer Banks Region averages 48.3 fires and 114 acres burned annually from fires that require the NCFS to respond. These numbers have changed in the last five years, with fewer fires on average but slightly more acres burned. Actual number of fires and acreage burned is likely higher because smaller fires within jurisdictional boundaries are managed by local fire departments.

The Outer Banks experienced prolonged periods of severe to extreme drought in 2011, as well as severe drought in 2008. These droughts may explain some of the annual variation in fires and acreage burned.

PROBABILITY OF FUTURE OCCURRENCE

The Southern Wildfire Risk Assessment provides a Burn Probability analysis which predicts the probability of an area burning based on landscape conditions, weather, historical ignition patterns, and historical fire prevention and suppression efforts. Burn Probability data is generated by simulating fires under different weather, fire intensity, and other conditions. Values in the Burn Probability (BP) data layer indicate, for each pixel, the number of times that cell was burned by a modeled fire, divided by the total number of annual weather scenarios simulated. The simulations are calibrated to historical fire size distributions. The Burn Probability for the Outer Banks Region is presented in Table 4.99 and illustrated in Figure 4.50. Note, maps for each local jurisdiction are provided in the jurisdictional annexes.

Table 4.99 – Burn Probability, Outer Banks Region

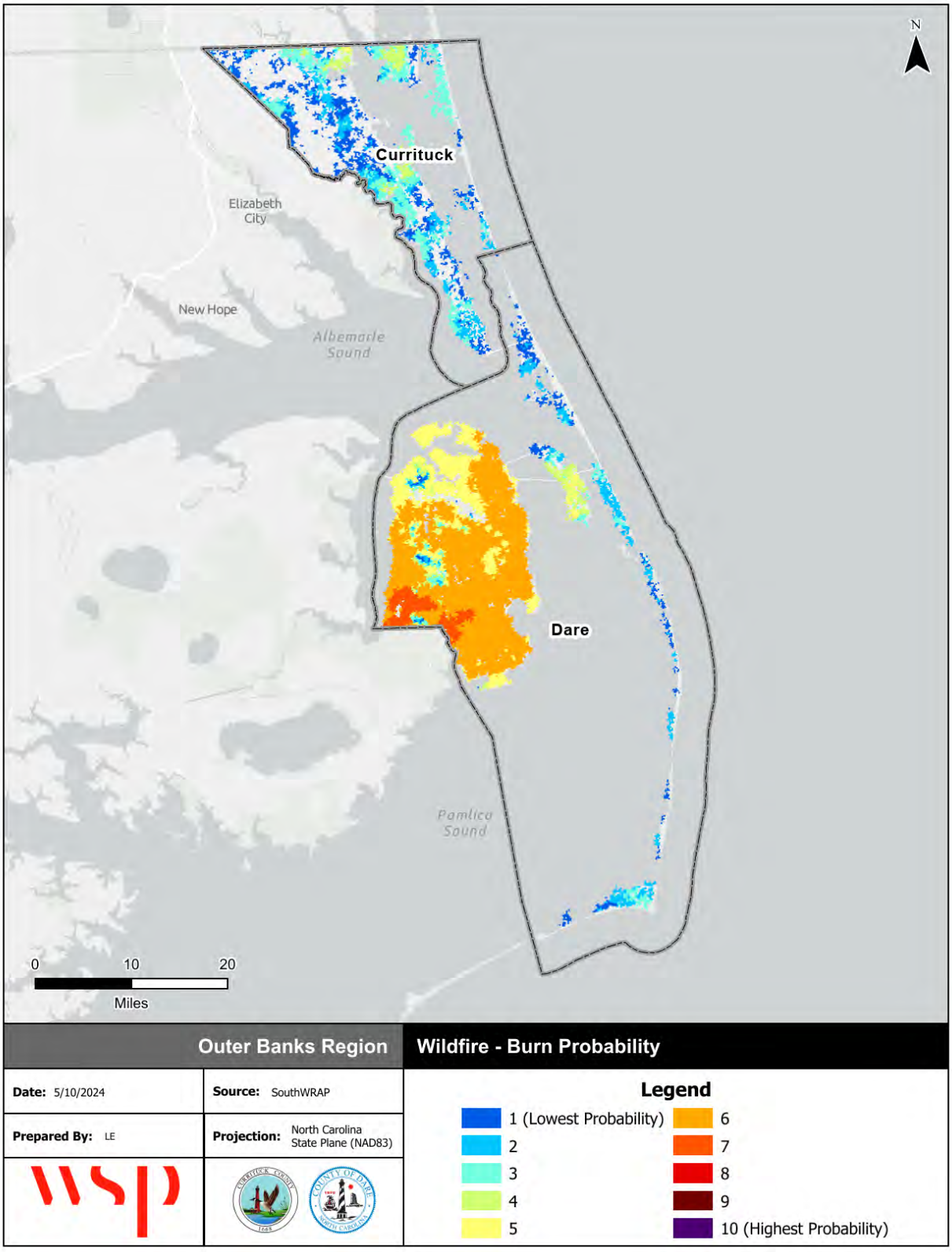
Class	Acres	Percent
1	39,597	13.2 %
2	34,427	11.4 %
3	36,877	12.3 %
4	16,664	5.5 %
5	44,065	14.7 %
6	116,721	38.8 %
7	12,340	4.1 %
8	0	0.0 %
9	0	0.0 %
10	0	0.0 %
Total	**300,691**	**100.0 %**

Source: Southern Wildfire Risk Assessment

Most of the Outer Banks region has a relatively low burn probability of 5 or less, however approximately 43 percent of the Region has a burn probability of 6 or 7. These areas of moderate to high moderate burn probability are located primarily in mainland Dare County. The probability of wildfire across the Region county is considered possible, defined as between a 1% and 10% annual chance of occurrence. While the whole area falls within this threshold, the communities containing moderate burn probability, noted above, have a comparatively higher probability of occurrence.

Probability: 2 – Possible

Figure 4.50 – Burn Probability, Outer Banks Region



Source: Southern Wildfire Risk Assessment

CLIMATE CHANGE

Wildfires are usually prevalent with a combination of high temperatures and dry conditions, combustible fuels and an ignition source. Climate change has been linked to longer, warmer and drier conditions in the southeast, exacerbating key potential conditions for a wildfire to spread. According to the Fifth National Climate Assessment, fire activity is projected to increase with further warming and reductions in precipitation creating a longer fire season across the United States.

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Population and property at risk to wildfire were estimated using data from the North Carolina Emergency Management (NCEM) IRISK database, which was compiled in NCEM's Risk Management Tool.

Within IRISK, wildfire hazard areas were determined using the Wildland Fire Susceptibility Index (WFSI). The following parameters were applied:

- Areas with a WFSI value of 0.01 – 0.05 were considered to be at moderate risk.
- Areas with a WFSI value greater than 0.05 were considered to be at high risk.
- Areas with a WFSI value less than 0.01 were considered to not be at risk.

The WFSI integrates the probability of an acre igniting and the expected final fire size based on the rate of spread in four weather percentile categories into a single measure of wildland fire susceptibility. Due to some necessary assumptions, mainly fuel homogeneity, it is not the true probability. But since all areas of the state have this value determined consistently, it allows for comparison and ordination of areas of the state as to the likelihood of an acre burning.

Critical facility exposure to wildfire was estimated using SWRA's Wildland Urban Interface Risk Index (WUIRI). The WUIRI provides a rating of the potential impact of a wildfire on people and properties. To calculate the WUIRI, SWRA combines WUI housing density data with flame length data and response functions to represent potential impacts. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact.

PEOPLE

Wildfire can cause fatalities and human health hazards. Ensuring procedures are in place for rapid warning and evacuation are essential to reducing vulnerability. Table 4.100 details the population estimated to be at risk to wildfire according to the NCEM IRISK database.

Table 4.100 – Estimated Population Impacted by Wildfire

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Currituck									
Unincorporated Currituck County	31,343	16,468	53	5,390	2,832	53	1,596	839	53

Jurisdiction	Total Population	Total Population at Risk		All Elderly Population	Elderly Population at Risk		All Children Population	Children at Risk	
		Number	Percent		Number	Percent		Number	Percent
Dare									
Unincorporated Dare County	24,369	12,567	52%	4,752	2,451	52%	1,150	593	52%
Town of Duck	1,722	441	26%	582	149	26%	53	14	26%
Town of Kill Devil Hills	7,588	1,416	19%	1,298	242	19%	260	49	19%
Town of Kitty Hawk	3,903	1,267	32%	861	280	33%	137	44	32%
Town of Manteo	1,360	799	59%	220	129	59%	80	47	59%
Town of Nags Head	3,178	777	24%	1,084	265	24%	70	17	24%
Town of Southern Shores	2,536	1,011	40%	858	342	40%	78	31	40%
Subtotal Dare	**44,656**	**18,278**	**41%**	**9655**	**3858**	**40%**	**1828**	**795**	**43%**
Region Total	**75,999**	**34,746**	**46%**	**15045**	**6690**	**44%**	**3424**	**1634**	**48%**

Source: NCEM Risk Management Tool

PROPERTY

Wildfire can cause direct property losses, including damage to buildings, vehicles, landscaped areas, agricultural lands, and livestock. Construction practices and building codes can increase fire resistance and fire safety of structures. Techniques for reducing vulnerability to wildfire include using street design to ensure accessibility to fire trucks, incorporating fire resistant materials and techniques in building construction, and using landscaping practices to reduce flammability and the ability for fire to spread.

Regarding structure vulnerability and wildfire-resistant construction techniques, a report from Headwaters Economics outlines key components of structure vulnerabilities and indicates that a new home can be built to wildfire-resistant construction standards for roughly the same cost as a typical home. The roof is the most vulnerable area of a home because of its large surface area. Embers can ignite vegetative debris that has accumulated on the roof surface or in gutters. Embers also can enter the attic through roof and under-eave vents. Exterior walls are vulnerable from exposure to flames or prolonged exposure to radiant heat, such as from burning vegetation or a neighboring home, which can ignite combustible siding. Decks and near-home landscaping are also vulnerable to embers and burning vegetation and can expose the rest of a structure if ignited.

Per Headwaters Economics, wildfire-resistant modifications to roofing, vents, fascia, soffits, and gutters add approximately 27% to the cost of the typical roof. Wildfire-resistant fiber-cement siding as compared to cedar plank siding is about 25% less expensive. Mitigation techniques to make a deck wildfire-resistant include using wildfire-resistant materials for walking surface, using foil-faced bitumen tape on the top surface of the support joists, and creating a noncombustible zone underneath the deck.

Table 4.101 details the buildings at risk to wildfire in the Outer Banks Region.

Table 4.101 – Estimated Buildings Impacted by Wildfire

Jurisdiction	All Buildings	Residential Buildings at Risk			Commercial Buildings at Risk			Public Buildings at Risk			Total Buildings at Risk		
	Num	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages	Num	% of Total	Estimated Damages
Currituck													
Currituck County	17,685	8,394	47%	$1,202,443,436	905	5%	$477,787,006	114	1%	$113,569,325	9,413	53%	$1,793,799,767
Dare													
Unincorporated Dare County	14,019	6,791	48%	$1,065,573,744	325	2%	$98,327,901	89	1%	$91,146,105	7,205	51%	$1,255,047,750
Town of Duck	2,409	594	25%	$208,013,816	27	1%	$14,783,889	2	0%	$2,375,605	623	26%	$225,173,310
Town of Kill Devil Hills	6,033	1,071	18%	$172,524,391	71	1%	$48,033,306	10	0%	$39,129,320	1,152	19%	$259,687,017
Town of Kitty Hawk	2,862	863	30%	$169,526,300	47	2%	$32,352,996	5	0%	$4,654,834	915	32%	$206,534,131
Town of Manteo	2,862	863	30%	$169,526,300	47	2%	$32,352,996	5	0%	$4,654,834	915	32%	$206,534,131
Town of Nags Head	2,862	863	30%	$169,526,300	47	2%	$32,352,996	5	0%	$4,654,834	915	32%	$206,534,131
Town of Southern Shores	943	458	49%	$114,321,743	83	9%	$49,400,268	17	2%	$49,456,777	558	59%	$213,178,787
Subtotal Dare	**54,133**	**17,794**	**33%**	**$3,636,462,218**	**986**	**2%**	**$521,205,840**	**190**	**0%**	**$320,001,028**	**18,970**	**35%**	**$4,477,669,091**
Region Total	**71,818**	**26,188**	**36%**	**$4,838,905,654**	**1,891**	**3%**	**$998,992,846**	**304**	**0%**	**$433,570,353**	**28,383**	**40%**	**$6,271,468,858**

Source: NCEM Risk Management Tool

Table 4.102 summarizes the number of critical facilities and their total value that fall within areas with moderate to high risk for wildfire impacts, defined as ratings of -5 to -9 on the WUIRI.

Table 4.102 – Critical Facility Exposure to Moderate to High Risk of Wildfire Impacts

FEMA Lifeline	Critical Facility Count	Total Structure Value
Communications	11	$2,024,450
Energy	3	$1,337,100
Food, Hydration, Shelter	53	$204,757,569
Health and Medical	11	$24,101,680
Safety and Security	56	$75,698,140
Transportation	4	$9,114,260
Water Systems	34	$11,812,020
Total	**172**	**$328,845,219**

The sectors facing the greatest risk to wildfire in the Outer Banks Region are commercial facilities, critical manufacturing, food and agriculture, government facilities, and transportation systems.

ENVIRONMENT

Wildfires have the potential to destroy forest and forage resources and damage natural habitats. Wildfire can also damage agricultural crops on private land. Wildfire is part of a natural process, however, and the environment will return to its original state in time.

CONSEQUENCE ANALYSIS

Table 4.103 summarizes the potential detrimental consequences of wildfire.

Table 4.103 – Consequence Analysis - Wildfire

Category	Consequences
Public	In addition to the potential for fatalities, wildfire and the resulting diminished air quality pose health risks, including asthma attacks and pneumonia, and can worsen chronic heart and lung diseases. Vulnerable populations include children, the elderly, people with respiratory problems or with heart disease. Even healthy citizens may experience minor symptoms, such as sore throats and itchy eyes.
Responders	Public and firefighter safety is the priority in all wildland fire management activities. Wildfires are a threat to the health and safety of the emergency services. Most fire-fighters in rural areas are 'retained'. This means that they are part-time and can be called away from their normal work to attend to fires.
Continuity of Operations (including Continued Delivery of Services)	Wildfire events can result in a loss of power which may impact operations. Downed trees, power lines and damaged road conditions may prevent access to critical facilities and/or emergency equipment.

Category	Consequences
Property, Facilities and Infrastructure	Wildfires can damage community infrastructure, including roadways, communication networks and facilities, power lines, and water distribution systems. Restoring basic services is critical. Efforts to restore roadways include the costs of maintenance and damage assessment teams, field data collection, and replacement or repair costs. Direct impacts to municipal water supply may occur through contamination of ash and debris during the fire, destruction of aboveground distribution lines, and soil erosion or debris deposits into waterways after the fire. Utilities and communications repairs are also necessary for equipment damaged by a fire. This includes power lines, transformers, cell phone towers, and phone lines.
Environment	Wildfires cause damage to the natural environment, killing vegetation and animals. The risk of floods and debris flows increases after wildfires due to the exposure of bare ground and the loss of vegetation. In addition, the secondary effects of wildfires, including erosion, landslides, introduction of invasive species, and changes in water quality, are often more disastrous than the fire itself.
Economic Condition of the Jurisdiction	Wildfires can have significant short-term and long-term effects on the local economy. Wildfires, and extreme fire danger, may reduce recreation and tourism in and near the fires. Local property values can decline. Extensive fire damage to trees can significantly alter the timber supply through a short-term surplus from timber salvage and a longer-term decline while trees regrow. Water supplies can be degraded by post-fire erosion and stream sedimentation.
Public Confidence in the Jurisdiction's Governance	Wildfire events may cause issues with public confidence because they have very visible impacts on the community. Public confidence in the jurisdiction's governance may be influenced by actions taken pre-disaster to mitigate and prepare for impacts, including the amount of public education provided; efforts to provide warning to residents; actions taken to respond to the event; and actions taken to recover from the impacts.

HAZARD SUMMARY BY JURISDICTION

The following table summarizes flood hazard risk by jurisdiction. Wildfire warning time and duration do not vary by jurisdiction. Spatial extent ratings were based on the proportion of area within the WUI; all jurisdictions have at least 50% of their area in the WUI and were assigned a rating of 3. Impact ratings were based on fire intensity data from SWRA. Jurisdictions with significant clusters of moderate to high fire intensity were assigned a rating of 3; all other jurisdictions were assigned a rating of 2. Probability ratings were determined based on burn probability data from SWRA. Jurisdictions with clusters of moderate burn probability were assigned a rating of 3; all other jurisdictions were assigned a probability of 2.

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Currituck County	2	2	3	4	3	2.5	M
Dare County	3	3	3	4	3	3.1	H
Duck	2	2	3	4	3	2.5	M
Kill Devil Hills	2	2	3	4	3	2.5	M
Kitty Hawk	2	2	3	4	3	2.5	M

Jurisdiction	Probability	Impact	Spatial Extent	Warning Time	Duration	Score	Priority
Manteo	2	3	3	4	3	2.8	M
Nags Head	2	2	3	4	3	2.5	M
Southern Shores	2	2	4	4	3	2.7	M

4.5.9 HAZARDOUS SUBSTANCES

HAZARD BACKGROUND

Generally, a hazardous material is a substance or combination of substances which, because of quantity, concentration, or physical, chemical, or infectious characteristics, may either cause or significantly contribute to an increase in mortality or serious illness. Hazardous materials may also pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed. Hazardous material incidents can occur while a hazardous substance is stored at a fixed facility, or while the substance is being transported along a road corridor or railroad line or via an enclosed pipeline or other linear infrastructure.

The U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) all have responsibilities relating to the transportation, storage, and use of hazardous materials and waste. The EPA's Toxic Release Inventory (TRI), is a primary source of information on the use and storage of hazardous materials, as well as data regarding spills and releases.

Hazardous materials are typically divided into the following classes:

- Explosives
- Compressed gases: flammable, non-flammable compressed, poisonous
- Flammable or combustible liquids
- Flammable solids: spontaneously combustible, dangerous when wet
- Oxidizers and organic peroxides
- Toxic materials: poisonous material, infectious agents
- Radioactive material
- Corrosive material: destruction of human skin, corrodes steel

It is common to see hazardous materials releases as escalating incidents resulting from other hazards such as floods, wildfires, and earthquakes that may cause containment systems to fail or affect transportation infrastructure. The release of hazardous materials can greatly complicate or even eclipse the response to the natural hazards disaster that caused the spill.

FIXED HAZARDOUS MATERIALS INCIDENT

A fixed hazardous materials incident is the accidental release of chemical substances or mixtures during production or handling at a fixed facility. While these incidents can sometimes involve large quantities of materials, their locations can be more easily predicted and monitored.

TRANSPORTATION HAZARDOUS MATERIALS INCIDENT

A transportation hazardous materials incident is the accidental release of chemical substances or mixtures during transport. Transportation hazardous materials incidents can occur during highway or air transport. Highway accidents involving hazardous materials pose a great potential for public exposures. Both nearby populations and motorists can be impacted and become exposed by accidents and releases. If airplanes carrying hazardous cargo crash or otherwise leak contaminated cargo, populations and the environment in the impacted area can become exposed.

PIPELINE INCIDENT

A pipeline transportation incident occurs when a break in a pipeline creates the potential for an explosion or leak of a dangerous substance (oil, gas, etc.) possibly requiring evacuation. An underground pipeline incident can be caused by environmental disruption, accidental damage, or sabotage. Incidents can range from a small, slow leak to a large rupture where an explosion is possible. Inspection and maintenance of the pipeline system along with marked gas line locations and an early warning and response procedure can lessen the risk to those near the pipelines.

Warning Time Score: 4 – Less than six hours

Duration Score: 2 – Less than 24 hours

LOCATION

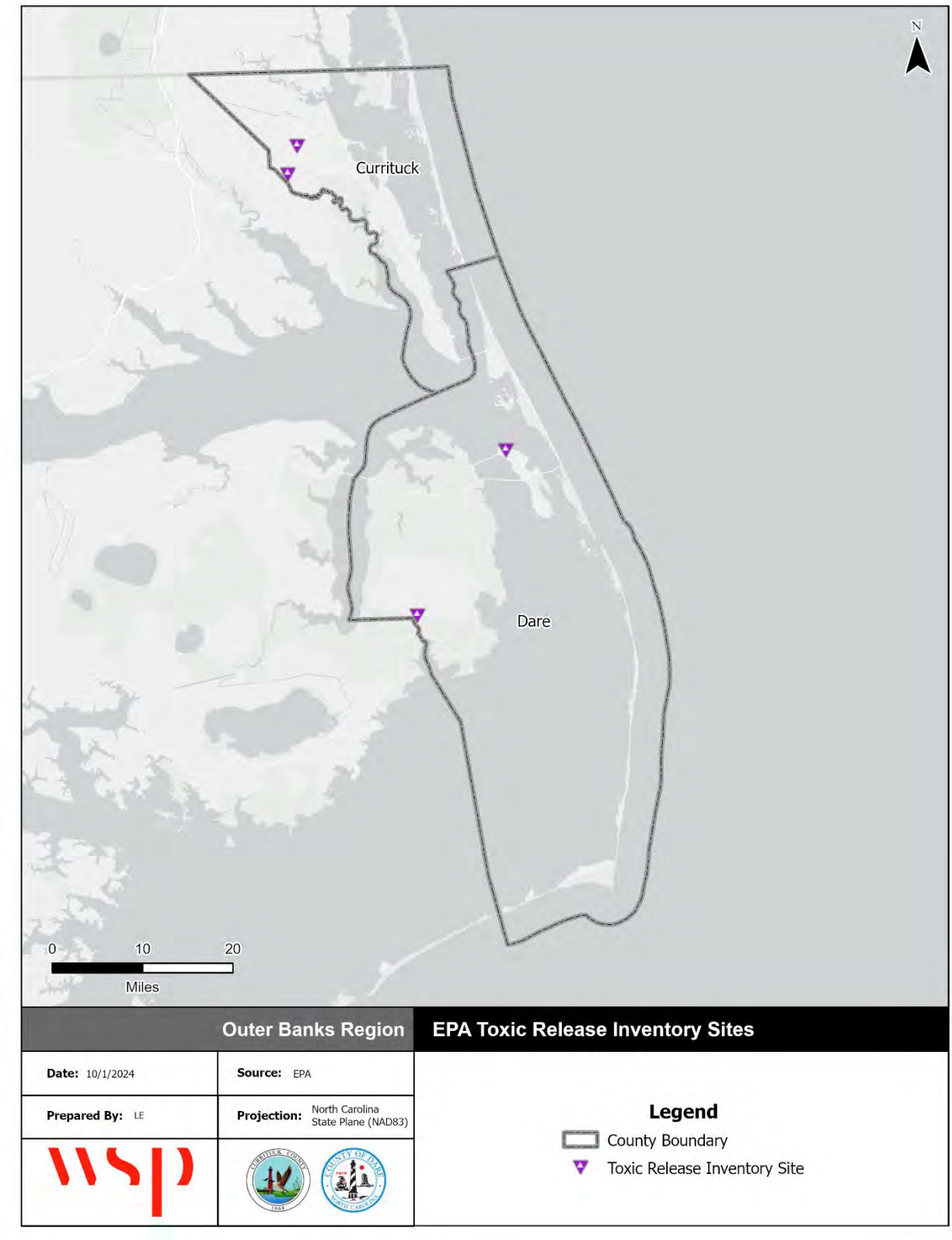
The Toxic Release Inventory (TRI) Program run by the U.S. Environmental Protection Agency (EPA) maintains a database of industrial facilities across the country and the type and quantity of toxic chemicals they release. The program also tracks pollution prevention activities and which facilities are reducing toxic releases. The Toxic Release Inventory reports four sites with hazardous materials in the planning area, two in Currituck County and two in Dare County. These sites are shown in Figure 4.51 and detailed in Table 4.104 below.

Table 4.104 – Toxic Release Inventory Sites

Facility Name	County	Chemicals Reported	Most Recent Release
Tidewater Agricorp Central Fertilizer	Currituck	Ammonium Sulfate, Ammonia, Phosphoric Acid	1988
W S Clark & Sons Inc	Currituck	Ammonia, Phosphoric Acid	1990
Us Air Force Dare County Bomb Range	Dare	Lead	2023
Us Natl Park Service Cape Hatteras Natl Seashore (Caha)	Dare	Lead	2018

Source: US EPA

Figure 4.51 – Toxic Release Inventory Sites in the Planning Area



Source: EPA Toxic Release Inventory

In transit, hazardous materials generally follow major transportation routes, including road, rail and pipelines, creating a risk area immediately adjacent to these routes. In 2021, the Outer Banks Local Emergency Planning Committee (LEPC) commissioned a Joint Hazardous Materials Commodity Flow Study to better understand and plan for exposure risks associated with the transport of hazardous materials. There are no designated or restricted hazardous materials routes in the planning area; all the area's roads have the potential for hazardous material incidents, particularly state and U.S. highways. The 2021 Hazardous Materials Commodity Flow Study identified these primary transportation routes as planning priorities:

- US 158 At NC 12
- US 158 at NC 168
- NC 168 at NC 34
- NC 168 at VA Border
- US 64 at US 264
- US 64 at NC 12

Railroad lines may also transport hazardous materials. Rail is limited in the planning area, with only one freight line, a segment of the Chesapeake & Albemarle Railway, that passes through northwestern Currituck County from Virginia to Camden County, running mostly parallel to NC 168. Per the 2021 Hazardous Materials Commodity Flow Study, the Chesapeake & Albemarle Railway does not transport hazardous materials.

Figure 4.52 shows the major transportation routes through the planning area.

Both Dare and Currituck County also have regional airports, which have Jet A fuel and 100LL fuel stored in large quantities.

Additionally, waterway traffic poses a risk for hazardous materials release. Commodity transport may occur in the Intracoastal Waterway, but no data is available. The Hatteras to Ocracoke ferry transports tanker trucks and vessels carrying large quantities of gasoline, diesel fuel, LP gas, and similar substances. Other near-shore or off-shore shipping accidents could result in hazardous materials releases affecting the region.

The U.S. Department of Transportation (USDOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) maintains an inventory of the location of all gas transmission and hazardous liquid pipelines as well as liquid natural gas plants and hazardous liquid breakout tanks. The location of pipelines, pipeline infrastructure, and past pipeline incidents in the planning area are shown by county in Figure 4.53 and Figure 4.54, as reported in the public viewer of the National Pipeline Mapping System.

Spatial Extent: 1 – Negligible

Figure 4.52 – Key Transportation Routes in the Planning Area

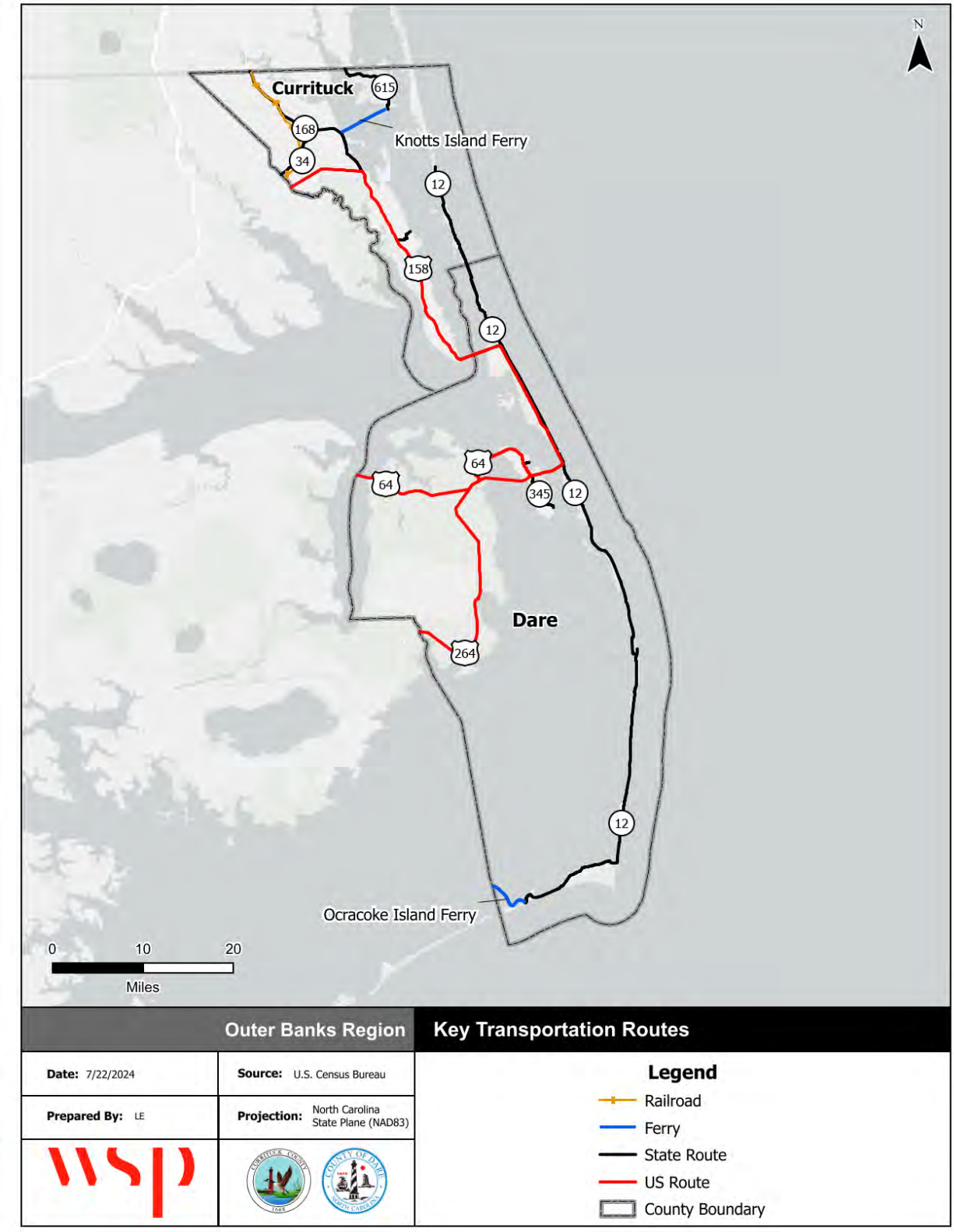
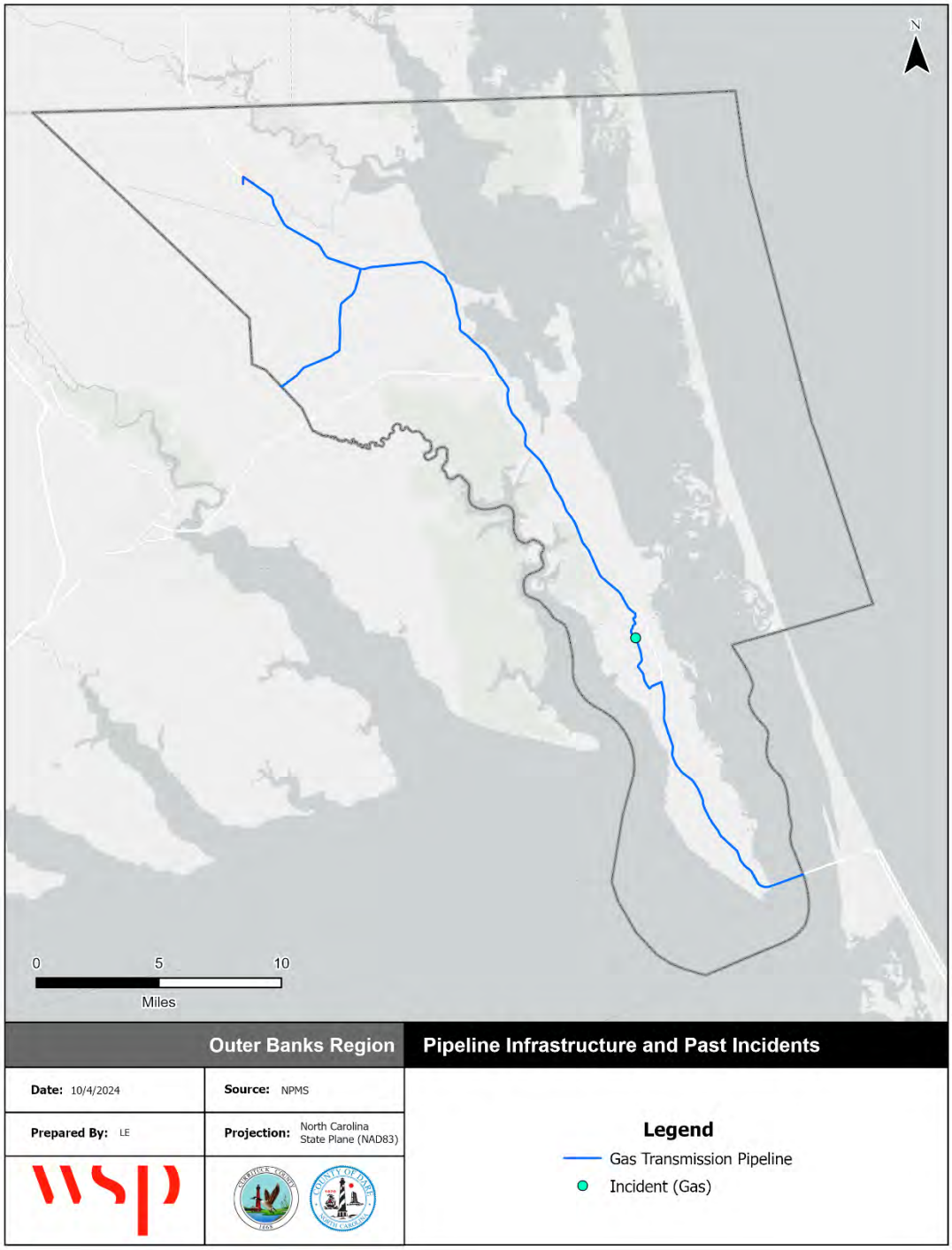
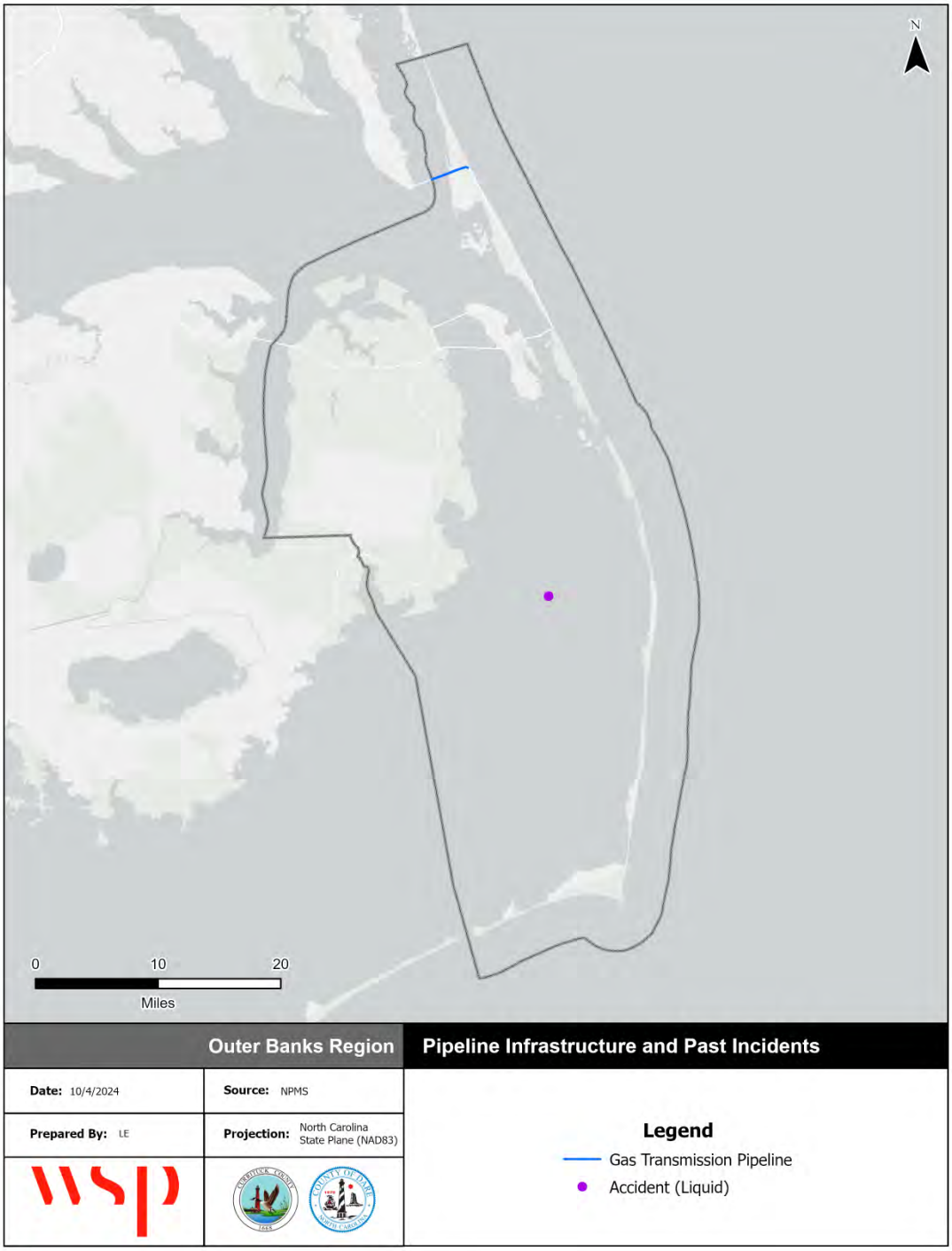


Figure 4.53 – Pipelines, Pipeline Infrastructure, and Past Incident Locations in Currituck County



Source: US Department of Transportation, Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System

Figure 4.54 – Pipelines, Pipeline Infrastructure, and Past Incident Locations in Dare County



Source: US Department of Transportation, Pipeline and Hazardous Materials Safety Administration, National Pipeline Mapping System

EXTENT

The magnitude of a hazardous materials incident can be defined by the material type, the amount released, and the location of the release. The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (PHMSA), which records hazardous material incidents across the country, defines a "serious incident" as a hazardous materials incident that involves:

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

The release or spill of hazardous materials can also require different emergency responses depending on the amount, type, and location of the spill incident. Potential losses can vary greatly for hazardous material incidents. For even a small incident, there are cleanup and disposal costs. In a larger scale incident, cleanup can be extensive and protracted. There can be deaths or injuries requiring doctor's visits and hospitalization, disabling chronic injuries, soil and water contamination can occur, necessitating costly remediation. Evacuations can disrupt home and business activities. Large-scale incidents can easily reach $1 million or more in direct damages, with clean-ups that can last for years.

Impact: 1 – Minor

HISTORICAL OCCURRENCES

The USDOT's PHMSA maintains a database of reported hazardous materials incidents since 1989. According to PHSMA records, there were 8 recorded releases in the Outer Banks Region from 1990 to 2023. These releases are listed in Table 4.105. Of these events, two were flagged as serious incidents. In total, these events caused an estimated $316,891 in damages.

Table 4.105 - PHMSA Recorded Hazardous Materials Incidents, 1990-2023

Report Number	Date	Hazard Class	Mode of Transportation	Causes of Failure	Total Damages	Serious?
I-1991060964	6/9/1991	2	Highway		$950	No
I-1998010879	12/13/1997	2	Highway	Loose Closure, Component, or Device	$10	No
I-2000050259	4/28/2000	3	Highway	Loose Closure, Component, or Device	$100	No
I-2003060990	5/22/2003	3	Highway	Rollover Accident; Vehicular Crash or Accident Damage	$311,625	Yes
I-2004041265	4/14/2004	3	Highway		$206	No
E-2009060055	5/6/2009	2.1	Highway	Corrosion - Exterior	$4,000	No
I-2011060083	5/24/2011		Air	Valve Open	$0	No
E-2016100250	9/26/2016	2.1	Highway	Corrosion - Exterior	$0	Yes

Source: PHMSA Incident Reports, Office of Hazardous Materials Safety, Incident Reports Database Search

The most common materials spilled in the planning area are Class 2 (Gases) and Class 3 (Flammable Combustible Liquids). Figure 4.55 describes all nine hazard classes.

Figure 4.55 - Hazardous Materials Classes

Source: U.S. Department of Transportation

The incidents and accidents mapped by PHMSA include a spill of 0.95 bbls of diesel fuel in 2004 in Dare County and a natural gas release in 2010 in Currituck County. Neither event caused any injuries or fatalities.

In addition to these events, in September 2023 Cape Hatteras National Seashore closed beach areas in Buxton after erosion uncovered a Formerly Used Defense Sites (FUDS) used by the Navy and Coast Guard, which resulted in the release of unknown hazardous materials. Cape Hatteras National Seashore staff reported petroleum odors and sheen on the ocean water. Samples from the area tested positive for petroleum-contaminated soils. The beach remains closed until it can be remediated.

The HMPC noted that there are several other FUDS in the region which could pose similar risks.

PROBABILITY OF FUTURE OCCURRENCE

Based on historical occurrences, there have been two serious incidents of hazardous materials releases in the 34-year period from 1990 through 2023. Based on this historical data, there is a 6% annual chance of the planning area experiencing a damaging hazardous materials incident.

Probability: 2 – Possible

VULNERABILITY ASSESSMENT

The impacts of a hazardous materials incident vary based on the type and quantity of material released, as well as the location, time of day, and weather conditions.

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to hazardous materials incidents was assessed based on past occurrences in the region and nationally and the known behavior of these materials.

PEOPLE

Hazardous materials incidents can cause injuries, hospitalizations, and even fatalities to people nearby. People living near hazardous facilities and along transportation routes may be at a higher risk of exposure, particularly those living or working downstream and downwind from such facilities. For example, a toxic spill or a release of an airborne chemical near a populated area can lead to significant evacuations and have a high potential for loss of life. Individuals working with or transporting hazardous materials are also at heightened risk.

In addition to the immediate health impacts of releases, a handful of studies have found long term health impacts such as increased incidence of certain cancers and birth defects among people living near certain chemical facilities. However there has not been sufficient research done on the subject to allow detailed analysis.

The primary economic impact of hazardous material incidents results from lost business, delayed deliveries, property damage, and potential contamination. Large and publicized hazardous material-related events can deter tourists and could potentially discourage residents and businesses. Economic effects from major transportation corridor closures can be significant.

PROPERTY

The impact of a fixed hazardous facility, such as a chemical processing facility is typically localized to the property where the incident occurs. The impact of a small spill (i.e. liquid spill) may also be limited to the extent of the spill and remediated if needed. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to property.

Impacts of hazardous material incidents on critical facilities are most often limited to the area or facility where they occurred, such as at a transit station, airport, fire station, hospital, or railroad. However, they can cause long-term traffic delays and road closures resulting in major delays in the movement of goods and services. These impacts can spread beyond the planning area to affect neighboring counties, or vice-versa. While cleanup costs from major spills can be significant, they do not typically cause significant long-term impacts to critical facilities.

ENVIRONMENT

Hazardous material incidents may affect a small area at a regulated facility or cover a large area outside such a facility. Widespread effects occur when hazards contaminate the groundwater and eventually the municipal water supply, or they migrate to a major waterway or aquifer. Impacts on wildlife and natural resources can also be significant.

CONSEQUENCE ANALYSIS

Table 4.106 summarizes the potential detrimental consequences of hazardous materials incident.

Table 4.106 – Consequence Analysis - Hazardous Materials Incident

Category	Consequences
Public	Contact with hazardous materials could cause serious illness or death. Those living and working closest to hazardous materials sites face the greatest risk of exposure. Exposure may also occur through contamination of food or water supplies.

Category	Consequences
Responders	Responders face similar risks as the general public but a heightened potential for exposure to hazardous materials.
Continuity of Operations (including Continued Delivery of Services)	A hazardous materials incident may cause temporary road closures or other localized impacts but is unlikely to affect continuity of operations.
Property, Facilities and Infrastructure	Some hazardous materials are flammable, explosive, and/or corrosive, which could result in structural damages to property. Impacts would be highly localized.
Environment	Consequences depend on the type of material released. Possible ecological impacts include loss of wildlife, loss of habitat, and degradation of air and/or water quality.
Economic Condition of the Jurisdiction	Clean up, remediation, and/or litigation costs may apply. Long-term economic damage is unlikely.
Public Confidence in the Jurisdiction's Governance	A hazardous materials incident may affect public confidence if the environmental or health impacts are enduring.

4.5.10 RADIOLOGICAL EMERGENCY

HAZARD BACKGROUND

A radiological incident is an occurrence resulting in the release of radiological material at a fixed facility (such as power plants, hospitals, laboratories, etc.) or in transit.

Radiological incidents related to transportation are described as an incident resulting in a release of radioactive material during transportation. Transportation of radioactive materials through North Carolina over the interstate highway system is considered a radiological hazard. The transportation of radioactive material by any means of transport is licensed and regulated by the federal government. As a rule, there are two categories of radioactive materials that are shipped over the interstate highways:

- Low level waste consists of primarily of materials that have been contaminated by low level radioactive substances but pose no serious threat except through long-term exposure. These materials are shipped in sealed drums within placarded trailers. The danger to the public is no more than a wide array of other hazardous materials.
- High level waste, usually in the form of spent fuel from nuclear power plants, is transported in specially constructed casks that are built to withstand a direct hit from a locomotive.

Radiological emergencies at nuclear power plants are divided into classifications. Table 4.107 shows these classifications, as well as descriptions of each.

Table 4.107 – Radiological Emergency Classifications

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

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

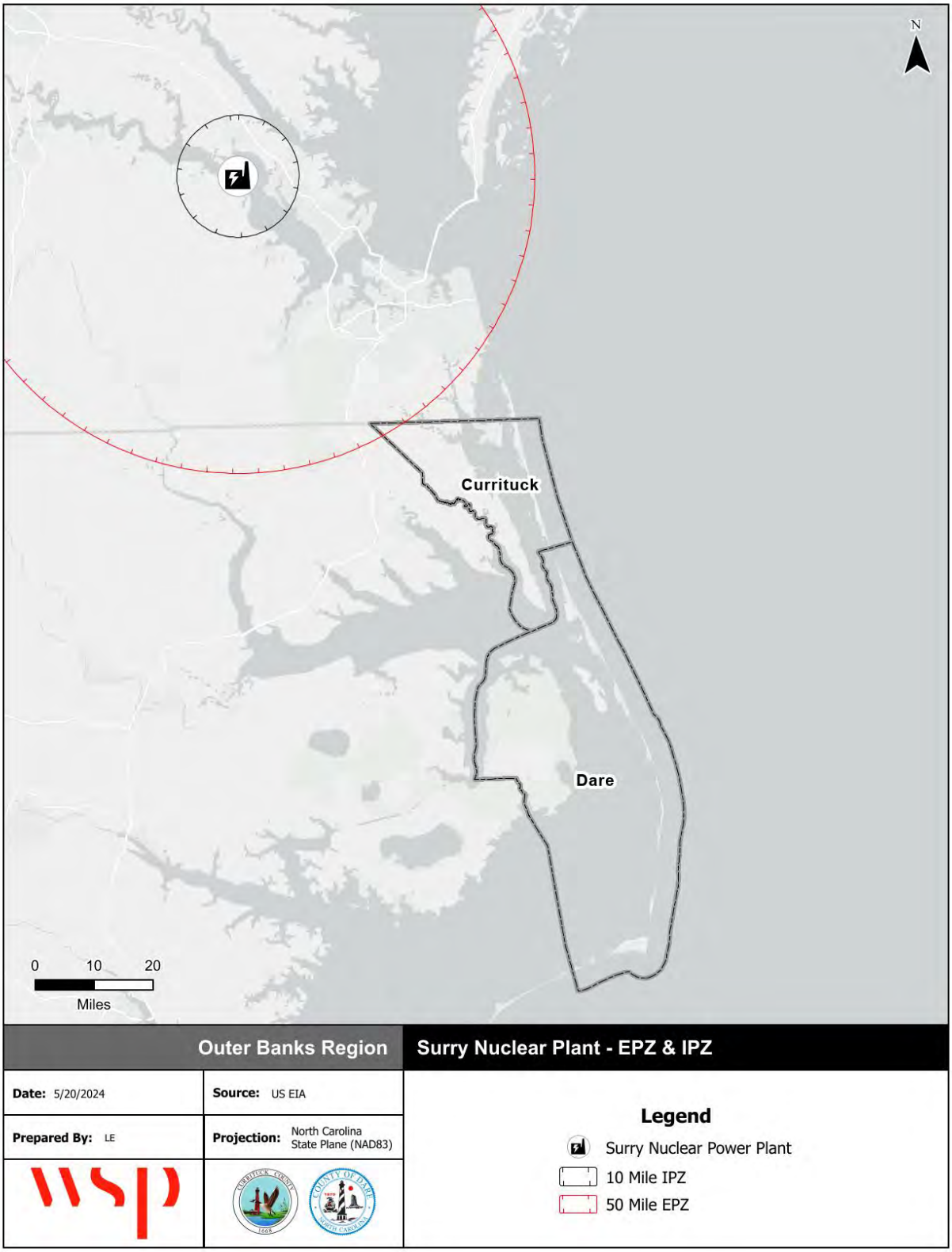
The Nuclear Regulatory Commission defines two emergency planning zones around nuclear plants:

- **Emergency Planning Zone (EPZ)** – The EPZ is a 10-mile radius around nuclear facilities. It is also known as the Plume Exposure Pathway. Areas located within this zone are considered to be at highest risk of exposure to radioactive materials. Within this zone, the primary concern is exposure to and inhalation of radioactive contamination. Predetermined action plans within the EPZ are designed to avoid or reduce dose from such exposure. Residents within this zone would be expected to evacuate in the event of an emergency. Other actions such as sheltering, evacuation, and the use of potassium-iodide must be taken to avoid or reduce exposure in the event of a nuclear incident.
- **Ingestion Pathway Zone (IPZ)** – The IPZ is delineated by a 50-mile radius around nuclear facilities as defined by the federal government. Also known as the Ingestion Exposure Pathway, the IPZ has been designated to mitigate contamination in the human food change resulting from a radiological accident at a nuclear power facility. Contamination to fresh produce, water supplies, and other food products may occur when radionuclides are deposited on surfaces.

The Surry Power Station is located in Surry, Virginia, about 17 miles away from Newport News. Its license of operation was issued in 1972 and is currently operating under a renewed license until 2032. The plant generates enough power for 420,000 homes. Northern Currituck County is located within the IPZ for this plant and could see impacts if there were a failure at the plant. Figure 4.56 shows the location of Surry Power Station and the area that falls within the EPZ and IPZ of the plant.

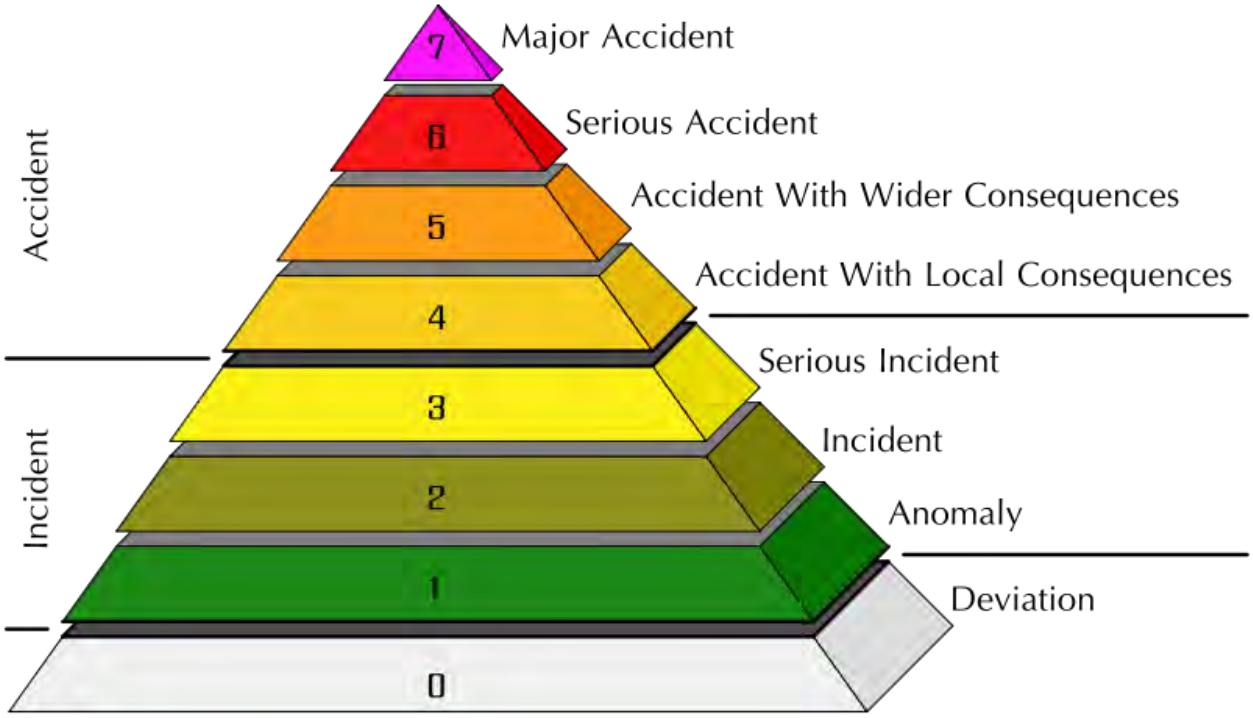
Spatial Extent: 1 – Negligible

Figure 4.56- Surry Power Station Location



EXTENT

The International Atomic Energy Association (IAEA) developed the International Nuclear and Radiological Event Scale to quantify the magnitude of radiological events. This scale is logarithmic, meaning each increasing level represents a 10-fold increase in severity compared to the previous level.



Source: International Atomic Energy Association

Impact: 2 – Limited

HISTORICAL OCCURRENCES

As reported in the 2018 State Hazard Mitigation Plan, there have been no major release events in North Carolina nuclear facilities; there was one situation in 2008 where the nuclear material was being monitored for criticality that occurred within the fuel rod fabrication facility.

On April 16, 2011, a tornado touched down in the switchyard of the Surry Nuclear Power Plant, cutting off external power to the plant. Both units of Surry NPP automatically shut down after losing offsite power. Because of loss of offsite power diesel generators started to supply units emergency loads for shutdown and cooling of the plant. Soon after loss of offsite power, the Surry NPP operator notified NRC of the situation and NRC declared an unusual event, the lowest of the four NRC emergency classification levels.

On August 23rd, 2011, an earthquake occurred in central Virginia. Dominion Energy's North Anna reactors automatically shut down. The earthquake was felt at the Surry Power Station, but not as strongly. Dominion Energy declared a Notification of Unusual Event but exited it later the same day. The station was built to seismic standards appropriate for the region.

PROBABILITY OF FUTURE OCCURRENCE

Radiological hazards are highly unpredictable. Nuclear reactors present the possibility of catastrophic damages, yet the industry is highly regulated and historical precedence suggests an incident is unlikely.

Probability: 1 – Unlikely

CLIMATE CHANGE

Climate change is not projected to have any impact on a potential radiological incident.

VULNERABILITY ASSESSMENT

PEOPLE

People within the 50-mile IPZ are at risk of exposure through ingestion of contaminated food and water. Part of northwestern Currituck County is located within a 50-mile radius, or within the Ingestion Pathway Zone (IPZ), of Surry Power Station. High exposure to radiation can cause serious illness or death, but such exposure is unlikely in Currituck County.

PROPERTY

A radiological incident could cause severe damage to the power station itself but would not cause direct property damage outside the station. However, property values could drop substantially if a radiological incident resulted in contamination of nearby areas.

ENVIRONMENT

A radiological incident could result in the spread of radioactive material into the environment, which could contaminate water and food sources and harm animal and plant life.

CONSEQUENCE ANALYSIS

Table 4.108 summarizes the potential detrimental consequences of radiological incident.

Table 4.108 – Consequence Analysis - Radiological Incident

Category	Consequences
Public	People living in Currituck County could be exposed to contaminated food or water after a major incident, but such an incident is unlikely.
Responders	Responders could face potential for heightened exposure to radiation, which could cause severe chronic illness and death.
Continuity of Operations (including Continued Delivery of Services)	An incident at the nuclear station could interrupt power generation and cause power shortages. Regular operations would likely be affected by the response effort an event would require.
Property, Facilities and Infrastructure	Property and facilities in the Outer Banks would not be directly affected by contamination.
Environment	Water supply, crops, and livestock within 50 miles of the nuclear station could be contaminated by radioactive material in the event of a major incident.
Economic Condition of the Jurisdiction	The local economy could be affected if a radiological incident caused contamination of nearby areas. Property values and tourism could decline.
Public Confidence in the Jurisdiction's Governance	A radiological incident would likely cause severe loss of public confidence given that the hazard is human-caused and highly regulated. Public confidence can also be affected by false alarms.

4.5.11 CYBER THREAT

HAZARD BACKGROUND

The State of North Carolina Hazard Mitigation Plan defines cyber-attacks as "deliberate attacks on information technology systems in an attempt to gain illegal access to a computer, or purposely cause damage." Cyber-attacks use malicious code to alter computer operations or data. The vulnerability of computer systems to attacks is a growing concern as people and institutions become more dependent upon networked technologies. The Federal Bureau of Investigation (FBI) reports that "cyber intrusions are becoming more commonplace, more dangerous, and more sophisticated," with implications for private- and public-sector networks.

There are many types of cyber-attacks. Among the most common is a direct denial of service, or DDoS attack. This is when a server or website will be queried or pinged rapidly with information requests, overloading the system and causing it to crash.

Malware, or malicious software, can cause numerous problems once on a computer or network, from taking control of users' machines to discreetly sending out confidential information. Ransomware is a specific type of malware that blocks access to digital files and demands a payment to release them. Hospitals, school districts, state and local governments, law enforcement agencies, businesses, and even individuals can be targeted by ransomware.

Cyber spying or espionage is the act of illicitly obtaining intellectual property, government secrets, or other confidential digital information, and often is associated with attacks carried out by professional agents working on behalf of a foreign government or corporation. According to cybersecurity firm Symantec, in 2016 "…the world of cyber espionage experienced a notable shift towards more overt activity, designed to destabilize and disrupt targeted organizations and countries."

Major data breaches - when hackers gain access to large amounts of personal, sensitive, or confidential information - have become increasingly common. The Symantec report says more than seven billion identities have been exposed in data breaches over the last eight years. In addition to networked systems, data breaches can occur due to the mishandling of external drives, as has been the case with losses of some state employee data.

Cyber-crime can refer to any of the above incidents when motivated primarily by financial gain or other criminal intent.

The most severe type of attack is cyber terrorism, which aims to disrupt or damage systems in order to cause fear, injury, and loss to advance a political agenda.

The North Carolina State Bureau of investigation' Computer Crime Unit helps law enforcement across North Carolina solve sophisticated crimes involving digital evidence.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

Cyber disruption events can occur and/or impact virtually any location in the state where computing devices are used. Incidents may involve a single location or multiple geographic areas. A disruption can have far-reaching effects beyond the location of the targeted system; disruptions that occur far outside the region can still impact people, businesses, and institutions within the region.

Spatial Extent: 2 – Small

EXTENT

The extent or magnitude/severity of a cyber disruption event is variable depending on the nature of the event. There is no universally accepted scale to quantify the severity of cyber-attacks. The strength of a DDoS attack is sometimes explained in terms of a data transmission rate. One of the largest DDoS disruptions ever, which brought down some of the internet's most popular sites on October 21, 2016, peaked at 1.2 terabytes per second. Data breaches are often described in terms of the number of records or identities exposed.

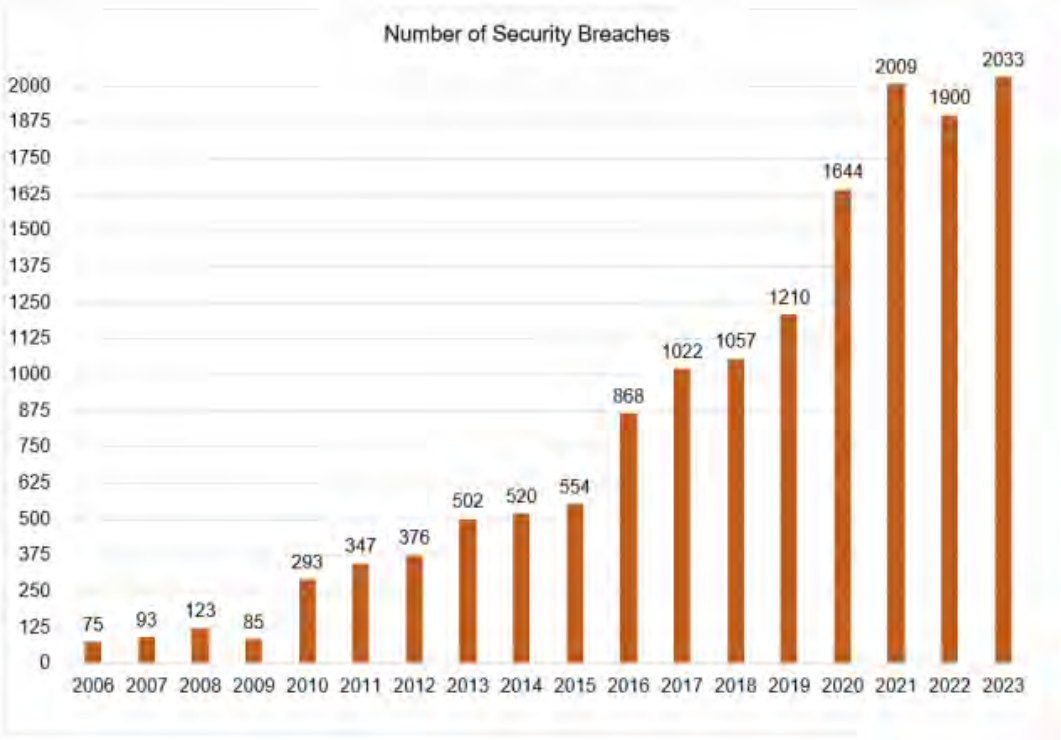
A disruption affecting a small, isolated system could impact only a few functions/processes. Disruptions of large, integrated systems could impact many functions/processes, as well as many individuals that rely on those systems. Ransomware attacks are a particular concern as they can shut down government operations for long periods of time and can interrupt delivery of critical services. For that reason, the HMPC assigned cyber attack an impact rating of critical.

Impact: 3 – Critical

HISTORICAL OCCURRENCES

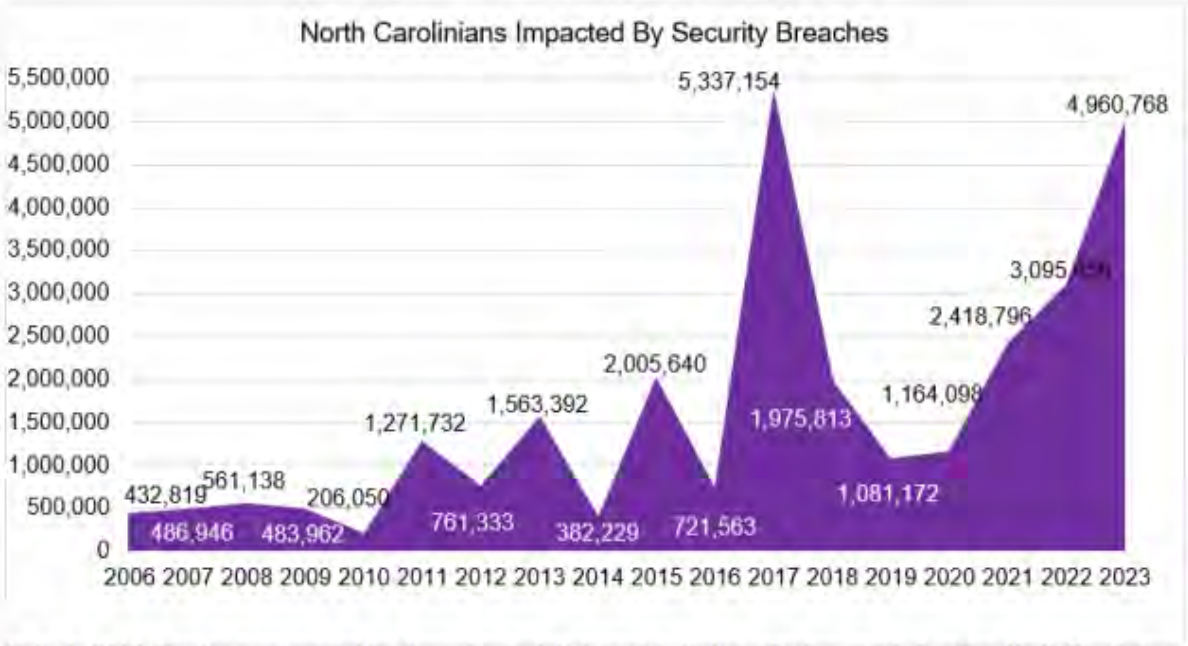
In North Carolina, businesses and organizations that experience data breaches are required to report the breach and the information that was compromised to the NC Department of Justice (DOJ). In 2023, the DOJ received 2,033 data breach notices from organizations according to their annual Data Breach Report. These breaches impacted more than 4.9 million North Carolinians – the second highest number of people impacted in a single year. Additionally, in 2023, hacking-related breaches were at a record high, causing 80 percent of all reported breaches. The report noted that most security breaches impacted general businesses (50%), healthcare industries (14%), and financial services/insurance (23%). It is common for these types of industries to collect many kinds of personal information, making them prime targets for hacking. Figure 4.57 and Figure 4.58 show the findings from the DOJ Annual Data Breach Report.

Figure 4.57 - Number of Security Breaches in North Carolina



Source: North Carolina Department of Justice

Figure 4.58 - North Carolinians Impacted by Security Breaches



Note: In 2017, Equifax experienced the largest-ever data breach in history affecting nearly 5 million North Carolinians, resulting in a high number of people having their information compromised that year.

Source: North Carolina Department of Justice

The Privacy Rights Clearinghouse, a nonprofit organization based in San Diego, maintains a timeline of 17,552 unique data breaches resulting from computer hacking incidents in the United States from 2002-2023. The database lists 359 data breaches on file in North Carolina, totaling 16,588,348 records breached since 2005. In September of 2016, The Outer Banks Hospital reported a breach where 943 records were impacted. While the majority of those breaches were not specifically targeted at the Outer Banks Region, some of them almost certainly included information on individuals who live in the region. Similarly, some Outer Banks residents were almost certainly affected by national and international data breaches.

PROBABILITY OF FUTURE OCCURRENCE

Cyber-attacks occur daily, but most have negligible impacts at the regional level. The possibility of a larger disruption affecting the region exists at all times, but it is difficult to quantify the exact probability due to such highly variable factors as the type of attack and intent of the attacker. Minor attacks against business and government systems have become a commonplace occurrence but are usually stopped with minimal impact. Similarly, data breaches impacting the information of residents of the Outer Banks Region are almost certain to happen in coming years. Major attacks or breaches specifically targeting systems in the region are less likely but cannot be ruled out.

Probability: 2 – Possible

VULNERABILITY ASSESSMENT

As discussed above, the impacts from a cyber-attack vary greatly depending on the nature, severity, and success of the attack.

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to cyber-attacks was assessed based on past occurrences nationally and internationally as well as publicly available information on these vulnerabilities.

PEOPLE

Cyber-attacks can have a significant cumulative economic impact. According to the Internet Crime Complaint Center run by the Federal Bureau of Investigation, the U.S. experienced a loss of $27.6 billion between the years 2018 to 2022. A major cyber-attack has the potential to undermine public confidence and build doubt in their government's ability to protect them from harm.

Injuries or fatalities from cyber-attacks would generally only be possible from a major cyber terrorist attack against critical infrastructure.

PROPERTY

Short of a major cyber terrorist attacks against critical infrastructure, property damage from cyber-attacks is typically limited to computer systems.

ENVIRONMENT

Short of a major cyber terrorist attacks against critical infrastructure, property damage from cyber-attacks is typically limited to computer systems. A major cyber terrorism attack could potentially impact the environment by triggering a release of a hazardous materials, or by causing an accident involving hazardous materials by disrupting traffic-control devices.

CONSEQUENCE ANALYSIS

Table 4.109 summarizes the potential consequences of a cyber threat.

Table 4.109 – Consequence Analysis - Cyber Threat

Category	Consequences
Public	Cyber-attacks can impact personal data and accounts. Injuries or fatalities could potentially result from a major cyber terrorist attacks against critical infrastructure.
Responders	Cyber-attacks can impact personal data and accounts. Injuries or fatalities could potentially result from a major cyber terrorist attacks against critical infrastructure.
Continuity of Operations (including Continued Delivery of Services)	Agencies that rely on electronic backup of critical files are vulnerable. The delivery of services can be impacted since governments rely, to a great extent, upon electronic delivery of services.
Property, Facilities and Infrastructure	Rare. Most attacks affect only data and computer systems. Sabotage of utilities and infrastructure from a major cyber terrorist attacks could potentially result in system failures that damage property on a scale equal with natural disasters. Facilities and infrastructure may become unusable as a result of a cyber-attack.
Environment	Rare. A major attack could theoretically result in a hazardous materials release.

Category	Consequences
Economic Condition of the Jurisdiction	Could greatly affect the economy. In an electronic-based commerce society, any disruption to daily activities can have disastrous impacts to the economy. It is difficult to measure the true extent of the impact.
Public Confidence in the Jurisdiction's Governance	The government's inability to protect critical systems or confidential personal data could impact public confidence. An attack could raise questions regarding the security of using electronic systems for government services.

4.5.12 TERRORISM

HAZARD BACKGROUND

There is no universal globally agreed-upon definition of terrorism. In a broad sense, terrorism is the use of violence and threats to intimidate or coerce, especially against civilians, in the pursuit of political aims.

For this analysis, this hazard encompasses the following sub-hazards: enemy attack, biological terrorism, agro-terrorism, chemical terrorism, conventional terrorism, cyber terrorism, radiological terrorism and public disorder. These hazards can occur anywhere and demonstrate unlawful force, violence, and/or threat against persons or property causing intentional harm for purposes of intimidation, coercion or ransom in violation of the criminal laws of the United States. These actions may cause massive destruction and/or extensive casualties. The threat of terrorism, both international and domestic, is ever present, and an attack can occur when least expected.

Enemy attack is an incident that could cause massive destruction and extensive casualties throughout the world. Some areas could experience direct weapons' effects: blast and heat; others could experience indirect weapons' effect. International political and military activities of other nations are closely monitored by the federal government and the State of North Carolina would be notified of any escalating military threats.

Use of conventional weapons and explosives against persons or property in violation of the criminal laws of the United States for purposes of intimidations, coercion, or ransom is conventional terrorism. Hazard effects are instantaneous; additional secondary devices may be used, lengthening the time duration of the hazard until the attack site is determined to be clear. The extent of damage is determined by the type and quantity of explosive. Effects are generally static other than cascading consequences and incremental structural failures. Conventional terrorism can also include tactical assault or sniping from remote locations.

Biological terrorism is the use of biological agents against persons or property. Liquid or solid contaminants can be dispersed using sprayers/aerosol generators or by point of line sources such as munitions, covert deposits and moving sprayers. Biological agents vary in the amount of time they pose a threat. They can be a threat for hours to years depending upon the agent and the conditions in which it exists.

Chemical terrorism involves the use or threat of chemical agents against persons or property. Effects of chemical contaminants are similar to biological agents.

Radiological terrorism is the use of radiological materials against persons or property. Radioactive contaminants can be dispersed using sprayers/aerosol generators, or by point of line sources such as munitions, covert deposits and moving sprayers or by the detonation of a nuclear device underground, at the surface, in the air or at high altitude.

Electronic attack using one computer system against another in order to intimidate people or disrupt other systems is a cyber-attack. All governments, businesses and citizens that conduct business utilizing computers face these threats. Cyber-security and critical infrastructure protection are among the most important national security issues facing our country today. The North Carolina State Bureau of investigation' Computer Crime Unit helps law enforcement across North Carolina solve sophisticated crimes involving digital evidence.

Mass demonstrations, or direct conflict by large groups of citizens, as in marches, protect rallies, riots, and non-peaceful strikes are examples of public disorder. These are assembling of people together in a manner to substantially interfere with public peace to constitute a threat, and with use of unlawful force or violence against another person, or causing property damage or attempting to interfere with, disrupting, or

destroying the government, political subdivision, or group of people. Labor strikes and work stoppages are not considered in this hazard unless they escalate into a threat to the community. Vandalism is usually initiated by a small number of individuals and limited to a small target or institution. Most events are within the capacity of local law enforcement.

The Southern Poverty Law Center (SPLC) reports 50 active hate groups in North Carolina, listed in Table 4.110. The SPLC defines a hate group as any group with "beliefs or practices that attack or malign an entire class of people – particularly when the characteristics being maligned are immutable." It is important to note that inclusion on the SPLC list is not meant to imply that a group advocates or engages in violence or other criminal activity.

Table 4.110 – Hate Groups Active in North Carolina

Group	Type	Location
Americans for Legal Immigration (ALIPAC)	Anti-Immigrant	Raleigh
North Carolinians for Immigration Reform and Enforcement	Anti-Immigrant	Wade
Gays Against Groomers North Carolina	Anti-LGBTQ	Monroe
Camp Constitution	Antigovernment General	Charlotte
Education First Alliance	Antigovernment General	Apex
Mom Army Charlotte	Antigovernment General	Charlotte
Moms for Liberty - Alexander County, NC Chapter	Antigovernment General	Alexander County
Moms for Liberty - Bladen County, NC	Antigovernment General	Bladen County
Moms for Liberty - Buncombe County, NC	Antigovernment General	Buncombe County
Moms for Liberty - Cabarrus County, NC Chapter	Antigovernment General	Cabarrus County
Moms for Liberty - Chatham County, NC Chapter	Antigovernment General	Chatham County
Moms for Liberty - Forsyth County, NC Chapter	Antigovernment General	Forsyth County
Moms for Liberty - Gaston County, NC Chapter	Antigovernment General	Gaston County
Moms for Liberty - Guilford County, NC Chapter	Antigovernment General	Guilford County
Moms for Liberty - Iredell County, NC Chapter	Antigovernment General	Iredell County
Moms for Liberty - Johnston County, NC	Antigovernment General	Johnston County
Moms for Liberty - Mecklenburg, NC County Chapter	Antigovernment General	
Moms for Liberty - New Hanover County, NC Chapter	Antigovernment General	
Moms for Liberty - Onslow County, NC	Antigovernment General	Onslow County
Moms for Liberty - Orange County, NC Chapter	Antigovernment General	Orange County
Moms for Liberty - Pender County, NC	Antigovernment General	Pender County
Moms for Liberty - Stanly County, NC Chapter	Antigovernment General	Stanly County
Moms for Liberty - Wake County, NC Chapter	Antigovernment General	Wake County
Moms for Liberty - Wilson County, NC	Antigovernment General	Wilson County
No Left Turn in Education - North Carolina	Antigovernment General	Raleigh
North Carolina Moms for America	Antigovernment General	
North Carolina Parents Involved in Education	Antigovernment General	
Tactical Civics - North Carolina	Antigovernment General	
GDL - North Carolina	Antisemitism	

Group	Type	Location
Masharah Yasharahla - Government of Israel	General Hate	Raleigh
Proud Boys	General Hate	Charlotte
Proud Boys	General Hate	Fayetteville
Proud Boys	General Hate	Raleigh
Proud Boys	General Hate	Wilmington
Proud Boys	General Hate	Winston-Salem
Loyal White Knights	Ku Klux Klan	Pelham
III% United Patriots	Militia Movement	Statewide
III% United Patriots	Militia Movement	Mt. Olive
III% United Patriots	Militia Movement	Region 3
Stokes County Militia	Militia Movement	King
Watchmen	Militia Movement	Concord
Identity Dixie	Neo-Confederate	Statewide
Asatru Folk Assembly	Neo-Volkisch	Statewide
America's Remedy	Sovereign Citizens Movement	Charlotte
National Assembly	Sovereign Citizens Movement	Statewide
National Assembly	Sovereign Citizens Movement	Cherokee County
The American States Assembly	Sovereign Citizens Movement	Statewide
Active Club	White Nationalist	Statewide
National Justice Party - North Carolina	White Nationalist	Statewide
Patriot Front	White Nationalist	Statewide

Source: SPLC, https://www.splcenter.org/hate-map

None of the hate groups identified by the SPLC have a specifically identified footprint in Currituck or Dare counties, though it can be inferred that any group with a statewide footprint may have a presence in the area.

Generally, no warning is given for specific acts of terrorism. Duration is dependent on the vehicle used during the terrorist attack. This score takes into account a prolonged scenario with continuous impacts.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

A terror threat could occur at any location in the Region, but are more likely to target highly populated areas, critical infrastructure, or symbolic locations.

Spatial Extent: 2 – Small

EXTENT

The extent of a terrorist incident is tied to many factors, including the attack vector, location, time of day, and other circumstances; for this reason, it is difficult to put assess a single definition or conclusion of the extent of "terrorism." As a general rule, terrorism incidents are targeted to where they can do the most damage and have the maximum impact possible, though this impact is tempered by the weapon used in the attack itself.

Impact: 4 – Catastrophic

HISTORICAL OCCURRENCES

There has never been an act of terrorism in Dare or Currituck counties; however, given the number of visitors to the many national sites and monuments in the region, and the ability to strike at will in most any area, it is prudent for communities in the Outer Banks to recognize potential terrorist threat. The ability to respond to a terrorist incident is provided by county and community emergency operations plans.

In 2022, a state of emergency went into effect in Moore County, North Carolina after two power substations were targeted and shot multiple times with firearms. This act of vandalism caused a mass power outage leaving approximately 45,000 people without power. It was reported that one woman who relied on an oxygen tank died during the incident. Currently, authorities are still unsure of the exact motive of protest that caused this event to occur.

PROBABILITY OF FUTURE OCCURRENCE

While difficult to estimate when a deliberate act like terrorism may occur, it can be inferred that the probability of a terrorism attack in any one area in the Region is very low at any given time. When identified, credible threats may increase the probability of an incident; these threats are generally tracked by law enforcement.

Probability: 1 – Unlikely

VULNERABILITY ASSESSMENT

METHODOLOGIES AND ASSUMPTIONS

Terrorism impacts van vary widely by the type of terror attack suffered. Terror attacks can be chemical, biological, radiological, nuclear or explosive.

Vulnerability to terrorism was assessed through hypothetical scenarios. These scenarios were modeled using the Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) tool developed by the Johns Hopkins Office of Critical Event Preparedness and Response, Johns Hopkins Applied Physics Laboratory, the U.S. Department of Homeland Security, and the National Center for the Study of Preparedness and Catastrophic Event Response.

PEOPLE

People can suffer death or illness as a result of a terrorist attack. Symptoms of illness from a biological or chemical attack may go undetected for days or even weeks. Local healthcare workers may observe a pattern of unusual illness or early warning monitoring systems may detect airborne pathogens. People will face increased risk if a biological or chemical agent is released indoors, as this may result in exposure to a higher concentration of pathogens, whereas agents that are released outdoors would disperse in the direction of the wind. Physical harm from a weapons attack or explosive device is not dependent on location, but risk is greater in areas where higher numbers of people may gather. People could also be

affected by an attack on food and water supply. In addition to impacts on physical health, any terrorist attack could cause significant stress and anxiety.

The following hypothetical scenarios illustrate the potential impacts of biological, chemical, and explosive attacks on sites in the Outer Banks Region. Three specific sites were chosen to illustrate potential worst-case scenarios. These scenarios were modeled using the Electronic Mass Casualty Assessment and Planning Scenarios (EMCAPS) tool developed by the Johns Hopkins Office of Critical Event Preparedness and Response, Johns Hopkins Applied Physics Laboratory, the U.S. Department of Homeland Security, and the National Center for the Study of Preparedness and Catastrophic Event Response.

Scenario #1 – Biological Attack: Aerosol Anthrax

Scenario Overview: A truck fitted with an improvised spraying device disseminates a liquid slurry containing anthrax spores. The hypothetical target for this attack is the Independence Day Fireworks Display at Historic Corolla Park in Currituck County, which typically draws approximately 7,000 attendees, with additional viewers likely watching from a distance. The size of the affected area and the percentage of people within the area that develop inhalational anthrax are determined based on the following input variables: quantity of release agent is 50 liters, line of release distance is 500 meters (the minimum allowable by the model, assuming the truck drives along Highway 12), population density is 8,000 persons per square mile (assuming the average crowd expands beyond the park boundaries), and dissemination efficiency is 1% (assuming low-tech dissemination). The following assumptions inherent to the model also apply:

- Infectious dose for 50% of people = 10,000 cfu
- Infectious dose for 1% of people = 530 cfu
- This scenario assumes treatment is provided to patients after the infectious agent is identified. For calculation purposes, the untreated case fatality rate = 99%
- Protection factor of buildings = 50%
- Percentage of population outdoors = 15%

Table 4.111Table 4.112 outlines the expected losses based on the above parameters.

Table 4.111 – Estimated Casualties from Aerosol Anthrax

Injury Description	Population affected
Exposures	14,119
Percentage Infected	3.9%
Total inhalation anthrax cases	557

Source: EMCAPS tool

Per the Department of Homeland Security's National Planning Scenarios guidance, "the first cases will not present themselves until 36 hours after the release and a median incubation period of 10 days will be required." Symptoms include fever, headache, weakness, respiratory distress, profound sweating, chest discomfort, cough, and muscle pain. Initial diagnosis may prove difficult if the release occurs during flu season. Persons with primary aerosol exposure to anthrax need to receive antibiotic therapy prior to the onset of symptoms in order to prevent inhalation anthrax - this is an illness with an exceptionally high mortality rate (approximately 40% to 50%) even when met with aggressive medical care. Person-to-person spread does not occur. Actions of incident-site personnel tested after the attack include hazard identification, site control, establishment and operation of ICS, treatment of exposed victims, mitigation efforts, obtainment of personal protective equipment (PPE) and prophylaxis for responders, site remediation and monitoring, notification of airlines and other transportation providers, provision of public

information, and effective coordination with national and international public health and governmental agencies" (DHS, 2005).

Scenario #2 – Chemical Attack: Toxic Gas – Chlorine Release

Scenario Overview: A bomb is attached to a tractor trailer tanker carrying compressed chlorine. The entire contents of the tank escape to the atmosphere and the plume spreads to the surrounding area. The hypothetical target for this attack is the annual Dare Day celebration, which brings approximately 5,000 people to downtown Manteo. The plume spreading and the effect on the population are calculated according to the following input variables: outdoor temperature is 90°F, wind speed is 9 mph, the setting is urban (defined by presence of obstructions from buildings and forested areas), and the population density is 3,000 persons per square mile, to account for the increase over normal population density brought by the festival. The following assumptions apply:

- 4,850-gallon tank, all contents released through 3-ft hole
- Partly cloudy, no precipitation
- 50% of people in plume area are indoors
- Effects of chlorine on population determined through evaluation of chlorine gas concentration zones, which were determined using ALOHA plume modeling software (see References)
- First effects on humans at concentration = 10 ppm
- Minimum lethal dose = 430 ppm for 30 min
- Median lethal dose (short-term exposure) = 1,000 ppm

Table 4.112 outlines the expected losses based on the above parameters.

Table 4.112 – Estimated Casualties from Chlorine Attack

Injury Description	Population affected
Fatality	64 persons
Eye pain & swelling, headache, restricted airflow – difficulty breathing, coughing, chest pain, lung inflammation and edema, bloody sputum, vomiting, skin irritation, possible chemical burns	99 persons
Eye pain & swelling, headache, throat irritation, rapid breathing, coughing, chest pain, lung inflammation and edema, bloody sputum, vomiting, skin irritation	221 persons
Eye pain & swelling, headache, throat irritation, rapid breathing, coughing, chest pain, skin irritation	449 persons
Eye irritation, headache, throat irritation, coughing, skin irritation	550 persons
Eye irritation, headache, coughing, skin irritation	522 persons

Source: EMCAPS tool

It is important to note that the psychological distressed but uninfected population (a.k.a. "worried well") reporting to hospitals could be as high as 9 times the actual number of cases.

Scenario #3 – IED: Truck Bomb

Scenario Overview: An Improvised Explosive Device (IED) utilizing an ammonium nitrate/fuel oil (ANFO) mixture is carried in a cargo truck to a populated area and detonated. The hypothetical target for this attack is the annual Seafood Festival at the Soundside Event Site in Nags Head, which brings between 10,000-12,500 people to downtown Manteo. The bomb size is assumed to be 1000 lbs ANFO and there is approximately 3 feet spacing between persons, equivalent to a moderately crowded pedestrian area as might be found on the festival grounds. It is assumed that the explosion takes place in a relatively open area (e.g. stadium parking lot, park, etc). The following assumptions apply:

- ANFO - TNT equivalence = 0.82
- Blast pressure damage impact taken from National Fire Protection Association (NFPA) 921 Guide for Fire and Explosion Investigations - 2001 Edition, Table 18.13.3.1[b]
- Buildings and other physical structures are not considered in these calculations

Table 4.113 outlines the expected losses based on the above parameters.

Table 4.113 – Estimated Casualties from IED Attack

Injury Description	Population
Fatalities	40 persons
Total Persons with At Least 1 Injury	660 persons
Total Injuries	1012 persons

Source: EMCAPS tool

Expected symptoms and injuries would include impact injuries (pulmonary blast), pulmonary contusion, barotrauma, fractures (internal, compound, spinal), smoke inhalation, GI blast injury (edema, hemorrhage, rupture), auditory blast injury (partial or total loss of hearing), lacerations, shrapnel, debris penetrations (glass, metal, etc.) and burns. Per the scenario, over 50% of injuries would be lacerations to civilians. Transportation would be limited or inaccessible near the blast, and services and utilities could be unavailable.

PROPERTY

The potential for damage to property is highly dependent on the type of attack. Buildings and infrastructure may be damaged by an explosive device or by contamination from a biological or chemical attack. Impacts are generally highly localized to the target of the attack.

ENVIRONMENT

Environmental impacts are also dependent on the type of attack. Impacts could be negligible or could require major clean-up and remediation.

CONSEQUENCE ANALYSIS

Table 4.114 summarizes the potential consequences of a terror attack.

Table 4.114 – Consequence Analysis – Terrorism

Category	Consequences
Public	Illness, injury, or fatality are possible; these impacts would be highly localized to the attack. Widespread stress and psychological suffering may occur. Human impacts may be long-term based on attack vector.
Responders	Injuries; fatalities are possible. Responders face increased risks during an effort to stop an attack or rescue others while an attack is underway. Potential impacts to response capabilities may result from an attack.
Continuity of Operations (including Continued Delivery of Services)	Potential impacts to continuity of operations due to attack impacts; delays in providing services; impacts tied to attack vector

Category	Consequences
Property, Facilities and Infrastructure	Impacted roads; downed power lines and power loss; utility disruption. Several key critical sites could be targeted in an attack, causing cascading impacts to daily life in the region
Environment	Water and food supply could be contaminated by a biological or chemical attack. Remediation could be required.
Economic Condition of the Jurisdiction	The local economy could be disrupted, depending on the location and scale of an attack.
Public Confidence in the Jurisdiction's Governance	Loss of public confidence likely should an attack be carried out; additional loss of confidence and trust may result if response and recovery are not swift and effective

4.5.13 INFRASTRUCTURE FAILURE

HAZARD BACKGROUND

The Outer Banks region depends on several key bridges, roads, and ferry crossings for access and services. There is limited redundancy in the transportation network, which means these key infrastructure are integral to the functioning of the communities in the planning area and would cause severe disruptions should they become inaccessible. Damage to any of this infrastructure could result from the majority of the natural and human-caused hazards described in this plan. In addition to a secondary or cascading impact from another primary hazard, infrastructure can fail as a result of faulty equipment, lack of maintenance, degradation over time, or accidental damage such as a barge colliding with a bridge support.

Building and construction standards along with regular inspection and maintenance can provide a degree of certainty as to the capacity of infrastructure to withstand some damages. However, accidental damage is unpredictable. Moreover, any damages that take a road or bridge out of service will likely require significant repairs that could take weeks or months to complete.

Warning Time: 4 – Less than six hours

Duration: 4 – More than one week

LOCATION

The primary transportation systems in the region are shown in Figure 4.60.

The North Carolina Department of Transportation (NCDOT) maintains an inventory of bridges in North Carolina. Currently there are 15 bridges that were built in 1995 or before within the Outer Banks region. Two of these bridges were rated as Structurally Deficient (SD) while five were rated as Functionally Obsolete (FO). According to NCDOT, a bridge at least 10 years old is considered SD if it is in relatively poor condition due to deterioration or has insufficient load-carrying capacity due to the original design. Bridges that are narrow, have inadequate under-clearances, have insufficient load-carrying capacity, are poorly aligned with the roadway, or can no longer adequately serve existing traffic are considered FO. To qualify for federal replacement funds a must first be classified as SD. These bridges may be at a higher risk for infrastructure failure causing inaccessibility to the Region. Bridges built in 1995 or prior are listed below in Table 4.115.

Table 4.115 – Bridges Built in 1995 or Prior

County	Bridge Number	Route	Crossing	Deficiency	Year Built	Age (years)
Dare	270009	US64	Croatan Sound	SD	1955	69
Dare	270008	NC12	The Slash	SD	1956	68
Currituck	260016	US158E	Currituck Sound	FO	1966	58
Dare	270004	US158	Jean Guite Creek		1966	58
Currituck	260012	SR1142	C. Off Intercoastal W		1979	45
Dare	270043	NC400	Dough's Creek		1983	41
Currituck	260015	US158	Intracoastal Waterway		1986	38
Dare	270012	US64	Roanoke Sound		1990	34
Dare	270044	NC12 FERRY	Hatteras Inlet	FO	1991	33
Dare	270045	NC12 FERRY	Hatteras Inlet	FO	1991	33
Dare	270046	NC12 FERRY	Hatteras Inlet	FO	1991	33

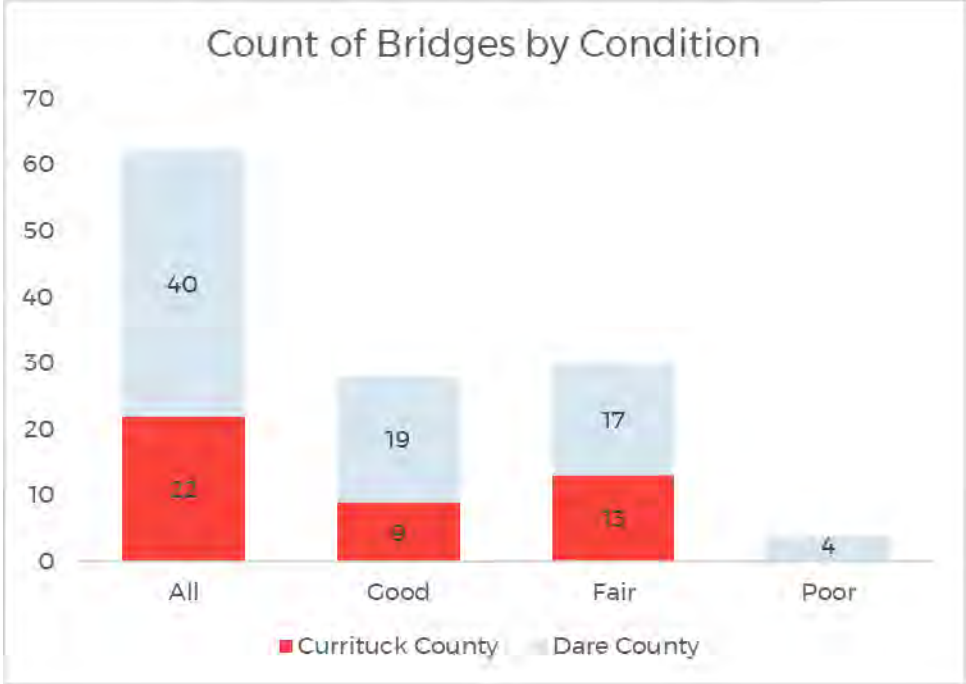
County	Bridge Number	Route	Crossing	Deficiency	Year Built	Age (years)
Dare	270005	SR1217	Cr Off Kitty Hawk Bay	FO	1994	30
Dare	270006	SR1217	Colington Creek		1994	30
Dare	270014	US64	Pond Island		1994	30
Currituck	260035	US158W	Currituck Sound		1995	29

Source: North Carolina Department of Transportation, updated August 2024

Spatial Extent: 2 – Small

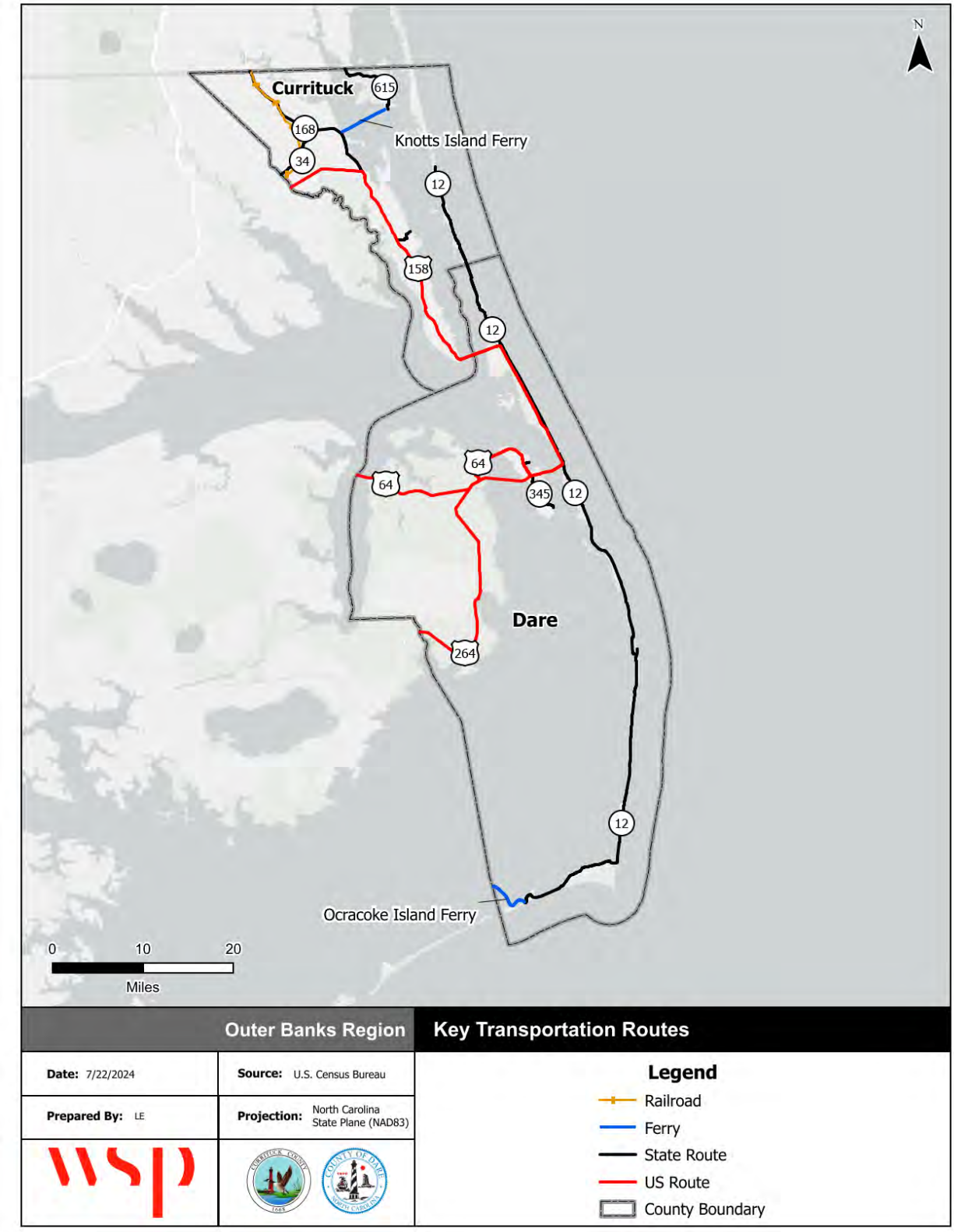
Figure 4.59 shows the distribution of bridges in Currituck County and Dare County by their rated condition according to data from the Federal Highway Administration as of June 2024. Per this data, most bridges in the region are in fair or good condition. There are four bridges in Dare County in poor condition.

Figure 4.59 – Bridge Condition by County



Source: U.S. Department of Transportation, 2024 - Bridge Condition by County - National Bridge Inventory - Bridge Inspection - Safety Inspection - Bridges & Structures - Federal Highway Administration (dot.gov)

Figure 4.60 – Key Transportation Routes in the Planning Area



EXTENT

The significance of any transportation infrastructure failure will vary depending on the location and nature of the infrastructure itself. The loss of a local road may have only minor impacts limited to the immediate area. However, the loss of a major highway or key bridge could cause significant disruption across the Region. Depending on time of day and the onset of the failure, significant casualties are also possible: the 1967 Silver Bridge collapse between Point Pleasant, West Virginia and Gallipolis, Ohio and the 1980 Sunshine Skyway Bridge collapse outside St. Petersburg, Florida killed 46 and 35 people respectively. If a bridge were closed or failed during a hurricane evacuation, it could put thousands of residents and visitors at risk.

According to a report published by The National Transportation Research Group known as TRIP, $672 billion in goods are shipped to and from sites in North Carolina every year. Approximately 81% of these goods are carried by trucks using the state's highway system. In addition to casualties, the loss of local roads could impact the accessibility for goods to be transported by trucks that are deemed necessary for residents living in the region.

Impact: 3 – Critical

HISTORICAL OCCURRENCES

A 2014 analysis of bridge failure rates by Dr. Wesley Cook of Utah State University found that an average of 128 bridges collapse every year in the U.S.; 53% of bridges that collapsed had been rated as structurally deficient prior to their collapse. Only 4% of bridge collapses resulted in loss of life. In 2022, a review of statistical characteristics of bridge failures was conducted by a Highway Research Center at Chang'an University and found that design error, construction mistakes, hydraulic, collision, and overload are the top 5 leading causes of bridge failures.

In 1990, a portion of the Herbert Bonner Bridge collapsed after being hit by a dredge vessel that was carried by hurricane winds and waves. The incident left approximately 5,000 Hatteras residents as well as tourists and fishermen stranded on the island and without power or phone service, as the bridge also carried electrical and phone lines. The economic losses from the incident were estimated at $20 million.

The HMPC previously noted issues with frequent, unpredictable closure of the Alligator River Bridge due to mechanical failures. The bridge is over 60 years old and is a key access point between the barrier island, Roanoke Island, and the mainland.

PROBABILITY OF FUTURE OCCURRENCE

The likelihood of a major transportation infrastructure failure occurring in the Outer Banks Region is difficult to quantify. The continuing age and deterioration of America's transportation infrastructure, coupled with increasing traffic and declining public investment in maintaining our infrastructure, indicate that road and bridge failures are likely to be more common in future decades than they have in the past. The American Society of Civil Engineers (ASCE) released their most recent Report Card for America's Infrastructure in 2021 giving the U.S a C- grade overall on infrastructure conditions. The Report Card noted that specifically in North Carolina, driving on roads in need of repair costs each driver $500 per year as 33% of roads in the state are in poor or fair condition. Additionally, it was noted that 9.3% of bridges are rated structurally deficient in North Carolina.

The ASCE estimated that $2.59 trillion would be needed to bring the nation's infrastructure up to a condition that meets the needs of the current population. (Note that this total includes non-transportation infrastructure.) The potential for accidents and failures from infrastructure operating beyond its intended lifespan or with insufficient maintenance thus continues to increase. Due to the passing of the Bipartisan Infrastructure Law in 2021 by the federal government, North Carolina is expected to receive approximately $7.7 billion over the following 5 years in Federal highway formula grant funding for

highways and bridges. According to NCDOT, this is about 28.7% more than the State's Federal-aid highway formula grant funding on an average annual basis. These investments may reduce the likelihood of future infrastructure failures.

Probability: 2 – Possible

VULNERABILITY ASSESSMENT

The impacts of transportation failures vary widely by the type of system, as well as the time of day and season of the failure.

METHODOLOGIES AND ASSUMPTIONS

Vulnerability to transportation infrastructure failures was assessed based on past occurrences nationally and internationally as well as publicly available information on infrastructure vulnerability.

PEOPLE

People can be injured or killed during transportation infrastructure failures. As noted above, the U.S. averages five fatality-causing bridge collapses per year, although data on the number of fatalities involved was not available. Numbers of non-fatal injuries was also not available.

Aside from direct injuries and fatalities, transportation failures can result in significant losses of time and money as individuals and commercial shipments are detoured or blocked. Disruption of transportation systems can limit the ability of emergency services and utility work crews to reach affected areas, and can put some members of the public at severe risk if they are unable to reach needed medical services, such as dialysis patients.

In extreme cases, a transportation failure could leave residents stranded without power, food, or other emergency supplies. Residents at a public meeting in Buxton expressed concern that a road or bridge washout following a major storm will leave them stranded for an extended period of time without emergency supplies or an alternative route off the island.

PROPERTY

The primary property damage from transportation infrastructure failures is to the infrastructure itself, as well as to privately-owned automobiles.

ENVIRONMENT

Transportation infrastructure failures can result in oil spills or other hazardous materials releases that can severely impact the environment in the surrounding area.

CONSEQUENCE ANALYSIS

Table 4.116 summarizes the potential consequences of a transportation infrastructure failure.

Table 4.116 – Consequence Analysis - Transportation Infrastructure Failure

Category	Consequences
Public	Potential injuries and fatalities.
Responders	Potential injuries and fatalities, as well as potentially significant delays to response times.

Category	Consequences
Continuity of Operations (including Continued Delivery of Services)	Loss of key roads or bridges can affect delivery of services.
Property, Facilities and Infrastructure	In addition to the loss of transportation infrastructure itself, sustained road closure can impact supply chain deliveries to other critical facilities.
Environment	Potential for oil spills or other hazardous materials releases.
Economic Condition of the Jurisdiction	Delays in movement of commuters, as well as good and services
Public Confidence in the Jurisdiction's Governance	Can cause loss of confidence in government's ability to maintain other critical infrastructure

4.6 CONCLUSIONS ON HAZARD RISK

PRIORITY RISK INDEX

As discussed in Section 4.3 Risk Assessment Methodology and Assumptions, the Priority Risk Index was used to rate each hazard on a set of risk criteria and determine an overall standardized score for each hazard. The conclusions drawn from this process are summarized below.

Table 4.117 summarizes the degree of risk assigned to each identified hazard using the PRI method.

Table 4.117 – Summary of PRI Results

Hazard	Probability	Impact	Spatial Extent	Warning Time	Duration	PRI Score
Drought	Possible	Minor	Large	More than 24 hrs	More than 1 week	2.2
Earthquake	Unlikely	Minor	Large	Less than 6 hrs	Less than 6 hrs	1.9
Excessive Heat	Highly Likely	Limited	Large	More than 24 hrs	Less than 1 week	3.0
Flooding	Highly Likely	Critical	Large	6 to 12 hours	Less than 1 week	3.5
Hurricane & Coastal Hazards	Likely	Catastrophic	Large	More than 24 hrs	Less than 1 week	3.3
Tornadoes & Thunderstorms	Highly Likely	Limited	Moderate	Less than 6 hrs	Less than 6 hrs	2.9
Severe Winter Weather	Highly Likely	Minor	Large	More than 24 hrs	Less than 1 week	2.7
Wildfire	Possible	Limited	Moderate	Less than 6 hrs	Less than 1 week	2.5
Hazardous Substances	Likely	Minor	Negligible	Less than 6 hrs	Less than 24 hrs	2.0
Radiological Emergency	Unlikely	Limited	Negligible	Less than 6 hrs	More than 1 week	1.9
Cyber Threat	Possible	Critical	Small	Less than 6 hrs	More than 1 week	2.7
Terrorism	Unlikely	Critical	Small	Less than 6 hrs	More than 1 week	2.4
Infrastructure Failure	Possible	Critical	Small	Less than 6 hrs	More than 1 week	2.7

The results from the PRI have been classified into three categories based on the assigned risk value which are summarized in Table 4.118:

- **High Risk** – Widespread potential impact. This ranking carries a high threat to the general population and/or built environment. The potential for damage is widespread.
- **Medium Risk** – Moderate potential impact. This ranking carries a moderate threat level to the general population and/or built environment. Here the potential damage is more isolated and less costly than a more widespread disaster.
- **Low Risk** – Minimal potential impact. The occurrence and potential cost of damage to life and property is negligible or nonexistent.

Table 4.118 – Summary of Hazard Risk Classification

High Risk (≥ 3.0)	Flooding Hurricane & Coastal Hazards Excessive Heat
Moderate Risk (2.0 – 2.9)	Tornadoes & Thunderstorms Severe Winter Weather Cyber Threat Infrastructure Failure Wildfire Terrorism Drought Hazardous Substances
Low Risk (< 2.0)	Earthquake Radiological Emergency

5 CAPABILITY ASSESSMENT

This section discusses the capability of the Outer Banks region to implement hazard mitigation activities. It consists of the following four subsections:

5.1 Overview
5.2 Conducting the Capability Assessment
5.3 Capability Assessment Findings
5.4 Conclusions on Local Capability

5.1 OVERVIEW

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

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

The capability assessment completed for the Outer Banks region serves as a critical planning step toward developing an effective mitigation strategy. Coupled with the risk assessment, the capability assessment helps identify and target effective goals, objectives, and mitigation actions that are realistically achievable under given local conditions.

5.2 CONDUCTING THE CAPABILITY ASSESSMENT

This capability assessment was originally developed using feedback from the HMPC through a detailed Local Capability Self-Assessment worksheet. The self-assessment requested information on a variety of "capability indicators" such as existing local plans, policies, programs, or ordinances that contribute to and/or hinder the region's ability to implement hazard mitigation actions. Other indicators included information related to the region's fiscal, administrative, and technical capabilities, such as access to local budgetary and personnel resources for mitigation purposes, and existing education and outreach programs that can be used to promote mitigation. Community representatives were also asked to comment on the current political climate with respect to hazard mitigation, an important consideration for any local planning or decision-making process.

The survey results provided an extensive and consolidated inventory of existing local plans, ordinances, programs, and resources in place or under development. In completing the survey, local officials were also asked to qualitatively rate their jurisdiction's specific capabilities. The survey instrument thereby not

only helps accurately assess the degree of local capability, but it also serves as a good source of introspection for counties and local jurisdictions that want to improve their capabilities. Identified gaps, weaknesses, or conflicts can be recast as opportunities for specific actions to be proposed as part of the mitigation strategy.

The information provided in response to the survey questionnaire was incorporated into a database for further analysis. A general scoring methodology was then applied to quantify each jurisdiction's overall capability. According to the scoring system, each capability indicator was assigned a point value based on its relevance to hazard mitigation. Additional points were added based on the jurisdiction's self-assessment of their own planning and regulatory capability, administrative and technical capability, fiscal capability, education and outreach capability, and political capability.

Using this scoring methodology, a total score and an overall capability rating of "High," "Moderate," or "Limited" could be determined according to the total number of points received. These classifications are designed to provide nothing more than a general assessment of local government capability. In combination with the narrative responses provided by local officials, the results of this capability assessment provide critical information for developing an effective and meaningful mitigation strategy.

5.3 CAPABILITY ASSESSMENT FINDINGS

The findings of the capability assessment are summarized in this plan to provide insight into the relevant capacity of the Outer Banks Region to implement hazard mitigation activities. All information is based upon the input provided by local government officials through the Local Capability Self-Assessment and subsequent updates by the planning team and the HMPC.

5.3.1 PLANNING AND REGULATORY CAPABILITY

Planning and regulatory capability is based on the implementation of plans, ordinances, and programs that demonstrate a local jurisdiction's commitment to guiding and managing growth, development, and redevelopment in a responsible manner, while maintaining the general welfare of the community. It includes emergency response and mitigation planning, comprehensive land use planning, and transportation planning. Regulatory capability also includes the enforcement of zoning or subdivision ordinances and building codes that regulate how land is developed and structures are built, as well as protecting environmental, historic, and cultural resources in the community. Although some conflicts can arise, these planning initiatives generally present significant opportunities to integrate hazard mitigation principles and practices into the local decision-making process.

Table 5.1 provides a summary of the relevant local plans, ordinances, and programs already in place or under development for the Outer Banks region. A checkmark (✓) indicates that the given item is currently in place and being implemented. A plus sign (+) indicates that a jurisdiction is covered for that item under a county-implemented version. Each of these local plans, ordinances, and programs should be considered available mechanisms for incorporating the requirements of the Hazard Mitigation Plan. This information will help identify opportunities to address gaps, weaknesses, or conflicts with other initiatives and integrate the implementation of this plan with existing planning mechanisms where appropriate.

Table 5.1 – Relevant Plans, Ordinances, and Programs

Jurisdiction	Hazard Mitigation Plan	Comprehensive Land Use Plan	Floodplain Management Plan	Open Space Management Plan	Stormwater Management Plan	Emergency Operations Plan	SARA Title III Plan	Radiological Emergency Plan	Continuity of Operations Plan	Evacuation Plan	Disaster Recovery Plan	Capital Improvements Plan	Economic Development Plan	Historic Preservation Plan	Transportation Plan	Flood Damage Prevention Ordinance	Zoning Ordinance	Subdivision Ordinance	Site Plan Review Requirements	Unified Development Ordinance	Post-Disaster Redevelopment Ordinance	Building Code	Fire Code	Community Wildfire Protection Plan	National Flood Insurance Program	Community Rating System
Currituck County	✓	✓			✓	✓	✓			✓	✓	✓			✓	✓	✓	✓	✓	✓		✓	✓		✓	✓
Dare County	✓	✓				✓	✓			✓	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Town of Duck	✓	✓				✓				+		✓			✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
Town of Kill Devil Hills	✓	✓			✓	✓				+	+	✓		✓	+	✓	✓	✓	✓			✓	✓		✓	✓
Town of Kitty Hawk	✓	✓				✓				+	✓	✓			+	✓	✓	✓	✓			✓	✓		✓	✓
Town of Manteo	✓	✓	✓		✓	✓				+				✓	+	✓	✓	✓	✓	✓		✓	✓		✓	✓
Town of Nags Head	✓	✓			✓	✓	+		✓	+		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Town of Southern Shores	✓	✓				✓				+		✓			+	✓	✓	✓	✓		✓	✓	✓		✓	✓

A more detailed discussion on the region's planning and regulatory capability follows, along with the incorporation of additional information based on the narrative comments provided by local officials in response to the survey questionnaire.

5.3.1.1 EMERGENCY MANAGEMENT

Hazard mitigation is widely recognized as one of the four primary phases of emergency management, as is shown in Figure 5.1. In reality, mitigation is interconnected with all other phases and is an essential component of effective preparedness, response, and recovery. Opportunities to reduce potential losses through mitigation practices are most often implemented before a disaster event, such as through the elevation of flood-prone structures or by regular enforcement of policies that regulate development. However, mitigation opportunities can also be identified during immediate preparedness or response activities, such as installing storm shutters in advance of a hurricane. Furthermore, incorporating mitigation during the long-term recovery and redevelopment process following a disaster event is what enables a community to become more resilient over time.

Figure 5.1 – The Four Phases of Emergency Management

Planning for each phase is a critical part of a comprehensive emergency management program and a key to the successful implementation of hazard mitigation actions.

HAZARD MITIGATION PLAN

A hazard mitigation plan is a community's blueprint for how it intends to reduce the impact of natural and human-caused hazards on people and the built environment. The essential elements of a hazard mitigation plan include a risk assessment, capability assessment, and mitigation strategy.

- All participating jurisdictions in this regional planning effort participated in and adopted the 2020 Outer Banks Regional Hazard Mitigation Plan.
- In addition to the official local hazard mitigation plan, several communities have participated in mitigation and resilience planning efforts that involve risk and vulnerability assessment and mitigation or resilience action development. Currituck County, Dare County, Duck, Nags Head, and Kitty Hawk have participated in North Carolina Division of Coastal Management's Resilient Coastal Communities Program and developed Resilience Strategies through that program. The Albemarle Commission worked with NCORR's RISE Program to develop the Albemarle Regional Resilience Portfolio, which contains regional resilience projects relevant to the Outer Banks Region. Dare

County supported establishment of the N.C. 12 Task Force, which developed a report of targeted mitigation projects to protect N.C. 12. Nags Head has a Vulnerability, Consequences, Adaptation, Planning Scenarios (VCAPS) Report which includes prioritized actions to support adaptation to hazard risks and climate change.

DISASTER RECOVERY PLAN

A disaster recovery plan serves to guide the physical, social, environmental, and economic recovery and reconstruction process following a disaster event. In many instances, hazard mitigation principles and practices are incorporated into local disaster recovery plans with the intent of capitalizing on opportunities to break the cycle of repetitive disaster losses. Disaster recovery plans can also lead to the preparation of disaster redevelopment policies and ordinances to be enacted following a hazard event.

— Both counties and the Town of Kitty Hawk indicated they have a plan. The Town of Kill Devil Hills indicated it is covered by Dare County's plan. If Dare County's plan covers incorporated areas, there may be a gap in awareness or an opportunity for the other towns in Dare County to participate in this plan.

EMERGENCY OPERATIONS PLAN

An emergency operations plan outlines responsibilities and how resources will be deployed during and following an emergency or disaster.

— All participating jurisdictions have an emergency operations plan in place. These plans are reviewed and updated annually. The Town of Nags Head recently completed a full rewrite of their Emergency Operations Plan.

— In addition to all hazards EOPs, Duck has a Flood Warning and Response Plan.

CONTINUITY OF OPERATIONS PLAN

A continuity of operations plan establishes a chain of command, line of succession, and plans for backup or alternate emergency facilities in case of an extreme emergency or disaster event.

— Only the Town of Nags Head indicated that it has a continuity of operations plan in place.

5.3.1.2 GENERAL PLANNING

The implementation of hazard mitigation activities involves agencies and individuals beyond the emergency management profession. Stakeholders may include local planners, public works officials, economic development specialists, and others. In many instances, concurrent local planning efforts will help to achieve or complement hazard mitigation goals.

COMPREHENSIVE/LAND USE PLAN

A comprehensive or land use plan establishes the overall vision for what a community wants to be and serves as a guide for future governmental decision making. Typically, a comprehensive plan contains sections on demographic conditions, land use, transportation elements, and community facilities. Given the broad nature of the plan and its regulatory standing in many communities, the integration of hazard mitigation measures into the comprehensive plan can enhance the likelihood of achieving risk reduction goals, objectives, and actions.

— All participating jurisdictions have comprehensive land use plans in place and have updated their comprehensive plans within the last five years.

CAPITAL IMPROVEMENTS PLAN

A capital improvements plan guides the scheduling of spending on public improvements. A capital improvements plan can serve as an important mechanism for guiding future development away from identified hazard areas. Limiting public spending in hazardous areas is one of the most effective long-term mitigation actions available to local governments.

— 7 of the 8 participating jurisdictions have a capital improvements plan in place.

HISTORIC PRESERVATION PLAN

A historic preservation plan is intended to preserve historic structures or districts within a community. An often-overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards, and the identification of ways to reduce future damages. This may involve retrofitting or relocation techniques that account for the need to protect buildings that do not meet current building standards or are within a historic district that cannot easily be relocated out of harm's way.

— 3 of the 8 participating jurisdictions have a historic preservation plan in place or under development.

ZONING ORDINANCE

Zoning represents the primary means by which land use is controlled by local governments. As part of a community's police power, zoning is used to protect the public health, safety, and welfare of those in a given jurisdiction that maintains zoning authority. A zoning ordinance is the mechanism through which zoning is typically implemented. Since zoning regulations enable municipal governments to limit the type and density of development, a zoning ordinance can serve as a powerful tool when applied in identified hazard areas.

— All participating jurisdictions have a zoning ordinance in place and enforce zoning regulations.

SUBDIVISION ORDINANCE

A subdivision ordinance is intended to regulate the development of residential, commercial, industrial, or other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development. Subdivision design that accounts for natural hazards can dramatically reduce the exposure of future development.

— All participating jurisdictions have a subdivision ordinance in place and enforce subdivision regulations.

BUILDING CODES, PERMITTING, AND INSPECTIONS

Building codes regulate construction standards. In many communities, permits and inspections are required for new construction. Decisions regarding the adoption of building codes (that account for hazard risk), the type of permitting process required both before and after a disaster, and the enforcement of inspection protocols all affect the level of hazard risk faced by a community.

— All participating jurisdictions have building codes in place and enforce building code requirements.

The adoption and enforcement of building codes by local jurisdictions is routinely assessed through the Building Code Effectiveness Grading Schedule (BCEGS) program, developed by the Insurance Services Office, Inc. (ISO). In North Carolina, the North Carolina Department of Insurance assesses the building codes in effect in a particular community and how the community enforces its building codes, with special emphasis on mitigation of losses from natural hazards. North Carolina has limitations regarding building codes and mandates statewide code enforcement.

The results of BCEGS assessments are routinely provided to ISO's member private insurance companies, which in turn may offer ratings credits for new buildings constructed in communities with strong BCEGS classifications. The expectation is that communities with well-enforced, up-to-date codes should experience fewer disaster-related losses, and as a result should have lower insurance rates.

In conducting the assessment, ISO collects information related to personnel qualification and continuing education, as well as number of inspections performed per day. This type of information combined with local building codes is used to determine a grade for that jurisdiction. The grades range from 1 to 10, with a BCEGS grade of 1 representing exemplary commitment to building code enforcement, and a grade of 10 indicating less than minimum recognized protection. In North Carolina, the average BCEGS grade is 4 for both commercial and residential building.

5.3.1.3 FLOODPLAIN MANAGEMENT

Flooding represents the greatest natural hazard facing the nation, yet the tools available to reduce the impacts associated with flooding are among the most developed when compared to other hazard-specific mitigation techniques. In addition to approaches that cut across hazards such as education, outreach, and the training of local officials, the National Flood Insurance Program (NFIP) contains specific regulatory measures that enable government officials to determine where and how growth occurs relative to flood hazards. Participation in the NFIP is voluntary for local governments; however, program participation is strongly encouraged by FEMA as a first step for implementing and sustaining an effective hazard mitigation program. It is therefore used as part of this capability assessment as a key indicator for measuring local capability.

To participate in the NFIP, a county or municipality must adopt a local flood damage prevention ordinance that requires established minimum building standards in the floodplain. These standards require that all new buildings and substantial improvements to existing buildings be protected from damage by a 100-year flood event and that new development in the floodplain not exacerbate existing flood problems or increase damage to other properties. Within the last five years, Dare County and its incorporated communities adopted flood damage prevention ordinance updates establishing minimum elevation requirements communitywide, protecting development not only in the SFHA but also in areas currently mapped as moderate and low risk zones.

A key service provided by the NFIP is the mapping of identified flood hazard areas. Flood Insurance Rate Maps (FIRMs) are used to assess flood hazard risk, regulate construction practices, and set flood insurance rates. FIRMs are an important source of information to educate residents, government officials, and the private sector about the likelihood of flooding in their community. The current effective FIRM date for all jurisdictions in the Outer Banks Region is June 19, 2020.

All jurisdictions in the region participate in the NFIP. Table 5.2 provides NFIP policy and claim information for each participating jurisdiction in the Outer Banks Region. Overall, in the last five years, the number of active policies has decreased by 42 percent and insurance in force has decreased by 35 percent, while the number of total closed paid losses has increased by 57 percent.

All jurisdictions in the region will continue to comply with all required provisions of the NFIP. Floodplain management is managed through zoning ordinances, building code restrictions, and the county building inspection program. The jurisdictions will coordinate with NCEM and FEMA to develop maps and regulations related to Special Flood Hazard Areas within their jurisdictional boundaries and, through a consistent monitoring process, will design and improve their floodplain management program in a way that reduces the risk of flooding to people and property. Additional details on Community Rating System (CRS) participation and substantial damage management procedures are provided below.

COMMUNITY RATING SYSTEM

An additional indicator of floodplain management capability is active participation in the CRS. The CRS is an incentive-based program that encourages communities to undertake defined flood mitigation activities that go beyond the minimum requirements of the NFIP. Each of the CRS mitigation activities is assigned a point value. As a community earns points and reaches identified thresholds, they can apply for an improved CRS class. Class ratings, which range from 10 to 1 and increase on 500-point increments, are tied to flood insurance premium reductions. Every class improvement earns an additional 5 percent discount for NFIP policyholders, with a starting discount of 5 percent for Class 9 communities and a maximum possible discount of 45 percent for Class 1 communities.

Community participation in the CRS is voluntary. Any community that is in full compliance with the rules and regulations of the NFIP may apply to FEMA for a CRS classification better than class 10. The CRS application process has been greatly simplified over the past several years, based on community comments intended to make the CRS more user friendly, and extensive technical assistance is available for communities who request it.

— All communities in the Outer Banks Region participate in the Community Rating System. Each community's CRS Class is shown in Table 5.2.

Table 5.2 – NFIP Policy and Claim Information as of November 2024

Jurisdiction	Date Joined NFIP	CRS Class	Current Effective Map Date	NFIP Policies in Force	Insurance in Force	Written Premium in Force	Closed Losses	Total Payments
Currituck County	11/01/1984	6	06/19/20	2,683	$837,455,000	$1,791,725	2,010	$21,074,657
Dare County	10/06/1978	6	06/19/20	5,139	$1,428,747,000	$3,010,736	11,122	$144,097,374
Town of Duck	11/06/2003	6	06/19/20	932	$277,628,000	$520,560	193	$1,834,983
Town of Kill Devil Hills	05/04/1973	5	06/19/20	2,099	$596,073,000	$923,765	2,031	$18,506,630
Town of Kitty Hawk	10/06/1978	6	06/19/20	947	$274,794,000	$516,614	1,942	$19,979,908
Town of Manteo	01/05/1973	5	06/19/20	732	$188,665,000	$262,260	339	$5,231,889
Town of Nags Head	11/10/1972	5	06/19/20	2,107	$655,808,000	$1,263,423	3,248	$33,699,544
Town of Southern Shores	05/13/1972	6	06/19/20	633	$206,442,000	$408,774	312	$1,637,468
TOTAL PLAN	-	-	-	**26,307**	**$6,858,128,500**	**$20,700,866**	**13,505**	**$218,020,328**

Source: FEMA Community Information System

FLOODPLAIN MANAGEMENT PLAN

A floodplain management plan (or a flood mitigation plan) provides a framework for action regarding corrective and preventative measures to reduce flood-related impacts.

- Only one participating jurisdiction has a floodplain management plan in place. However, this hazard mitigation plan follows the 10 steps of the CRS Activity 510 Floodplain Management Plan process and provides a similar framework for flood mitigation; therefore, all jurisdictions have planned for floodplain management through this process.

SUBSTANTIAL DAMAGE PROCEDURES

The NFIP requires that participating communities regulate and enforce substantial damage and substantial improvement procedures such that, at a minimum, buildings that are damaged to 50 percent or more of their market value or improved by 50 percent or more of their market value are required to be brought into compliance with flood damage prevention regulations for new development, such as being elevated to the freeboard requirement. Procedures followed by the participating jurisdictions in the Outer Banks Region are outlined below.

CURRITUCK COUNTY

To streamline the identification of substantially damaged structures immediately after an event, Currituck County has inspection teams conduct initial sweep inspections to flag structures by their general level of damage. This process helps to identify those structures that will need a full inspection to determine if they are substantially damaged and facilitates a faster determination process, so that property owners can quickly submit proper permits. Damage assessment reports are entered and maintained electronically in the Orion Damage Assessment program. Currituck County Planning and Inspections Department staff assist in conducting these damage assessments and coordinate with the Currituck County Tax Office to make substantial damage determinations based on damage estimates. When a property owner applies for a permit for repair work, this data is referenced and if the structure is determined to be substantially damaged, or if a substantial improvement is triggered, then the building must be brought into compliance with all County ordinances, including the flood damage prevention ordinance.

If a property owner applies for a permit for alterations, repairs, renovations, or other improvements to an existing structure in the SFHA, the application is reviewed to determine whether the work constitutes a substantial improvement by evaluating the estimated cost of the work and comparing this estimate to the building's market value as determined by the Tax Office or an appraisal. If it is determined that the work constitutes a substantial improvement, the scope of work must be adjusted accordingly to bring the building into compliance with County ordinances. Work is field verified by County inspectors to ensure code compliance.

DARE COUNTY

Substantial damage and substantial improvement procedures are outlined in the flood damage prevention ordinance and are integrated with the County's permitting processes. The Dare County Planning Director is the designated Floodplain Administrator and oversees these procedures.

For improvements or repairs to damage of any origin, Planning & Inspections Department staff consisting of Certified Floodplain Managers and/or Building Inspectors review building permit applications and the estimated cost of repairs listed on the application to determine if the repair or damage is 50% or greater than the tax value of the structure listed with the Dare County Tax Department. Dare County Planning and Inspections requires that the estimated cost of repairs be a real-world estimate provided by a North

Carolina licensed General Contractor or a report from the property owners insurance company if the property was insured. The estimate from the General Contractor must include labor and materials. If a property owner feels that the structure's tax value listed by the Tax Department is below the structure's appraised market value, the property owner must supply an appraisal from a North Carolina licensed property appraiser showing a higher value for the structure.

If staff determine that the damage or repair is 50% or more than the structure's tax value or appraised market value, they notify the applicant that the work constitutes a substantial improvement or repair of substantial damage, and the property owner is required to bring the structure into compliance with the standards for new construction at the time of repairs.

Substantial damage and substantial improvements are tracked for a one-year period from the date of the certificate of occupancy issuance for the first repair of that structure. If it has been determined that the structure has sustained substantial damage, any repairs are considered substantial improvements, regardless of the actual repair work performed. Once determined a substantial damage/improvement Dare County Planning Staff uses our permit software to track the 1-year period.

To assist with making substantial damage determinations after a storm event, Dare County Planning staff reviews damage assessment reports logged by the Dare County Tax Department. The Tax Department uses a software called Crisis Track to conduct damage assessments.

The **Town of Duck** enforces substantial damage and substantial improvement requirements when a property owner applies for a permit. The Director of Community Development is designated as the Floodplain Administrator for the Town and works in coordination with the Building Official to make a substantial damage or substantial improvement determination according to the following procedures outlined in the Flood Damage Prevention Ordinance:

- Estimate the market value, or require the applicant to obtain an appraisal of the market value prepared by a qualified independent appraiser, of the building or structure before the start of construction of the proposed work; in the case of repair, the market value of the building or structure shall be the market value before the damage occurred and before any repairs are made;
- Compare the cost to perform the improvement, the cost to repair a damaged building to its pre-damaged condition, or the combined costs of improvements and repairs, if applicable, to the market value of the building or structure;
- Determine and document whether the proposed work constitutes substantial improvement or repair of substantial damage; and
- Notify the applicant if it is determined that the work constitutes substantial improvement or repair of substantial damage and that compliance with the flood resistant construction requirements of the NC Building Code and the flood damage prevention ordinance is required.

On-site inspections of work in progress are completed to confirm compliance with code requirements.

In the **Town of Kill Devil Hills**, the Town's Planning and Inspections Department implements the requirements of the flood damage prevention ordinance via the Floodplain Administrator/Planning Director, including substantial damage and substantial improvement requirements. Immediately after a natural disaster the floodplain administrator deploys the Kill Devil Hills Damage Assessment Team to impacted areas to conduct damage assessments. The team is divided into separate groups and includes building inspectors, certified floodplain managers, engineers, surveyors, and other staff. The groups assess initial damage including estimated damage amount; this data is tracked electronically and is given to the Floodplain Administrator to maintain.

When a property owner applies for a permit for repair work to the Town's Planning and Inspections Department, the substantial damage determination procedures outlined in the flood damage prevention

ordinance are taken to ensure compliance with the ordinance. These procedures are the same as those outlined above for the Town of Duck.

After an applicant is notified of a substantial damage or substantial improvement determination, a flood development permit is issued and all work is field verified by inspectors to ensure all work meets all applicable code requirements.

In the **Town of Kitty Hawk**, the **Town of Nags Head**, and the **Town of Manteo**, the Floodplain Administrators are responsible for managing and enforcing substantial damage requirements and making substantial damage determinations for existing buildings and structures, as outlined in each town's flood damage prevention ordinance. In Kitty Hawk, the Floodplain Administrator is the Planning Director. In Nags Head, the Floodplain Administrator is the Chief Building Inspector. In Manteo, the Floodplain Administrator is the Town's Code Enforcement Officer.

In these communities, substantial damage and substantial improvement determinations are made during the permitting process for repairs or improvements. For applications for building permits to improve buildings and structures, including alterations, movement, enlargement, replacement, repair, change of occupancy, additions, rehabilitations, renovations, substantial improvements, repairs of substantial damage, and any other improvement of or work on such buildings and structures, the Floodplain Administrator, in coordination with the Building Official, shall follow the same procedures as outlined above for the Town of Duck.

The **Town of Southern Shores** utilizes the NCEM Substantial Damage/Substantial Improvement form to track and enforce substantial damage and substantial improvement requirements. The form must be completed and submitted by a property owner or contractor when a property in a Special Flood Hazard Area (SFHA) has been damaged and improvements are proposed. Property owners and contractors are instructed to complete and submit the form prior to or when applying for a Building/Floodplain Development Permit. The form must be submitted to the Planning & Code Enforcement Department for trained staff to make a determination. Once all required information has been submitted, the Planning & Code Enforcement Department determines if the proposed improvements constitute a substantial improvement.

To proactively manage substantial damage enforcement after a storm event, the Town also utilizes Dare County's Guidelines for Hurricane Damage Types when conducting damage assessments immediately following a storm event. Damage assessment information is entered into Crisis Track and shared with Dare County Emergency Management. Damage that exceeds a certain threshold is flagged for additional review to make a substantial damage determination.

OPEN SPACE MANAGEMENT PLAN

An open space management plan is designed to preserve, protect, and restore largely undeveloped lands in their natural state, and to expand or connect areas in the public domain such as parks, greenways, and other outdoor recreation areas. In many instances open space management practices are consistent with the goals of reducing hazard losses, such as the preservation of wetlands or other flood-prone areas in their natural state in perpetuity.

— None of the participating jurisdictions have an open space management plan in place or under development.

STORMWATER MANAGEMENT PLAN

A stormwater management plan is designed to address flooding associated with stormwater runoff. The stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

- Half the participating jurisdictions have a stormwater management plan in place.
- Duck recently completed a neighborhood stormwater study through the Resilient Coastal Communities Program.

5.3.2 ADMINISTRATIVE AND TECHNICAL CAPABILITY

The ability of a local government to develop and implement mitigation projects, policies, and programs is directly tied to its ability to direct staff time and resources for that purpose. Administrative capability can be evaluated by determining how mitigation-related activities are assigned to local departments and if there are adequate personnel resources to complete these activities. The degree of intergovernmental coordination among departments will also affect administrative capability for the implementation and success of proposed mitigation activities.

Technical capability can generally be evaluated by assessing the level of knowledge and technical expertise of local government employees, such as personnel skilled in using GIS to analyze and assess community hazard vulnerability. The Local Capability Self-Assessment was used to capture information on administrative and technical capability through the identification of available staff and personnel resources.

Table 5.3 provides a summary of the Local Capability Self-Assessment results for the region with regard to relevant staff and personnel resources. A checkmark indicates the presence of a staff member(s) in that jurisdiction with the specified knowledge or skill.

Several administrative capability improvements were completed in the past five years. Southern Shores now has a full-time building inspector, and Duck now has a community planner and a second assistant inspector.

Administrative capability was also improved for Dare County and Manteo through their designation as Community Disaster Resilience Zones (CDRZs), which means they have advantages in some federal grant programs, as well as administrative support from NCORR.

Table 5.3 – Relevant Staff/Personnel Resources

Jurisdiction	Planners with knowledge of land development and land management practices	Engineers or professionals trained in construction practices related to buildings and/or infrastructure	Planners or engineers with an understanding of natural and/or human-caused hazards	Building Official	Emergency Manager	Floodplain Manager	Land surveyors	Scientist familiar with the hazards of the community	Staff with education or expertise to assess the community vulnerability to hazards	Personnel skilled in Geographic Information Systems (GIS) and/or HAZUS	Resource development staff or grant writers	Maintenance programs to reduce risk	Warning systems/services	Mutual Aid Agreements
Currituck County	✓	✓	✓	✓	✓	✓			✓	✓		✓	✓	✓
Dare County	✓		✓	✓	✓	✓			✓	✓	✓		✓	✓
Town of Duck	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Town of Kill Devil Hills	✓	✓	✓	✓		✓			✓	✓	✓		✓	✓
Town of Kitty Hawk	✓	✓	✓	✓		✓							✓	✓
Town of Manteo	✓	✓	✓	✓	✓	✓			✓		✓		✓	✓
Town of Nags Head	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Town of Southern Shores	✓	✓	✓	✓	✓	✓					✓		✓	✓

Source: Local Capability Assessment Survey

5.3.3 FISCAL CAPABILITY

The ability of a local government to implement mitigation actions is often dependent on the amount of money available. This may take the form of outside grant funding awards or locally based revenue and financing. The costs associated with mitigation policy and project implementation vary widely. In some cases, policies are tied primarily to staff time or administrative costs associated with the creation and monitoring of a given program. In other cases, direct expenses are linked to an actual project such as the acquisition of flood-prone houses, which can require a substantial commitment from local, state, and federal funding sources.

The Local Capability Self-Assessment was used to capture information on the region's fiscal capability through the identification of locally available financial resources.

Table 5.4 provides a summary of the results for the region with regard to relevant fiscal resources. A checkmark indicates that the given fiscal resource is locally available for hazard mitigation purposes (including match funds for state and federal mitigation grant funds).

Table 5.4 – Relevant Fiscal Resources

Jurisdiction	Capital Improvement Programming	Community Development Block Grants (CDBG)	Special Purpose Taxes	Gas/Electric Utility Fees	Water/Sewer Fees	Stormwater Utility Fees	Development Impact Fees	General Obligation Bonds	Revenue Bonds	Special Tax Bonds	Other
Currituck County	✓		✓		✓	✓	✓		✓		
Dare County	✓	✓	✓		✓	✓		✓	✓	✓	
Town of Duck	✓	✓	✓	✓	✓		✓	✓	✓	✓	
Town of Kill Devil Hills	✓				✓		✓				
Town of Kitty Hawk	✓		✓								
Town of Manteo	✓				✓		✓				
Town of Nags Head	✓		✓		✓	✓	✓	✓	✓	✓	✓
Town of Southern Shores	✓							✓	✓		

Source: Local Capability Assessment Survey

Within the past five years Hazard Mitigation Grant Program funds were used for property elevations in Currituck County and Dare County. Additionally, Currituck County Soil & Water Conservation District

received grant funding for ditch maintenance. Currituck County also applied for BRIC funding for stormwater improvements in Corolla but was not selected.

5.3.4 EDUCATION AND OUTREACH CAPABILITY

This type of local capability refers to education and outreach programs and methods already in place that could be used to implement mitigation activities and communicate hazard-related information. Examples include natural disaster or safety related school programs; participation in community programs such as Firewise or StormReady; and activities conducted as part of hazard awareness campaigns such as a Tornado Awareness Month.

Table 5.5 provides a summary of the results for the region with regard to relevant education and outreach resources. A checkmark indicates that the given resource is locally available for hazard mitigation purposes.

Table 5.5 – Education and Outreach Resources

Jurisdiction	Local citizen groups or non-profit organizations focused on environmental protection, emergency preparedness, access and functional needs populations, etc.	Ongoing public education or information program (e.g., responsible water use, fire safety, household preparedness, environmental education)	Natural disaster or safety related school programs	StormReady certification	Firewise USA Site certification	Public-private partnership initiatives addressing disaster-related issues	Other
Currituck County	✓	✓	✓	✓	✓		
Dare County	✓	✓	✓	✓		✓	
Town of Duck	✓	✓					
Town of Kill Devil Hills	✓	✓	✓				
Town of Kitty Hawk		✓					
Town of Manteo	✓	✓	✓				
Town of Nags Head	✓	✓	✓			✓	✓
Town of Southern Shores	✓	✓				✓	

Source: Local Capability Assessment Survey

There are three Firewise USA sites in Currituck County: Point Harbor Beach, Pine Island, and Currituck Club. Successful mitigation has been achieved through this program. For example, Point Harbor Beach

community previously only had one access into the subdivision. The subdivision borders county-owned property, Sound Park. The County worked with the Point Harbor Beach community to install a gate in the existing fence line to provide secondary egress from the community in the event of an emergency.

Currituck County has expanded the use of social media for outreach and reports that Everbridge participation in the county is increasing. Additionally, Currituck County has Fire and EMA classes in the high school and at the Currituck branch of the College of the Albemarle.

5.3.5 MITIGATION CAPABILITY

This type of local capability refers to the mitigation strategies and actions that are developed by the communities in this plan.

Table 5.6 provides a summary of the results for the planning area with regard to relevant mitigation resources. A checkmark (✓) indicates that the given resource is locally available for hazard mitigation purposes.

Table 5.6 – Mitigation Resources

Jurisdiction	Do you apply for mitigation grant funding?	Do you perform reconstruction projects?	Do you perform building elevations?	Do you perform acquisitions?
Currituck County	✓		✓	
Dare County	✓		✓	
Town of Duck	✓	✓		
Town of Kill Devil Hills			✓	
Town of Kitty Hawk				
Town of Manteo	✓	✓	✓	
Town of Nags Head	✓		✓	✓
Town of Southern Shores				

Building elevations are a preferred mitigation approach in the Region, and several communities have experience managing and completing these projects. Within the last five years, Currituck County and Dare County completed elevations with HMGP funding. Currituck County completed seven home elevations, and Dare County completed 27 elevations post-Hurricane Florence and has another 31 elevations post-Hurricane Dorian that are scheduled to be completed in 2025, including several in incorporated areas. Dare County supports local mitigation capabilities by managing elevation grant projects countywide.

5.3.6 POLITICAL CAPABILITY

One of the most difficult capabilities to evaluate involves the political will of a jurisdiction to enact meaningful policies and projects designed to reduce the impact of future hazard events. Hazard mitigation may not be a local priority, or it may conflict with or be seen as an impediment to other goals of the community, such as growth and economic development. Therefore, the local political climate must be

considered in designing mitigation strategies, as it could be the most difficult hurdle to overcome in accomplishing their adoption and implementation.

In completing the Local Capability Self-Assessment, HMPC representatives from each community were asked to rate political support as they perceive it and identify general examples of local political capability, such as guiding development away from identified hazard areas, restricting public investments or capital improvements within hazard areas, or enforcing local development standards that go beyond minimum state or federal requirements (e.g., building codes, floodplain management, etc.).

HMPC representatives from all participating jurisdictions indicated that political leaders are at least potentially willing to implement mitigation measures. All participating jurisdictions have some local standards that exceed state requirements. For example, Currituck County, Dare County, Kill Devil Hills, Kitty Hawk, Manteo, and Nags Head have a one-foot freeboard requirement; Duck and Southern Shores require a two-foot freeboard.

5.3.7 LOCAL SELF-ASSESSMENT RATING

Staff representatives from each of the participating communities were asked to rate their community's perceived capability across each of the capability categories and overall, as either "limited," "moderate," or "high." Table 5.7 summarizes the results of the self-assessment ratings for each community in the Outer Banks Region.

Table 5.7 – Self-Assessment of Capability

Jurisdiction	Plans, Ordinances, Codes and Programs	Administrative and Technical Capability	Fiscal Capability	Education and Outreach Capability	Mitigation Capability	Political Capability	Overall Capability
Currituck County	High	High	High	Moderate	Moderate	Moderate	High
Dare County	High	High	High	High	High	High	High
Town of Duck	High	Moderate	Moderate	High	Limited	Moderate	Moderate
Town of Kill Devil Hills	High	High	Moderate	High	Limited	Moderate	Moderate
Town of Kitty Hawk	Moderate	Limited	Moderate	Limited	Moderate	Moderate	Moderate
Town of Manteo	Moderate	Moderate	Moderate	Limited	Limited	Moderate	Moderate
Town of Nags Head	High	High	High	High	High	High	High
Town of Southern Shores	High	High	High	High	High	High	High

Source: Local Capability Assessment Survey

5.4 CONCLUSIONS ON LOCAL CAPABILITY

To form meaningful conclusions on the assessment of local capability, a quantitative scoring methodology was designed and applied to results of the Local Capability Assessment Survey. This methodology attempts to assess the overall level of capability of the Outer Banks region to implement hazard mitigation actions.

Table 5.8 shows the results of the capability assessment using the designed scoring methodology. The capability score is based solely on the information provided by local officials in response to the Local Capability Self-Assessment. According to the assessment, the average local capability score for all responding jurisdictions is 150, which falls into the High capability ranking; however, this is somewhat skewed by a few very high-performing jurisdictions. The median score is 97. This score indicates a slight increase in capability over the last five years since the previous plan.

Table 5.8 – Capability Assessment Results

Jurisdiction	Overall Capability Score	Overall Capability Rating
Currituck County	94	Moderate
Dare County	100	Moderate
Town of Duck	86	Moderate
Town of Kill Devil Hills	81	Moderate
Town of Kitty Hawk	195	High
Town of Manteo	80	Moderate
Town of Nags Head	330	High
Town of Southern Shores	237	High

Source: Local Capability Assessment Survey, NCEM Risk Management Tool

As previously discussed, one of the reasons for conducting a capability assessment is to examine local capabilities to detect any existing gaps or weaknesses within ongoing government activities that could hinder proposed mitigation activities and possibly exacerbate community hazard vulnerability. These gaps or weaknesses have been identified, for each jurisdiction, in the tables found throughout this section. The participating jurisdictions used the capability assessment as part of the basis for the mitigation actions that are identified in Section 7; therefore, each jurisdiction addresses their ability to expand on and improve their existing capabilities through the identification of their mitigation actions.

6 MITIGATION STRATEGY

Requirement §201.6(c)(3): [The plan shall include] a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.

This section describes the process for developing the mitigation strategy for the Outer Banks Regional Hazard Mitigation Plan. It describes how the Region met the requirements for Planning Step 6 (Set Goals), Planning Step 7 (Review Possible Activities), and Planning Step 8 (Draft an Action Plan). This section includes the following sub-sections:

- 6.1 Goals and Objectives
- 6.2 Identification & Analysis of Mitigation Activities

6.1 GOALS AND OBJECTIVES

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

Goal setting builds upon the findings of Section 4, which documents the hazards and associated risks that threaten the Outer Banks Region, and Section 5, which evaluates the capacity of the Region to reduce the impact of those hazards. The intent of goal setting is to identify areas where feasible actions can be taken or improvements to existing capabilities can be made so that community vulnerability to hazards is reduced. Goals are also necessary to guide the review of possible mitigation measures. This plan needs to make sure that recommended actions are consistent with what is appropriate for the Region. Mitigation goals need to reflect community priorities and should be consistent with other local plans.

- **Goals** are general guidelines that explain what is to be achieved. They are usually broad-based policy type statements, long term and represent global visions. Goals help define the benefits that the plan is trying to achieve.
- **Objectives** are short term aims that, when combined, form a strategy or course of action to meet a goal. Unlike goals, objectives are specific and measurable.

6.1.1 COORDINATION WITH OTHER PLANNING EFFORTS

The goals of this plan need to be consistent with and complement the goals of other local planning efforts. The primary planning documents that the goals of this plan should complement and be consistent with are the participating jurisdictions' comprehensive plans. Comprehensive plans are important because they are developed and designed to guide future growth within their communities so they encompass long-term strategies and can be critical to reducing long term vulnerabilities. Keeping the Hazard Mitigation Plan and Comprehensive Plans consistent ensures that land development is done with awareness and understanding of hazard risk and that mitigation projects complement rather than contradict community development objectives.

6.1.2 GOAL SETTING

At the third planning meetings, held on October 21 and October 22, 2024, the HMPC reviewed and discussed the goals and objectives from the 2020 plan. The HMPC largely approved of the existing goals but proposed some revisions to improve overall clarity and add verbiage regarding supporting vulnerable populations and underserved communities, improving resilience of critical facilities, leveraging outside resources, and pursuing regional resilience projects.

The revised goals and objectives of this plan update are detailed below in Section 6.1.3.

6.1.3 RESULTING GOALS AND OBJECTIVES

The HMPC agreed upon four general goals for this planning effort and included specific objectives in support of each goal. The refined goals and objectives are as follows:

Goal 1 – Reduce the risk of loss of life and personal injury from hazards.

Objective 1.1: Educate citizens to encourage individual responsibility to protect themselves and their families from hazards. Recognize that vulnerable populations and underserved communities may need additional resources and support.

Objective 1.2: Reduce the impact of current and future hazards by mitigating risk of development.

Goal 2 – Maintain critical facilities and infrastructure and protect them from damage.

Objective 2.1: Retrofit or otherwise protect critical facilities and infrastructure to prevent damage or enable operations to resume quickly after impacts.

Objective 2.2: Increase redundancy of critical systems and services.

Goal 3 – Ensure that hazard mitigation practices, construction techniques, and development policies and ordinances are integrated to enhance resiliency and enable speedy recovery.

Objective 3.1: Adopt protective development standards and establish post-disaster redevelopment policies.

Objective 3.2: Preserve and protect natural and beneficial floodplain functions and key natural resources.

Objective 3.3: Explore, develop, and implement new pre-disaster opportunities that build community resilience.

Goal 4 – Improve interjurisdictional cooperation and coordination and leverage state and regional resources to support mitigation.

Objective 4.1: Coordinate development standards across jurisdictions.

Objective 4.2: Encourage and enable inter-jurisdictional communication.

Objective 4.3: Pursue regional approaches to building resilience.

6.2 IDENTIFICATION AND ANALYSIS OF MITIGATION ACTIVITIES

Requirement §201.6(c)(3)(ii): [The mitigation strategy section shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

To identify and select mitigation projects that support the mitigation goals and objectives, the risks and vulnerabilities associated with all hazards identified and evaluated in Section 4 Risk Assessment were evaluated for mitigation opportunities. The HMPC analyzed viable mitigation options that supported the identified goals and objectives, addressed key problems, risks, or vulnerabilities, and aligned with other local plans and efforts. The HMPC was provided with the following list of mitigation categories which are utilized as part of the CRS planning process but are also applicable to multi-hazard mitigation:

- Prevention
- Property Protection
- Natural Resource Protection
- Emergency Services
- Structural Projects
- Public Information and Outreach

The HMPC was also provided with examples of potential mitigation actions for each of the above categories. The HMPC was instructed to consider both future and existing buildings in evaluating possible mitigation actions. Facilitated discussions took place to examine and analyze the options. The HMPC also considered which actions from the previous plan that were not already completed should be continued in this action plan.

More details on mitigation alternatives considered by the HMPC are provided in Appendix C.

6.2.1 PRIORITIZATION PROCESS

In the process of identifying continuing and new mitigation actions, the HMPC was provided with a set of prioritization criteria to assist in deciding why one recommended action might be more important, more effective, or more likely to be implemented than another. HMPC members were asked to consider a set of prioritization criteria, which were grouped into three categories: Suitability, Risk Reduction, and Cost. The criteria for the prioritization process included the following:

- **Suitability**
  - Appropriateness of Action
  - Community Acceptance
  - Technical and Administrative Feasibility
  - Environmental Impact
  - Legal Conformance
  - Consistency with Existing Plans and Other Community Goals

- **Risk Reduction**
  - Scope of Benefits
  - Potential to Save Lives
  - Importance of Benefits
  - Level of Inconvenience or Unintended Consequence
  - Losses Avoided
  - Number of People to Benefit
- **Cost**
  - Estimate of Upfront Cost
  - Estimate of Ongoing Cost
  - Benefit to Cost Ratio
  - Financing Availability
  - Affordability
  - Elimination of Repetitive Damages

In accordance with the DMA requirements, an emphasis was placed on the importance of a benefit-cost analysis in determining action priority, as reflected in the prioritization criteria above. For each action, the HMPC considered the benefit-cost analysis in terms of:

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

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

Using these prioritization criteria, the HMPC assigned each action a ranking of High, Medium, or Low priority. The prioritization ranking for each mitigation action considered by the HMPC is provided in Section 7 Mitigation Action Plans.

7 MITIGATION ACTION PLANS

Requirement §201.6(c)(3)(iii): [The mitigation strategy section shall include an] action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

This section provides the mitigation action plans for each participating jurisdiction. The plans are organized as follows:

Table 7.1 – Currituck County Mitigation Action Plan
Table 7.2 – Dare County Mitigation Action Plan
Table 7.3 – Town of Duck Mitigation Action Plan
Table 7.4 – Town of Kill Devil Hills Mitigation Action Plan
Table 7.5 – Town of Kitty Hawk Mitigation Action Plan
Table 7.6 – Town of Manteo Mitigation Action Plan
Table 7.7 – Town of Nags Head Mitigation Action Plan
Table 7.8 – Town of Southern Shores Mitigation Action Plan

Table 7.1 – Currituck County Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR1	Establish appropriate buffers/setbacks between critical facilities and other uses that may be incompatible	All Hazards	2.1	High	Prevention	Planning	General Fund	On going	Carried Forward	Currituck participated in DCM's Resilient Coastal Communities Program (RCCP) which included a detailed Risk & Vulnerability Assessment of critical assets (see final report link)
CUR2	Maintain partnerships with adjacent counties and municipalities to leverage and share resources.	All Hazards	2.2	Medium	Prevention	Emergency Management	General Fund	On going	Carried Forward	Continuous - county-to-county mutual aid agreement
CUR3	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Prevention, Public Education & Awareness	Planning, NC Forest Service	Grant Funds	3-5 years	New	
CUR4	Direct development away from high-risk and vulnerable areas and establish redevelopment standards that decrease hazard risk	All Hazards	3.1	High	Prevention	Planning	General Fund	On going	Carried Forward	We allow higher density development as an incentive for developers to place special flood hazard area portions of large tracts in perpetual conservation. The new Coastal Resilience Tool, created for Currituck County by The Nature Conservancy, is used during subdivision review to encourage development away from high-risk areas.
CUR5	Pursue acquisition and/or elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Planning, Emergency Management	Grant Funds	Ongoing	New	
CUR6	Enhance existing and/or implement new groundwater lowering systems in low-lying coastal areas.	Hurricane & Coastal Hazards, Flooding	1.2	Medium	Property Protection	Stormwater Service Districts/ Engineering	Service District Taxes	On going	Carried Forward	An additional pump is being installed in the Whalehead Subdivision and will be completed by December. As of July 1, 2023, the Ocean Sands Stormwater District is now paying increased taxes for additional revenue to fund the groundwater lowering system. The project will also be split into smaller more affordable phases to provide an earlier start date.
CUR7	Support individuals and Homeowners Associations in acquiring funding for green stormwater infrastructure to mitigate nuisance flooding.	Hurricane & Coastal Hazards, Flooding	1.2	Medium	Property Protection	Soil & Water Conservation Board, Planning, Cooperative Extension	General Funds and Grants	On going	Carried Forward	Currituck County was awarded $248,000 through the North Carolina Department of Agriculture's *Stream Flow Rehabilitation Program*. The County continues to use this money to improve drainage infrastructure.
CUR8	Preserve natural environmental features to naturally absorb water run-off and serve as wind buffers	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Medium	Natural Resource Protection	Planning	General Fund	On going	Carried Forward	UDO contains provisions for preserving existing vegetation for buffers as well as preservation of wetland areas. Our stormwater manual contains water quality standards as well.
CUR9	Retain vegetation and require buffers in areas adjacent to wetlands, water bodies and Maritime forests	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Medium	Natural Resource Protection	Planning	General Fund	On going	Carried Forward	This is ongoing through a combination of wetland buffers, implementation of CAMA regulations, and heritage tree protection standards.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR10	Evaluate allocating a portion of occupancy tax toward the dune protection program and shoreline restoration, and expand extent of the dune protection program to include grant support of sand fencing.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Planning	Occ Tax	On going	Carried Forward	The county is offering yearly dune vegetation and sand fence cost share programs. The county has recently increased funding for this program to $20,000.
CUR11	Work to pursue shoreline stabilization projects and regular shoreline monitoring.	Hurricane & Coastal Hazards	3.3	Medium	Natural Resource Protection	Engineering	General Funds	On going	Carried Forward	The 3-year shoreline study has been completed and presented at a Board of Commissioners retreat. The County has now contracted the development of a beach management plan.
CUR12	Currituck Sound Coalition will prioritize marsh restoration planning and design for storm surge mitigation benefits.	Hurricane & Coastal Hazards	3.3	Medium	Natural Resource Protection	Audubon, Planning, GIS, Soil & Water Conservation	General Funds	On going	Carried Forward	Coalition meetings are held quarterly. Audubon Pine Island Marsh Restoration Planning Project is in the process of designing project sites within the Currituck sound to address the following: increase resilience of existing marshes to sea level rise and other climate change impacts while reducing flood and storm surge impacts to nearby communities and infrastructure. Pilot projects include: a living shoreline with soft sill, Christmas tree breakwater, thin layer placement (TLP) for marsh restoration.
CUR13	Encourage linkage of existing and future open space areas to implement greenways throughout unique geographies of the county.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	Medium	Natural Resource Protection	Planning	No funding needed	On going	Carried Forward	In partnership with The Nature Conservancy the county is testing out utility of a Green Space Dashboard
CUR14	Seek funding for public hazard mitigation projects.	All Hazards	1.2	Medium	Structural Projects	Emergency Management	Grant	On going	Carried Forward	Grant writing and monitoring added to Soil & Water admin position. Also monitoring EPA flood reduction grants. County has signed agreements with State for the State centric plan. The state will now handle all contract work and county EM will now be the liaison between homeowner and state. State has bids out for contractors to lift each of the houses. Very slow process.
CUR15	Continue to support efforts for planning, design, and construction of the Mid-County bridge project.	All Hazards	3.3	Medium	Structural Projects	Planning	NC Turnpike Authority	5 years	Carried Forward	Planning staff is working on terminus designs and studying impacts to properties on both sides of the bridge.
CUR16	Identify bridges for retrofitting.	All Hazards	1.2	High	Structural Projects	Planning	NCDOT	On going	Carried Forward	Ongoing. Continuing to work with DOT to maintain roadways and the Wright Memorial Bridge.
CUR17	Implement drainage improvement projects to reduce stormwater related flooding.	Hurricane & Coastal Hazards, Flooding	2.1	Medium	Structural Projects	Planning	Grants	Ongoing	New	
CUR18	Maintain and work to improve radio communications and technology throughout public safety programs	All Hazards	4.2	High	Emergency Services	Public Safety Agencies	General Funds and Grants	On going	Carried Forward	This project is still in process. Updates to the microwave system will be worked on first. Waiting on proposal from vendor.
CUR19	Provide continuous training and information for first responders in hazard response	All Hazards	4.1	High	Emergency Services	Public Safety Agencies	General Funds and Grants	On going	Carried Forward	Ongoing

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR20	Coordinate response to bridge incidents for the Wright Memorial Bridge	Infrastructure Failure	4.1	High	Emergency Services	Public Safety Agencies	General Funds/Grants	On going	Carried Forward	This exercise is complete and continuous, planning will improve response.
CUR21	Educate the public and inform them of the benefits of participation in the Fire Wise program.	Wildfire	1.1	High	Public Education & Awareness	Emergency Management	Grant	On going	Carried Forward	We have 3 communities that are in the Firewise program: Pine Island, Currituck Club, Point Harbor. We met with each community at the end of April to renew their certifications.
CUR22	Educate homeowners and builders on the benefits of sprinkler systems in residential structures	Wildfire	1.1	Medium	Public Education & Awareness	Fire Marshal/ Planning	General Fund	On going	Carried Forward	Ongoing through the fire marshal and planning department. The County is periodically conducting citizen academy sessions where planning processes and building codes are discussed with developers, contractors, and the general public. Residential sprinkle systems are included in these sessions.
CUR23	Increase public awareness and understanding of the locations and proper way to dispose of hazardous waste	Hazardous Substances	1.1	Medium	Public Education & Awareness	Public Works	General Fund	On going	Carried Forward	PW continues to sponsor an annual household hazardous waste day. Hazardous waste day is now advertised in the Focus on Currituck publication and on social media platforms. Participation continues to increase.
CUR24	Periodically survey the public to evaluate if public outreach efforts are effective in identifying potential flood hazards, public concern, and ways to mitigate against hazards	Hurricane & Coastal Hazards, Flooding	1.1	Medium	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	Tailoring future outreach projects using survey results. Progress for this activity has recently been hindered due to the planning and inspections department being severely understaffed with a significant increase in development.
CUR25	Develop a joint public outreach document that addresses all hazards (published by the Planning and Emergency Management Departments)	All Hazards	1.1	High	Public Education & Awareness	Planning/ Emergency Management	General Fund	On going	Carried Forward	The planning department and the emergency management department publish documents in the "Focus on Currituck" publication. The new outreach brochure, created as a joint effort by Currituck and Dare Counties through our CRS user's group, addresses all hazards.
CUR26	Evaluate effectiveness of Currituck's warning systems	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund	On going	Carried Forward	Number of individuals registering for Currituck Alert provides a baseline for effectiveness of mass notification. Planning a campaign to increase awareness of ENS and increase number of subscribers. Registrations still rising. Utilizing social media and Focus on Currituck publication to increase awareness.
CUR27	Educate and assist vulnerable populations in developing personal preparedness plans	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund	On going	Carried Forward	Continuous implementation. No new activities to report.
CUR28	Partner with other County Departments, State, local agencies to educate and inform vulnerable populations about special needs registry with Social Services through community outreach (survey, website, social media, water bill)	All Hazards	1.1	High	Public Education & Awareness	DSS, EM, PIO	General Fund	On going	Carried Forward	Continuous implementation. No new activities to report.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR29	Create curriculums for all hazards preparedness to better educate the public	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund/Grants	less than 5 years	Carried Forward	Emergency Management is working on this action as budget and staffing allows.
CUR30	Continue to educate elected officials and the public on the need for and benefits of sustained shoreline management strategies.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.1	High	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	Staff continues to share information with elected officials and the public.
CUR31	Educate property owners on the natural and beneficial functions of floodplains, watersheds, and other natural/coastal areas.	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	This is included in the new outreach brochure.
CUR32	Educate the development and agricultural communities as well as the public on the impacts of turbidity on floodplain/natural areas and mitigating best management practices	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Public Education & Awareness	Soil & Water Conservation Board, Planning, Cooperative Extension	General Fund	On going	Carried Forward	The Soil and Water Conservation Board and the Cooperative Extension continue to work on this action as time and budget allows.
CUR33	Develop outreach materials and offer training on Low Impact Development (LID) best management practices that can be distributed to the public and engineering communities.	Hurricane & Coastal Hazards, Flooding	3.2	High	Public Education & Awareness	Soil & Water Conservation Board, Planning, Cooperative Extension	General Fund	less than 5 years	Carried Forward	The stormwater manual addresses this. Training has not been offered yet. Progress on this action has been hindered by staffing and budget constraints.
CUR34	Send targeted outreach on flood risk, preparedness, insurance and mitigation options to repetitive loss property owners	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Planning	General Fund	1 year	Carried Forward	All repetitive loss properties received a copy of our outreach brochure which addresses these concerns.
CUR35	Send targeted outreach on flood risk, preparedness, insurance, and mitigation options to pre-FIRM property owners	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Planning	General Fund	1 year	Carried Forward	The County is hoping to develop a new letter to be sent to all pre-FIRM property owners in the near future. Working to get more outreach funding included in the budget.

Table 7.2 – Dare County Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR1	Identify Funding to improve stormwater drainage and land management preparation for flooding	Flooding, Hurricane & Coastal Hazards	3.3	7-High	Prevention	Dare County Planning	General Fund, Grant Funds	1-3 years	Carry Forward	Funding Received: DCM $234,000 grant for modeling stormwater drainage in Salvo. DCM grant for $160k Hatteras Village stormwater infrastructure construction and $770k DRMF grant for Buxton stormwater infrastructure construction. Golden Leaf $250k for Northern Roanoke Island stormwater infrastructure construction. Continuing to seek funding for additional projects.
DAR2	Expand the number of lifeguarded beaches in unincorporated Dare to bring lifeguards to all villages in addition to ocean rescue response personnel.	Hurricane & Coastal Hazards	3.3	3-Medium	Prevention	National Park Service Dare County	General Fund, Grant Funds	2-3 years	Carry Forward	Dare County shifted a staffed lifeguard position from Manteo to County beach access in Rodanthe. Continue pursuing additional opportunities for lifeguarded beaches.
DAR3	Grow Local Emergency Planning Committee membership by expanding industry participation while fully implementing Community Right to Know reporting requirements to enhance knowledge of hazardous material risk across the region.	Radiological Emergency, Hazardous Substances	3.3	5-High	Prevention	Dare County Emergency Management	General Fund, Grant Funds	1-2 years	Carry Forward	Continue growing LEPC membership and holding regular meetings, seeking grant opportunities, implementing EPCRA. Bring new Fire Inspector position into leadership role.
DAR4	Expand involvement with the North Carolina Information Sharing and Analysis Center to ensure actionable intelligence on immediate and emerging threats to the region are identified and shared with first responders, private sector, emergency management, local law enforcement and other partner agencies in a timely manner.	Terrorism, Radiological Emergency	4.2	3-Medium	Prevention	Dare County Emergency Management, Dare Sheriff's office	General Fund, Grant Funds	1-3 years	Carry Forward	Added a FLO in Dare County with EM Planner. Continue growing participation in ISAAC and FLO program.
DAR5	Identify and pursue opportunities to establish Community Resilience Hubs at existing facilities and during the planning stages for new community facilities like libraries, public safety stations (fire, Police, EMS), community centers, and government office complexes. Focus on hub development should start in the FEMA designated Community Disaster Resilience Zones on the north end of Roanoke Island and Hatteras Island.	All Hazards	2.1, 3.3	Medium	Prevention	Dare County Emergency Management	General Fund, Grant Funds	5 years	New	
DAR6	Utilize existing post storm information and GIS mapping to identify the most vulnerable structures in the County.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.3	5-High	Property Protection	Dare County Planning, Dare County Emergency Management	General Fund, Grant Funds	1 year	Carry Forward	Need to acquire data on structures built pre-1976 that may be below BFE and could benefit from FMA grant process.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR7	Establish Firewise USA sites by conducting wildfire risk assessments in vulnerable communities, engage residents, and co-create individual mitigation action plans to protect people, property, and natural resources from wildland fire.	Wildfire	3.3	7-High	Property Protection	Dare County Emergency Management. Fire Marshal, US Fish & Wildlife, NC Forest Service	Grant funds, General Fund	1-3 years	Carry Forward	No progress to report
DAR8	Continue to encourage property owners to maintain or obtain flood insurance policies across Dare County since the adoption of the 2020 flood maps, which resulted in a reduction of properties located in FEMA Special Flood Hazard Areas. Many properties were reclassified as Shaded X and/or X zone which no longer require flood insurance associated with a federally insured mortgage.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.3	5-High	Property Protection, Public Education & Awareness	Dare County Planning. Emergency Management	General Fund, Grant Funds	1-2 years	Carry Forward	Action revised. County will work to mitigate the loss of policies since the update to the FIRM and undertake efforts to raise awareness that properties in the X zone will still flood and the impacts owners will face without a flood insurance policy.
DAR9	Pursue a maintenance/monitoring "adopt a gauge" program to help service the equipment. Pursue installation of additional gauges at key points of interest across Dare County.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	2.2	5-High	Property Protection	Dare County Emergency Management	Grant Funds, NC Emergency Mgmt.	2 years	Carry Forward	Action revised to prioritize gauge maintenance.
DAR10	Complete a cybersecurity risk assessment from an external subject matter expert. Based on risk assessment outcomes develop and require all employees, volunteers and elected officials to complete cybersecurity awareness training before being given access to county information technology systems. Develop and offer cybersecurity awareness training for citizens. Develop and conduct cybersecurity exercises.	Terrorism, Cyber Threat	3.3	5-High	Property Protection	Dare County Emergency Management Dare County Information Technology	General Fund, Grant Funds	2 years	Carry Forward	Completed risk assessment with NCNG Cybersecurity task force. Outcome led to follow on grants and actions to implement risk assessment findings. Effort is ongoing to include formal cybersecurity plan development and recurring exercises.
DAR11	Work with all landowners including federal, state, and private to ensure proper maintenance and use of existing drainage systems to minimize impacts and reduce standing water on all property.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	1.1	7-High	Property Protection	Dare County Planning -- Soil and Water Conservation Board	Grants, tax or tax incentive program	1-3 years	Carry Forward	Continue pursuing grant opportunities and promoting proper drainage.
DAR12	Explore opportunities to improve the continuous operation of critical government and business functions that are essential to human health and safety or economic security by determining the designed wind load, elevation level, power generation capability, redundant communications and shelter in place capacity at public safety and critical facilities. This effort should go beyond public facilities and explore all facilities that are relied upon to deliver services under the FEMA Community Lifeline construct, especially those in a designated Community Disaster Resilience Zone.	All Hazards	2.1	High	Property Protection	Dare County Emergency Management	General Fund, Grant Funds	5 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR13	Continue to seek funding for elevation, acquisition, or relocation of vulnerable structures to include those that moved into the X zone based on the 2020 flood maps and those that are facing imminent threat from the hazards of coastal erosion. Take action to fully understand the risk and scope of the need for elevation projects by determining the number of structures that are below the Dare County local elevation standard of eight feet or greater depending on whether the property is in a flood zone and the height of the natural topography.	Flooding, Hurricane & Coastal Hazards	1.2	High	Property Protection	Dare County Planning Department	Grant Funds, General Fund	1-3 years	New	
DAR14	Study and document sound side erosion rates and water level changes	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	3-Low	Natural Resource Protection	NC Division of Coastal Mgmt.	Grants, Volunteer	3- 5 years	Carry Forward	No data available on soundside erosion rates. Discussed Coastal Fed receiving large grant to monitor estuarine erosion with DCM and possible Corps of Engineers project on soundside erosion.
DAR15	Encourage the use of natural barriers and innovative solutions, such as living shorelines, to reduce shoreline and marsh erosion and protect built infrastructure.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	3.3	4-Medium	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	General Fund, Grant Funds	3-5 years	Carry Forward	Action revised to prioritize green infrastructure
DAR16	Protect natural floodplain function and resilient areas as open space to provide flood and coastal hazard risk reduction and potentially increase CRS 420 open space credit	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	4-Medium	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	General Fund, Grant Funds	1-3 years	Carry Forward	No new open space acquisitions to report.
DAR17	Continue to build/maintain engineered beaches and use living shorelines to protect the community from sea level rise, erosion and the impacts of storm surge from tropical and non tropical coastal weather events. Efforts should remain focused on FEMA designated Community Disaster Resilience Zones.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	High	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	Grant Funds, General Fund	3-5 years	New	
DAR18	Advocate and pursue funding opportunities to accomplish recommendations made by the NC 12 Taskforce.	Flooding, Hurricane & Coastal Hazards	2.2	7-High	Structural Projects	Dare County Planning, Dare County Emergency Management, NCDOT	NCDOT	1 -3 years	Carry Forward	Action revised to prioritize projects identified by the NC 12 Task Force
DAR19	Monitor construction of the Lindsey Warren (Alligator River) Bridge replacement span until completion.	Flooding, Hurricane & Coastal Hazards	2.1	7-High	Structural Projects	Dare Board of Commissioners, NCDOT	NCDOT	1 year	Carry Forward	Action revised. Bridge replacement underway.
DAR20	Fund critical stormwater and resiliency projects identified in 2023 Dare County Stormwater Master Plan and Resilient Coastal Communities Program Risk & Vulnerability Assessment.	Flooding, Hurricane & Coastal Hazards	2.1	7-High	Structural Projects	NCDOT, Dare County Planning, Dare Soil & Water Board	Grant Fund, local stormwater assessments	1-3 years	Carry Forward	Action revised to integrate identified projects in the Stormwater Master Plan and RCCP Resilience Strategy
DAR21	Fund and construct stormwater improvements for Northern Roanoke Island as identified in Roanoke Island Flooding Analysis and Stormwater Master Plan.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	3.3	7-High	Structural Projects	Dare Board of Commissioners, NCDOT	Grant Fund, local stormwater assessments	2 years	Carry Forward	Action revised. $250k Golden Leaf grant received and construction completed on a segment of proposed improvements. FEMA HMGP grant applied for to complete project.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR22	Complete physical security assessment at all public facilities and large crowd (500+ people) gathering venues and events. Based on results, make physical security improvements and/or implement measures to protect lives from likely threats.	Terrorism	3.3	3-Low	Structural Projects	Dare County Emergency Management. Dare Sheriff's Office	General Fund, Grant Funds	1-3 years	Carry Forward	No progress to report
DAR23	Improve water supply and delivery systems to reduce water waste from breaks and leaks. Encourage development best practices to reduce water use/runoff such as drought-tolerant landscaping and permeable surfaces. Discuss creating or improving the Emergency Water / Resiliency Plan, including lessons learned from the aftermath of Hurricane Helene in WNC.	Drought, Flooding, Infrastructure Failure	2.1	7-High	Structural Projects	Dare County Water Department	Water enterprise fund	3-5 years	Carry Forward	Action revised to incorporate emergency/resiliency planning.
DAR24	Establish secondary water supplies/points for fire protection efforts.	Flooding, Wildfire	2.2	4-Medium	Emergency Services	Dare County Fire Marshal	Grant Funds	3-5 years	Carry Forward	Manns Harbor cluster homes, auxiliary tanks at locations where water supply insufficient for fire protection.
DAR25	Acquire generators or other forms of redundant power supply to ensure that critical facilities and infrastructure remain operational where normal power supply is not available	All Hazards	2.2	5-High	Emergency Services	Dare County Fire Marshal, Public Works, Emergency Mgmt.	Grant Funds	1-2 years	Carry Forward	Progress has been made, but critical facilities without backup power remain ready for future opportunities.
DAR26	Study and identify all key secondary roadways used by workforce that flood routinely and develop plans to mitigate flood hazards. These are transit corridors that support year-round resident populations like Colington Road, NC 345, and Kitty Hawk Road.	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Infrastructure Failure	2.2	5-High	Emergency Services	NCDOT, Dare County Planning	General Fund, Grant Funds	2 years	Carry Forward	Colington project completed, other troublesome areas remain to be addressed.
DAR27	Improve the Dare County Emergency Pumping Plan by identifying additional areas that would benefit from pre-planning efforts and utilization of new pumping equipment.	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms, Infrastructure Failure	2.2	7-High	Emergency Services	Dare County Planning, Emergency Management, NC Forest Service	General Fund, Grant Funds	1 year	Carry Forward	Action revised to expand plan scope.
DAR28	With internet access provided by a commercial entity that uses a straight line ground based fiber optic infrastructure that ends on Ocracoke Island, efforts need to be taken to add a subsea connection from Ocracoke to the mainland to complete a service loop. In addition satellite based internet access needs to be provided to ensure continuity of operations when ground based access is interrupted.	All Hazards	2.1, 3.3	High	Emergency Services	Dare County Emergency Management	General Fund, Grant Funds, other outside funding	5 years	New	Reliable access to the internet is needed to support public safety communications to include 911 services and dissemination of Alerts, Warnings and Messages. It is also needed to ensure continuity of government and business operations especially in the Community Disaster Resilience Zone on Hatteras Island.
DAR29	Pursue a Tsunami Ready Community designation for all of Dare County from the National Weather Service under the NWS TsunamiReady® Program.	Earthquake	1.1	Low	Emergency Services	Dare County Emergency Management	General Fund, Grant Funds	1-3 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR30	Expand hazardous weather awareness to include tornados and winter storms by expanding NWS partnership opportunities to include SKYWARN training and community forums	Excessive Heat, Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Drought	1.1	6-High	Public Education & Awareness	National Weather Service, Dare County Emergency Management	General Fund, Grant Funds	2 years	Carry Forward	No progress to report. This remains a priority.
DAR31	Increase the use of the NWS alert feature of the County mass notification system so that residents and visitors have direct access to all issued weather alerts.	Excessive Heat, Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Drought	1.1	6-High	Public Education & Awareness	Dare County Emergency Management	General Fund, Grant Funds	1 year	Carry Forward	No progress to report. This remains a priority.
DAR32	Expand the “Love The Beach Respect The Ocean” beach safety campaign by expanding participation with the Chamber of Commerce, Property Managers, as well as hotel, restaurant, and beach equipment rental companies	Hurricane & Coastal Hazards	1.1	5-High	Public Education & Awareness	Dare County Emergency Management, Public Relations	General Fund, Grant Funds	1-3 years	Carry Forward	No progress to report. This remains a priority.
DAR33	Undertake efforts to improve individual resilience of all residents with focus on those living in a Community Disaster Resilience Zone. Develop outreach programs to reach the underserved and/or marginalized populations that may not trust government officials. Seek opportunities to engage residents in their communities at small functions as well as at large scale open houses/festivals. Efforts could include programs that focus on children and emergency planning like Ready Kids, Faith-Based Community Preparedness and Community Emergency Response Teams.	All Hazards	1.1	High	Public Education & Awareness	Dare County Emergency Management, Public Relations	General Fund, Grant Funds	1-3 years	New	
DAR34	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Dare County Emergency Management, NC Forest Service	Grant Funds	3-5 years	New	

Table 7.3 – Town of Duck Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK1	Continue to fund enforcement of current hazard mitigation regulations.	All Hazards	3.1	High	Prevention	Town Staff, Town Council	General Fund	Annual, Ongoing	Carry Forward	Town Council continues to annually fund a Code Enforcement Position and Certified Floodplain Manager as well as continuing education training.
DCK2	Adopt and apply development policies that balance protection of natural resources and fragile areas with residential and economic development	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	1.2	High	Prevention	Town Staff, Town Council	General Fund	6 Month, Annual	Carry Forward	Town Council adopted an ordinance establishing allowances for living shorelines. They adopted a separate resolution establishing a policy related to the Emergency Pumping of Floodwaters in September 2018. The Town had an emergency floodwater management discharge plan approved by the NCDWQ in May 2019. The Town Council adopted an updated Comprehensive and Land Use Plan addressing natural resources, economic development, and coastal resiliency issues, and the Town will continue to review its adopted Comprehensive and CAMA Land Use Plan, Flood Damage Prevention Ordinance and Fire Ordinance annually to determine if there are additional goals, policies or regulations necessary to address best management development policies.
DCK3	Develop policies that minimize threats to life, property, and natural resources resulting from development located in or adjacent to hazard areas, such as those subject to erosion, high winds, storm surge, flooding, or sea level rise.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	1.2	High	Prevention	Town Staff, Town Council	General Fund	6 Month, Annual	Carry Forward	The Town adopted revised Flood Insurance Rate Maps and Flood Damage Prevention Ordinance, local participation in CAMA LPO program, Participation in the FEMA Community Rating System, enforcement of NC State Building Code Revisions and amendments including wind- borne debris provisions. The Town has also revised policies related to oceanfront development including additional setbacks for accessory structures, new dune walkway standards, and remedies for structures encroaching on the ocean beach. Annual beach profile surveys initiated in 2017 continue to assess changing shoreline patterns. The Town will also consider a CIP Funded program to conduct septic systems inspections on individual properties on a voluntary basis. This will help to create a baseline to determine our community's overall septic health as we look forward to developing strategies to address climate and sea level rise changes.
DCK4	Develop location, density, and intensity criteria for new, existing development and redevelopment including public facilities and infrastructure so that they can better avoid or withstand natural hazards.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	3.1	High	Prevention	Town Staff, Town Council	General Fund	Annual Review	Carry Forward	Town Code revisions including lot coverage regulations, limitations on residential dwelling size, including increased setbacks for large structures, additional elevation requirements for V-Zone structures and incentives for use of permeable and semi-permeable materials for driveways and parking have been adopted. Town Council adopted additional limitations on the scale of development through house size limitations and increased setback requirements January 2019. Higher regulatory standards for areas that are not located within the Special Flood Hazard Area (SFHA) were adopted in 2020 to address known flood risks. The Town will continue to review its zoning ordinance and development standards to better withstand natural hazards.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK5	As a FEMA CRS community, we will take advantage of the various mitigation strategies promoted by this program	Hurricane & Coastal Hazards, Flooding	3.3	High	Prevention	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town continues to develop actions and strategies that will lower its CRS rating and therefore provide lower flood insurance premiums to property owners within the Town. In conjunction with Dare County, there are topics that go out every month via social media and e-news. Town Staff intends to work to develop a Program for Public Information (PPI), Flood Insurance Assessment and Coverage Plan (FIA), and Substantial Damage Management Plan (SDP). Town Staff is working to revise its current damage assessments zone and will implement them into a Crisis Track SOG. Town Staff recently completed and the Town Council approved a Flood Response Plan (FRP). See also DCK3.
DCK6	Support programs and initiatives to annually assess shoreline changes (erosion and accretion)	Hurricane & Coastal Hazards, Flooding	3.2	High	Prevention	Town Council	General Fund	Annual, As Needed	Carry Forward	The Town has been monitoring high oceanfront erosion areas by documenting storm damage and taking photos/Go Pro and aerial drone video. A beach erosion study has been completed for the Town by the USACOE and Coastal Planning and Engineering which documents erosion patterns and existing conditions. The Town enacted an additional tax to support beach management activities, and annual beach profile surveys were initiated in 2017 to assess changing patterns. These surveys are supplemented with aerial drone technology providing 3D imaging analysis that will further enhance the Town's ability to track shoreline change. These techniques are proposed to be carried over to assess soundside shoreline changes pending funding opportunities.
DCK7	Stay informed, involved and supportive relative to Federal, State, and/or regional studies, initiatives and efforts concerning coastal resiliency	Hurricane & Coastal Hazards, Flooding	3.2	High	Prevention	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town participates in the annual program established by the Dare County Shoreline Commission to provide funds for beach maintenance. The Town started discussions in 3/2019 regarding beach re-nourishment in conjunction with Dare County and the Towns of Kill Devil Hills, Kitty Hawk and Southern Shores. These discussions transitioned into quarterly multi-jurisdictional meetings with all of the beach front communities engaging in nourishment activities. This collaborative discussion process will begin again in early to mid 2025 as the above-named communities begin planning for the 2027 renourishment. The Town also participates and engages with NC Beach Inlet Waterway Association (NCBIWA), a network of legislators, agencies, local governments, scientists, educators and other stakeholders with an interest in coastal issues. The Town maintains representation on the Currituck Sound Coalition, a regional network of local government and permitting agencies as well as the Coastal Communities of Practice and the State Coastal Resource Advisory Council. The Town supports staff networking and engagement with local municipalities, non-profits and resiliency efforts by promoting OBX Leadership participation sponsored by the Outer Banks Chamber of Commerce.
DCK8	Develop a Fire Ordinance consistent with State regulations and unique to the Town.	All Hazards	3.1	Medium	Prevention	Public Safety, Town Staff, Town Council	General Fund	Annual	Carry Forward	Comprehensive updates to the Town's fire prevention ordinance were adopted in 2020, addressing fire inspections, mutual aid, allowable and prohibited fires, and life safety provisions. The ordinance will be reviewed annually for recommended updates, including a proposal to prohibit all burning when the National Weather Service issues a Red Flag Warning, or at the discretion of the Fire Chief (or designee).

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK9	Update and implement CAMA Land Use Plan	All Hazards	3.3	High	Prevention	Town Staff, Planning Consultant, NC Division of Coastal Management	General Fund	9 Month	Carry Forward	The Town of Duck completed its update to its Comprehensive CAMA Land Use Plan in 2020 and will be working to implement the goal and objectives identified in that plan. This plan is a backbone for developing areas of study, and resilient policies and flood damage mitigation efforts. Examples of future projects include Soundside Shoreline Management Study, pursuit of new Living Shoreline Opportunities, Sea Level Rise Analysis and Climate Adaptation Planning, Septic System and Drainfield Mapping, Townwide Stormwater Management Study, Townwide Beach Management Program, Dune Maintenance Education Program, Development of Post-Hazard Assessments and establishment of a Resilience Review Team.
DCK10	Identify areas most at risk for flooding and investigate strategies to reduce those risks	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Town Staff	General Fund	Annual	New	The Town completed Phase II and III of Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management, DEQ, engineering consultants and stakeholders to identify priority projects with proposed nature-based solutions that will then be moved forward to implementation phase. From these priority projects, Phase IV completed a focused area study related to floodprone areas, identifying stormwater control measures (SCMs) for best management practices. This has led to grant submission and acquisition for a pilot project to implement one of the SCMs. This project is currently in the design and bid process with expected completion in mid-2025. The completion of the Phase IV study and development of a menu of SCMs is intended to drive additional town and privately funded projects to improve resiliency and mitigate flood damage.
DCK11	Identify areas most at risk and investigate strategies to reduce risk from heat and wildland/urban interface fires	Wildfire	1.2	High	Property Protection	Fire Department, Town Staff	General Fund	1-2 Years	Carry Forward	Fire department staff will request a survey by the NC Forest Service to identify areas of concern along with the use of GIS ground cover mapping to focus education and prevention efforts on areas at risk for wildfire. Utilizing social media and Town messaging, educational material regarding safety and best practices for ground cover management will be disseminated.
DCK12	Pursue acquisition and/or elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Town Staff	Grant Funds	Ongoing	New	
DCK13	Increase the amount of open space throughout the town by seeking land donations or making land purchases. Develop an open space plan to further enhance these areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Natural Resource Protection	Town Council	General Fund	Annual Review	Carry Forward	The Town owns an 11-acre park in the center of the Village Commercial area which is partially maintained as open space. On this property, town staff continues to research ideas to engage the community in the natural environment while teaching them best management practices. With the completion and implementation of a stormwater wetland/rain garden, transition and implementation of focal points to native cultivars to improve and encourage habitat and a nature at play area, the Town will shift focus to education related to the importance of these resources for a healthy and resilient environment. As the Town is 90 percent developed, there are few areas available to purchase and maintain as open space, however the Town is in the process of purchasing three parcels in the Village Commercial District with development plans yet to be determined, however development expectation will likely lean toward the preservation of open space while also focusing on the Town's need for public restrooms and parking. Town funds for property acquisitions are limited so future activities in this area will largely depend on the success of the Town in acquiring property or easements with available grants.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK14	Promote living shoreline protection as a means to preserve wetlands.	Hurricane & Coastal Hazards, Flooding	3.2	High	Natural Resource Protection	Town Council, Town Staff	General Fund	Annual Review	New	The Town recently completed its NC12 Resiliency project which included the development of a living shoreline which will be monitored and used as an educational piece for residents, property owners and businesses in Duck as well as other communities. To continue this effort to promote resiliency through action, the Town is in the permitting process of a phased project to construct additional shoreline protection features within the Town park and shoreline along the Currituck Sound. CIP Funding was approved in FY 2024-2025 and is anticipated to continue in FY 2025-2026.
DCK15	Promote open space preservation throughout the town's communities	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Natural Resource Protection	Town Council, Town Staff	General Fund	Annual Review	New	As the Town continues to seek land acquisition opportunities to preserve open space, it will encourage privately owned communities to do the same constructing examples that can be a model for private resiliency through action. See DCK1
DCK16	Protect the oceanfront recreation area through active beach maintenance, nourishment, and public engagement	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Town Council, Town Staff	General Fund, Dare County Occupancy Tax, Municipal Service Districts, Bonds	Annual Maintenance, 5 Year Renourishment	Carry Forward	The Town recently completed the first cycle of renourishment of 1.7 miles of oceanfront beach, and the next cycle is tentatively scheduled for 2027. Before and after beach renourishment, surveys and data for the entire oceanfront are continually considered to determine whether other areas are subject to vulnerability and in need of nourishment as well. Aside from the renourishment, the Town continues to fund annual beach planting, limited sand fencing and supports a volunteer planting program to engage residents, owners and visitors in the protection of the ocean shoreline. Volunteers plant ~ 5,000 - 7,000 linear feet of beach grass each year. The Town purchased an oceanfront property with the intent of providing access for future beach nourishment, beach maintenance and emergency services. Prior to this purchase, the Town had no owned or leased access to the beach for these purposes. Town Staff continues to actively work with NC State Department of Agriculture, and researchers regarding identification and control of invasive species and continues to support facilitation of academic research to help confirm and develop modifications and improvements to best management practices along the shoreline.
DCK17	Continue to work with State and Federal Agencies to promote living shoreline opportunities along the soundfront.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Town Council, Town Staff	General Fund, Grants	2-3 Years	Carry Forward	The Town has completed the design, permitting, and construction of a living shoreline project in a vulnerable area along Currituck Sound (NC12 Resiliency Project). As a recipient of the Marvin Collins APA-NC 2024 Award for Resilience and Sustainability and a project that aligns with the North Carolina Division of Coastal Management 2022-2026 Estuarine Shoreline Strategy, the Town is sharing the project details, funding and successes with the community as well as Local, Regional, State and National organizations as a case study for future projects within our community as well as others. CIP Budgeting is in place and permitting currently in process for a shoreline protection project at the Town park facility.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK18	Increase coastal resiliency through research and progressive planning	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Town Council, Town Staff, NCDOT	General Fund, Grants	Present to 5 Years, Annual Review	Carry Forward	The Town completed Phase III of the Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management (DCM), DEQ, engineering consultants and stakeholders to identify priority projects with proposed solutions that will then be moved forward to implementation phase. A Neighborhood Stormwater Management Study was the subject of Phase III. The Town obtained grant funding from DCM to implement construction of one of the proposed SCM's identified in the Phase IV study and will begin permitting and construction in early 2025 with a completion date expected in Mid-2025. Examples of future projects include Soundside Shoreline Management Study, pursuit of new Living Shoreline and Shoreline Protection Opportunities, Sea Level Rise Analysis and Climate Adaptation Planning, Septic System and Drainfield Mapping, Townwide Stormwater Management Study, Townwide Beach Management Program, Dune Maintenance Education Program, Stormwater Outfall and Pond Retrofits, Development of Post-Hazard Assessments and establishment of a Resilience Review Team. The Town also participates and engages with NCBIWA, CSC, NC-CRCP, and State CRAC.
DCK19	Improve stormwater drainage in vulnerable areas and provide funding for necessary stormwater improvements	Hurricane & Coastal Hazards, Flooding, Tornado & Thunderstorm	3.3	High	Structural Projects	Town Staff, Town Council	General Fund, Grants	Annual	Carry Forward	Town Staff continues to identify and resolve localized roadway flooding issues as funding and resources become available. The Town identifies low lying areas through GIS mapping and flooding from rain events. The Town has a NCDWR approved emergency floodwater management plan to address stormwater flooding in these areas. Drainage and stormwater improvement projects along NC12 are continually considered and annually funded to mitigate flooding and standing water. Improvements needed related to areas of standing water along NC12 and the Duck Trail have been identified at Station Bay Marina and Sanderling Resort, Martin Lane and areas near Waxwing Lane. Other improvements and retrofit needs have been identified in the area of Kitty Hawk Kites, Wings/NC Coast/Bob's and Charles Jenkinis Lane. Grant funds are currently being sought out to address flooding at Charles Jenkins Lane, and will be the subject of a joint BRIC and LASSI Grant submittal with the Town of Southern Shores in late 2024 and early 2025. Improvements and retrofits at Wee Winks Square and the Duck Church are anticipated in 2025. The Town completed Phase II of Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management, DEQ, engineering consultants and stakeholders to identify priority projects with proposed solutions that will then be moved forward to implementation phase. From these priority projects, Phase III completed a focused area study related to floodprone areas, identifying stormwater control measures (SCMs) for best management practices. This has led to a Phase IV grant submission and acquisition for a pilot project to implement one of the SCMs. This project is currently in the design and bid process with expected completion in mid-2025. The completion of the Phase III study and development of a menu of SCMs is intended to drive additional town and privately funded projects to improve resiliency and mitigate flood damage.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK20	Support the NC Board of Transportation and the NC Department of Transportation and NC Turnpike Authority construction of the Mid-County Bridge.	Hurricane & Coastal Hazards, Flooding	3.3	High	Structural Projects	Town Council, NCDOT	NCDOT	Annual	Carry Forward	In June 2022, the Town of Duck joined the Town of Southern Shores, Currituck County, Dare County Tourism Board, Duck Community and Business Alliance (DCBA), and the Currituck Chamber of Commerce in filing an Amicus Curiae (friend of the court) brief with the U.S. Court of Appeals for the Fourth Circuit supporting NCDOT and Mid-Currituck Bridge (MCB) construction in an appeal filed by NC Wildlife Federation et al against a lower court ruling in favor of bridge construction. On 23 February 2023, the U.S. Court of Appeals for the Fourth Circuit upheld the lower court ruling in favor of proceeding with MCB construction. The Town will continue to support this construction and act as needed in the coming years.
DCK20	Participate in the Dare/Currituck County Local Emergency Preparedness Committee (LEPC)	All Hazards	4.1	High	Emergency Services	Public Safety	General Fund	Quarterly	Carry Forward	The OBX LEPC is formed as a joint venture by Currituck and Dare Counties to meet the requirements of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) as a means of sharing knowledge, interest, concerns, and resources to better plan for, respond to, and recovery from chemical emergencies using an all threats/all-hazards approach. Public safety personnel is and will continue to participate in meetings and joint trainings to improve multi-jurisdictional emergency response to all hazards. Town Staff completed a 2024 HUREX, hurricane simulation event, training exercises in coordination with Dare County in June with a final report anticipated in the near future.
DCK21	Annual Review of Emergency Operations Plan	All Hazards	2.2	High	Emergency Services	Public Safety, Town Staff	General Fund	Annual	Carry Forward	The Town continues to review the Town's Emergency Operations Plan (EOP) annually in order to address any lessons learned, priorities, procedures, or additions to ensure effective implementation of the plan. Recent appendix additions to the EOP include a Continuity of Operations Plan (COOP) and Flood Response Plan (FRP).
DCK22	Develop Standard Operating procedure for Crisis Track	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Emergency Services	Public Safety, Town Staff	General Fund	6-12 Months, Annual	Carry Forward	Town staff is revisiting and reimagining the damage assessments zones to align better with the County Hurricane Assessment Software, Crisis Track. Upon completion of the new zones, a Crisis Track standard operation procedure for instructional purposes will be finalized and appended to the EOP. Annual staff training will be incorporated in the plan.
DCK23	Conduct Annual Hazard Warning Exercises with Post-Storm After Action Reports	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Emergency Services	Public Safety, Town Staff	General Fund	6-12 Months, Annual	Carry Forward	Public Safety and Town Staff will conduct annual hazard warning exercises either in collaboration with Dare County Emergency Management or individually on the implementation of the EOP and COOP with follow-up exercise to evaluate the effectiveness of the plan and to address any shortcomings. The evaluation may include post event debriefs and after action reports detailing strengths, weaknesses and areas for improvement with recommendations for implementation. A Standard procedure for this process is planned for development to ensure active participation from the various departments.
DCK24	Development of Fire CERT program.	All Hazards	1.1	High	Emergency Services	Town Staff	General Fund	Annual	New	During the FLOCK academy, Public Safety will asses the interest level of participants in formation of a CERT team. If there is a sufficient pool of interested parties, Town Staff will consider the development of a program that integrates CERT team functions within the existing structure of the Fire Department.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK25	Collaborate with Duck Fire and Town Staff to educate the homeowners, developers and landscapers on designing fire safe communities.	Wildfire	1.1	High	Public Education & Awareness	Fire Department, Town Staff	General Fund	6 Month-2 Years	Carry Forward	Fire department staff will work to produce educational, multi-media products to cover the basics of fire safety and the goals and objectives of the fire inspection program. They will continue to use town events for education and outreach along with the department's annual fire department open house and fire prevention week programming.
DCK26	Continue education efforts to promote dune maintenance.	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Division of Coastal Management	General Fund, Grant Fund	Annual	Carry Forward	Town distributes information and promotes the proper installation of sand fence and encourages the planting of native vegetation. The Town implemented volunteer based beach planting program November, 2017 and this program has continued annually at a consistent pace with support from residents, non-residents and local volunteer groups. Town Staff also identified beach vitex, an invasive species on our dunes, and initiated assistance from State resources and local researchers to develop methods to eradicate these species. Staff engaged local residents and volunteers to assist in the effort thereby educating them on both identification and treatment techniques. The Town funded a PSA related to Beach Vitex to increase awareness. As monitoring and treatment continues, additional PSAs may be developed. The Town will seek to assist other communities and encourage State resources to identify the extent of the impacts to our coastal resource so mitigation can be implemented.
DCK27	Keep effective construction techniques for coastal communities available online	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	Carry Forward	Town of Duck Floodplain webpage has been updated to include FEMA/NC Department of Insurance publications on Coastal Construction Techniques.
DCK28	Engage Community stakeholders on an annual basis with a directed focus related to heat exposure, fire and storm event risks	All Hazards	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The Town will create opportunities for public engagement from stakeholders to include citizens, residents, non-resident property owners, businesses, homeowner association and property management companies to determine their level of preparedness and understanding in emergency situations and the effectiveness of the messaging that is being disseminated. An annual grassroots Mitigation Awareness Week to coincide with Easter and Spring bulk waste will be the target timeline and may morph into a biannual event to coincide with Columbus Day and the Fall bulk waste collection; both timelines notable for both non-resident and vacationer influx. Social media incentives will be developed influence engagement.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK29	Mitigate ocean overwash and sound erosion by identifying vulnerable areas, developing public outreach information and disseminating this information to the public.	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	6 Months-Annual	Carry Forward	The Town has been monitoring high oceanfront erosion areas by documenting storm damage and taking photos/go pro and aerial drone video. A beach erosion study has been completed for the Town by the USACOE and Coastal Planning and Engineering which documents erosion patterns and existing conditions. As a result of these findings, annual beach profile surveys were initiated in 2017 to assess changing patterns and continue annually. These surveys are occasionally supplemented with aerial drone technology to develop 3D imaging analysis. The Town still needs to develop a method to track sound side shoreline, wetlands, and erosion but is optimistic that RCCP Phase II deliverables will put us in positions to acquire grant funds to complete a soundside shoreline management study. Information regarding these findings are disseminated through social media, the Town website and direct email correspondence to owners, as available. With the completion of the NC12 Resiliency project, and in anticipation of a second living shoreline project, staff is in a position to provide real life examples of the benefits of living shorelines and can work to provide resources such as video clips, best management practice interactive tutorials, grant opportunities and a contractor database for private property interests.
DCK30	Provide residents information and links to technical assistance concerning beach nourishment, re-nourishment and maintenance activities, including options such as sand fencing	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town website, social media, The Sitting Duck Podcast, Destination Dare video productions and direct email communications are utilized to disseminate beach nourishment information. The Town provides information and issues CAMA permits to oceanfront property owners seeking to maintain their primary and frontal dunes.
DCK31	Provide residents information and links to technical assistance concerning soundfront property protection	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Annual	New	The Town website, social media, The Sitting Duck Podcast, Destination Dare video productions and direct email communications are utilized to disseminate soundside information. The Town provides information and issues CAMA permits to oceanfront property owners seeking to maintain their primary and frontal dunes.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK32	Continue to provide effective public information and education materials to disseminate data on hazards, and educate beachgoers on beach safety (rip currents, beach holes, beach fires, sand heat and heat exposure, etc.)	All Hazards	1.1	High	Public Education & Awareness	Town Council, Town Manager, Public Information Officer, Ocean Rescue	General Fund	Annual	Carry Forward	The Town continues collaboration through the County's Joint Information Center (JIC) and Emergency Management tools to include methods such as OBXAlerts and other joint marketing techniques designed for large scale public dissemination. The Town also collaborates with Dare County to participate in the Love the Beach Respect the Ocean campaign. Collaborative materials have been shared with the Town to post at lifeguard stands and ocean rescue vehicles. Continue annual and in-season evaluations and reviews regarding public safety staffing, life-guard stand locations, and effective means to communicate threats (ocean conditions, storms hazardous conditions, heat and sand threats); i.e. social media, life guard advisories, use of flag notification systems and signage at beach access locations. A Town Media Kit has been developed and distributed via email to property management companies as well as the Town's platforms to create a streamlined, branded source of information that can be shared universally. New and creative Destination Dare video productions are continually being developed to further the messaging. An informational poster with safety guidelines, rules, and other accompanying information has been developed to disseminate information in an eye-catching manner in the Town's public restroom facility. Efforts are being made to distribute these materials to local businesses. The Sitting Duck Podcast and Destination Dare video productions also supplement efforts to disseminate information to the public.
DCK33	Continue development and improvement related to the dissemination of public information to stakeholders	All Hazards	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Biannual	Carry Forward	The Town effectively utilizes its website, social media, and direct email and telephone communications to communicate threats to and from its stakeholders (i.e.; property owners, residents, business owners, and vacationers), however continual research and development of new and effective means of communication are constantly pursued. Collaboration with the County's Joint Information Center (JIC) and Emergency Management has helped with the development of new techniques and technology to disseminate information. To assist with dissemination of information to stakeholders, ongoing communications and efforts to collaborate with the Duck Community and Business Alliance (DCBA), Homeowner and Property Owner Association and Civic Leagues continue. Direct emails are also sent to business owners. Databases for the purpose of direct email communications with owners are maintained and updated regularly. A communication survey was developed and conducted to evaluate our audience as well as their preferred source of information and information preferred. This survey is aiding in the creation of a Strategic Communication Plan that will provide insight on how to maximize our communication efforts on each platform. Once completed, this plan will be evaluated on a biannual basis to determine its effectiveness and new opportunities. Public Meeting summaries are shared in weekly digital newsletters to provide a summary of actions taken by Town Council and Planning Board to increase the availability of information and public engagement.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK34	Develop Annual Outreach Event regarding Heat Health and Fire Safety	All Hazards	1.1	High	Public Education & Awareness	Public Safety, Town Staff	General Fund	Biannual	Carry Forward	Public Safety and Town Staff will work on the development of educational multi-media products to cover the basics of fire safety and the goals and objectives of the fire prevention inspection program. They will continue to use town events for education and outreach along with the Department's annual fire department open house and fire prevention week programming
DCK35	Develop Branded Messaging related to Flooding and the need for Flood Insurance	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Biannual	New	Town Staff in collaboration with the CRS users group developed a branded logo brochure, Prepare, Protect, Insure (PPI) which is distributed annually in conjunction with repeated and coordinated social media releases with the County and other municipal public information officers. Efforts will begin to rebrand this message based on three Rs – Raise, Rebuild, and Resiliency with anticipated release following the next storm event impacting the area.
DCK36	Development and continuation of Flock Academy	All Hazards	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The FLOCK Academy is an invaluable resource for educating stakeholders about community development regulations and hazard mitigation. This six-session course offers residents the opportunity to engage with Town Department Directors who provide insights into the workings of local government. Through interactive lessons participants gain a deeper understanding of topics such as the roles and responsibilities of the Town. By fostering civic engagement and awareness, the program empowers residents to actively contribute to community development and informed decision-making, helping to mitigate potential hazards in their neighborhoods.
DCK37	Promote Septic Health	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The CIP funded budget proposes to conduct septic system inspections of individual properties on a voluntary basis. Town staff will be launching a septic health initiative campaign to educate owners and visitors of the potential impacts to our environment and potential flooding related to overuse and inappropriate use of septic systems
DCK38	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Town Staff, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

Table 7.4 – Town of Kill Devil Hills Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH1	Drainage System Maintenance - Continue mowing drainage ditches and conduct normal maintenance and storm event driven maintenance	Flooding, Hurricane & Coastal Hazards	2.2	High	Prevention	Public Services, NCDOT	General Fund	Annually	Carry Forward	Drainage maintenance has been completed annually and upgrades to the drainage system have also been completed.
KDH2	Maritime Forest Environmental Zoning District - Pursue mitigation and preparedness planning within this district.	Wildfire	3.2	High	Prevention	Planning Department	General Fund	Annually	Carry Forward	North Carolina Forest Service in conjunction with the Town Fire Department and the Nature Conservancy have preformed several controlled burns to the benefit of the Maritime Forest. Work with TNC and NC Forest Service to develop a written plan for KDH.
KDH3	Flood Response - Coordinate efforts to expedite reconstruction and resilient rebuilding efforts in cooperation with Dare County Emergency Management staff.	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather	3.1	High	Prevention	Planning Department	General Fund	1-3 years	Carry Forward	Town has had no State of Emergency since last update but will continue the policy for any future event.
KDH4	Fire Protection - Implement Water Systems Master Plan	Wildfire	3.3	High	Prevention	Public Services, Water Department	Water Fund	1-5 years	Carry Forward	Town continues to implement the Water System Master Plan. 3,847 linear feet of water line were replaced in 2023 Flow test are still required for all new development sites. Amendment to Zoning for sprinklers in SFD over 6,000 Sf on the oceanfront.
KDH5	Storm Water Management - Continue to implement the storm water management plan. Local Planning and Regulations.	Flooding, Hurricane & Coastal Hazards	3.3	High	Prevention	Public Services	General Fund	6 months	Carry Forward	Town implemented stormwater regulations for large single family dwellings. Maintenance requirements are being enforced on all engineered stormwater designs. Additional regulations and amendments will be considered.
KDH6	Map Information - Maintain updated flood map information for citizens and customers. Map Erosion areas annually to help inform the public of high erosion areas.	Flooding, Hurricane & Coastal Hazards	1.1	High	Prevention	NC Division of Emergency Management, Planning Department	NC Division of Emergency Management	1 year	Carry Forward	Historic Flood Maps have been digitized into laser fiche. Flood outreach is completed annually to all residents and also to targeted groups with particular risks. Erosion prone areas have not been mapped at this time but still need to be looked at. Maintain CAMA Erosion Rate Maps.
KDH7	Continue to participate in CRS	Flooding, Hurricane & Coastal Hazards	3.3	High	Prevention	Planning Department	General Fund	Annually	Carry Forward	Town completed a cycle visit in 2023 maintaining a Class 5 community. The Town had enough points for a Class 4 but did not have some the prerequisite for the Class. We will be working toward Class 4 in next cycle. The Town has completed annual recertifications.
KDH8	Develop Stormwater Management Working Group	Flooding, Hurricane & Coastal Hazards	4.3	High	Prevention	County And neighboring Municipalities	Staff Time	2-5 Years	New	
KDH9	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Prevention, Public Education & Awareness	Planning Department, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH10	Develop Heat Emergency Response Procedure	Excessive Heat	1.1, 3.3	Medium	Prevention	Planning Department, Fire Department and Dare County Emergency Management	General Fund	2-3 years	New	
KDH11	Relocation/Elevation - Relocate or elevate repetitive loss and high risk properties and expedite permitting for these situations	Flooding, Hurricane & Coastal Hazards	1.2	Medium	Property Protection	Planning Department	General Fund	3-5 years	Carry Forward	There have been no requests from houses within repetitive loss areas to implement mitigation with express permitting unless it was in a State of Emergency during which all permits are expedited.
KDH12	Acquisition - Encourage repetitive loss and high risk properties to consider acquisition as a possible solution	Flooding, Hurricane & Coastal Hazards	1.2	Low	Property Protection	Planning Director, Board of Commissioners	NC Division of Emergency Management, FEMA	5+ years	Carry Forward	Continues to be incomplete for lack of funding.
KDH13	Critical Facilities Protection - Take appropriate actions to prevent and/or minimize damages to critical facilities. Use generators or other forms of redundant power to ensure that critical facilities and infrastructure remain operational.	All Hazards	2.1/2.2	High	Property Protection	Police, Fire & Rescue, Public Works, NC Dominion Power	General Fund	1-3 years	Carry Forward	Additional critical facilities outside of government owned are reviewed for having alternative power (generators) and hurricane ready construction methods. New Fire Station constructed and occupied in 2024 has up to date hurricane protective measures and generators
KDH14	Substantial Damage/Substantial Improvement - Lower Threshold	Flooding, Hurricane & Coastal Hazards	3.1	High	Property Protection	Planning	General Fund	1-3 years	New	
KDH15	Open Space Preservation - Support efforts to preserve natural areas	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Planning Department	General Fund	3-5 years	Carry Forward	Continues to be incomplete for lack of funding.
KDH16	Reservoirs - 1. Coordinate with Nags Head on the future of Fresh Pond. 2. Maintain liaison with NC Division of Coastal Management concerning the development of the Kill Devil Hills Land Use Plan	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather	3.1	High	Natural Resource Protection	Planning Department, CAMA	General Fund	1 year	Carry Forward	CAMA Land Use Plan was updated and adopted September 2020 and CRC Certified November 2020. The CAMA AEC around Fresh Pond has been maintained. Work with Nags Head on removing Fresh Pond from the AEC and using Fresh Pond as a resource for recreation, stormwater management, and open space.
KDH17	Surface Water Quality - Preserve surface water quality and enhance water quality through storm water management and zoning.	Flooding, Hurricane & Coastal Hazards	3.2	High	Natural Resource Protection	Planning Department, Public Services	General Fund	3-5 years	Carry Forward	Town continues to upgrade and maintain existing stormwater drainage system. Town is working on a major drainage project on Wrightsville Ave to alleviate dependence on ocean outfalls (2024).
KDH18	Septic Health Initiative	Flooding (including Sea Level Rise)	1.1, 3.1	High	Natural Resource Protection, Public Education & Awareness	Planning and Dare County Health Department	General Fund	1-3 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH19	Dune and Beach Maintenance - Continue ongoing beach nourishment efforts	Flooding, Hurricane & Coastal Hazards	3.2	High	Structural Projects	Planning Director, Board of Commissioners	General Fund	Monitor Annually, nourish every 5 years	Carry Forward	5 year renourishment project was completed in July 2022 along with an updated Beach Maintenance Plan . The Town also contracts for annual monitoring of the engineered beach. Adopted a more strict zoning regulations for dune protection.
KDH20	Complete the Wrightsville Goddard Street Intercept Project	Flooding (including Sea Level Rise)	1.2, 2.1	High	Structural Projects	Planning Department and Public Services	General Fund and Grants	1-3 years	New	
KDH21	Increase Storm Drainage Capacity and improve stormwater quality	Flooding (including Sea Level Rise), Hurricane & Coastal Hazards	1.2	High	Structural Projects	Planning Department and Public Services	General Fund and Grants	1-5 years	New	
KDH22	Develop Living Shorelines to prevent estuarine erosion	Flooding, Hurricane & Coastal Hazards (including Erosion)	1.2, 3.2	High	Structural Projects	Planning	General Fund and Grants	2-5 years	New	
KDH23	Virginia Dare Shores: Lee Ave with Portion of Aycock and Eden	Flooding (including Sea Level Rise)	1.2, 2.1	High	Structural Projects	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH24	US158 East First St to East Second and Princess Anne Road	Flood (including sea level rise)	1.2, 2.1	High	Structural Project	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH25	West Third Street, Indian Drive, Clamshell Drive and connecting streets	Flood (including sea level rise)	1.2, 2.1	High	Structural Project	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH26	Extend NCDOT Outfalls	Flooding	1.2, 2.1	High	Structural Projects	NCDOT	NCDOT	1-5 Years	New	
KDH27	Hazard Warning - Facilitate evacuation	All Hazards	1.1	High	Emergency Services	Dare County Control Group	General Fund	Annually	Carry Forward	Dare County tests its emergency system and procedures annually.
KDH28	Health and Safety Maintenance - Develop ongoing protocols to assure the maintenance of critical public services	All Hazards	2.1	High	Emergency Services	Police, Fire & Rescue, Public Works, Dare County Emergency Management	General Fund	Annually	Carry Forward	Town reviews and inspects critical public facilities continually throughout the year and also does a pre-check in the event of a pending storm
KDH29	Emergency Services - Hurricane Exercises	Hurricane & Coastal Hazards	2.1	High	Emergency Services	Planning Department	General Fund	1 year	Carry Forward	Town continues to participate in the Dare County Emergency response training, a multi jurisdictional training exercises. Town reviews and update Kill Devil Hills' Emergency Plan annually.
KDH30	Hazard Recovery - Coordinate efforts to expedite recovery.	All Hazards	1.1	High	Public Education & Awareness	Planning Department, Board of Commissioners	General Fund	1 year	Carry Forward	Town Public Information Officer works closely with all other jurisdictions and Dare County. Dare County serves as the point of information with input from the Towns to create a unified message.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH31	Insurance - Maintain outreach efforts and continue making flood insurance available to the Town's residents	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning Department, Town Clerk	General Fund	1 year	Carry Forward	Continue to follow the Town PPI plan and annual updates for public outreach and education. Continue coordinate with CRS Users Group on regional outreach projects.
KDH32	Compile and maintain current information in the Kill Devil Hills Floodplain Management Library	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	CRS Coordinator	General Fund	Annually	Carry Forward	Town has scanned all historic flood maps and elevation certificates. Planning Department has developed a scanning protocol to ensure build permits and associated submittals are scanned at the completion of a project including but not limited to as built surveys, elevation certificates and permits. The Town is currently working on an educational video on how to prepare your home from freezing temperatures both about energy efficiency and avoiding frozen pipes. We will also be looking into another educational video on heat stroke and how to protect yourself in extreme heat this spring/ summer. The video will run on Government TV, Town YouTube channel and the Town website.
KDH33	Outreach Projects - Initiate outreach projects to inform the public on Town and County initiatives that will reduce hazard related losses of property and life	All Hazards	1.1	High	Public Education & Awareness	Planning Department, Dare County Emergency Management	General Fund	1 year or Annually	Carry Forward	Continue to follow the Town PPI plan for public outreach and education for flood-related hazards. Additional all-hazards education efforts includes mailings, videos, brochures, public engagement and coordinated efforts with Dare County outreach.
KDH34	Circulate brochure specifically on NFIP	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning Department	General Fund	Annually	Carry Forward	Town maintained a Class 5 CRS rating in 2023. Town continue to strive to improve. Town provides FEMA publication in the office, on the Town website and at the Kill Devil Hills Public Library
KDH35	Conduct contractors meeting - Hold an annual outreach meeting for engineers and developers on how to construct to a higher standard to prevent damage.	All Hazards	3.1	High	Public Education & Awareness	Planning Department	General Fund	1 year	Carry Forward	Missed several year of contractor meeting due to global pandemic. Held a surveyor/engineers Elevation Certificate training by NCEM at KDH Town Hall Spring 2024 and planning a contractor meeting Fall 2024.
KDH36	Outreach Projects - Present at civic groups, professional organizations, etc. annually for citizens and stakeholder groups to discuss hazards and how to protect themselves.	All Hazards	1.1	High	Public Education & Awareness	Planning Department	General Fund	1 year	Carry Forward	Presented Hurricane Preparation and Flood Information and protection session at the Dare County Senior Center in 2023 and 2024. AS well as targeted outreach efforts to other civic groups.
KDH37	Create educational brochure on the dangers of extreme heat and cold and steps the public can take to protect themselves	Excessive Heat, Severe Winter Weather	1.1	Medium	Public Education & Awareness	Planning Department	General Fund	1-2 years	Carry Forward	Not yet completed. Still a priority.
KDH38	Mitigation education for homeowners	All Hazards	1.1	Medium	Public Education & Awareness	Planning Department	General Fund	2-3 years	Carry Forward	Mitigation education is part of our brochures. Need to create a presentation calendar for the Board of Commissioners. This action includes pre-event preparedness outreach.
KDH39	Keep Storm Drains Open Education Campaign	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning and Public Services	General Fund	1-3 Years	New	
KDH40	Wildfire Education Program	Wildfire	1.1	Medium	Public Education & Awareness	Fire Department	General Fund	3-5 years	New	

Table 7.5 – Town of Kitty Hawk Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KH1	Establish town plans for mitigation and recovery through information on disaster planning recovery and reconstruction.	All Hazards	3.1	High	Prevention	Town Manager	Town Budget, Grants	1 year	Carry forward	Should establish a separate mitigation plan, or add on to Emergency Preparedness, Response and Recovery Plan.
KH2	Implement projects identified in Kitty Hawk RCCP Plan.	Flooding, Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Wildfire	1.2, 2.1, 3.2, 3.3	High	Prevention, Property Protection, Structural Projects, Natural Resource Protection	Planning & Inspections	NC DCM	2 Years	New	See Kitty Hawk Resilience Strategy for project details.
KH3	Clean out culverts, ditches, and waterways to relieve standing water and facilitate the stormwater drainage	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	2.1	High	Property Protection	Public Works	Town Budget, Grants	Ongoing	Carry Forward	Partially complete. Waterways cleaned out, ditches and culverts still need to be addressed
KH4	Establish long-term plan for funding and implementation of beach renourishment	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Med	Property Protection	Town Council/Town Manager	Town Budget	1 year	Carry Forward	No new progress to report.
KH5	Pursue the acquisition and/or elevation of repetitive loss properties and other highly vulnerable properties. Expedite permitting for these situations.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	Low	Property Protection	Planning & Inspections	N/A	Ongoing	Carry Forward	Town will continue to partner with Dare County on the implementation of these projects as requests arise.
KH6	Construct and maintain living shoreline projects in most vulnerable soundside areas	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Med	Natural Resource Protection	Town Council/Town Manager	Town Budget, Grants, Private	3 years	Carry Forward	Partially complete.
KH7	Encourage open space preservation/conservation	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	3.3	Med	Natural Resource Protection	Planning & Inspections	Town Budget (outreach documentation)	Ongoing	Carry Forward	No new progress to report.
KH8	Implement stormwater drainage improvements per the studies/plan	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Structural Projects	Town Manager/Public Works	Town Budget, Grants	Ongoing	Carry Forward	Partially complete
KH9	Update and improve protocols and procedures (local, county, and state) by which citizens in KH are made aware of impending storm events and expected impacts	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.1	High	Emergency Services	Town Manager	Town Budget, Grants	1 year	Carry Forward	Partially complete. Has been some discussion of a town alert, in addition to the existing county one.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KH10	Work w/ Dare Co. to improve the communication systems between all public safety departments within the towns, county, and state so that in the event of a disaster, all entities will be able to communicate with one another.	All Hazards	4.2	Med	Emergency Services	Town Manager/Fire Department/Police Department	N/A - Staff Time	2 years	Carry forward	In Progress. Coordinating with Dare County on communications improvements.
KH11	Review vulnerabilities of all critical facilities as a component of annual review of Emergency Preparedness, Response and Recovery Plan	All Hazards	2.1	High	Emergency Services	Town Manager, Fire Department/Police Department	N/A - Staff Time	1 year	Carry forward	No new progress to report.
KH13	Increase awareness of availability of flood insurance through various methods (mailings, flyers, etc.)	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget	Twice Annually	Carry forward	No new progress to report.
KH14	Provide information on flood damage protection techniques to citizens and property owners.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget	Ongoing	Carry forward	No new progress to report.
KH15	Initiate outreach projects to inform the public on Town and County initiatives that will reduce hazard related losses of property and life	All Hazards	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget, Grants	2 years	Carry forward	No new progress to report.
KH16	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Med	Public Education & Awareness, Prevention	Planning & Inspections, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

Table 7.6 – Town of Manteo Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
MAN1	Continue to stay current with all Community Rating System reporting requirements to ensure continued program participation.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.3	7 - High	Prevention	Planning Department	General Fund	Ongoing	Carry Forward	The Town is currently a CRS Class 5.
MAN2	Coordinate with the State to replace heat strips and water-sewer line on *utility lines running under* the Cora Mae Basnight Bridge	Severe Winter Weather	2.1	3 - Medium	Prevention	Utilities Department, NC Dept. of Natural & Cultural Resources	Water Sewer Enterprise Fund	2027	Carry Forward	No progress to report, but this remains a priority. Revised to include water-sewer line replacement and to reflect needed coordination with State.
MAN3	Strategic Planning CDRZ	All Hazards	3.3	7 – High	Prevention	Planning Department, Board of Commissioners	Rural Communities Grant	2025	New	This project will be completed in partnership with NCSU and the Coastal Dynamics Design Lab. Scheduled to begin in January 2025.
MAN4	Excessive Heat Plan for Crowd Gathering Events	Excessive Heat	1.1	Low	Prevention, Emergency Services	Planning Department	General Fund	2027	New	Coordinate with NCORR and Heat Action Plan Toolkit resources
MAN5	Maintain and improve Town wide stormwater system for appropriate performance. Consider future conditions (sea level rise, rainfall, subsidence, rising groundwater) when evaluating performance needs.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	2.1	7 - High	Property Protection	Planning Department	Stormwater Fund	Ongoing	Carry Forward	In 2024, completed $500k stormwater project in low-income neighborhood, funded by Golden LEAF and general fund. Town will continue to identify and implement improvements, including nature-based solutions.
MAN6	Replace or retrofit critical and high risk facilities that are located below base flood elevation or are vulnerable to future climate impacts.	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Property Protection	Planning Department	HMG Grant	Ongoing	Carry Forward	In 2023, replaced a 1940s wastewater lift station with new state of the art lift station and fixed generator; both above regulatory flood protection level. Project underway to replace generator at wastewater treatment plant. Town will consider green energy options and wind load retrofits for facilities.
MAN7	Police Department Building	All Hazards	2.1	Medium	Property Protection	Planning Department	Federal Grants, General Fund	2028	New	Moving Town Hall to new building and will renovate existing Town Hall as hub for police department and emergency services.
MAN8	Generator for New Town Hall	All Hazards	2.1	Medium	Property Protection	Planning Department	FEMA Grants, General Fund	2028	New	Install a back up generator at new town hall facility. Will consider green energy options.
MAN9	Undergrounding utilities	All Hazards	2.1	High	Property Protection	Utilities Department, Planning Department	FEMA Grants, General Fund	2030	New	Implement in conjunction with MAN10 for cost savings.
MAN10	Replace terracotta pipes to lower inflow and infiltration risk	Flooding, Hurricane & Coastal Hazards	2.1	High	Property Protection	Utilities Department, Planning Department	FEMA Grants, General Fund	2030	New	Implement in conjunction with MAN9 for cost savings.
MAN11	Pursue acquisition and/or elevation of repetitive loss or other high-risk structures and promote other residential retrofit programs.	Flooding, Hurricane & Coastal Hazards	2.1	Medium	Property Protection	Planning Department, Dare County	FEMA Grants	Ongoing	New	Will continue to coordinate with Dare County on implementation of elevations/acquisitions as requests arise. Town will promote Fortified Roof and Weatherization Programs.
MAN12	Upgrade and improve stormwater and wastewater systems to improve water quality in Shallowbag Bay.	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Natural Resource Protection	Planning Department	Stormwater Fund/Clean Water Trust Fund	Ongoing	Carry Forward	UV disinfection project currently underway. Generator replacement currently underway. Will consider other nature-based solutions.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
MAN13	Protect natural wetland areas	Flooding, Hurricane & Coastal Hazards	3.2	7 - High	Natural Resource Protection	Planning Department	National Wetlands Conservation Grant Program/Clean Water Management Trust Fund	Ongoing	Carry Forward	Land Use Plan includes prohibition of filling wetlands. Considering options for acquisition and preservation of wetland areas. Will consider other nature-based solutions.
MAN14	Capital Improvement Plan development with resiliency as a priority	All Hazards	3.3	7 - High	Structural Projects	Administration Department	General Fund	2030	Carry Forward	This will be informed by the Strategic Plan that is currently underway.
MAN15	Boardwalk, bulkhead and docks replacement with higher standards/higher quality materials	All Hazards	2.1	7 - High	Structural Projects	Planning Department	CAMA Access, General Fund	2028	Carry Forward	One section is completed. Another CAMA Access Grant project going to bid soon.
MAN16	Floodproofing of East, West Hammock, and Ballast Point, Peninsula lift stations	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Structural Projects	Utilities Department	HMG Grant	2027	Carry Forward	Some pump replacements have been completed. Additional engineering required.
MAN17	Implement 2018 lightening study for water and sewer plant	Tornadoes & Thunderstorms	2.1	7 - High	Structural Projects	Utilities Department	Water Sewer Enterprise Fund	2027	Carry Forward	This will be pursued once the generator replacement is completed.
MAN18	Repair and maintain Town Waterfront Gazebo with higher standards/higher quality materials for improved resiliency	Flooding, Hurricane & Coastal Hazards	1.2	7 - High	Structural Projects	Town Marina/Maritime Museum	CAMA Access, General Fund	2030	Carry Forward	Just replaced adjacent bulkhead; this can be pursued once MAN15 is completed.
MAN19	Implement priority strategies for flood risk reduction and shoreline protection identified through NCSU's Coastal Dynamics Design Lab	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	1.2, 3.2, 3.3	High	Structural Projects	Planning Department	General Fund, Federal Grants, CAMA Access	2030	New	
MAN20	Continue to enhance the Water and Sewer Department's back-up generator system for all lift stations	All Hazards	2.2	7 - High	Emergency Services	Utilities Department	HMG Grant	2027	Carry Forward	Wingina, Burnside and Waterfront lift stations (almost) have fixed generators. Final electrical work in progress.
MAN21	Participate in and conduct Emergency Management training for appropriate Town elected officials and staff.	All Hazards	2.2	7 - High	Emergency Services	All Departments, Dare County EM	General Fund	Ongoing	Carry Forward	Town participated in annual Dare County exercises. Will consider other partner organizations for additional training.
MAN23	Implement essential spare equipment (standby equipment) program for water sewer plant	All Hazards	2.1	7 - High	Emergency Services	Utilities Department	Water Sewer Enterprise Fund	Ongoing	Carry Forward	Inventory has been developed. Continually identifying new standby equipment needs and updating as needed.
MAN24	Develop Communications Plan for hazards.	All Hazards	1.1	7 - High	Public Education & Awareness	All Departments	General Fund	2028	Carry Forward	Implementation is ongoing. Town uses Dare County's emergency notification system. Town has improved downtown flooded streets notifications.
MAN25	Educate Residents on water saving techniques	Drought	1.1	7 - High	Public Education & Awareness	All Departments	Water Sewer Enterprise Fund	Ongoing	Carry Forward	No progress to report but this remains a priority.
MAN26	Educate the public and inform them of the benefits of participation in the Firewise program.	Wildfire	1.1	Low	Public Education & Awareness	Planning Department	General Fund, Grants	Ongoing	New	
MAN27	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning Department, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

Table 7.7 – Town of Nags Head Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH1	Petition FEMA through the Town's state and regional NFIP representatives to consider adopting realistic regulations regarding the determination of destroyed structures. Specifically, this would apply to structures which are located on the public beach that are not eligible for flood insurance until they collapse.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.1	Low	Prevention	Planning, Town Manager	General Fund	5+ years	Carry Forward	Town Manager participated in the threatened structures working group. A report is being written which details a multi-prong approach with actionable items to solve this goal.
NGH2	Explore seeking authority and adopting regulations which would allow qualified Town staff to inspect sewer treatment facilities and on-site septic systems after a storm. These regulations should also allow staff to request the corrective actions necessary to ensure proper operation of these systems.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	2.2	Low	Prevention	Planning, Town Manager	General Fund	5+ years	Carry Forward	Carry forward damage information to health department so they can take action for any repairs that are required. Use Crisis Track to report damages after storm event. No need to seek independent authority.
NGH3	Lobby for a state policy and strategy on beach nourishment and beach re-nourishment through joint efforts with other local governments and organization. This includes an annually funded state program to support local nourishment activities.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	4.1	High	Prevention	Board of Commissioners	General Fund	3-5 years	Carry Forward	Beach and inlet management plan developed by the NC beach and waterways association we participate in. We collectively pursue with other localities.
NGH4	Develop contingency plans for infrastructure or services that may be lost as a result of exposure to hazards. Potential infrastructure includes roads/streets, waterlines, wastewater, stormwater, and other key utilities.	All Hazards	2.2	Medium	Prevention	Planning, Town Engineer, Public Works	General Fund/Stormwater	5+	Carry Forward	The Town has developed a comprehensive Infrastructure Plan where stormwater, waterlines, streets and paving work are reviewed at the same time during our CIP process. Upgrading drainage system with larger drainage pipes funded through Golden Leaf Grant.
NGH5	Evaluate the Nags Head Woods Fire Plan annually and coordinate information with Nature Conservancy staff and seek grant funding for fuel reduction activities.	Wildfire	3.3	Medium	Prevention	Town Manager, Fire, Police	General Fund, Grant Funds	1 year	Carry Forward	Staff discusses and reviews the Nags Head Woods Fire Plan annually for update and to discuss areas for fuel reduction. Staff seeks grant opportunities as needed.
NGH6	Plan and participate with partners to evaluate the need and maintenance of wild land urban interface areas including removal of dead wood in critically fire prone areas and controlled burn activities.	Wildfire	1.2	Medium	Prevention	Public Safety – Fire/Nature Conservancy/NPS	General Fund, Grant Funds	1 year	Carry Forward	Continue to work with the NPS, Dominion and the Nature Conservancy to maintain reduction of fuel loads in wildland-urban interface areas and to seek opportunities for grant funding to reduce vegetation in wildland-urban interface areas of the Town.
NGH7	Explore the feasibility of supporting residents in vulnerable areas becoming Firewise USA Sites.	Wildfire	3.3	Medium	Prevention	Fire	General Fund	2-3 years	Carry Forward	Action revised to reflect that this must be a resident-led effort with Town support.
NGH8	Work with Dare County to expand Town representation on the Local Emergency Planning Committee.	All Hazards	4.2	Low	Prevention	Fire	General Fund	1 year	Carry Forward	Town staff continue to participate on the committee.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH9	Acquire equipment and materials and retrofit critical facilities to ensure critical facilities and infrastructure remain operational during events.	All Hazards	2.1	High	Prevention	Town Manager, Fire, Police, Public Works, Planning,	General Fund	3-5 years	Carry Forward	The public works and water distribution facilities were redesigned and are currently under construction for more efficiency in operations and with contingency plans for hazards. Expectation of Public Services master plan completion September 2024. Currently developing a master plan for Fire station and Town Hall facilities.
NGH10	Purchase property, utilizing grants when possible, to acquire property for the purpose of mitigating damage and co-locating (dual use) Town facilities.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Planning, Town Engineer, Town Manager	General Fund/Grants	2-3 years	Carry Forward	Staff seeks any viable opportunity, on a case by case as needed basis, for funds to acquire properties for the purposed of mitigating damage, improvement water quality, preserving open space, protecting natural resources, and co-locating Town facilities.
NGH11	Identify and evaluate solutions to mitigate areas of repetitive flooding.	Hurricane & Coastal Hazards, Flooding	1.2	High	Property Protection	Planning, Town Engineer, Public Works	General Fund/Stormwater	1 year	Carry Forward	The Town received over 3 million dollars in grant funding to implement stormwater control projects in areas of repetitive loss. Two of these projects have been designed and will begin construction in 2024.
NGH12	Support public and private mitigation projects that reduce the potential damaging effects of hazards on the town, including acquisition and/or elevation of at-risk properties. Homes that are pre-FIRM and repetitive loss structures should be prioritized.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Planning, Town Engineer, Town Manager	General Fund/Grants	1 year	Carry Forward	No action taken as of this date.
NGH13	Seek methods to remove structures located on the public beach which degrade the recreational and natural quality of the environment, create public health and safety hazards, and impede the ability of life safety personnel to move along the shoreline.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Town Manager, Planning, Town Engineer	General Fund	5+ years	Carry Forward	The Town successfully removed a structure from the public beach in April 2023. The former structure was located at 10211 Sea Gull Drive.
NGH14	The town will identify, acquire, and seek grant funding of property for the purposes of open space, improving water quality, protecting natural resources, and recreational purposes.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Natural Resource Protection	Town Manager, Planning, Town Engineer	General Fund, Grant Funds	2-3 years	Carry Forward	The Town acquired five parcels of vacant land located at 8504, 8506, 8508, 8510 and 8512 SOOIR. These properties will be kept as open space in perpetuity.
NGH15	Nourish the Town's beaches as a means to mitigate damage to oceanfront properties and infrastructure. This includes the pursuit of potential funding sources to supplement Town funds and programmatic permitting to assist with future nourishment projects.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Structural Projects	Town Manager, Town Engineer	Dare County Shoreline Fund, Town Municipal Service Districts	3-5 years	Carry Forward	The Town's third beach nourishment project occurred in 2022. Beach Nourishment master plan will dictate timing of future nourishment projects.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH16	Investigate innovative solutions to unconventional drainage problems. This may include the implementation of groundwater management techniques and low impact development practices which address stormwater runoff at or near its source. Possible solutions will consider improvements to address both water quality and water quantity. Continue to evaluate and assess existing infrastructure for replacement and improvement to include drainage systems maintained by NCDOT that may be impacted by other Town initiatives (i.e. beach nourishment).	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Structural Projects	Town Engineer, Public Works, Planning	General Fund/Stormwater	1 year	Carry Forward	The Town of Nags Head received grant funding for the construction of stormwater projects areas #12 and #11. These projects will address roadway flooding through a french drain system and pump to a natural dune infiltration area.
NGH17	Adhere to the Incident Command Structure to maintain and improve emergency operations and communications. This includes the annual update of the critical facilities list in the Emergency Operations Plan (EOP) and purchase of additional emergency operations communication equipment.	All Hazards	2.2	Medium	Emergency Services	Fire, Police, Town Manager	General Fund	5+ years	Carry Forward	Staff recently completed a new EOP. Staff continues to adhere to the ICS, update the critical facilities list and participate in the EOP with Dare County.
NGH18	Continue to educate property owners to maintain fire safe landscaping and vegetation adjacent to structures.	Wildfire	1.1	Low	Public Education & Awareness	Fire	General Fund	5+ years	Carry Forward	This is accomplished on a case by case basis as needed. In addition, during fuel reduction burns staff meets with the community to explain the need for reduction of fuel loads.
NGH19	Develop outreach materials to educate the public and increase awareness on hazards, how to develop and retrofit their properties against hazards, and individual tasks that can help them better prepare and respond to hazards. Staff should explore alternative options to traditional on-site meetings. This may include increased use of social media, the public access channel and short videos and handouts.	All Hazards	1.1	High	Public Education & Awareness	Planning, Town Manager, Town Engineer, Fire/Ocean Rescue	General Fund	2-3 years	Carry Forward	The Town has utilized social media, videos, the website, and mailed information to inform residents about the new flood maps, flooding, stormwater, hurricane preparedness, and other coastal hazards.
NGH20	Educate and assist vulnerable populations in preparing for and recovering from impacts by hazards. This may include hazard awareness, evacuation planning, or disaster relief.	All Hazards	1.1	Low	Public Education & Awareness	Fire/Ocean Rescue, Police, Planning, Town Manager	General Fund	3-5 years	Carry Forward	Continue communicating with stakeholders regarding at-risk populations who may require special assistance during disasters.
NGH21	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning, Fire, NC Forest Service	Grant Funds	3-5 years	New	

Table 7.8 – Town of Southern Shores Mitigation Action Plan

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
SOS1	Identify "at risk" X Zone properties for added emphasis on flood risks and notify the responsible agencies about discrepancies between floodplain maps (FIRM vs SLOSH)	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	1.2	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Planning and Code Enforcement Department continues to identify at risk properties following storm events by utilizing GIS data and in the field observations.
SOS2	Seek the maximum points available from the Community Rating System to keep flood insurance costs to the citizens as low as possible	Flooding	3.3	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to seek the maximum points available from the Community Rating System. The Town's last cycle visit was in 2021 which gave the Town a rating of Class 6 which is recertified annually. Communities with a Class 6 rating receive a 20% discount on insurance policies.
SOS3	Coordinate wildfire prevention efforts with tree preservation policies	Wildfire	3.1	Low	Prevention	Planning/Code Enforcement, Fire Department	General Fund	Ongoing	Carry Forward	The Town continues to require a permit for open burning and encourages all property owners to contact the Southern Shores Volunteer Fire Department prior to any open burning.
SOS4	Obtaining local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis.	All Hazards	3.3	High	Prevention	Planning/Code Enforcement	General Fund	Less than two years	Carry Forward	The Town continues to use Dare County GIS to obtain local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis
SOS5	Ensure that all stormwater management facilities and infrastructure within the Town, whether public or private, are designed, constructed, operated, and maintained in a proper manner.	Flooding	1.2	High	Prevention	Planning/Code Enforcement	General Fund, NCDEQ	Ongoing	New	
SOS6	Continue implementing local elevation standards for all special flood hazard areas and shaded X and X zones.	Flooding	1.2, 4.1	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	New	
SOS7	Conduct the Canal Inspection and Debris Removal program twice a year	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	2.1	High	Property Protection	Public Works, Southern Shores Civic Association	General Fund	Twice Per Year	Carry Forward	The Town's Public Works Dept. periodically inspects the Town's canal system and removes debris as needed.
SOS8	Encourage the use of Low Impact Development (LID), vegetative buffers to filter stormwater, impervious surface limits, and innovative stormwater management alternatives to reduce runoff and to improve environmental water quality.	Flooding	3.2	High	Property Protection	Administration, Planning/Code Enforcement	General Fund, NCDEQ	Ongoing	New	
SOS9	Pursue elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Planning, Emergency Management	Grant Funds	Ongoing	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
SOS10	Continue enforcement of the Beach and Dune Management Ordinance	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.2	High	Natural Resource Protection	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town Community Resource Officer and contracted lifeguard service conduct patrols of the beach to ensure compliance
SOS11	Implement shoreline restoration projects, including beach renourishment, dune protection, dune vegetation, sand fencing, and living shorelines.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.2	High	Natural Resource Protection	Administration, Planning/Code Enforcement	General Fund, Dare County, NCDEQ, FEMA	5 Years	New	
SOS12	Continue to monitor plans for the Mid-Currituck Bridge to expedite evacuation	All Hazards	2.1	High	Structural Projects	Administration, Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to monitor plans for and support a Mid-Currituck Bridge.
SOS13	Inspecting bridges and identifying if any repairs or retrofits are needed to prevent scour.	Flooding	2.1	High	Structural Projects	Administration, Public Works	NCDOT, General Fund	Annually	Carry Forward	The Town receives bridge inspection reports from the North Carolina Department of Transportation. Work to replace the Trinitie Bridge is anticipated to begin in early 2025.
SOS14	Implement drainage improvement projects to reduce stormwater related flooding.	Hurricane & Coastal Hazards, Flooding	2.1	Medium	Structural Projects	Planning	Grants	Ongoing	New	
SOS15	Continue to have a standing Reconstruction Task Force	All Hazards	3.1	High	Emergency Services	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Reconstruction Task Force was reappointed on October 1, 2024.
SOS16	Continue to provide an Emergency Operations Center	All Hazards	2.2	High	Emergency Services	Administration	General Fund	Ongoing	Carry Forward	The Town continues to provide an Emergency Operations Center when needed for storm events and coordinates events with the Dare County Emergency Operations Center.
SOS17	Keep emergency plans current and provide staff with continuing education opportunities	All Hazards	2.2	Low	Emergency Services	Administration	General Fund	Ongoing	Carry Forward	The Town updates its Emergency Management Plan annually and provides Town Staff with continuing education opportunities.
SOS18	Educate citizens on expected impacts of hazards on daily lives	All Hazards	1.1	High	Public Education & Awareness	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town utilizes a website, social media, and a bi-weekly newsletter to disseminate information regarding the impacts of hazards on daily lives.
SOS19	Educate citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur	Excessive Heat	1.1	High	Public Education & Awareness	Administration, Planning/Code Enforcement	General Fund	Annually	Carry Forward	The Town utilizes social media to share information about the dangers of extreme weather and how citizens can protect themselves.
SOS20	Encouraging residents in flood-prone areas to elevate homes.	Flooding	1.2	High	Public Education & Awareness	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to encourage residents in flood-prone areas to elevate homes
SOS21	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

8 PLAN MAINTENANCE

Implementation and maintenance of the plan is critical to the overall success of hazard mitigation planning. This section discusses how the Mitigation Action Plans will be implemented by participating jurisdictions and outlines the method and schedule for monitoring, updating, and evaluating the plan. This section also discusses incorporating the plan into existing planning mechanisms and how the public will continue to be involved in the planning process. It consists of the following three subsections:

8.1 Implementation
8.2 Monitoring, Evaluation, and Enhancement
8.3 Continued Public Involvement

8.1 IMPLEMENTATION

8.1.1 MITIGATION ACTION PLAN IMPLEMENTATION

Each jurisdiction participating in this plan update is responsible for implementing specific mitigation actions as prescribed in their Mitigation Action Plan (found in Section 7). In each Mitigation Action Plan, every proposed action is assigned to a specific local department or agency to ensure responsibility and accountability for each action. Additionally, a timeline or target date for implementation is provided for each action to help assess whether reasonable progress is being made toward implementation. When applicable, potential funding sources have also been identified for actions. The participating jurisdictions will seek funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. These criteria will be reviewed and updated as needed as part of the HMPC's regular review of the Hazard Mitigation Plan and the Mitigation Action Plans. This approach enables individual jurisdictions to update their own unique Mitigation Action Plan as needed without altering the broader focus of the regional plan.

8.1.2 PLAN INTEGRATION

Another important implementation mechanism that is highly effective and low-cost is incorporation of the Hazard Mitigation Plan recommendations and their underlying principles into other local plans and programs. Where possible, plan participants will use existing plans and/or programs to implement the Mitigation Action Plan. It will be the responsibility of the HMPC representatives from each participating jurisdiction to determine and pursue opportunities for integrating the findings and goals of this plan with other local planning documents. HMPC members should strive to ensure that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Hazard Mitigation Plan and will not contribute to increased hazard vulnerability in the region. Methods for integration may include:

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

During the last five years, all participating communities in the Outer Banks region pursued plan integration through updates to their local comprehensive land use plans. These plans incorporate findings from the hazard mitigation plan regarding high-risk areas into future land use maps and development strategies. All participating jurisdictions also updated their emergency operations plans, using the hazard mitigation plan findings to inform revisions to local response and recovery procedures. Several communities, including Currituck County, Dare County, Duck, Kill Devil Hills, Kitty Hawk, and Nags Head, have also pursued resiliency planning beyond what has been covered by the hazard mitigation plan, including through participation in NC DCM's Resilient Coastal Communities Program. Manteo is undertaking strategic planning and collaboration with NCSU's Coastal Dynamics Design Lab. These efforts will be integrated with future updates of the hazard mitigation plan.

Opportunities to integrate the requirements of this plan into other local planning mechanisms shall continue to be identified through future meetings of the HMPC and through the five-year review process described herein. Although it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the development and maintenance of this stand-alone Hazard Mitigation Plan is deemed by the HMPC to be the most effective and appropriate method to implement local hazard mitigation actions at this time.

8.2 MONITORING, EVALUATION, AND ENHANCEMENT

8.2.1 ROLE OF HMPC IN IMPLEMENTATION, MONITORING AND MAINTENANCE

With adoption of this plan, each jurisdiction will be responsible for the implementation and maintenance of their mitigation actions. Dare County Emergency Management will take the lead for the region in initiating all plan monitoring and update procedures. As such, Dare County, led by the Emergency Manager, agrees to continue its relationship with the HMPC and:

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

The HMPC's primary duty moving forward is to see the plan successfully carried out and report to the County Boards of Commissioners and Town Councils, NCEM, FEMA, and the public on the status of plan implementation and mitigation opportunities. Other duties include reviewing and promoting mitigation proposals, considering stakeholder concerns about flood mitigation, passing concerns on to appropriate entities, and provide relevant information for posting on County and Town websites (and others as appropriate).

Simultaneous to these efforts, it will be important to maintain a constant monitoring of funding opportunities that can be leveraged to implement some of the costlier recommended actions. This will include creating and maintaining a bank of ideas on how to meet local match or participation requirements. When funding does become available, the counties and towns will be positioned to

capitalize on the opportunity. Funding opportunities to be monitored include special pre- and post-disaster funds, state and federal earmarked funds, benefit assessments, and other grant programs, including those that can serve or support multi-objective applications.

8.2.2 MAINTENANCE SCHEDULE

Plan maintenance implies an ongoing effort to monitor and evaluate plan implementation and to update the plan as progress, roadblocks, or changing circumstances are recognized. The Dare County Emergency Manager will be responsible for convening the HMPC and initiating regular reviews. Regular maintenance will take place through quarterly meetings of the HMPC. The HMPC will also convene to review the plan after significant hazard events. If determined appropriate or as requested, an annual report on the plan will be developed and presented to local governing bodies of participating jurisdictions to report on implementation progress and recommended changes.

The five-year written update to this plan will be submitted to the NCEM and FEMA Region 4, unless disaster or other circumstances (e.g., changing regulations) require a change to this schedule. With this plan update anticipated to be adopted and fully approved by 2025, the next plan update for the Outer Banks Region will be completed by 2030.

8.2.3 MAINTENANCE EVALUATION PROCESS

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

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

Updates to this plan will:

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

In order to best evaluate any changes in vulnerability as a result of plan implementation, the HMPC will follow the following process:

- The HMPC representatives from each jurisdiction will be responsible for tracking and reporting on their mitigation actions. Jurisdictional representatives should provide input on whether the action as implemented met the defined objectives and/or is likely to be successful in reducing vulnerabilities.
- If the action does not meet identified objectives, the jurisdictional representatives will determine what additional measures may be implemented and will make any required modifications to the plan.
- All monitoring and implementation information will be reported to the full HMPC, led by the Dare County Emergency Manager, during quarterly meetings. An annual plan maintenance report may be drafted as deemed necessary.

Changes will be made to the plan as needed to accommodate for actions that have failed or are not considered feasible after a review of their consistency with established criteria, time frame, community priorities, and/or funding resources. Actions that were not ranked high but were identified as potential mitigation activities will be reviewed during the monitoring and update of this plan to determine feasibility of future implementation. Updating of the mitigation action plans will be by written changes and submissions, as is appropriate and necessary, and as approved by the appropriate jurisdiction's local governing body.

Following a disaster declaration, the plan will be revised as necessary to reflect lessons learned, or to address specific issues and circumstances arising from the event. It will be the responsibility of Dare County Emergency Management to reconvene the HMPC and ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

CRITERIA FOR QUARTERLY REVIEWS IN PREPARATION FOR 5-YEAR UPDATE

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

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

8.3 CONTINUED PUBLIC INVOLVEMENT

Continued public involvement is imperative to the overall success of the plan's implementation. The quarterly review process will provide an opportunity to solicit participation from new and existing stakeholders and to publicize success stories from the plan implementation and seek additional public comment. Efforts to involve the public in the maintenance, evaluation and revision process may include:

- Advertising HMPC meetings in the local newspaper, public bulletin boards and/or Town and County office buildings;
- Designating willing citizens and private sector representatives as official members of the HMPC;
- Utilizing local media to update the public of any maintenance and/or review activities;
- Utilizing Town and County websites to advertise any maintenance and/or review activities;
- Maintaining copies of the plan in public libraries or other appropriate venues;
- Posting annual progress reports on the plan to County and Town websites;
- Heavy publicity of the plan and potential ways for the public to be involved after significant hazard events, tailored to the event that has just happened;
- Keeping websites, social media outlets, etc. updated;
- Drafting articles for the local community newspapers/newsletters;
- Utilizing social media accounts (e.g. Twitter, Facebook).

PUBLIC INVOLVEMENT FOR FIVE-YEAR UPDATE

When the HMPC reconvenes for the five-year update, they will coordinate with all stakeholders participating in the planning process—including those that joined the committee since the planning process began—to update and revise the plan. In reconvening, the HMPC will be responsible for coordinating the activities necessary to involve the greater public, including disseminating information through a variety of media channels detailing the plan update process. As part of this effort, public meetings will be held, and public comments will be solicited on the plan update draft. The HMPC will continue to reach out to stakeholders and organizations that can represent or connect with vulnerable populations and underserved communities.

9 PLAN ADOPTION

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

The purpose of formally adopting this plan is to secure buy-in, raise awareness of the plan, and formalize the plan's implementation. The adoption of this plan completes Planning Step 9 (Adopt the Plan) of the 10-step planning process, in accordance with the requirements of DMA 2000. FEMA approval letters and community adoption resolutions are provided below.

U.S. Department of Homeland Security
Region 4
3005 Chamblee Tucker Road
Atlanta, GA 30341

FEMA

April 15, 2025

Mr. Steve McGugan
State Hazard Mitigation Officer
Assistant Director / Mitigation Section Chief
Division of Emergency Management, NC Department of Public Safety
200 Park Offices Drive
Durham, NC 27713

Reference: Outer Banks Regional Hazard Mitigation Plan

Dear Mr. McGugan:

We are pleased to inform you the Outer Banks Regional Hazard Mitigation Plan update complies with the Federal hazard mitigation planning requirements resulting from the Disaster Mitigation Act of 2000, as contained in 44 CFR §201.6. FEMA approval does not include the review or approval of content that exceeds these applicable FEMA mitigation planning requirements. Effective April 15, 2025, the plan is approved for a period of five (5) years to April 14, 2030.

Enclosed is the status of all participating jurisdictions. Approved jurisdictions are eligible applicants through the State for the following mitigation grant programs administered by the Federal Emergency Management Agency (FEMA):

- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA)

Please note that all funding requests will be evaluated individually according to the program's specific eligibility requirements.

The State and all plan participants should be commended for their close coordination and communications with our office in the review and subsequent approval of the plan. If you or any plan participant need assistance, please do not hesitate to contact Kymberly Kudla, of my staff, at (202) 655-6712.

Sincerely,

Kristen M. Martinenza, P.E.
Risk Analysis Branch Chief

Enclosure

U.S. Department of Homeland Security
Region 4
3005 Chamblee Tucker Road
Atlanta, GA 30341

FEMA

April 30, 2025

Mr. Steve McGugan
State Hazard Mitigation Officer
Assistant Director / Mitigation Section Chief
Division of Emergency Management, NC Department of Public Safety
200 Park Offices Drive
Durham, NC 27713

Reference: Outer Banks Regional Hazard Mitigation Plan

Dear Mr. McGugan:

This is a follow-up to our previous correspondence of April 15, 2025, in which we approved the Outer Banks Regional Hazard Mitigation Plan and all participating jurisdictions that originally submitted adoption resolutions. We have recently received and approved additional resolution(s) for inclusion. FEMA approval does not include the review or approval of content that exceeds the applicable FEMA mitigation planning requirements.

Enclosed is the status of all participating jurisdictions. Approved jurisdictions are eligible applicants through the State for the following mitigation grant programs administered by the Federal Emergency Management Agency (FEMA):

- Hazard Mitigation Grant Program (HMGP)
- Flood Mitigation Assistance (FMA)

Please note that all funding requests will be evaluated individually according to the program's specific eligibility requirements.

If you or any plan participant need assistance, please do not hesitate to contact Kymberly Kudla, of my staff, at (202) 655-6712.

Sincerely,

Kristen M. Martinenza, P.E.
Risk Analysis Branch Chief

Enclosure

Enclosure: Plan Participant Status List

Attached is the list of participating jurisdictions in the referenced hazard mitigation plan.

	Jurisdiction Name	Jurisdiction Status	Date Approved by FEMA
1)	Currituck County	Approved	4/29/25
2)	Dare County	Approved	4/15/25
3)	Duck town	Approved	4/30/25
4)	Kill Devil Hills town	Approved	4/22/25
5)	Kitty Hawk town	Approved	4/22/25
6)	Manteo town	Approved	4/30/25
7)	Nags Head town	Approved	4/15/25
8)	Southern Shores town	Approved	4/15/25

COUNTY OF CURRITUCK

RESOLUTION ADOPTING THE OUTER BANKS REGIONAL HAZARD MITIGATION PLAN

WHEREAS, the citizens and property within Currituck County are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, Currituck County desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and.

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, Currituck County has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the said plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management.

WHEREAS, it is the intent of the Board of Commissioners of Currituck County to fulfill this obligation in order that the county will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County;

1

NOW, THEREFORE, be it resolved that the Board of Commissioners of Currituck County hereby:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

2. Vests Currituck County with the responsibility, authority, and the means to:

   (a) Inform all concerned parties of this action.
   (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Appoints Currituck County Emergency Management to assure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Currituck County Board of Commissioners for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted this the 21st day of April, 2025.

S. Paul O'Neal, Chair

Attest:

Leeann Walton,
Clerk to the Board of Commissioners

2

RESOLUTION OF ADOPTION

COUNTY OF DARE

25-04-19

Outer Banks Regional Hazard Mitigation Plan

WHEREAS, the County of Dare is vulnerable to an array of natural hazards that can cause loss of life and damages to public and private property; and

WHEREAS, the County of Dare desires to seek ways to mitigate situations that may aggravate such circumstances; and

WHEREAS, the development and implementation of a hazard mitigation plan can result in actions that reduce the long-term risk to life and property from natural hazards; and

WHEREAS, it is the intent of the County of Dare Board of Commissioners to protect its citizens and property from the effects of natural hazards by preparing and maintaining a local hazard mitigation plan; and

WHEREAS, it is also the intent of the County of Dare Board of Commissioners to fulfill its obligation under North Carolina General Statutes, Chapter 166A: North Carolina Emergency Management Act and Section 322: Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act to remain eligible to receive state and federal assistance in the event of a declared disaster affecting the County of Dare; and

WHEREAS, the County of Dare in coordination with the County of Currituck, and the Towns of Duck, Kill Devil Hills, Kitty Hawk, Manteo, Nags Head, and Southern Shores has prepared a regional hazard mitigation plan with input from the appropriate local and state officials; and

WHEREAS, the North Carolina Division of Emergency Management and the Federal Emergency Management Agency have reviewed the Outer Banks Regional Hazard Mitigation Plan for legislative compliance and has approved the plan pending the completion of local adoption procedures;

NOW, THEREFORE, BE IT RESOLVED that the County of Dare Board of Commissioners hereby adopts the Outer Banks Regional Hazard Mitigation Plan and agrees to take such other official action as may be reasonably necessary to carry out the proposed actions of the Plan.

By: _____ 4/7/25

Robert L. Woodard, Sr. Chairman — Date:

SEAL:

Attest: _____

Skyler Foley, Clerk to the Board

RESOLUTION OF THE TOWN COUNCIL OF THE TOWN OF DUCK, NORTH CAROLINA ADOPTING THE OUTER BANKS REGIONAL HAZARD MITIGATION PLAN

RESOLUTION 25-01

WHEREAS, the citizens and property owners within the Town of Duck are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Duck desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, the Town of Duck has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management; and

WHEREAS, it is the intent of the Duck Town Council to fulfill this obligation in order that the Town of Duck will be eligible for Federal and State assistance in the event that a state of disaster is declared for a hazard event affecting the County.

NOW, THEREFORE, BE IT RESOLVED that the Town Council of the Town of Duck, North Carolina hereby:

1

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

2. Vests the Town Manager and Community Development Department with the responsibility, authority, and the means to:

   (a) Inform all concerned parties of this action.
   (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Appoints Dare County Emergency Management to ensure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to ensure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Duck Town Council and the Dare County Board of Commissioners for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Outer Banks Regional Hazard Mitigation Plan.

Adopted this the 5th day of March, 2025.

Don Kingston, Mayor

Attest:

Lori Ackerman, Clerk

TOWN OF DUCK NORTH CAROLINA

2

TOWN OF KILL DEVIL HILLS

Land Where Flight Began

A Resolution Adopting the 2025 Outer Banks Regional Hazard Mitigation Plan

WHEREAS, the citizens and property within the Town of Kill Devil Hills are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the Outer Banks region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Kill Devil Hills desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the North Carolina General Assembly has enacted North Carolina General Statute Section 166A-19.41 (*State emergency assistance funds*), which provides that for a state of emergency declared pursuant to N.C.G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency, pursuant to the Disaster Mitigation Act of 2000, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and.

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an all-hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, the Town of Kill Devil Hills has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated that plan as required under regulation 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management; and

WHEREAS, it is the intent of the Kill Devil Hills Board of Commissioners to fulfill this obligation in order that the Town of Kill Devil Hills will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County; now, therefore be it

RESOLVED that the Kill Devil Hills Board of Commissioners:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

2. Vests appropriate Town Staff with the responsibility, authority, and the means to:

   (a) Inform all concerned parties of this action; and
   (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Requests that the Dare County Emergency Management Director assures that the Hazard Mitigation Plan is reviewed annually and updated every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the appropriate governing boards for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

This the 10th day of February, 2025.

SEAL

KILL DEVIL HILLS Birthplace of Aviation NORTH CAROLINA

John Windley
Mayor

ATTEST:

James Michael O'Dell
Town Clerk

Town of Kitty Hawk
Post Office Box 554, 101 Veterans Memorial Dr
Kitty Hawk, North Carolina 27949
Ph: 252-261-3552 Fax 252-261-7900
www.kittyhawknc.gov

Mayor
Craig Garriss

Mayor Pro Tem
Jeff Pruitt

Councilman
David Hines

Councilman
Dylan Tillett

Councilwoman
Charlotte Walker

Town Manager
Melody Clopton

Town Clerk
Lauren Garrett

Town Attorney
Casey C. Varnell

RESOLUTION
ADOPTING OUTER BANKS REGIONAL
HAZARD MITIGATION PLAN

WHEREAS, the citizens and property within the Town of Kitty Hawk are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Kitty Hawk desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and.

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, the Town of Kitty Hawk has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the said plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management.

WHEREAS, it is the intent of the Town Council of Kitty Hawk to fulfill this obligation in order that the Town of Kitty Hawk will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County;

NOW, THEREFORE, be it resolved that the Kitty Hawk Town Council hereby:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

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2. Vests Kitty Hawk town administration with the responsibility, authority, and the means to:
   a) Inform all concerned parties of this action.
   b)Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Appoints Kitty Hawk Emergency Management to assure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Kitty Hawk Town Council for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted this the 3rd day of March, 2025.

S. Craig Garriss

Craig Garriss, Mayor
Kitty Hawk Town Council

Attest:

Lauren Fox Garrett, C

THE TOWN OF 1981 KITTY HAWK

Certified by: _____ (SEAL)

Date: March 3, 2025

THE TOWN OF MANTEO
PRESERVE PROSPER

Resolution 2025-01
ADOPTING OUTER BANKS REGIONAL HAZARD MITIGATION PLAN

WHEREAS, the citizens and property within Town of Manteo are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Manteo desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and.

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five-year cycle; and

WHEREAS, the Town of Manteo has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the said plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management.

WHEREAS, it is the intent of the Town of Manteo of Board of Commissioners to fulfill this obligation in order that the Town of Manteo will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County;

NOW, THEREFORE, be it resolved that the Town of Manteo Board of Commissioners hereby:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

2. Vests Town of Manteo with the responsibility, authority, and the means to:

   (a) Inform all concerned parties of this action.
   (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Appoints Town of Manteo Emergency Management to assure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Town of Manteo Board of Commissioners for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted this the 12th day of February, 2025.

Sherry Butcher Wickstrom, Mayor

Attest:

Jamie Whitley, Town Clerk

Certified by: Jamie Whitley (SEAL)

Date: February 12, 2025

TOWN OF MANTEO CORPORATE SEAL 1899 NORTH CAROLINA

Resolution No. 25-03-004
Adoption of Hazard Mitigation Plan
BOC Meeting March 5, 2025

RESOLUTION OF THE BOARD OF COMMISSIONERS OF THE TOWN OF NAGS HEAD, NORTH CAROLINA - ADOPTING THE OUTER BANKS REGIONAL HAZARD MITGATION PLAN

WHEREAS, the citizens and property within the Town of Nags Head are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Nags Head desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, the Town of Nags Head has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the said plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management; and

WHEREAS, it is the intent of the Board of Commissioners of the Town of Nags Head to fulfill this obligation in order that the Town of Nags Head will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County.

NOW, THEREFORE, be it resolved that the Board of Commissioners of the Town of Nags Head hereby:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.
2. Vests the Town of Nags Head with the responsibility, authority, and the means to:
   (a) Inform all concerned parties of this action.
   (b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.
3. Appoints Dare County Emergency Management to assure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Dare County Board of Commissioners for consideration.
4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted this 5th day of March 2025.

Benjamin Cahoon, Mayor
Town of Nags Head

ATTEST: Brittany A Phillips
Brittany A Phillips, Town Clerk

Town of Southern Shores

5375 N. Virginia Dare Trail, Southern Shores, NC 27949
Phone 252-261-2394 / Fax 252-255-0876
www.southernshores-nc.gov

Town of Southern Shores Resolution Adopting the Outer Banks Regional Hazard Mitigation Plan
Resolution # 2025-03-02

WHEREAS, the citizens and property within the Town of Southern Shores are subject to the effects of natural hazards that pose threats to lives and cause damage to property, and with the knowledge and experience that certain areas of the region are particularly vulnerable to drought, excessive heat, hurricane and coastal hazards, thunderstorm, tornado, winter weather, flooding, wildfire, hazardous substances, cyber threat, terrorism, and infrastructure failure; and

WHEREAS, the Town of Southern Shores desires to seek ways to mitigate the impact of identified hazard risks; and

WHEREAS, the Legislature of the State of North Carolina has in Article 5, Section 160D-501 of Chapter 160D of the North Carolina General Statutes, delegated to local governmental units the responsibility to adopt regulations designed to promote the public health, safety, and general welfare of its citizenry; and

WHEREAS, the Legislature of the State of North Carolina has enacted General Statute Section 166A-19.41 (*State emergency assistance funds*) which provides that for a state of emergency declared pursuant to G.S. 166A-19.20(a) after the deadline established by the Federal Emergency Management Agency pursuant to the Disaster Mitigation Act of 2002, P.L. 106-390, the eligible entity shall have a hazard mitigation plan approved pursuant to the Stafford Act; and.

WHEREAS, Section 322 of the Federal Disaster Mitigation Act of 2000 states that local governments must develop an All-Hazards Mitigation Plan in order to be eligible to receive future Hazard Mitigation Grant Program Funds and other disaster-related assistance funding and that said Plan must be updated and adopted within a five year cycle; and

WHEREAS, the Town of Southern Shores has performed a comprehensive review and evaluation of each section of the previously approved Hazard Mitigation Plan and has updated the said plan as required under regulations at 44 CFR Part 201 and according to guidance issued by the Federal Emergency Management Agency and the North Carolina Division of Emergency Management.

WHEREAS, it is the intent of the Town Council of the Town of Southern Shores to fulfill this obligation in order that the Town of Southern Shores will be eligible for federal and state assistance in the event that a state of disaster is declared for a hazard event affecting the County;

NOW, THEREFORE, be it resolved that the Town Council of the Town of Southern Shores hereby:

1. Adopts the Outer Banks Regional Hazard Mitigation Plan.

2. Vests the Town of Southern Shores Planning & Code Enforcement Department with the responsibility, authority, and the means to:

(a) Inform all concerned parties of this action.
(b) Cooperate with Federal, State and local agencies and private firms which undertake to study, survey, map and identify floodplain areas, and cooperate with neighboring communities with respect to management of adjoining floodplain areas in order to prevent exacerbation of existing hazard impacts.

3. Appoints the Town of Southern Shores Planning & Code Enforcement Department to assure that the Hazard Mitigation Plan is reviewed annually and every five years as specified in the Plan to assure that the Plan is in compliance with all State and Federal regulations and that any needed revisions or amendments to the Plan are developed and presented to the Town of Southern Shores Town Council for consideration.

4. Agrees to take such other official action as may be reasonably necessary to carry out the objectives of the Hazard Mitigation Plan.

Adopted this the 4 day of March, 2025.

Elizabeth Morey, Mayor

3/4/2025
Date:

SEAL:

TOWN OF SOUTHERN SHORES SEAL NC

Sheila Kane, Town Clerk

ANNEX A. CURRITUCK COUNTY

A.1 ASSET INVENTORY

Currituck County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table A.1 provides a count of critical facilities by FEMA lifeline category within Currituck County. Figure A.1 shows the locations of all critical facilities within Currituck County.

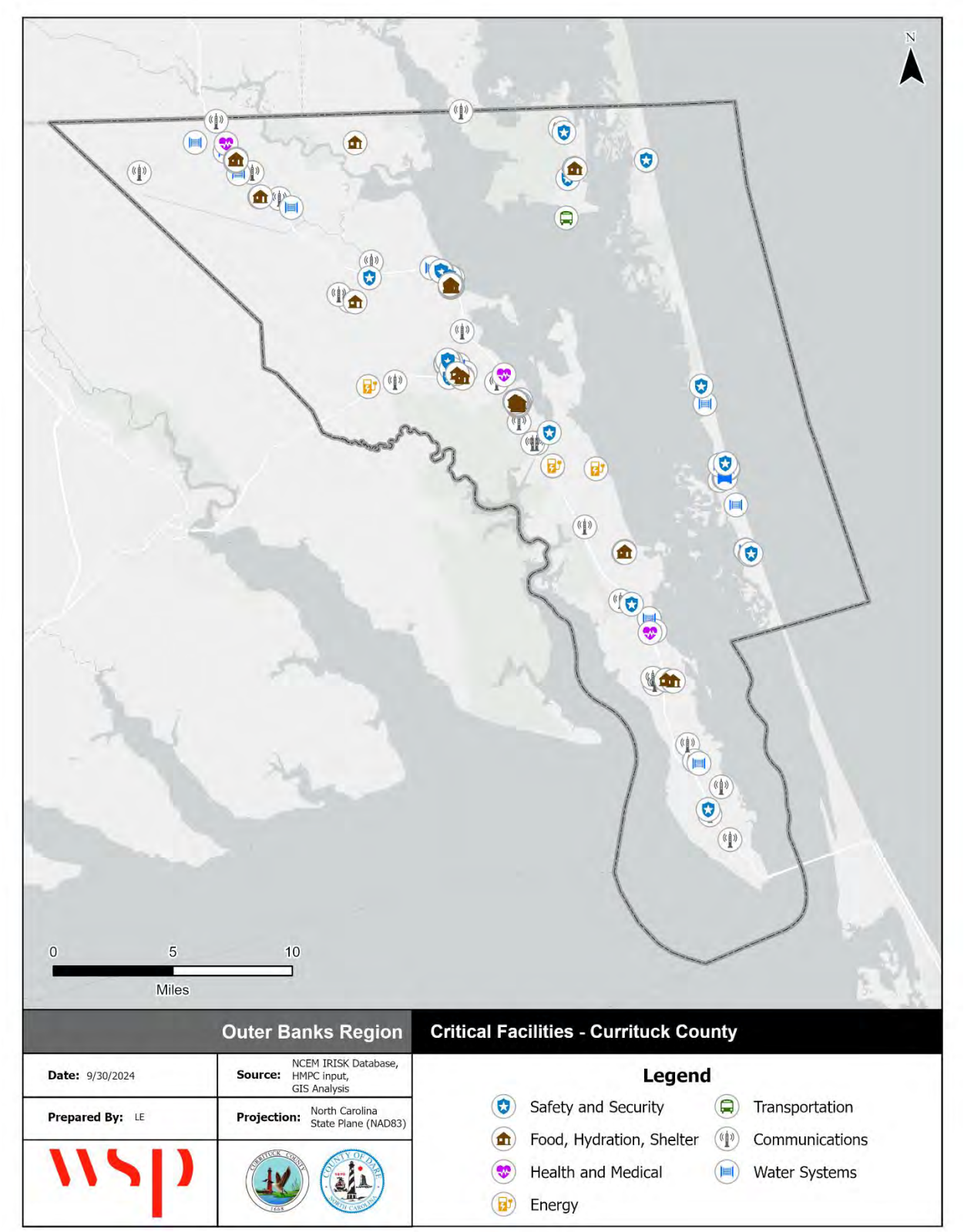
Table A.2 provides a detailed inventory of the critical facilities in Currituck County, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles. Note that in some cases there are multiple buildings that comprise a critical facility at a single address, such as a school. In these cases, each building was evaluated and is listed individually in the inventory.

Table A.1 – Critical Facilities by Type, Currituck County

Facility Type	Count of Facility Type	Structure Value
Communications	30	$8,760,400
Energy	3	$208,950
Food, Hydration, Shelter	62	$82,419,950
Hazardous Materials	0	$0
Health and Medical	3	$15,952,200
Safety and Security	23	$18,519,800
Transportation	4	$3,523,400
Water Systems	34	$9,881,100
Total	**159**	**$139,265,800**

Source: Currituck County, HMPC

Figure A.1 – Critical Facilities, Unincorporated Currituck County



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table A.2 – Currituck County Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Comms.	Comms.	125 Caratoke Hwy	$22,500	0.10	X Unshaded	NA	3		0	0
Comms.	Comms.	410 Shawboro Rd	$41,900	0.10	X Unshaded	NA	2		0	0
Comms.	Comms.	142 Young Rd	$12,650	0.10	X Shaded	NA	3	Y	3	4 - High
Comms.	Comms.	515 Snowden Rd	$47,400	0.10	X Unshaded	NA	3		2	2 - Low
Comms.	Comms.	929 S Bayview Rd	$15,600	0.10	X Unshaded	NA	3		0	3 - Moderate
Comms.	Comms.	219 Sawyertown Rd	$0	0.10	X Unshaded	NA	2		0	0
Comms.	Comms.	138-A W Mobile Rd	$0	0.10	X Unshaded	NA	3	Y	0	3 - Moderate
Comms.	Comms.	574 Poyners Rd	$0	4.04	AE	2	1		2	2.5
Comms.	Comms.	179 Doctor Newbern Rd	$46,700	0.10	X Unshaded	NA	5		3	3.5
Comms.	Comms.	195-A Fisher Landing Rd	$189,000	0.10	X Unshaded	NA	NA		0	1.5
Comms.	Comms.	108 Delena Ln	$12,700	0.10	X Unshaded	NA	4		0	3 - Moderate
Comms.	Comms.	176 Radio Rd	$341,900	0.10	X Unshaded	NA	4		2	3.5
Comms.	Comms.	4263-A Caratoke Hwy	$491,050	0.10	X Unshaded	NA	3		0	0
Comms.	Comms.	187-A Four Forks Rd	$0	0.10	AE	NA	2		1	1.5
Comms.	Comms.	6246-A Caratoke Hwy	$32,600	0.10	X Unshaded	NA	5		2	1.5
Comms.	Comms.	4396 Caratoke Hwy	$0	2.12	AE	NA	1		3	3 - Moderate
Comms.	Comms.	564-A Guinea Rd	$0	0.10	X Unshaded	NA	2		0	0
Comms.	Comms.	5493 Caratoke Hwy	$0	0.10	X Unshaded	NA	5		0	3 - Moderate
Comms.	Comms.	183-A Shortcut Rd	$0	0.10	X Shaded	NA	2		0	0
Comms.	Comms.	169 Worth Guard Rd	$49,100	0.10	X Unshaded	NA	5	Y	0	0
Comms.	Comms.	148 Worth Guard Rd	$6,900	0.10	X Unshaded	NA	3	Y	0	3 - Moderate
Comms.	Comms.	166 Fisher Landing Rd	$67,000	0.10	X Unshaded	NA	NA		0	0
Comms.	Comms.	101 Marsh Cswy	$0	0.10	X Unshaded	NA	3	Y	0	0
Comms.	Comms.	8382 Caratoke Hwy	$108,600	0.10	X Unshaded	NA	NA		2	0
Comms.	Comms.	1099-A Ocean Trl	$54,500	0.10	X Unshaded	NA	5	Y	0	4 - High
Comms.	Comms.	1073 Marsh Cswy	$117,900	0.10	X Unshaded	NA	4		0	1.5

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Comms.	Comms.	734-A Ocean Trl	$6,680,700	0.10	X Unshaded	NA	3		1	2.5
Comms.	Comms.	147 Courthouse Rd	$409,300	0.10	X Unshaded	NA	4		0	0
Comms.	Comms.	702 Northwest Backwoods Rd	$0	0.10	X Unshaded	NA	4		1	1.5
Comms.	Comms.	2169-A Ocean Pearl Rd	$12,400	0.10	X Unshaded	NA	3		0	3.5
Energy	Substation	183 Sanderlin Rd	$121,500	0.10	X Unshaded	NA	2		0	0
Energy	Substation	142 Young Rd	$12,650	0.10	X Shaded	NA	3	Y	3	3.5
Energy	Substation	Narrow Shore Rd	$74,800	0.10	X Unshaded	NA	5		0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	216 Survey Rd	$4,837,300	0.10	X Unshaded	NA	4	Y	0	3.5
Food, Hydration, Shelter	School	216 Survey Rd	$4,837,300	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	3.5
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3		0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	255 Shingle Landing Rd	$561,260	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	261 Poplar Branch Rd	$2,218,067	0.10	X Unshaded	NA	5	Y	0	3.5

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Food, Hydration, Shelter	School	261 Poplar Branch Rd	$2,218,067	0.10	X Unshaded	NA	5	Y	1	0
Food, Hydration, Shelter	School	261 Poplar Branch Rd	$2,218,067	0.10	X Unshaded	NA	5	Y	1	0
Food, Hydration, Shelter	Hog Farm	365 Middle Gibbs Rd	$261,400	0.10	X Unshaded	NA	4		0	3.5
Food, Hydration, Shelter	School	504 Shortcut Rd	$858,633	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	504 Shortcut Rd	$858,633	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	504 Shortcut Rd	$858,633	0.10	X Unshaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	370 Shawboro Rd	$8,917,700	0.10	X Shaded	NA	4		0	3.5
Food, Hydration, Shelter	School	413 Woodleigh Rd	$2,358,450	0.10	X Unshaded	NA	4	Y	2	3.5
Food, Hydration, Shelter	School	413 Woodleigh Rd	$2,358,450	0.10	X Unshaded	NA	4	Y	0	3 - Moderate
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	3.5
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	121 Forbes Rd	$2,050,500	0.10	X Unshaded	NA	5	Y	0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	3.5
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	3.5

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	3.5
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	1	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	1	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	1	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	1	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4	Y	0	2.5
Food, Hydration, Shelter	School	2958 Caratoke Hwy	$189,337	0.10	X Unshaded	NA	4		0	3.5
Food, Hydration, Shelter	School	110 Jarvisburg Rd	$4,184,450	0.10	X Unshaded	NA	5		0	3.5
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	3.5
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4203 Caratoke Hwy	$4,671,933	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	4		0	0
Food, Hydration, Shelter	School	4263 Caratoke Hwy	$491,050	0.10	X Unshaded	NA	3		0	0
Food, Hydration, Shelter	School	Caratoke Hwy	$0	0.10	X Unshaded	NA	4		0	3.5
Food, Hydration, Shelter	School	4203 Caratoke Hwy	$4,671,933	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	4203 Caratoke Hwy	$4,671,933	0.10	X Unshaded	NA	4	Y	0	0
Food, Hydration, Shelter	Shelter	130 Community Way	$9,590,400	0.10	X Unshaded	NA	5		0	3 - Moderate
Food, Hydration, Shelter	School	110 Jarvisburg Rd	$4,184,450	0.10	X Unshaded	NA	5		0	3.5
Health & Medical	Medical	3907 Caratoke Hwy	$5,874,800	0.10	X Unshaded	NA	4	Y	0	0
Health & Medical	Medical	141 Moyock Landing Dr	$9,970,700	0.10	X Unshaded	NA	3		0	3.5
Health & Medical	Medical	6644 Caratoke Highway	$106,700	0.10	X Unshaded	NA	5	Y	1	0
Safety & Security	Fire Station	121 Shawboro Rd	$354,400	0.10	AE	NA	3	Y	0	0
Safety & Security	Fire Station	Fire Station Ct	$124,500	0.10	X Unshaded	NA	2	Y	1	0

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Safety & Security	Police Station	413 Maple Rd	$405,220	0.10	X Unshaded	NA	5	Y	0	2 - Low
Safety & Security	Police Station	413 Maple Rd	$405,220	0.10	X Unshaded	NA	5	Y	0	3.5
Safety & Security	Police Station	413 Maple Rd	$405,220	0.10	X Unshaded	NA	5	Y	0	0
Safety & Security	Police Station	413 Maple Rd	$405,220	0.10	X Unshaded	NA	5	Y	0	0
Safety & Security	Police Station	413 Maple Rd	$405,220	0.10	X Unshaded	NA	5		0	0
Safety & Security	Fire Station	620 Shortcut Rd	$73,700	0.10	X Unshaded	NA	4	Y	0	2 - Low
Safety & Security	Fire Station	153 South End Rd	$124,800	0.10	X Unshaded	NA	4	Y	2	0
Safety & Security	Fire Station	2169 Ocean Pearl Rd	$12,400	0.10	X Unshaded	NA	4		0	0
Safety & Security	Fire Station	827 Whalehead Dr	$336,600	0.10	X Unshaded	NA	2		0	0
Safety & Security	Fire Station	2950 Caratoke Hwy	$59,900	0.10	X Unshaded	NA	4	Y	0	2 - Low
Safety & Security	Fire Station	2950 Caratoke Hwy	$59,900	0.10	X Unshaded	NA	4	Y	0	0
Safety & Security	Government	153 Courthouse Rd	$409,300	0.10	X Unshaded	NA	4		0	0
Safety & Security	Fire Station	470 Ocean Trl	$640,000	0.10	X Unshaded	NA	4		0	0
Safety & Security	Fire Station	8336 Caratoke Hwy	$163,600	0.10	X Unshaded	NA	NA	Y	2	0
Safety & Security	Fire Station	6323 Caratoke Hwy	$388,900	0.10	X Unshaded	NA	5		3	3 - Moderate
Safety & Security	Government	2801 Caratoke Hwy	$2,956,900	0.10	X Unshaded	NA	4	Y	0	0
Safety & Security	Fire Station	327 Knotts Island Rd	$539,900	0.10	X Unshaded	NA	5		1	3.5
Safety & Security	Government	1123 Ocean Trl	$912,600	0.10	X Unshaded	NA	4		0	0
Safety & Security	Emergency Operations Center	2801 Caratoke Hwy	$2,956,900	0.10	X Unshaded	NA	4		0	0
Safety & Security	Fire Station	424 Waterlily Rd	$301,500	0.10	X Shaded	NA	4		4	1.5
Safety & Security	Government	101 College Way Barco 27917	$6,077,900	0.10	X Unshaded	NA	4		2	1.5
Transportation	Regional Airport	264 Airport Rd	$1,624,350	0.10	X Unshaded	NA	5		0	0

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Transportation	Regional Airport	264 Airport Rd	$1,624,350	0.10	X Unshaded	NA	5		1	0
Transportation	Ferry Dock	173 Courthouse Rd	$204,000	5.77	AE	1	NA		0	0
Transportation	Transpo.	153 Ferry Dock Rd	$70,700	4.30	AE	1	NA		0	0
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5		0	3.5
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5	Y	0	3.5
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	444 Maple Rd	$152,117	0.10	X Unshaded	NA	5		0	3.5
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	4	Y	0	0
Water Systems	Treatment Plant	741 Ocean Trl	$2,008,500	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	5		0	0
Water Systems	Treatment Plant	743 Ocean Trl	$0	0.10	X Unshaded	NA	4		0	0
Water Systems	Treatment Plant	814 Lighthouse Dr	$293,900	0.10	X Unshaded	NA	2		0	0

FEMA Lifeline	Facility Type	Address	Structure Value	2005 Flood Depth	2005 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Water Systems	Treatment Plant	802 Lighthouse Dr	$1,360,500	0.10	X Unshaded	NA	4		0	0
Water Systems	Treatment Plant	804 Lighthouse Dr	$259,500	0.10	X Unshaded	NA	2		0	0
Water Systems	Treatment Plant	500 Old Stoney Rd	$53,267	0.10	X Unshaded	NA	2		2	0
Water Systems	Treatment Plant	500 Old Stoney Rd	$53,267	0.10	X Shaded	NA	1		2	0
Water Systems	Treatment Plant	500 Old Stoney Rd	$53,267	0.10	X Unshaded	NA	3		2	0
Water Systems	Water Tank	131 Shingle Landing Rd	$667,600	0.10	X Unshaded	NA	3	Y	0	0
Water Systems	Water Tank	2519 Tulls Creek Rd	$1,275,000	0.10	X Unshaded	NA	3	Y	0	0
Water Systems	Water Tank	104 Walnut Island Blvd	$1,254,400	0.10	X Unshaded	NA	5	Y	0	2 - Low
Water Systems	Treatment Plant	104 Moyock Commons Dr	$1,000	0.10	X Unshaded	NA	3		0	0
Water Systems	Treatment Plant	105 Barco Way	$180,300	0.10	X Unshaded	NA	5		0	4.5
Water Systems	Treatment Plant	501 Winslow Rd	$48,400	0.10	X Unshaded	NA	4		0	0
Water Systems	Utility	159 Southern Pine Dr	$317,200	0.10	AE	NA	2		1	1.5
Water Systems	Utility	201 Fox Knoll Dr	$0	0.10	X Unshaded	NA	5		3	1.5
Water Systems	Utility	468 Ocean Trl	$540,700	0.10	X Unshaded	NA	3		2	3.5
Water Systems	Utility	Ocean Trl	$0	0.10	X Unshaded	NA	1		0	3.5
Water Systems	Utility	1099 Ocean Trl	$54,500	0.10	X Unshaded	NA	5	Y	0	4 - High
Water Systems	Treatment Plant	100 Pirate Quay Ln	$0	0.10	X Unshaded	NA	NA		1	0
Water Systems	Treatment Plant	468 Ocean Trl	$540,700	0.10	X Unshaded	NA	3		0	0
Water Systems	Treatment Plant	819 Malia Dr	$6,400	0.10	X Unshaded	NA	NA		0	0

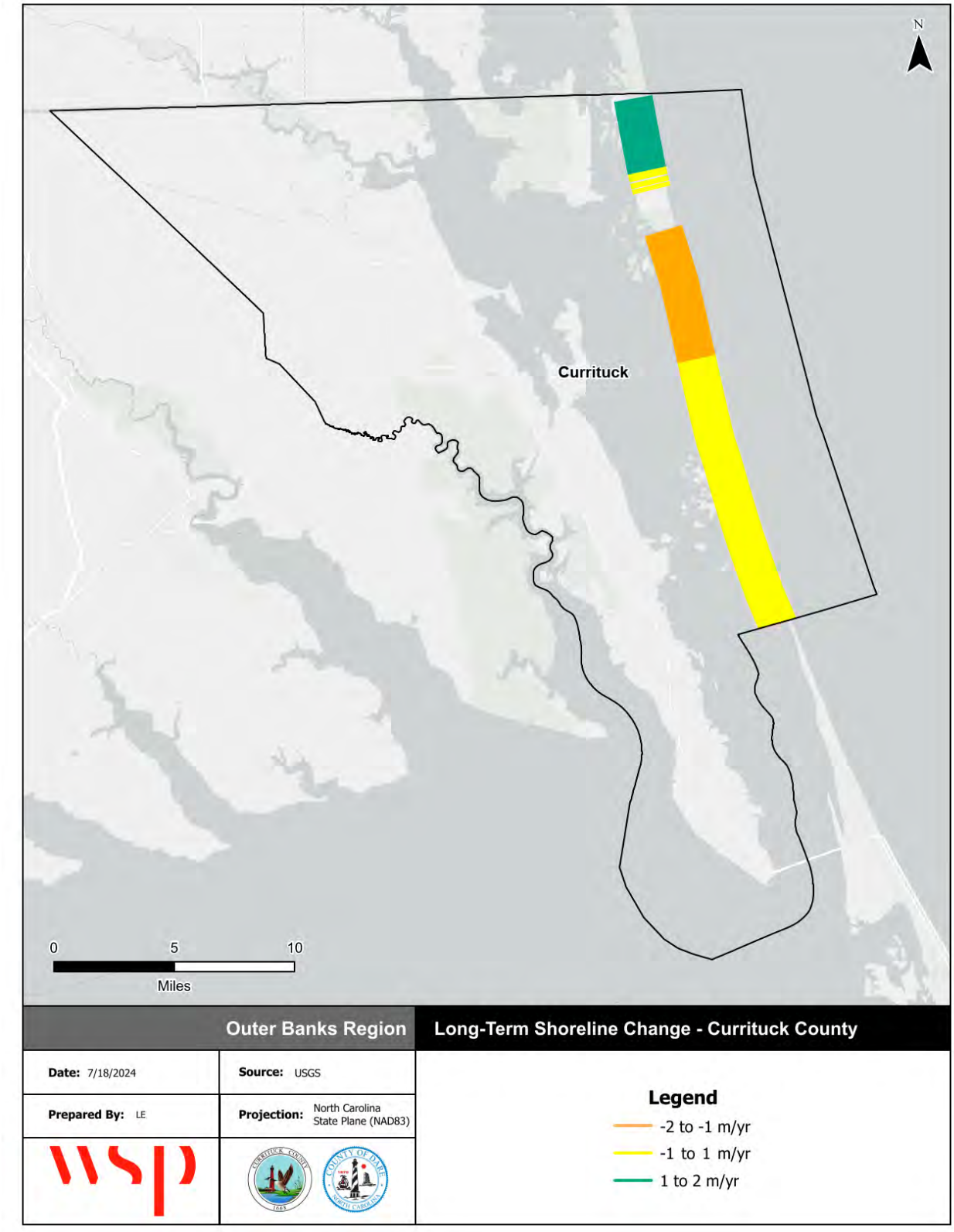
A.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within unincorporated Currituck County. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

A.2.1 HURRICANE & COASTAL HAZARDS

Figure A.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Currituck County oceanfront coastline from Corolla to the County's southern border. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of Currituck County is experiencing some level of change every year.

Figure A.2 – Long-Term Shoreline Change Rates, Currituck County



Source: United States Geological Survey

A.2.2 FLOODING

Table A.3 details the acreage of Currituck County's total area by flood zone on the effective FIRM and previous 2005 FIRM. Per this assessment, over 59 percent of the County falls within the current effective mapped 1%-annual-chance floodplains. Over 69 percent of the County falls within the previous 2005 mapped 1%-annual-chance floodplains.

Table A.3 – Flood Zone Acreage in Currituck County

Flood Zone	Current Effective FIRM		2005 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone A	3,327.68	1.17%	4,294.32	1.51%
Zone AE	147,151.79	51.71%	123,599.50	43.44%
Zone VE	16,472.99	5.79%	70,531.84	24.79%
Zone X (500-year)	6,880.05	2.42%	15,108.54	5.31%
Zone X Unshaded	76,803.35	26.99%	51,271.99	18.02%
Open Water	33,934.38	11.92%	19,716.44	6.93%
Total	**284,570**	--	**284,522.63**	--

Source: FEMA Effective DFIRM and 2005 FIRM

Figure A.3 reflects the effective mapped flood hazard zones for Currituck County, and Figure A.4 reflects the flood hazard zones from the previous 2005 FIRM.

Figure A.5 and Figure A.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table A.4 provides building counts and values for critical facilities by flood zone in Currituck County.

Table A.4 – Critical Facilities Exposed to Flooding, Currituck County

Flood Zone	Critical Facility Count	Structure Value
AE	7	$946,300
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	6	$9,297,766.67
X	146	$129,021,733.33
Total	**159**	**$139,265,800.00**

Source: FEMA 2005 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2005 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2005 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table A.5 summarizes exposure under each freeboard scenario using the 2005 FIRM as a baseline, and Table A.6 summarizes exposure using the current effective FIRM as a baseline.

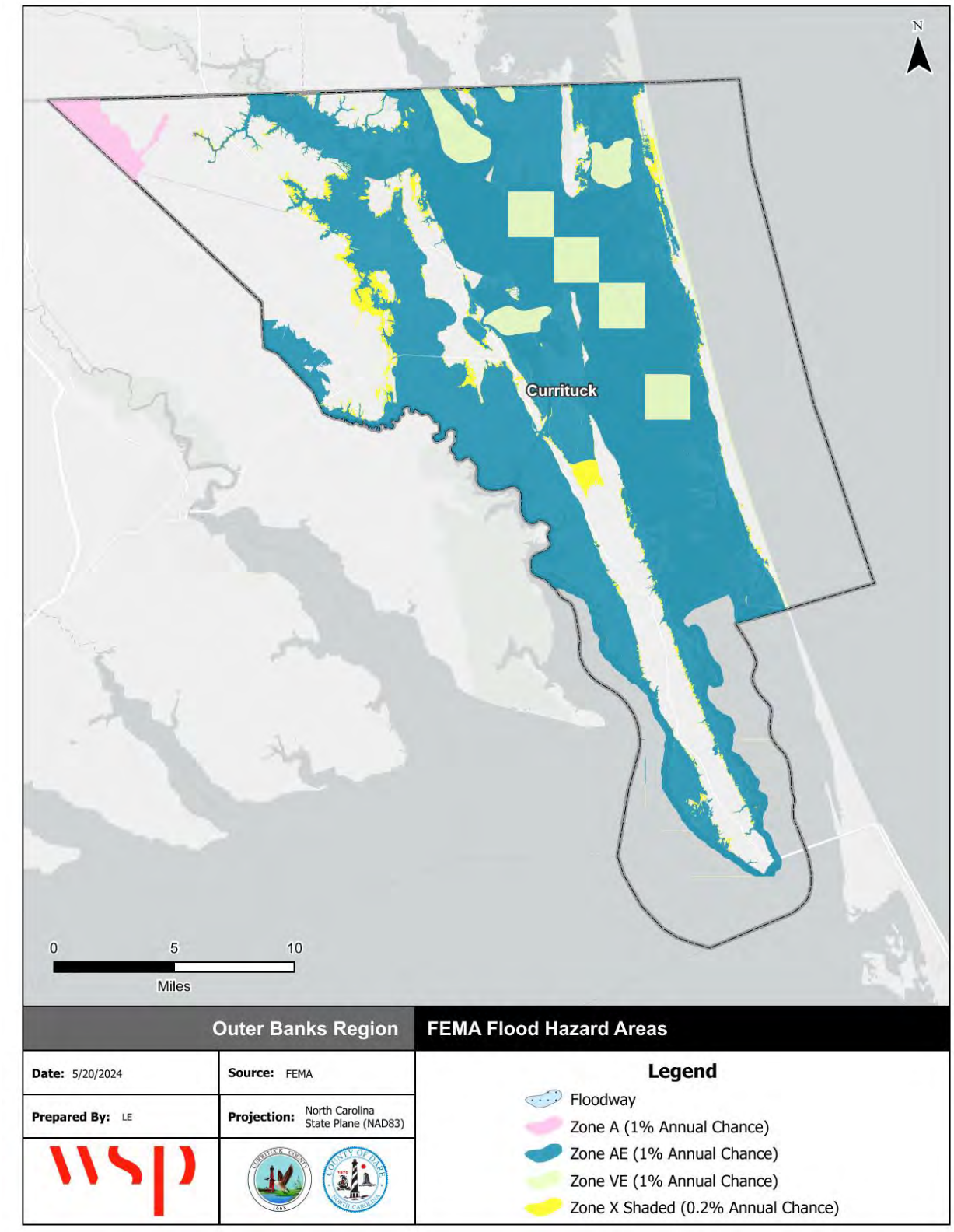
Table A.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**5,968**	**$1,573,579,279**	**$903,782,739**	**$2,477,362,018**
Agriculture	48	$1,822,076	$1,822,076	$3,644,152
Commercial	93	$22,431,976	$22,431,976	$44,863,952
Education	0	$0	$0	$0
Government	136	$15,489,474	$15,489,474	$30,978,948
Industrial	24	$96,015,950	$144,023,925	$240,039,875
Religious	10	$2,210,773	$2,210,773	$4,421,546
Residential	5,657	$1,435,609,030	$717,804,515	$2,153,413,545
+1 Foot Freeboard	**1,661**	**$413,930,527**	**$226,819,541**	**$640,750,068**
Agriculture	23	$1,299,054	$1,299,054	$2,598,108
Commercial	45	$10,844,069	$10,844,069	$21,688,138
Education	0	$0	$0	$0
Government	6	$3,352,519	$3,352,519	$6,705,038
Industrial	6	$11,546,098	$17,319,147	$28,865,245
Religious	3	$1,120,716	$1,120,716	$2,241,432
Residential	1,578	$385,768,071	$192,884,036	$578,652,107
+2 Foot Freeboard	**1,960**	**$491,630,489**	**$301,183,815**	**$792,814,304**
Agriculture	35	$2,031,854	$2,031,854	$4,063,708
Commercial	69	$32,248,882	$32,248,882	$64,497,764
Education	1	$234,482	$234,482	$468,964
Government	14	$9,153,519	$9,153,519	$18,307,038
Industrial	22	$31,679,447	$47,519,171	$79,198,618
Religious	6	$3,709,510	$3,709,510	$7,419,020
Residential	1,813	$412,572,795	$206,286,398	$618,859,193
+3 Foot Freeboard	**2,453**	**$631,075,386**	**$442,362,918**	**$1,073,438,304**
Agriculture	49	$2,748,662	$2,748,662	$5,497,324
Commercial	86	$45,088,780	$45,088,780	$90,177,560
Education	3	$1,441,314	$1,441,314	$2,882,628
Government	7	$1,619,632	$1,619,632	$3,239,264
Industrial	18	$99,900,512	$149,850,768	$249,751,280
Religious	7	$2,951,038	$2,951,038	$5,902,076
Residential	2,283	$477,325,448	$238,662,724	$715,988,172

Table A.6 – Current and Future Property Exposure to Flooding, 2005 FIRM Baseline

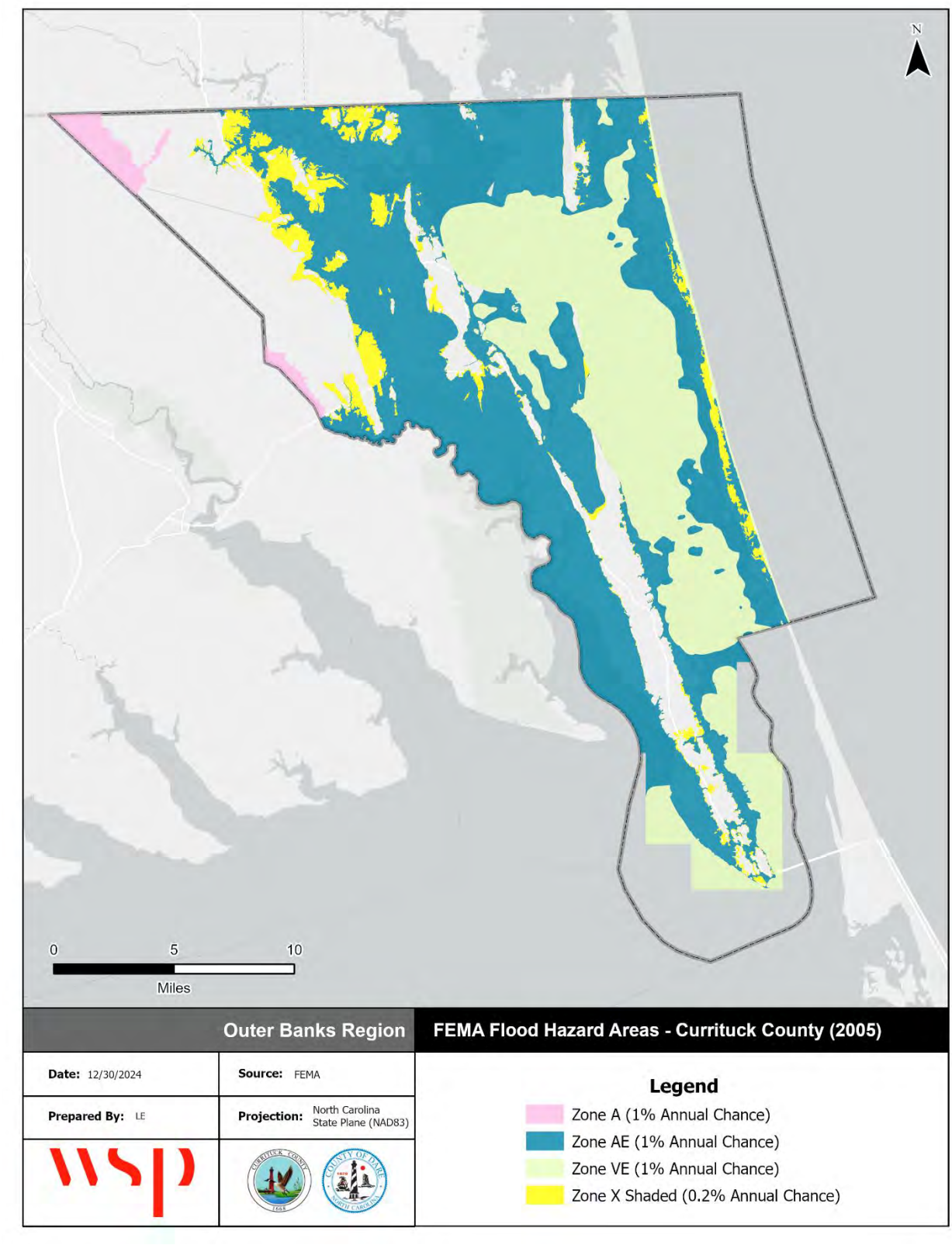
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**6,667**	**$1,731,880,898**	**$1,021,257,282**	**$2,753,138,180**
Agriculture	73	$3,461,370	$3,461,370	$6,922,740
Commercial	136	$51,308,541	$51,308,541	$102,617,082
Education	0	$0	$0	$0
Government	139	$16,004,674	$16,004,674	$32,009,348
Industrial	29	$118,904,614	$178,356,921	$297,261,535
Religious	9	$2,049,853	$2,049,853	$4,099,706
Residential	6,281	$1,540,151,846	$770,075,923	$2,310,227,769
+1 Foot Freeboard	**1,444**	**$454,410,020**	**$338,361,192**	**$792,771,212**
Agriculture	26	$1,249,242	$1,249,242	$2,498,484
Commercial	52	$13,063,914	$13,063,914	$26,127,828
Education	0	$0	$0	$0
Government	5	$789,800	$789,800	$1,579,600
Industrial	15	$102,600,668	$153,901,002	$256,501,670
Religious	6	$2,008,072	$2,008,072	$4,016,144
Residential	1,340	$334,698,324	$167,349,162	$502,047,486
+2 Foot Freeboard	**616**	**$175,381,143**	**$104,050,760**	**$279,431,903**
Agriculture	12	$1,129,582	$1,129,582	$2,259,164
Commercial	26	$22,151,209	$22,151,209	$44,302,418
Education	0	$0	$0	$0
Government	2	$1,072,180	$1,072,180	$2,144,360
Industrial	10	$3,782,183	$5,673,275	$9,455,458
Religious	4	$803,039	$803,039	$1,606,078
Residential	562	$146,442,950	$73,221,475	$219,664,425
+3 Foot Freeboard	**142**	**$60,909,282**	**$38,365,202**	**$99,274,484**
Agriculture	2	$89,026	$89,026	$178,052
Commercial	5	$2,203,411	$2,203,411	$4,406,822
Education	1	$13,368,916	$13,368,916	$26,737,832
Government	1	$159,768	$159,768	$319,536
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	133	$45,088,161	$22,544,081	$67,632,242

Figure A.3 – FEMA Flood Hazard Areas, Currituck County



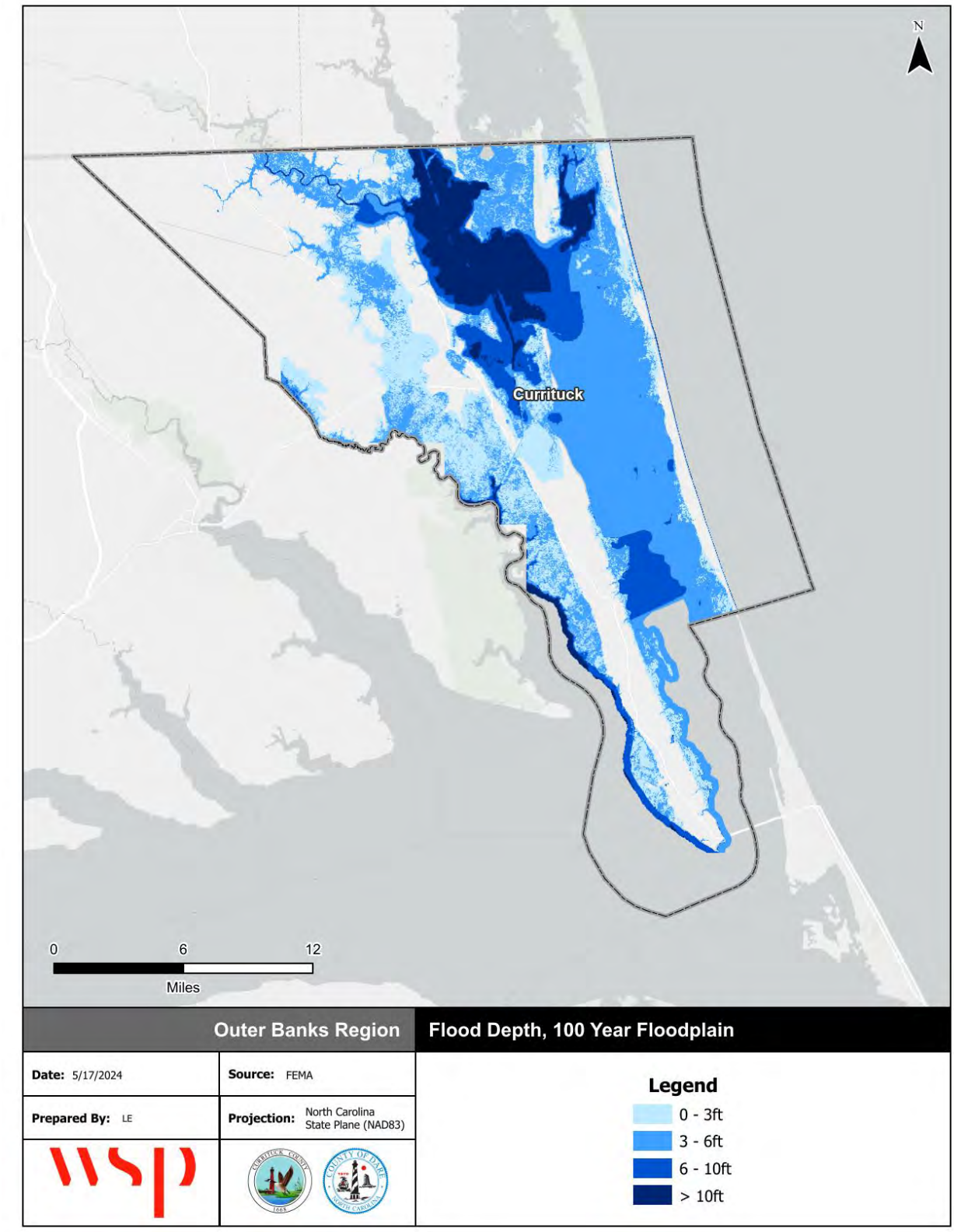
Source: FEMA Effective DFIRM

Figure A.4 – FEMA Flood Hazard Areas, Currituck County – 2005 FIRM



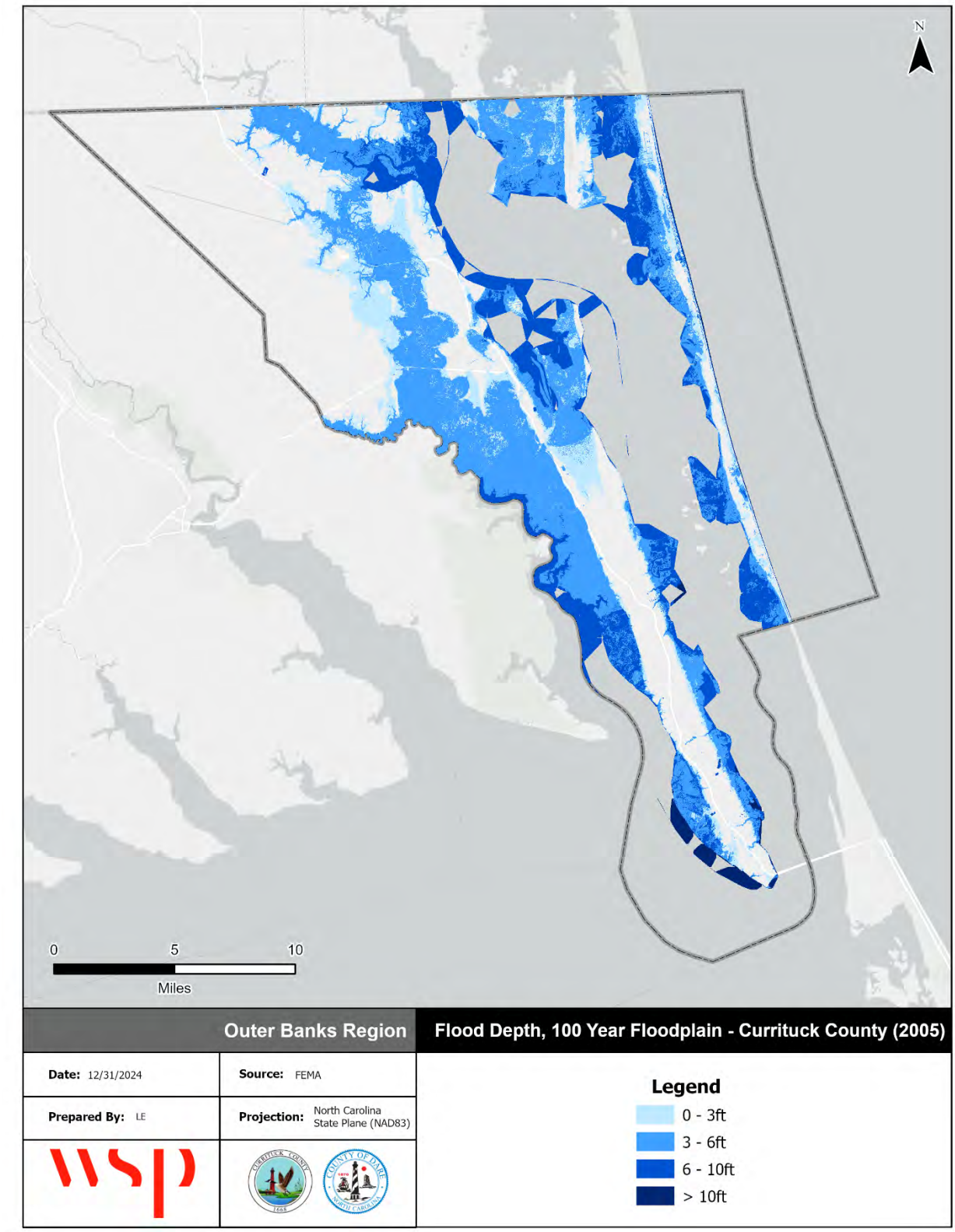
Source: FEMA 2005 DFIRM

Figure A.5 – Flood Depth, 1%-Annual-Chance Floodplain, Currituck County



Source: FEMA Effective DFIRM

Figure A.6 – Flood Depth, 1%-Annual-Chance Floodplain, Currituck County – 2005 FIRM



Source: FEMA 2005 DFIRM

FLOOD INSURANCE DATA

Currituck County joined the NFIP emergency program in 1974 and has been a regular participant in the NFIP since November 1984. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table A.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	2,516	$1,650,725	$780,076,000	1,948	$20,264,900.87
2-4 Family	9	$4,891	$2,786,000	15	$135,303.10
All Other Residential	59	$14,417	$12,328,000	2	$47,398.60
Non-Residential	84	$118,678	$38,012,000	46	$756,354.51
Total	**2,688**	**$1,788,711**	**$833,202,000**	**2,011**	**$21,203,957.08**

Source: FEMA Community Information System, accessed December 2024

Table A.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	858	$588,952	$219,956,000	816	$7,210,975.21
A Zones	1	$907	$196,000	6	$55,521.43
V01-30 & VE Zones	6	$2,647	$1,633,000	7	$69,189.65
B, C & X Zone					
Standard	1,803	$1,196,205	$611,417,000	587	$7,070,644.28
Preferred	0	$0	$0	589	$6,775,560.57
Total	**2,668**	**$1,788,711**	**$833,202,000**	**2,005**	**$21,181,891.14**

Source: FEMA Community Information System, accessed December 2024

Table A.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	224	$193,414	$49,056,000	448	$5,391,774.59
A Zones	1	$907	$196,000	5	$55,521.43
V01-30 & VE Zones	1	$619	$83,000	4	$68,150.71
B, C & X Zone	178	$123,819	$55,723,000	109	$994,174.12
Standard	178	$123,819	$55,723,000	109	$994,174.12
Preferred	0	$0	$0	57	$437,003.53
Total	**404**	**$318,759**	**$105,058,000**	**566**	**$6,509,620.85**

Source: FEMA Community Information System, accessed December 2024

Table A.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	634	$395,538	$170,900,000	368	$1,819,200.62
A Zones	0	$0	$0	1	$0.00
V01-30 & VE Zones	5	$2,028	$1,550,000	3	$1,038.94
B, C & X Zone	1,625	$1,072,386	$555,694,000	1,064	$12,839,391.66
Standard	1,625	$1,072,386	$555,694,000	535	$6,513,473.69
Preferred	0	$0	$0	532	$6,338,557.04
Total	**2,264**	**$1,469,952**	**$728,144,000**	**1,436**	**$14,659,631.22**

Source: FEMA Community Information System, accessed December 2024

A.2.3 WILDFIRE

Table A.11 summarizes the acreage in Currituck County that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 73 percent of Currituck County is not included in the WUI.

Table A.11 – Wildland Urban Interface Acreage, Currituck County

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	160,526.3	73.6%
	LT 1hs/40ac	11,248.7	5.2%
	1hs/40ac to 1hs/20ac	6,907.6	3.2%
	1hs/20ac to 1hs/10ac	10,448.2	4.8%
	1hs/10ac to 1hs/5ac	9,694.1	4.4%
	1hs/5ac to 1hs/2ac	11,505.2	5.3%
	1hs/2ac to 3hs/1ac	7,572.4	3.5%
	GT 3hs/1ac	185.0	0.1%
	Total	**218,087.6**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure A.7 depicts the WUI for Currituck County. Figure A.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure A.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Potential fire intensity is highest along the sound side and North River shorelines; however, these areas have low to moderate burn probability and/or are largely outside of the WUI, meaning little to no development is at risk. The areas of greatest risk in the County are in and around small unincorporated communities including Harbinger, Powells Point, Coinjock, Currituck, and Moyock where moderate fire intensity and burn probability abut or surround WUI areas.

Table A.12 provides the count and estimated value of all structures that intersect with areas of Currituck County that are rated moderate to high on the WUI Risk Index.

Table A.12 – Structures at Risk to Moderate-High WUI Risk Index, Currituck County

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	141	$7,718,086	$7,718,086	$15,436,172
Commercial	599	$199,871,294	$199,871,294	$399,742,588
Education	25	$30,415,184	$30,415,184	$60,830,368
Government	94	$46,317,680	$46,317,680	$92,635,360
Industrial	122	$90,377,403	$135,566,105	$225,943,508
Religious	51	$24,724,168	$24,724,168	$49,448,336
Residential	10515	$1,627,984,087	$813,992,044	$2,441,976,131
Total	**11,547**	**$2,027,407,902**	**$1,258,604,560**	**$3,286,012,462**

Source: Southern Wildfire Risk Assessment

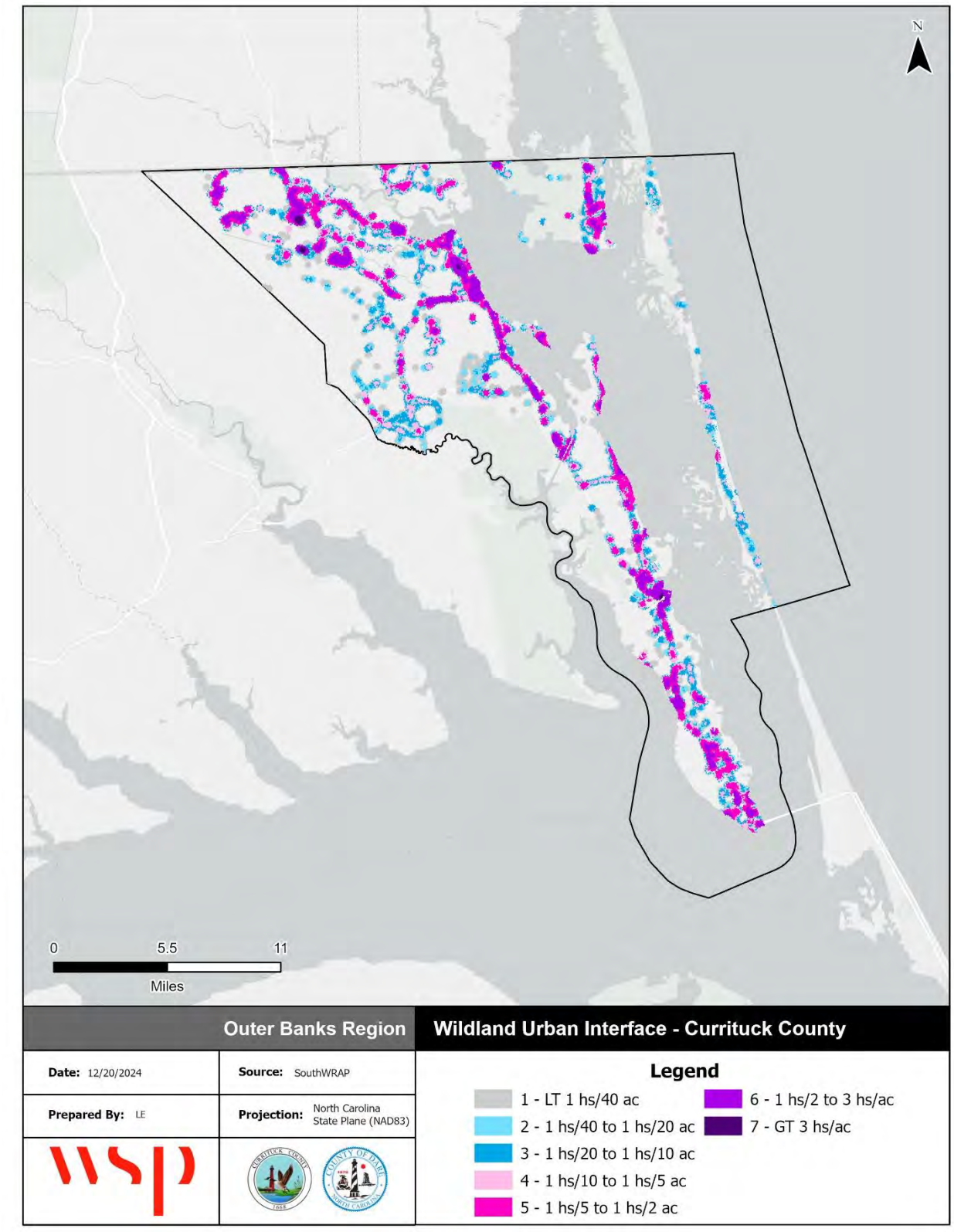
Table A.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table A.13 – Critical Facilities Exposed to Wildfire, Currituck County

Type	Critical Facility Count	Structure Value
Communications	6	$123,150
Energy	1	$12,650
Food, Hydration, Shelter	34	$41,802,059
Hazardous Materials	0	$0
Health and Medical	2	$5,981,500
Safety and Security	12	$5,538,580
Transportation	0	$0
Water Systems	6	$3,403,617
Total	**61**	**$56,861,556**

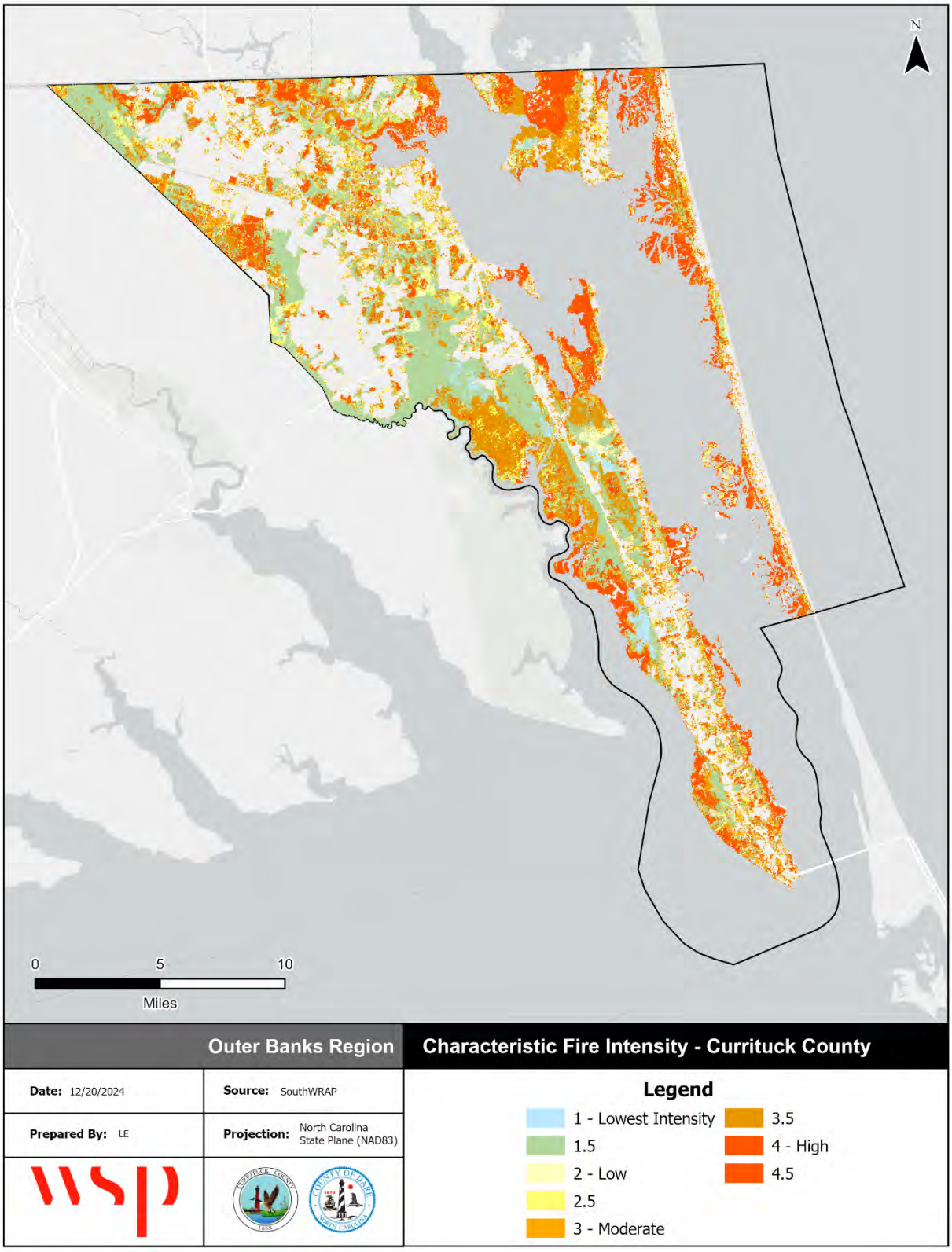
Source: Southern Wildfire Risk Assessment

Figure A.7 – Wildland Urban Interface, Currituck County



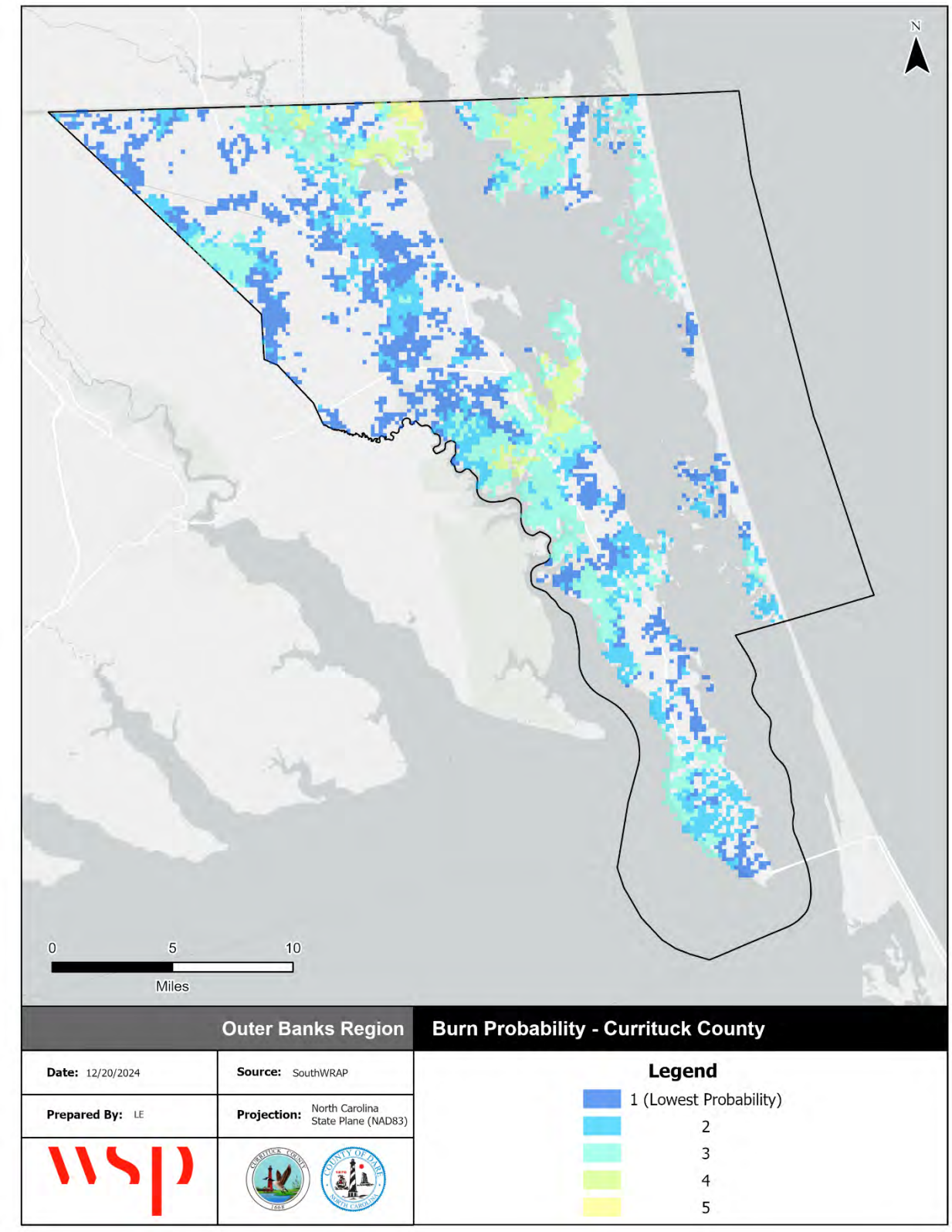
Source: Southern Wildfire Risk Assessment

Figure A.8 – Fire Intensity Scale, Currituck County



Source: Southern Wildfire Risk Assessment

Figure A.9 – Burn Probability, Currituck County



Source: Southern Wildfire Risk Assessment

A.3 MITIGATION STRATEGY

Table A.14 – Mitigation Action Plan, Currituck County

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR1	Establish appropriate buffers/setbacks between critical facilities and other uses that may be incompatible	All Hazards	2.1	High	Prevention	Planning	General Fund	On going	Carried Forward	Currituck participated in DCM's Resilient Coastal Communities Program (RCCP) which included a detailed Risk & Vulnerability Assessment of critical assets (see final report link)
CUR2	Maintain partnerships with adjacent counties and municipalities to leverage and share resources.	All Hazards	2.2	Medium	Prevention	Emergency Management	General Fund	On going	Carried Forward	Continuous - county-to-county mutual aid agreement
CUR3	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Prevention, Public Education & Awareness	Planning, NC Forest Service	Grant Funds	3-5 years	New	
CUR4	Direct development away from high-risk and vulnerable areas and establish redevelopment standards that decrease hazard risk	All Hazards	3.1	High	Prevention	Planning	General Fund	On going	Carried Forward	We allow higher density development as an incentive for developers to place special flood hazard area portions of large tracts in perpetual conservation. The new Coastal Resilience Tool, created for Currituck County by The Nature Conservancy, is used during subdivision review to encourage development away from high-risk areas.
CUR5	Pursue acquisition and/or elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Planning, Emergency Management	Grant Funds	Ongoing	New	
CUR6	Enhance existing and/or implement new groundwater lowering systems in low-lying coastal areas.	Hurricane & Coastal Hazards, Flooding	1.2	Medium	Property Protection	Stormwater Service Districts/ Engineering	Service District Taxes	On going	Carried Forward	An additional pump is being installed in the Whalehead Subdivision and will be completed by December. As of July 1, 2023, the Ocean Sands Stormwater District is now paying increased taxes for additional revenue to fund the groundwater lowering system. The project will also be split into smaller more affordable phases to provide an earlier start date.
CUR7	Support individuals and Homeowners Associations in acquiring funding for green stormwater infrastructure to mitigate nuisance flooding.	Hurricane & Coastal Hazards, Flooding	1.2	Medium	Property Protection	Soil & Water Conservation Board, Planning, Cooperative Extension	General Funds and Grants	On going	Carried Forward	Currituck County was awarded $248,000 through the North Carolina Department of Agriculture's *Stream Flow Rehabilitation Program*. The County continues to use this money to improve drainage infrastructure.
CUR8	Preserve natural environmental features to naturally absorb water run-off and serve as wind buffers	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Medium	Natural Resource Protection	Planning	General Fund	On going	Carried Forward	UDO contains provisions for preserving existing vegetation for buffers as well as preservation of wetland areas. Our stormwater manual contains water quality standards as well.
CUR9	Retain vegetation and require buffers in areas adjacent to wetlands, water bodies and Maritime forests	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	Medium	Natural Resource Protection	Planning	General Fund	On going	Carried Forward	This is ongoing through a combination of wetland buffers, implementation of CAMA regulations, and heritage tree protection standards.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR10	Evaluate allocating a portion of occupancy tax toward the dune protection program and shoreline restoration, and expand extent of the dune protection program to include grant support of sand fencing.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Planning	Occ Tax	On going	Carried Forward	The county is offering yearly dune vegetation and sand fence cost share programs. The county has recently increased funding for this program to $20,000.
CUR11	Work to pursue shoreline stabilization projects and regular shoreline monitoring.	Hurricane & Coastal Hazards	3.3	Medium	Natural Resource Protection	Engineering	General Funds	On going	Carried Forward	The 3-year shoreline study has been completed and presented at a Board of Commissioners retreat. The County has now contracted the development of a beach management plan.
CUR12	Currituck Sound Coalition will prioritize marsh restoration planning and design for storm surge mitigation benefits.	Hurricane & Coastal Hazards	3.3	Medium	Natural Resource Protection	Audubon, Planning, GIS, Soil & Water Conservation	General Funds	On going	Carried Forward	Coalition meetings are held quarterly. Audubon Pine Island Marsh Restoration Planning Project is in the process of designing project sites within the Currituck sound to address the following: increase resilience of existing marshes to sea level rise and other climate change impacts while reducing flood and storm surge impacts to nearby communities and infrastructure. Pilot projects include: a living shoreline with soft sill, Christmas tree breakwater, thin layer placement (TLP) for marsh restoration.
CUR13	Encourage linkage of existing and future open space areas to implement greenways throughout unique geographies of the county.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	Medium	Natural Resource Protection	Planning	No funding needed	On going	Carried Forward	In partnership with The Nature Conservancy the county is testing out utility of a Green Space Dashboard
CUR14	Seek funding for public hazard mitigation projects.	All Hazards	1.2	Medium	Structural Projects	Emergency Management	Grant	On going	Carried Forward	Grant writing and monitoring added to Soil & Water admin position. Also monitoring EPA flood reduction grants. County has signed agreements with State for the State centric plan. The state will now handle all contract work and county EM will now be the liaison between homeowner and state. State has bids out for contractors to lift each of the houses. Very slow process.
CUR15	Continue to support efforts for planning, design, and construction of the Mid-County bridge project.	All Hazards	3.3	Medium	Structural Projects	Planning	NC Turnpike Authority	5 years	Carried Forward	Planning staff is working on terminus designs and studying impacts to properties on both sides of the bridge.
CUR16	Identify bridges for retrofitting.	All Hazards	1.2	High	Structural Projects	Planning	NCDOT	On going	Carried Forward	Ongoing. Continuing to work with DOT to maintain roadways and the Wright Memorial Bridge.
CUR17	Implement drainage improvement projects to reduce stormwater related flooding.	Hurricane & Coastal Hazards, Flooding	2.1	Medium	Structural Projects	Planning	Grants	Ongoing	New	
CUR18	Maintain and work to improve radio communications and technology throughout public safety programs	All Hazards	4.2	High	Emergency Services	Public Safety Agencies	General Funds and Grants	On going	Carried Forward	This project is still in process. Updates to the microwave system will be worked on first. Waiting on proposal from vendor.
CUR19	Provide continuous training and information for first responders in hazard response	All Hazards	4.1	High	Emergency Services	Public Safety Agencies	General Funds and Grants	On going	Carried Forward	Ongoing

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR20	Coordinate response to bridge incidents for the Wright Memorial Bridge	Infrastructure Failure	4.1	High	Emergency Services	Public Safety Agencies	General Funds/Grants	On going	Carried Forward	This exercise is complete and continuous, planning will improve response.
CUR21	Educate the public and inform them of the benefits of participation in the Fire Wise program.	Wildfire	1.1	High	Public Education & Awareness	Emergency Management	Grant	On going	Carried Forward	We have 3 communities that are in the Firewise program: Pine Island, Currituck Club, Point Harbor. We met with each community at the end of April to renew their certifications.
CUR22	Educate homeowners and builders on the benefits of sprinkler systems in residential structures	Wildfire	1.1	Medium	Public Education & Awareness	Fire Marshal/ Planning	General Fund	On going	Carried Forward	Ongoing through the fire marshal and planning department. The County is periodically conducting citizen academy sessions where planning processes and building codes are discussed with developers, contractors, and the general public. Residential sprinkle systems are included in these sessions.
CUR23	Increase public awareness and understanding of the locations and proper way to dispose of hazardous waste	Hazardous Substances	1.1	Medium	Public Education & Awareness	Public Works	General Fund	On going	Carried Forward	PW continues to sponsor an annual household hazardous waste day. Hazardous waste day is now advertised in the Focus on Currituck publication and on social media platforms. Participation continues to increase.
CUR24	Periodically survey the public to evaluate if public outreach efforts are effective in identifying potential flood hazards, public concern, and ways to mitigate against hazards	Hurricane & Coastal Hazards, Flooding	1.1	Medium	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	Tailoring future outreach projects using survey results. Progress for this activity has recently been hindered due to the planning and inspections department being severely understaffed with a significant increase in development.
CUR25	Develop a joint public outreach document that addresses all hazards (published by the Planning and Emergency Management Departments)	All Hazards	1.1	High	Public Education & Awareness	Planning/ Emergency Management	General Fund	On going	Carried Forward	The planning department and the emergency management department publish documents in the "Focus on Currituck" publication. The new outreach brochure, created as a joint effort by Currituck and Dare Counties through our CRS user's group, addresses all hazards.
CUR26	Evaluate effectiveness of Currituck's warning systems	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund	On going	Carried Forward	Number of individuals registering for Currituck Alert provides a baseline for effectiveness of mass notification. Planning a campaign to increase awareness of ENS and increase number of subscribers. Registrations still rising. Utilizing social media and Focus on Currituck publication to increase awareness.
CUR27	Educate and assist vulnerable populations in developing personal preparedness plans	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund	On going	Carried Forward	Continuous implementation. No new activities to report.
CUR28	Partner with other County Departments, State, local agencies to educate and inform vulnerable populations about special needs registry with Social Services through community outreach (survey, website, social media, water bill)	All Hazards	1.1	High	Public Education & Awareness	DSS, EM, PIO	General Fund	On going	Carried Forward	Continuous implementation. No new activities to report.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
CUR29	Create curriculums for all hazards preparedness to better educate the public	All Hazards	1.1	High	Public Education & Awareness	Emergency Management	General Fund/Grants	less than 5 years	Carried Forward	Emergency Management is working on this action as budget and staffing allows.
CUR30	Continue to educate elected officials and the public on the need for and benefits of sustained shoreline management strategies.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.1	High	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	Staff continues to share information with elected officials and the public.
CUR31	Educate property owners on the natural and beneficial functions of floodplains, watersheds, and other natural/coastal areas.	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Public Education & Awareness	Planning	General Fund	On going	Carried Forward	This is included in the new outreach brochure.
CUR32	Educate the development and agricultural communities as well as the public on the impacts of turbidity on floodplain/natural areas and mitigating best management practices	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Public Education & Awareness	Soil & Water Conservation Board, Planning, Cooperative Extension	General Fund	On going	Carried Forward	The Soil and Water Conservation Board and the Cooperative Extension continue to work on this action as time and budget allows.
CUR33	Develop outreach materials and offer training on Low Impact Development (LID) best management practices that can be distributed to the public and engineering communities.	Hurricane & Coastal Hazards, Flooding	3.2	High	Public Education & Awareness	Soil & Water Conservation Board, Planning, Cooperative Extension	General Fund	less than 5 years	Carried Forward	The stormwater manual addresses this. Training has not been offered yet. Progress on this action has been hindered by staffing and budget constraints.
CUR34	Send targeted outreach on flood risk, preparedness, insurance and mitigation options to repetitive loss property owners	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Planning	General Fund	1 year	Carried Forward	All repetitive loss properties received a copy of our outreach brochure which addresses these concerns.
CUR35	Send targeted outreach on flood risk, preparedness, insurance, and mitigation options to pre-FIRM property owners	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Planning	General Fund	1 year	Carried Forward	The County is hoping to develop a new letter to be sent to all pre-FIRM property owners in the near future. Working to get more outreach funding included in the budget.

ANNEX B. DARE COUNTY UNINCORPORATED AREAS

B.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table B.1 provides a count of critical facilities by FEMA lifeline category within Unincorporated Dare County. Figure B.1 shows the locations of all critical facilities within Unincorporated Dare County.

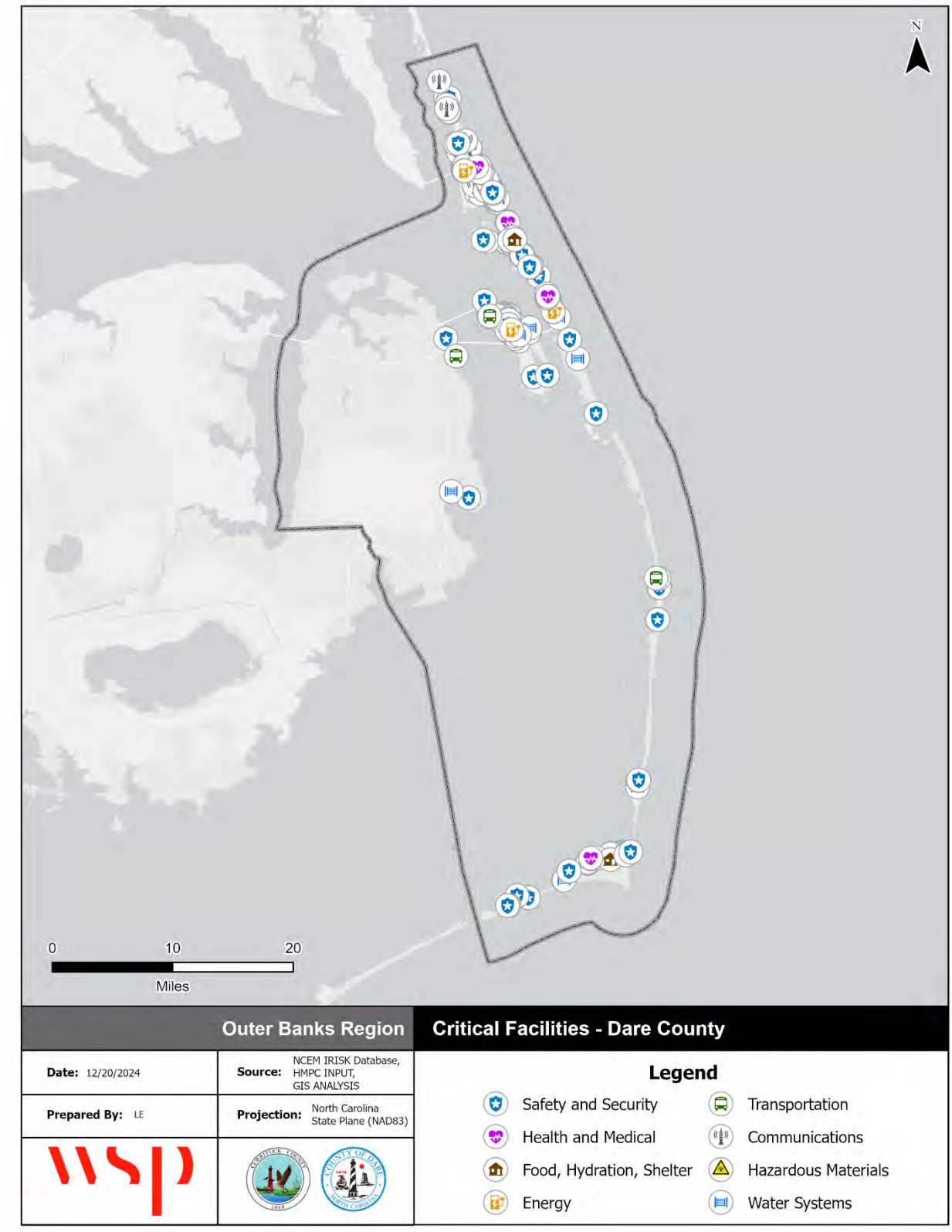
Table B.2 provides a detailed inventory of the critical facilities in unincorporated Dare County, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table B.1 – Critical Facilities by Type, Unincorporated Dare County

Facility Type	Count of Facility Type	Structure Value
Communications	0	$0
Energy	1	$1,295,600
Food, Hydration, Shelter	7	$51,939,500
Hazardous Materials	0	$0
Health and Medical	2	$3,503,180
Safety and Security	31	$67,561,360
Transportation	5	$10,066,160
Water Systems	17	$7,462,700
Total	**63**	**$141,828,500**

Source: Dare County, HMPC

Figure B.1 – Critical Facilities, Unincorporated Dare County



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table B.2 – Unincorporated Dare County Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Energy	Power Plant	47109 Light Plant Rd	$1,295,600	2.24	AE	NA	1	Y	0	0
Food, Hydration, Shelter	School	48576 NC 12 Hwy	$12,602,300	2.85	AE	NA	1	Y	0	0
Food, Hydration, Shelter	School	47500 Middle Ridge Trl	$5,229,250	0.10	X Shaded	NA	NA		2	0
Food, Hydration, Shelter	School	48576 NC 12 Hwy	$12,602,300	0.10	AE	NA	4	Y	0	0
Food, Hydration, Shelter	School	1000 Hwy 64/264	$7,627,700	0.10	X Shaded	NA	5	Y	3	3.5
Food, Hydration, Shelter	School	1000 Hwy 64/264	$7,627,700	0.10	X Shaded	NA	4	Y	3	0
Food, Hydration, Shelter	Shelter	47500 Middle Ridge Rd	$5,229,250	0.10	X Shaded	NA	NA	Y	2	3 - Moderate
Food, Hydration, Shelter	Shelter	1000 Wescott Park Rd	$1,021,000	0.10	X Shaded	NA	4	Y	3	0
Health & Medical	Medical	1078 Driftwood Drive	$3,082,680	0.10	X Shaded	NA	3	Y	2	2 - Low
Health & Medical	Medical	50346 NC Hwy 12	$420,500	0.10	X Shaded	NA	4	Y	2	0
Safety & Security	Fire Station	27209 Roth Rd	$450,750	0.10	AE	NA	1	Y	0	0
Safety & Security	Fire Station	27209 Roth Rd	$450,750	0.10	AE	NA	1	Y	0	0
Safety & Security	Fire Station	24297 NC 12 Hwy	$331,250	0.10	AE	NA	2		0	0
Safety & Security	Fire Station	24297 NC 12 Hwy	$331,250	0.10	AE	NA	2		0	0
Safety & Security	Fire Station	47095 NC 12 Hwy	$624,400	2.33	AE	NA	1	Y	2	0
Safety & Security	Fire Station	323 Old Schoolhouse Rd	$789,700	0.10	X Shaded	NA	4	Y	3	0
Safety & Security	Fire Station	108 Schoolhouse Rd	$502,700	0.10	AE	NA	1		1	0
Safety & Security	Fire Station	40159 Harbor Rd	$483,567	0.10	AE	NA	2	Y	0	0
Safety & Security	Government	974 Marshall C Collins Dr	$12,868,900	3.12	AE	NA	2	Y	4	2.5
Safety & Security	Fire Station	255 Bayview Dr	$175,800	1.41	AE	NA	2	Y	0	0
Safety & Security	Fire Station	6677 Hwy 64/264	$390,100	0.10	X Shaded	NA	2	Y	6	0

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Safety & Security	EOC	1002 Driftwood Dr	$402,100	0.10	X Shaded	NA	3	Y	3	4 - High
Safety & Security	Government	50347 NC 12 Hwy, Frisco, Nc 27936	$0	2.03	AE	NA	2	Y	2	0
Safety & Security	EOC	370 Airport Rd	$15,746,600	0.10	X Shaded	NA	4	Y	0	2.5
Safety & Security	Civic	56658 NC Hwy 12	$543,700	0.10	AE	NA	1	Y	0	0
Safety & Security	Police Station	962 Marshall C. Collins Dr	$12,868,900	0.10	AE	NA	3		4	4 - High
Safety & Security	Fire Station	47095 NC Hwy 12	$1,039,700	0.10	X Shaded	NA	NA	Y	2	0
Safety & Security	Fire Station	52470 NC Hwy 12	$429,100	4.00	VE	NA	1	Y	1	0
Safety & Security	Fire Station	57717 NC Hwy 12	$1,064,500	0.10	AE	NA	1	Y	0	0
Safety & Security	Government	59248 Coast Guard Rd	$1,431,700	0.10	X Shaded	NA	3		0	0
Safety & Security	Government	8700 NC Hwy 12	$0	0.10	AE	NA	2		2	3.5
Safety & Security	Government	908 Harbor Rd	$2,073,900	0.10	AE	NA	2	Y	0	0
Safety & Security	Police Station	1044 Driftwood Dr	$3,082,680	0.10	X Shaded	NA	3	Y	3	0
Safety & Security	Government	1018 Driftwood Dr	$3,082,680	0.10	AE	NA	2	Y	3	0
Safety & Security	Police Station	2077 Colington Rd	$842,700	0.10	AE	NA	2	Y	1	2 - Low
Safety & Security	Fire Station	40159 Harbor Rd	$483,567	0.10	AE	NA	2	Y	0	0
Safety & Security	Fire Station	40159 Harbor Rd	$483,567	0.10	AE	NA	2	Y	0	0
Safety & Security	Government	47027 Buxton Back Rd	$32,300	3.40	AE	NA	1		2	3 - Moderate
Safety & Security	Government	46830 NC Hwy 12	$1,276,200	2.70	VE	3	1	Y	0	3 - Moderate
Safety & Security	Government	1500 Fort Raleigh Rd	$5,064,400	0.10	X Shaded	NA	NA	Y	0	4 - High
Safety & Security	Civic	402 Airport Road	$213,900	0.00	X Shaded	NA	3	Y	0	0
Transportation	Transportation	410 Airport Rd	$3,082,680	0.10	X Shaded	NA	3	Y	3	0
Transportation	Transportation	410 Airport Rd	$3,082,680	0.10	X Shaded	NA	3	Y	0	0
Transportation	Transportation	59063 NC Hwy 12	$1,515,800	0.10	AE	NA	2		0	0
Transportation	Transportation	23170 Myrna Peters Rd	$30,800	2.03	VE	3	1		1	0
Transportation	Transportation	8550 Shipyard Rd	$2,354,200	0.10	AE	NA	2	Y	0	0

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Water Systems	Treatment Plant	23697 NC 12 Hwy	$454,700	0.10	AE	NA	2	Y	0	0
Water Systems	Treatment Plant	0 Midgett Dr	$636,800	0.10	AE	NA	3	Y	0	2 - Low
Water Systems	Treatment Plant	47000 Oak Ln	$290,300	0.10	AE	NA	2	Y	0	3 - Moderate
Water Systems	Treatment Plant	50249 Water Association Rd	$85,967	2.38	AE	NA	1		2	3 - Moderate
Water Systems	Treatment Plant	50249 Water Association Rd	$85,967	1.42	AE	NA	1	Y	2	3 - Moderate
Water Systems	Treatment Plant	50249 Water Association Rd	$85,967	0.10	AE	NA	3	Y	2	0
Water Systems	Treatment Plant	50225 Water Association Rd	$402,400	0.10	AE	NA	4	Y	2	0
Water Systems	Treatment Plant	50225 Water Association Rd	$402,400	0.10	AE	NA	4	Y	2	0
Water Systems	Treatment Plant	50225 Water Association Rd	$402,400	1.88	AE	NA	1		2	2 - Low
Water Systems	Treatment Plant	53282 NC 12 Hwy	$197,550	6.30	AE	3	1	Y	2	4 - High
Water Systems	Treatment Plant	53282 NC 12 Hwy	$197,550	5.16	AE	3	1	Y	2	4 - High
Water Systems	Treatment Plant	359 Water Plant Rd	$2,845,900	1.49	AE	3	1		0	3 - Moderate
Water Systems	Treatment Plant	8210 Lighthouse Rd	$0	0.10	AE	NA	2	Y	0	0
Water Systems	Treatment Plant	49815 Nc 12 Hwy	$842,200	1.47	AE	NA	2	Y	3	0
Water Systems	Treatment Plant	41105 Big Kinnakeet Dr, Avon NC 27915	$0	0.10	AE	NA	2	Y	0	3 - Moderate
Water Systems	Treatment Plant	98 Bayview Dr. Stumpy Point NC 27978	$0	1.76	AE	NA	1	Y	6	4 - High
Water Systems	Treatment Plant	40162 Harbor Rd	$532,600	1.37	AE	NA	1	Y	0	0

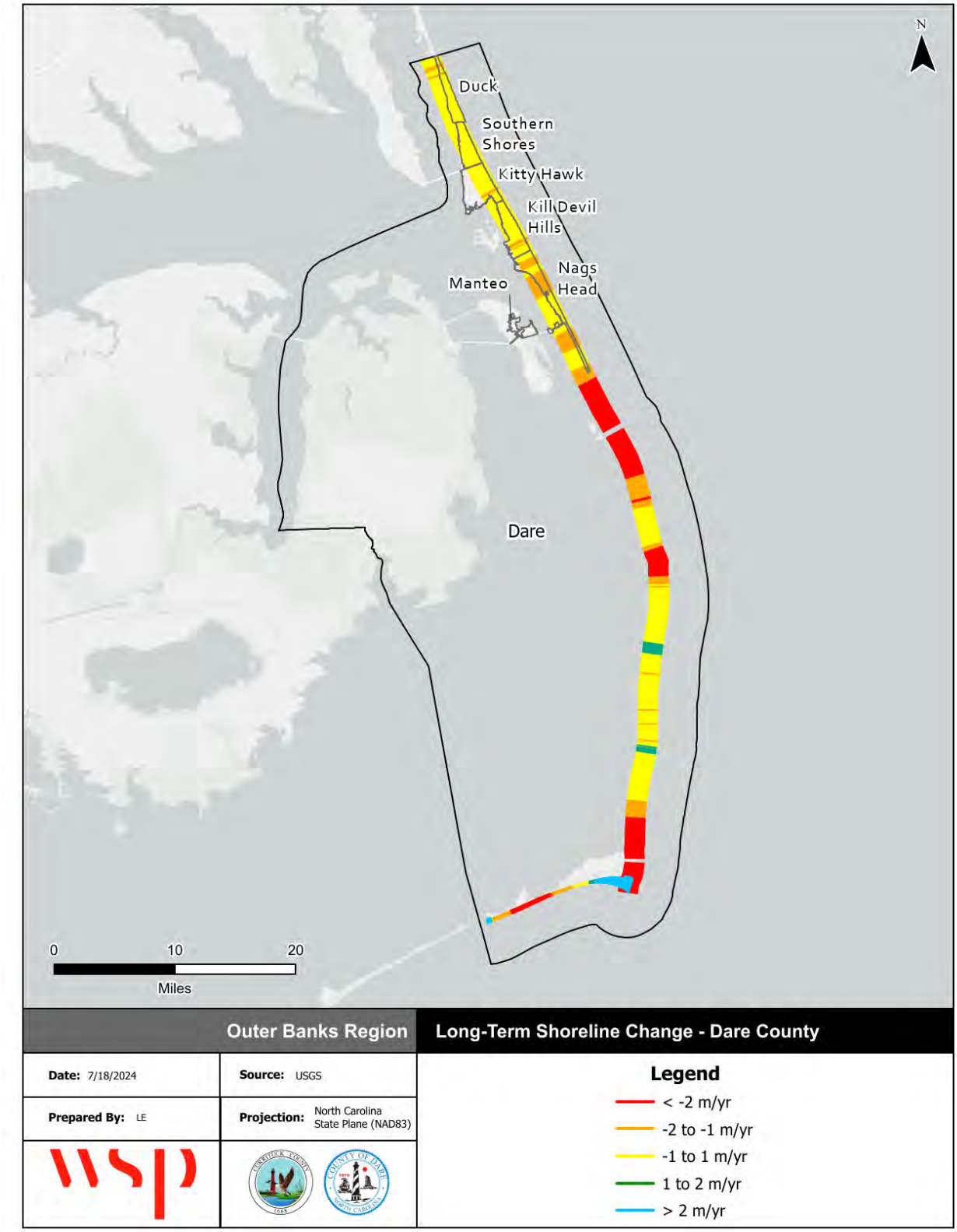
B.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within unincorporated Dare County. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

B.2.1 HURRICANE & COASTAL HAZARDS

Figure B.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Dare County oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of Dare County is experiencing some level of change every year.

Figure B.2 – Long-Term Shoreline Change Rates, Dare County



Source: Source: United States Geological Survey

B.2.2 FLOODING

Table B.3 details the acreage of unincorporated Dare County's total area by flood zone on the effective FIRM and previous 2006 FIRM. Per this assessment, over 30 percent of the unincorporated area in the County falls within the mapped 1%-annual-chance floodplains. Around 50 percent of the County falls within the previous 2006 mapped 1%-annual-chance floodplains.

Table B.3 – Flood Zone Acreage in Unincorporated Dare County

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone A	-	-	25.20	0.00%
Zone AE	229,324.15	29.13%	268,267.60	34.13%
Zone AO	344.00	0.04%	-	-
Zone AH	118.75	0.02%	-	-
Zone VE	10,433.14	1.33%	126,595.90	16.11%
Zone X (500-year)	11,618.71	1.48%	20,904.54	2.66%
Zone X Unshaded	33,579.20	4.27%	21,814.31	2.78%
Open Water	501,800.65	63.74%	348,447.40	44.33%
Total	**787,218.60**	**--**	**786,054.95**	**--**

Source: FEMA Effective DFIRM and 2006 FIRM

Figure B.3 reflects the effective mapped flood hazard zones for unincorporated Dare County, and Figure B.5 reflects the flood hazard zones from the previous 2006 FIRM.

Figure B.5 and Figure B.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table B.4 provides building counts and values for critical facilities by flood zone in unincorporated Dare County.

Table B.4 – Critical Facilities Exposed to Flooding, Unincorporated Dare County

Flood Zone	Critical Facility Count	Structure Value
AE	42	$75,528,080
VE	3	$1,736,100
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	18	$64,564,320
Total	**63**	**$141,828,500**

Source: FEMA 2006 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table B.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table B.6 summarizes exposure using the current effective FIRM as a baseline.

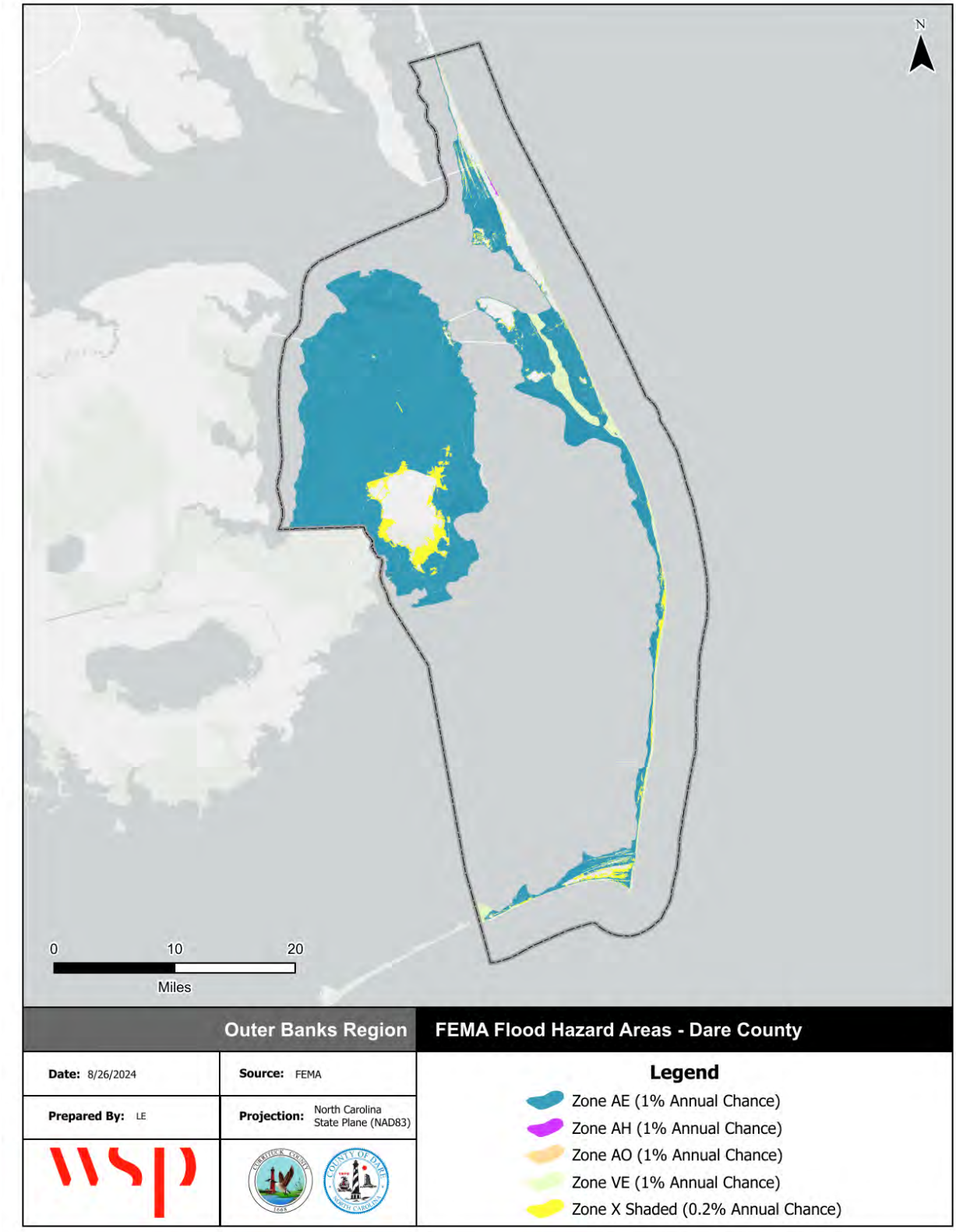
Table B.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**7,791**	**$1,712,590,135**	**$1,026,460,686**	**$2,739,050,821**
Agriculture	11	$789,599	$789,599	$1,579,198
Commercial	308	$72,274,283	$72,274,283	$144,548,566
Education	4	$19,092,105	$19,092,105	$38,184,210
Government	70	$70,654,981	$70,654,981	$141,309,962
Industrial	58	$85,793,704	$128,690,555	$214,484,259
Religious	25	$5,932,863	$5,932,863	$11,865,726
Residential	7,315	$1,458,052,601	$729,026,300	$2,187,078,901
+1 Foot Freeboard	**2,444**	**$421,305,475**	**$221,928,034**	**$643,233,510**
Agriculture	0	$0	$0	$0
Commercial	79	$17,976,599	$17,976,599	$35,953,199
Education	0	$0	$0	$0
Government	12	$1,635,636	$1,635,636	$3,271,272
Industrial	7	$483,939	$725,909	$1,209,849
Religious	6	$1,970,479	$1,970,479	$3,940,958
Residential	2,340	$399,238,822	$199,619,411	$598,858,232
+2 Foot Freeboard	**791**	**$148,404,371**	**$82,651,389**	**$231,055,759**
Agriculture	0	$0	$0	$0
Commercial	21	$6,347,277	$6,347,277	$12,694,555
Education	2	$680,200	$680,200	$1,360,400
Government	13	$4,896,523	$4,896,523	$9,793,046
Industrial	8	$2,487,203	$3,730,805	$6,218,008
Religious	0	$0	$0	$0
Residential	747	$133,993,167	$66,996,584	$200,989,751
+3 Foot Freeboard	**648**	**$112,976,762**	**$65,564,461**	**$178,541,223**
Agriculture	0	$0	$0	$0
Commercial	19	$2,972,555	$2,972,555	$5,945,110
Education	1	$8,953,200	$8,953,200	$17,906,400
Government	5	$1,204,919	$1,204,919	$2,409,838
Industrial	6	$1,407,455	$2,111,183	$3,518,638
Religious	6	$2,206,575	$2,206,575	$4,413,150
Residential	611	$96,232,058	$48,116,029	$144,348,087

Table B.6 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

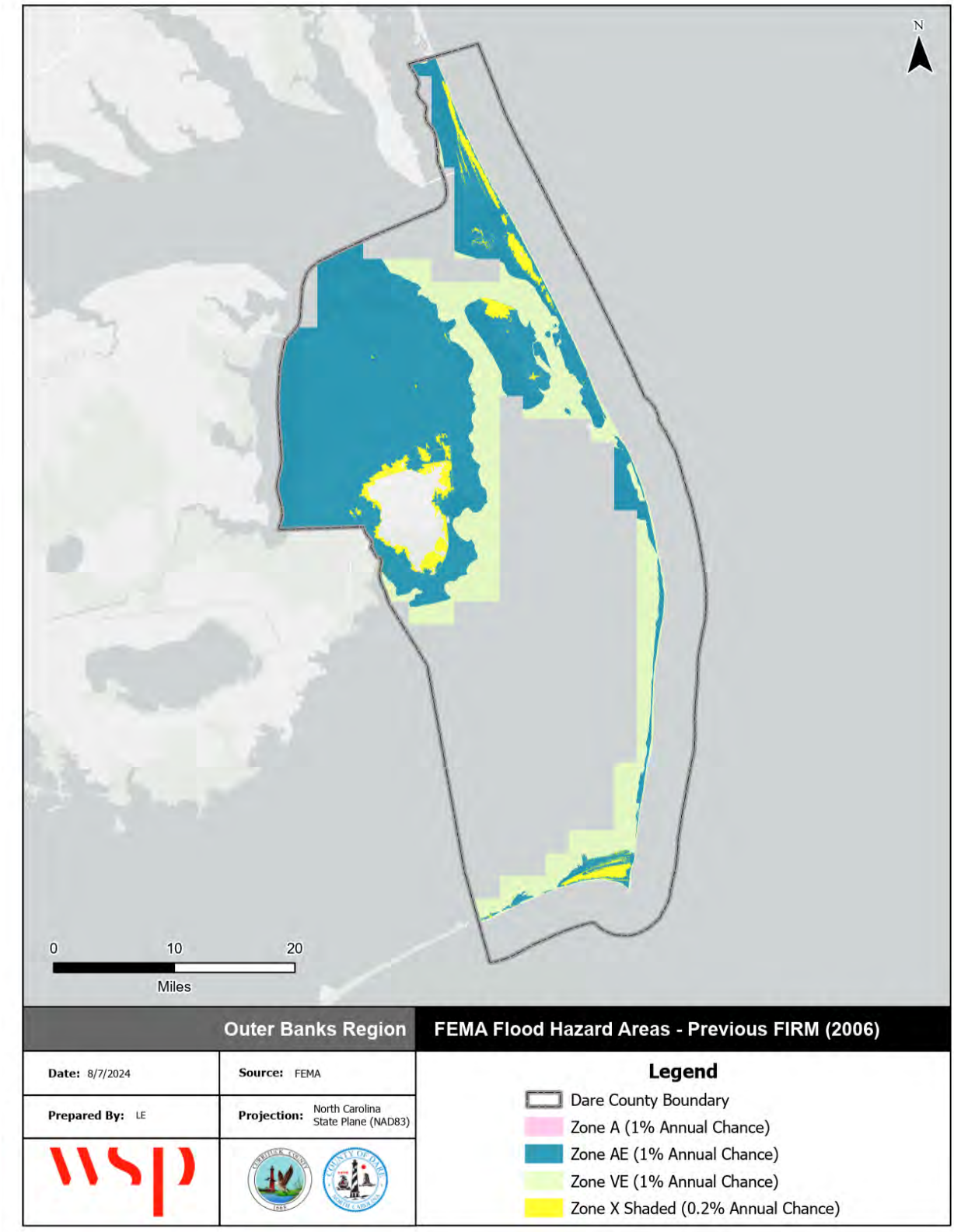
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**11,901**	**$2,405,189,716**	**$1,397,143,396**	**$3,802,333,112**
Agriculture	9	$305,163	$305,163	$610,326
Commercial	428	$100,716,116	$100,716,116	$201,432,231
Education	5	$19,546,205	$19,546,205	$39,092,410
Government	100	$78,653,405	$78,653,405	$157,306,810
Industrial	81	$90,102,672	$135,154,008	$225,256,680
Religious	35	$9,670,843	$9,670,843	$19,341,686
Residential	11,243	$2,106,195,312	$1,053,097,656	$3,159,292,968
+1 Foot Freeboard	**641**	**$104,826,254**	**$58,330,417**	**$163,156,672**
Agriculture	1	$66,438	$66,438	$132,877
Commercial	23	$3,916,136	$3,916,136	$7,832,272
Education	1	$226,100	$226,100	$452,200
Government	9	$6,266,932	$6,266,932	$12,533,864
Industrial	4	$258,400	$387,600	$646,000
Religious	3	$842,174	$842,174	$1,684,348
Residential	600	$93,250,074	$46,625,037	$139,875,111
+2 Foot Freeboard	**469**	**$75,712,052**	**$49,744,620**	**$125,456,672**
Agriculture	0	$0	$0	$0
Commercial	23	$14,232,495	$14,232,495	$28,464,990
Education	0	$0	$0	$0
Government	13	$7,358,037	$7,358,037	$14,716,074
Industrial	4	$716,029	$1,074,044	$1,790,073
Religious	3	$754,597	$754,597	$1,509,194
Residential	426	$52,650,894	$26,325,447	$78,976,341
+3 Foot Freeboard	**449**	**$68,119,816**	**$39,339,526**	**$107,459,342**
Agriculture	0	0	$0	$0
Commercial	14	$4,551,414	$4,551,414	$9,102,828
Education	1	$240,926	$240,926	$481,852
Government	11	$4,986,156	$4,986,156	$9,972,312
Industrial	2	$206,820	$310,230	$517,050
Religious	1	$367,100	$367,100	$734,200
Residential	420	$57,767,400	$28,883,700	$86,651,100

Figure B.3 – FEMA Flood Hazard Areas, Unincorporated Dare County



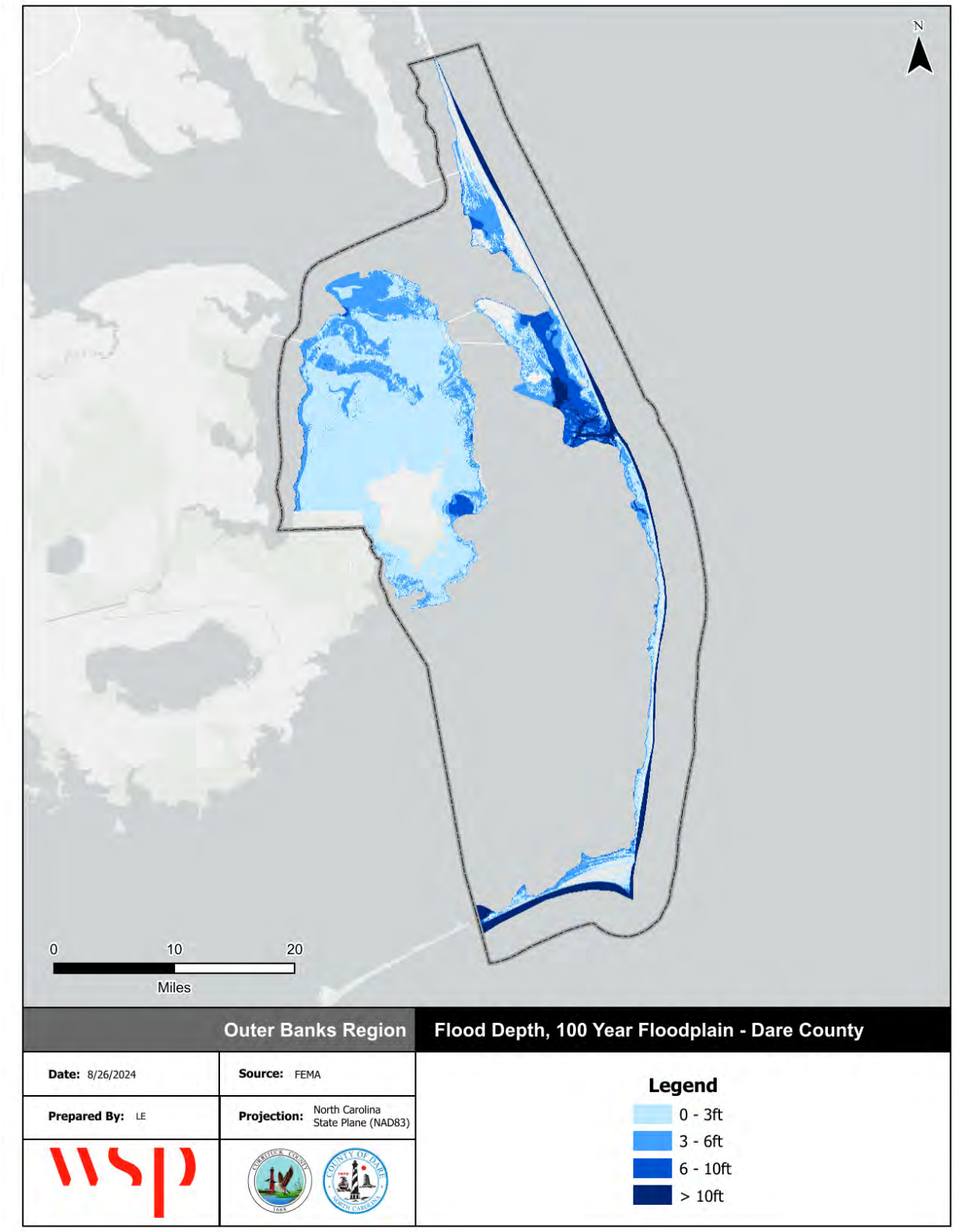
Source: FEMA Effective DFIRM

Figure B.4 – FEMA Flood Hazard Areas, Unincorporated Dare County – 2006 FIRM



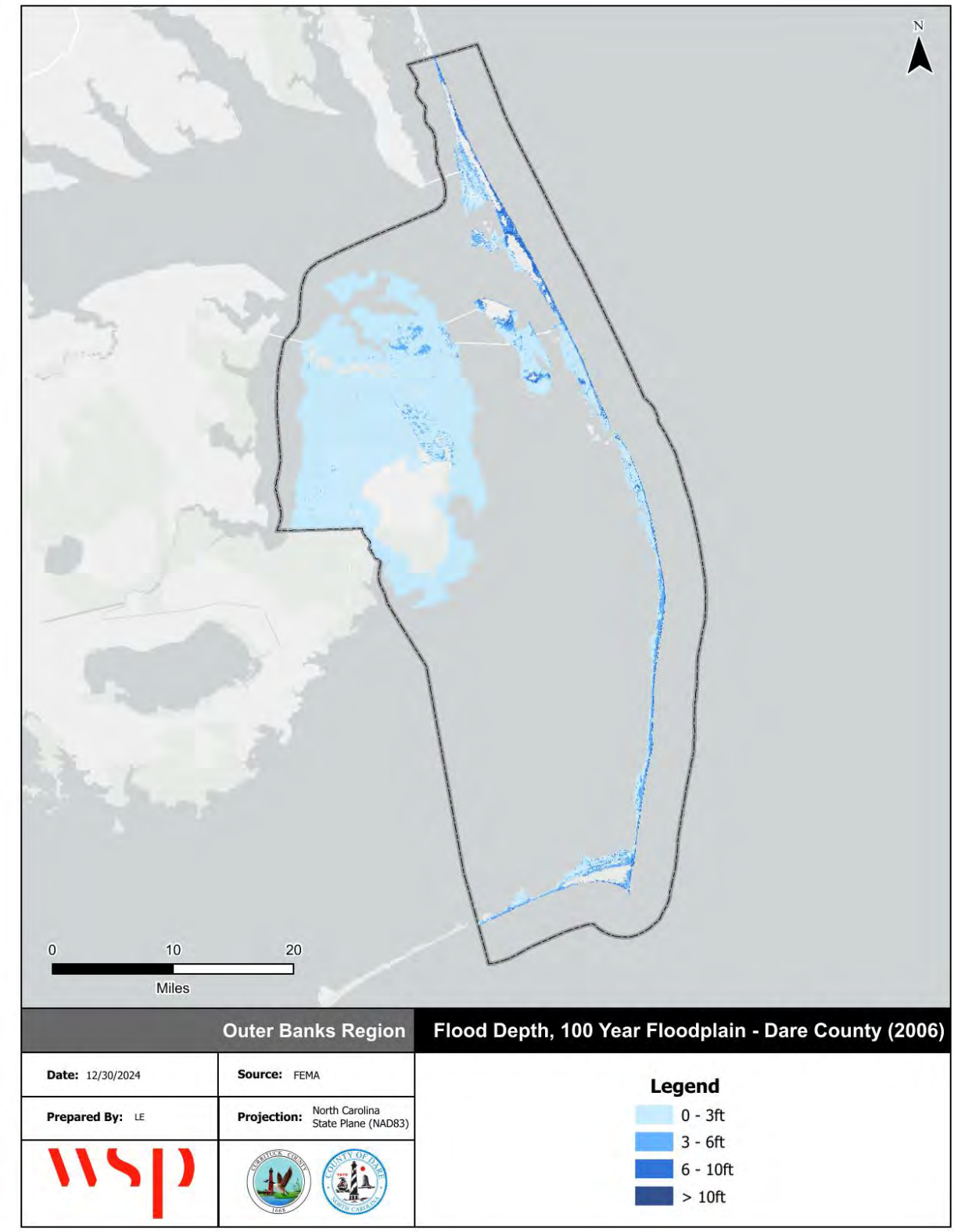
Source: FEMA 2006 DFIRM

Figure B.5 – Flood Depth, 1%-Annual-Chance Floodplain, Unincorporated Dare County



Source: FEMA Effective DFIRM

Figure B.6 – Flood Depth, 1%-Annual-Chance Floodplain, Unincorporated Dare County – 2006 FIRM



Source: FEMA 2006 DFIRM

FLOOD INSURANCE DATA

Dare County joined the NFIP emergency program in 1971 and has been a regular participant in the NFIP since October 1978. The following tables reflect NFIP policy and claims data for the County categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table B.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	4,409	$2,513,806	$1,219,608,000	9,087	$94,564,531.46
2-4 Family	53	$34,474	$13,150,000	260	$4,933,290.70
All Other Residential	323	$61,037	$62,399,000	143	$5,363,009.33
Non-Residential	333	$411,820	$128,391,000	1,654	$39,830,522.81
Total	**5,118**	**$3,021,137**	**$1,423,548,000**	**11,144**	**$144,691,354.30**

Source: FEMA Community Information System, accessed December 2024

Table B.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3,938	$2,294,966	$1,068,509,000	9,098	$123,703,774.77
A Zones	18	$13,815	$4,344,000	477	$4,564,407.17
AO Zones	14	$10,122	$4,797,000	20	$57,954.95
V01-30 & VE Zones	19	$17,177	$5,101,000	397	$4,132,373.90
V Zones	0	$0	$0	396	$3,744,436.97
B, C & X Zone					
Standard	1,053	$655,020	$324,263,000	556	$7,048,192.79
Preferred	0	$0	$0	113	$809,447.80
Total	**5,042**	**$2,991,100**	**$1,407,014,000**	**11,057**	**$144,060,588.35**

Source: FEMA Community Information System, accessed December 2024

Table B.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	535	$386,946	$126,404,000	2,516	$55,925,585.66
A Zones	5	$6,249	$1,065,000	322	$3,267.798.34
AO Zones	1	$598	$170,000	1	$10,263.55
V01-30 & VE Zones	36	$5,539	$1,109,000	243	$2,320,048.39
V Zones	0	$0	$0	377	$3,642,799.86
B, C & X Zone	135	$101,777	$41,458,000	282	$3,987,182.79
Standard	135	$101777	$41,458,000	272	$4,053,751.18
Preferred	0	$0	$0	13	$47,172.25
Total	**682**	**$501,109**	**$170,206,000**	**3,741**	**$69,153,678.59**

Source: FEMA Community Information System, accessed December 2024

Table B.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3,401	$1,908,020	$942,105,000	6,582	$67,778,189.11
A Zones	13	$7,566	$3,279,000	155	$1,296,608.83
AO Zones	13	$9,524	$4,627,000	19	$47,691.40
V01-30 & VE Zones	13	$11,638	$3,992,000	154	$1,812,325.51
V Zones	9	$0	$0	19	$101,637.11
B, C & X Zone	918	$553,243	$282,805,000	384	$3,756,717.16
Standard	918	$533,243	$282,805,000	284	$2,994,441.61
Preferred	0	$0	$0	100	$762,275.55
Total	**4,360**	**$2,489,991**	**$1,236,808,000**	**7,313**	**$74,793,169.12**

Source: FEMA Community Information System, accessed December 2024

B.2.3 WILDFIRE

Table B.11 summarizes the acreage in unincorporated Dare County that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 94 percent of unincorporated Dare County is not included in the WUI.

Table B.11 – Wildland Urban Interface Acreage, Unincorporated Dare County

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	298,439.7	94.1%
	LT 1hs/40ac	2,191.7	0.7%
	1hs/40ac to 1hs/20ac	1,166.7	0.4%
	1hs/20ac to 1hs/10ac	1,705.5	0.5%
	1hs/10ac to 1hs/5ac	1,842.8	0.6%
	1hs/5ac to 1hs/2ac	3,464.4	1.1%
	1hs/2ac to 3hs/1ac	7,332.8	2.3%
	GT 3hs/1ac	1,032.8	0.3%
	Total	**317,176.4**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure B.7 depicts the WUI for unincorporated Dare County. Figure B.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure B.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Much of mainland Dare County has high potential fire intensity and moderate burn probability. There is minimal WUI in this area, but it is at significant risk. Along the barrier island, potential fire intensity is

greatest on the sound side. There is a significant overlap of WUI, moderate to high fire intensity, and burn probability in Frisco, Buxton, and Avon.

Table B.12 provides the count and estimated value of all structures that intersect with areas of unincorporated Dare County that are rated moderate to high on the WUI Risk Index.

Table B.12 – Structures at Risk to Moderate-High WUI Risk Index, Unincorporated Dare County

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	1	$25,132	$25,132	$50,264
Commercial	424	$109,994,508	$109,994,508	$219,989,016
Education	9	$41,274,008	$41,274,008	$82,548,016
Government	117	$83,382,314	$83,382,314	$166,764,627
Industrial	75	$90,603,829	$135,905,744	$226,509,573
Religious	35	$10,099,584	$10,099,584	$20,199,168
Residential	11735	$1,979,049,747	$989,524,873	$2,968,574,620
Total	**12,396**	**$2,314,429,122**	**$1,370,206,163**	**$3,684,635,285**

Source: Southern Wildfire Risk Assessment

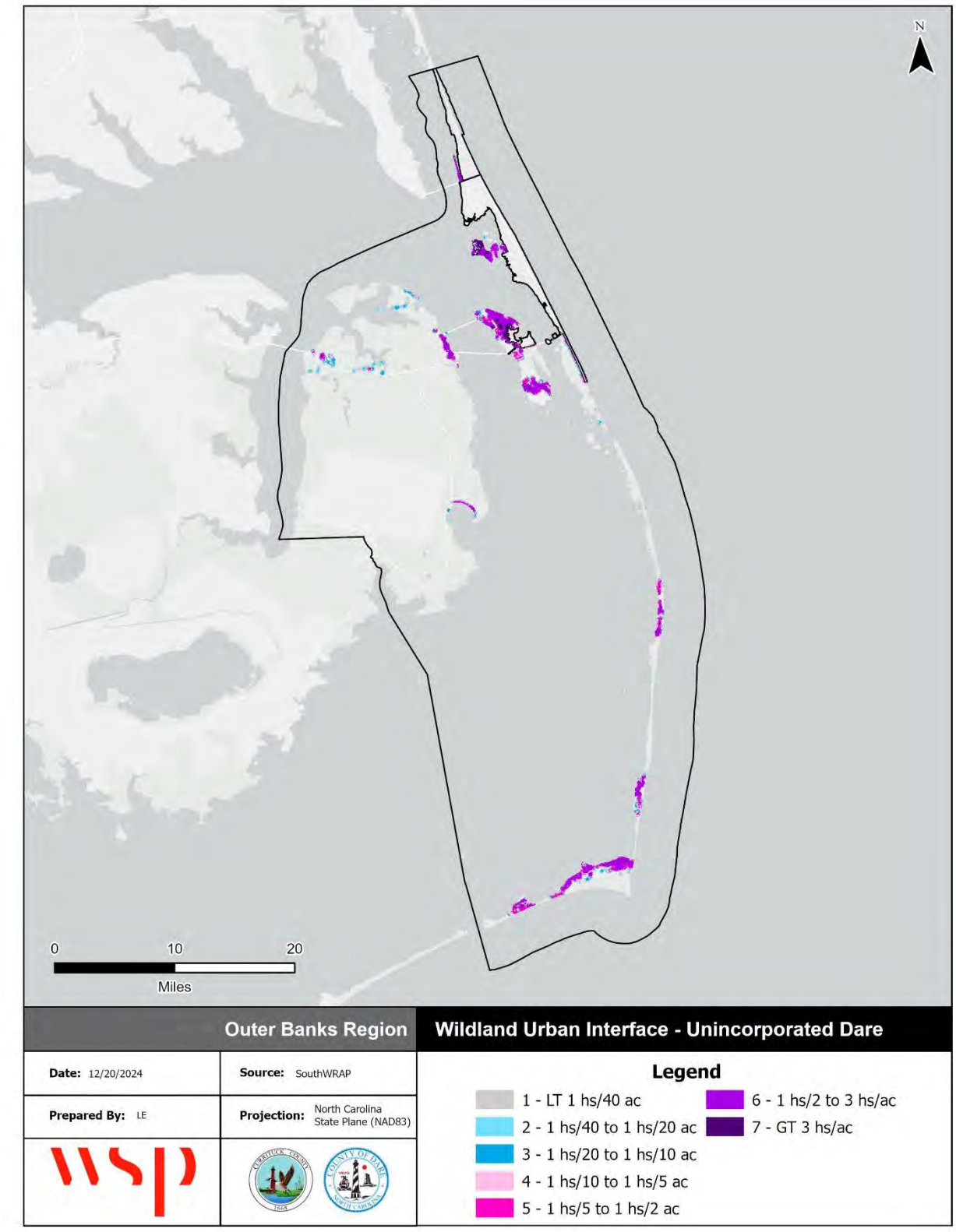
Table B.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table B.13 – Critical Facilities Exposed to Wildfire, Unincorporated Dare County

Type	Critical facility County	Structure Value
Communications	0	$0
Energy	1	$1,295,600
Food, Hydration, Shelter	6	$46,710,250
Hazardous Materials	0	$0
Health and Medical	2	$3,503,180
Safety and Security	24	$52,063,260
Transportation	3	$8,519,560
Water Systems	14	$4,128,433
Total	**50**	**$116,220,283**

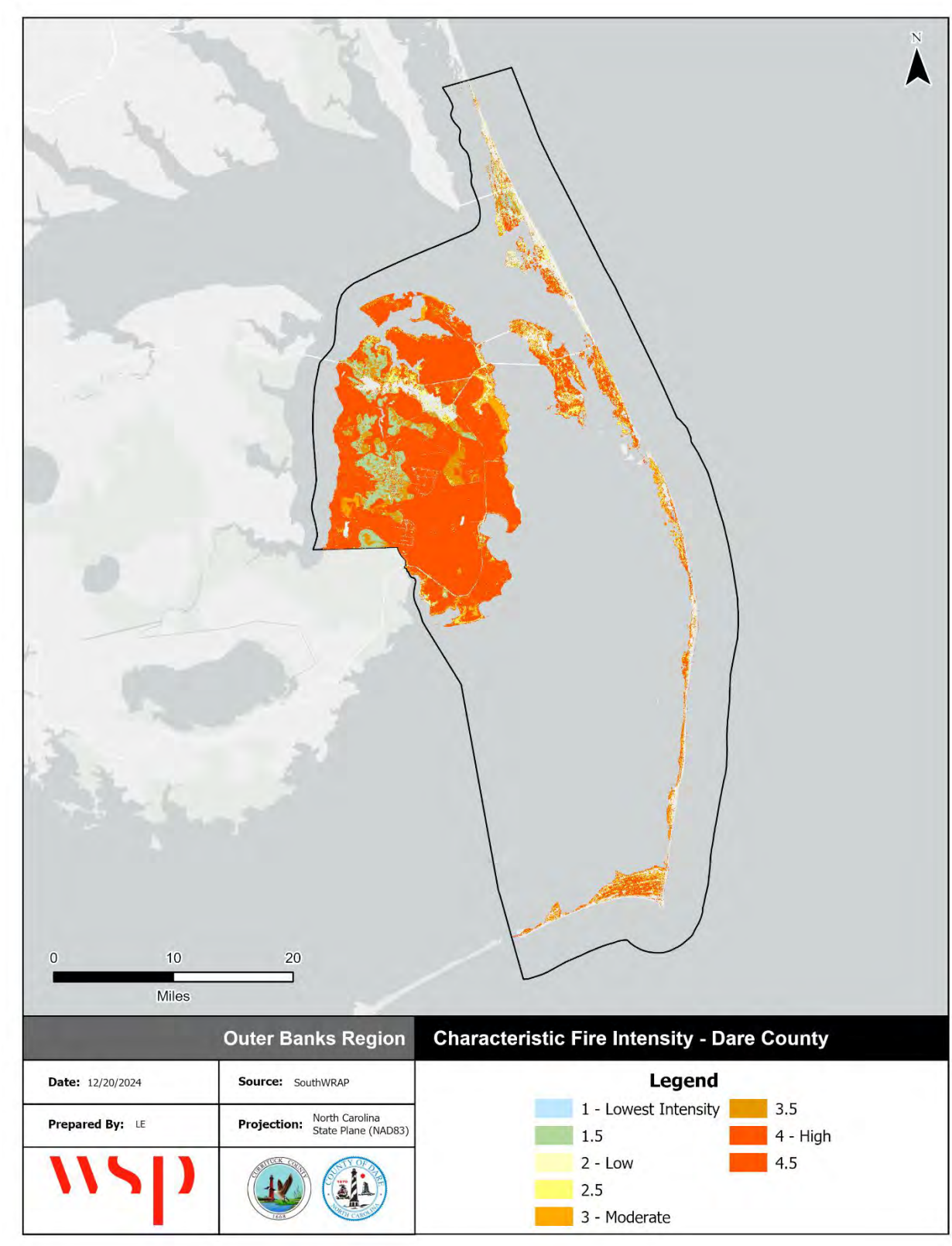
Source: Southern Wildfire Risk Assessment

Figure B.7 – Wildland Urban Interface, Unincorporated Dare County



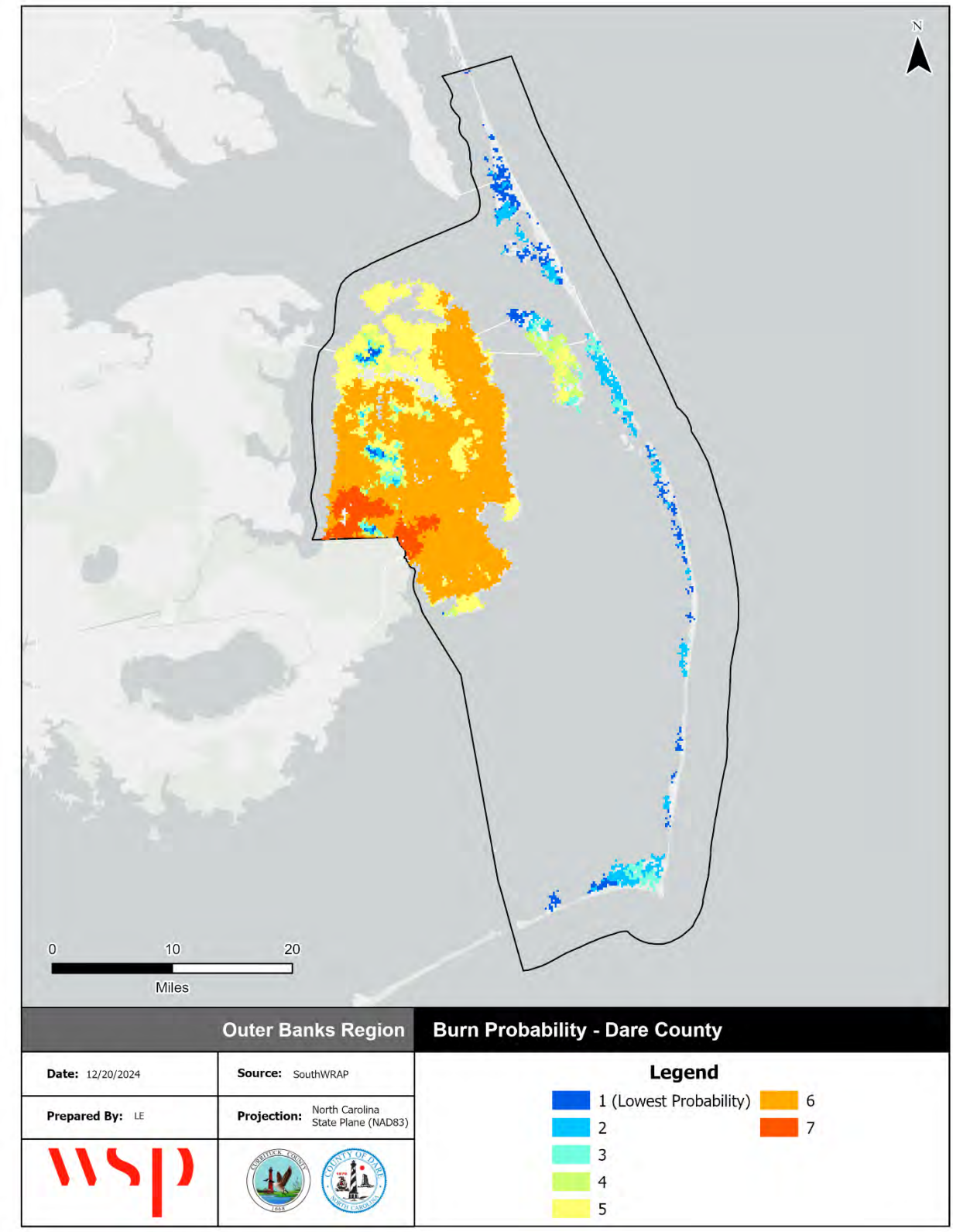
Source: Southern Wildfire Risk Assessment

Figure B.8 – Fire Intensity Scale, Unincorporated Dare County



Source: Southern Wildfire Risk Assessment

Figure B.9 – Burn Probability, Unincorporated Dare County



Source: Southern Wildfire Risk Assessment

B.3 MITIGATION STRATEGY

Table B.14 – Mitigation Action Plan, Dare County

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR1	Identify Funding to improve stormwater drainage and land management preparation for flooding	Flooding, Hurricane & Coastal Hazards	3.3	7-High	Prevention	Dare County Planning	General Fund, Grant Funds	1-3 years	Carry Forward	Funding Received: DCM $234,000 grant for modeling stormwater drainage in Salvo. DCM grant for $160k Hatteras Village stormwater infrastructure construction and $770k DRMF grant for Buxton stormwater infrastructure construction. Golden Leaf $250k for Northern Roanoke Island stormwater infrastructure construction. Continuing to seek funding for additional projects.
DAR2	Expand the number of lifeguarded beaches in unincorporated Dare to bring lifeguards to all villages in addition to ocean rescue response personnel.	Hurricane & Coastal Hazards	3.3	3-Medium	Prevention	National Park Service Dare County	General Fund, Grant Funds	2-3 years	Carry Forward	Dare County shifted a staffed lifeguard position from Manteo to County beach access in Rodanthe. Continue pursuing additional opportunities for lifeguarded beaches.
DAR3	Grow Local Emergency Planning Committee membership by expanding industry participation while fully implementing Community Right to Know reporting requirements to enhance knowledge of hazardous material risk across the region.	Radiological Emergency, Hazardous Substances	3.3	5-High	Prevention	Dare County Emergency Management	General Fund, Grant Funds	1-2 years	Carry Forward	Continue growing LEPC membership and holding regular meetings, seeking grant opportunities, implementing EPCRA. Bring new Fire Inspector position into leadership role.
DAR4	Expand involvement with the North Carolina Information Sharing and Analysis Center to ensure actionable intelligence on immediate and emerging threats to the region are identified and shared with first responders, private sector, emergency management, local law enforcement and other partner agencies in a timely manner.	Terrorism, Radiological Emergency	4.2	3-Medium	Prevention	Dare County Emergency Management, Dare Sheriff's office	General Fund, Grant Funds	1-3 years	Carry Forward	Added a FLO in Dare County with EM Planner. Continue growing participation in ISAAC and FLO program.
DAR5	Identify and pursue opportunities to establish Community Resilience Hubs at existing facilities and during the planning stages for new community facilities like libraries, public safety stations (fire, Police, EMS), community centers, and government office complexes. Focus on hub development should start in the FEMA designated Community Disaster Resilience Zones on the north end of Roanoke Island and Hatteras Island.	All Hazards	2.1, 3.3	Medium	Prevention	Dare County Emergency Management	General Fund, Grant Funds	5 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR6	Utilize existing post storm information and GIS mapping to identify the most vulnerable structures in the County.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.3	5-High	Property Protection	Dare County Planning, Dare County Emergency Management	General Fund, Grant Funds	1 year	Carry Forward	Need to acquire data on structures built pre-1976 that may be below BFE and could benefit from FMA grant process.
DAR7	Establish Firewise USA sites by conducting wildfire risk assessments in vulnerable communities, engage residents, and co-create individual mitigation action plans to protect people, property, and natural resources from wildland fire.	Wildfire	3.3	7-High	Property Protection	Dare County Emergency Management. Fire Marshal, US Fish & Wildlife, NC Forest Service	Grant funds, General Fund	1-3 years	Carry Forward	No progress to report
DAR8	Continue to encourage property owners to maintain or obtain flood insurance policies across Dare County since the adoption of the 2020 flood maps, which resulted in a reduction of properties located in FEMA Special Flood Hazard Areas. Many properties were reclassified as Shaded X and/or X zone which no longer require flood insurance associated with a federally insured mortgage.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.3	5-High	Property Protection, Public Education & Awareness	Dare County Planning. Emergency Management	General Fund, Grant Funds	1-2 years	Carry Forward	Action revised. County will work to mitigate the loss of policies since the update to the FIRM and undertake efforts to raise awareness that properties in the X zone will still flood and the impacts owners will face without a flood insurance policy.
DAR9	Pursue a maintenance/monitoring "adopt a gauge" program to help service the equipment. Pursue installation of additional gauges at key points of interest across Dare County.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	2.2	5-High	Property Protection	Dare County Emergency Management	Grant Funds, NC Emergency Mgmt.	2 years	Carry Forward	Action revised to prioritize gauge maintenance.
DAR10	Complete a cybersecurity risk assessment from an external subject matter expert. Based on risk assessment outcomes develop and require all employees, volunteers and elected officials to complete cybersecurity awareness training before being given access to county information technology systems. Develop and offer cybersecurity awareness training for citizens. Develop and conduct cybersecurity exercises.	Terrorism, Cyber Threat	3.3	5-High	Property Protection	Dare County Emergency Management Dare County Information Technology	General Fund, Grant Funds	2 years	Carry Forward	Completed risk assessment with NCNG Cybersecurity task force. Outcome led to follow on grants and actions to implement risk assessment findings. Effort is ongoing to include formal cybersecurity plan development and recurring exercises.
DAR11	Work with all landowners including federal, state, and private to ensure proper maintenance and use of existing drainage systems to minimize impacts and reduce standing water on all property.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	1.1	7-High	Property Protection	Dare County Planning -- Soil and Water Conservation Board	Grants, tax or tax incentive program	1-3 years	Carry Forward	Continue pursuing grant opportunities and promoting proper drainage.
DAR12	Explore opportunities to improve the continuous operation of critical government and business functions that are essential to human health and safety or economic security by determining the designed wind load, elevation level, power generation capability, redundant communications and shelter in place capacity at public safety and critical facilities. This effort should go beyond public facilities and explore all facilities that are relied upon to deliver services under the FEMA Community Lifeline construct, especially those in a designated Community Disaster Resilience Zone.	All Hazards	2.1	High	Property Protection	Dare County Emergency Management	General Fund, Grant Funds	5 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR13	Continue to seek funding for elevation, acquisition, or relocation of vulnerable structures to include those that moved into the X zone based on the 2020 flood maps and those that are facing imminent threat from the hazards of coastal erosion. Take action to fully understand the risk and scope of the need for elevation projects by determining the number of structures that are below the Dare County local elevation standard of eight feet or greater depending on whether the property is in a flood zone and the height of the natural topography.	Flooding, Hurricane & Coastal Hazards	1.2	High	Property Protection	Dare County Planning Department	Grant Funds, General Fund	1-3 years	New	
DAR14	Study and document sound side erosion rates and water level changes	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	3-Low	Natural Resource Protection	NC Division of Coastal Mgmt.	Grants, Volunteer	3- 5 years	Carry Forward	No data available on soundside erosion rates. Discussed Coastal Fed receiving large grant to monitor estuarine erosion with DCM and possible Corps of Engineers project on soundside erosion.
DAR15	Encourage the use of natural barriers and innovative solutions, such as living shorelines, to reduce shoreline and marsh erosion and protect built infrastructure.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	3.3	4-Medium	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	General Fund, Grant Funds	3-5 years	Carry Forward	Action revised to prioritize green infrastructure
DAR16	Protect natural floodplain function and resilient areas as open space to provide flood and coastal hazard risk reduction and potentially increase CRS 420 open space credit	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	4-Medium	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	General Fund, Grant Funds	1-3 years	Carry Forward	No new open space acquisitions to report.
DAR17	Continue to build/maintain engineered beaches and use living shorelines to protect the community from sea level rise, erosion and the impacts of storm surge from tropical and non tropical coastal weather events. Efforts should remain focused on FEMA designated Community Disaster Resilience Zones.	Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Flooding	3.2	High	Natural Resource Protection	Dare County Planning -- Soil and Water Conservation Board	Grant Funds, General Fund	3-5 years	New	
DAR18	Advocate and pursue funding opportunities to accomplish recommendations made by the NC 12 Taskforce.	Flooding, Hurricane & Coastal Hazards	2.2	7-High	Structural Projects	Dare County Planning, Dare County Emergency Management, NCDOT	NCDOT	1 -3 years	Carry Forward	Action revised to prioritize projects identified by the NC 12 Task Force
DAR19	Monitor construction of the Lindsey Warren (Alligator River) Bridge replacement span until completion.	Flooding, Hurricane & Coastal Hazards	2.1	7-High	Structural Projects	Dare Board of Commissioners, NCDOT	NCDOT	1 year	Carry Forward	Action revised. Bridge replacement underway.
DAR20	Fund critical stormwater and resiliency projects identified in 2023 Dare County Stormwater Master Plan and Resilient Coastal Communities Program Risk & Vulnerability Assessment.	Flooding, Hurricane & Coastal Hazards	2.1	7-High	Structural Projects	NCDOT, Dare County Planning, Dare Soil & Water Board	Grant Fund, local stormwater assessments	1-3 years	Carry Forward	Action revised to integrate identified projects in the Stormwater Master Plan and RCCP Resilience Strategy
DAR21	Fund and construct stormwater improvements for Northern Roanoke Island as identified in Roanoke Island Flooding Analysis and Stormwater Master Plan.	Flooding, Hurricane & Coastal Hazards, Infrastructure Failure	3.3	7-High	Structural Projects	Dare Board of Commissioners, NCDOT	Grant Fund, local stormwater assessments	2 years	Carry Forward	Action revised. $250k Golden Leaf grant received and construction completed on a segment of proposed improvements. FEMA HMGP grant applied for to complete project.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR22	Complete physical security assessment at all public facilities and large crowd (500+ people) gathering venues and events. Based on results, make physical security improvements and/or implement measures to protect lives from likely threats.	Terrorism	3.3	3-Low	Structural Projects	Dare County Emergency Management. Dare Sheriff's Office	General Fund, Grant Funds	1-3 years	Carry Forward	No progress to report
DAR23	Improve water supply and delivery systems to reduce water waste from breaks and leaks. Encourage development best practices to reduce water use/runoff such as drought-tolerant landscaping and permeable surfaces. Discuss creating or improving the Emergency Water / Resiliency Plan, including lessons learned from the aftermath of Hurricane Helene in WNC.	Drought, Flooding, Infrastructure Failure	2.1	7-High	Structural Projects	Dare County Water Department	Water enterprise fund	3-5 years	Carry Forward	Action revised to incorporate emergency/resiliency planning.
DAR24	Establish secondary water supplies/points for fire protection efforts.	Flooding, Wildfire	2.2	4-Medium	Emergency Services	Dare County Fire Marshal	Grant Funds	3-5 years	Carry Forward	Manns Harbor cluster homes, auxiliary tanks at locations where water supply insufficient for fire protection.
DAR25	Acquire generators or other forms of redundant power supply to ensure that critical facilities and infrastructure remain operational where normal power supply is not available	All Hazards	2.2	5-High	Emergency Services	Dare County Fire Marshal, Public Works, Emergency Mgmt.	Grant Funds	1-2 years	Carry Forward	Progress has been made, but critical facilities without backup power remain ready for future opportunities.
DAR26	Study and identify all key secondary roadways used by workforce that flood routinely and develop plans to mitigate flood hazards. These are transit corridors that support year-round resident populations like Colington Road, NC 345, and Kitty Hawk Road.	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Infrastructure Failure	2.2	5-High	Emergency Services	NCDOT, Dare County Planning	General Fund, Grant Funds	2 years	Carry Forward	Colington project completed, other troublesome areas remain to be addressed.
DAR27	Improve the Dare County Emergency Pumping Plan by identifying additional areas that would benefit from pre-planning efforts and utilization of new pumping equipment.	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms, Infrastructure Failure	2.2	7-High	Emergency Services	Dare County Planning, Emergency Management, NC Forest Service	General Fund, Grant Funds	1 year	Carry Forward	Action revised to expand plan scope.
DAR28	With internet access provided by a commercial entity that uses a straight line ground based fiber optic infrastructure that ends on Ocracoke Island, efforts need to be taken to add a subsea connection from Ocracoke to the mainland to complete a service loop. In addition satellite based internet access needs to be provided to ensure continuity of operations when ground based access is interrupted.	All Hazards	2.1, 3.3	High	Emergency Services	Dare County Emergency Management	General Fund, Grant Funds, other outside funding	5 years	New	Reliable access to the internet is needed to support public safety communications to include 911 services and dissemination of Alerts, Warnings and Messages. It is also needed to ensure continuity of government and business operations especially in the Community Disaster Resilience Zone on Hatteras Island.
DAR29	Pursue a Tsunami Ready Community designation for all of Dare County from the National Weather Service under the NWS TsunamiReady® Program.	Earthquake	1.1	Low	Emergency Services	Dare County Emergency Management	General Fund, Grant Funds	1-3 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DAR30	Expand hazardous weather awareness to include tornados and winter storms by expanding NWS partnership opportunities to include SKYWARN training and community forums	Excessive Heat, Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Drought	1.1	6-High	Public Education & Awareness	National Weather Service, Dare County Emergency Management	General Fund, Grant Funds	2 years	Carry Forward	No progress to report. This remains a priority.
DAR31	Increase the use of the NWS alert feature of the County mass notification system so that residents and visitors have direct access to all issued weather alerts.	Excessive Heat, Flooding, Hurricane & Coastal Hazards, Severe Winter Weather, Tornadoes & Thunderstorms, Wildfire, Drought	1.1	6-High	Public Education & Awareness	Dare County Emergency Management	General Fund, Grant Funds	1 year	Carry Forward	No progress to report. This remains a priority.
DAR32	Expand the “Love The Beach Respect The Ocean” beach safety campaign by expanding participation with the Chamber of Commerce, Property Managers, as well as hotel, restaurant, and beach equipment rental companies	Hurricane & Coastal Hazards	1.1	5-High	Public Education & Awareness	Dare County Emergency Management, Public Relations	General Fund, Grant Funds	1-3 years	Carry Forward	No progress to report. This remains a priority.
DAR33	Undertake efforts to improve individual resilience of all residents with focus on those living in a Community Disaster Resilience Zone. Develop outreach programs to reach the underserved and/or marginalized populations that may not trust government officials. Seek opportunities to engage residents in their communities at small functions as well as at large scale open houses/festivals. Efforts could include programs that focus on children and emergency planning like Ready Kids, Faith-Based Community Preparedness and Community Emergency Response Teams.	All Hazards	1.1	High	Public Education & Awareness	Dare County Emergency Management, Public Relations	General Fund, Grant Funds	1-3 years	New	
DAR34	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Dare County Emergency Management, NC Forest Service	Grant Funds	3-5 years	New	

ANNEX C. TOWN OF DUCK

C.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table C.1 provides a count of critical facilities by FEMA lifeline category within the Town of Duck. Figure C.1 shows the locations of all critical facilities within the Town of Duck.

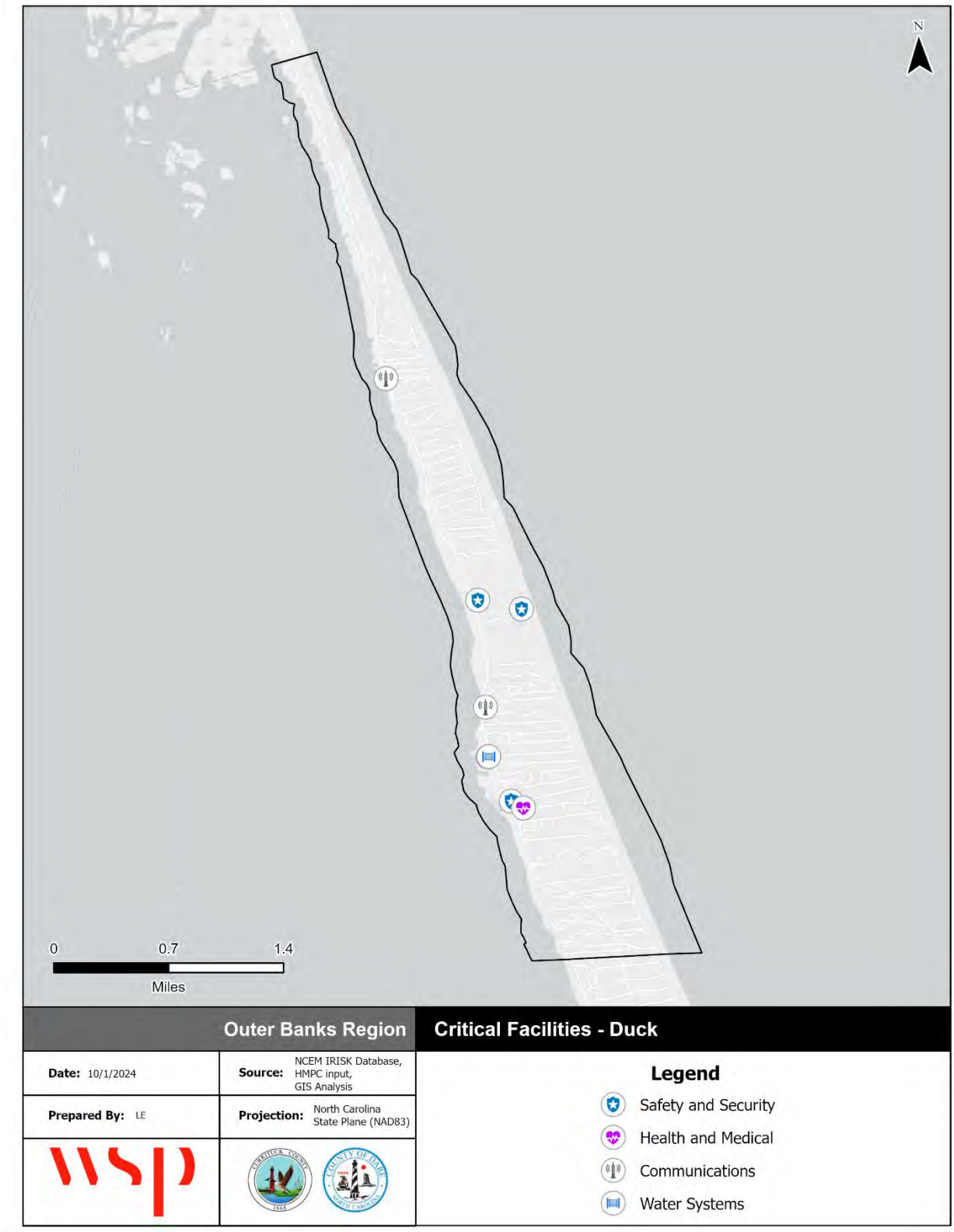
Table C.2 provides a detailed inventory of the critical facilities in Duck, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table C.1 – Critical Facilities by Type, Town of Duck

Facility Type	Count of Facility Type	Structure Value
Communications	3	$687,050
Energy	0	$0
Food, Hydration, Shelter	0	$0
Hazardous Materials	0	$0
Health and Medical	1	$594,900
Safety and Security	4	$4,127,400
Transportation	0	$0
Water Systems	1	$560,650
Total	**9**	**$5,970,000**

Source: Dare County, HMPC

Figure C.1 – Critical Facilities, Town of Duck



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table C.2 – Duck Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Communications	Communications	1438 Duck Rd	$19,100	0.10	AE	NA	1		0	0
Communications	Communications	1239 Duck Rd	$107,300	0.10	X Shaded	NA	4		0	0
Communications	Communications	1230 Duck Rd	$560,650	2.46	AE	NA	1	Y	0	2.5
Health & Medical	Medical	1187 Duck Road	$594,900	0.10	X Shaded	NA	5	Y	0	0
Safety & Security	Fire Station	1261 Duck Rd	$2,151,800	0.10	X Shaded	NA	4		0	0
Safety & Security	Government	1200 Duck Road	$1,975,600	0.10	AE	NA	3	Y	0	0
Safety & Security	Government	1200 Duck Road	$0	0.10	AE	NA	3	Y	0	0
Safety & Security	Government	1259 Duck Road	$0	0.10	VE	NA	5		0	0
Water Systems	Treatment Plant	1230 Duck Rd	$560,650	0.93	AE	NA	1	Y	0	2.5

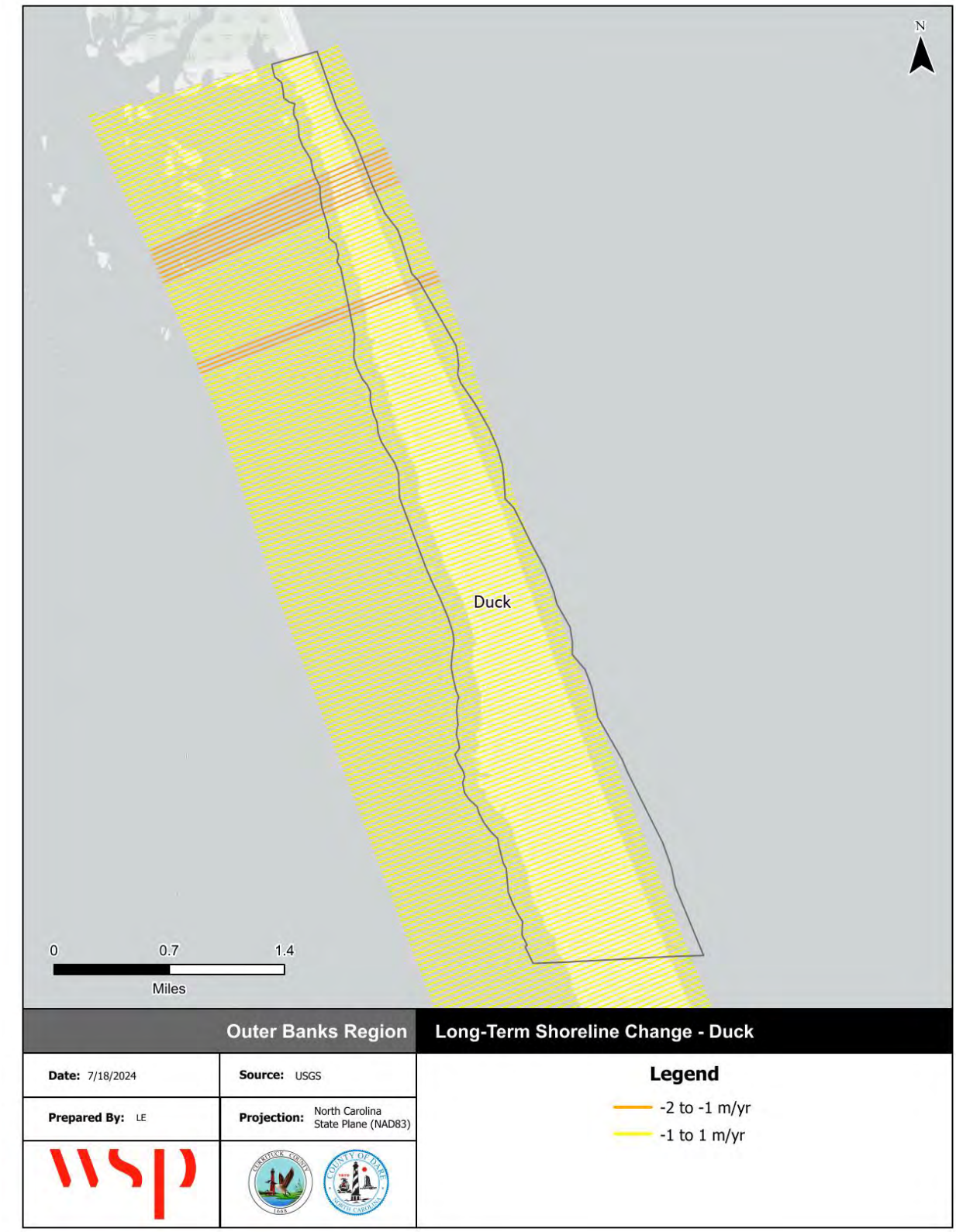
C.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Duck. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

C.2.1 HURRICANE & COASTAL HAZARDS

Figure C.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Town of Duck oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of the Town of Duck is experiencing some level of change every year.

Figure C.2 – Long-Term Shoreline Change Rates, Town of Duck



Source: Source: United States Geological Survey

C.2.2 FLOODING

Table C.3 details the acreage of the Town of Duck's total area by flood zone on the effective DFIRM and 2006 DFIRM. Per this assessment, over 27 percent of the Town falls within the current effective mapped 1%-annual-chance floodplains. Over 62 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplains.

Table C.3 – Flood Zone Acreage in the Town of Duck

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	291.30	14.99%	907.07	46.67%
Zone AO	57.00	2.93%	--	--
Zone VE	211.12	10.86%	310.08	15.95%
Zone X (500-year)	47.20	2.43%	726.44	37.38%
Zone X Unshaded	1,127.31	58.00%	--	--
Open Water	209.63	10.79%	--	--
Total	**1,943.57**	**--**	**1,943.59**	**--**

Source: FEMA Effective DFIRM and 2006 FIRM

Figure C.3 reflects the effective mapped flood hazard zones for the Town of Duck, and Figure C.4 reflect the flood hazard zones from the previous 2006 FIRM.

Figure C.5 and Figure C.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table C.4 provides building counts and values for critical facilities by flood zone in the Town of Duck based on the 2006 FIRM.

Table C.4 – Critical Facilities Exposed to Flooding, Town of Duck

Flood Zone	Critical Facility Count	Structure Value
AE	5	$3,116,000
VE	1	$0.00
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	3	$2,854,000
Total	**9**	**$5,970,000**

Source: FEMA 2006 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table C.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table C.6 summarizes exposure using the current effective FIRM as a baseline.

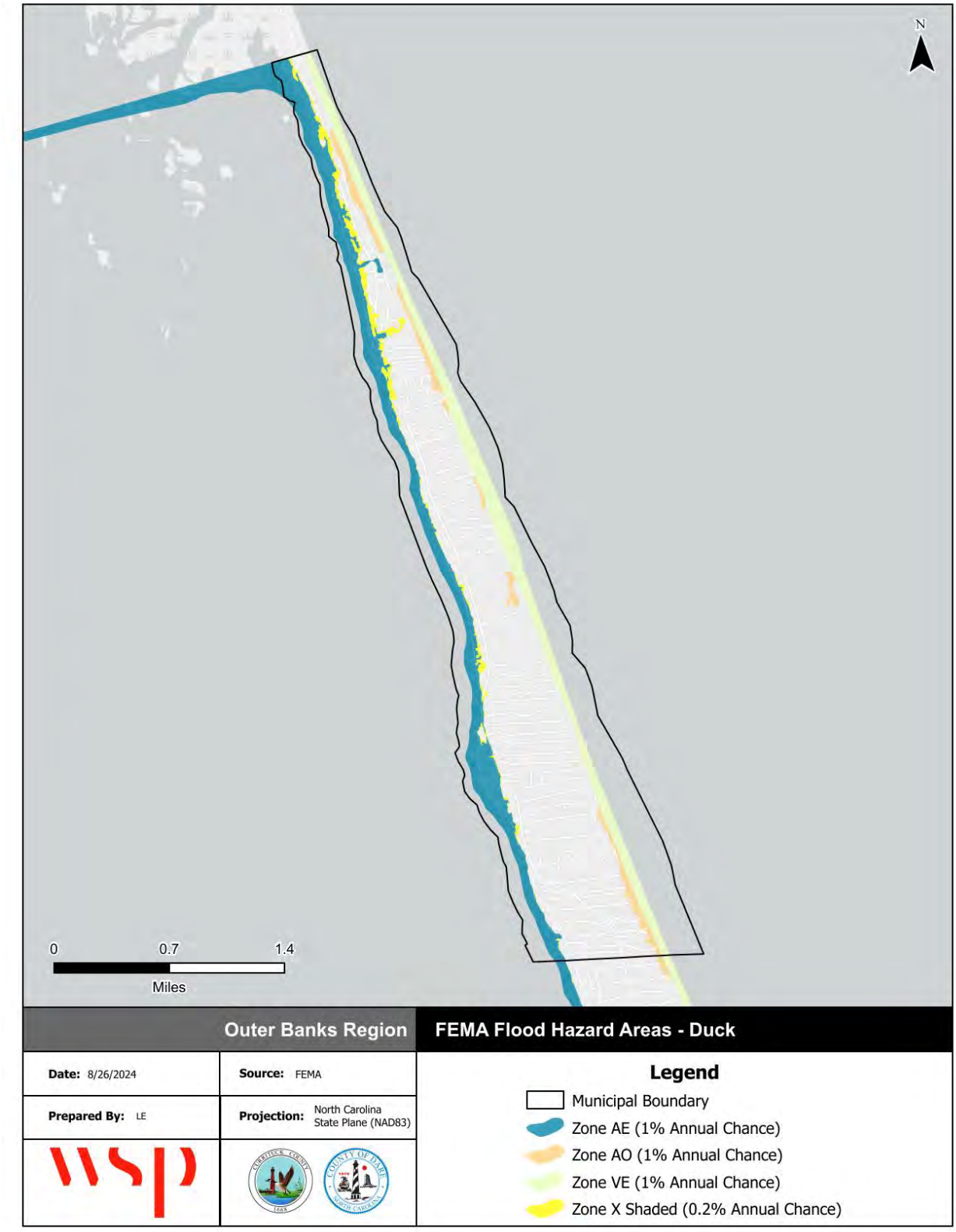
Table C.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,153**	**$408,015,307**	**$211,077,448**	**$619,092,755**
Agriculture	0	$0	$0	$0
Commercial	26	$10,400,440	$10,400,440	$20,800,881
Education	0	$0	$0	$0
Government	4	$2,559,228	$2,559,228	$5,118,456
Industrial	0	$0	$0	$0
Religious	1	$1,179,921	$1,179,921	$2,359,842
Residential	1,122	$393,875,718	$196,937,859	$590,813,576
+1 Foot Freeboard	**103**	**$31,559,003**	**$18,705,981**	**$50,264,984**
Agriculture	0	$0	$0	$0
Commercial	9	$5,224,763	$5,224,763	$10,449,526
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$283,808	$425,712	$709,520
Religious	1	$60,579	$60,579	$121,158
Residential	92	$25,989,853	$12,994,927	$38,984,780
+2 Foot Freeboard	**102**	**$26,098,064**	**$13,369,032**	**$39,467,096**
Agriculture	0	$0	$0	$0
Commercial	4	$640,000	$640,000	$1,280,000
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	98	$25,458,064	$12,729,032	$38,187,096
+3 Foot Freeboard	**63**	**$18,246,558**	**$9,427,979**	**$27,674,537**
Agriculture	0	$0	$0	$0
Commercial	2	$609,400	$609,400	$1,218,800
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	61	$17,637,158	$8,818,579	$26,455,737

Table C.6 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,030**	**$332,543,118**	**$176,174,885**	**$508,718,003**
Agriculture	0	$0	$0	$0
Commercial	42	$16,003,836	$16,003,836	$32,007,673
Education	0	$0	$0	$0
Government	2	$1,994,700	$1,994,700	$3,989,400
Industrial	1	$283,808	$425,712	$709,520
Religious	2	$1,240,500	$1,240,500	$2,481,000
Residential	983	$313,020,273	$156,510,137	$469,530,410
+1 Foot Freeboard	**206**	**$76,759,856**	**$40,831,828**	**$117,591,684**
Agriculture	0	$0	$0	$0
Commercial	10	$4,903,800	$4,903,800	$9,807,600
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	196	$71,856,056	$35,928,028	$107,784,084
+2 Foot Freeboard	**136**	**$47,575,746**	**$25,083,828**	**$72,659,574**
Agriculture	0	$0	$0	$0
Commercial	7	$2,413,675	$2,413,675	$4,827,350
Education	0	$0	$0	$0
Government	1	$178,234	$178,234	$356,468
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	128	$44,983,837	$22,491,919	$67,475,756
+3 Foot Freeboard	**107**	**$35,432,459**	**$18,790,148**	**$54,222,607**
Agriculture	0	$0	$0	$0
Commercial	7	$2,123,650	$2,123,650	$4,247,300
Education	0	$0	$0	$0
Government	1	$24,187	$24,187	$48,374
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	99	$33,284,622	$16,642,311	$49,926,933

Figure C.3 – FEMA Flood Hazard Areas, Town of Duck

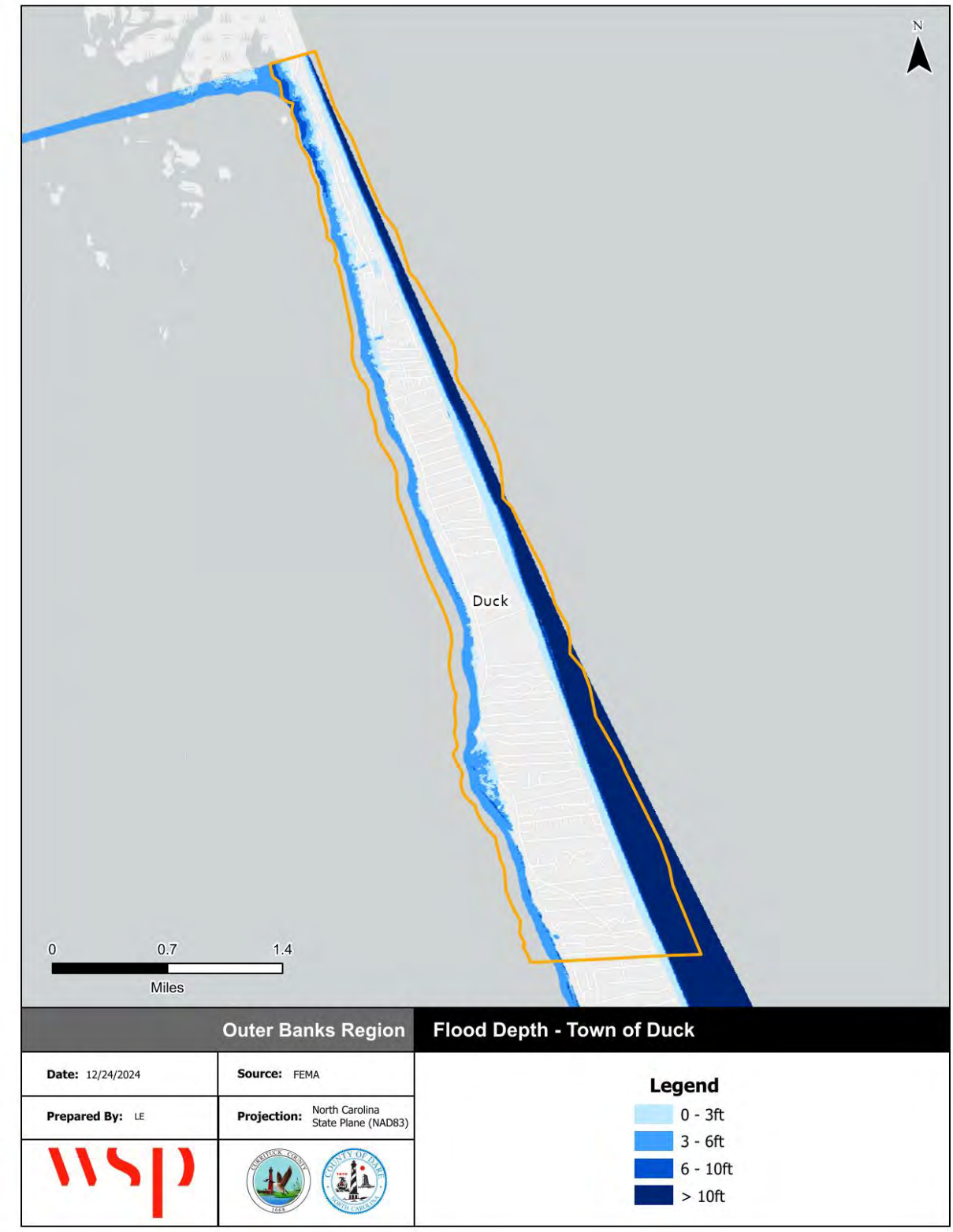


Source: FEMA Effective DFIRM

Figure C.4 – FEMA Flood Hazard Areas, Town of Duck – 2006 FIRM

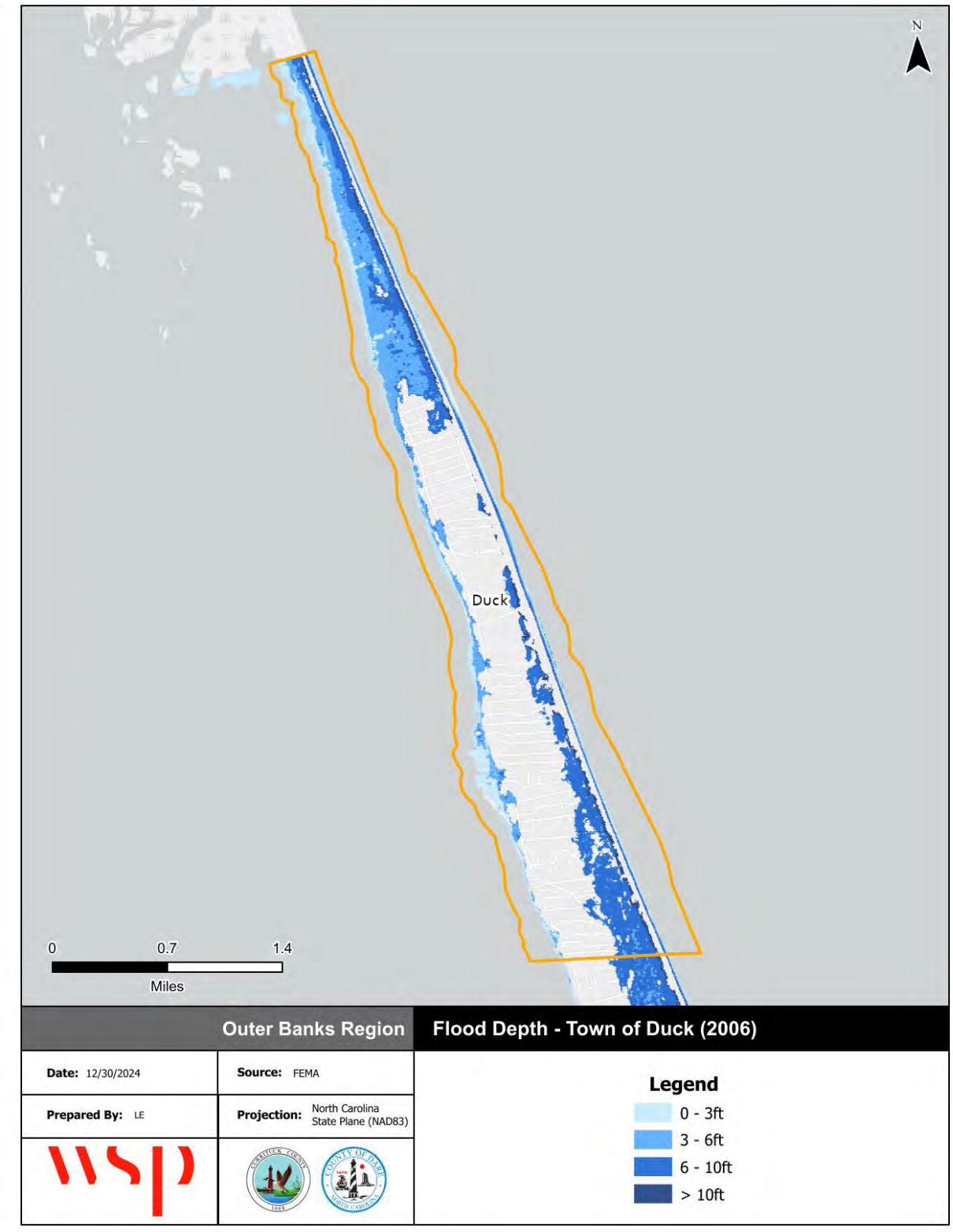
Source: FEMA 2006 DFIRM

Figure C.5 – Flood Depth, 1%-Annual Chance Floodplain, Town of Duck



Source: FEMA Effective DFIRM

Figure C.6 – Flood Depth, 1%-Annual Chance Floodplain, Town of Duck – 2006 FIRM



Source: FEMA 2006 DFIRM

FLOOD INSURANCE DATA

The Town of Duck joined the NFIP as a regular participant in November 2003. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table C.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	654	$410,991	$214,808,000	161	$1,094,638.83
2-4 Family	36	$21,752	$9,176,000	2	$0.00
All Other Residential	177	$16,083	$25,563,000	9	$100,787.38
Non-Residential	60	$72,353	$26,361,000	22	$679,559.93
Total	**927**	**$521,179**	**$275,908,000**	**194**	**$1,874,986.14**

Source: FEMA Community Information System, accessed December 2024

Table C.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	175	$116,358	$57,085,000	119	$960,478.19
AO Zones	26	$19,689	$8,019,000	3	$35,990.12
V01-30 & VE Zones	27	$17,036	$7,684,000	9	$31,949.87
B, C & X Zone					
Standard	675	$354,778	$195,750,000	37	$502,630.73
Preferred	0	$0	$0	21	$342,736.81
Total	**903**	**$507,861**	**$268,538,000**	**189**	**$1,873,785.72**

Source: FEMA Community Information System, accessed December 2024

Table C.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	6	$5,820	$2,572,000	7	$242,501.18
AO Zones	1	$1,111	$271,000	0	$0.00
V01-30 & VE Zones	2	$1,751	$428,000	0	$0.00
B, C & X Zone	21	$16,902	$6,971,000	4	$30,041.52
Standard	21	$16,902	$6,971,000	1	$0.00
Preferred	0	$0	$0	3	$30,041.52
Total	**39**	**$25,584**	**$10,242,000**	**11**	**$272,542.70**

Source: FEMA Community Information System, accessed December 2024

Table C.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	169	$110,538	$54,513,000	112	$717,977.01
AO Zones	25	$18,578	$7,748,000	3	$35,990.17
V01-30 & VE Zones	25	$15,285	$7,256,000	9	$31,949.87
B, C & X Zone	654	$337,876	$188,779,000	54	$815,326.02
Standard	654	$337,876	$188,779,000	36	$502,630.73
Preferred	0	$0	$0	18	$312,695.29
Total	**873**	**$482,277**	**$258,296,000**	**178**	**$1,601,243.02**

Source: FEMA Community Information System, accessed December 2024

C.2.3 WILDFIRE

Table C.11 summarizes the acreage in the Town of Duck that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 66 percent of the Town of Duck is not included in the WUI.

Table C.11 – Wildland Urban Interface Acreage, Town of Duck

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	1,591.1	66.8%
	LT 1hs/40ac	24.8	1.0%
	1hs/40ac to 1hs/20ac	28.0	1.2%
	1hs/20ac to 1hs/10ac	109.8	4.6%
	1hs/10ac to 1hs/5ac	358.3	15.0%
	1hs/5ac to 1hs/2ac	215.1	9.0%
	1hs/2ac to 3hs/1ac	53.8	2.3%
	GT 3hs/1ac	0.0	0.0%
	Total	**2,380.9**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure C.7 depicts the WUI for the Town of Duck. Figure C.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure C.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

There are two small clusters of moderate to high potential fire intensity in Duck, and both coincide with areas in the WUI. However, most of the Town is not burnable and the few areas that are have a low burn probability. Therefore, there is no area of significant wildfire risk in the Town.

Table C.12 provides the count and estimated value of all structures that intersect with areas of the Town of Duck that are rated moderate to high on the WUI Risk Index.

Table C.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Duck

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	43	$17,514,090	$17,514,090	$35,028,180
Education	0	$0	$0	$0
Government	1	$1,975,600	$1,975,600	$3,951,200
Industrial	1	$283,808	$425,712	$709,520
Religious	2	$1,240,500	$1,240,500	$2,481,000
Residential	911	$302,815,980	$151,407,990	$454,223,971
Total	**958**	**$323,829,978**	**$172,563,892**	**$496,393,870**

Source: Southern Wildfire Assessment

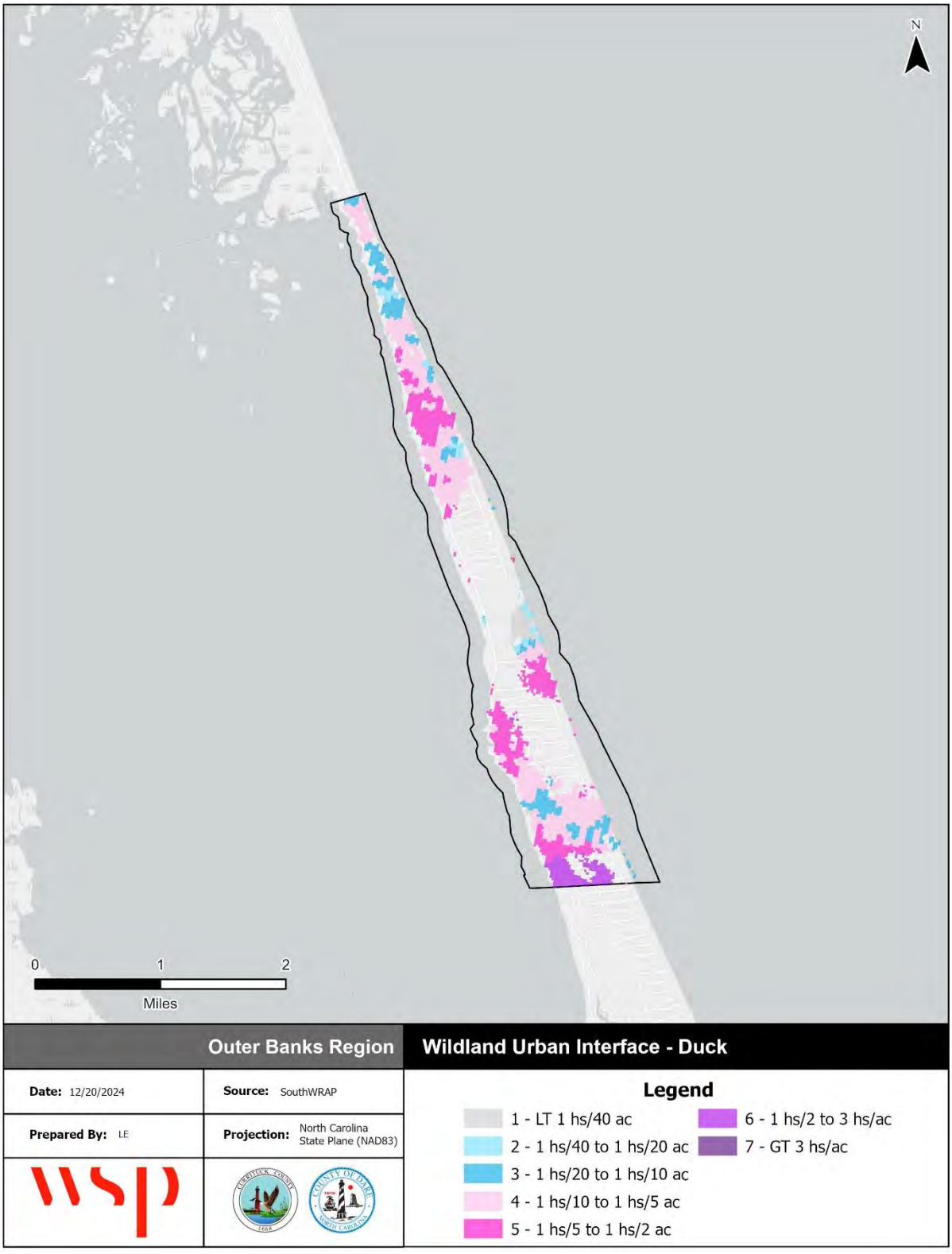
Table C.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table C.13 – Critical Facilities Exposed to Wildfire, Town of Duck

Type	Critical Facility Count	Structure Value
Communications	1	$560,650
Energy	0	$0
Food, Hydration, Shelter	0	$0
Hazardous Materials	0	$0
Health and Medical	1	$594,900
Safety and Security	2	$1,975,600
Transportation	0	$0
Water Systems	1	$560,650
Total	**5**	**$3,691,800**

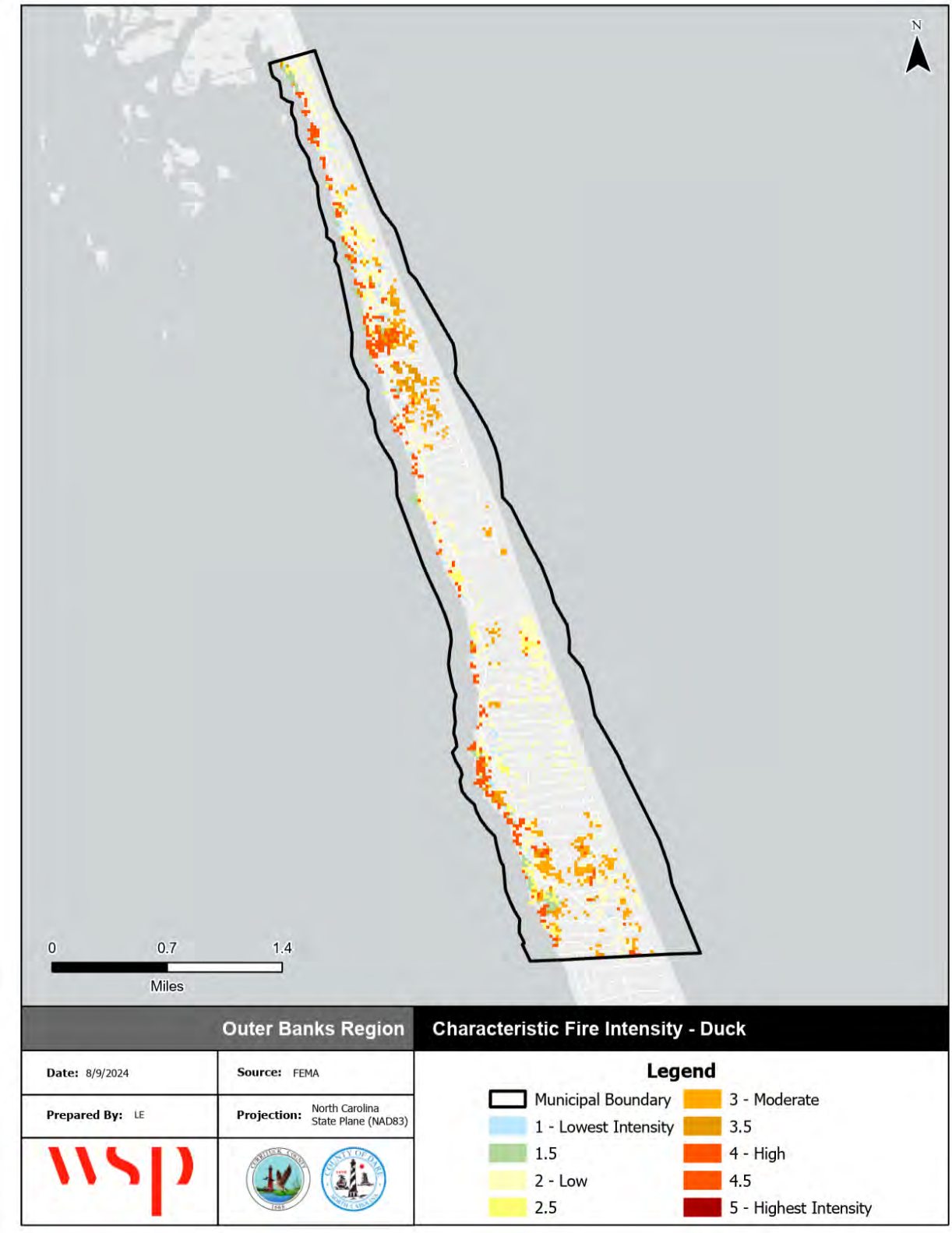
Source: Southern Wildfire Assessment

Figure C.7 – Wildland Urban Interface, Town of Duck



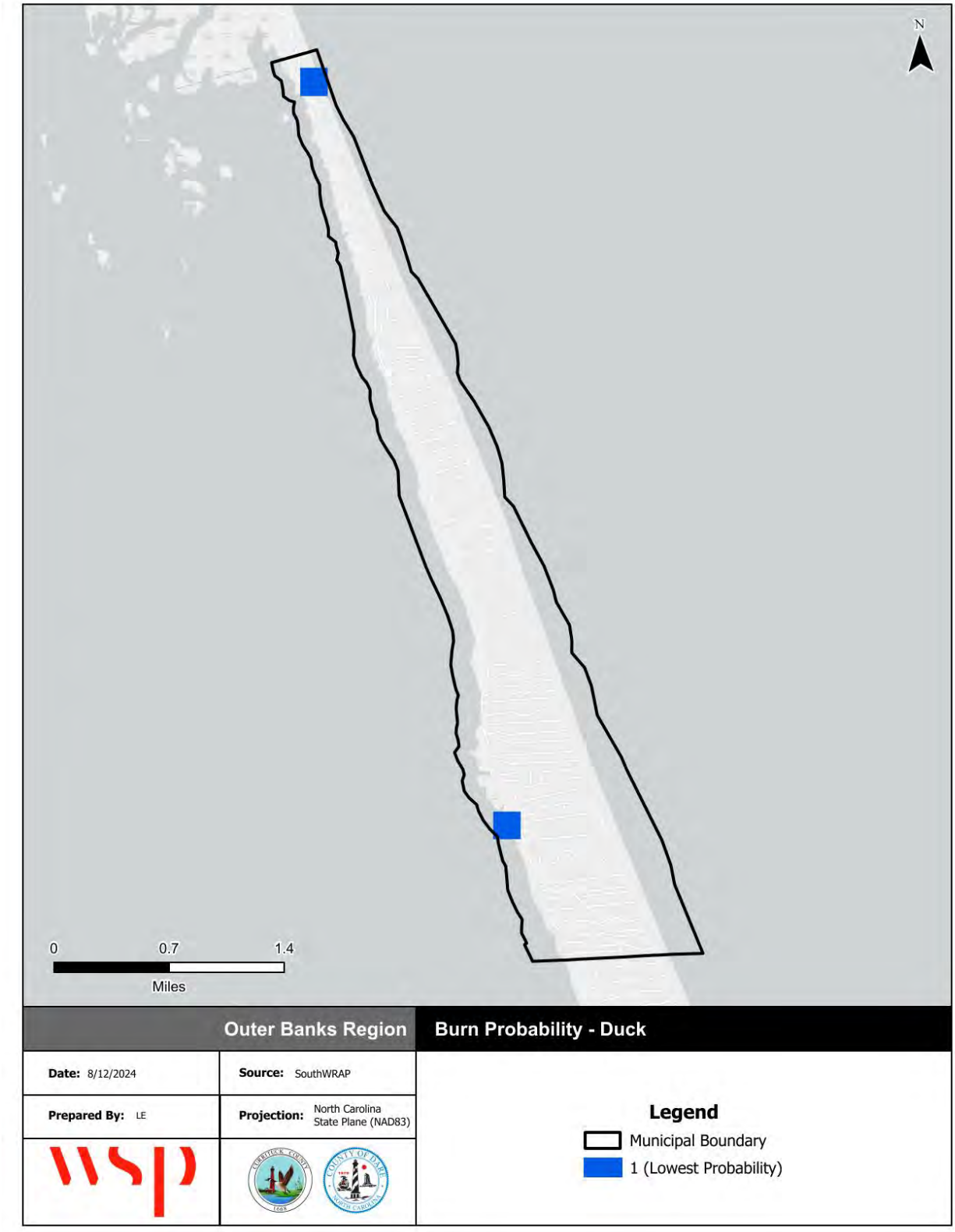
Source: Southern Wildfire Risk Assessment

Figure C.8 – Fire Intensity Scale, Town of Duck



Source: Southern Wildfire Risk Assessment

Figure C.9 – Burn Probability, Town of Duck



Source: Southern Wildfire Risk Assessment

C.3 MITIGATION STRATEGY

Table C.14 – Mitigation Action Plan, Town of Duck

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK1	Continue to fund enforcement of current hazard mitigation regulations.	All Hazards	3.1	High	Prevention	Town Staff, Town Council	General Fund	Annual, Ongoing	Carry Forward	Town Council continues to annually fund a Code Enforcement Position and Certified Floodplain Manager as well as continuing education training.
DCK2	Adopt and apply development policies that balance protection of natural resources and fragile areas with residential and economic development	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	1.2	High	Prevention	Town Staff, Town Council	General Fund	6 Month, Annual	Carry Forward	Town Council adopted an ordinance establishing allowances for living shorelines. They adopted a separate resolution establishing a policy related to the Emergency Pumping of Floodwaters in September 2018. The Town had an emergency floodwater management discharge plan approved by the NCDWQ in May 2019. The Town Council adopted an updated Comprehensive and Land Use Plan addressing natural resources, economic development, and coastal resiliency issues, and the Town will continue to review its adopted Comprehensive and CAMA Land Use Plan, Flood Damage Prevention Ordinance and Fire Ordinance annually to determine if there are additional goals, policies or regulations necessary to address best management development policies.
DCK3	Develop policies that minimize threats to life, property, and natural resources resulting from development located in or adjacent to hazard areas, such as those subject to erosion, high winds, storm surge, flooding, or sea level rise.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	1.2	High	Prevention	Town Staff, Town Council	General Fund	6 Month, Annual	Carry Forward	The Town adopted revised Flood Insurance Rate Maps and Flood Damage Prevention Ordinance, local participation in CAMA LPO program, Participation in the FEMA Community Rating System, enforcement of NC State Building Code Revisions and amendments including wind- borne debris provisions. The Town has also revised policies related to oceanfront development including additional setbacks for accessory structures, new dune walkway standards, and remedies for structures encroaching on the ocean beach. Annual beach profile surveys initiated in 2017 continue to assess changing shoreline patterns. The Town will also consider a CIP Funded program to conduct septic systems inspections on individual properties on a voluntary basis. This will help to create a baseline to determine our community's overall septic health as we look forward to developing strategies to address climate and sea level rise changes.
DCK4	Develop location, density, and intensity criteria for new, existing development and redevelopment including public facilities and infrastructure so that they can better avoid or withstand natural hazards.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms, Wildfire	3.1	High	Prevention	Town Staff, Town Council	General Fund	Annual Review	Carry Forward	Town Code revisions including lot coverage regulations, limitations on residential dwelling size, including increased setbacks for large structures, additional elevation requirements for V-Zone structures and incentives for use of permeable and semi-permeable materials for driveways and parking have been adopted. Town Council adopted additional limitations on the scale of development through house size limitations and increased setback requirements January 2019. Higher regulatory standards for areas that are not located within the Special Flood Hazard Area (SFHA) were adopted in 2020 to address known flood risks. The Town will continue to review its zoning ordinance and development standards to better withstand natural hazards.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK5	As a FEMA CRS community, we will take advantage of the various mitigation strategies promoted by this program	Hurricane & Coastal Hazards, Flooding	3.3	High	Prevention	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town continues to develop actions and strategies that will lower its CRS rating and therefore provide lower flood insurance premiums to property owners within the Town. In conjunction with Dare County, there are topics that go out every month via social media and e-news. Town Staff intends to work to develop a Program for Public Information (PPI), Flood Insurance Assessment and Coverage Plan (FIA), and Substantial Damage Management Plan (SDP). Town Staff is working to revise its current damage assessments zone and will implement them into a Crisis Track SOG. Town Staff recently completed and the Town Council approved a Flood Response Plan (FRP). See also DCK3.
DCK6	Support programs and initiatives to annually assess shoreline changes (erosion and accretion)	Hurricane & Coastal Hazards, Flooding	3.2	High	Prevention	Town Council	General Fund	Annual, As Needed	Carry Forward	The Town has been monitoring high oceanfront erosion areas by documenting storm damage and taking photos/Go Pro and aerial drone video. A beach erosion study has been completed for the Town by the USACOE and Coastal Planning and Engineering which documents erosion patterns and existing conditions. The Town enacted an additional tax to support beach management activities, and annual beach profile surveys were initiated in 2017 to assess changing patterns. These surveys are supplemented with aerial drone technology providing 3D imaging analysis that will further enhance the Town's ability to track shoreline change. These techniques are proposed to be carried over to assess soundside shoreline changes pending funding opportunities.
DCK7	Stay informed, involved and supportive relative to Federal, State, and/or regional studies, initiatives and efforts concerning coastal resiliency	Hurricane & Coastal Hazards, Flooding	3.2	High	Prevention	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town participates in the annual program established by the Dare County Shoreline Commission to provide funds for beach maintenance. The Town started discussions in 3/2019 regarding beach re-nourishment in conjunction with Dare County and the Towns of Kill Devil Hills, Kitty Hawk and Southern Shores. These discussions transitioned into quarterly multi-jurisdictional meetings with all of the beach front communities engaging in nourishment activities. This collaborative discussion process will begin again in early to mid 2025 as the above-named communities begin planning for the 2027 renourishment. The Town also participates and engages with NC Beach Inlet Waterway Association (NCBIWA), a network of legislators, agencies, local governments, scientists, educators and other stakeholders with an interest in coastal issues. The Town maintains representation on the Currituck Sound Coalition, a regional network of local government and permitting agencies as well as the Coastal Communities of Practice and the State Coastal Resource Advisory Council. The Town supports staff networking and engagement with local municipalities, non-profits and resiliency efforts by promoting OBX Leadership participation sponsored by the Outer Banks Chamber of Commerce.
DCK8	Develop a Fire Ordinance consistent with State regulations and unique to the Town.	All Hazards	3.1	Medium	Prevention	Public Safety, Town Staff, Town Council	General Fund	Annual	Carry Forward	Comprehensive updates to the Town's fire prevention ordinance were adopted in 2020, addressing fire inspections, mutual aid, allowable and prohibited fires, and life safety provisions. The ordinance will be reviewed annually for recommended updates, including a proposal to prohibit all burning when the National Weather Service issues a Red Flag Warning, or at the discretion of the Fire Chief (or designee).

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK9	Update and implement CAMA Land Use Plan	All Hazards	3.3	High	Prevention	Town Staff, Planning Consultant, NC Division of Coastal Management	General Fund	9 Month	Carry Forward	The Town of Duck completed its update to its Comprehensive CAMA Land Use Plan in 2020 and will be working to implement the goal and objectives identified in that plan. This plan is a backbone for developing areas of study, and resilient policies and flood damage mitigation efforts. Examples of future projects include Soundside Shoreline Management Study, pursuit of new Living Shoreline Opportunities, Sea Level Rise Analysis and Climate Adaptation Planning, Septic System and Drainfield Mapping, Townwide Stormwater Management Study, Townwide Beach Management Program, Dune Maintenance Education Program, Development of Post-Hazard Assessments and establishment of a Resilience Review Team.
DCK10	Identify areas most at risk for flooding and investigate strategies to reduce those risks	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Town Staff	General Fund	Annual	New	The Town completed Phase II and III of Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management, DEQ, engineering consultants and stakeholders to identify priority projects with proposed nature-based solutions that will then be moved forward to implementation phase. From these priority projects, Phase IV completed a focused area study related to floodprone areas, identifying stormwater control measures (SCMs) for best management practices. This has led to grant submission and acquisition for a pilot project to implement one of the SCMs. This project is currently in the design and bid process with expected completion in mid-2025. The completion of the Phase IV study and development of a menu of SCMs is intended to drive additional town and privately funded projects to improve resiliency and mitigate flood damage.
DCK11	Identify areas most at risk and investigate strategies to reduce risk from heat and wildland/urban interface fires	Wildfire	1.2	High	Property Protection	Fire Department, Town Staff	General Fund	1-2 Years	Carry Forward	Fire department staff will request a survey by the NC Forest Service to identify areas of concern along with the use of GIS ground cover mapping to focus education and prevention efforts on areas at risk for wildfire. Utilizing social media and Town messaging, educational material regarding safety and best practices for ground cover management will be disseminated.
DCK12	Pursue acquisition and/or elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Town Staff	Grant Funds	Ongoing	New	
DCK13	Increase the amount of open space throughout the town by seeking land donations or making land purchases. Develop an open space plan to further enhance these areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Natural Resource Protection	Town Council	General Fund	Annual Review	Carry Forward	The Town owns an 11-acre park in the center of the Village Commercial area which is partially maintained as open space. On this property, town staff continues to research ideas to engage the community in the natural environment while teaching them best management practices. With the completion and implementation of a stormwater wetland/rain garden, transition and implementation of focal points to native cultivars to improve and encourage habitat and a nature at play area, the Town will shift focus to education related to the importance of these resources for a healthy and resilient environment. As the Town is 90 percent developed, there are few areas available to purchase and maintain as open space, however the Town is in the process of purchasing three parcels in the Village Commercial District with development plans yet to be determined, however development expectation will likely lean toward the preservation of open space while also focusing on the Town's need for public restrooms and parking. Town funds for property acquisitions are limited so future activities in this area will largely depend on the success of the Town in acquiring property or easements with available grants.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK14	Promote living shoreline protection as a means to preserve wetlands.	Hurricane & Coastal Hazards, Flooding	3.2	High	Natural Resource Protection	Town Council, Town Staff	General Fund	Annual Review	New	The Town recently completed its NC12 Resiliency project which included the development of a living shoreline which will be monitored and used as an educational piece for residents, property owners and businesses in Duck as well as other communities. To continue this effort to promote resiliency through action, the Town is in the permitting process of a phased project to construct additional shoreline protection features within the Town park and shoreline along the Currituck Sound. CIP Funding was approved in FY 2024-2025 and is anticipated to continue in FY 2025-2026.
DCK15	Promote open space preservation throughout the town's communities	Hurricane & Coastal Hazards, Flooding	3.2	Medium	Natural Resource Protection	Town Council, Town Staff	General Fund	Annual Review	New	As the Town continues to seek land acquisition opportunities to preserve open space, it will encourage privately owned communities to do the same constructing examples that can be a model for private resiliency through action. See DCK1
DCK16	Protect the oceanfront recreation area through active beach maintenance, nourishment, and public engagement	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Town Council, Town Staff	General Fund, Dare County Occupancy Tax, Municipal Service Districts, Bonds	Annual Maintenance, 5 Year Renourishment	Carry Forward	The Town recently completed the first cycle of renourishment of 1.7 miles of oceanfront beach, and the next cycle is tentatively scheduled for 2027. Before and after beach renourishment, surveys and data for the entire oceanfront are continually considered to determine whether other areas are subject to vulnerability and in need of nourishment as well. Aside from the renourishment, the Town continues to fund annual beach planting, limited sand fencing and supports a volunteer planting program to engage residents, owners and visitors in the protection of the ocean shoreline. Volunteers plant ~ 5,000 - 7,000 linear feet of beach grass each year. The Town purchased an oceanfront property with the intent of providing access for future beach nourishment, beach maintenance and emergency services. Prior to this purchase, the Town had no owned or leased access to the beach for these purposes. Town Staff continues to actively work with NC State Department of Agriculture, and researchers regarding identification and control of invasive species and continues to support facilitation of academic research to help confirm and develop modifications and improvements to best management practices along the shoreline.
DCK17	Continue to work with State and Federal Agencies to promote living shoreline opportunities along the soundfront.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Town Council, Town Staff	General Fund, Grants	2-3 Years	Carry Forward	The Town has completed the design, permitting, and construction of a living shoreline project in a vulnerable area along Currituck Sound (NC12 Resiliency Project). As a recipient of the Marvin Collins APA-NC 2024 Award for Resilience and Sustainability and a project that aligns with the North Carolina Division of Coastal Management 2022-2026 Estuarine Shoreline Strategy, the Town is sharing the project details, funding and successes with the community as well as Local, Regional, State and National organizations as a case study for future projects within our community as well as others. CIP Budgeting is in place and permitting currently in process for a shoreline protection project at the Town park facility.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK18	Increase coastal resiliency through research and progressive planning	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Town Council, Town Staff, NCDOT	General Fund, Grants	Present to 5 Years, Annual Review	Carry Forward	The Town completed Phase III of the Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management (DCM), DEQ, engineering consultants and stakeholders to identify priority projects with proposed solutions that will then be moved forward to implementation phase. A Neighborhood Stormwater Management Study was the subject of Phase III. The Town obtained grant funding from DCM to implement construction of one of the proposed SCM's identified in the Phase IV study and will begin permitting and construction in early 2025 with a completion date expected in Mid-2025. Examples of future projects include Soundside Shoreline Management Study, pursuit of new Living Shoreline and Shoreline Protection Opportunities, Sea Level Rise Analysis and Climate Adaptation Planning, Septic System and Drainfield Mapping, Townwide Stormwater Management Study, Townwide Beach Management Program, Dune Maintenance Education Program, Stormwater Outfall and Pond Retrofits, Development of Post-Hazard Assessments and establishment of a Resilience Review Team. The Town also participates and engages with NCBIWA, CSC, NC-CRCP, and State CRAC.
DCK19	Improve stormwater drainage in vulnerable areas and provide funding for necessary stormwater improvements	Hurricane & Coastal Hazards, Flooding, Tornado & Thunderstorm	3.3	High	Structural Projects	Town Staff, Town Council	General Fund, Grants	Annual	Carry Forward	Town Staff continues to identify and resolve localized roadway flooding issues as funding and resources become available. The Town identifies low lying areas through GIS mapping and flooding from rain events. The Town has a NCDWR approved emergency floodwater management plan to address stormwater flooding in these areas. Drainage and stormwater improvement projects along NC12 are continually considered and annually funded to mitigate flooding and standing water. Improvements needed related to areas of standing water along NC12 and the Duck Trail have been identified at Station Bay Marina and Sanderling Resort, Martin Lane and areas near Waxwing Lane. Other improvements and retrofit needs have been identified in the area of Kitty Hawk Kites, Wings/NC Coast/Bob's and Charles Jenkinis Lane. Grant funds are currently being sought out to address flooding at Charles Jenkins Lane, and will be the subject of a joint BRIC and LASSI Grant submittal with the Town of Southern Shores in late 2024 and early 2025. Improvements and retrofits at Wee Winks Square and the Duck Church are anticipated in 2025. The Town completed Phase II of Resilient Coastal Community Program (RCCP) working with the Division of Coastal Management, DEQ, engineering consultants and stakeholders to identify priority projects with proposed solutions that will then be moved forward to implementation phase. From these priority projects, Phase III completed a focused area study related to floodprone areas, identifying stormwater control measures (SCMs) for best management practices. This has led to a Phase IV grant submission and acquisition for a pilot project to implement one of the SCMs. This project is currently in the design and bid process with expected completion in mid-2025. The completion of the Phase III study and development of a menu of SCMs is intended to drive additional town and privately funded projects to improve resiliency and mitigate flood damage.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK20	Support the NC Board of Transportation and the NC Department of Transportation and NC Turnpike Authority construction of the Mid-County Bridge.	Hurricane & Coastal Hazards, Flooding	3.3	High	Structural Projects	Town Council, NCDOT	NCDOT	Annual	Carry Forward	In June 2022, the Town of Duck joined the Town of Southern Shores, Currituck County, Dare County Tourism Board, Duck Community and Business Alliance (DCBA), and the Currituck Chamber of Commerce in filing an Amicus Curiae (friend of the court) brief with the U.S. Court of Appeals for the Fourth Circuit supporting NCDOT and Mid-Currituck Bridge (MCB) construction in an appeal filed by NC Wildlife Federation et al against a lower court ruling in favor of bridge construction. On 23 February 2023, the U.S. Court of Appeals for the Fourth Circuit upheld the lower court ruling in favor of proceeding with MCB construction. The Town will continue to support this construction and act as needed in the coming years.
DCK20	Participate in the Dare/Currituck County Local Emergency Preparedness Committee (LEPC)	All Hazards	4.1	High	Emergency Services	Public Safety	General Fund	Quarterly	Carry Forward	The OBX LEPC is formed as a joint venture by Currituck and Dare Counties to meet the requirements of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) as a means of sharing knowledge, interest, concerns, and resources to better plan for, respond to, and recovery from chemical emergencies using an all threats/all-hazards approach. Public safety personnel is and will continue to participate in meetings and joint trainings to improve multi-jurisdictional emergency response to all hazards. Town Staff completed a 2024 HUREX, hurricane simulation event, training exercises in coordination with Dare County in June with a final report anticipated in the near future.
DCK21	Annual Review of Emergency Operations Plan	All Hazards	2.2	High	Emergency Services	Public Safety, Town Staff	General Fund	Annual	Carry Forward	The Town continues to review the Town's Emergency Operations Plan (EOP) annually in order to address any lessons learned, priorities, procedures, or additions to ensure effective implementation of the plan. Recent appendix additions to the EOP include a Continuity of Operations Plan (COOP) and Flood Response Plan (FRP).
DCK22	Develop Standard Operating procedure for Crisis Track	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Emergency Services	Public Safety, Town Staff	General Fund	6-12 Months, Annual	Carry Forward	Town staff is revisiting and reimagining the damage assessments zones to align better with the County Hurricane Assessment Software, Crisis Track. Upon completion of the new zones, a Crisis Track standard operation procedure for instructional purposes will be finalized and appended to the EOP. Annual staff training will be incorporated in the plan.
DCK23	Conduct Annual Hazard Warning Exercises with Post-Storm After Action Reports	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Emergency Services	Public Safety, Town Staff	General Fund	6-12 Months, Annual	Carry Forward	Public Safety and Town Staff will conduct annual hazard warning exercises either in collaboration with Dare County Emergency Management or individually on the implementation of the EOP and COOP with follow-up exercise to evaluate the effectiveness of the plan and to address any shortcomings. The evaluation may include post event debriefs and after action reports detailing strengths, weaknesses and areas for improvement with recommendations for implementation. A Standard procedure for this process is planned for development to ensure active participation from the various departments.
DCK24	Development of Fire CERT program.	All Hazards	1.1	High	Emergency Services	Town Staff	General Fund	Annual	New	During the FLOCK academy, Public Safety will asses the interest level of participants in formation of a CERT team. If there is a sufficient pool of interested parties, Town Staff will consider the development of a program that integrates CERT team functions within the existing structure of the Fire Department.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK25	Collaborate with Duck Fire and Town Staff to educate the homeowners, developers and landscapers on designing fire safe communities.	Wildfire	1.1	High	Public Education & Awareness	Fire Department, Town Staff	General Fund	6 Month-2 Years	Carry Forward	Fire department staff will work to produce educational, multi-media products to cover the basics of fire safety and the goals and objectives of the fire inspection program. They will continue to use town events for education and outreach along with the department's annual fire department open house and fire prevention week programming.
DCK26	Continue education efforts to promote dune maintenance.	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Division of Coastal Management	General Fund, Grant Fund	Annual	Carry Forward	Town distributes information and promotes the proper installation of sand fence and encourages the planting of native vegetation. The Town implemented volunteer based beach planting program November, 2017 and this program has continued annually at a consistent pace with support from residents, non-residents and local volunteer groups. Town Staff also identified beach vitex, an invasive species on our dunes, and initiated assistance from State resources and local researchers to develop methods to eradicate these species. Staff engaged local residents and volunteers to assist in the effort thereby educating them on both identification and treatment techniques. The Town funded a PSA related to Beach Vitex to increase awareness. As monitoring and treatment continues, additional PSAs may be developed. The Town will seek to assist other communities and encourage State resources to identify the extent of the impacts to our coastal resource so mitigation can be implemented.
DCK27	Keep effective construction techniques for coastal communities available online	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	Carry Forward	Town of Duck Floodplain webpage has been updated to include FEMA/NC Department of Insurance publications on Coastal Construction Techniques.
DCK28	Engage Community stakeholders on an annual basis with a directed focus related to heat exposure, fire and storm event risks	All Hazards	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The Town will create opportunities for public engagement from stakeholders to include citizens, residents, non-resident property owners, businesses, homeowner association and property management companies to determine their level of preparedness and understanding in emergency situations and the effectiveness of the messaging that is being disseminated. An annual grassroots Mitigation Awareness Week to coincide with Easter and Spring bulk waste will be the target timeline and may morph into a biannual event to coincide with Columbus Day and the Fall bulk waste collection; both timelines notable for both non-resident and vacationer influx. Social media incentives will be developed influence engagement.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK29	Mitigate ocean overwash and sound erosion by identifying vulnerable areas, developing public outreach information and disseminating this information to the public.	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	6 Months-Annual	Carry Forward	The Town has been monitoring high oceanfront erosion areas by documenting storm damage and taking photos/go pro and aerial drone video. A beach erosion study has been completed for the Town by the USACOE and Coastal Planning and Engineering which documents erosion patterns and existing conditions. As a result of these findings, annual beach profile surveys were initiated in 2017 to assess changing patterns and continue annually. These surveys are occasionally supplemented with aerial drone technology to develop 3D imaging analysis. The Town still needs to develop a method to track sound side shoreline, wetlands, and erosion but is optimistic that RCCP Phase II deliverables will put us in positions to acquire grant funds to complete a soundside shoreline management study. Information regarding these findings are disseminated through social media, the Town website and direct email correspondence to owners, as available. With the completion of the NC12 Resiliency project, and in anticipation of a second living shoreline project, staff is in a position to provide real life examples of the benefits of living shorelines and can work to provide resources such as video clips, best management practice interactive tutorials, grant opportunities and a contractor database for private property interests.
DCK30	Provide residents information and links to technical assistance concerning beach nourishment, re-nourishment and maintenance activities, including options such as sand fencing	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Annual	Carry Forward	The Town website, social media, The Sitting Duck Podcast, Destination Dare video productions and direct email communications are utilized to disseminate beach nourishment information. The Town provides information and issues CAMA permits to oceanfront property owners seeking to maintain their primary and frontal dunes.
DCK31	Provide residents information and links to technical assistance concerning soundfront property protection	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Annual	New	The Town website, social media, The Sitting Duck Podcast, Destination Dare video productions and direct email communications are utilized to disseminate soundside information. The Town provides information and issues CAMA permits to oceanfront property owners seeking to maintain their primary and frontal dunes.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK32	Continue to provide effective public information and education materials to disseminate data on hazards, and educate beachgoers on beach safety (rip currents, beach holes, beach fires, sand heat and heat exposure, etc.)	All Hazards	1.1	High	Public Education & Awareness	Town Council, Town Manager, Public Information Officer, Ocean Rescue	General Fund	Annual	Carry Forward	The Town continues collaboration through the County's Joint Information Center (JIC) and Emergency Management tools to include methods such as OBXAlerts and other joint marketing techniques designed for large scale public dissemination. The Town also collaborates with Dare County to participate in the Love the Beach Respect the Ocean campaign. Collaborative materials have been shared with the Town to post at lifeguard stands and ocean rescue vehicles. Continue annual and in-season evaluations and reviews regarding public safety staffing, life-guard stand locations, and effective means to communicate threats (ocean conditions, storms hazardous conditions, heat and sand threats); i.e. social media, life guard advisories, use of flag notification systems and signage at beach access locations. A Town Media Kit has been developed and distributed via email to property management companies as well as the Town's platforms to create a streamlined, branded source of information that can be shared universally. New and creative Destination Dare video productions are continually being developed to further the messaging. An informational poster with safety guidelines, rules, and other accompanying information has been developed to disseminate information in an eye-catching manner in the Town's public restroom facility. Efforts are being made to distribute these materials to local businesses. The Sitting Duck Podcast and Destination Dare video productions also supplement efforts to disseminate information to the public.
DCK33	Continue development and improvement related to the dissemination of public information to stakeholders	All Hazards	1.1	High	Public Education & Awareness	Town Staff, Town Council	General Fund	Biannual	Carry Forward	The Town effectively utilizes its website, social media, and direct email and telephone communications to communicate threats to and from its stakeholders (i.e.; property owners, residents, business owners, and vacationers), however continual research and development of new and effective means of communication are constantly pursued. Collaboration with the County's Joint Information Center (JIC) and Emergency Management has helped with the development of new techniques and technology to disseminate information. To assist with dissemination of information to stakeholders, ongoing communications and efforts to collaborate with the Duck Community and Business Alliance (DCBA), Homeowner and Property Owner Association and Civic Leagues continue. Direct emails are also sent to business owners. Databases for the purpose of direct email communications with owners are maintained and updated regularly. A communication survey was developed and conducted to evaluate our audience as well as their preferred source of information and information preferred. This survey is aiding in the creation of a Strategic Communication Plan that will provide insight on how to maximize our communication efforts on each platform. Once completed, this plan will be evaluated on a biannual basis to determine its effectiveness and new opportunities. Public Meeting summaries are shared in weekly digital newsletters to provide a summary of actions taken by Town Council and Planning Board to increase the availability of information and public engagement.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
DCK34	Develop Annual Outreach Event regarding Heat Health and Fire Safety	All Hazards	1.1	High	Public Education & Awareness	Public Safety, Town Staff	General Fund	Biannual	Carry Forward	Public Safety and Town Staff will work on the development of educational multi-media products to cover the basics of fire safety and the goals and objectives of the fire prevention inspection program. They will continue to use town events for education and outreach along with the Department's annual fire department open house and fire prevention week programming
DCK35	Develop Branded Messaging related to Flooding and the need for Flood Insurance	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Biannual	New	Town Staff in collaboration with the CRS users group developed a branded logo brochure, Prepare, Protect, Insure (PPI) which is distributed annually in conjunction with repeated and coordinated social media releases with the County and other municipal public information officers. Efforts will begin to rebrand this message based on three Rs – Raise, Rebuild, and Resiliency with anticipated release following the next storm event impacting the area.
DCK36	Development and continuation of Flock Academy	All Hazards	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The FLOCK Academy is an invaluable resource for educating stakeholders about community development regulations and hazard mitigation. This six-session course offers residents the opportunity to engage with Town Department Directors who provide insights into the workings of local government. Through interactive lessons participants gain a deeper understanding of topics such as the roles and responsibilities of the Town. By fostering civic engagement and awareness, the program empowers residents to actively contribute to community development and informed decision-making, helping to mitigate potential hazards in their neighborhoods.
DCK37	Promote Septic Health	Hurricane & Coastal Hazards, Flooding	1.1	High	Public Education & Awareness	Town Staff	General Fund	Annual	New	The CIP funded budget proposes to conduct septic system inspections of individual properties on a voluntary basis. Town staff will be launching a septic health initiative campaign to educate owners and visitors of the potential impacts to our environment and potential flooding related to overuse and inappropriate use of septic systems
DCK38	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Town Staff, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

ANNEX D. TOWN OF KILL DEVIL HILLS

D.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table D.1 provides a count of critical facilities by FEMA lifeline category within the Town of Kill Devil Hills. Figure D.1 shows the locations of all critical facilities within the Town of Kill Devil Hills.

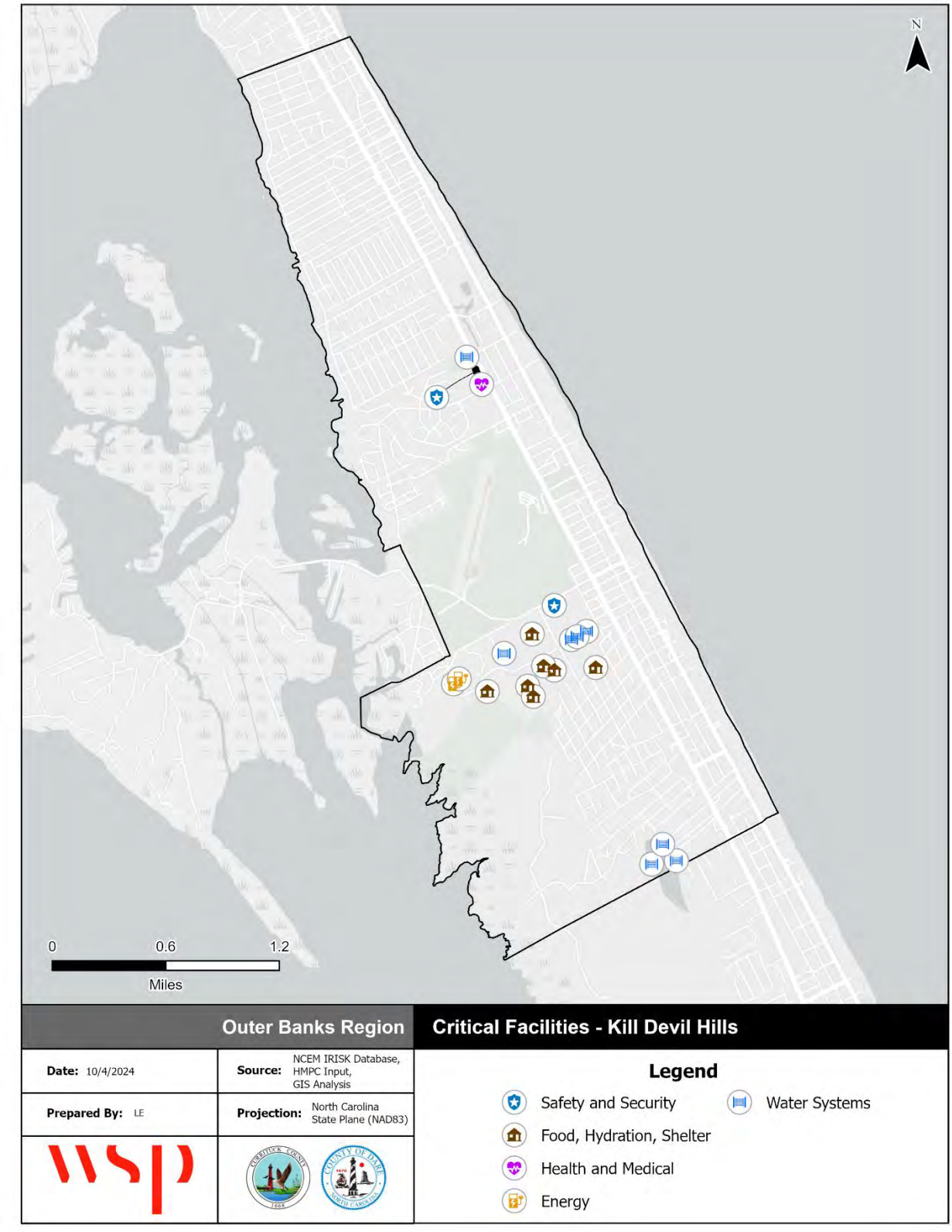
Table D.2 provides a detailed inventory of the critical facilities in Kill Devil Hills, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table D.1 – Critical Facilities by Type, Town of Kill Devil Hills

Facility Type	Count of Facility Type	Structure Value
Communications	0	$0
Energy	2	$57,700
Food, Hydration, Shelter	7	$58,583,050
Hazardous Materials	0	$0
Health and Medical	1	$4,518,400
Safety and Security	2	$4,049,533
Transportation	0	$0
Water Systems	9	$6,712,116
Total	**21**	**$73,920,799**

Source: Dare County, HMPC

Figure D.1 – Critical Facilities, Town of Kill Devil Hills



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table D.2 – Kill Devil Hills Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Energy	Substation	0 Veterans Dr	$28,850	0.10	X Shaded	NA	3	Y	0	2 - Low
Energy	Substation	0 Veterans Dr	$28,850	0.10	X Shaded	NA	3		0	0
Food, Hydration, Shelter	School	109 Veterans Dr	$6,236,080	0.10	X Shaded	NA	4		0	0
Food, Hydration, Shelter	School	100 Veterans Dr	$26,208,100	0.10	X Shaded	NA	5	Y	1	2.5
Food, Hydration, Shelter	School	109 Veterans Dr	$6,236,080	0.10	X Shaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	109 Veterans Dr	$6,236,080	0.10	X Shaded	NA	3		0	2 - Low
Food, Hydration, Shelter	School	109 Veterans Dr	$6,236,080	0.10	X Shaded	NA	4	Y	0	0
Food, Hydration, Shelter	School	109 Veterans Dr	$6,236,080	0.10	X Shaded	NA	3		0	0
Food, Hydration, Shelter	Shelter	602 Mustian St	$1,194,550	0.10	AE	NA	3		0	0
Health & Medical	Medical	1634 North Croatan Hwy	$4,518,400	0.10	AE	NA	2	Y	0	0
Safety & Security	Fire Station	1634 North Croatan Hwy	$977,833	0.10	AE	NA	2	Y	0	0
Safety & Security	Police Station	102 Town Hall Drive	$3,071,700	0.10	X Shaded	NA	3	Y	1	2 - Low
Water Systems	Treatment Plant	600 Mustian St	$1,194,550	0.10	AE	NA	3	Y	0	0
Water Systems	Treatment Plant	1634 Croatan Hwy	$977,833	0.10	AE	NA	2	Y	0	0
Water Systems	Treatment Plant	600 Mustian St	$1,194,550	0.10	X Shaded	NA	3		0	3 - Moderate
Water Systems	Treatment Plant	600 Mustian St	$1,194,550	0.10	X Shaded	NA	3		0	0
Water Systems	Treatment Plant	500 Eighth St	$388,600	0.10	X Shaded	NA	3		0	2 - Low
Water Systems	Treatment Plant	500 Eighth St	$388,600	0.10	X Shaded	NA	4		2	0
Water Systems	Treatment Plant	500 Eighth St	$388,600	0.10	X Shaded	NA	3	Y	2	0
Water Systems	Treatment Plant	801 Bermuda Bay Blvd	$7,000	0.10	X Shaded	NA	4	Y	0	0
Water Systems	Treatment Plant	1634 N Croatan Hwy	$977,833	0.10	AE	NA	2	Y	0	0

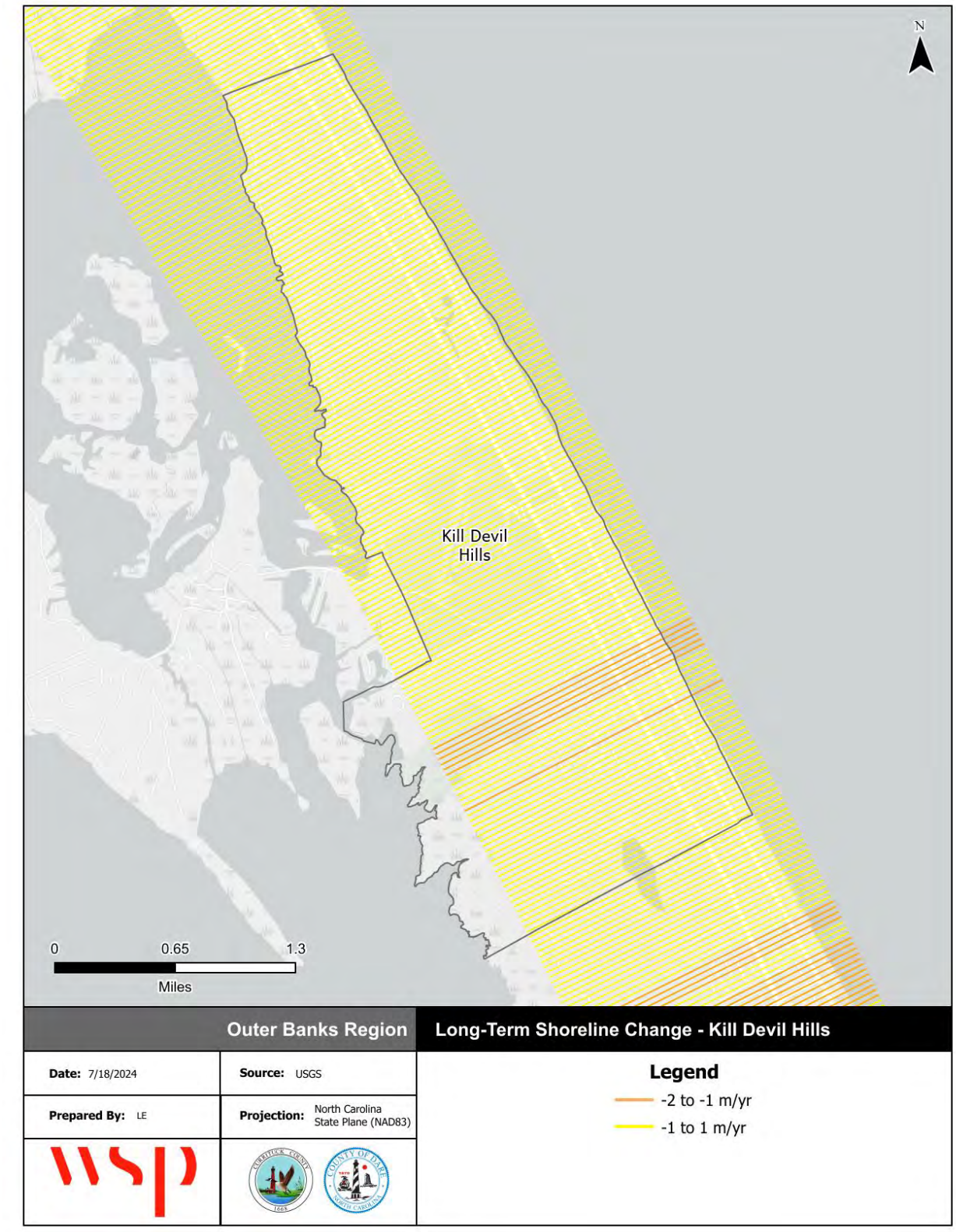
D.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Kill Devil Hills. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

D.2.1 HURRICANE & COASTAL HAZARDS

Figure D.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Town of Kill Devil Hills oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of the Town of Kill Devil Hills is experiencing some level of change every year.

Figure D.2 – Long-Term Shoreline Change Rate, Town of Kill Devil Hills



Source: Source: United States Geological Survey

D.2.2 FLOODING

Table D.3 details the acreage of the Town of Kill Devil Hills total area by flood zone on the effective DFIRM and previous 2006 FIRM. Per this assessment, over 15 percent of the Town falls within the current effective mapped 1%-annual-chance floodplains. Over 65 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplains. The remainder is within the 0.2 percent annual chance floodplain.

Table D.3 – Flood Zone Acreage in the Town of Kill Devil Hills

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	388.91	10.77%	2,068.94	57.31%
Zone A	--	--	13.36	0.37%
Zone AO	36.86	1.02%		
Zone VE	145.53	4.03%	279.42	7.74%
Zone X (500-year)	92.34	2.56%	1,248.12	34.58%
Zone X Unshaded	2,946.39	81.61%	--	--
Open Water	0.11	0.00%	--	--
Total	**787,218.60**	**--**	**3,609.83**	**--**

Source: FEMA Effective DFIRM and 2006 FIRM

Figure D.3 reflects the effective mapped flood hazard zones for the Town of Kill Devil Hills, and Figure D.4 reflects the flood hazard zones from the previous 2006 FIRM.

Figure D.5 and Figure D.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table D.4 provides building counts and values for critical facilities by flood zone in the Town of Kill Devil Hills based on the 2006 FIRM.

Table D.4 - Critical Facilities Exposed to Flooding, Town of Kill Devil Hills

Flood Zone	Critical Facility Count	Structure Value
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	15	$64,079,800.00
Total	**15**	**$64,079,800.00**

Source: FEMA 2006 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table D.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table D.6 summarizes exposure using the current effective FIRM as a baseline.

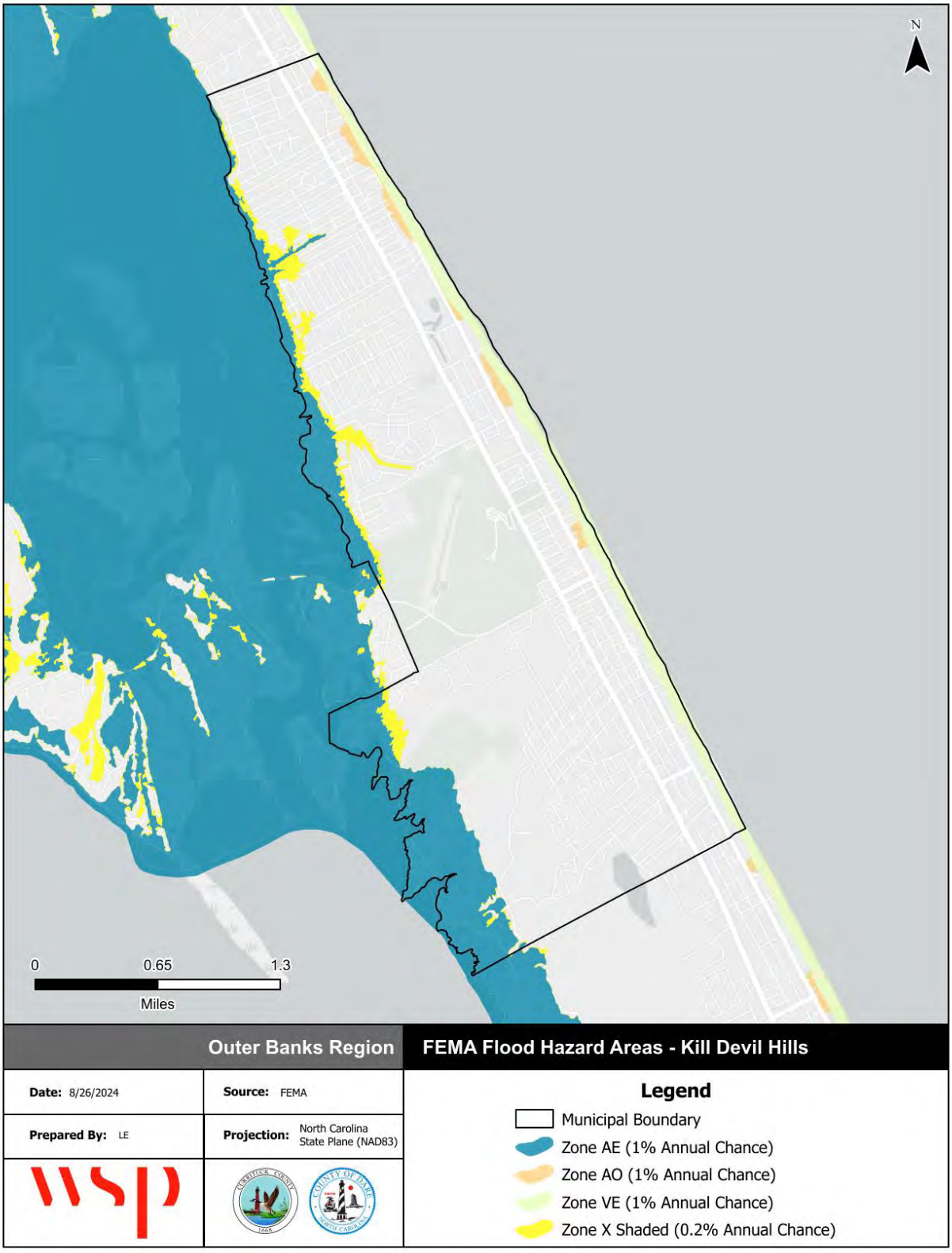
Table D.5 – Current and Future Property Exposure to Flooding, Current and Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**3,461**	**$687,964,462**	**$396,266,324**	**$1,084,230,786**
Agriculture	0	$0	$0	$0
Commercial	205	$78,998,054	$78,998,054	$157,996,107
Education	2	$10,774,315	$10,774,315	$21,548,630
Government	26	$2,771,334	$2,771,334	$5,542,668
Industrial	18	$5,212,025	$7,818,037	$13,030,062
Religious	6	$1,600,433	$1,600,433	$3,200,866
Residential	3,204	$588,608,302	$294,304,151	$882,912,453
+1 Foot Freeboard	**626**	**$95,779,607**	**$48,502,185**	**$144,281,792**
Agriculture	0	$0	$0	$0
Commercial	9	$5,224,763	$5,224,763	$10,449,526
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$283,808	$425,712	$709,520
Religious	1	$60,579	$60,579	$121,158
Residential	92	$25,989,853	$12,994,927	$38,984,780
+2 Foot Freeboard	**494**	**$96,529,024**	**$58,751,838**	**$155,280,862**
Agriculture	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	1	$20,728,800	$20,728,800	$41,457,600
Government	0	$0	$0	$0
Industrial	2	$122,926	$184,389	$307,315
Religious	0	$0	$0	$0
Residential	491	$75,677,298	$37,838,649	$113,515,947
+3 Foot Freeboard	**468**	**$86,287,466**	**$51,044,452**	**$137,331,918**
Agriculture	0	$0	$0	$0
Commercial	5	$869,459	$869,459	$1,738,918
Education	2	$14,570,778	$14,570,778	$29,141,556
Government	0	$0	$0	$0
Industrial	1	$180,600	$270,900	$451,500
Religious	0	$0	$0	$0
Residential	460	$70,666,629	$35,333,315	$105,999,944

Table D.6 – Current and Future Property Exposure to Flooding, 2006 FIRM

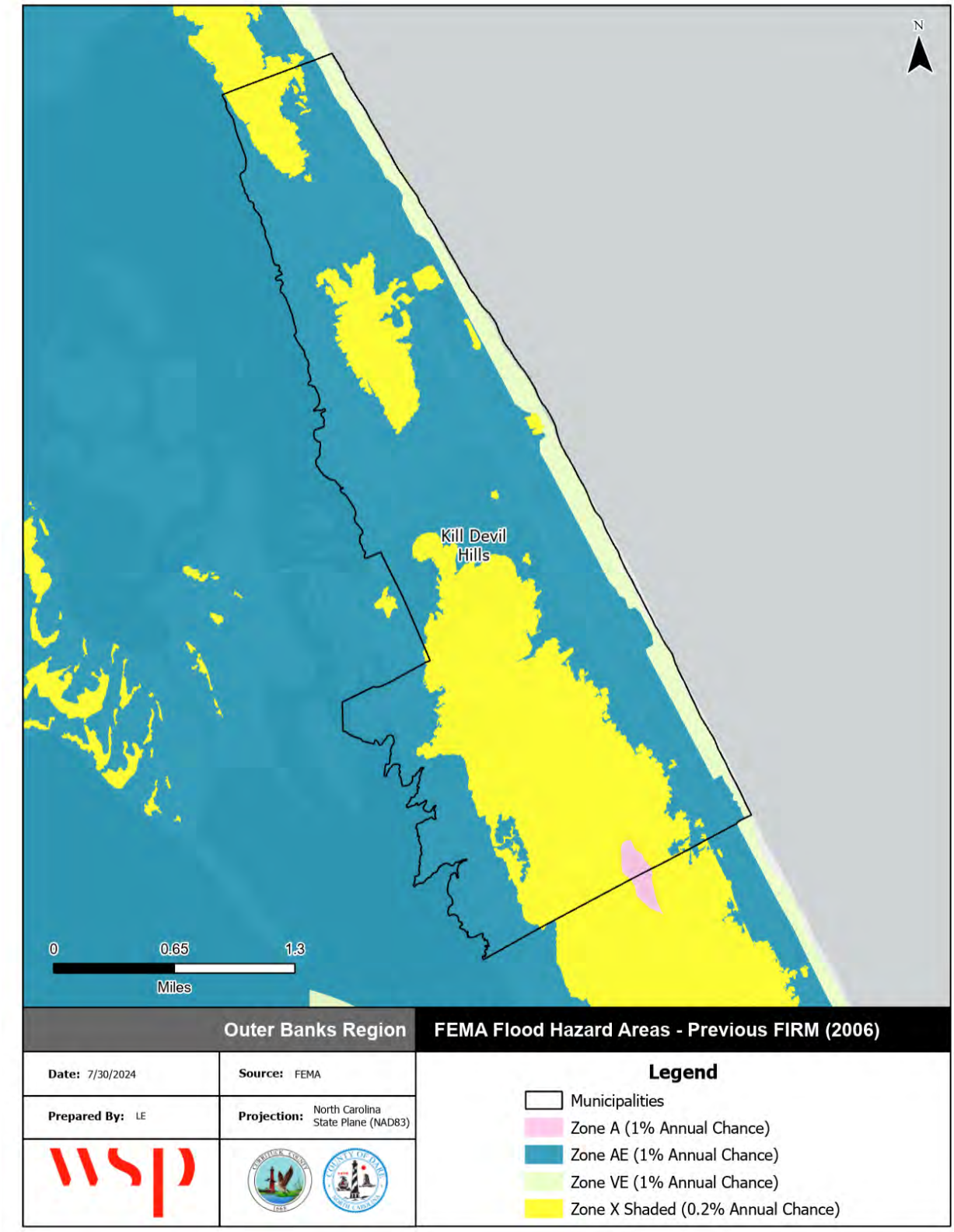
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**3,845**	**$668,654,509**	**$359,729,363**	**$1,028,383,872**
Agriculture	0	$0	$0	$0
Commercial	127	$45,061,360	$45,061,360	$90,122,719
Education	1	$428,676	$428,676	$857,352
Government	23	$1,854,698	$1,854,698	$3,709,396
Industrial	5	$1,371,542	$2,057,313	$3,428,855
Religious	3	$716,400	$716,400	$1,432,800
Residential	3,686	$619,221,833	$309,610,917	$928,832,750
+1 Foot Freeboard	**876**	**$165,115,135**	**$96,661,514**	**$261,776,649**
Agriculture	0	$0	$0	$0
Commercial	51	$24,266,633	$24,266,633	$48,533,266
Education	0	$0	$0	$0
Government	1	$889,254	$889,254	$1,778,508
Industrial	4	$1,083,986	$1,625,980	$2,709,966
Religious	3	$884,033	$884,033	$1,768,066
Residential	817	$137,991,229	$68,995,614	$206,986,843
+2 Foot Freeboard	**620**	**$114,635,942**	**$63,222,494**	**$177,858,437**
Agriculture	0	$0	$0	$0
Commercial	20	$6,540,001	$6,540,001	$13,080,002
Education	1	$66,942	$66,942	$133,884
Government	1	$240,100	$240,100	$480,200
Industrial	12	$2,481,002	$3,721,502	$6,202,504
Religious	0	$0	$0	$0
Residential	586	$105,307,898	$52,653,949	$157,961,847
+3 Foot Freeboard	**578**	**$98,426,431**	**$58,624,858**	**$157,051,289**
Agriculture	0	$0	$0	$0
Commercial	10	$3,084,191	$3,084,191	$6,168,382
Education	1	$125,971	$125,971	$251,942
Government	2	$27,382	$27,382	$54,764
Industrial	7	$7,792,870	$11,689,305	$19,482,175
Religious	0	$0	$0	$0
Residential	558	$87,396,017	$43,698,009	$131,094,026

Figure D.3 – FEMA Flood Hazard Areas, Town of Kill Devil Hills



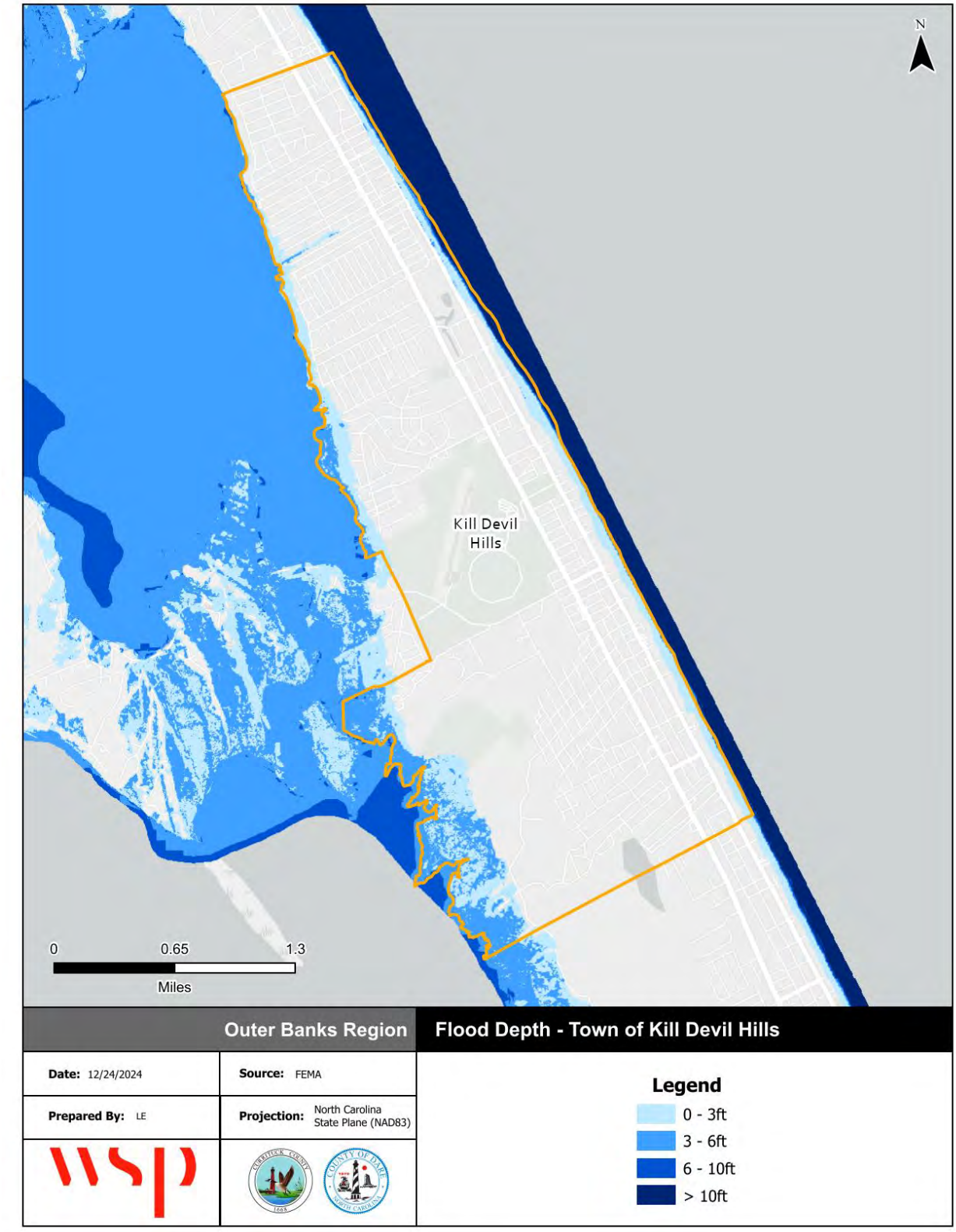
Source: FEMA Effective DFIRM

Figure D.4 – FEMA Flood Hazard Areas, Town of Kill Devil Hills – 2006 FIRM



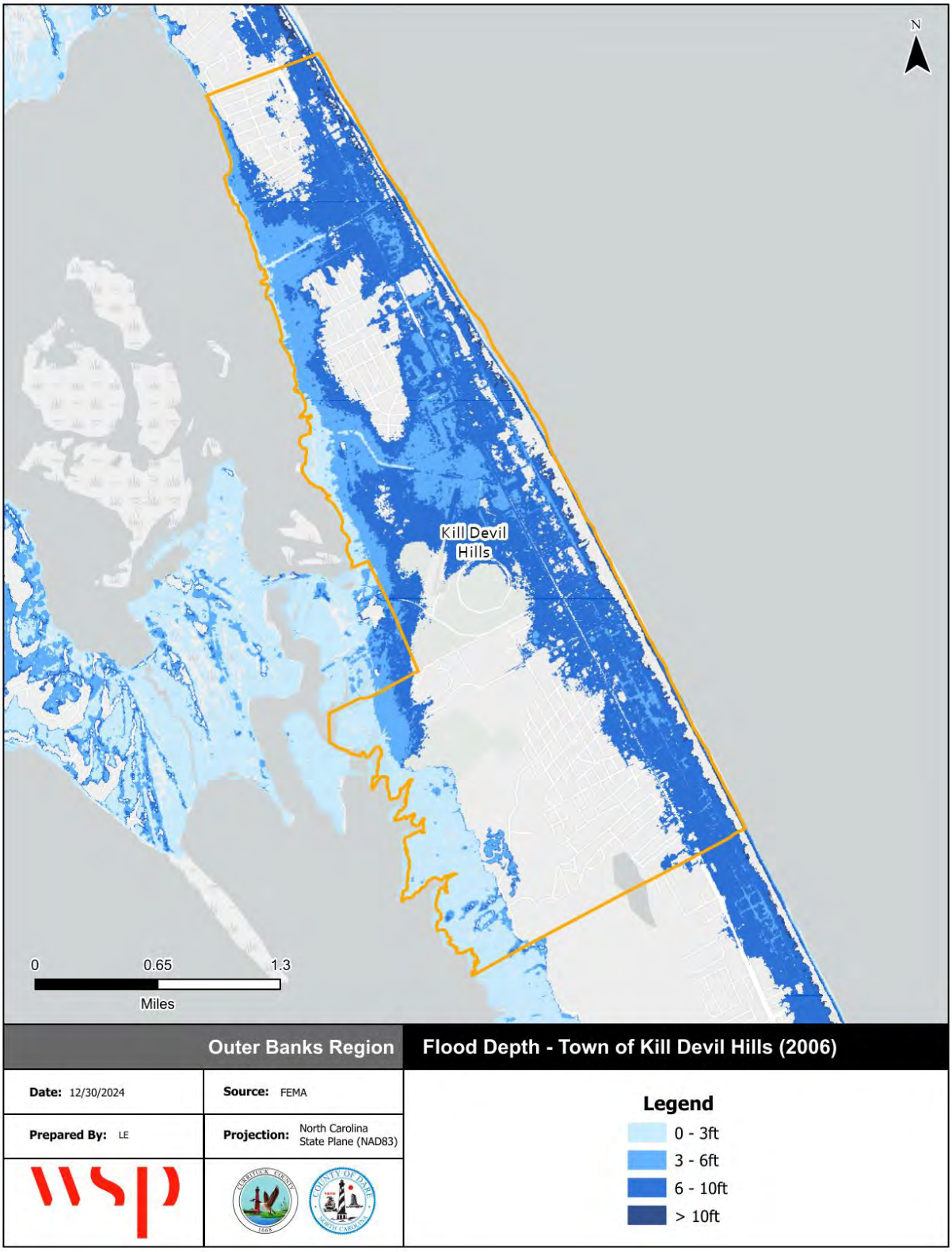
Source: FEMA 2006 FIRM

Figure D.5 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Kill Devil Hills



Source: FEMA Effective DFIRM

Figure D.6 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Kill Devil Hills- 2006 FIRM



Source: FEMA 2006 FIRM

FLOOD INSURANCE DATA

The Town of Kill Devil Hills joined the NFIP emergency program in 1971and has been a regular participant in May the NFIP since October 1973. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table D.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	4,409	$2,513,806	$1,219,608,000	9,087	$94,564,531.46
2-4 Family	53	$34,474	$13,150,000	260	$4,933,290.70
All Other Residential	323	$61,037	$62,399,000	143	$5,363,009.33
Non-Residential	333	$411,820	$128,391,000	1,654	$39,830,522.81
Total	**5,118**	**$3,021,137**	**$1,423,548,000**	**11,144**	**$144,691,354.30**

Source: FEMA Community Information System, accessed December 2024

Table D.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3,938	$2,294,966	$1,068,509,000	9,098	$123,703,774.77
A Zones	18	$13,815	$4,344,000	477	$4,564,407.17
AO Zones	14	$10,122	$4,797,000	20	$57,954.95
V01-30 & VE Zones	19	$17,177	$4,797,000	397	$4,132,373.90
V Zones	0	$0	$5,101,000	396	$3,744,436.97
B, C & X Zone					
Standard	1,053	$655,020	$324,263,000	556	$7,048,192.79
Preferred	0	$0	$0	113	$809,447.80
Total	**5,042**	**$2,991,100**	**$1,407,014,000**	**11,057**	**$144,060,588.35**

Source: FEMA Community Information System, accessed December 2024

Table D.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	535	$386,946	$126,404,000	2,516	$55,925,585.66
A Zones	5	$6,249	$1,065,000	322	$3,267,798.34
AO Zones	1	$598	$170,000	1	$10,263.55
V01-30 & VE Zones	6	$5,539	$1,109,000	243	$2,320,048.39
V Zones	0	$0	$0	377	$3,642,799.86
B, C & X Zone	135	$101,777	$41,458,000	282	$3,987,182.79
Standard	135	$101,777	$41,458,000	272	$4,053,751.18
Preferred	0	$0	$0	13	$47,172.25
Total	**682**	**$501,109**	**$170,206,000**	**3,741**	**$69,153,678.59**

Source: FEMA Community Information System, accessed December 2024

Table D.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	3,403	$1,908,020	$942,105,000	6,582	$67,778,189.11
A Zones	13	$7,566	$3,279,000	155	$1,296,608.83
AO Zones	13	$9,524	$4,627,000	19	$47,691.40
V01-30 & VE Zones	13	$11,638	$3,992,000	154	$1,812,325.51
V Zones	0	$0	$0	19	$101,637.11
B, C & X Zone	918	$553,243	$282,805,000	384	$3,756,717.16
Standard	918	$553,243	$282,805,000	284	$2,994,441.61
Preferred	0	$0	$0	100	$762,257.55
Total	**4,360**	**$2,489,991**	**$1,236,808,000**	**7,313**	**$74,793,169.12**

Source: FEMA Community Information System, accessed December 2024

D.2.3 WILDFIRE

Table D.11 summarizes the acreage in the Town of Kill Devil Hills that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 44 percent of the Town of Kill Devil Hills is not included in the WUI.

Table D.11 – Wildland Urban Interface Acreage, Town of Kill Devil Hills

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	1,611.2	44.5%
	LT 1hs/40ac	11.7	0.3%
	1hs/40ac to 1hs/20ac	24.2	0.7%
	1hs/20ac to 1hs/10ac	34.9	1.0%
	1hs/10ac to 1hs/5ac	44.2	1.2%
	1hs/5ac to 1hs/2ac	228.2	6.3%
	1hs/2ac to 3hs/1ac	946.0	26.1%
	GT 3hs/1ac	724.3	20.0%
	Total	**3,624.7**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure D.7 depicts the WUI for the Town of Kill Devil Hills. Figure A.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure D.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Potential fire intensity is highest in the southwestern part of the Town of Kill Devil Hills. Much of this area falls outside the WUI; however, the eastern and northern fringes of this area contain the highest areas of risk in the Town, where housing, moderate to high fire intensity, and burn probability overlap.

Table D.12 provides the count and estimated value of all structures that intersect with areas of the Town of Kill Devil Hills that are rated moderate to high on the WUI Risk Index.

Table D.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Kill Devil Hills

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	102	$44,148,186	$44,148,186	$88,296,371
Education	4	$45,947,922	$45,947,922	$91,895,844
Government	11	$2,081,522	$2,081,522	$4,163,044
Industrial	22	$12,171,520	$18,257,280	$30,428,800
Religious	6	$1,600,433	$1,600,433	$3,200,866
Residential	3456	$575,453,071	$287,726,536	$863,179,607
Total	**3,601**	**$681,402,654**	**$399,761,878**	**$1,081,164,532**

Source: Southern Wildfire Risk Assessment

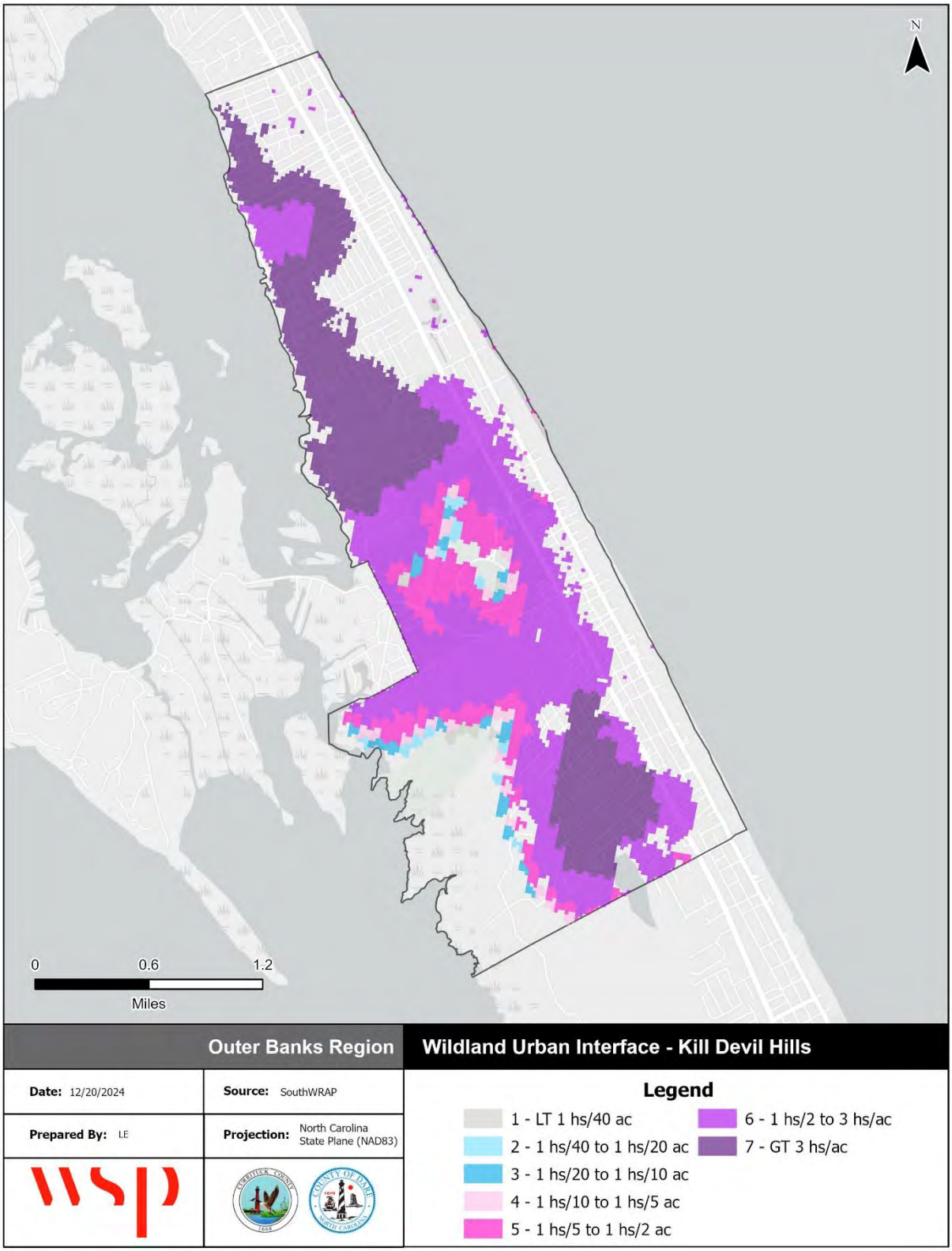
Table D.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table D.13 – Critical Facilities Exposed to Wildfire, Town of Kill Devil Hills

Type	Critical Facility Count	Structure Value
Communications	0	$0
Energy	1	$28,850
Food, Hydration, Shelter	3	$38,680,260
Hazardous Materials	0	$0
Health and Medical	1	$4,518,400
Safety and Security	2	$4,049,533
Transportation	0	$0
Water Systems	5	$3,545,816
Total	**12**	**$50,822,859**

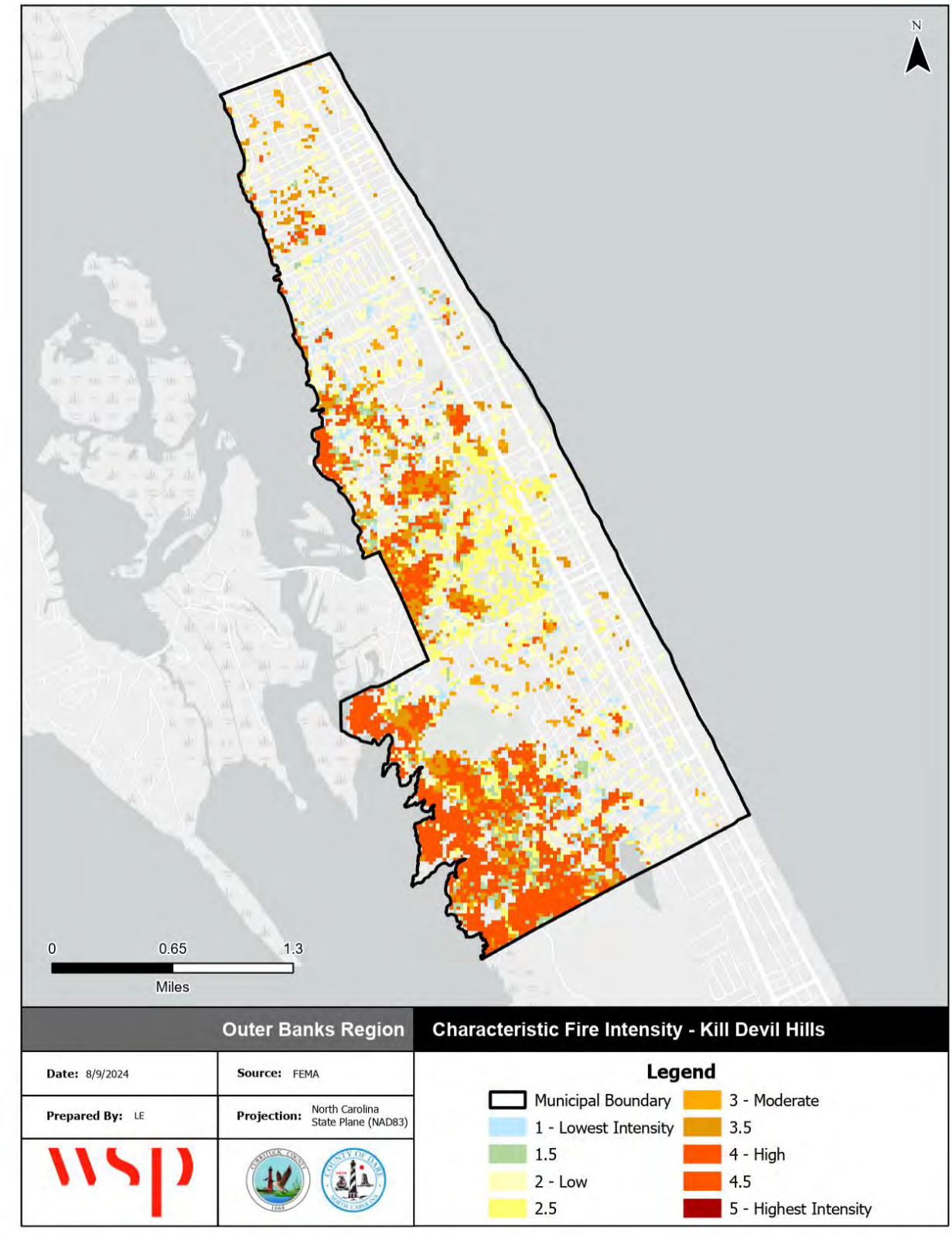
Source: Southern Wildfire Risk Assessment

Figure D.7 – Wildland Urban Interface, Town of Kill Devil Hills



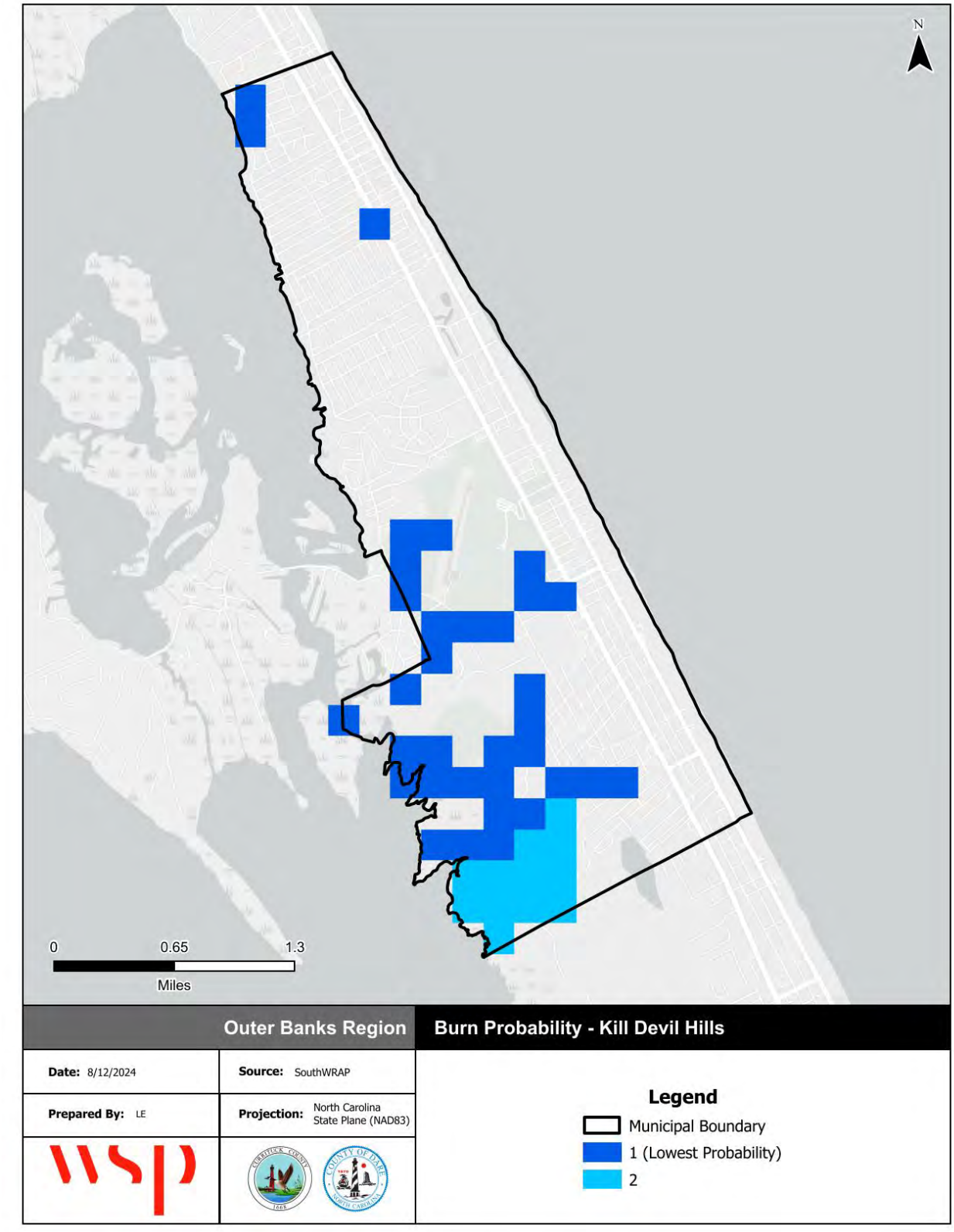
Source: Southern Wildfire Risk Assessment

Figure D.8 – Fire Intensity Scale, Town of Kill Devil Hills



Source: Southern Wildfire Risk Assessment

Figure D.9 – Burn Probability, Town of Kill Devil Hills



Source: Southern Wildfire Risk Assessment

D.3 MITIGATION STRATEGY

Table D.14 – Mitigation Action Plan, Town of Kill Devil Hills

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH1	Drainage System Maintenance - Continue mowing drainage ditches and conduct normal maintenance and storm event driven maintenance	Flooding, Hurricane & Coastal Hazards	2.2	High	Prevention	Public Services, NCDOT	General Fund	Annually	Carry Forward	Drainage maintenance has been completed annually and upgrades to the drainage system have also been completed.
KDH2	Maritime Forest Environmental Zoning District - Pursue mitigation and preparedness planning within this district.	Wildfire	3.2	High	Prevention	Planning Department	General Fund	Annually	Carry Forward	North Carolina Forest Service in conjunction with the Town Fire Department and the Nature Conservancy have preformed several controlled burns to the benefit of the Maritime Forest. Work with TNC and NC Forest Service to develop a written plan for KDH.
KDH3	Flood Response - Coordinate efforts to expedite reconstruction and resilient rebuilding efforts in cooperation with Dare County Emergency Management staff.	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather	3.1	High	Prevention	Planning Department	General Fund	1-3 years	Carry Forward	Town has had no State of Emergency since last update but will continue the policy for any future event.
KDH4	Fire Protection - Implement Water Systems Master Plan	Wildfire	3.3	High	Prevention	Public Services, Water Department	Water Fund	1-5 years	Carry Forward	Town continues to implement the Water System Master Plan. 3,847 linear feet of water line were replaced in 2023 Flow test are still required for all new development sites. Amendment to Zoning for sprinklers in SFD over 6,000 Sf on the oceanfront.
KDH5	Storm Water Management - Continue to implement the storm water management plan. Local Planning and Regulations.	Flooding, Hurricane & Coastal Hazards	3.3	High	Prevention	Public Services	General Fund	6 months	Carry Forward	Town implemented stormwater regulations for large single family dwellings. Maintenance requirements are being enforced on all engineered stormwater designs. Additional regulations and amendments will be considered.
KDH6	Map Information - Maintain updated flood map information for citizens and customers. Map Erosion areas annually to help inform the public of high erosion areas.	Flooding, Hurricane & Coastal Hazards	1.1	High	Prevention	NC Division of Emergency Management, Planning Department	NC Division of Emergency Management	1 year	Carry Forward	Historic Flood Maps have been digitized into laser fiche. Flood outreach is completed annually to all residents and also to targeted groups with particular risks. Erosion prone areas have not been mapped at this time but still need to be looked at. Maintain CAMA Erosion Rate Maps.
KDH7	Continue to participate in CRS	Flooding, Hurricane & Coastal Hazards	3.3	High	Prevention	Planning Department	General Fund	Annually	Carry Forward	Town completed a cycle visit in 2023 maintaining a Class 5 community. The Town had enough points for a Class 4 but did not have some the prerequisite for the Class. We will be working toward Class 4 in next cycle. The Town has completed annual recertifications.
KDH8	Develop Stormwater Management Working Group	Flooding, Hurricane & Coastal Hazards	4.3	High	Prevention	County And neighboring Municipalities	Staff Time	2-5 Years	New	
KDH9	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Prevention, Public Education & Awareness	Planning Department, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH10	Develop Heat Emergency Response Procedure	Excessive Heat	1.1, 3.3	Medium	Prevention	Planning Department, Fire Department and Dare County Emergency Management	General Fund	2-3 years	New	
KDH11	Relocation/Elevation - Relocate or elevate repetitive loss and high risk properties and expedite permitting for these situations	Flooding, Hurricane & Coastal Hazards	1.2	Medium	Property Protection	Planning Department	General Fund	3-5 years	Carry Forward	There have been no requests from houses within repetitive loss areas to implement mitigation with express permitting unless it was in a State of Emergency during which all permits are expedited.
KDH12	Acquisition - Encourage repetitive loss and high risk properties to consider acquisition as a possible solution	Flooding, Hurricane & Coastal Hazards	1.2	Low	Property Protection	Planning Director, Board of Commissioners	NC Division of Emergency Management, FEMA	5+ years	Carry Forward	Continues to be incomplete for lack of funding.
KDH13	Critical Facilities Protection - Take appropriate actions to prevent and/or minimize damages to critical facilities. Use generators or other forms of redundant power to ensure that critical facilities and infrastructure remain operational.	All Hazards	2.1/2.2	High	Property Protection	Police, Fire & Rescue, Public Works, NC Dominion Power	General Fund	1-3 years	Carry Forward	Additional critical facilities outside of government owned are reviewed for having alternative power (generators) and hurricane ready construction methods. New Fire Station constructed and occupied in 2024 has up to date hurricane protective measures and generators
KDH14	Substantial Damage/Substantial Improvement - Lower Threshold	Flooding, Hurricane & Coastal Hazards	3.1	High	Property Protection	Planning	General Fund	1-3 years	New	
KDH15	Open Space Preservation - Support efforts to preserve natural areas	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	3.3	High	Natural Resource Protection	Planning Department	General Fund	3-5 years	Carry Forward	Continues to be incomplete for lack of funding.
KDH16	Reservoirs - 1. Coordinate with Nags Head on the future of Fresh Pond. 2. Maintain liaison with NC Division of Coastal Management concerning the development of the Kill Devil Hills Land Use Plan	Flooding, Hurricane & Coastal Hazards, Severe Winter Weather	3.1	High	Natural Resource Protection	Planning Department, CAMA	General Fund	1 year	Carry Forward	CAMA Land Use Plan was updated and adopted September 2020 and CRC Certified November 2020. The CAMA AEC around Fresh Pond has been maintained. Work with Nags Head on removing Fresh Pond from the AEC and using Fresh Pond as a resource for recreation, stormwater management, and open space.
KDH17	Surface Water Quality - Preserve surface water quality and enhance water quality through storm water management and zoning.	Flooding, Hurricane & Coastal Hazards	3.2	High	Natural Resource Protection	Planning Department, Public Services	General Fund	3-5 years	Carry Forward	Town continues to upgrade and maintain existing stormwater drainage system. Town is working on a major drainage project on Wrightsville Ave to alleviate dependence on ocean outfalls (2024).
KDH18	Septic Health Initiative	Flooding (including Sea Level Rise)	1.1, 3.1	High	Natural Resource Protection, Public Education & Awareness	Planning and Dare County Health Department	General Fund	1-3 years	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH19	Dune and Beach Maintenance - Continue ongoing beach nourishment efforts	Flooding, Hurricane & Coastal Hazards	3.2	High	Structural Projects	Planning Director, Board of Commissioners	General Fund	Monitor Annually, nourish every 5 years	Carry Forward	5 year renourishment project was completed in July 2022 along with an updated Beach Maintenance Plan . The Town also contracts for annual monitoring of the engineered beach. Adopted a more strict zoning regulations for dune protection.
KDH20	Complete the Wrightsville Goddard Street Intercept Project	Flooding (including Sea Level Rise)	1.2, 2.1	High	Structural Projects	Planning Department and Public Services	General Fund and Grants	1-3 years	New	
KDH21	Increase Storm Drainage Capacity and improve stormwater quality	Flooding (including Sea Level Rise), Hurricane & Coastal Hazards	1.2	High	Structural Projects	Planning Department and Public Services	General Fund and Grants	1-5 years	New	
KDH22	Develop Living Shorelines to prevent estuarine erosion	Flooding, Hurricane & Coastal Hazards (including Erosion)	1.2, 3.2	High	Structural Projects	Planning	General Fund and Grants	2-5 years	New	
KDH23	Virginia Dare Shores: Lee Ave with Portion of Aycock and Eden	Flooding (including Sea Level Rise)	1.2, 2.1	High	Structural Projects	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH24	US158 East First St to East Second and Princess Anne Road	Flood (including sea level rise)	1.2, 2.1	High	Structural Project	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH25	West Third Street, Indian Drive, Clamshell Drive and connecting streets	Flood (including sea level rise)	1.2, 2.1	High	Structural Project	Planning Department and Public Services	General Funds and Grants	2-5 years	New	
KDH26	Extend NCDOT Outfalls	Flooding	1.2, 2.1	High	Structural Projects	NCDOT	NCDOT	1-5 Years	New	
KDH27	Hazard Warning - Facilitate evacuation	All Hazards	1.1	High	Emergency Services	Dare County Control Group	General Fund	Annually	Carry Forward	Dare County tests its emergency system and procedures annually.
KDH28	Health and Safety Maintenance - Develop ongoing protocols to assure the maintenance of critical public services	All Hazards	2.1	High	Emergency Services	Police, Fire & Rescue, Public Works, Dare County Emergency Management	General Fund	Annually	Carry Forward	Town reviews and inspects critical public facilities continually throughout the year and also does a pre-check in the event of a pending storm
KDH29	Emergency Services - Hurricane Exercises	Hurricane & Coastal Hazards	2.1	High	Emergency Services	Planning Department	General Fund	1 year	Carry Forward	Town continues to participate in the Dare County Emergency response training, a multi jurisdictional training exercises. Town reviews and update Kill Devil Hills' Emergency Plan annually.
KDH30	Hazard Recovery - Coordinate efforts to expedite recovery.	All Hazards	1.1	High	Public Education & Awareness	Planning Department, Board of Commissioners	General Fund	1 year	Carry Forward	Town Public Information Officer works closely with all other jurisdictions and Dare County. Dare County serves as the point of information with input from the Towns to create a unified message.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KDH31	Insurance - Maintain outreach efforts and continue making flood insurance available to the Town's residents	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning Department, Town Clerk	General Fund	1 year	Carry Forward	Continue to follow the Town PPI plan and annual updates for public outreach and education. Continue coordinate with CRS Users Group on regional outreach projects.
KDH32	Compile and maintain current information in the Kill Devil Hills Floodplain Management Library	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	CRS Coordinator	General Fund	Annually	Carry Forward	Town has scanned all historic flood maps and elevation certificates. Planning Department has developed a scanning protocol to ensure build permits and associated submittals are scanned at the completion of a project including but not limited to as built surveys, elevation certificates and permits. The Town is currently working on an educational video on how to prepare your home from freezing temperatures both about energy efficiency and avoiding frozen pipes. We will also be looking into another educational video on heat stroke and how to protect yourself in extreme heat this spring/ summer. The video will run on Government TV, Town YouTube channel and the Town website.
KDH33	Outreach Projects - Initiate outreach projects to inform the public on Town and County initiatives that will reduce hazard related losses of property and life	All Hazards	1.1	High	Public Education & Awareness	Planning Department, Dare County Emergency Management	General Fund	1 year or Annually	Carry Forward	Continue to follow the Town PPI plan for public outreach and education for flood-related hazards. Additional all-hazards education efforts includes mailings, videos, brochures, public engagement and coordinated efforts with Dare County outreach.
KDH34	Circulate brochure specifically on NFIP	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning Department	General Fund	Annually	Carry Forward	Town maintained a Class 5 CRS rating in 2023. Town continue to strive to improve. Town provides FEMA publication in the office, on the Town website and at the Kill Devil Hills Public Library
KDH35	Conduct contractors meeting - Hold an annual outreach meeting for engineers and developers on how to construct to a higher standard to prevent damage.	All Hazards	3.1	High	Public Education & Awareness	Planning Department	General Fund	1 year	Carry Forward	Missed several year of contractor meeting due to global pandemic. Held a surveyor/engineers Elevation Certificate training by NCEM at KDH Town Hall Spring 2024 and planning a contractor meeting Fall 2024.
KDH36	Outreach Projects - Present at civic groups, professional organizations, etc. annually for citizens and stakeholder groups to discuss hazards and how to protect themselves.	All Hazards	1.1	High	Public Education & Awareness	Planning Department	General Fund	1 year	Carry Forward	Presented Hurricane Preparation and Flood Information and protection session at the Dare County Senior Center in 2023 and 2024. AS well as targeted outreach efforts to other civic groups.
KDH37	Create educational brochure on the dangers of extreme heat and cold and steps the public can take to protect themselves	Excessive Heat, Severe Winter Weather	1.1	Medium	Public Education & Awareness	Planning Department	General Fund	1-2 years	Carry Forward	Not yet completed. Still a priority.
KDH38	Mitigation education for homeowners	All Hazards	1.1	Medium	Public Education & Awareness	Planning Department	General Fund	2-3 years	Carry Forward	Mitigation education is part of our brochures. Need to create a presentation calendar for the Board of Commissioners. This action includes pre-event preparedness outreach.
KDH39	Keep Storm Drains Open Education Campaign	Flooding, Hurricane & Coastal Hazards	1.1	High	Public Education & Awareness	Planning and Public Services	General Fund	1-3 Years	New	
KDH40	Wildfire Education Program	Wildfire	1.1	Medium	Public Education & Awareness	Fire Department	General Fund	3-5 years	New	

ANNEX E. TOWN OF KITTY HAWK

E.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table E.1 provides a count of critical facilities by FEMA lifeline category within the Town of Kitty Hawk. Figure E.1 shows the locations of all critical facilities within the Town of Kitty Hawk.

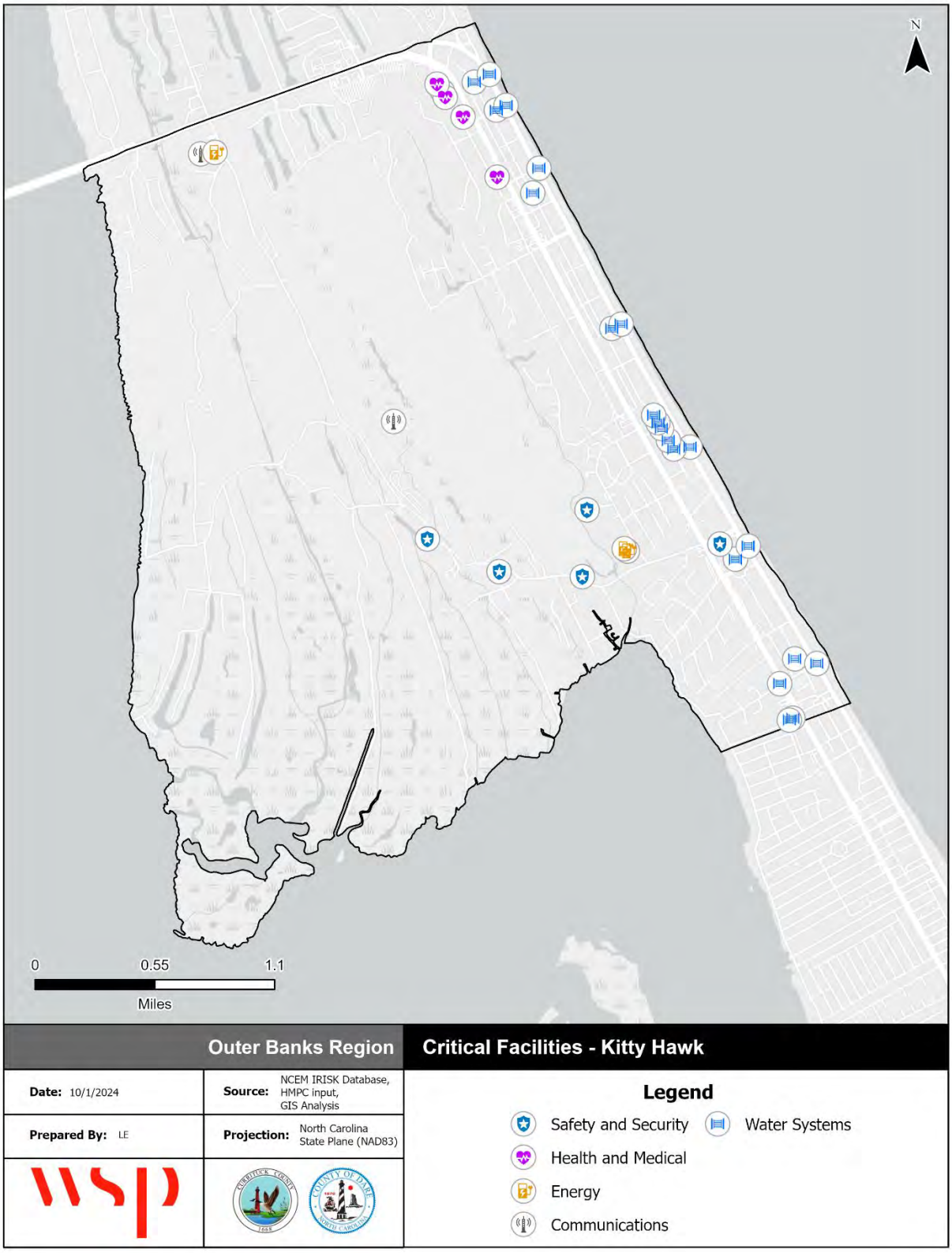
Table E.2 provides a detailed inventory of the critical facilities in Kitty Hawk, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table E.1 – Critical Facilities by Type, Town of Kitty Hawk

Facility Type	Count of Facility Type	Structure Value
Communications	2	$881,500
Energy	3	$1,112,200
Food, Hydration, Shelter	0	$0
Hazardous Materials	0	$0
Health and Medical	4	$2,057,250
Safety and Security	6	$4,814,850
Transportation	0	$0
Water Systems	21	$531,600
Total	**36**	**$9,397,400**

Source: Dare County, HMPC

Figure E.1 – Critical Facilities, Town of Kitty Hawk



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table E.2 – Kitty Hawk Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Communications	Communications	5300 The Woods Rd	$881,500	0.10	X Shaded	NA	2	Y	0	0
Communications	Communications	4371 The Woods Rd	$0	0.10	AE	NA	4		1	1 - Lowest Intensity
Energy	Power Plant	3912 Shelby Ave	$115,350	0.10	X Shaded	NA	NA		0	4 - High
Energy	Power Plant	3912 Shelby Ave	$115,350	0.10	X Shaded	NA	NA		0	0
Energy	Power Plant	5300 The Woods Rd	$881,500	0.10	X Shaded	NA	3		0	0
Health & Medical	Medical	5200 N Croatan Hwy	$482,450	0.10	X Shaded	NA	NA		0	0
Health & Medical	Medical	5112 N Croatan Hwy	$1,052,000	0.10	X Shaded	NA	NA		0	0
Health & Medical	Medical	4904 N Croatan Hwy	$0	0.10	X Shaded	NA	3	Y	0	0
Health & Medical	Medical	5200 N Croatan Hwy	$522,800	0.10	X Shaded	NA	NA		0	0
Safety & Security	Government	965 Kitty Hawk Rd	$300,500	0.10	AE	NA	1		1	0
Safety & Security	Police Station	722 Kitty Hawk Rd	$309,800	0.10	AE	NA	1	Y	1	0
Safety & Security	Police Station	5200 N Croatan Hwy	$482,450	0.10	X Shaded	NA	NA	Y	0	0
Safety & Security	Fire Station	859 W Kitty Hawk Rd	$1,778,500	1.63	AE	NA	3	Y	0	0
Safety & Security	Government	101 Veteran's Memorial Dr	$548,900	1.18	AE	NA	2	Y	0	1.5
Safety & Security	Government	3841 N Croatan Hwy	$1,394,700	0.10	X Shaded	NA	4		0	0
Water Systems	Treatment Plant	3404 Croatan Hwy	$531,600	0.10	X Shaded	NA	4		0	0
Water Systems	Treatment Plant	0 Jejac Dr	$0	0.10	X Shaded	NA	4		0	0
Water Systems	Utility	3600 N Croatan Hwy	$0	0.10	AE	NA	3		0	0
Water Systems	Utility	3616 Poseidon St	$0	0.10	AE	NA	2		0	0
Water Systems	Utility	3938 N Virginia Dare Trl	$0	0.10	VE	NA	5		0	0
Water Systems	Utility	3836 N Virginia Dare Trl	$0	2.10	AE	NA	3		0	0
Water Systems	Utility	3847 N Virginia Dare Trail	$0	0.10	VE	NA	NA		0	0
Water Systems	Utility	4101 N Virginia Dare Trail	$0	2.15	VE	NA	NA		0	0
Water Systems	Utility	4107 Lindbergh Ave	$0	2.22	AE	NA	2		0	0
Water Systems	Utility	4117 Lindbergh Ave	$0	2.34	AE	NA	2		0	0

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Water Systems	Utility	4133 Lindbergh Ave	$0	1.56	AE	NA	2		0	0
Water Systems	Utility	4143 Lindbergh Ave	$0	1.77	AE	NA	2	Y	0	0
Water Systems	Utility	4155 Lindbergh Ave	$0	1.95	AE	NA	2	Y	0	0
Water Systems	Utility	204 Hawk St	$0	1.63	AE	NA	2		0	0
Water Systems	Utility	4401 N Virginia Dare Trl	$0	1.67	VE	NA	4		0	0
Water Systems	Utility	4815 Lindbergh Ave	$0	0.10	AE	NA	3	Y	0	0
Water Systems	Utility	4832 N Virginia Dare Trl	$0	1.41	VE	NA	NA		0	0
Water Systems	Utility	205 Fonck St	$0	0.10	AE	NA	3		0	2 - Low
Water Systems	Utility	5031 N Virginia Dare Trl	$0	0.10	VE	NA	5		0	0
Water Systems	Utility	5131 Lindbergh Ave	$0	0.10	AE	NA	3		0	0
Water Systems	Utility	5129 N Virginia Dare Trl	$0	2.61	VE	NA	3		0	0

E.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Kitty Hawk. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

E.2.1 HURRICANE & COASTAL HAZARDS

Figure E.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Town of Kitty Hawk oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of the Town of Kitty Hawk is experiencing some level of change every year.

Figure E.2 – Long-Term Shoreline Change Rates, Town of Kitty Hawk

Source: Source: United States Geological Survey

E.2.2 FLOODING

Table E.3 details the acreage of the Town of Kitty Hawk total area by flood zone on the effective DFIRM and previous 2006 FIRM. Per this assessment, over 66 percent of the Town falls within the current effective mapped 1-%-annual-chance floodplains. Over 80 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplains.

Table E.3 – Flood Zone Acreage in the Town of Kitty Hawk

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	3,403.65	64.34%	4,069.57	76.94%
Zone AH	118.75	2.24%	--	--
Zone AO	37.32	0.71%	--	--
Zone VE	135.17	2.56%	187.54	3.55%
Zone X (500-year)	189.26	3.58%	1,032.31	19.52%
Zone X Unshaded	1,405.55	26.57%	--	--
Total	**5,289.70**	**--**	**5,289.41**	**--**

Source: FEMA Effective DFIRM and 2006 DFIRM

Figure E.3 reflects the effective mapped flood hazard zones for the Town of Kitty Hawk, and Figure E.4 reflects the flood hazard zones from the previous 2006 FIRM.

Figure E.5 and Figure E.6 displays the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table E.4 provides building counts and values for critical facilities by flood zone in the Town of Kitty Hawk.

Table E.4 - Critical Facilities Exposed to Flooding, Town of Kitty Hawk

Flood Zone	Critical Facility Count	Structure Value
AE	17	$2,937,700.00
VE	7	$0.00
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	12	$6,459,700.00
Total	**36**	**$9,397,400.00**

Source: FEMA 2006 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table E.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table E.6 summarizes exposure using the current effective FIRM as a baseline.

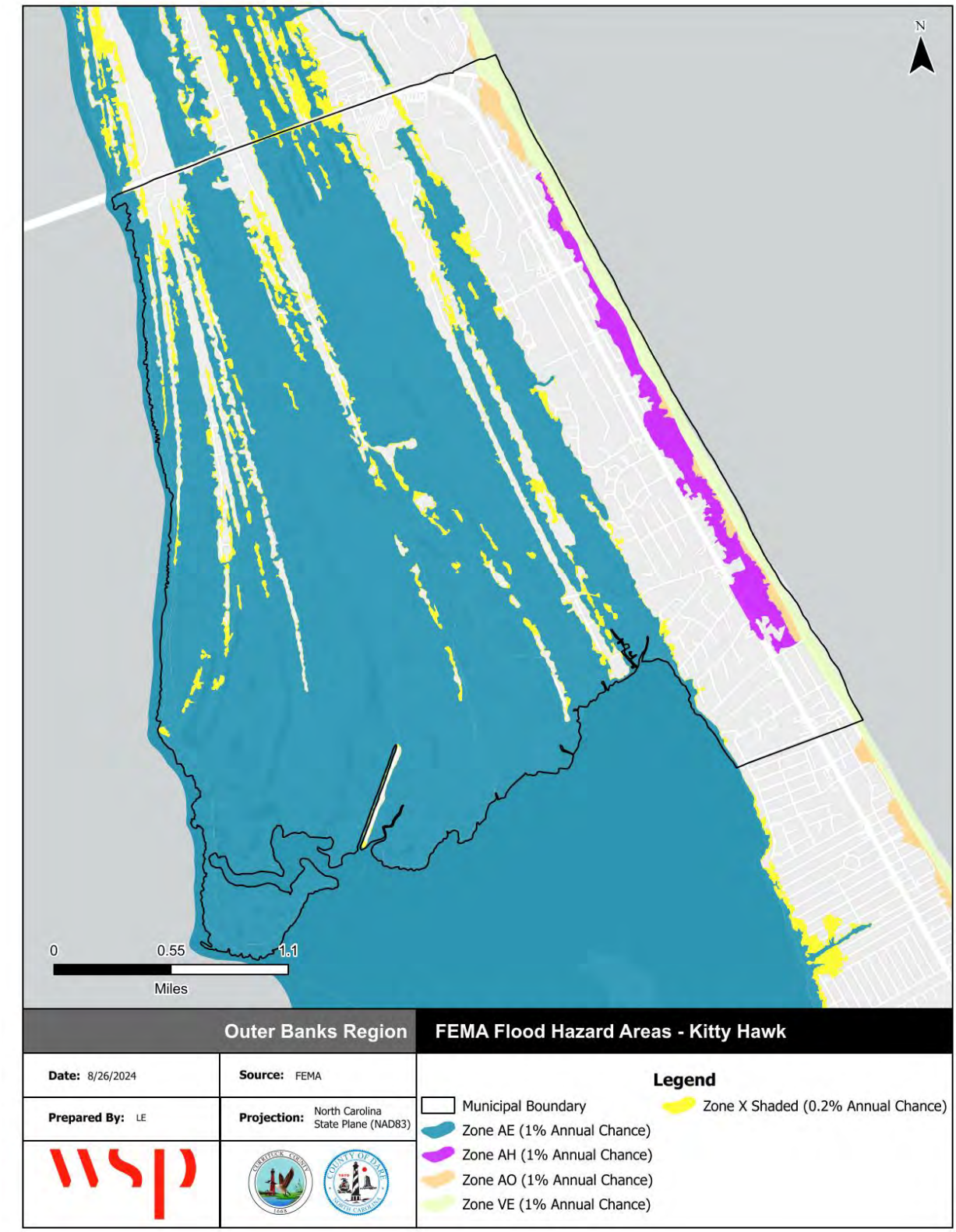
Table E.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,488**	**$279,673,592**	**$151,871,910**	**$431,545,502**
Agriculture	0	$0	$0	$0
Commercial	60	$21,575,205	$21,575,205	$43,150,410
Education	1	$51,027	$51,027	$102,054
Government	14	$1,804,500	$1,804,500	$3,609,000
Industrial	6	$286,098	$429,147	$715,245
Religious	1	$67,300	$67,300	$134,600
Residential	1,406	$255,889,462	$127,944,731	$383,834,193
+1 Foot Freeboard	**409**	**$72,931,419**	**$39,513,397**	**$112,444,816**
Agriculture	0	$0	$0	$0
Commercial	14	$5,835,964	$5,835,964	$11,671,928
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	1	$259,410	$259,410	$518,820
Residential	394	$66,836,045	$33,418,023	$100,254,068
+2 Foot Freeboard	**163**	**$35,202,720**	**$23,754,189**	**$58,956,909**
Agriculture	0	$0	$0	$0
Commercial	20	$12,248,257	$12,248,257	$24,496,514
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$28,700	$43,050	$71,750
Religious	0	$0	$0	$0
Residential	142	$22,925,763	$11,462,882	$34,388,645
+3 Foot Freeboard	**97**	**$24,962,753**	**$17,117,958**	**$42,080,711**
Agriculture	0	$0	$0	$0
Commercial	12	$6,766,763	$6,766,763	$13,533,526
Education	0	$0	$0	$0
Government	1	$1,171,000	$1,171,000	$2,342,000
Industrial	2	$434,800	$652,200	$1,087,000
Religious	1	$465,800	$465,800	$931,600
Residential	81	$16,124,390	$8,062,195	$24,186,585

Table E.6 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

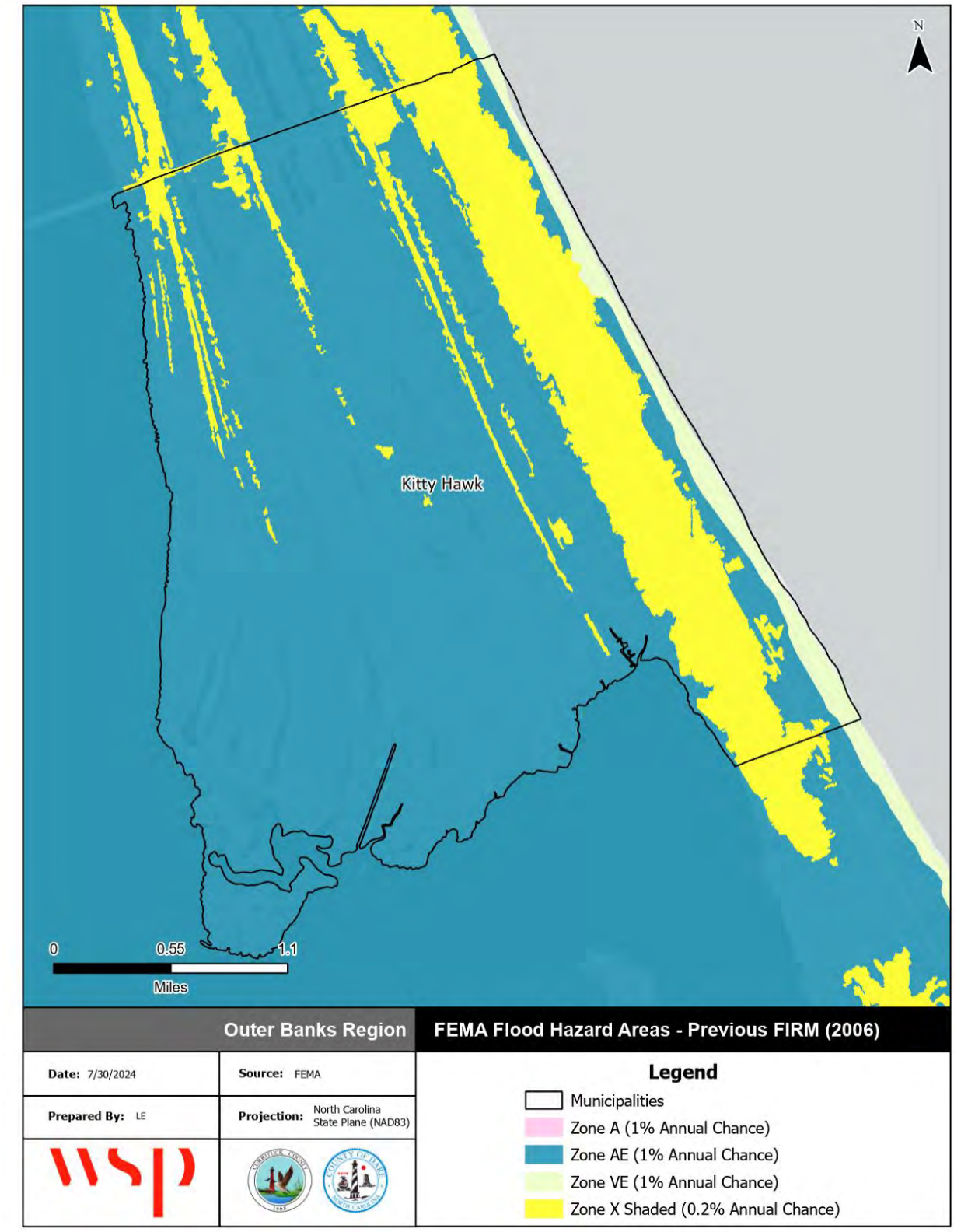
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,863**	**$336,841,853**	**$183,179,230**	**$520,021,083**
Agriculture	0	$0	$0	$0
Commercial	67	$25,939,570	$25,939,570	$51,879,140
Education	1	$51,027	$51,027	$102,054
Government	14	$1,804,500	$1,804,500	$3,609,000
Industrial	9	$697,400	$1,046,100	$1,743,500
Religious	2	$326,710	$326,710	$653,420
Residential	1,770	$308,022,646	$154,011,323	$462,033,969
+1 Foot Freeboard	221	$39,620,538	$23,259,463	$62,880,001
Agriculture	0	$0	$0	$0
Commercial	18	$6,432,587	$6,432,587	$12,865,174
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	1	$465,800	$465,800	$931,600
Residential	202	$32,722,151	$16,361,076	$49,083,227
+2 Foot Freeboard	**110**	**$21,799,704**	**$13,514,050**	**$35,313,754**
Agriculture	0	$0	$0	$0
Commercial	6	$3,962,600	$3,962,600	$7,925,200
Education	0	$0	$0	$0
Government	1	$1,171,000	$1,171,000	$2,342,000
Industrial	1	$47,398	$71,097	$118,495
Religious	0	$0	$0	$0
Residential	102	$16,618,706	$8,309,353	$24,928,059
+3 Foot Freeboard	**93**	**$37,917,913**	**$23,771,208**	**$61,689,121**
Agriculture	0	$0	$0	$0
Commercial	19	$8,854,902	$8,854,902	$17,709,804
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	1	$384,800	$577,200	$962,000
Religious	0	$0	$0	$0
Residential	73	$28,678,211	$14,339,106	$43,017,317

Figure E.3 – FEMA Flood Hazard Areas, Town of Kitty Hawk



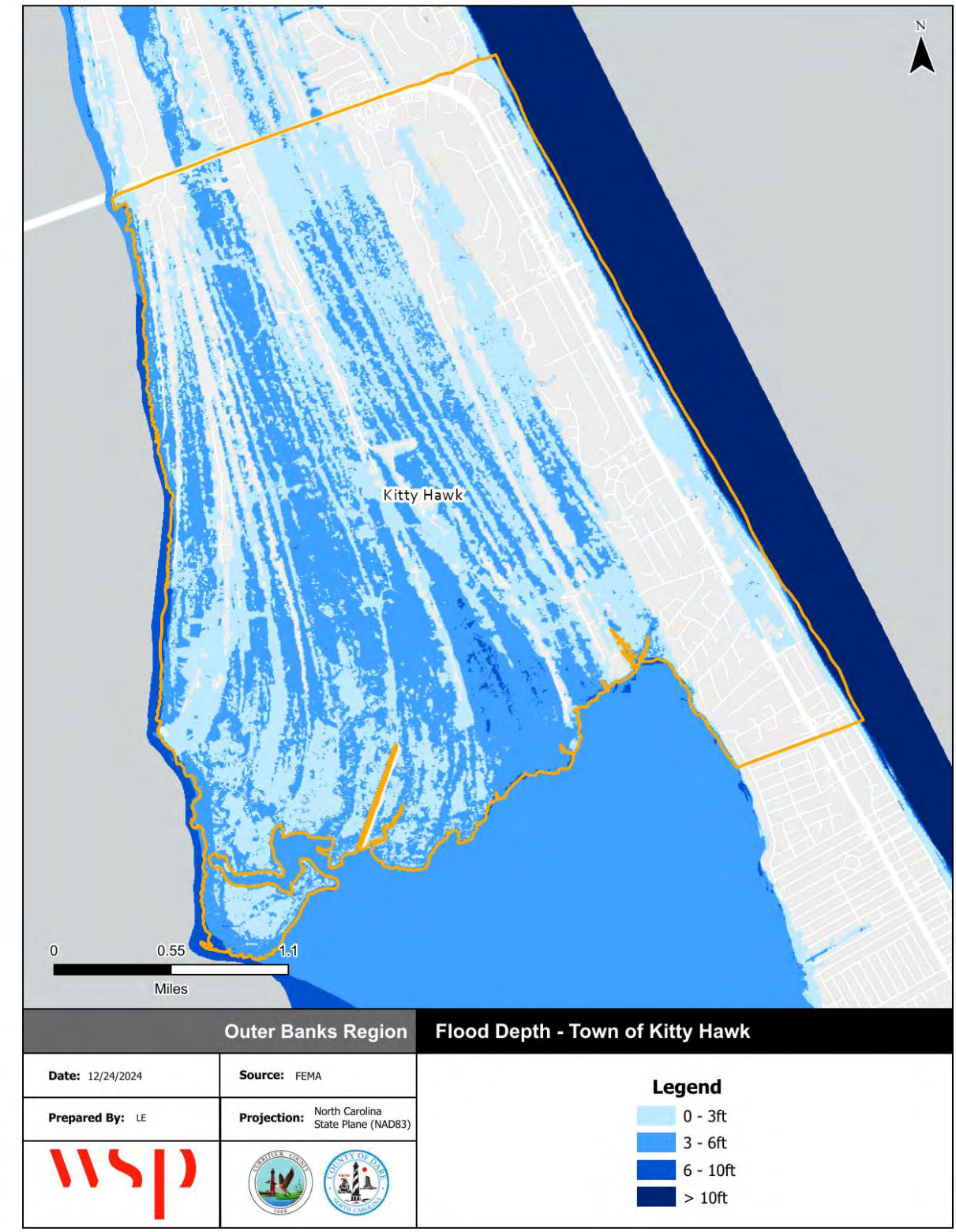
Source: FEMA Effective DFIRM

Figure E.4 – FEMA Flood Hazard Areas, Town of Kitty Hawk – 2006 FIRM



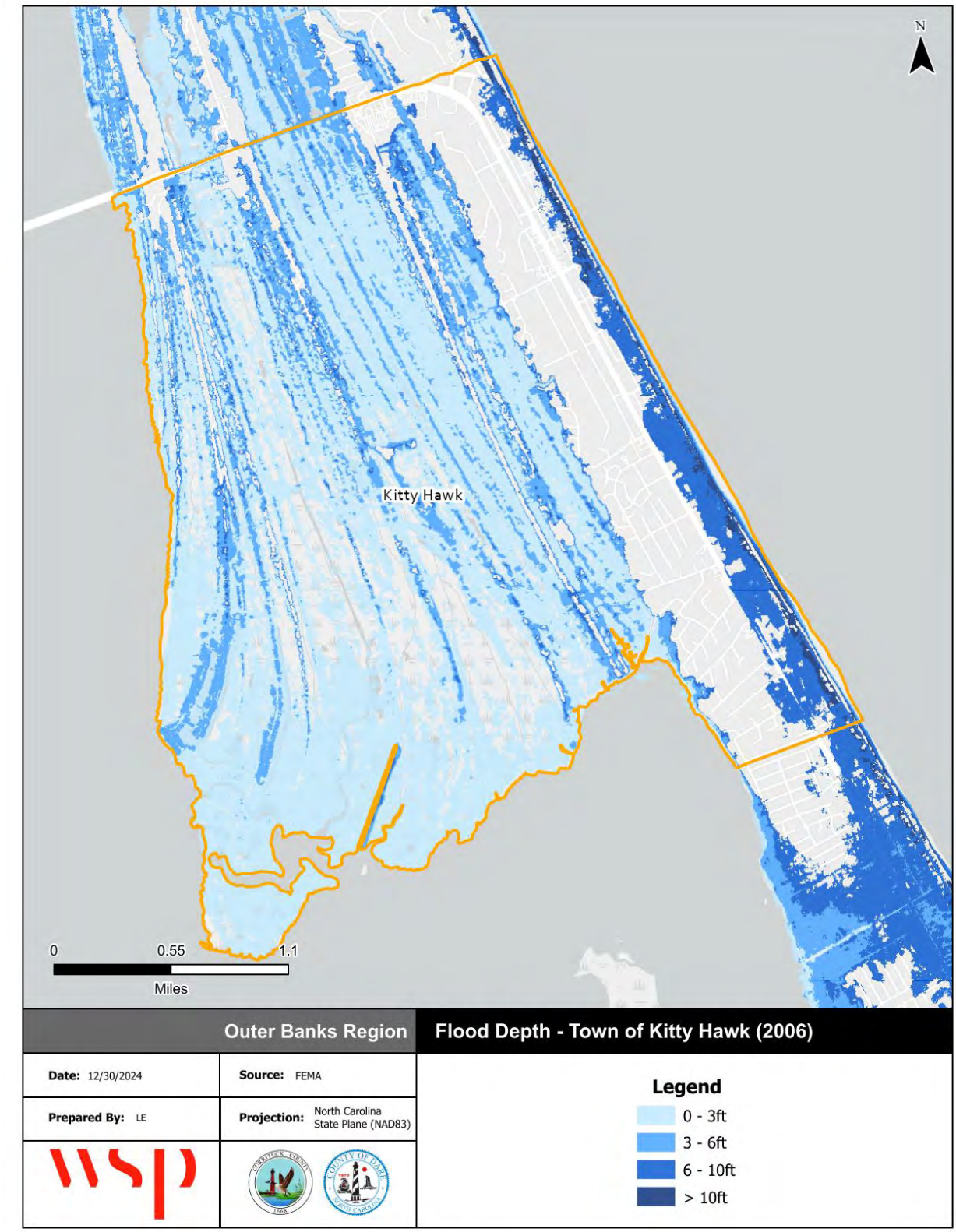
Source: FEMA 2006 FIRM

Figure E.5 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Kitty Hawk



Source: FEMA Effective DFIRM

Figure E.6 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Kitty Hawk – 2006 FIRM



Source: FEMA 2006 DFIRM

FLOOD INSURANCE DATA

The Town of Kitty Hawk joined the NFIP emergency program in 1971 and the NFIP as a regular participant in October 1978. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table E.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	850	$430,289	$235,592,000	1,768	$15,873,237.55
2-4 Family	14	$4,798	$3,179,000	36	$493,691.60
All Other Residential	9	$7,175	$4,436,000	35	$470,575.73
Non-Residential	69	$69,619	$29,249,000	103	$3,142,402.97
Total	**942**	**$511,881**	**$272,456,000**	**1,942**	**$19,979,907.85**

Source: FEMA Community Information System, accessed December 2024

Table E.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	386	$194,776	$103,756,000	464	$4,234,163.41
A Zones	12	$6,256	$2,950,000	35	$366,758.10
AO Zones	42	$22,690	$11,006,000	191	$2,320,983.55
AH Zones	35	$18,270	$9,311,000	24	$160,977.83
V01-30 & VE Zones	35	$20,295	$9,785,000	130	$1,915,751.54
B, C & X Zone					
Standard	302	$187,896	$96,158,000	879	$9,424,643.92
Preferred	0	$0	$0	44	$314,470.22
Total	**812**	**$450,183**	**$232,966,000**	**1,768**	**$18,737,748.57**

Source: FEMA Community Information System, accessed December 2024

Table E.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	61	$39,772	$14,927,000	147	$2,756,448.11
A Zones	5	$2,303	$1,081,000	20	$265,138.92
AO Zones	12	$6,718	$2,767,000	42	$718,745.00
AH Zone	8	$4,493	$1,637,000	6	$60,558.59
V01-30 & VE Zones	18	$10,587	$4,687,000	79	$1,212,394.00
B, C & X Zone	84	$56,429	$22,948,000	387	$4,440,957.08
Standard	84	$56,429	$22,948,000	380	$4,369,237.51
Preferred	0	$0	$0	7	$71,719.57
Total	**188**	**$120,302**	**$48,047,000**	**682**	**$9,454,241.70**

Source: FEMA Community Information System, accessed December 2024

Table E.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	325	$155,004	$88,829,000	317	$1,477,715.30
A Zones	7	$3,953	$1,869,000	15	$101,619.18
AO Zones	30	$15,972	$8,239,000	149	$1,602,238.55
AH Zones	27	$13,777	$7,674,000	18	$100,419.24
V01-30 & VE Zones	17	$9,708	$5,098,000	51	$703,357.54
B, C & X Zone	218	$131,467	$73,210,000	533	$5,291,126.64
Standard	218	$131,467	$73,210,000	499	$5,055,406.41
Preferred	0	$0	$0	37	$242,750.65
Total	**624**	**$329,881**	**$184,919,000**	**1,083**	**$9,276,476.45**

Source: FEMA Community Information System, accessed December 2024

E.2.3 WILDFIRE

Table E.11 summarizes the acreage in the Town of Kitty Hawk that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Approximately 37 percent the Town of Kitty Hawk is not included in the WUI.

Table E.11 – Wildland Urban Interface Acreage, Town of Kitty Hawk

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	1,963.1	37.0%
	LT 1hs/40ac	408.9	7.7%
	1hs/40ac to 1hs/20ac	220.0	4.2%
	1hs/20ac to 1hs/10ac	199.8	3.8%
	1hs/10ac to 1hs/5ac	271.9	5.1%
	1hs/5ac to 1hs/2ac	663.8	12.5%
	1hs/2ac to 3hs/1ac	1,431.4	27.0%
	GT 3hs/1ac	142.8	2.7%
	Total	**5,301.8**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure E.7 depicts the WUI for the Town of Kitty Hawk. Figure E.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure E.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

There are areas of moderate and high potential fire intensity throughout much of Kitty Hawk, which coincide with low burn probability. Because these areas fall within the WUI, there is development at risk to wildfire.

Table E.12 provides the count and estimated value of all structures that intersect with areas of the Town of Kitty Hawk that are rated moderate to high on the WUI Risk Index.

Table E.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Kitty Hawk

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	87	$43,658,484	$43,658,484	$87,316,968
Education	1	$51,027	$51,027	$102,054
Government	7	$1,699,362	$1,699,362	$3,398,724
Industrial	9	$26,113,441	$39,170,162	$65,283,603
Religious	3	$4,342,210	$4,342,210	$8,684,420
Residential	1566	$320,156,830	$160,078,415	$480,235,245
Total	**1,673**	**$396,021,354**	**$248,999,660**	**$645,021,014**

Source: Southern Wildfire Risk Assessment

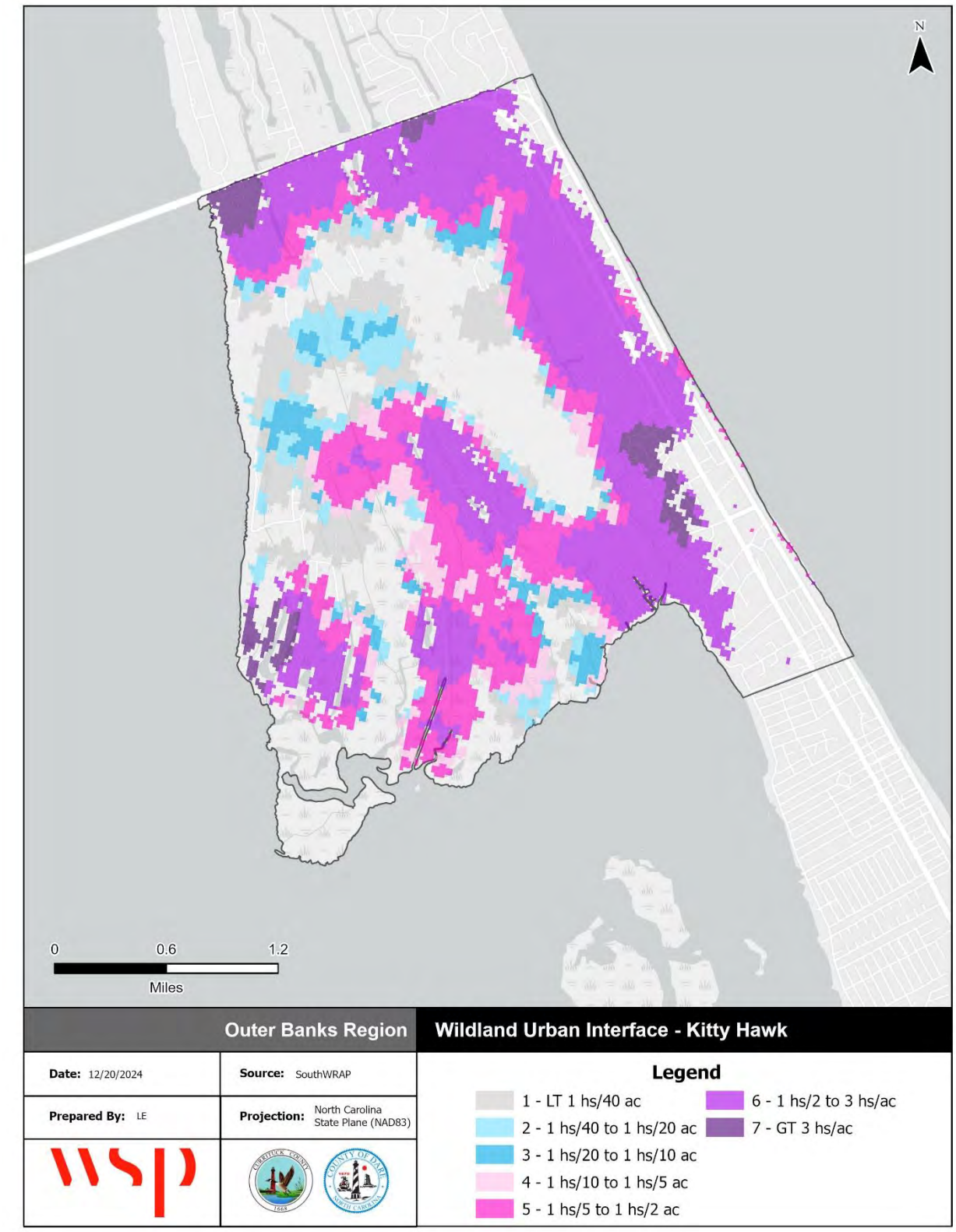
Table E.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table E.13 – Critical Facilities Exposed to Wildfire, Town of Kitty Hawk

Type	Critical Facility Count Risk	Structure Value
Communications	1	$881,500
Energy	0	$0
Food, Hydration, Shelter	0	$0
Hazardous Materials	0	$0
Health and Medical	1	$0
Safety and Security	4	$3,119,650
Transportation	0	$0
Water Systems	3	$0
Total	**9**	**$4,001,150**

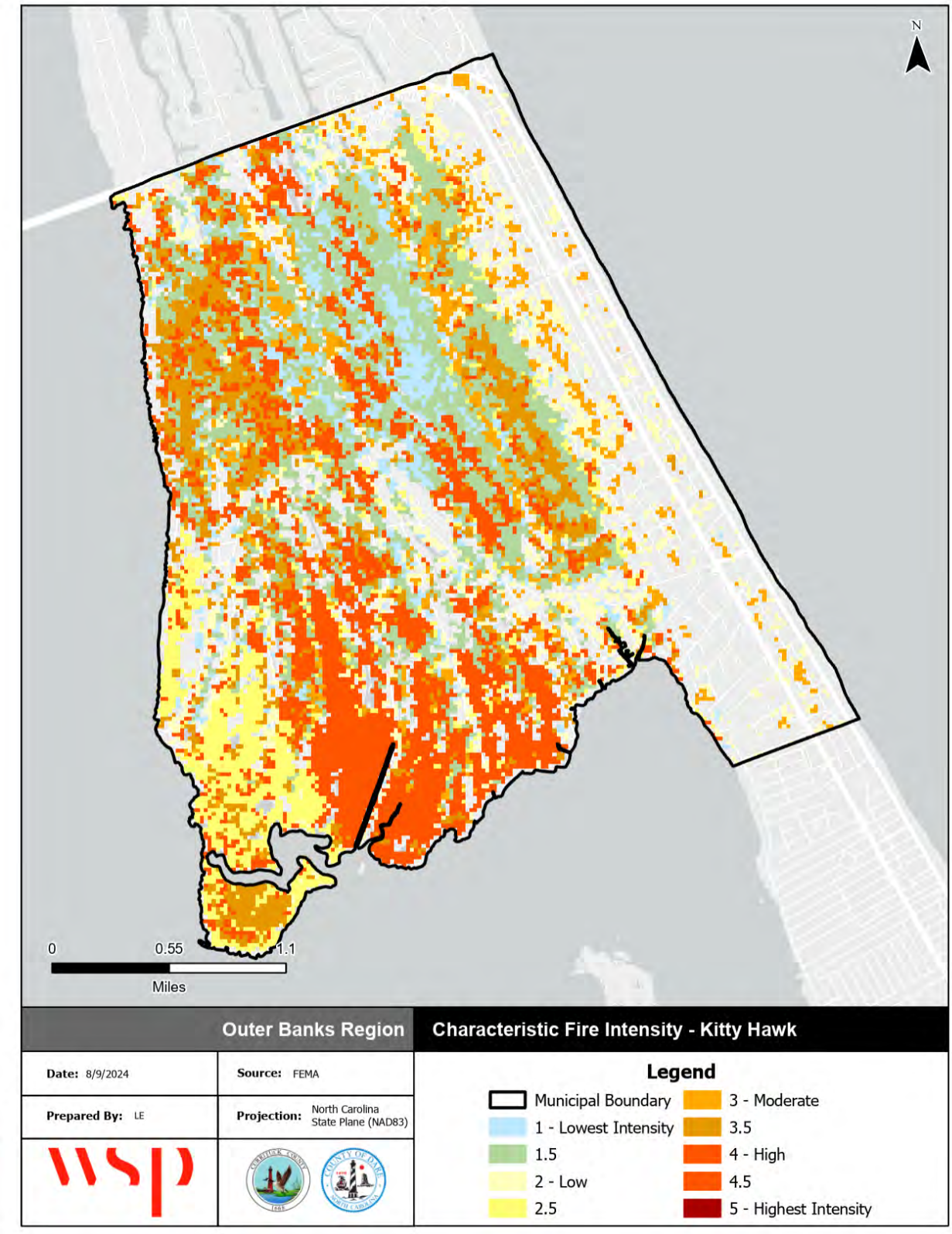
Source: Southern Wildfire Risk Assessment

Figure E.7 – Wildland Urban Interface, Town of Kitty Hawk



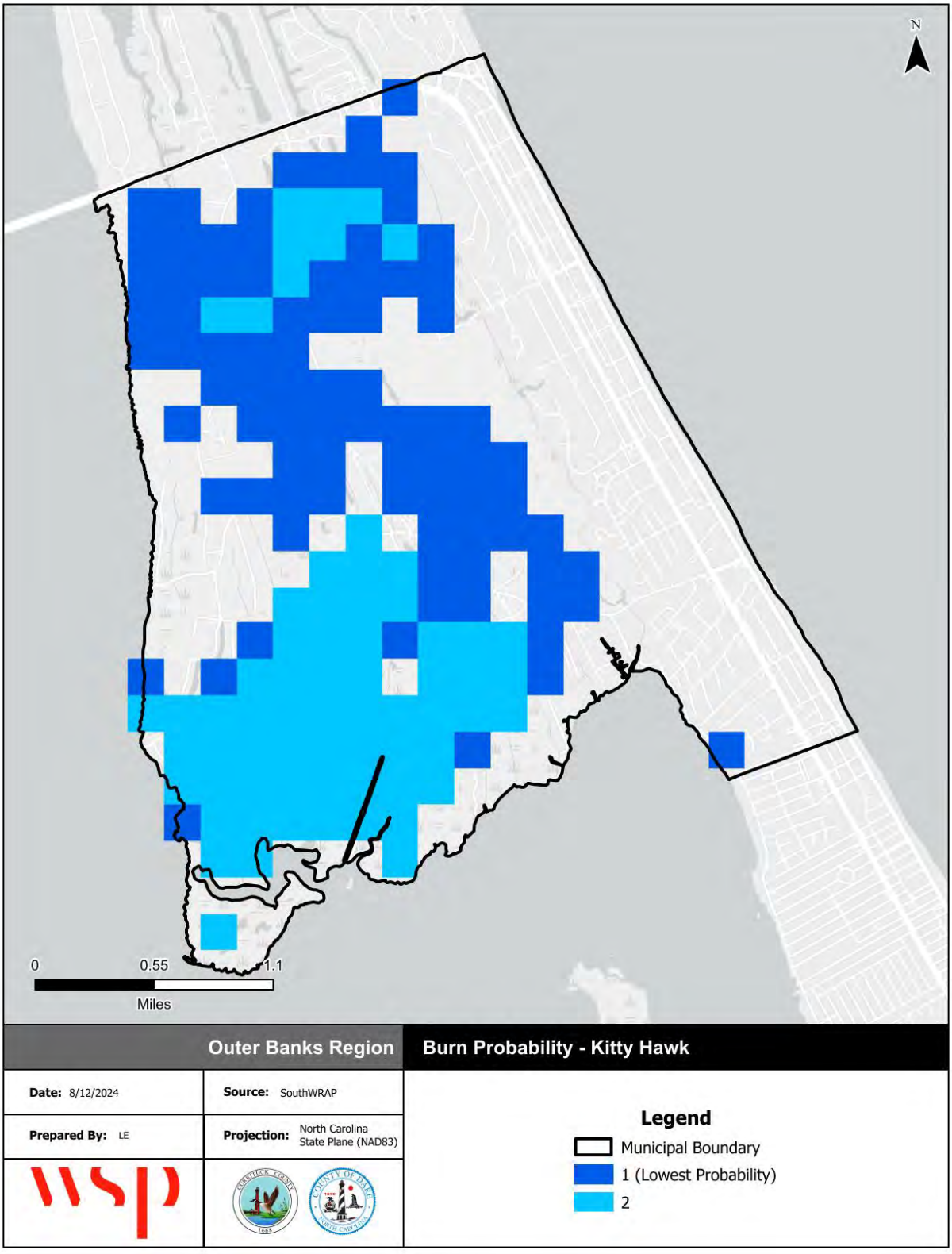
Source: Southern Wildfire Risk Assessment

Figure E.8 – Fire Intensity Scale, Town of Kitty Hawk



Source: Southern Wildfire Risk Assessment

Figure E.9 – Burn Probability, Town of Kitty Hawk



Source: Southern Wildfire Risk Assessment

E.3 MITIGATION STRATEGY

Table E.14 – Mitigation Action Plan, Town of Kitty Hawk

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KH1	Establish town plans for mitigation and recovery through information on disaster planning recovery and reconstruction.	All Hazards	3.1	High	Prevention	Town Manager	Town Budget, Grants	1 year	Carry forward	Should establish a separate mitigation plan, or add on to Emergency Preparedness, Response and Recovery Plan.
KH2	Implement projects identified in Kitty Hawk RCCP Plan.	Floods, Tornadoes & Thunderstorms, Hurricane & Coastal Hazards, Wildfire	1.2, 2.1, 3.2, 3.3	High	Prevention, Property Protection, Structural Projects, Natural Resource Protection	Planning & Inspections	NC DCM	2 Years	New	See Kitty Hawk Resilience Strategy for project details.
KH3	Clean out culverts, ditches, and waterways to relieve standing water and facilitate the stormwater drainage	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	2.1	High	Property Protection	Public Works	Town Budget, Grants	Ongoing	Carry Forward	Partially complete. Waterways cleaned out, ditches and culverts still need to be addressed
KH4	Establish long-term plan for funding and implementation of beach renourishment	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	3.2	Med	Property Protection	Town Council/Town Manager	Town Budget	1 year	Carry Forward	No new progress to report.
KH5	Pursue the acquisition or elevation of repetitive loss properties and other highly vulnerable properties. Expedite permitting for these situations.	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	1.2	Low	Property Protection	Planning & Inspections	N/A	Ongoing	Carry Forward	Town will continue to partner with Dare County on the implementation of these projects as requests arise.
KH6	Construct and maintain living shoreline projects in most vulnerable soundside areas	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	3.2	Med	Natural Resource Protection	Town Council/Town Manager	Town Budget, Grants, Private	3 years	Carry Forward	Partially complete.
KH7	Encourage open space preservation/conservation	Flood, Hurricane & Tropical Storm, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	3.3	Med	Natural Resource Protection	Planning & Inspections	Town Budget (outreach documentation)	Ongoing	Carry Forward	No new progress to report.
KH8	Implement stormwater drainage improvements per the studies/plan	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	3.3	High	Structural Projects	Town Manager/Public Works	Town Budget, Grants	Ongoing	Carry Forward	Partially complete

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
KH9	Update and improve protocols and procedures (local, county, and state) by which citizens in KH are made aware of impending storm events and expected impacts	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	1.1	High	Emergency Services	Town Manager	Town Budget, Grants	1 year	Carry Forward	Partially complete. Has been some discussion of a town alert, in addition to the existing county one.
KH10	Work w/ Dare Co. to improve the communication systems between all public safety departments within the towns, county, and state so that in the event of a disaster, all entities will be able to communicate with one another.	All Hazards	4.2	Med	Emergency Services	Town Manager/Fire Department/Police Department	N/A - Staff Time	2 years	Carry forward	In Progress. Coordinating with Dare County on communications improvements.
KH11	Review vulnerabilities of all critical facilities as a component of annual review of Emergency Preparedness, Response and Recovery Plan	All Hazards	2.1	High	Emergency Services	Town Manager, Fire Department/Police Department	N/A - Staff Time	1 year	Carry forward	No new progress to report.
KH13	Increase awareness of availability of flood insurance through various methods (mailings, flyers, etc.)	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget	Twice Annually	Carry forward	No new progress to report.
KH14	Provide information on flood damage protection techniques to citizens and property owners.	Hurricane & Coastal Hazards, Floods, Tornadoes & Thunderstorms	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget	Ongoing	Carry forward	No new progress to report.
KH15	Initiate outreach projects to inform the public on Town and County initiatives that will reduce hazard related losses of property and life	All Hazards	1.1	Med	Public Education & Awareness	Planning & Inspections	Town Budget, Grants	2 years	Carry forward	No new progress to report.

ANNEX F. TOWN OF MANTEO

F.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table F.1 provides a count of critical facilities by FEMA lifeline category within the Town of Manteo. Figure F.1 shows the locations of all critical facilities within the Town of Manteo.

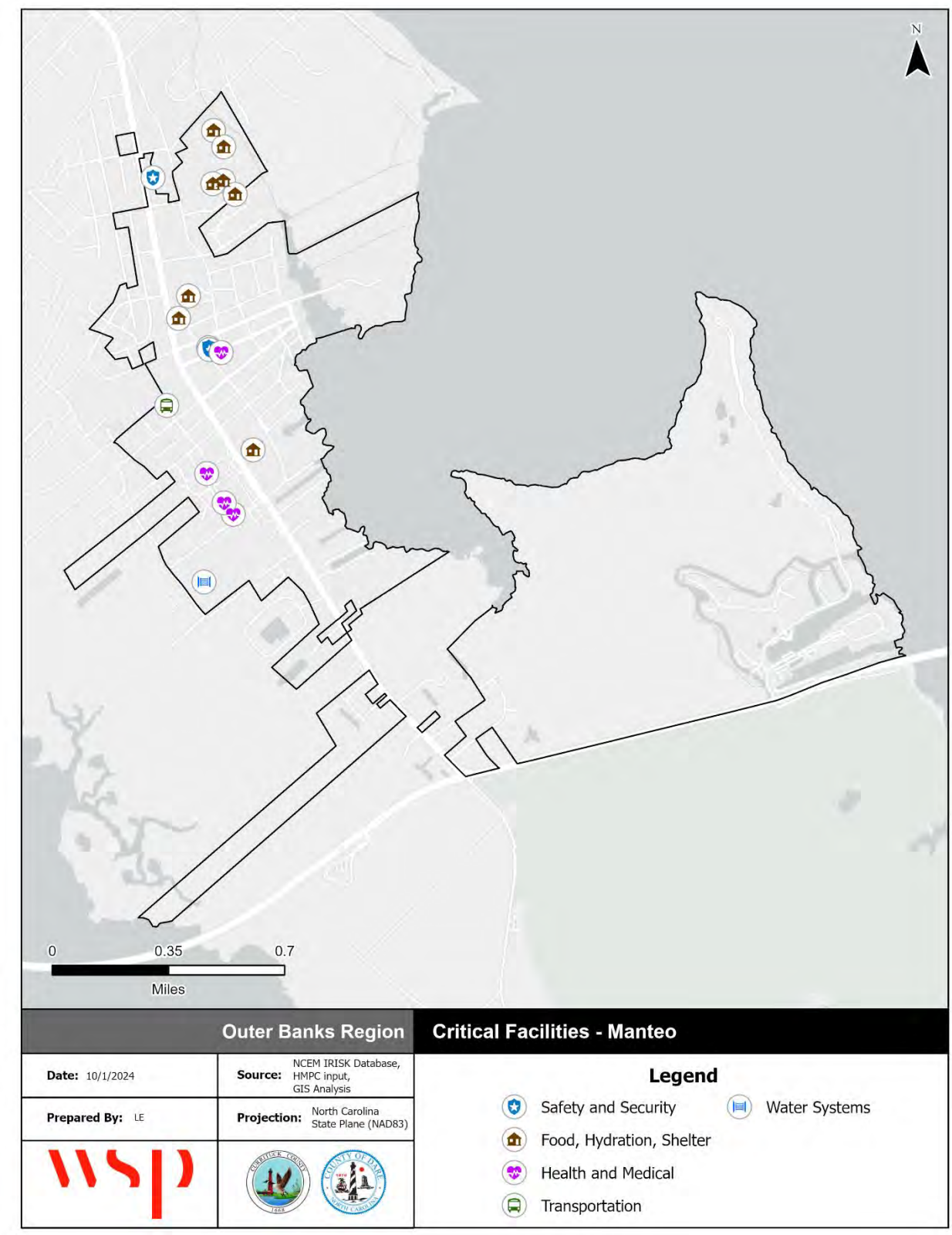
Table F.2 provides a detailed inventory of the critical facilities in Manteo, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table F.1 – Critical Facilities by Type, Town of Manteo

Facility Type	Count of Facility Type	Structure Value
Communications	2	$434,200
Energy	1	$199,800
Food, Hydration, Shelter	8	$57,573,800
Hazardous Materials	0	$0
Health and Medical	4	$9,503,700
Safety and Security	4	$2,466,800
Transportation	1	$594,700
Water Systems	10	$415,700
Total	**30**	**$71,188,700**

Source: Dare County, HMPC

Figure F.1 – Critical Facilities, Town of Manteo



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table F.2 – Manteo Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Communications	Communications	309 Uppowoc Avenue	$282,900	0.00	AE	NA	2	Y	0	0
Communications	Communications	311 John Borden St	$151,300	0.00	X Shaded	NA	4	Y	2	0
Energy	Utility	414 US-64	$199,800	1.17	AE	NA	1	Y	0	0
Food, Hydration, Shelter	School	829 Wingina Ave	$4,638,240	0.10	AE	NA	2	Y	2	0
Food, Hydration, Shelter	School	701 Hwy 64/264	$8,091,000	0.10	AE	NA	4	Y	0	0
Food, Hydration, Shelter	School	205 Hwy 64/264	$18,200,600	0.10	AE	NA	2	Y	0	0
Food, Hydration, Shelter	School	829 Wingina Ave	$4,638,240	0.10	X Shaded	NA	3	Y	2	0
Food, Hydration, Shelter	School	701 Hwy 64/264	$8,091,000	0.10	X Shaded	NA	3	Y	0	0
Food, Hydration, Shelter	School	829 Wingina Ave	$4,638,240	0.10	AE	NA	2	Y	2	4 - High
Food, Hydration, Shelter	School	829 Wingina Ave	$4,638,240	0.10	AE	NA	2	Y	2	0
Food, Hydration, Shelter	School	829 Wingina Ave	$4,638,240	0.10	AE	NA	2	Y	2	0
Health & Medical	Medical	515 Bowsertown Rd	$3,089,233	0.10	AE	NA	2	Y	0	0
Health & Medical	Medical	109 Exeter Street	$3,089,233	0.10	AE	NA	2	Y	0	0
Health & Medical	Medical	115 Exeter St	$3,089,233	0.10	AE	NA	2	Y	0	0
Health & Medical	Medical	402 Budleigh St	$236,000	0.10	AE	NA	2	Y	0	0
Safety & Security	Police Station	407 Budleigh St	$348,300	0.10	AE	NA	2	Y	0	0
Safety & Security	Fire Station	917 N Croatan Hwy	$800,100	0.10	AE	NA	2	Y	2	2 - Low
Safety & Security	Government	407 Budleigh St	$348,300	0.10	AE	NA	2	Y	0	0
Safety & Security	Government	301 US 64	$970,100	0.00	AE	NA	2	Y	0	0
Transportation	Transportation	306 Simon St	$594,700	0.10	AE	NA	2	Y	0	0
Water Systems	Treatment Plant	710 Bowsertown Rd	$415,700	0.10	AE	NA	3	Y	4	0
Water Systems	Utility	1 Hammock Dr	$0	1.35	AE	3	1		0	4 - High

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Water Systems	Utility	100 Queen Elizabeth Avenue	$0	2.61	AE	3	1		0	0
Water Systems	Utility	903 Burnside Road	$0	0.00	AE	NA	3		0	0
Water Systems	Utility	69A Ballast Point Drive	$0	0.00	AE	NA	2		4	0
Water Systems	Utility	804 S. George Howe Street	$0	0.00	AE	NA	2	Y	0	3 - Moderate
Water Systems	Utility	815 Wingina Avenue, Manteo NC	$0	0.00	X Shaded	NA	3		2	4 - High
Water Systems	Utility	Live Oak Lane	$0	1.16	AE	NA	2	Y	4	0
Water Systems	Utility	800 Lindsey Lane	$0	0.00	AE	NA	2	Y	4	0
Water Systems	Utility	Peninsula Drive, Manteo NC	$0	0.00	AE	NA	2	Y	4	0

F.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Manteo. The hazards included in this section are: Flood and Wildfire.

F.2.1 FLOODING

Table F.3 details the acreage of the Town of Manteo by flood zone on the effective DFIRM and previous 2006 FIRM. Per this assessment, over 70 percent of the Town of Manteo falls within the current effective mapped 1%-annual-chance floodplains. Over 99 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplain.

Table F.3 – Flood Zone Acreage in the Town of Manteo

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	875.69	70.66%	18.54	96.52%
Zone VE	--	--	24.54	1.98%
Zone X (500-year)	88.85	7.17%	1,239.21	100.00%
Zone X Unshaded	274.82	22.17%	--	--
Total	**1,239.36**	**--**	**3,609.83**	**--**

Source: FEMA Effective DFIRM and 2006 FIRM

Figure F.2 reflects the effective mapped flood hazard zones for the Town of Manteo, and Figure F.3 reflects the flood hazard zones from the previous 2006 FIRM.

Figure F.4 and Figure F.5 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table F.4 provides building counts and values for critical facilities by flood zone in the Town of Manteo based on the 2006 FIRM.

Table F.4 – Critical Facilities Exposed to Flooding, Town of Manteo

Flood Zone	Critical Facility Count	Structure Value
AE	26	$58,308,160.00
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	4	$12,880,540.00
Total	**30**	**$71,188,700**

Source: FEMA 2006 FIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table F.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table F.6 summarizes exposure using the current effective FIRM as a baseline.

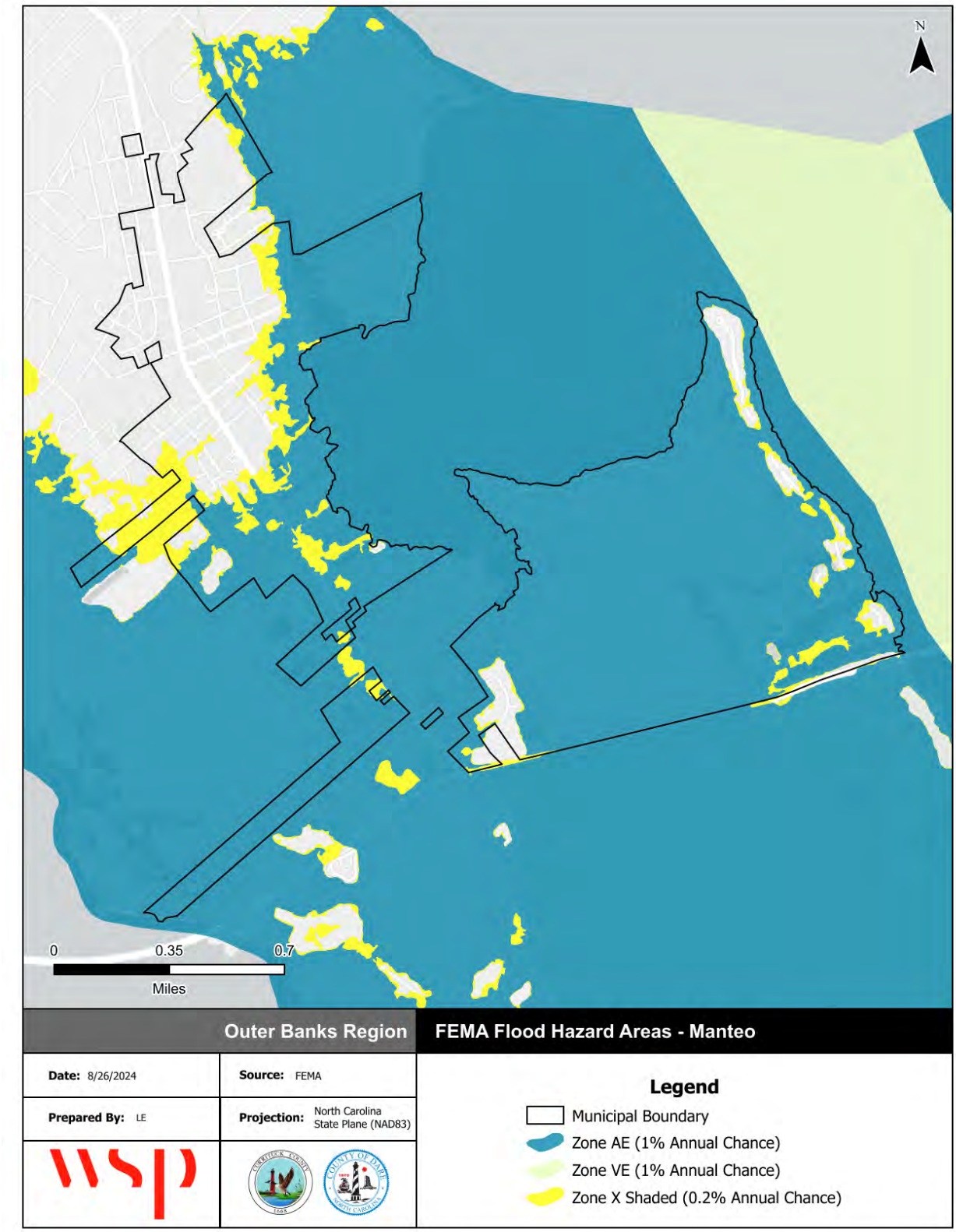
Table F.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**481**	**$161,656,680**	**$95,850,326**	**$257,507,006**
Agriculture	0	$0	$0	$0
Commercial	59	$22,559,807	$22,559,807	$45,119,614
Education	2	$6,678,418	$6,678,418	$13,356,836
Government	3	$546,400	$546,400	$1,092,800
Industrial	1	$129,674	$194,511	$324,185
Religious	0	$0	$0	$0
Residential	416	$131,742,381	$65,871,190	$197,613,571
+1 Foot Freeboard	**182**	**$48,801,109**	**$28,407,552**	**$77,208,661**
Agriculture	0	$0	$0	$0
Commercial	11	$3,364,594	$3,364,594	$6,729,188
Education	1	$4,626,300	$4,626,300	$9,252,600
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	1	$23,100	$23,100	$46,200
Residential	169	$40,787,115	$20,393,558	$61,180,673
+2 Foot Freeboard	**106**	**$22,582,186**	**$15,413,940**	**$37,996,126**
Agriculture	0	$0	$0	$0
Commercial	4	$5,914,376	$5,914,376	$11,828,752
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	2	$82,759	$124,139	$206,898
Religious	3	$2,165,800	$2,165,800	$4,331,600
Residential	97	$14,419,251	$7,209,626	$21,628,877
+3 Foot Freeboard	**110**	**$21,963,468**	**$13,226,787**	**$35,190,255**
Agriculture	0	$0	$0	$0
Commercial	12	$3,545,929	$3,545,929	$7,091,858
Education	1	$221,685	$221,685	$443,370
Government	3	$71,892	$71,892	$143,784
Industrial	0	$0	$0	$0
Religious	1	$650,600	$650,600	$1,301,200
Residential	93	$17,473,362	$8,736,681	$26,210,043

Table F.6 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

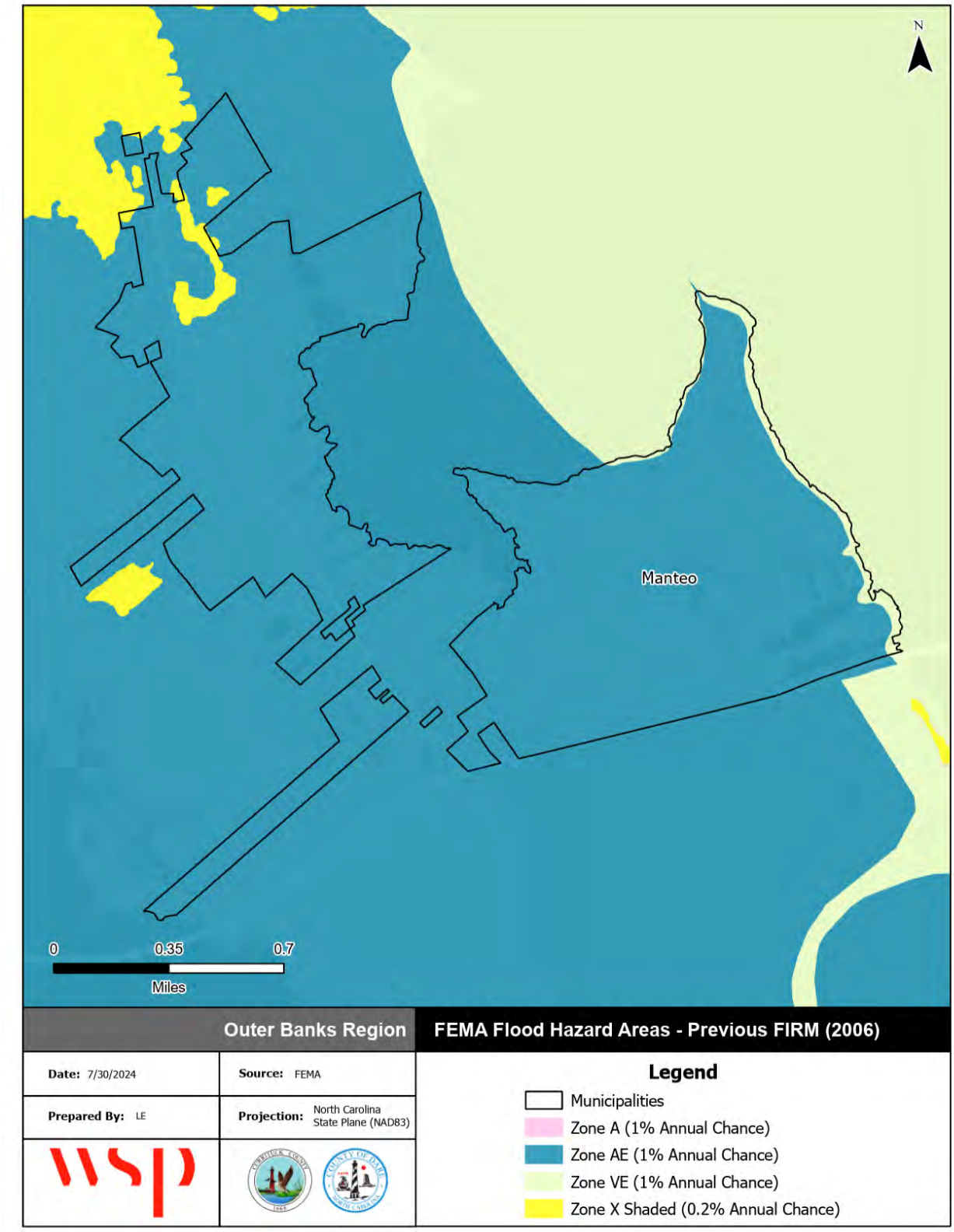
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,060**	**$311,648,654**	**$198,451,537**	**$510,100,191**
Agriculture	0	$0	$0	$0
Commercial	105	$41,490,887	$41,490,887	$82,981,774
Education	10	$35,398,799	$35,398,799	$70,797,598
Government	14	$2,205,583	$2,205,583	$4,411,166
Industrial	5	$342,233	$513,350	$855,583
Religious	8	$5,474,686	$5,474,686	$10,949,372
Residential	918	$226,736,466	$113,368,233	$340,104,699
+1 Foot Freeboard	**36**	**$14,228,107**	**$8,490,904**	**$22,719,011**
Agriculture	0	$0	$0	$0
Commercial	3	$2,207,900	$2,207,900	$4,415,800
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	1	$545,800	$545,800	$1,091,600
Residential	32	$11,474,407	$5,737,204	$17,211,611
+2 Foot Freeboard	**6**	**$9,463,508**	**$9,308,054**	**$18,771,562**
Agriculture	0	$0	$0	$0
Commercial	0	$0	$0	$0
Education	1	$9,152,599	$9,152,599	$18,305,198
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	5	$310,909	$155,455	$466,364
+3 Foot Freeboard	**4**	**$149,427**	**$123,964**	**$273,391**
Agriculture	0	$0	$0	$0
Commercial	1	$98,500	$98,500	$197,000
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	3	$50,927	$25,464	$76,391

Figure F.2 – FEMA Flood Hazard Areas, Town of Manteo



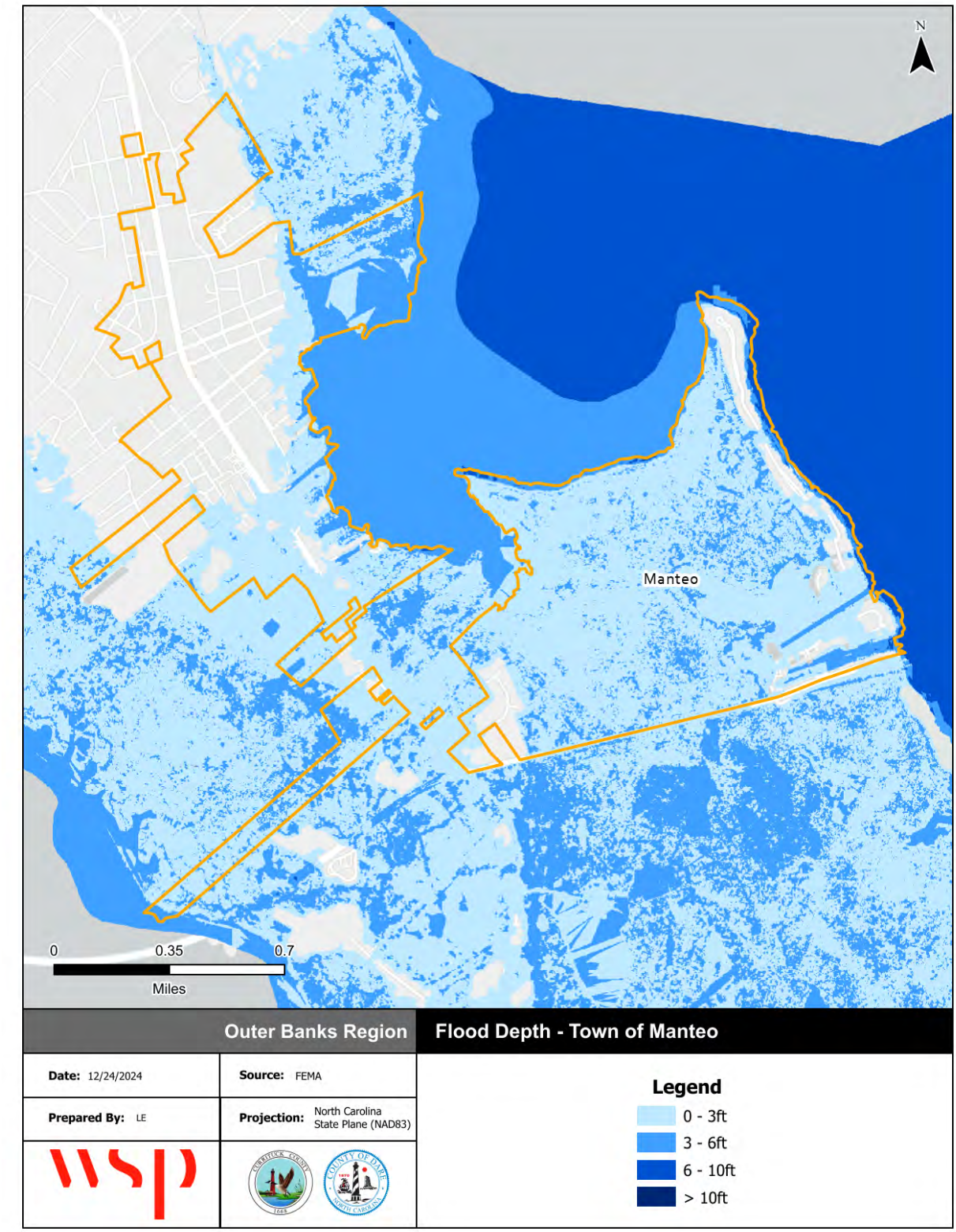
Source: FEMA Effective DFIRM

Figure F.3 – FEMA Flood Hazard Areas, Town of Manteo – 2006 FIRM



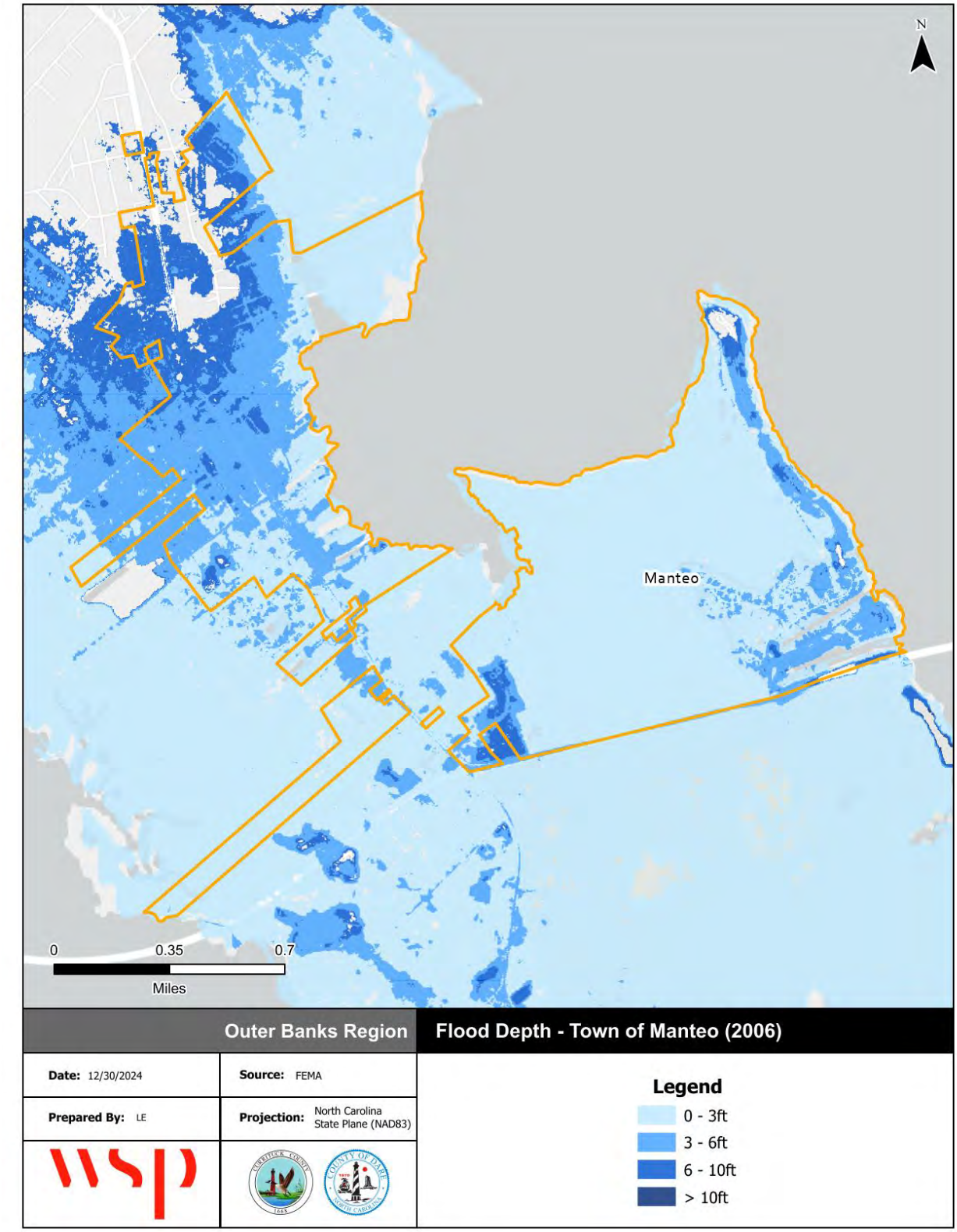
Source: FEMA 2006 DFIRM

Figure F.4 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Manteo



Source: FEMA Effective DFIRM

Figure F.5 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Manteo – 2006 FIRM



Source: FEMA 2006 DFIRM

FLOOD INSURANCE DATA

The Town of Manteo joined the NFIP emergency program in 1972 and has been a regular participant since January 1973. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table F.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	229	$117,620	$66,697,000	120	$530,249.81
2-4 Family	24	$3,774	$6,000,000	2	$43,791.46
All Other Residential	421	$70,048	$91,241,000	82	$1,005,883.64
Non Residential	57	$71,092	$24,774,000	135	$3,651,964.27
Total	**731**	**$262,534**	**$188,712,000**	**339**	**$5,231,889.18**

Source: FEMA Community Information System, accessed December 2024

Table F.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	652	$204,321	$160,088,000	311	$4,797,749.25
B, C & X Zone					
Standard	79	$58,213	$28,624,000	28	$434,139.93
Preferred	0	$0	$0	0	$0.00
Total	731	$262,534	$188,712,000	339	$5,231,889.18

Source: FEMA Community Information System, accessed December 2024

Table F.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	30	$31,055	$6,171,000	113	$3,313,938.25
B, C & X Zone	34	$22,170	$11,306,000	4	$64,606.63
Standard	34	$22,170	$11,306,000	4	$64,606.63
Preferred	0	$0	$0	0	$0.00
Total	64	$53,225	$17,477,000	117	$3,378,544.88

Source: FEMA Community Information System, accessed December 2024

Table F.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	622	$173,266	$153,917,000	198	$1,483,811.00
B, C & X Zone	45	$36,043	$17,318,000	24	$369,533.30
Standard	45	$36,043	$17,318,000	24	$369,533.30
Preferred	0	$0	$0	0	$0.00
Total	667	$209,309	$171,235,000	222	$1,853,344.30

Source: FEMA Community Information System, accessed December 2024

F.2.2 WILDFIRE

Table F.11 summarizes the acreage in the Town of Manteo that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 33 percent of the Town of Manteo is not included in the WUI.

Table F.11 – Wildland Urban Interface Acreage, Town of Manteo

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	420.0	33.9%
	LT 1hs/40ac	56.7	4.6%
	1hs/40ac to 1hs/20ac	15.7	1.3%
	1hs/20ac to 1hs/10ac	25.7	2.1%
	1hs/10ac to 1hs/5ac	44.8	3.6%
	1hs/5ac to 1hs/2ac	89.7	7.2%
	1hs/2ac to 3hs/1ac	407.7	32.9%
	GT 3hs/1ac	178.9	14.4%
	Total	**1,239.2**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure F.6 depicts the WUI the Town of Manteo. Figure F.7 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure F.8 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Potential fire intensity is moderate to high along the waterfront and throughout the southeastern portion of the Town. The southeastern area has moderate burn probability and overlaps areas of the WUI, indicating development is at risk. These are the most significant areas of wildfire risk in Manteo.

Table F.12 provides the count and estimated value of all structures that intersect with areas of the Town of Manteo that are rated moderate to high on the WUI Risk Index.

Table F.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Manteo

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	104	$42,567,082	$42,567,082	$85,134,164
Education	11	$44,551,398	$44,551,398	$89,102,796
Government	14	$2,205,583	$2,205,583	$4,411,166
Industrial	5	$342,233	$513,350	$855,583
Religious	9	$6,020,486	$6,020,486	$12,040,972
Residential	876	$206,122,632	$103,061,316	$309,183,948
Total	**1,019**	**$301,809,414**	**$198,919,214**	**$500,728,628**

Source: Southern Wildfire Risk Assessment

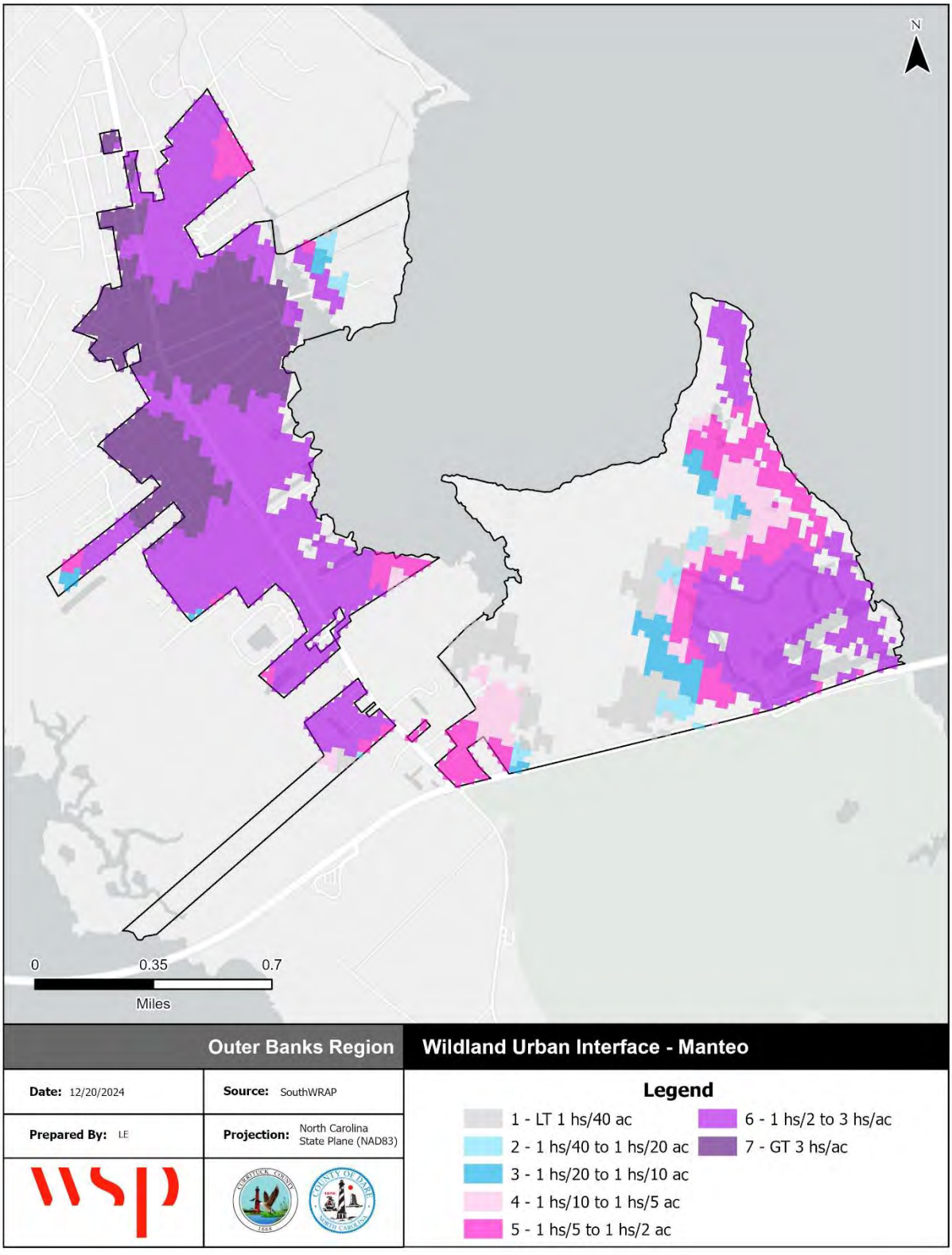
Table F.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table F.13 – Critical Facilities Exposed to Wildfire, Town of Manteo

Type	Critical Facility Count	Structure Value
Communications	2	$434,200
Energy	1	$199,800
Food, Hydration, Shelter	8	$57,573,800
Hazardous Materials	0	$0
Health and Medical	4	$9,503,700
Safety and Security	4	$2,466,800
Transportation	1	$594,700
Water Systems	5	$415,700
Total	**25**	**$71,188,700**

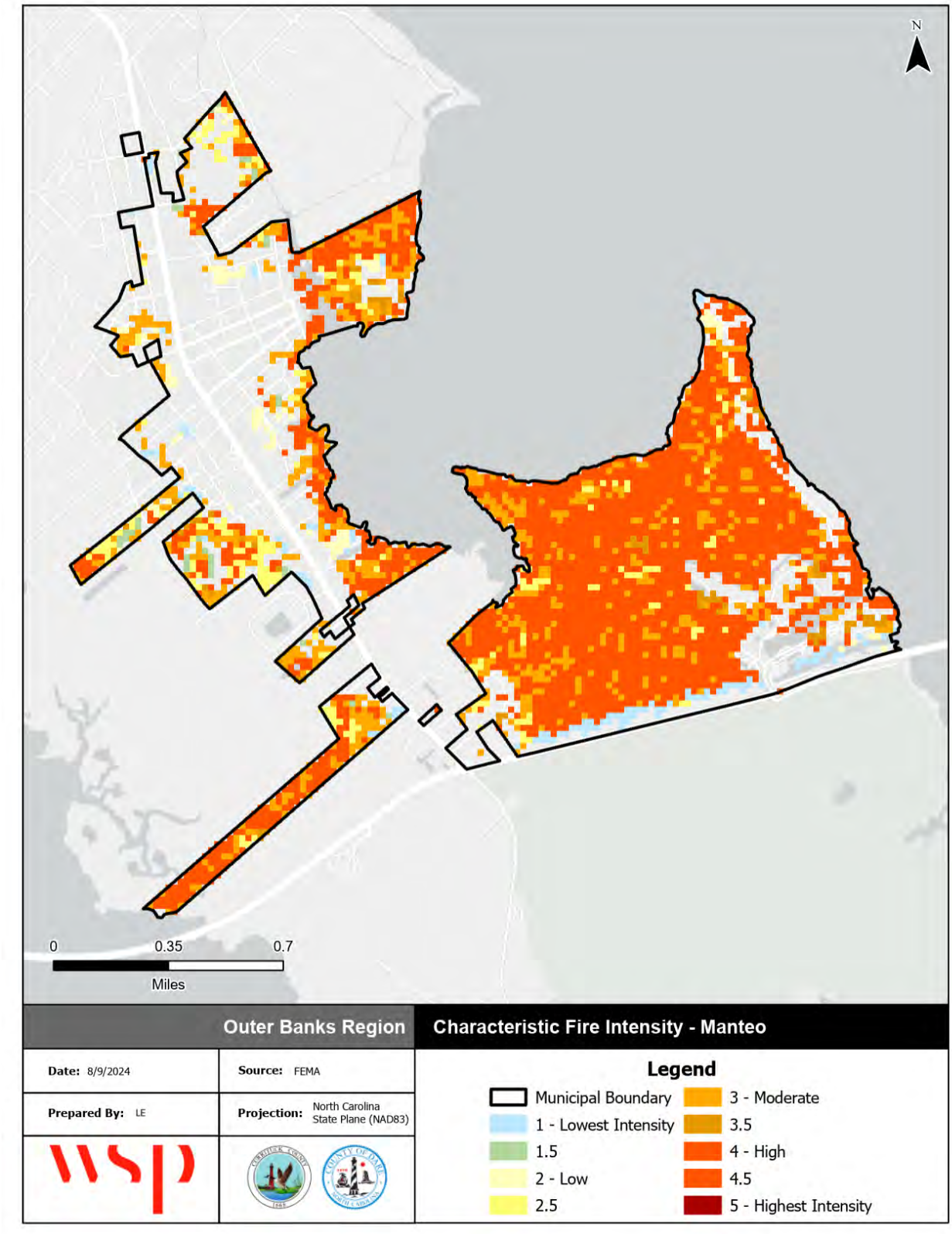
Source: Southern Wildfire Risk Assessment

Figure F.6 – Wildland Urban Interface, Manteo



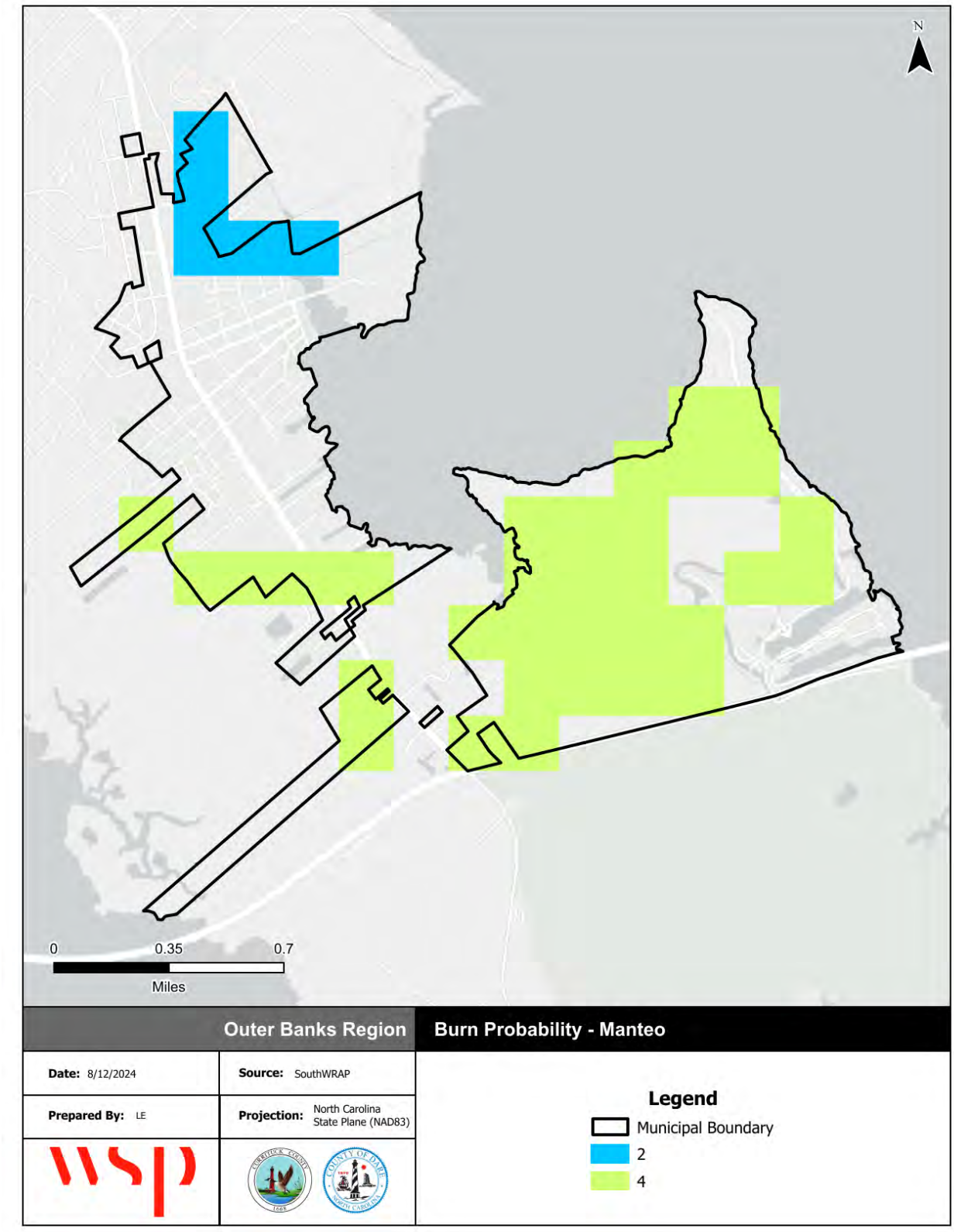
Source: Southern Wildfire Risk Assessment

Figure F.7 – Fire Intensity Scale, Manteo



Source: Southern Wildfire Risk Assessment

Figure F.8 – Burn Probability, Manteo



Source: Southern Wildfire Risk Assessment

F.3 MITIGATION STRATEGY

Table F.14 – Mitigation Action Plan, Town of Manteo

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
MAN1	Continue to stay current with all Community Rating System reporting requirements to ensure continued program participation.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.3	7 - High	Prevention	Planning Department	General Fund	Ongoing	Carry Forward	The Town is currently a CRS Class 5.
MAN2	Coordinate with the State to replace heat strips and water-sewer line on *utility lines running under* the Cora Mae Basnight Bridge	Severe Winter Weather	2.1	3 - Medium	Prevention	Utilities Department, NC Dept. of Natural & Cultural Resources	Water Sewer Enterprise Fund	2027	Carry Forward	No progress to report, but this remains a priority. Revised to include water-sewer line replacement and to reflect needed coordination with State.
MAN3	Strategic Planning CDRZ	All Hazards	3.3	7 – High	Prevention	Planning Department, Board of Commissioners	Rural Communities Grant	2025	New	This project will be completed in partnership with NCSU and the Coastal Dynamics Design Lab. Scheduled to begin in January 2025.
MAN4	Excessive Heat Plan for Crowd Gathering Events	Excessive Heat	1.1	Low	Prevention, Emergency Services	Planning Department	General Fund	2027	New	Coordinate with NCORR and Heat Action Plan Toolkit resources
MAN5	Maintain and improve Town wide stormwater system for appropriate performance. Consider future conditions (sea level rise, rainfall, subsidence, rising groundwater) when evaluating performance needs.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	2.1	7 - High	Property Protection	Planning Department	Stormwater Fund	Ongoing	Carry Forward	In 2024, completed $500k stormwater project in low-income neighborhood, funded by Golden LEAF and general fund. Town will continue to identify and implement improvements, including nature-based solutions.
MAN6	Replace or retrofit critical and high risk facilities that are located below base flood elevation or are vulnerable to future climate impacts.	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Property Protection	Planning Department	HMG Grant	Ongoing	Carry Forward	In 2023, replaced a 1940s wastewater lift station with new state of the art lift station and fixed generator; both above regulatory flood protection level. Project underway to replace generator at wastewater treatment plant. Town will consider green energy options and wind load retrofits for facilities.
MAN7	Police Department Building	All Hazards	2.1	Medium	Property Protection	Planning Department	Federal Grants, General Fund	2028	New	Moving Town Hall to new building and will renovate existing Town Hall as hub for police department and emergency services.
MAN8	Generator for New Town Hall	All Hazards	2.1	Medium	Property Protection	Planning Department	FEMA Grants, General Fund	2028	New	Install a back up generator at new town hall facility. Will consider green energy options.
MAN9	Undergrounding utilities	All Hazards	2.1	High	Property Protection	Utilities Department, Planning Department	FEMA Grants, General Fund	2030	New	Implement in conjunction with MAN10 for cost savings.
MAN10	Replace terracotta pipes to lower inflow and infiltration risk	Flooding, Hurricane & Coastal Hazards	2.1	High	Property Protection	Utilities Department, Planning Department	FEMA Grants, General Fund	2030	New	Implement in conjunction with MAN9 for cost savings.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
MAN11	Pursue acquisition and/or elevation of repetitive loss or other high-risk structures and promote other residential retrofit programs.	Flooding, Hurricane & Coastal Hazards	2.1	Medium	Property Protection	Planning Department, Dare County	FEMA Grants	Ongoing	New	Will continue to coordinate with Dare County on implementation of elevations/acquisitions as requests arise. Town will promote Fortified Roof and Weatherization Programs.
MAN12	Upgrade and improve stormwater and wastewater systems to improve water quality in Shallowbag Bay.	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Natural Resource Protection	Planning Department	Stormwater Fund/Clean Water Trust Fund	Ongoing	Carry Forward	UV disinfection project currently underway. Generator replacement currently underway. Will consider other nature-based solutions.
MAN13	Protect natural wetland areas	Flooding, Hurricane & Coastal Hazards	3.2	7 - High	Natural Resource Protection	Planning Department	National Wetlands Conservation Grant Program/Clean Water Management Trust Fund	Ongoing	Carry Forward	Land Use Plan includes prohibition of filling wetlands. Considering options for acquisition and preservation of wetland areas. Will consider other nature-based solutions.
MAN14	Capital Improvement Plan development with resiliency as a priority	All Hazards	3.3	7 - High	Structural Projects	Administration Department	General Fund	2030	Carry Forward	This will be informed by the Strategic Plan that is currently underway.
MAN15	Boardwalk, bulkhead and docks replacement with higher standards/higher quality materials	All Hazards	2.1	7 - High	Structural Projects	Planning Department	CAMA Access, General Fund	2028	Carry Forward	One section is completed. Another CAMA Access Grant project going to bid soon.
MAN16	Floodproofing of East, West Hammock, and Ballast Point, Peninsula lift stations	Flooding, Hurricane & Coastal Hazards	2.1	7 - High	Structural Projects	Utilities Department	HMG Grant	2027	Carry Forward	Some pump replacements have been completed. Additional engineering required.
MAN17	Implement 2018 lightening study for water and sewer plant	Tornadoes & Thunderstorms	2.1	7 - High	Structural Projects	Utilities Department	Water Sewer Enterprise Fund	2027	Carry Forward	This will be pursued once the generator replacement is completed.
MAN18	Repair and maintain Town Waterfront Gazebo with higher standards/higher quality materials for improved resiliency	Flooding, Hurricane & Coastal Hazards	1.2	7 - High	Structural Projects	Town Marina/Maritime Museum	CAMA Access, General Fund	2030	Carry Forward	Just replaced adjacent bulkhead; this can be pursued once MAN16 is completed.
MAN19	Implement priority strategies for flood risk reduction and shoreline protection identified through NCSU's Coastal Dynamics Design Lab	Flooding, Hurricane & Coastal Hazards, Tornadoes & Thunderstorms	1.2, 3.2, 3.3	High	Structural Projects	Planning Department	General Fund, Federal Grants, CAMA Access	2030	New	
MAN20	Continue to enhance the Water and Sewer Department's back-up generator system for all lift stations	All Hazards	2.2	7 - High	Emergency Services	Utilities Department	HMG Grant	2027	Carry Forward	Wingina, Burnside and Waterfront lift stations (almost) have fixed generators. Final electrical work in progress.
MAN21	Participate in and conduct Emergency Management training for appropriate Town elected officials and staff.	All Hazards	2.2	7 - High	Emergency Services	All Departments, Dare County EM	General Fund	Ongoing	Carry Forward	Town participated in annual Dare County exercises. Will consider other partner organizations for additional training.
MAN23	Implement essential spare equipment (standby equipment) program for water sewer plant	All Hazards	2.1	7 - High	Emergency Services	Utilities Department	Water Sewer Enterprise Fund	Ongoing	Carry Forward	Inventory has been developed. Continually identifying new standby equipment needs and updating as needed.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
MAN24	Develop Communications Plan for hazards.	All Hazards	1.1	7 - High	Public Education & Awareness	All Departments	General Fund	2028	Carry Forward	Implementation is ongoing. Town uses Dare County's emergency notification system. Town has improved downtown flooded streets notifications.
MAN25	Educate Residents on water saving techniques	Drought	1.1	7 - High	Public Education & Awareness	All Departments	Water Sewer Enterprise Fund	Ongoing	Carry Forward	No progress to report but this remains a priority.
MAN26	Educate the public and inform them of the benefits of participation in the Firewise program.	Wildfire	1.1	Low	Public Education & Awareness	Planning Department	General Fund, Grants	Ongoing	New	
MAN27	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning Department, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

ANNEX G. TOWN OF NAGS HEAD

G.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table G.1 provides a count of critical facilities by FEMA lifeline category within the Town of Nags Head. Figure G.1 shows the locations of all critical facilities within the Town of Nags Head.

Table G.2 provides a detailed inventory of the critical facilities in Nags Head, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table G.1 – Critical Facilities by Type, Town of Nags Head

Facility Type	Count of Facility Type	Structure Value
Communications	1	$0
Energy	2	$0
Food, Hydration, Shelter	2	$15,140,200
Hazardous Materials	0	$0
Health and Medical	3	$19,668,200
Safety and Security	8	$5,865,800
Transportation	0	$0
Water Systems	9	$1,864,900
Total	**25**	**$42,539,100**

Source: Dare County, HMPC

Figure G.1 – Critical Facilities, Town of Nags Head

Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table G.2 – Nags Head Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Communications	Communications	4801 S. Croatan Hwy.	$0	0.10	X Shaded	NA	3		0	0
Energy	Substation	301 West Lakeside St.	$0	0.10	X Shaded	NA	2		0	0
Energy	Substation	301 W. Lakeside St.	$0	0.10	X Shaded	NA	2		0	0
Food, Hydration, Shelter	School	3100 Wrightsville Ave	$7,570,100	0.10	AE	NA	4		0	0
Food, Hydration, Shelter	School	3100 Wrightsville Ave	$7,570,100	0.10	AE	NA	4	Y	0	2.5
Health & Medical	Medical	4800 Croatan Hwy	$19,668,200	0.10	X Shaded	NA	4		0	0
Health & Medical	Medical	5002 S. Croatan Hwy	$0	0.10	X Shaded	NA	3		0	0
Health & Medical	Medical	4927 S. Croatan Hwy.	$0	0.10	AE	NA	3		0	0
Safety & Security	Police Station	5401 Croatan Hwy	$2,843,500	0.10	X Shaded	NA	3		0	0
Safety & Security	Fire Station	3719 Croatan Hwy	$161,400	0.10	AE	NA	2	Y	0	0
Safety & Security	Fire Station	8806 Old Oregon Inlet Rd	$812,600	0.10	AE	NA	2	Y	0	2 - Low
Safety & Security	Fire Station	5314 Croatan Hwy	$1,686,700	0.10	X Shaded	NA	5		0	0
Safety & Security	Government	5401 S Croatan Hwy	$0	0.10	X Shaded	NA	3		0	0
Safety & Security	Government	2203 S Lark Av	$0	0.10	X Shaded	NA	3	Y	0	0
Safety & Security	Government	2200 S. Lark Avenue	$0	0.10	X Shaded	NA	3		2	0
Safety & Security	Government	114 W Woodhill Dr	$361,600	0.10	X Shaded	NA	4	Y	0	3 - Moderate
Water Systems	Treatment Plant	104 Gull St	$393,000	0.10	AE	NA	2	Y	0	0
Water Systems	Treatment Plant	2110 Pond Ave	$122,020	0.10	X Shaded	NA	3		2	2 - Low
Water Systems	Treatment Plant	2110 Pond Ave	$122,020	0.10	X Shaded	NA	3		2	0
Water Systems	Treatment Plant	2110 Pond Ave	$122,020	0.10	X Shaded	NA	3		2	2 - Low
Water Systems	Treatment Plant	2110 Pond Ave	$122,020	0.10	X Shaded	NA	3		2	2 - Low
Water Systems	Treatment Plant	2110 Pond Ave	$122,020	0.10	X Shaded	NA	4	Y	2	0
Water Systems	Treatment Plant	2208 Lark Ave	$430,900	0.10	X Shaded	NA	3	Y	0	1.5
Water Systems	Treatment Plant	2208 Lark Ave	$430,900	0.10	X Shaded	NA	4	Y	0	4 - High
Water Systems	Treatment Plant	201 West Seachase Dr	$0	0.10	X Shaded	NA	4		0	0

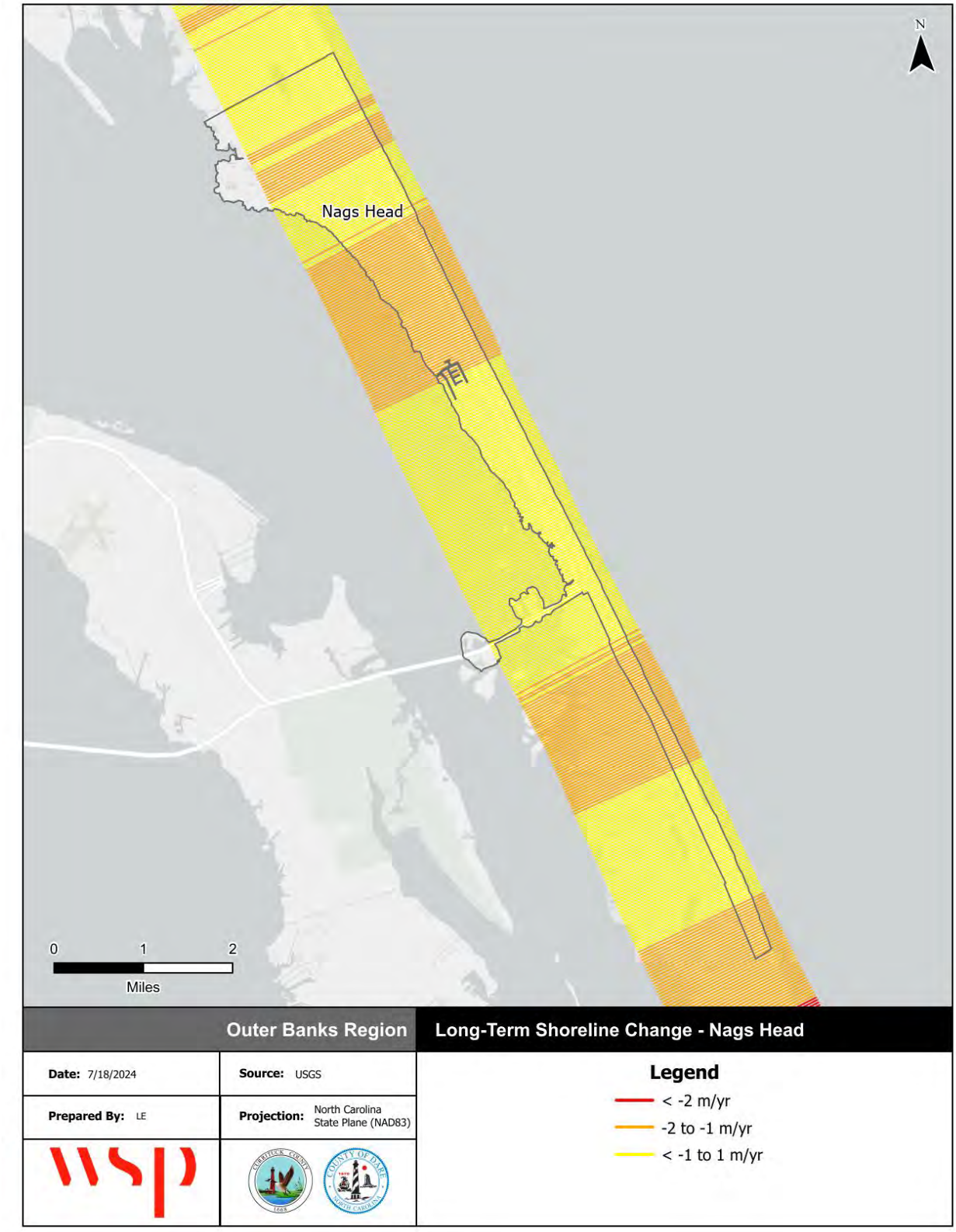
G.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Nags Head. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

G.2.1 HURRICANE & COASTAL HAZARDS

Figure G.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Town of Nags Head oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of the Town of Nags Head is experiencing some level of change every year.

Figure G.2 – Long-Term Shoreline Change Rates, Town of Nags Head



Source: United States Geological Survey

G.2.2 FLOODING

Table G.3 details the acreage of the Town of Nags Head by flood zone on the effective FIRM and previous 2006 FIRM. Per this assessment, over 33 percent of Nags Head falls within the mapped 1%-annual-chance floodplains. Over 64 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplains and the remainder falls within the 0.2 percent annual chance floodplain.

Table G.3 – Flood Zone Acreage in the Town of Nags Head

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	852.50	19.96%	1,991.51	46.62%
Zone AO	148.39	3.47%	11.84	0.28%
Zone VE	417.03	9.76%	771.26	18.06%
Zone X (500-year)	192.74	4.51%	1,496.91	35.04%
Zone X Unshaded	2,661.27	62.30%	--	--
Open Water	0.06	0.00%	--	--
Total	**4,271.99**	**--**	**4,271.51**	**--**

Source: FEMA Effective DFIRM and 2006 DFIRM

Figure G.3 reflects the effective mapped flood hazard zones for the Town of Nags Head, and Figure G.4 reflects the flood hazard zones from the previous 2006 FIRM.

Figure G.5 and Figure G.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table G.4 provides building counts and values for critical facilities by flood zone in Nags Head.

Table G.4 – Critical Facilities Exposed to Flooding, Town of Nags Head

Flood Zone	Critical Facility Count	Structure Value
AE	6	$16,507,200.00
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	19	$26,031,900.00
Total	**25**	**$42,539,100.00**

Source: FEMA Effective DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table G.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table G.6 summarizes exposure using the current effective FIRM as a baseline.

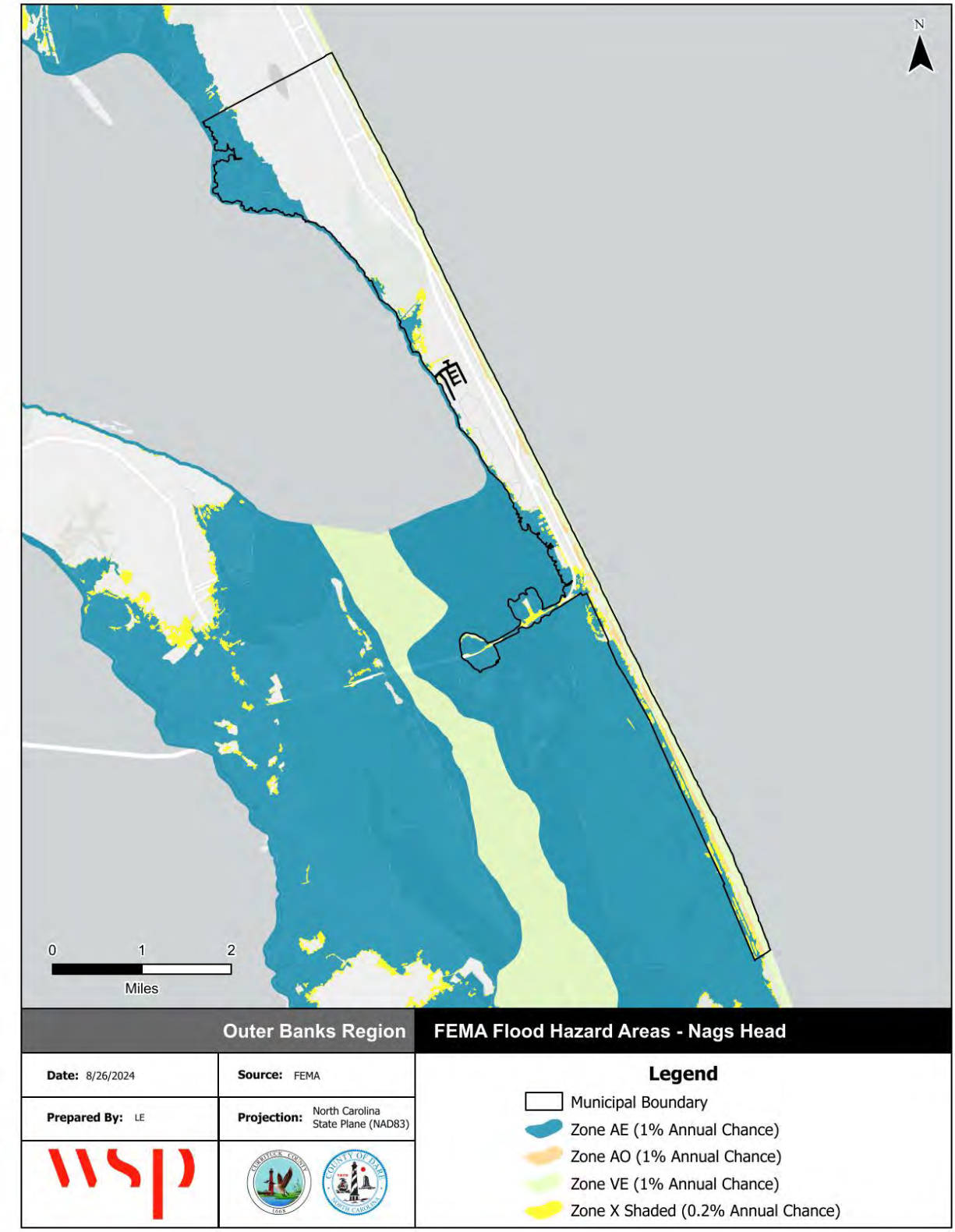
Table G.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**3,214**	**$830,266,985**	**$469,646,519**	**$1,299,913,505**
Agriculture	0	$0	$0	$0
Commercial	188	$78,961,975	$78,961,975	$157,923,950
Education	2	$11,635,000	$11,635,000	$23,270,000
Government	43	$4,577,373	$4,577,373	$9,154,746
Industrial	11	$3,169,053	$4,753,579	$7,922,632
Religious	10	$7,513,600	$7,513,600	$15,027,200
Residential	2,960	$724,409,984	$362,204,992	$1,086,614,976
+1 Foot Freeboard	**490**	**$98,381,082**	**$57,232,153**	**$155,613,235**
Agriculture	0	$0	$0	$0
Commercial	18	$14,522,267	$14,522,267	$29,044,534
Education	0	$0	$0	$0
Government	3	$276,775	$276,775	$553,550
Industrial	3	$321,274	$481,911	$803,185
Religious	2	$641,635	$641,635	$1,283,270
Residential	464	$82,619,131	$41,309,566	$123,928,697
+2 Foot Freeboard	**279**	**$48,930,252**	**$24,868,676**	**$73,798,928**
Agriculture	0	$0	$0	$0
Commercial	5	$494,060	$494,060	$988,120
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	2	$156,519	$234,779	$391,299
Religious	0	$0	$0	$0
Residential	272	$48,279,673	$24,139,837	$72,419,510
+3 Foot Freeboard	**280**	**$53,305,718**	**$28,271,740**	**$81,577,458**
Agriculture	0	$0	$0	$0
Commercial	7	$3,237,762	$3,237,762	$6,475,524
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	273	$50,067,956	$25,033,978	$75,101,934

Table G.6 – Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

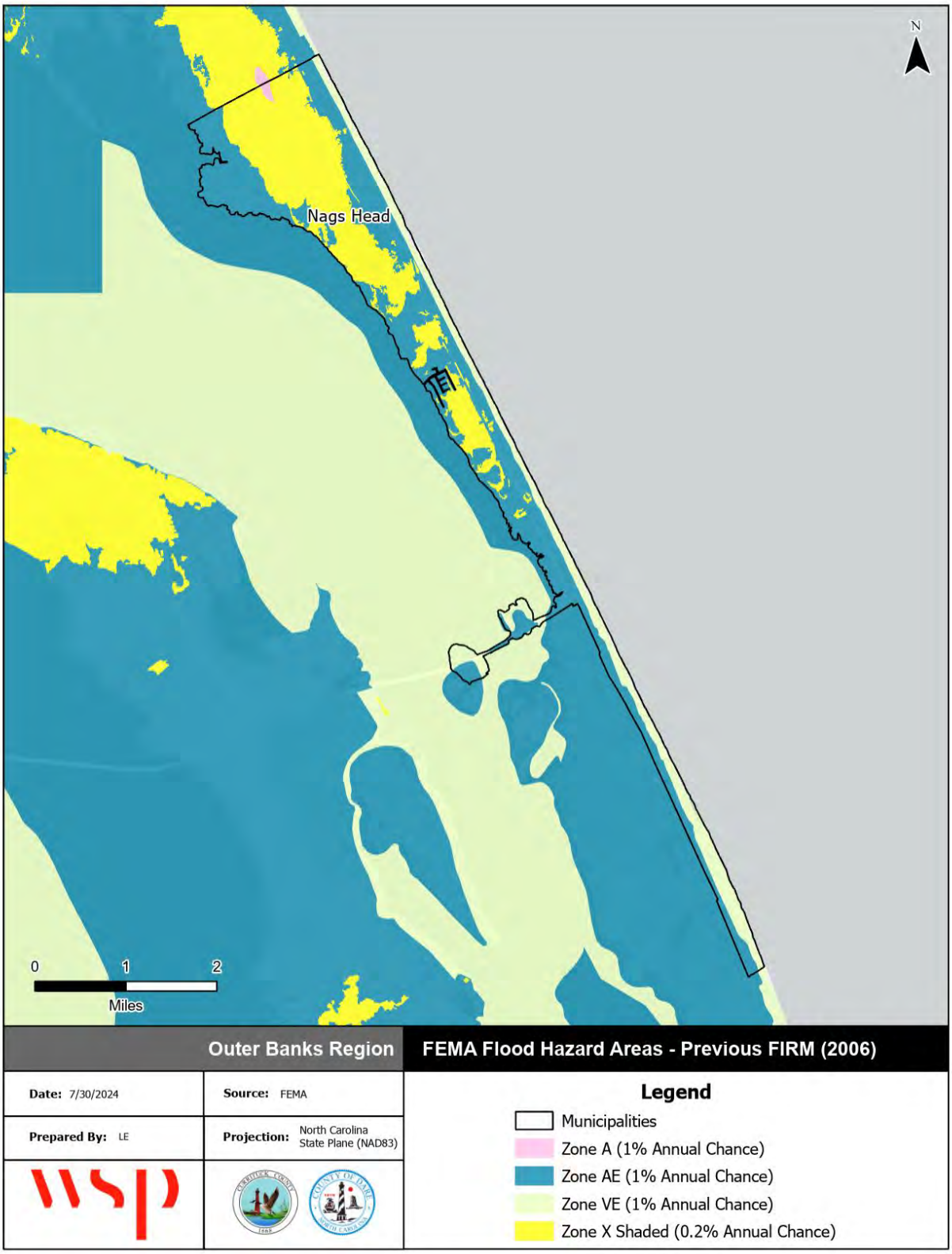
Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**3,841**	**$902,556,802**	**$489,819,268**	**$1,392,376,070**
Agriculture	0	$0	$0	$0
Commercial	155	$64,737,128	$64,737,128	$129,474,256
Education	0	$0	$0	$0
Government	42	$2,130,407	$2,130,407	$4,260,814
Industrial	4	$1,350,300	$2,025,450	$3,375,750
Religious	10	$7,513,600	$7,513,600	$15,027,200
Residential	3,630	$826,825,367	$413,412,684	$1,240,238,051
+1 Foot Freeboard	**490**	**$98,381,082**	**$57,232,153**	**$155,613,235**
Agriculture	0	$0	$0	$0
Commercial	29	$15,643,905	$15,643,905	$31,287,810
Education	1	$10,246,406	$10,246,406	$20,492,812
Government	1	$1,642,766	$1,642,766	$3,285,532
Industrial	6	$1,350,253	$2,025,379	$3,375,632
Religious	1	$373,791	$373,791	$747,582
Residential	268	$55,449,930	$27,724,965	$83,174,895
+2 Foot Freeboard	**279**	**$83,506,073**	**$57,605,640**	**$141,111,713**
Agriculture	0	$0	$0	$0
Commercial	26	$28,210,545	$28,210,545	$56,421,090
Education	1	$1,388,594	$1,388,594	$2,777,188
Government	2	$258,675	$258,675	$517,350
Industrial	4	$789,774	$1,184,661	$1,974,435
Religious	1	$267,844	$267,844	$535,688
Residential	245	$52,590,641	$26,295,321	$78,885,962
+3 Foot Freeboard	**220**	**$49,594,512**	**$27,890,408**	**$77,484,920**
Agriculture	0	$0	$0	$0
Commercial	7	$5,873,264	$5,873,264	$11,746,528
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	2	$156,519	$234,779	$391,299
Religious	0	$0	$0	$0
Residential	211	$43,564,729	$21,782,365	$65,347,094

Figure G.3 – FEMA Flood Hazard Areas, Town of Nags Head



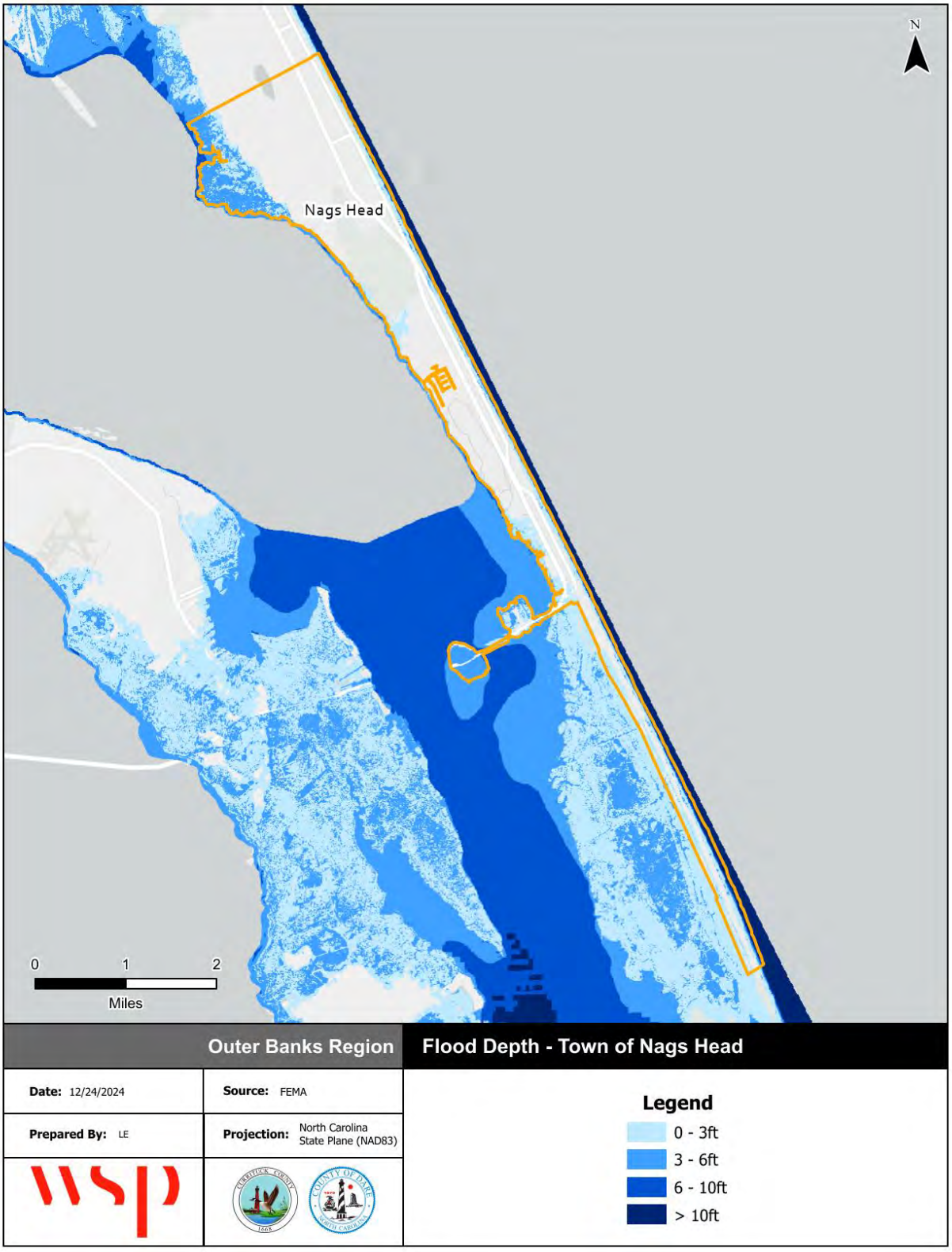
Source: FEMA Effective DFIRM

Figure G.4 – FEMA Flood Hazard Areas, Town of Nags Head – 2006 FIRM



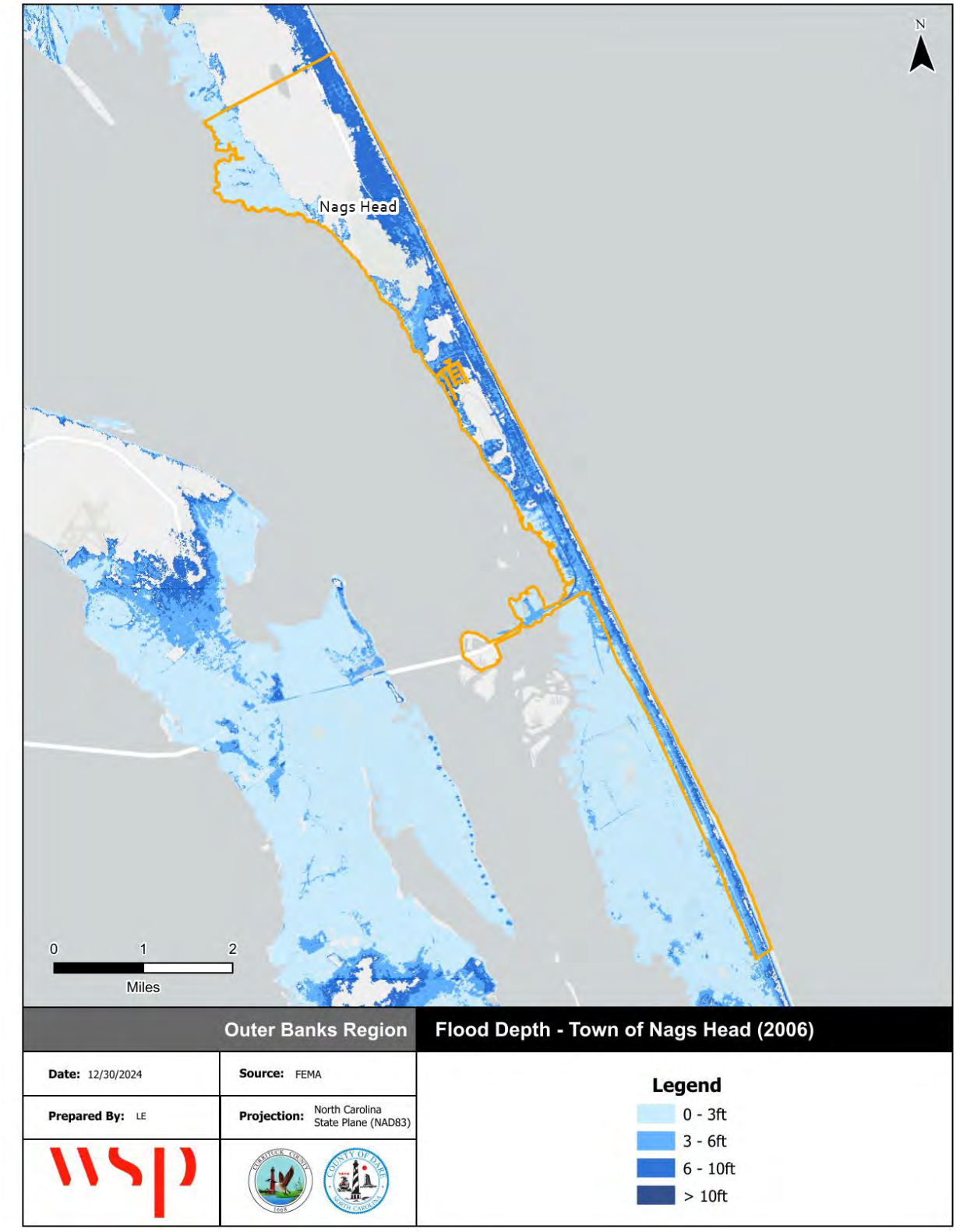
Source: FEMA 2006 DFIRM

Figure G.5 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Nags Head



Source: FEMA Effective DFIRM

Figure G.6 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Nags Head – 2006 FIRM



Source: FEMA 2006 DFIRM

The Town of Nags Head provided the following additional details on past flooding occurrences, which detail potential flood extent, areas exposed to flooding, and the cause of certain flood problems:

- **Hurricane Irene:** During Hurricane Irene, the town documented soundside flooding with flood heights reaching properties as high as seven feet above mean sea level. Many structures along the sound were damaged, and post-storm inspections revealed flood heights within structures between one and three feet. The average ground elevation in these same areas ranges between four and six feet above mean sea level.
- **Hurricane Matthew:** In the northern portion of town, flooding associated with rainfall from Hurricane Matthew was documented up to 3.5 feet within structures. Rainfall measurements recorded range between 11.7 inches to 13.7 inches across the Town of Nags Head, most of which occurred during a six hour period. The affected area is currently in the AE flood zone with a BFE of 10 feet. The extent of the floodwater surface elevations were documented between 10.0' msl and 11.5' msl.
- **July 2017-August 2017 Rainfall Events:** During this period an exceptional amount of rainfall occurred, and the time interval can derived from the North Ridge Weather station located in the north section of the Town of Nags Head. For the period between July 2, 2017 and July 16, 2017, three separate significant rainfall events occurred; a 25-yr rainfall event, a 50-yr rainfall, and a 200-yr event. Cumulatively, when combined with other rainfall occurrences and extended over a 47-day time period, this equates to an approximate 200-yr recurrence interval. The rainfall amount during this period accounts for approximately one-half of the annual average rainfall for the town. These circumstances were similar to conditions experienced in the Fall of 2016 when approximately one-half of the annual average rainfall occurred over the course of a 45-day period. Again, flood depths ranged between one and three feet and approximately 300 homes were impacted.

The Town's HMPC representatives noted that the topography and development patterns in the Town result in vulnerability to flood damages from heavy rainfall events. The natural topography of the barrier island creates a low-lying "trough" between the maritime forest zone west of US 158 and the primary beach and foredunes in the vicinity of NC 12. In general, the maritime ridge serves as the breakpoint for overland surface runoff and subsurface groundwater flow between the Atlantic Ocean and the Roanoke Sound. A majority of the developed properties exist east of the maritime ridge and are concentrated in the lower lying areas between the beach and maritime forest zones. Runoff tends to accumulate in the lower elevations of developed areas, creating a bowl like effect which leads to localized flooding by way of elevated groundwater conditions, surface runoff, or a combination of the two.

Additionally, the Town noted an increase in chronic flooding resulting from an increase in occurrences of "extreme" rainfall events. The Town noted that the significant flood risk associated with heavy rainfall events is not accounted for in upcoming changes to the Town's FIRM.

It was also noted that the Town's stormwater drainage system is very limited and relies heavily on five ocean outfalls maintained by NCDOT. These outfalls are undersized for the Town's needs.

FLOOD INSURANCE DATA

The Town of Nags Head joined the NFIP emergency program in 1971 and has been a regular participant since November 1972. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table G.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	1,630	$919,614	$496,998,000	2,680	$19,492,247.51
2-4 Family	86	$61,608	$22,689,000	193	$2,641,312.38
All Other Residential	235	$38,617	$53,774,000	44	$2,262,457.35
Non Residential	147	$240,078	$79,199,000	331	$9,303,526.70
Total	**2,098**	**$1,259,917**	**$652,660,000**	**3,248**	**$33,699,543.94**

Source: FEMA Community Information System, accessed December 2024

Table G.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	1,108	$593,237	$331,552,000	1,698	$12,689,566.14
A Zones	0	$0	$0	3	$34,599.18
AO	37	$30,309	$9,810,000	22	$476,516.58
V01-30 & VE Zones	74	$53,679	$21,499,000	693	$9,882,818.19
B, C & X Zone					
Standard	847	$566,048	$280,272,000	766	$10,185,566.03
Preferred	0	$0	$0	61	$428,499.41
Total	**2,066**	**$1,243,273**	**$643,133,000**	**3,243**	**$33,697,562.53**

Source: FEMA Community Information System, accessed December 2024

Table G.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	115	$73,032	$30,172,000	520	$6,896,120.42
A Zones	0	$0	$0	3	$34,599.18
AO Zones	16	$11,996	$3,952,000	19	$473,926.25
V01-30 & VE Zones	21	$25,709	$6,652,000	330	$6,161,926.26
B, C & X Zone	110	$98,313	$35,328,000	362	$5,756,901.34
Standard	110	$98,313	$35,328,000	352	$5,697,802.28
Preferred	0	$0	$0	10	$59,099.06
Total	**262**	**$209,050**	**$76,204,000**	**1,234**	**$19,323,473.45**

Source: FEMA Community Information System, accessed December 2024

Table G.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	993	$520,205	$301,380,000	1,178	$5,793,445.72
AO Zones	21	$18,313	$5,858,000	3	$2,587.33
V01-30 & VE Zones	53	$27,970	$14,847,000	363	$3,720,891.93
B, C & X Zone	737	$467,735	$244,944,000	465	$4,855,260.00
Standard	737	$467,735	$244,944,000	414	$4,487,763.75
Preferred	0	$0	$0	51	$369,400.35
Total	**1,804**	**$1,034,223**	**$567,029,000**	**2,009**	**$14,372,184.98**

Source: FEMA Community Information System, accessed December 2024

G.2.3 WILDFIRE

Table G.11 summarizes the acreage in the Town of Nags Head that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 50 percent of the Town of Nags Head is not included in the WUI.

Table G.11 – Wildland Urban Interface Acreage, Town of Nags Head

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	2,147.3	50.2%
	LT 1hs/40ac	56.5	1.3%
	1hs/40ac to 1hs/20ac	18.8	0.4%
	1hs/20ac to 1hs/10ac	118.3	2.8%
	1hs/10ac to 1hs/5ac	253.0	5.9%
	1hs/5ac to 1hs/2ac	808.6	18.9%
	1hs/2ac to 3hs/1ac	780.6	18.3%
	GT 3hs/1ac	94.0	2.2%
	Total	**4,277.1**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure G.7 depicts the WUI for the Town of Nags Head. Figure G.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure G.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Potential fire intensity is highest in northern Nags Head and along the sound toward Cedar Island and Pond Island. Northern Nags Head and Cedar Island also contain low to moderate burn probability and coincide with areas in the WUI. Therefore, these are the areas of greatest wildfire risk in the Town.

Table G.12 provides the count and estimated value of all structures that intersect with areas of the Town of Nags Head that are rated moderate to high on the WUI Risk Index.

Table G.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Nags Head

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	123	$59,904,681	$59,904,681	$119,809,362
Education	2	$11,635,000	$11,635,000	$23,270,000
Government	22	$1,119,875	$1,119,875	$2,239,750
Industrial	13	$3,235,737	$4,853,606	$8,089,343
Religious	10	$5,303,135	$5,303,135	$10,606,270
Residential	2522	$534,374,827	$267,187,414	$801,562,241
Total	**2,692**	**$615,573,255**	**$350,003,711**	**$965,576,966**

Source: Southern Wildfire Risk Assessment

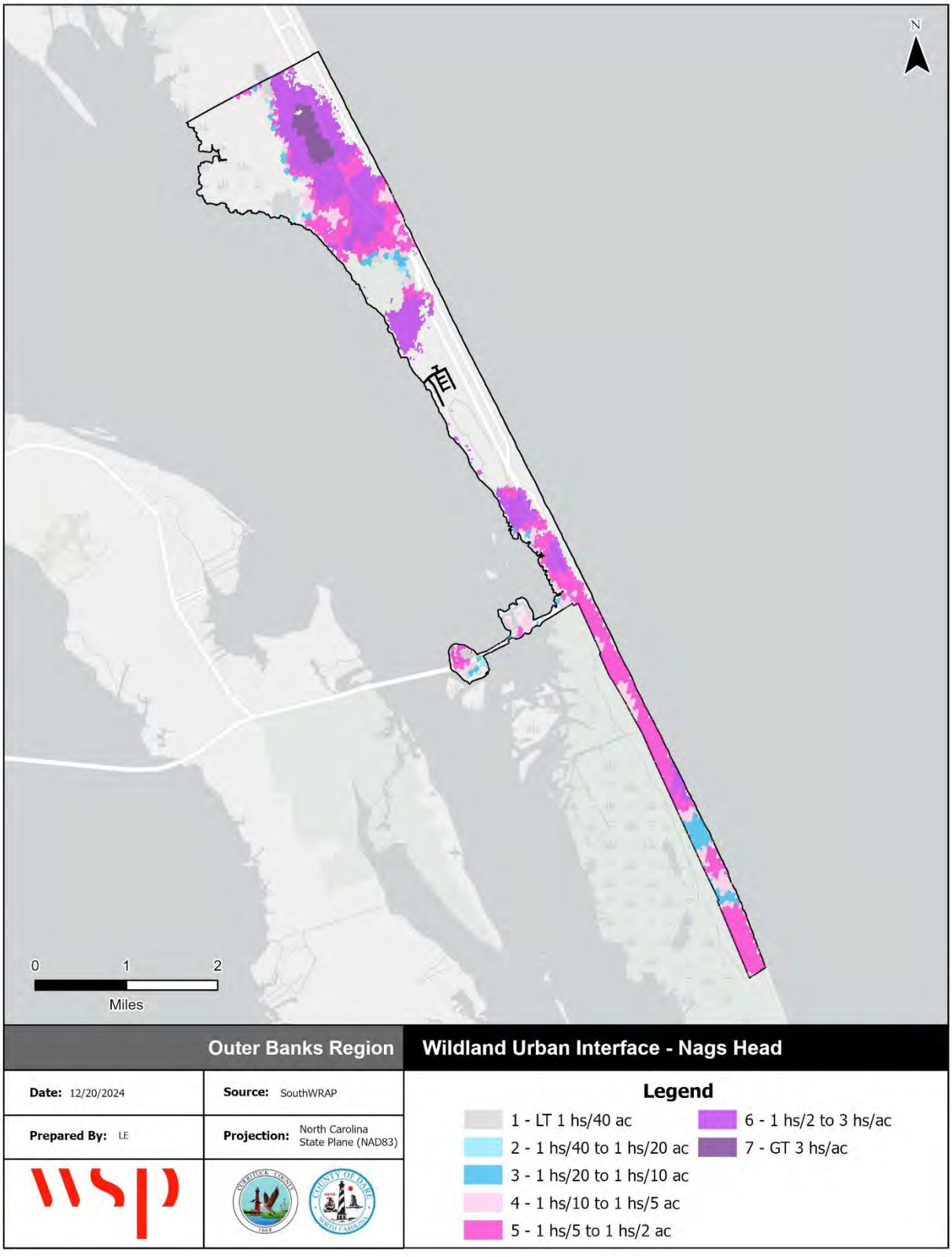
Table G.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table G.13 – Critical Facilities Exposed to Wildfire, Town of Nags Head

Type	Critical Facility Count	Structure Value
Communications	0	$0
Energy	0	$0
Food, Hydration, Shelter	1	$7,570,100
Hazardous Materials	0	$0
Health and Medical	0	$0
Safety and Security	4	$1,335,600
Transportation	0	$0
Water Systems	4	$1,376,820
Total	**9**	**$10,282,520**

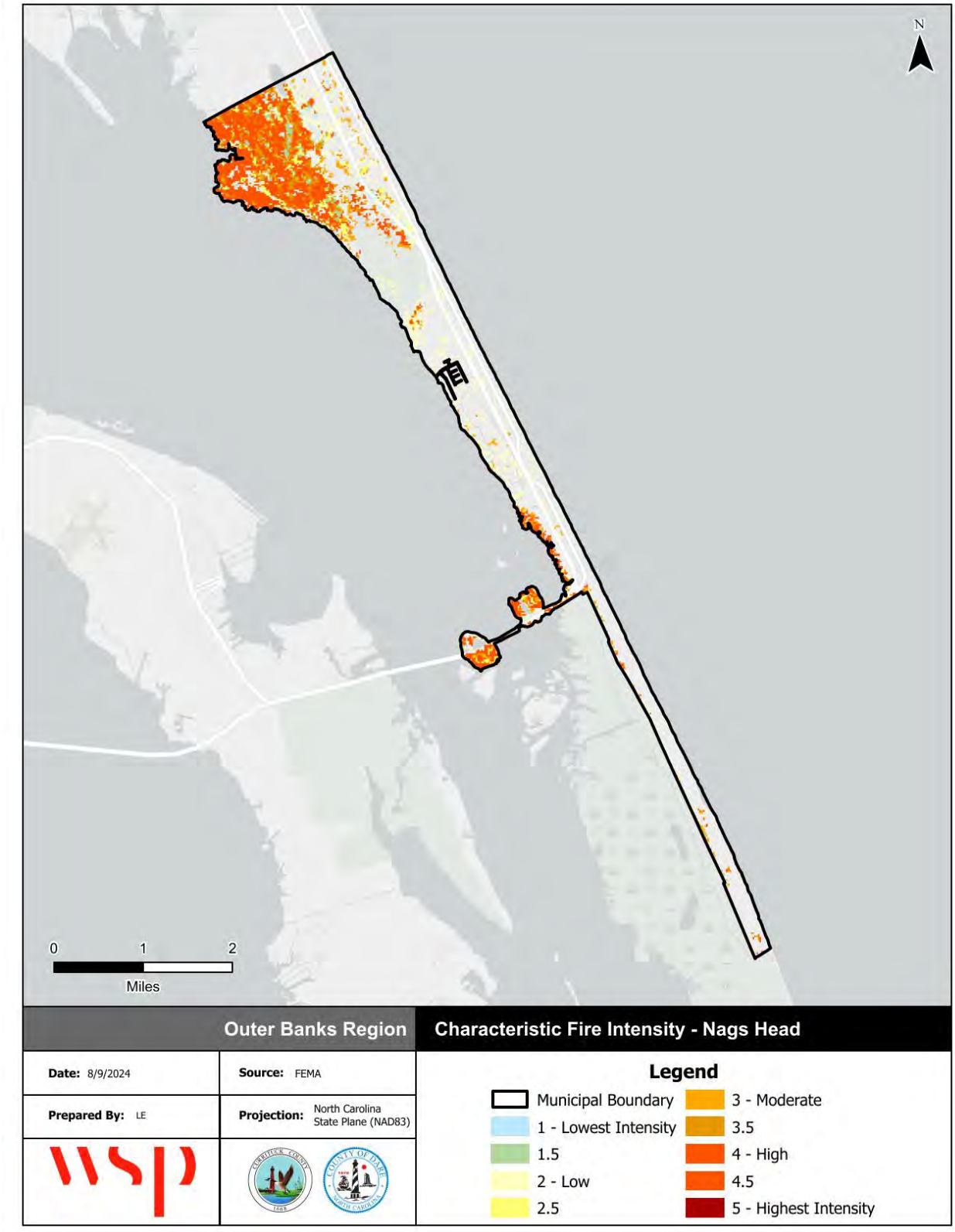
Source: Southern Wildfire Risk Assessment

Figure G.7 – Wildland Urban Interface, Town of Nags Head



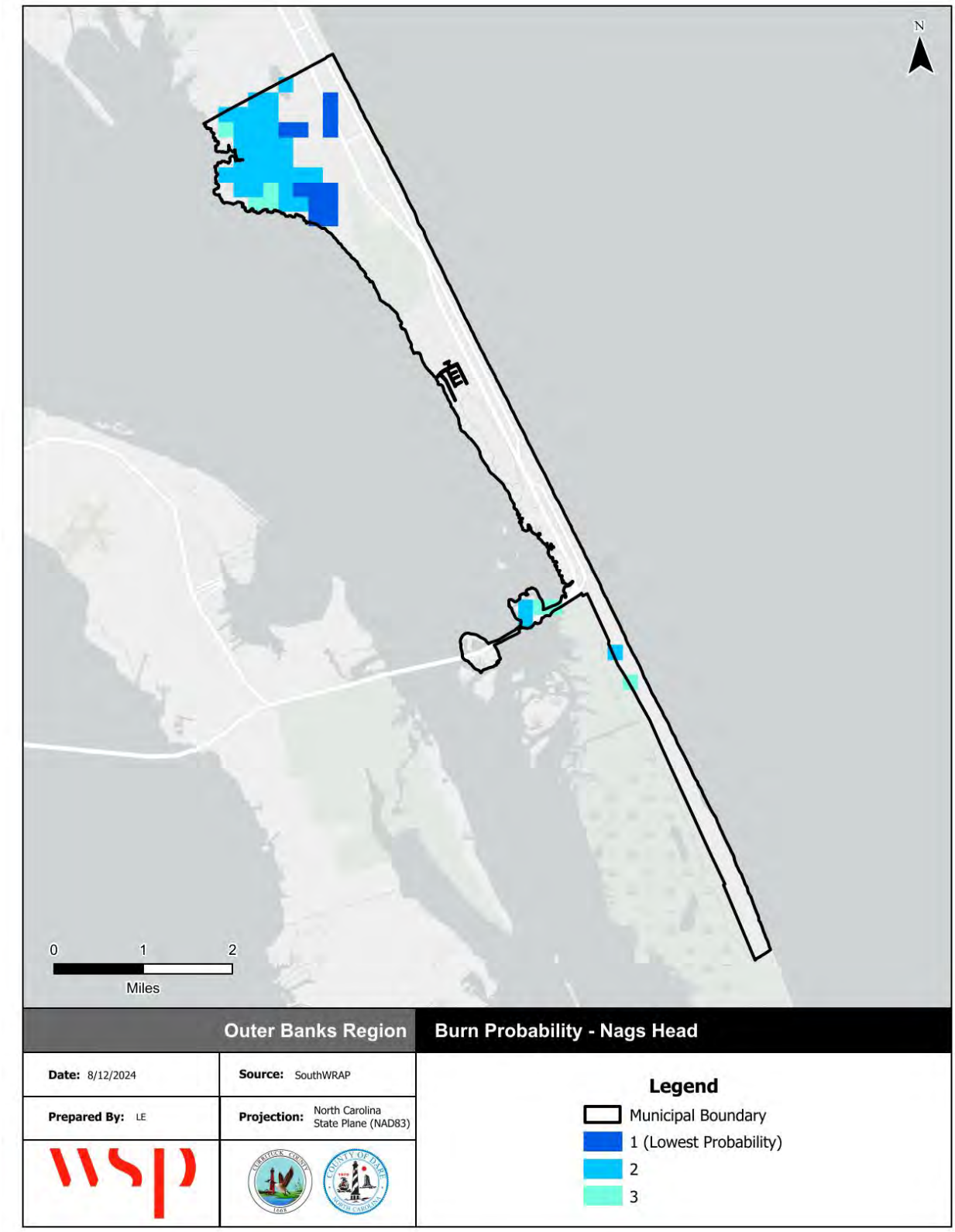
Source: Southern Wildfire Risk Assessment

Figure G.8 – Fire Intensity Scale, Town of Nags Head



Source: Southern Wildfire Risk Assessment

Figure G.9 – Burn Probability, Town of Nags Head



Source: Southern Wildfire Risk Assessment

G.3 MITIGATION STRATEGY

Table G.14 – Mitigation Action Plan, Town of Nags Head

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH1	Petition FEMA through the Town's state and regional NFIP representatives to consider adopting realistic regulations regarding the determination of destroyed structures. Specifically, this would apply to structures which are located on the public beach that are not eligible for flood insurance until they collapse.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.1	Low	Prevention	Planning, Town Manager	General Fund	5+ years	Carry Forward	Town Manager participated in the threatened structures working group. A report is being written which details a multi-prong approach with actionable items to solve this goal.
NGH2	Explore seeking authority and adopting regulations which would allow qualified Town staff to inspect sewer treatment facilities and on-site septic systems after a storm. These regulations should also allow staff to request the corrective actions necessary to ensure proper operation of these systems.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	2.2	Low	Prevention	Planning, Town Manager	General Fund	5+ years	Carry Forward	Carry forward damage information to health department so they can take action for any repairs that are required. Use Crisis Track to report damages after storm event. No need to seek independent authority.
NGH3	Lobby for a state policy and strategy on beach nourishment and beach re-nourishment through joint efforts with other local governments and organization. This includes an annually funded state program to support local nourishment activities.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	4.1	High	Prevention	Board of Commissioners	General Fund	3-5 years	Carry Forward	Beach and inlet management plan developed by the NC beach and waterways association we participate in. We collectively pursue with other localities.
NGH4	Develop contingency plans for infrastructure or services that may be lost as a result of exposure to hazards. Potential infrastructure includes roads/streets, waterlines, wastewater, stormwater, and other key utilities.	All Hazards	2.2	Medium	Prevention	Planning, Town Engineer, Public Works	General Fund/Stormwater	5+	Carry Forward	The Town has developed a comprehensive Infrastructure Plan where stormwater, waterlines, streets and paving work are reviewed at the same time during our CIP process. Upgrading drainage system with larger drainage pipes funded through Golden Leaf Grant.
NGH5	Evaluate the Nags Head Woods Fire Plan annually and coordinate information with Nature Conservancy staff and seek grant funding for fuel reduction activities.	Wildfire	3.3	Medium	Prevention	Town Manager, Fire, Police	General Fund, Grant Funds	1 year	Carry Forward	Staff discusses and reviews the Nags Head Woods Fire Plan annually for update and to discuss areas for fuel reduction. Staff seeks grant opportunities as needed.
NGH6	Plan and participate with partners to evaluate the need and maintenance of wild land urban interface areas including removal of dead wood in critically fire prone areas and controlled burn activities.	Wildfire	1.2	Medium	Prevention	Public Safety – Fire/Nature Conservancy/NPS	General Fund, Grant Funds	1 year	Carry Forward	Continue to work with the NPS, Dominion and the Nature Conservancy to maintain reduction of fuel loads in wildland-urban interface areas and to seek opportunities for grant funding to reduce vegetation in wildland-urban interface areas of the Town.
NGH7	Explore the feasibility of supporting residents in vulnerable areas becoming Firewise USA Sites.	Wildfire	3.3	Medium	Prevention	Fire	General Fund	2-3 years	Carry Forward	Action revised to reflect that this must be a resident-led effort with Town support.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH8	Work with Dare County to expand Town representation on the Local Emergency Planning Committee.	All Hazards	4.2	Low	Prevention	Fire	General Fund	1 year	Carry Forward	Town staff continue to participate on the committee.
NGH9	Acquire equipment and materials and retrofit critical facilities to ensure critical facilities and infrastructure remain operational during events.	All Hazards	2.1	High	Prevention	Town Manager, Fire, Police, Public Works, Planning,	General Fund	3-5 years	Carry Forward	The public works and water distribution facilities were redesigned and are currently under construction for more efficiency in operations and with contingency plans for hazards. Expectation of Public Services master plan completion September 2024. Currently developing a master plan for Fire station and Town Hall facilities.
NGH10	Purchase property, utilizing grants when possible, to acquire property for the purpose of mitigating damage and co-locating (dual use) Town facilities.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Planning, Town Engineer, Town Manager	General Fund/Grants	2-3 years	Carry Forward	Staff seeks any viable opportunity, on a case by case as needed basis, for funds to acquire properties for the purposed of mitigating damage, improvement water quality, preserving open space, protecting natural resources, and co-locating Town facilities.
NGH11	Identify and evaluate solutions to mitigate areas of repetitive flooding.	Hurricane & Coastal Hazards, Flooding	1.2	High	Property Protection	Planning, Town Engineer, Public Works	General Fund/Stormwater	1 year	Carry Forward	The Town received over 3 million dollars in grant funding to implement stormwater control projects in areas of repetitive loss. Two of these projects have been designed and will begin construction in 2024.
NGH12	Support public and private mitigation projects that reduce the potential damaging effects of hazards on the town, including acquisition and/or elevation of at-risk properties. Homes that are pre-FIRM and repetitive loss structures should be prioritized.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Property Protection	Planning, Town Engineer, Town Manager	General Fund/Grants	1 year	Carry Forward	No action taken as of this date.
NGH13	Seek methods to remove structures located on the public beach which degrade the recreational and natural quality of the environment, create public health and safety hazards, and impede the ability of life safety personnel to move along the shoreline.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Natural Resource Protection	Town Manager, Planning, Town Engineer	General Fund	5+ years	Carry Forward	The Town successfully removed a structure from the public beach in April 2023. The former structure was located at 10211 Sea Gull Drive.
NGH14	The town will identify, acquire, and seek grant funding of property for the purposes of open space, improving water quality, protecting natural resources, and recreational purposes.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	1.2	High	Natural Resource Protection	Town Manager, Planning, Town Engineer	General Fund, Grant Funds	2-3 years	Carry Forward	The Town acquired five parcels of vacant land located at 8504, 8506, 8508, 8510 and 8512 SOOIR. These properties will be kept as open space in perpetuity.
NGH15	Nourish the Town's beaches as a means to mitigate damage to oceanfront properties and infrastructure. This includes the pursuit of potential funding sources to supplement Town funds and programmatic permitting to assist with future nourishment projects.	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.2	High	Structural Projects	Town Manager, Town Engineer	Dare County Shoreline Fund, Town Municipal Service Districts	3-5 years	Carry Forward	The Town's third beach nourishment project occurred in 2022. Beach Nourishment master plan will dictate timing of future nourishment projects.

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
NGH16	Investigate innovative solutions to unconventional drainage problems. This may include the implementation of groundwater management techniques and low impact development practices which address stormwater runoff at or near its source. Possible solutions will consider improvements to address both water quality and water quantity. Continue to evaluate and assess existing infrastructure for replacement and improvement to include drainage systems maintained by NCDOT that may be impacted by other Town initiatives (i.e. beach nourishment).	Hurricane & Coastal Hazards, Flooding, Tornadoes & Thunderstorms	3.3	High	Structural Projects	Town Engineer, Public Works, Planning	General Fund/Stormwater	1 year	Carry Forward	The Town of Nags Head received grant funding for the construction of stormwater projects areas #12 and #11. These projects will address roadway flooding through a french drain system and pump to a natural dune infiltration area.
NGH17	Adhere to the Incident Command Structure to maintain and improve emergency operations and communications. This includes the annual update of the critical facilities list in the Emergency Operations Plan (EOP) and purchase of additional emergency operations communication equipment.	All Hazards	2.2	Medium	Emergency Services	Fire, Police, Town Manager	General Fund	5+ years	Carry Forward	Staff recently completed a new EOP. Staff continues to adhere to the ICS, update the critical facilities list and participate in the EOP with Dare County.
NGH18	Continue to educate property owners to maintain fire safe landscaping and vegetation adjacent to structures.	Wildfire	1.1	Low	Public Education & Awareness	Fire	General Fund	5+ years	Carry Forward	This is accomplished on a case by case basis as needed. In addition, during fuel reduction burns staff meets with the community to explain the need for reduction of fuel loads.
NGH19	Develop outreach materials to educate the public and increase awareness on hazards, how to develop and retrofit their properties against hazards, and individual tasks that can help them better prepare and respond to hazards. Staff should explore alternative options to traditional on-site meetings. This may include increased use of social media, the public access channel and short videos and handouts.	All Hazards	1.1	High	Public Education & Awareness	Planning, Town Manager, Town Engineer, Fire/Ocean Rescue	General Fund	2-3 years	Carry Forward	The Town has utilized social media, videos, the website, and mailed information to inform residents about the new flood maps, flooding, stormwater, hurricane preparedness, and other coastal hazards.
NGH20	Educate and assist vulnerable populations in preparing for and recovering from impacts by hazards. This may include hazard awareness, evacuation planning, or disaster relief.	All Hazards	1.1	Low	Public Education & Awareness	Fire/Ocean Rescue, Police, Planning, Town Manager	General Fund	3-5 years	Carry Forward	Continue communicating with stakeholders regarding at-risk populations who may require special assistance during disasters.
NGH21	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning, Fire, NC Forest Service	Grant Funds	3-5 years	New	

ANNEX H. TOWN OF SOUTHERN SHORES

H.1 ASSET INVENTORY

Dare County and the HMPC provided a local inventory of critical facilities and community lifelines, which are a priority for mitigation planning and emergency management. Lifelines are the most fundamental services in the community that, when stabilized, enable all other aspects of society to function. Table H.1 provides a count of critical facilities by FEMA lifeline category within the Town of Southern Shores. Figure H.1 shows the locations of all critical facilities within the Town of Southern Shores.

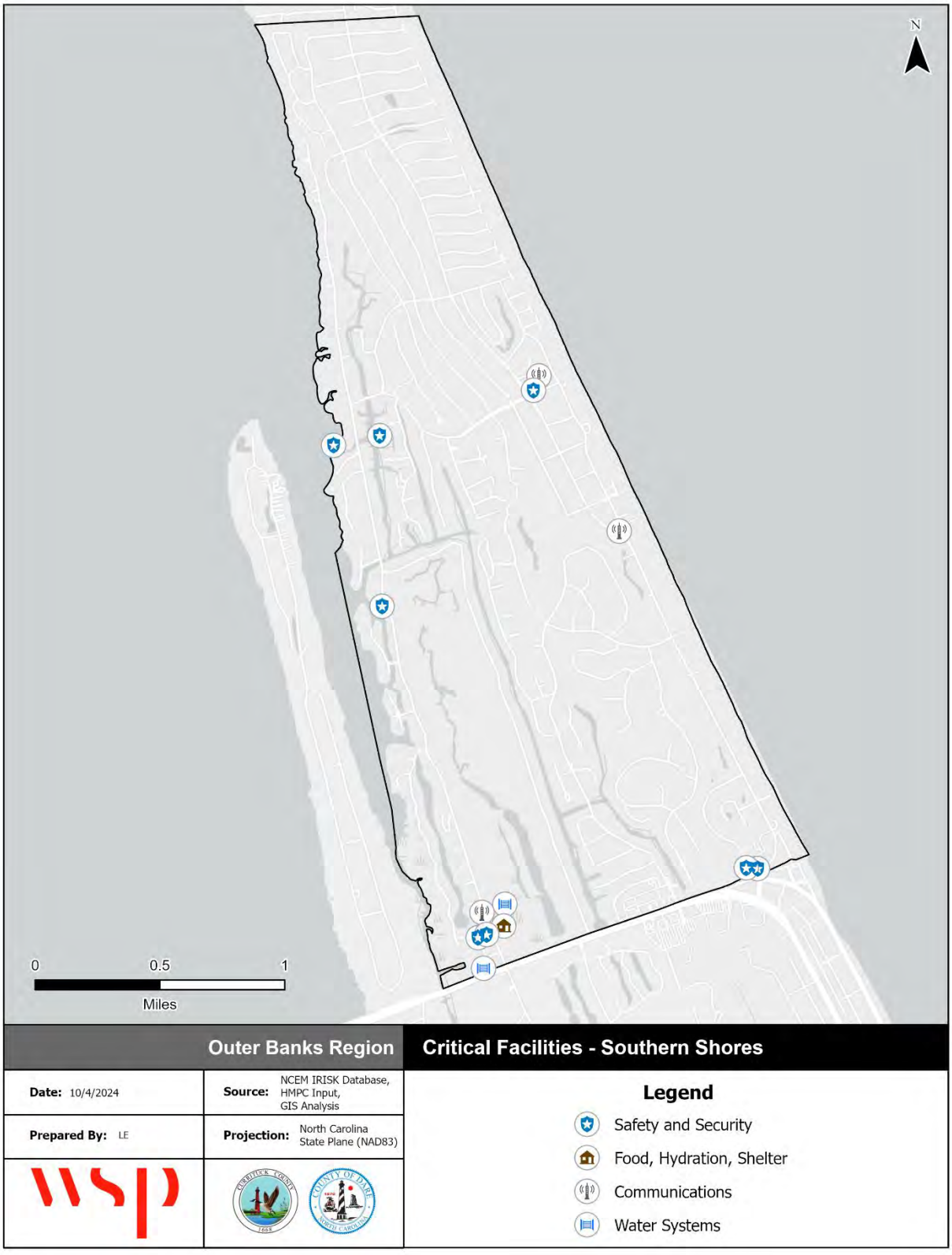
Table H.2 provides a detailed inventory of the critical facilities in Southern Shores, indicating each facility's FEMA lifeline category, flood zone, 1% annual chance flood depth, and vulnerability to storm surge, sea level rise, and wildfire. More information on hazard vulnerability is provided in the hazard profiles.

Table H.1 – Critical Facilities by Type, Town of Southern Shores

Facility Type	Count of Facility Type	Structure Value
Communications	3	$459,150
Energy	0	$0
Food, Hydration, Shelter	1	$12,421,100
Hazardous Materials	0	$0
Health and Medical	0	$0
Safety and Security	8	$6,554,700
Transportation	0	$0
Water Systems	2	$336,650
Total	**14**	**$19,771,600**

Source: Dare County, HMPC

Figure H.1 – Critical Facilities, Town of Southern Shores



Source: NCEM IRISK Database, HMPC input, GIS Analysis

Table H.2 – Southern Shores Critical Facilities Inventory

FEMA Lifeline	Facility Type	Address	Structure Value	2006 Flood Depth	2006 Flood Zone	Min. Sea Level Rise	Min. Storm Surge Cat.	High WUIRI?	Burn Probability	Fire Intensity
Communications	Communications	148 A Ocean Blvd	$1,900	0.10	AE	NA	3	Y	0	0
Communications	Communications	7 Sandfiddler Ct	$120,600	0.10	X Shaded	NA	4	Y	0	1 - Lowest Intensity
Communications	Communications		$336,650	0.10	AE	NA	1	Y	1	2 - Low
Food, Hydration, Shelter	School	16 Dogwood Trl	$12,421,100	0.10	X Shaded	NA	3	Y	1	0
Safety & Security	Government	27 Pintail Trl	$103,700	0.10	AE	NA	2	Y	1	0
Safety & Security	Fire Station	28 Dogwood Trl	$4,301,600	0.10	X Shaded	NA	4	Y	0	0
Safety & Security	Police Station	5375 Va Dare Trl	$514,800	0.10	X Shaded	NA	NA		0	0
Safety & Security	Civic	113 Dogwood Trl	$92,900	1.59	AE	NA	1	Y	0	0
Safety & Security	Civic	177 Dogwood Trl	$195,700	1.47	AE	NA	1		0	0
Safety & Security	Government	5375 Va Dare Trl	$514,800	0.10	X Shaded	NA	NA	Y	0	0
Safety & Security	Fire Station	15 Dogwood Trl	$663,400	0.10	X Shaded	NA	4	Y	1	0
Safety & Security	Civic	3 Loblolly Dr	$167,800	0.87	AE	NA	2	Y	0	1.5
Water Systems	Treatment Plant	18 Dogwood Trl	$336,650	0.10	AE	NA	1	Y	1	2 - Low
Water Systems	Treatment Plant		$0	0.10	AE	NA	3	Y	1	2 - Low

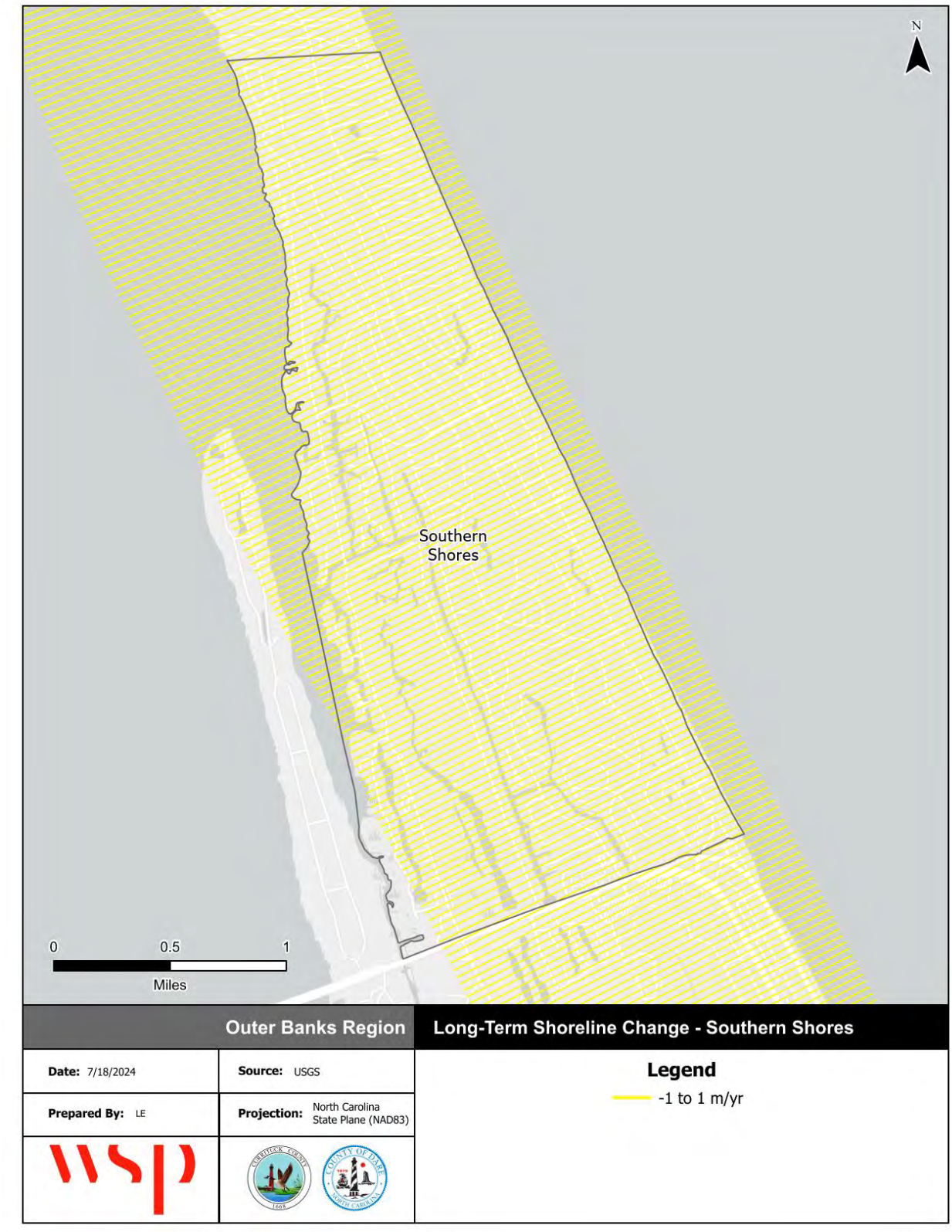
H.2 RISK ASSESSMENT

This section contains a hazard profile and vulnerability assessment for those hazards that are spatially defined and have variations in risk that could be evaluated quantitatively on a jurisdictional level within the Town of Southern Shores. The hazards included in this section are: Coastal Hazards, Flood, and Wildfire.

H.2.1 HURRICANE & COASTAL HAZARDS

Figure H.2 on the following page shows long-term (78-177 years) rates of shoreline change along developed areas of the Town of Southern Shores oceanfront coastline. Shoreline change rates were calculated using a linear regression method of lidar data from the U.S. Geological Survey's National Assessment Project. Most of the developed coastline of the Town of Southern Shores is experiencing some level of change every year.

Figure H.2 – Long-Term Shoreline Change Rates, Town of Southern Shores



Source: United States Geological Survey

H.2.2 FLOODING

Table H.3 details the acreage of the Town of Southern Shores by flood zone on the effective FIRM and previous 2006 FIRM. Per this assessment, over 24 percent of the Southern Shores falls within the mapped 1%-annual-chance floodplains. Over 51 percent of the Town falls within the previous 2006 mapped 1%-annual-chance floodplains and the remainder is within the 0.2 percent annual chance floodplain.

Table H.3 – FEMA Flood Hazard Areas, Town of Southern Shores

Flood Zone	Current Effective FIRM		2006 FIRM	
	Acreage	Percent of Total (%)	Acreage	Percent of Total (%)
Zone AE	514.73	19.43%	1,166.73	44.52%
Zone AO	19.58	0.74%	0	--
Zone VE	111.70	4.22%	196.92	7.43%
Zone X (500-year)	167.42	6.32%	1,285.25	48.52%
X Unshaded	1,835.54	69.29%	0	--
Total	**2,648.97**	**--**	**2,648.89**	**--**

Source: FEMA Effective DFIRM and 2006 DFIRM

Figure H.3 reflects the effective mapped flood hazard zones for the Town of Southern Shores, and Figure H.4 reflects the flood hazard zones from the previous 2006 FIRM.

Figure H.4 and Figure H.6 display the depth of flooding estimated to occur in these areas during the 1%-annual-chance flood.

Table H.4 provides building counts and values for critical facilities by flood zone in the Town of Southern Shores.

Table H.4 - Critical Facilities Exposed to Flooding, Town of Southern Shores

Flood Zone	Critical Facility Count	Structure Value
AE	8	$1,235,300.00
X, 0.2 PCT ANNUAL CHANCE FLOOD HAZARD	6	$18,536,300.00
Total	**14**	**$19,771,600.00**

Source: FEMA 2006 DFIRM

To supplement the vulnerability assessment from IRISK, the planning team used the Federal Flood Risk Management Standard (FFRMS) Freeboard Value Approach (FVA) for evaluating future flood conditions. This analysis was completed using the 2006 FIRM and the current effective FIRM as baselines. Each baseline scenario provides an estimate of current exposure to the 1%-annual-chance flood event, and the freeboard scenarios provide an approximation of exposure under possible future flood conditions. The analysis using the 2006 FIRM is considered the more appropriate measure of current and future exposure because the baseline scenario is a more accurate representation of current flood risk. Table H.5 summarizes exposure under each freeboard scenario using the 2006 FIRM as a baseline, and Table H.6 summarizes exposure using the current effective FIRM as a baseline.

Table H.5 – Current and Future Property Exposure to Flooding, Current Effective FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,118**	**$328,094,662**	**$166,272,750**	**$494,367,412**
Agriculture	0	$0	$0	$0
Commercial	7	$1,969,204	$1,969,204	$3,938,408
Education	0	$0	$0	$0
Government	3	$568,700	$568,700	$1,137,400
Industrial	2	$352,917	$529,376	$882,293
Religious	1	$1,207,100	$1,207,100	$2,414,200
Residential	1,105	$323,996,741	$161,998,371	$485,995,112
+1 Foot Freeboard	**197**	**$60,424,809**	**$33,297,311**	**$93,722,120**
Agriculture	0	$0	$0	$0
Commercial	3	$6,169,813	$6,169,813	$12,339,626
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	194	$54,254,996	$27,127,498	$81,382,494
+2 Foot Freeboard	**113**	**$29,379,942**	**$15,247,881**	**$44,627,823**
Agriculture	0	$0	$0	$0
Commercial	4	$1,115,819	$1,115,819	$2,231,638
Education	0	$0	$0	$0
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	109	$28,264,123	$14,132,062	$42,396,185
+3 Foot Freeboard	**117**	**$29,907,269**	**$16,270,452**	**$46,177,721**
Agriculture	0	$0	$0	$0
Commercial	5	$2,336,915	$2,336,915	$4,673,830
Education	0	$0	$0	$0
Government	1	$176,181	$176,181	$352,362
Industrial	1	$60,269	$90,404	$150,673
Religious	0	$0	$0	$0
Residential	110	$27,333,904	$13,666,952	$41,000,856

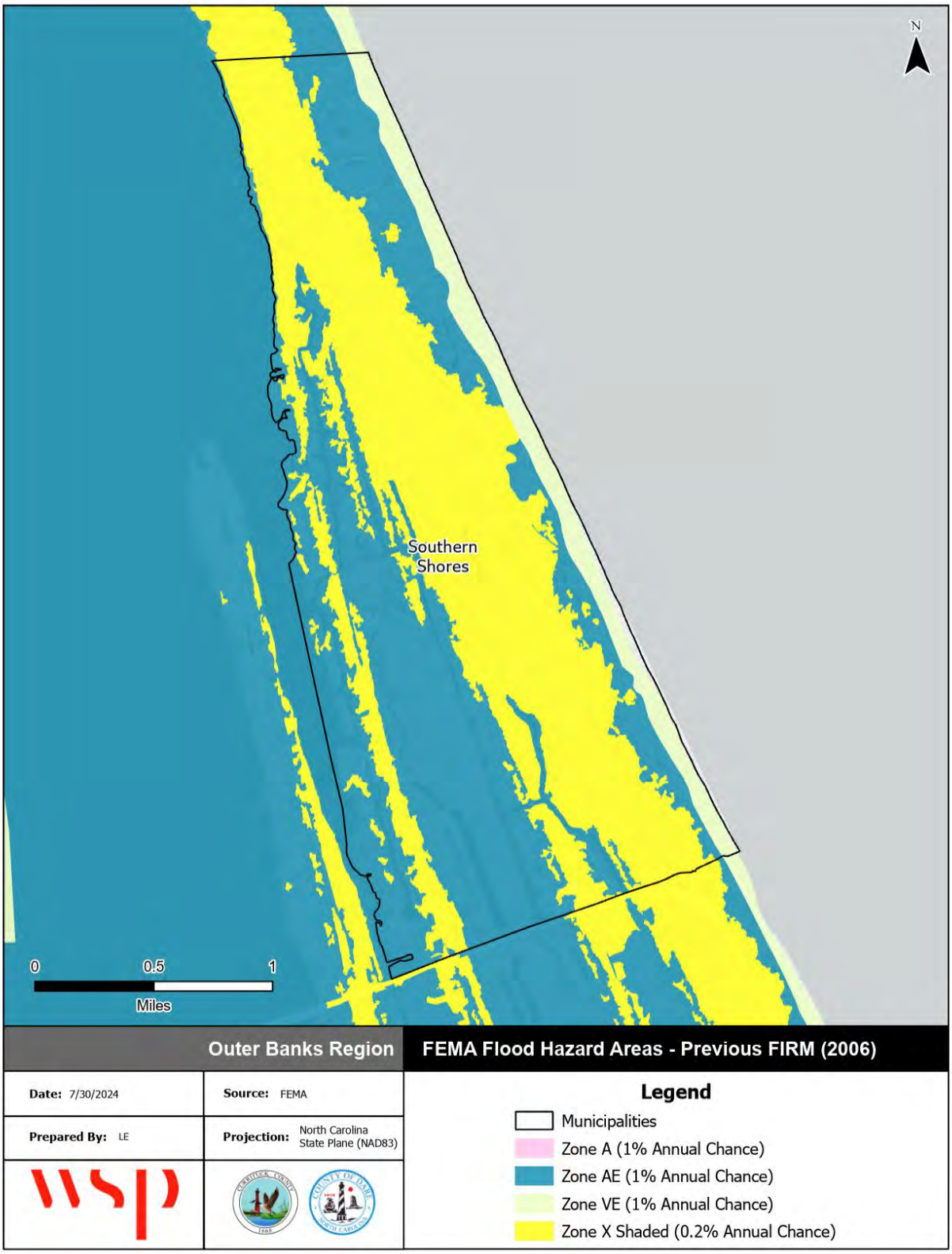
Table H.6 - Current and Future Property Exposure to Flooding, 2006 FIRM Baseline

Occupancy	Estimated Parcel Count	Structure Value	Estimated Content Value	Total Value
+0 Foot Freeboard	**1,037**	**$308,705,540**	**$159,952,890**	**$468,658,430**
Agriculture	0	$0	$0	$0
Commercial	14	$8,900,905	$8,900,905	$17,801,810
Education	0	$0	$0	$0
Government	2	$386,400	$386,400	$772,800
Industrial	2	$352,917	$529,376	$882,293
Religious	1	$1,207,100	$1,207,100	$2,414,200
Residential	1,018	$297,858,218	$148,929,109	$446,787,327
+1 Foot Freeboard	**274**	**$76,684,682**	**$39,204,526**	**$115,889,208**
Agriculture	0	$0	$0	$0
Commercial	2	$1,427,650	$1,427,650	$2,855,300
Education	0	$0	$0	$0
Government	1	$176,181	$176,181	$352,362
Industrial	1	$60,269	$90,404	$150,673
Religious	0	$0	$0	$0
Residential	270	$75,020,582	$37,510,291	$112,530,873
+2 Foot Freeboard	**237**	**$83,847,899**	**$50,152,749**	**$134,000,648**
Agriculture	0	$0	$0	$0
Commercial	3	$1,257,198	$1,257,198	$2,514,396
Education	1	$14,623,200	$14,623,200	$29,246,400
Government	0	$0	$0	$0
Industrial	0	$0	$0	$0
Religious	1	$577,200	$577,200	$1,154,400
Residential	232	$67,390,301	$33,695,151	$101,085,452
+3 Foot Freeboard	**143**	**$44,908,872**	**$24,159,537**	**$69,068,409**
Agriculture	0	$0	$0	$0
Commercial	3	$3,227,902	$3,227,902	$6,455,804
Education	0	$0	$0	$0
Government	1	$182,300	$182,300	$364,600
Industrial	0	$0	$0	$0
Religious	0	$0	$0	$0
Residential	139	$41,498,670	$20,749,335	$62,248,005

Figure H.3 – FEMA Flood Hazard Areas, Town of Southern Shores

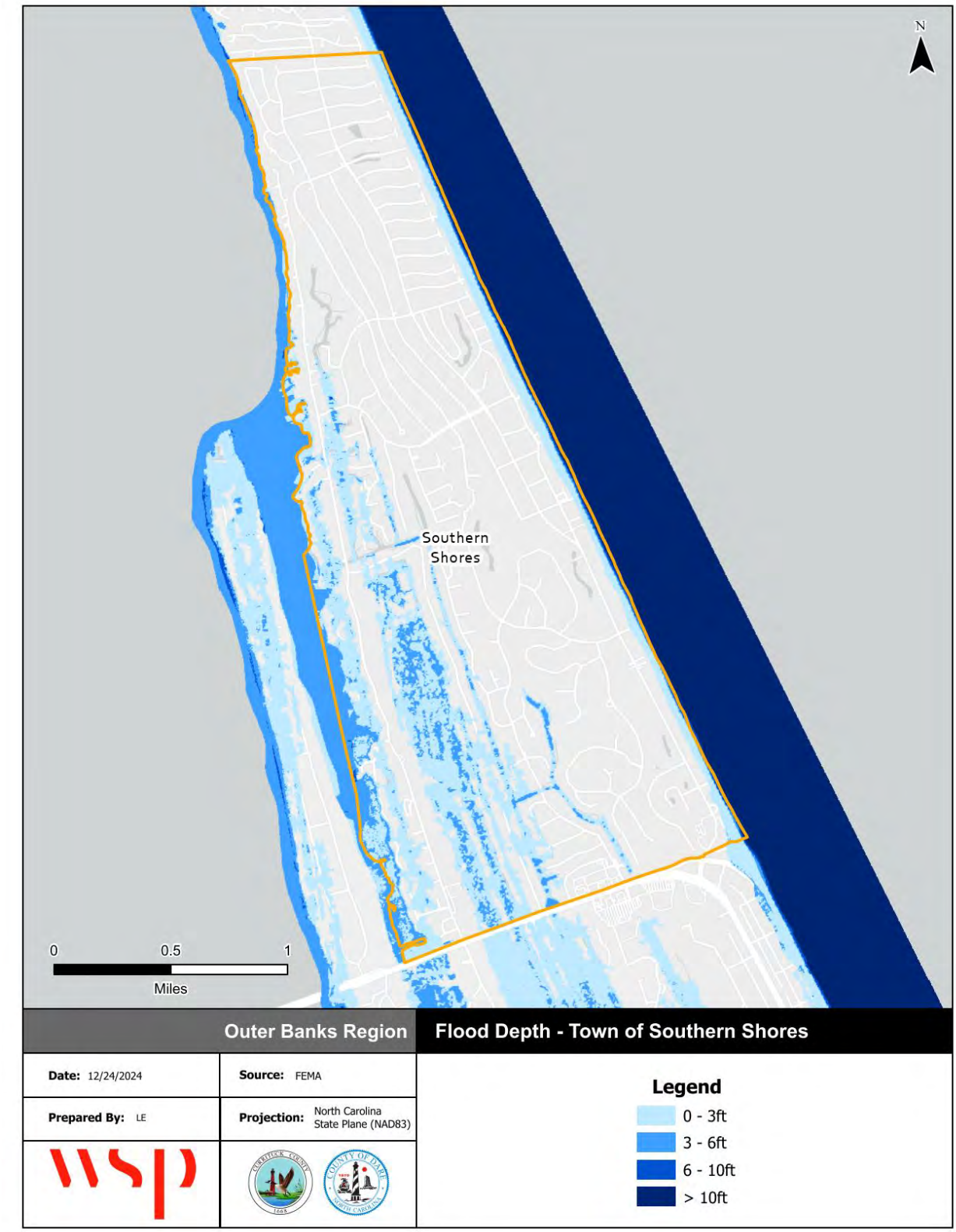
Source: FEMA Effective DFIRM

Figure H.4 - FEMA Flood Hazard Areas, Town of Southern Shores – 2006 FIRM



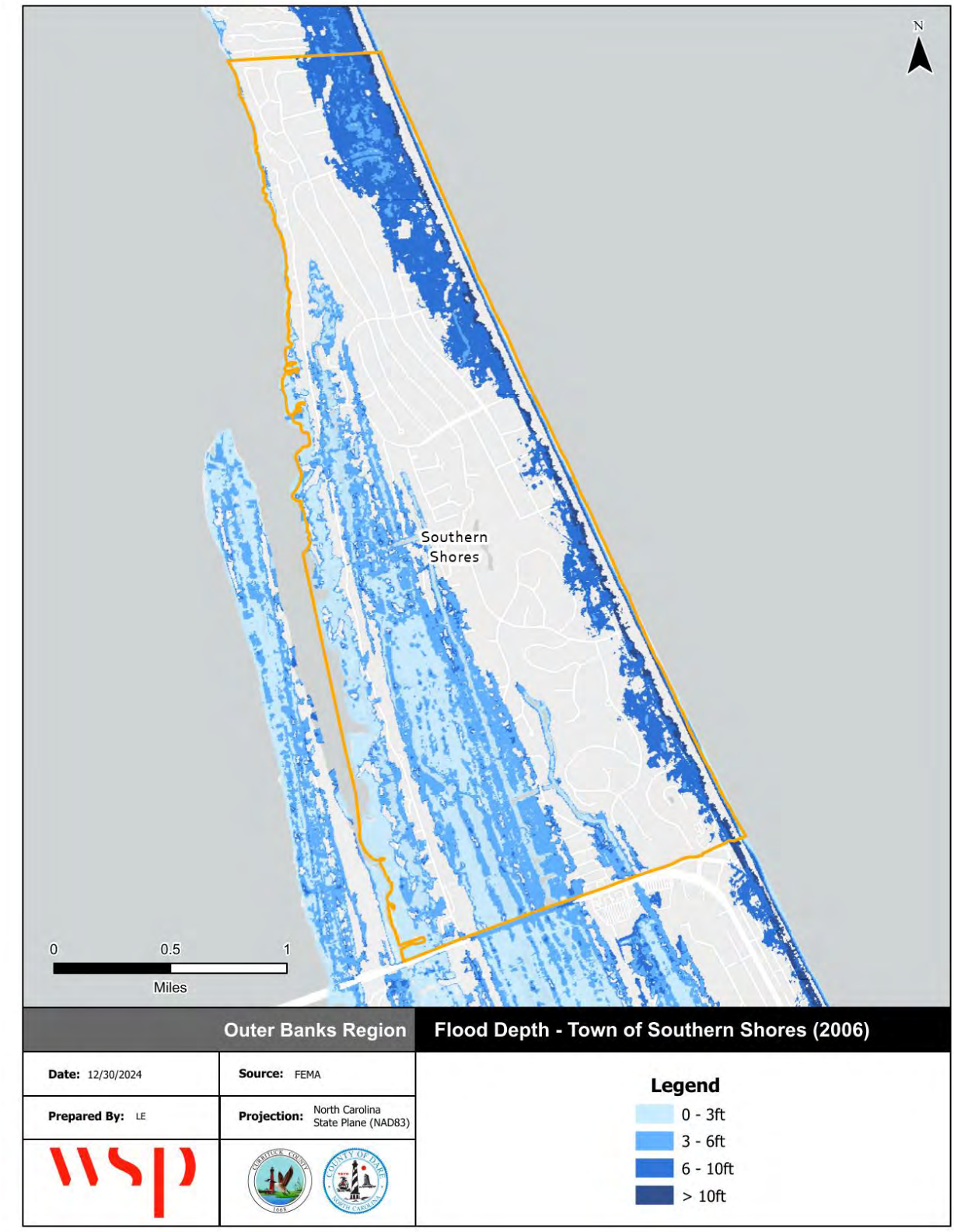
Source: FEMA 2006 FIRM

Figure H.5 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Southern Shores



Source: FEMA Effective DFIRM

Figure H.6 – Flood Depth, 1%-Annual-Chance Floodplain, Town of Southern Shores – 2006 FIRM



Source: FEMA 2006 DFIRM

FLOOD INSURANCE DATA

The Town of Southern Shores joined the NFIP emergency program in 1971 and has been a regular participant since November 1972. The following tables reflect NFIP policy and claims data for the Town categorized by structure type, flood zone, Pre-FIRM and Post-FIRM.

Table H.7 – NFIP Policy and Claims Data by Structure Type

Structure Type	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
Single Family	606	$380,290	$195,983,000	307	$1,627,491.12
2-4 Family	14	$9,153	$3,454,000	2	$4,686.48
All Other Residential	0	$0	$0	0	$0.00
Non Residential	13	$20,945	$6,954,000	3	$5,290.70
Total	**633**	**$410,388**	**$206,391,000**	**312**	**$1,637,468.30**

Source: FEMA Community Information System, accessed December 2024

Table H.8 – NFIP Policy and Claims Data by Flood Zone

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	207	$125,021	$63,189,000	184	$998,038.26
A Zone	0	$0	$0	2	$59,192.93
AO Zones	13	$11,871	$3,911,000	13	$28,772.94
V01-30 & VE Zones	31	$18,208	$9,644,000	14	$3,221.05
B, C & X Zone					
Standard	361	$18,208	$123,766,000	47	$309,566.83
Preferred	0	$244,300	$0	33	$207,007.47
Total	**612**	**$399,400**	**$200,510,000**	**293**	**$1,605,799.48**

Source: FEMA Community Information System, accessed December 2024

Table H.9 – NFIP Policy and Claims Data Pre-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	18	$10,589	$5,220,000	15	$122,932.89
A Zones	0	$0	$0	2	$59,192.93
AO Zones	4	$3,835	$1,242,000	1	$0.00
V01-30 & VE Zones	4	$2,239	$1,139,000	5	$2,494.81
B, C & X Zone	49	$36,428	$16,556,000	14	$90,555.72
Standard	49	$36,428	$16,556,000	11	$24,601.98
Preferred	0	$0	$0	3	$65,953.74
Total	**75**	**$53,091**	**$24,157,000**	**37**	**$275,176.35**

Source: FEMA Community Information System, accessed December 2024

Table H.10 – NFIP Policy and Claims Data Post-FIRM

Flood Zone	Number of Policies in Force	Total Premium	Insurance in Force	Number of Closed Paid Losses	Total of Closed Paid Losses
A01-30 & AE Zones	189	$114,432	$57,969,000	169	$875,105.37
AO Zones	9	$8,036	$2,669,000	12	$28,772.94
V01-30 & VE Zones	27	$15,969	$8,505,000	9	$726.24
B, C & X Zone	312	$207,872	$107,210,000	66	$426,018.58
Standard	312	$207,872	$107,210,000	36	$284,964.85
Preferred	0	$0	$0	30	$141,053.73
Total	**537**	**$346,309**	**$176,353,000**	**256**	**$1,330,623.13**

Source: FEMA Community Information System, accessed December 2024

H.2.3 WILDFIRE

Table H.11 summarizes the acreage in the Town of Southern Shores that falls within the Wildland Urban Interface (WUI), categorized by housing density. The WUI is the area where housing development is built near or among areas of vegetation that may be prone to wildfire. Areas in the WUI are those where development may intermix with flammable vegetation. Over 11 percent of the Town of Southern Shores is not included in the WUI.

Table H.11 – Wildland Urban Interface Acreage, Town of Southern Shores

	Housing Density	Total Acreage	Percent of Total Acreage
	Not in WUI	304.8	11.5%
	LT 1hs/40ac	12.2	0.5%
	1hs/40ac to 1hs/20ac	6.1	0.2%
	1hs/20ac to 1hs/10ac	33.2	1.3%
	1hs/10ac to 1hs/5ac	103.0	3.9%
	1hs/5ac to 1hs/2ac	343.2	12.9%
	1hs/2ac to 3hs/1ac	1,844.1	69.4%
	GT 3hs/1ac	9.7	0.4%
	Total	**2,656.3**	**100.0%**

Source: Southern Wildfire Risk Assessment

Figure H.7 depicts the WUI for the Town of Southern Shores. Figure H.8 depicts the Fire Intensity Scale, which indicates the potential severity of fire based on fuel loads, topography, and other factors. Figure H.9 depicts Burn Probability based on landscape conditions, percentile weather, historical ignition patterns, and historical prevention and suppression efforts.

Most of Southern Shores falls within the WUI, but there is minimal burnable land in the Town. There are areas of moderate to high potential fire intensity throughout the Town. The only significant cluster of higher potential fire intensity, burn probability, and WUI occurs in the southwestern portion of the Town along Jean Guite Creek.

Table H.12 provides the count and estimated value of all structures that intersect with areas of the Town of Southern Shores that are rated moderate to high on the WUI Risk Index.

Table H.12 – Structures at Risk to Moderate-High WUI Risk Index, Town of Southern Shores

Occupancy	Structures at Risk	Structure Value	Estimated Content Value	Total Value
Agriculture	0	$0	$0	$0
Commercial	24	$17,665,874	$17,665,874	$35,331,748
Education	1	$14,623,200	$14,623,200	$29,246,400
Government	6	$1,233,319	$1,233,319	$2,466,638
Industrial	2	$278,651	$417,977	$696,628
Religious	3	$2,447,600	$2,447,600	$4,895,200
Residential	2194	$608,545,735	$304,272,868	$912,818,603
Total	**2,230**	**$644,794,379**	**$340,660,837**	**$985,455,216**

Source: Southern Wildfire Risk Assessment

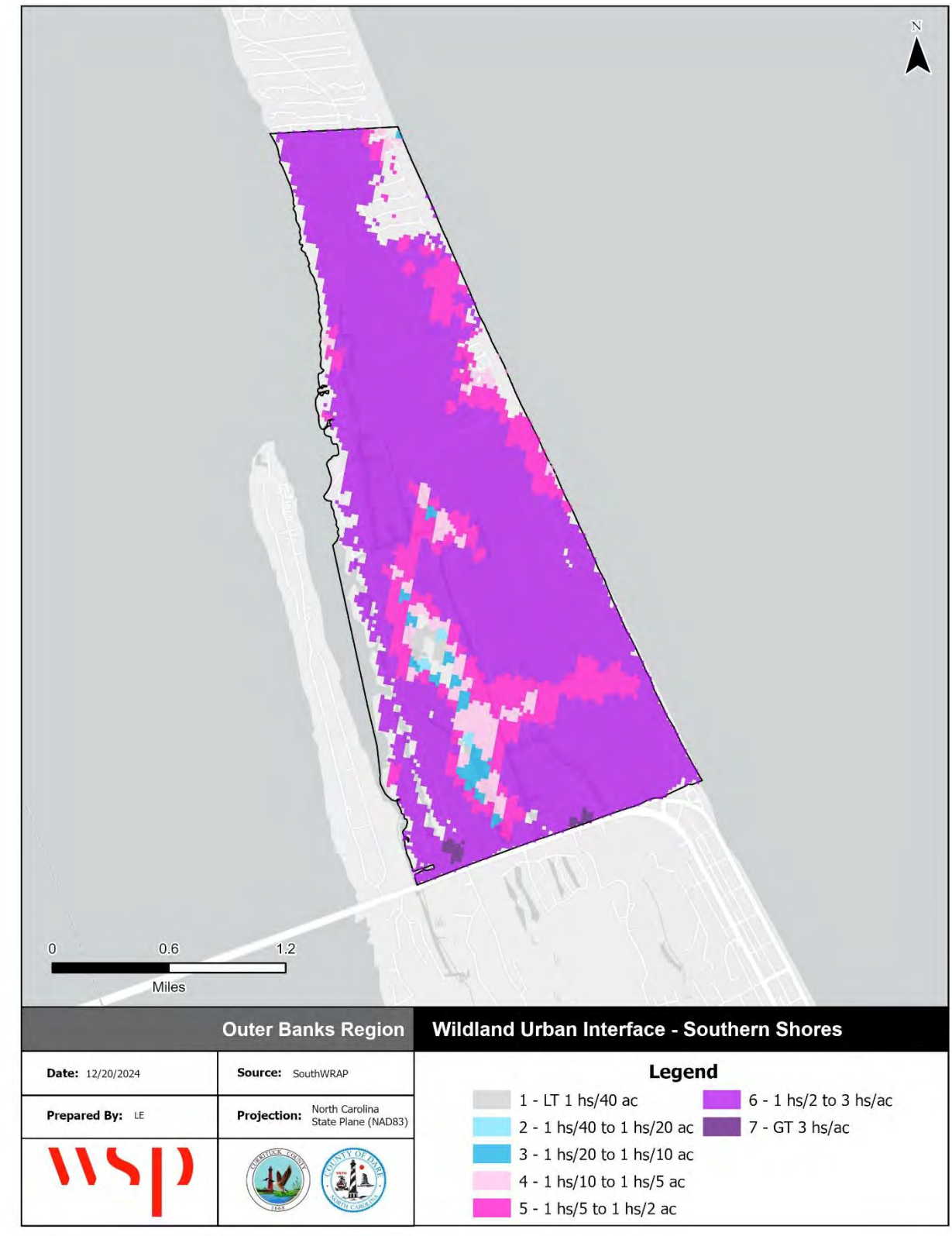
Table H.13 provides building counts and values for critical facilities by FEMA lifeline that are located in areas rated moderate to high on the WUI Risk Index.

Table H.13 – Critical Facilities Exposed to Wildfire, Town of Southern Shores

Type	Critical Facility Count	Structure Value
Communications	3	$459,150
Energy	0	$0
Food, Hydration, Shelter	1	$12,421,100
Hazardous Materials	0	$0
Health and Medical	0	$0
Safety and Security	6	$5,844,200
Transportation	0	$0
Water Systems	2	$336,650
Total	**12**	**$19,061,100**

Source: Southern Wildfire Risk Assessment

Figure H.7 – Wildland Urban Interface, Town of Southern Shores

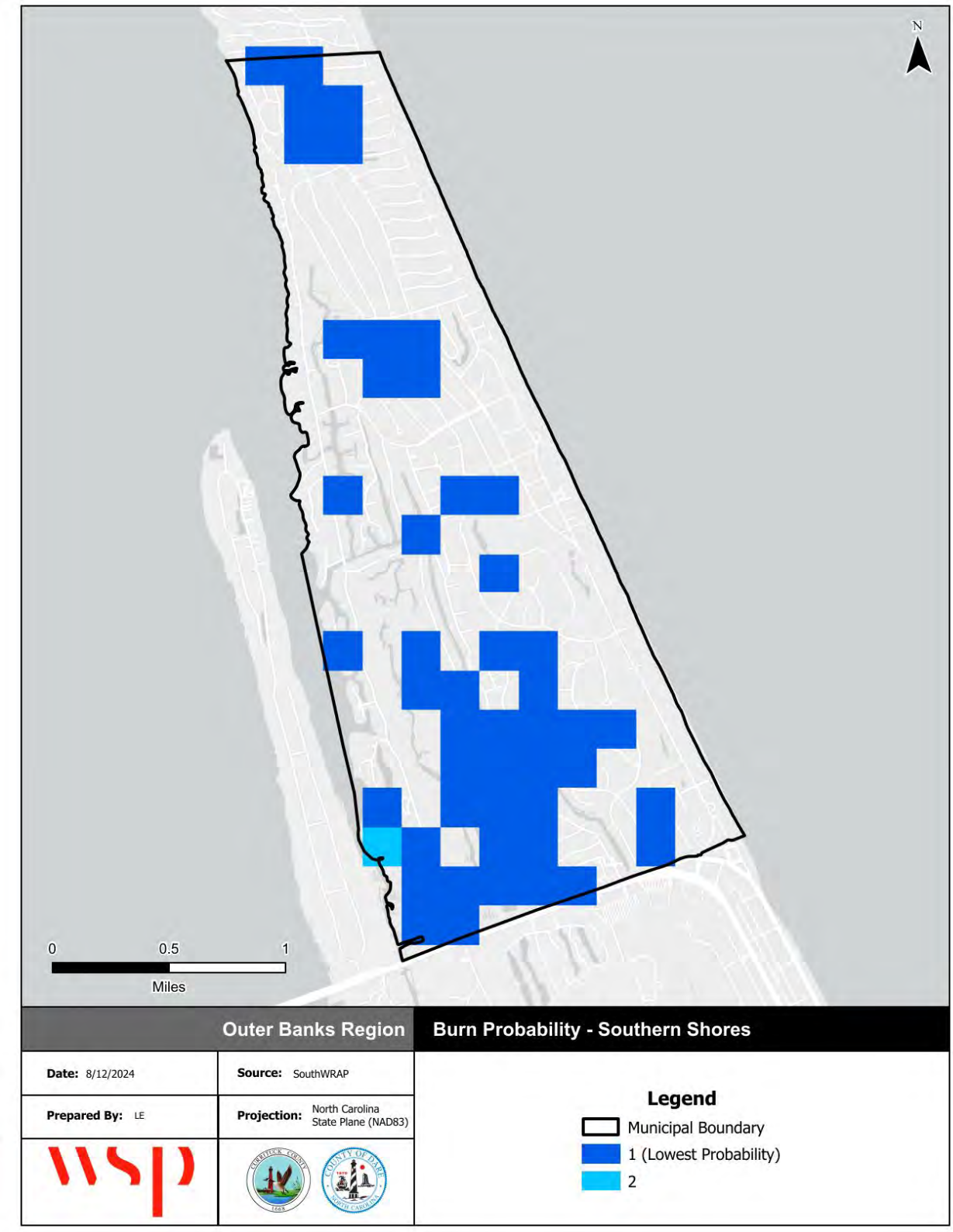


Source: Southern Wildfire Risk Assessment

Figure H.8 – Fire Intensity Scale, Town of Southern Shores

Source: Southern Wildfire Risk Assessment

Figure H.9 – Burn Probability, Town of Southern Shores



Source: Southern Wildfire Risk Assessment

H.3 MITIGATION STRATEGY

Table H.14 – Mitigation Action Plan, Town of Southern Shores

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
SOS1	Identify "at risk" X Zone properties for added emphasis on flood risks and notify the responsible agencies about discrepancies between floodplain maps (FIRM vs SLOSH)	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	1.2	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Planning and Code Enforcement Department continues to identify at risk properties following storm events by utilizing GIS data and in the field observations.
SOS2	Seek the maximum points available from the Community Rating System to keep flood insurance costs to the citizens as low as possible	Flooding	3.3	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to seek the maximum points available from the Community Rating System. The Town's last cycle visit was in 2021 which gave the Town a rating of Class 6 which is recertified annually. Communities with a Class 6 rating receive a 20% discount on insurance policies.
SOS3	Coordinate wildfire prevention efforts with tree preservation policies	Wildfire	3.1	Low	Prevention	Planning/Code Enforcement, Fire Department	General Fund	Ongoing	Carry Forward	The Town continues to require a permit for open burning and encourages all property owners to contact the Southern Shores Volunteer Fire Department prior to any open burning.
SOS4	Obtaining local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis.	All Hazards	3.3	High	Prevention	Planning/Code Enforcement	General Fund	Less than two years	Carry Forward	The Town continues to use Dare County GIS to obtain local data including tax parcels, building footprints, critical facility locations, and other information for use in risk analysis
SOS5	Ensure that all stormwater management facilities and infrastructure within the Town, whether public or private, are designed, constructed, operated, and maintained in a proper manner.	Flooding	1.2	High	Prevention	Planning/Code Enforcement	General Fund, NCDEQ	Ongoing	New	
SOS6	Continue implementing local elevation standards for all special flood hazard areas and shaded X and X zones.	Flooding	1.2, 4.1	High	Prevention	Planning/Code Enforcement	General Fund	Ongoing	New	
SOS7	Conduct the Canal Inspection and Debris Removal program twice a year	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	2.1	High	Property Protection	Public Works, Southern Shores Civic Association	General Fund	Twice Per Year	Carry Forward	The Town's Public Works Dept. periodically inspects the Town's canal system and removes debris as needed.
SOS8	Encourage the use of Low Impact Development (LID), vegetative buffers to filter stormwater, impervious surface limits, and innovative stormwater management alternatives to reduce runoff and to improve environmental water quality.	Flooding	3.2	High	Property Protection	Administration, Planning/Code Enforcement	General Fund, NCDEQ	Ongoing	New	

Action #	Action Description	Hazard(s) Addressed	Goal & Objective Addressed	Priority	Mitigation Category	Lead Agency / Department	Potential Funding Source	Implementation Timeline	2024 Status	2024 Implementation Status Comments
SOS9	Pursue elevation of properties in high risk areas.	Hurricane & Coastal Hazards, Flooding	3.3	Medium	Property Protection	Planning, Emergency Management	Grant Funds	Ongoing	New	
SOS10	Continue enforcement of the Beach and Dune Management Ordinance	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.2	High	Natural Resource Protection	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town Community Resource Officer and contracted lifeguard service conduct patrols of the beach to ensure compliance
SOS11	Implement shoreline restoration projects, including beach renourishment, dune protection, dune vegetation, sand fencing, and living shorelines.	Hurricane & Coastal Hazards, Tornadoes & Thunderstorm, Flooding	3.2	High	Natural Resource Protection	Administration, Planning/Code Enforcement	General Fund, Dare County, NCDEQ, FEMA	5 Years	New	
SOS12	Continue to monitor plans for the Mid-Currituck Bridge to expedite evacuation	All Hazards	2.1	High	Structural Projects	Administration, Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to monitor plans for and support a Mid-Currituck Bridge.
SOS13	Inspecting bridges and identifying if any repairs or retrofits are needed to prevent scour.	Flooding	2.1	High	Structural Projects	Administration, Public Works	NCDOT, General Fund	Annually	Carry Forward	The Town receives bridge inspection reports from the North Carolina Department of Transportation. Work to replace the Trinitie Bridge is anticipated to begin in early 2025.
SOS14	Implement drainage improvement projects to reduce stormwater related flooding.	Hurricane & Coastal Hazards, Flooding	2.1	Medium	Structural Projects	Planning	Grants	Ongoing	New	
SOS15	Continue to have a standing Reconstruction Task Force	All Hazards	3.1	High	Emergency Services	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Reconstruction Task Force was reappointed on October 1, 2024.
SOS16	Continue to provide an Emergency Operations Center	All Hazards	2.2	High	Emergency Services	Administration	General Fund	Ongoing	Carry Forward	The Town continues to provide an Emergency Operations Center when needed for storm events and coordinates events with the Dare County Emergency Operations Center.
SOS17	Keep emergency plans current and provide staff with continuing education opportunities	All Hazards	2.2	Low	Emergency Services	Administration	General Fund	Ongoing	Carry Forward	The Town updates its Emergency Management Plan annually and provides Town Staff with continuing education opportunities.
SOS18	Educate citizens on expected impacts of hazards on daily lives	All Hazards	1.1	High	Public Education & Awareness	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town utilizes a website, social media, and a bi-weekly newsletter to disseminate information regarding the impacts of hazards on daily lives.
SOS19	Educate citizens regarding the dangers of extreme heat and cold and the steps they can take to protect themselves when extreme temperatures occur	Excessive Heat	1.1	High	Public Education & Awareness	Administration, Planning/Code Enforcement	General Fund	Annually	Carry Forward	The Town utilizes social media to share information about the dangers of extreme weather and how citizens can protect themselves.
SOS20	Encouraging residents in flood-prone areas to elevate homes.	Flooding	1.2	High	Public Education & Awareness	Planning/Code Enforcement	General Fund	Ongoing	Carry Forward	The Town continues to encourage residents in flood-prone areas to elevate homes
SOS21	Create or Update Community Wildfire Protection Plans in each fire district	Wildfire	3.3	Medium	Public Education & Awareness, Prevention	Planning, Fire Department, NC Forest Service	Grant Funds	3-5 years	New	

APPENDIX A PLAN REVIEW TOOL

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Local Mitigation Plan Review Tool

Cover Page

The Local Mitigation Plan Review Tool (PRT) demonstrates how the local mitigation plan meets the regulation in 44 CFR § 201.6 and offers states and FEMA Mitigation Planners an opportunity to provide feedback to the local governments, including special districts.

1. The Multi-Jurisdictional Summary Sheet is a worksheet that is used to document how each jurisdiction met the requirements of the plan elements (Planning Process; Risk Assessment; Mitigation Strategy; Plan Maintenance; Plan Update; and Plan Adoption).
2. The Plan Review Checklist summarizes FEMA's evaluation of whether the plan has addressed all requirements.

For greater clarification of the elements in the Plan Review Checklist, please see Section 4 of this guide. Definitions of the terms and phrases used in the PRT can be found in Appendix E of this guide.

Plan Information	
Jurisdiction(s)	Currituck County, Dare County, Town of Duck, Town of Kill Devil Hills, Town of Kitty Hawk, Town of Manteo, Town of Nags Head, Town of Southern Shores
Title of Plan	Outer Banks Regional Hazard Mitigation Plan
New Plan or Update	Update
Single- or Multi-Jurisdiction	Multi-jurisdiction
Date of Plan	1/10/2025
Local Point of Contact	
Title	Drew Pearson, Emergency Management Director
Agency	Dare County Emergency Management
Address	P.O. Box 1000, Manteo, NC 27954
Phone Number	252-475-5897
Email	Drew.pearson@darenc.gov

Additional Point of Contact	
Title	David Stroud
Agency	WSP
Address	4021 Stirrup Creek Drive, Suite 100, Durham, NC 27703
Phone Number	919-325-6497
Email	david.stroud@wsp.com

Review Information	
State Review	
State Reviewer(s) and Title	Click or tap here to enter text.
State Review Date	Click or tap to enter a date.
FEMA Review	
FEMA Reviewer(s) and Title	Click or tap here to enter text.
Date Received in FEMA Region	Click or tap to enter a date.
Plan Not Approved	Click or tap to enter a date.
Plan Approvable Pending Adoption	Click or tap to enter a date.
Plan Approved	Click or tap to enter a date.

Multi-Jurisdictional Summary Sheet

#	Jurisdiction Name	Requirements Met (Y/N)						
		A. Planning Process	B. Risk Assessment	C. Mitigation Strategy	D. Plan Maintenance	E. Plan Update	F. Plan Adoption	G. State Requirements
1	Currituck County							
2	Dare County							
3	Duck							
4	Kill Devil Hills							
5	Kitty Hawk							
6	Manteo							
7	Nags Head							
8	Southern Shores							

Plan Review Checklist

The Plan Review Checklist is completed by FEMA. States and local governments are encouraged, but not required, to use the PRT as a checklist to ensure all requirements have been met prior to submitting the plan for review and approval. The purpose of the checklist is to identify the location of relevant or applicable content in the plan by element/sub-element and to determine if each requirement has been "met" or "not met." FEMA completes the "required revisions" summary at the bottom of each element to clearly explain the revisions that are required for plan approval. Required revisions must be explained for each plan sub-element that is "not met." Sub-elements in each summary should be referenced using the appropriate numbers (A1, B3, etc.), where applicable. Requirements for each element and sub-element are described in detail in Section 4: Local Plan Requirements of this guide.

Plan updates must include information from the current planning process.

If some elements of the plan do not require an update, due to minimal or no changes between updates, the plan must document the reasons for that.

Multi-jurisdictional elements must cover information unique to all participating jurisdictions.

Element A: Planning Process

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A1. Does the plan document the planning process, including how it was prepared and who was involved in the process for each jurisdiction? (Requirement 44 CFR § 201.6(c)(1))		
A1-a. Does the plan document how the plan was prepared, including the schedule or time frame and activities that made up the plan's development, as well as who was involved?	Section 2, p.7-24; Appendix B	Choose an item.
A1-b. Does the plan list the jurisdiction(s) participating in the plan that seek approval, and describe how they participated in the planning process?	Section 1.3, p.2; Section 2.3, p.7-24; Appendix B	Choose an item.
A2. Does the plan document an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development as well as businesses, academia, and other private and non-profit interests to be involved in the planning process? (Requirement 44 CFR § 201.6(b)(2))		
A2-a. Does the plan identify all stakeholders involved or given an opportunity to be involved in the planning process, and how each stakeholder was presented with this opportunity?	Section 2.4, p.11-14; Section 2.5, p.15-16; Section 2.7, p.16-18, Appendix B, p.B.89-B.91	Choose an item.

Element A Requirements	Location in Plan (section and/or page number)	Met / Not Met
A3. Does the plan document how the public was involved in the planning process during the drafting stage and prior to plan approval? (Requirement 44 CFR § 201.6(b)(1))		
A3-a. Does the plan document how the public was given the opportunity to be involved in the planning process and how their feedback was included in the plan?	Section 2.4-2.7, p.11-18; Appendix B, p.B.38-B.88	Choose an item.
A4. Does the plan describe the review and incorporation of existing plans, studies, reports, and technical information? (Requirement 44 CFR § 201.6(b)(3))		
A4-a. Does the plan document what existing plans, studies, reports and technical information were reviewed for the development of the plan, as well as how they were incorporated into the document?	Section 2.3.1, p.8-9	Choose an item.
ELEMENT A REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element B: Risk Assessment

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1. Does the plan include a description of the type, location, and extent of all natural hazards that can affect the jurisdiction? Does the plan also include information on previous occurrences of hazard events and on the probability of future hazard events? (Requirement 44 CFR § 201.6(c)(2)(i))		
B1-a. Does the plan describe all natural hazards that can affect the jurisdiction(s) in the planning area, and does it provide the rationale if omitting any natural hazards that are commonly recognized to affect the jurisdiction(s) in the planning area?	Section 4.2, p.67-72, Section 4.5, p.84-285 (Hazard Description, Location, Extent, Hazard Summary by Jurisdiction)	Choose an item.
B1-b. Does the plan include information on the location of each identified hazard?	Section 4.5, p.84-285 ("Location" subheadings)	Choose an item.
B1-c. Does the plan describe the extent for each identified hazard?	Section 4.5, p.84-285 ("Extent" subheadings)	Choose an item.

Element B Requirements	Location in Plan (section and/or page number)	Met / Not Met
B1-d. Does the plan include the history of previous hazard events for each identified hazard?	Section 4.5, p.84-285 ("Historical Occurrences" subheadings)	Choose an item.
B1-e. Does the plan include the probability of future events for each identified hazard? Does the plan describe the effects of future conditions, including climate change (e.g., long-term weather patterns, average temperature and sea levels), on the type, location and range of anticipated intensities of identified hazards?	Section 4.5, p.84-285 ("Probability of Future Occurrence" subheadings	Choose an item.
B1-f. For participating jurisdictions in a multi-jurisdictional plan, does the plan describe any hazards that are unique to and/or vary from those affecting the overall planning area?	Section 4.5, p.84-285 ("Hazard Summary by Jurisdiction" subheadings); Annexes, p.357-544	Choose an item.
B2. Does the plan include a summary of the jurisdiction's vulnerability and the impacts on the community from the identified hazards? Does this summary also address NFIP-insured structures that have been repetitively damaged by floods? (Requirement 44 CFR § 201.6(c)(2)(ii))		
B2-a. Does the plan provide an overall summary of each jurisdiction's vulnerability to the identified hazards?	Section 4.3, p.72-75; Section 4.4, p.76-83; Section 4.5, p. 84-285 ("Vulnerability Assessment" subheadings); Annexes, p.357-544	Choose an item.
B2-b. For each participating jurisdiction, does the plan describe the potential impacts of each of the identified hazards on each participating jurisdiction?	Section 4.5, p.84-285; Annexes, p.357-543	Choose an item.
B2-c. Does the plan address NFIP-insured structures within each jurisdiction that have been repetitively damaged by floods?	Section 4.5.4, p.160-162	Choose an item.
ELEMENT B REQUIRED REVISIONS		
Required Revision**:** Click or tap here to enter text.		

Element C: Mitigation Strategy

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C1. Does the plan document each participant's existing authorities, policies, programs and resources and its ability to expand on and improve these existing policies and programs? (Requirement 44 CFR § 201.6(c)(3))		
C1-a. Does the plan describe how the existing capabilities of each participant are available to support the mitigation strategy? Does this include a discussion of the existing building codes and land use and development ordinances or regulations?	Section 5, p.286-304	Choose an item.
C1-b. Does the plan describe each participant's ability to expand and improve the identified capabilities to achieve mitigation?	Section 5, p.286-304	Choose an item.
C2. Does the plan address each jurisdiction's participation in the NFIP and continued compliance with NFIP requirements, as appropriate? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C2-a. Does the plan contain a narrative description or a table/list of their participation activities?	Section 5.3.1, p.292-297, Table 5.2	Choose an item.
C3. Does the plan include goals to reduce/avoid long-term vulnerabilities to the identified hazards? (Requirement 44 CFR § 201.6(c)(3)(i))		
C3-a. Does the plan include goals to reduce the risk from the hazards identified in the plan?	Section 6.1, p.305-306	Choose an item.
C4. Does the plan identify and analyze a comprehensive range of specific mitigation actions and projects for each jurisdiction being considered to reduce the effects of hazards, with emphasis on new and existing buildings and infrastructure? (Requirement 44 CFR § 201.6(c)(3)(ii))		
C4-a. Does the plan include an analysis of a comprehensive range of actions/projects that each jurisdiction considered to reduce the impacts of hazards identified in the risk assessment?	Section 7, p.309-341; Appendix C	Choose an item.
C4-b. Does the plan include one or more action(s) per jurisdiction for each of the hazards as identified within the plan's risk assessment?	Section 7, p.309-341	Choose an item.
C5. Does the plan contain an action plan that describes how the actions identified will be prioritized (including a cost-benefit review), implemented, and administered by each jurisdiction? (Requirement 44 CFR § 201.6(c)(3)(iv)); (Requirement §201.6(c)(3)(iii))		
C5-a. Does the plan describe the criteria used for prioritizing actions?	Section 6.2, p. 307-308	Choose an item.

Element C Requirements	Location in Plan (section and/or page number)	Met / Not Met
C5-b. Does the plan provide the position, office, department or agency responsible for implementing/administrating the identified mitigation actions, as well as potential funding sources and expected time frame?	Section 7, p.309-341	Choose an item.
ELEMENT C REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element D: Plan Maintenance

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D1. Is there discussion of how each community will continue public participation in the plan maintenance process? (Requirement 44 CFR § 201.6(c)(4)(iii))		
D1-a. Does the plan describe how communities will continue to seek future public participation after the plan has been approved?	Section 8.3, p.345-346	Choose an item.
D2. Is there a description of the method and schedule for keeping the plan current (monitoring, evaluating and updating the mitigation plan within a five-year cycle)? (Requirement 44 CFR § 201.6(c)(4)(i))		
D2-a. Does the plan describe the process that will be followed to track the progress/status of the mitigation actions identified within the Mitigation Strategy, along with when this process will occur and who will be responsible for the process?	Section 8.2, p.343-345	Choose an item.
D2-b. Does the plan describe the process that will be followed to evaluate the plan for effectiveness? This process must identify the criteria that will be used to evaluate the information in the plan, along with when this process will occur and who will be responsible.	Section 8.2, p.343-345	Choose an item.
D2-c. Does the plan describe the process that will be followed to update the plan, along with when this process will occur and who will be responsible for the process?	Section 8.2, p.343-345	Choose an item.

Element D Requirements	Location in Plan (section and/or page number)	Met / Not Met
D3. Does the plan describe a process by which each community will integrate the requirements of the mitigation plan into other planning mechanisms, such as comprehensive or capital improvement plans, when appropriate? (Requirement 44 CFR § 201.6(c)(4)(ii))		
D3-a. Does the plan describe the process the community will follow to integrate the ideas, information and strategy of the mitigation plan into other planning mechanisms?	Section 8.1, p. 342-343; Section 8.2, p.343-345	Choose an item.
D3-b. Does the plan identify the planning mechanisms for each plan participant into which the ideas, information and strategy from the mitigation plan may be integrated?	Section 8.1, p. 342-343; Section 8.2, p.343-345	Choose an item.
D3-c. For multi-jurisdictional plans, does the plan describe each participant's individual process for integrating information from the mitigation strategy into their identified planning mechanisms?	Section 8.1, p. 342-343; Section 8.2, p.343-345	Choose an item.
ELEMENT D REQUIRED REVISIONS		
Required Revision**:** Click or tap here to enter text.		

Element E: Plan Update

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E1. Was the plan revised to reflect changes in development? (Requirement 44 CFR § 201.6(d)(3))		
E1-a. Does the plan describe the changes in development that have occurred in hazard-prone areas that have increased or decreased each community's vulnerability since the previous plan was approved?	Section 3.6, p.43-61	Choose an item.
E2. Was the plan revised to reflect changes in priorities and progress in local mitigation efforts? (Requirement 44 CFR § 201.6(d)(3))		
E2-a. Does the plan describe how it was revised due to changes in community priorities?	Section 2.1, p.5-6; Section 6, p.305-308, Section 7, p. 309-341	Choose an item.
E2-b. Does the plan include a status update for all mitigation actions identified in the previous mitigation plan?	Section 7, p. 309-341; Section 2.9, p.18-24	Choose an item.

Element E Requirements	Location in Plan (section and/or page number)	Met / Not Met
E2-c. Does the plan describe how jurisdictions integrated the mitigation plan, when appropriate, into other planning mechanisms?	Section 8.1, p.342-343	Choose an item.
ELEMENT E REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element F: Plan Adoption

Element F Requirements	Location in Plan (section and/or page number)	Met / Not Met
F1. For single-jurisdictional plans, has the governing body of the jurisdiction formally adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F1-a. Does the participant include documentation of adoption?	Section 9, p.347-356	Choose an item.
F2. For multi-jurisdictional plans, has the governing body of each jurisdiction officially adopted the plan to be eligible for certain FEMA assistance? (Requirement 44 CFR § 201.6(c)(5))		
F2-a. Did each participant adopt the plan and provide documentation of that adoption?	Section 9, p.347-356	Choose an item.
ELEMENT F REQUIRED REVISIONS		
Required Revision: Click or tap here to enter text.		

Element G: High Hazard Potential Dams (Optional)

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD1. Did the plan describe the incorporation of existing plans, studies, reports and technical information for HHPDs?		
HHPD1-a. Does the plan describe how the local government worked with local dam owners and/or the state dam safety agency?	N/A	Choose an item.
HHPD1-b. Does the plan incorporate information shared by the state and/or local dam owners?	N/A	Choose an item.

HHPD Requirements	Location in Plan (section and/or page number)	Met / Not Met
HHPD2. Did the plan address HHPDs in the risk assessment?		
HHPD2-a. Does the plan describe the risks and vulnerabilities to and from HHPDs?	N/A	Choose an item.
HHPD2-b. Does the plan document the limitations and describe how to address deficiencies?	N/A	Choose an item.
HHPD3. Did the plan include mitigation goals to reduce long-term vulnerabilities from HHPDs?		
HHPD3-a. Does the plan address how to reduce vulnerabilities to and from HHPDs as part of its own goals or with other long-term strategies?	N/A	Choose an item.
HHPD3-b. Does the plan link proposed actions to reducing long-term vulnerabilities that are consistent with its goals?	N/A	Choose an item.
HHPD4-a. Did the plan include actions that address HHPDs and prioritize mitigation actions to reduce vulnerabilities from HHPDs?		
HHPD4-a. Does the plan describe specific actions to address HHPDs?	N/A	Choose an item.
HHPD4-b. Does the plan describe the criteria used to prioritize actions related to HHPDs?	N/A	Choose an item.
HHPD4-c. Does the plan identify the position, office, department or agency responsible for implementing and administering the action to mitigate hazards to or from HHPDs?	N/A	Choose an item.
HHPD Required Revisions		
Required Revision**:** Click or tap here to enter text.		

Element H: Additional State Requirements

Element H Requirements	Location in Plan (section and/or page number)	Met / Not Met
This space is for the State to include additional requirements		
Click or tap here to enter text.	Click or tap here to enter text.	Choose an item.

Plan Assessment

These comments can be used to help guide your annual/regularly scheduled updates and the next plan update.

Element A. Planning Process

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element B. Risk Assessment

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element C. Mitigation Strategy

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element D. Plan Maintenance

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element E. Plan Update

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element G. HHPD Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

Element H. Additional State Requirements (Optional)

Strengths

- [insert comments]

Opportunities for Improvement

- [insert comments]

APPENDIX B PLANNING PROCESS DOCUMENTATION

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

Table B.1 – HMPC Meeting Topics, Dates, and Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
HMPC Mtg. #1 (Kickoff) – Dare County Group	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Review of HMPC responsibilities and the project schedule.	April 22, 2024 2pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #1 (Kickoff) – Currituck County Group		April 23, 2024 2pm	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #2	1) Review Draft Hazard Identification & Risk Assessment (HIRA)	August 28, 2024 1pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #3 – Currituck County Group	1) Discuss changes in capability 2) Review and update plan goals and objectives 3) Report on status of actions from the 2020 plan 4) Discuss new mitigation action alternatives	October 21, 2024 2 pm	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #2 – Dare County Group		October 22, 2024 10 am	Dare County Emergency Operations Center, 370 Airport Road, Manteo
HMPC Mtg. #4 – Currituck County Group	1) Review the Draft Hazard Mitigation Plan 2) Solicit comments and feedback	January 28, 2025 11 am	Currituck County Public Safety Center, 125 College Way, Barco
HMPC Mtg. #4 – Dare County Group		January 28, 2025 3 pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo

Note: All HMPC Meetings were open to the public.

HMPC MEETING MINUTES AND ATTENDANCE

HMPC MEETING 1: APRIL 22, 2024 & APRIL 23, 2024

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE (DARE COUNTY GROUP) - MEETING #1

April 22, 2024, 2pm, Dare County Emergency Operations Center

ATTENDANCE

There were 26 attendees in person and 8 online. The following individuals were in attendance:
James Wooten, Dare County EM
Drew Pearson, Dare County EM
Barton Grover, Dare County Planning
Noah Gillam, Dare County Planning
John Finelli, Dare County stakeholder – Martin's Point
Mike McGuire, Dare County stakeholder – Hatteras Island
Donna Creef, Dare County stakeholder – Outer Banks Association of Realtors
Shari Fiveash, Dare County stakeholder – Room in the Inn
Tom Amatucci, Dare County stakeholder – Salvo
Joe Heard, Duck Planning
Walter Hancock, Duck stakeholder
Kevin Wright, Duck stakeholder
Skip Jones, Kill Devil Hills stakeholder – Outer Banks Home Builders Association
Doug Styons, Kill Devil Hills stakeholder
Rob Testerman, Kitty Hawk Planning
Mike Talley, Kitty Hawk Fire
Melissa Dickerson, Manteo Planning
Kevin Zorc, Manteo EM
Kelly Wyatt, Nags Head Planning
Shane Hite, Nags Head Fire
Ed Snyder, Nags Head Planning
Joe Costello, Nags Head Planning
Megan Lambert, Nags Head stakeholder
David Thompson, Nags Head stakeholder
Andy Ward, Southern Shores Planning
Wes Haskett, Southern Shores Planning/Administration
David Bradley, Southern Shores Public Works
Tony DiBernardo, Southern Shores stakeholder
Chris Crew, NCEM
Carl Baker, NCEM
Chris Smith, NCEM Area 1 Coordinator
David Stroud, WSP
Abby Moore, WSP
Ranger Ruffins, WSP

AGENDA

- Introductions
- Why Plan?
- Project Overview
- Planning Process
- Project Schedule
- Next Steps
- Q & A

Outer Banks Regional Hazard Mitigation Plan Update
Hazard Mitigation Planning Committee - Dare County Group - Meeting #1
April 2024
Page 1

INTRODUCTIONS

Drew Pearson, Dare County Emergency Manager, kicked off the meeting with an introduction to the plan update process and the importance of hazard mitigation. David Stroud and Abby Moore with WSP facilitated the rest of the meeting following the agenda above.

WHY PLAN?

David began the presentation with why we plan in the first place. David discussed the Disaster Mitigation Act (DMA) of 2000, which is codified in 44 CFR 201.6 and requires local government to update their hazard mitigation plans every five years to receive FEMA pre- and post-disaster mitigation funding through the Hazard Mitigation Assistance funding programs. David reviewed some trends in disasters including that we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). In 2023 there were 28 billion-dollar disasters, more than any prior year. Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio (BCR) for federally-funded projects is 6:1; for flood mitigation the average BCR is 7:1.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we will integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding, guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance premium reductions are community-wide.

Overall, the WSP team will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

Abby described the planning process in more detail. Phase 1 is already underway. The HMPC was reconvened with some new members and will be asked to attend four meetings, provide input on risk and capability, update mitigation actions, and review plan drafts. HMPC members, especially staff, were also asked to consider ways to involve the public throughout the planning process. Another priority is to identify stakeholders that should be invited to participate in the planning process, especially those that may be able to represent underserved communities and/or vulnerable populations. To maximize CRS credit and support awareness of the plan, 30 outside stakeholders must be invited to participate and provide input. The following stakeholders were suggested by the committee:

- NCDOT Roads Division and Ferries Division
- National Parks Service
- Department of the Interior
- USFWS
- Others on the NC-12 Task Force
- Outer Banks Home Builders Association
- Division of Coastal Management
- USACE
- Non-profits and churches
- Representatives from the school system (School Board, Dare Education Foundation)
- Coastal Studies Institute
- Chamber of Commerce
- Fiber/Utility providers
- Community Foundations
- Visitors Bureau
- Food Bank of the Albemarle
- Community Care Clinic

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. The hazards that were addressed in the previous plan were presented and the planning committee reviewed and discussed potential additional hazards. Solar flare and electromagnetic pulse were brought up as a potential hazard. It was suggested that this might be more appropriately addressed by an Emergency Operations Plan. Pandemic was also brought up, and it was noted that there is a detailed public health plan in place. There was discussion about the concern that the current flood maps do not accurately represent flood risk; WSP discussed an alternate methodology for estimating exposure and potential future risk using the Federal Flood Risk Management Standard Freeboard Value Approach. Regarding the asset inventory, Abby noted that NCEM iRisk data will be used and communities will be asked to review and update their critical facility list; critical facilities will be categorized by FEMA lifeline in the plan update, which may be helpful to communities when preparing FEMA grant applications.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. Abby reviewed different approaches to mitigation, the six FEMA/CRS mitigation categories, and the count of actions by category for each jurisdiction in the existing HMP. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements and should include a flood-related action for at least 5 of the 6 mitigation categories to maximize CRS credit.

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC will meet quarterly to review the action plan and look for funding and opportunities to implement projects. The plan will continue to be updated every five years.

PROJECT SCHEDULE

Abby presented a tentative schedule for the planning process, which includes additional HMPC meetings around June/July, September/October, and November. The draft plan is due to NCEM in December. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in June 2025.

NEXT STEPS

Abby discussed public outreach efforts which includes public meetings facilitated by WSP, a public survey, and an informational flyer. Community staff were asked to post outreach on local websites and social media and consider ways to advertise the plan or bring the survey and flyer to community events. The plan website used for the previous plan update will be rebooted and shared once it is available.

WSP has begun work on the risk and vulnerability assessment update. The HMPC was asked to begin reviewing the existing mitigation strategy to provide action status updates and to look for opportunities to support public engagement.

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #1 (Dare County Group) – April 22, 2024, 2:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
James Wooten	Dare Co	EM	james.wooten@darenc.gov
DAVID STROUD	WSP	WSP	David Stroud@wsp.com
DREW PONSON	DARE EM	DARE COUNTY	drew.pons~@darenc.gov
MIKE McGuire	HATTERAS ISL	—	MMcGuire53@HOTMAIL.com
KEVIN WRIGHT	DUCK	DUCK COMMUNITY MEMBER	kvwkmw@gmail.com
Tony DiBernardo	Southern Shores	Community	LTD 32@charter.net
Donna Creef	OBAR	Govt Affairs	dvcreef@gmail.com
Abby Moore	WSP	WSP	abigail.moore@wsp.com
SHARI FIVEASH	DARE	RITI	OBXROOMINTHEINN@GMAIL.COM
Kelly Wyatt	Nags Head	Planning Dept	kelly.wyatt@nagsheadnc.gov
Wes Haskett	Southern Shores	Manny/Admin.	whaskett@southernshores-nc.gov
David Bradley	Southern Shores	Public Works	dbradley@southernshores-nc.gov
Shane Hite	Nags Head	Fire	shane.hite@nagsheadnc.gov
Rob Testerman	Kitty Hawk	Planning	rob.testerman@kittyhawktown.net
Barton Grover	Dare County	Planning	barton.grover@darenc.gov
Megan Lambert	Nags Head	Nags Head Town	megan@bootytreats.com

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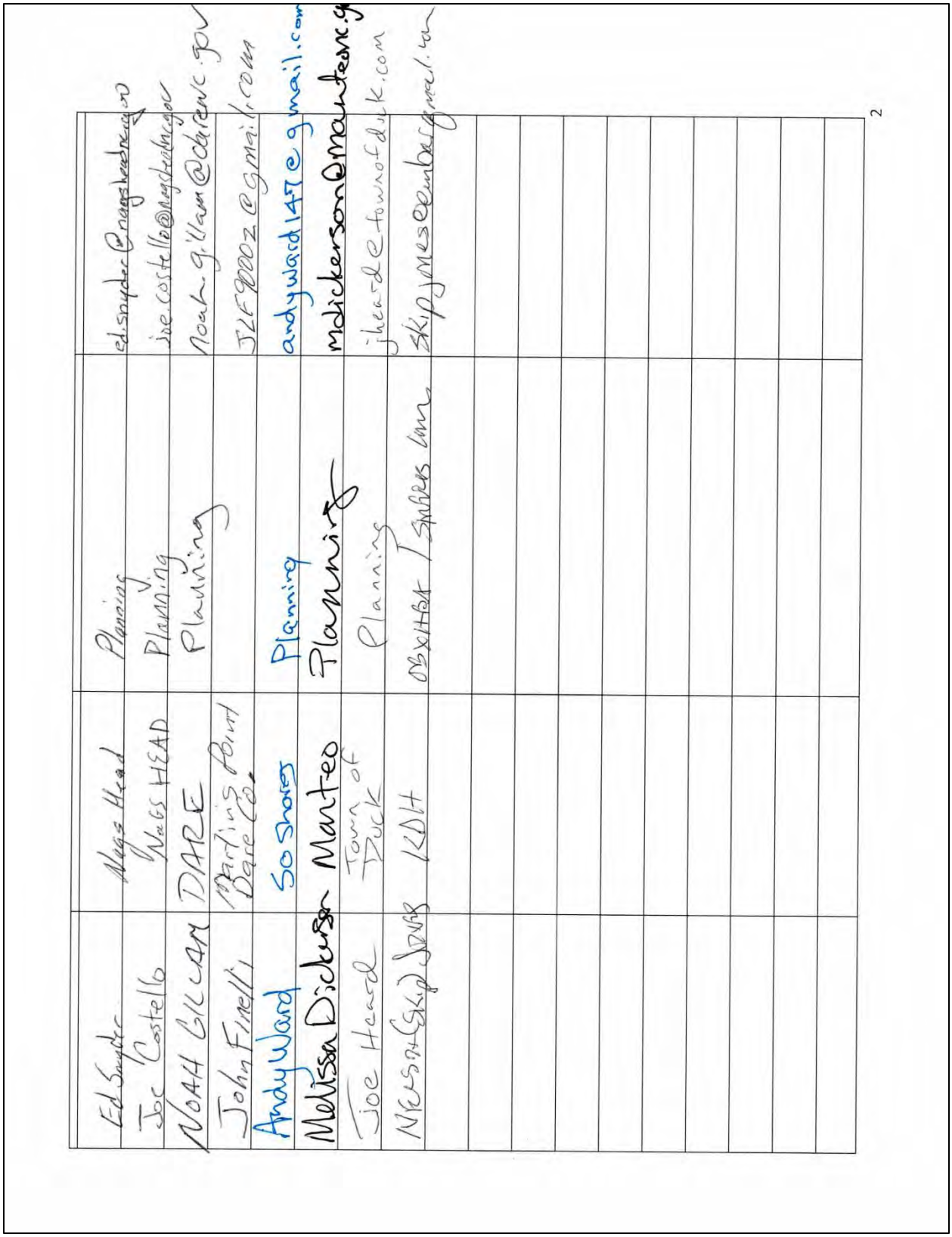
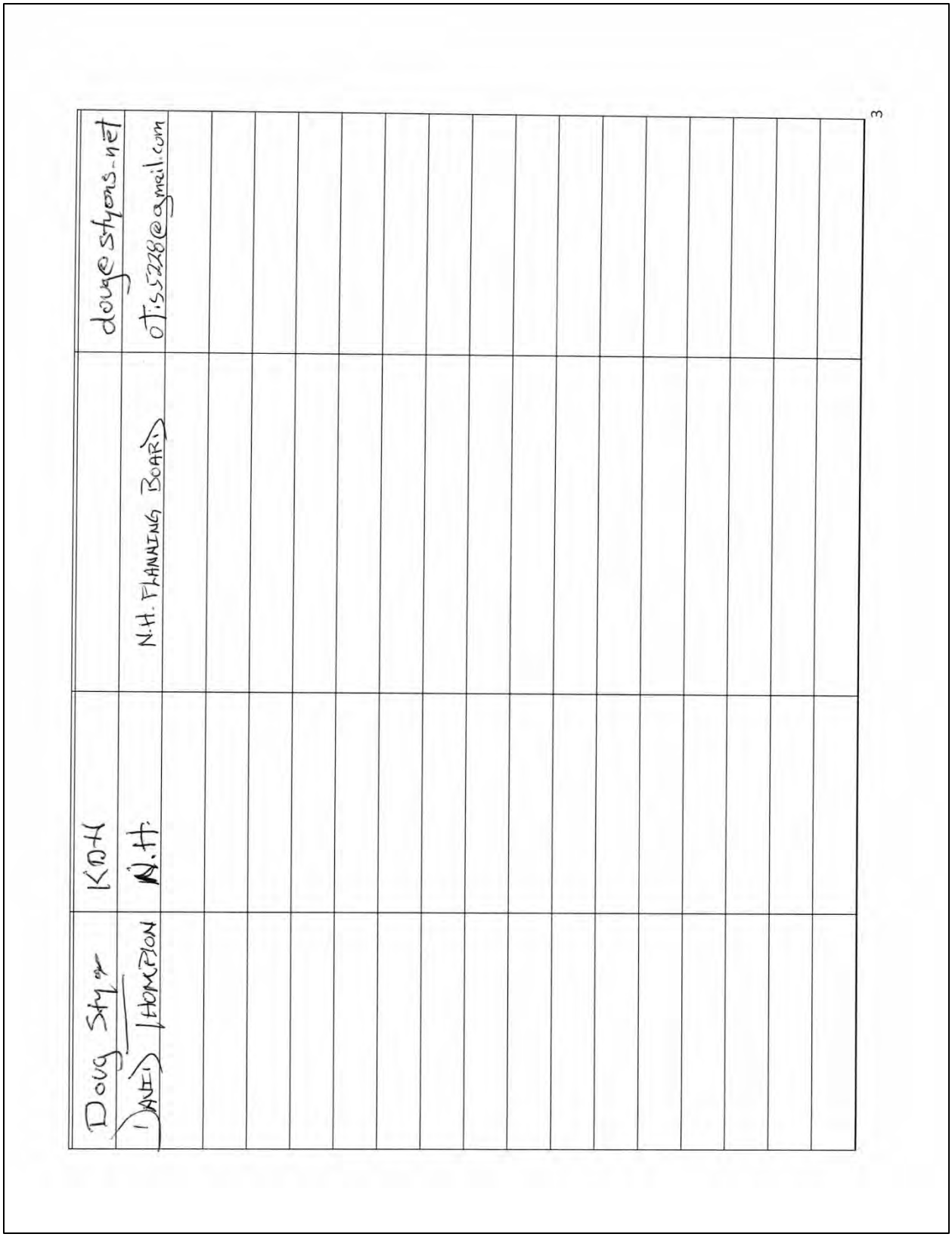
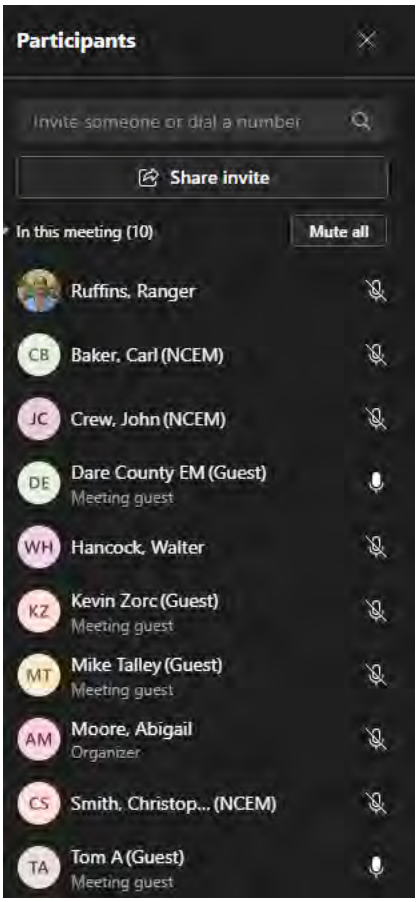


Ed Snyder	Nags Head	Planning	ed.snyder@nagsheadnc.gov
Joe Costello	Nags HEAD	V. Planning	joe.costello@nagsheadnc.gov
NOAH GILLIAM	DARE	Planning	noah.gilliam@darenc.gov
John Finelli	Martin's Point Dare Co.		JLF8002@gmail.com
Andy Ward	So Shores	Planning	andyward147@gmail.com
Melissa Dickerson	Manteo	Planning	mdickerson@manteonc.gov
Joe Heard	Town of Duck	Planning	jheard@townofduck.com
Nessa (Skip) Jones	KDH	OBX H&A / Sanders Lane	skipjonesenc@gmail.com



Doug Styons DANIEL THOMPSON	KDH N.H.	N.H. PLANNING BOARD	dougestyons.net OT.55228@gmail.com

HMPC Meeting 1 Dare County Online Attendees



OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE (CURRITUCK COUNTY GROUP) – MEETING #1

April 23, 2024, 2pm, Currituck County Public Safety Center EOC Conference Room

ATTENDANCE

There were 10 attendees in person and 5 online. The following individuals were in attendance:
Mary Beth Newns, Currituck County Emergency Management
Olivia Doherty, Currituck County Emergency Management
Jason Litteral, Currituck County Planning
Jennie Turner, Currituck County Planning
Anna Cherry, Currituck County Planning
Carol Frazier, Currituck County stakeholder – Pilmoor UMC Food Pantry
Lora Eddy, Currituck County stakeholder – The Nature Conservancy
Michael Strader, Currituck County stakeholder – Quible & Associates
Anthony Dickinson, Currituck County stakeholder – Farm Bureau Insurance
Mike Palkovics, Kitty Hawk Police
Carl Baker, NCEM
Chris Smith, NCEM Area 1 Coordinator
David Stroud, WSP
Abby Moore, WSP
Ranger Ruffins, WSP

AGENDA

- Introductions
- Why Plan?
- Project Overview
- Planning Process
- Project Schedule
- Next Steps
- Q & A

WHY PLAN?

David Stroud and Abby Moore with WSP facilitated the meeting following the agenda above. David began the presentation with why we plan in the first place. David discussed that the Disaster Mitigation Act (DMA) of 2000 which is codified in 44 CFR 201.6 requires local governments to update their hazard mitigation plans every five years to receive FEMA pre- and post-disaster mitigation funding through the Hazard Mitigation Assistance funding programs. David reviewed some trends in disasters including that we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). In 2023 there were 28 billion-dollar disasters, more than any prior year. Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio for federally-funded projects is 6:1.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we will integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding,

guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance premium reductions are community-wide.

WSP will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

Abby described the planning process in more detail. Phase 1 is already underway. The HMPC was reconvened with some new members and will be asked to attend four meetings, provide input on risk and capability, update mitigation actions, and review plan drafts. HMPC members, especially staff, were also asked to consider ways to involve the public throughout the planning process. Another priority is to identify stakeholders that should be invited to participate in the planning process, especially those that may be able to represent underserved communities and/or vulnerable populations. To maximize CRS credit and support awareness of the plan, 30 outside stakeholders must be invited to participate and provide input. The HMPC suggested including faith-based organizations and adult services.

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. The hazards that were addressed in the previous plan were presented and the planning committee reviewed and discussed potential additional hazards. There was a question about whether offshore wind farms pose a risk relevant to the HMP. For flood risk, WSP discussed an alternate methodology for estimating exposure and potential future risk using the Federal Flood Risk Management Standard Freeboard Value Approach. Regarding the asset inventory, Abby noted that NCEM iRisk data will be used and communities will be asked to review and update their critical facility list; critical facilities will be categorized by FEMA lifeline in the plan update, which may be helpful to communities when preparing FEMA grant applications. For the capability assessment, WSP will update the existing report and request feedback from each community on any additional changes.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. Abby reviewed different approaches to mitigation, the six FEMA/CRS mitigation categories, and the count of actions by category for each jurisdiction in the existing HMP. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements and should include a flood-related action for at least 5 of the 6 mitigation categories to maximize CRS credit.

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC will meet quarterly to review the action plan and look for funding and opportunities to implement projects. Abby suggested the Currituck County working group select one person to lead this effort and set up a recurring call so that quarterly meetings are already scheduled. The plan will continue to be updated every five years.

PROJECT SCHEDULE

Abby presented a tentative schedule for the planning process, which includes additional HMPC meetings around June/July, September/October, and November. The HIRA meeting in June/July will likely be held jointly with the Dare County group. The draft plan is due to NCEM in December. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in June 2025.

NEXT STEPS

Abby discussed public outreach efforts which includes public meetings facilitated by WSP, a public survey, and an informational flyer. Community staff were asked to post outreach on local websites and social media and consider ways to advertise the plan or bring the survey and flyer to community events. The plan website used for the previous plan update will be rebooted and shared once it is available.

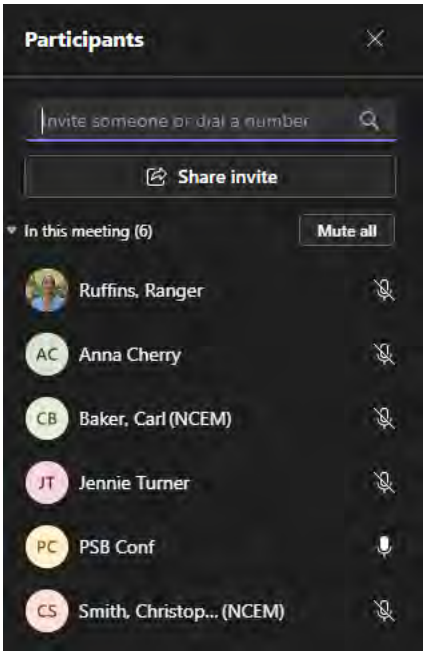
WSP has begun work on the risk and vulnerability assessment update. Abby noted that Currituck County has posted an annual report of the hazard mitigation action plan with the status of existing actions but asked the HMPC to begin considering new mitigation actions. Carl Baker of NCEM reminded everyone that actions must be included in the HMP to be eligible for FEMA grant funding, so the HMPC should consider any project they may want to pursue in the next five years and add them to the action plan now so that a plan amendment isn't needed later. The HMPC was also asked to look for opportunities to support public engagement and to document any publicity and engagement efforts.

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #1 (Currituck County Group) – April 23, 2024, 2:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
DAVID STRAUD	—	WSP	david.straud@wsp.com
Abby Moore	—	WSP	abigail.moore@wsp.com
Carol Frazier		Pilmoor UMC Food Pantry	carolfrazier@gmail.com
Lora Eddy		The Nature Conservancy	lora.eddy@tnc.org
MICHAEL STRADER	CURRITUCK	QUIBLE & ASSOCIATES	mstrader@quible.com
MIKE PALKOVICS	KITTY HAWK	KITTY HAWK POLICE DEPARTMENT	MIKE.PALKOVICS@KITTYHAWKTOWN.NET
JASON LITTERAL	CURRITUCK	PLANNING DEPARTMENT	jason.litteral@currituckcountync.gov
Anthony Dickinson	Currituck	Farm Bureau Ins (Agent	anthony.dickinson@ncfbins.com
Mary Beth Newns	Currituck	Currituck EM/COMMS	mary.newns@currituckcountync.gov
Olivia Doherty	Currituck	Currituck EM	olivia.doherty@currituckcounty.gov

HMPC Meeting 1 Currituck County Online Attendees



HMPC MEETING 2: AUGUST 28, 2024

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE - MEETING #2

August 28, 2024, 1pm, Dare County Emergency Operations Center

ATTENDANCE

There were 25 attendees in person and 15 online. The following individuals were in attendance:

Drew Pearson, Dare County EM
James Wooten, Dare County EM
Mary Ellon Ballance Dare County stakeholder – Hatteras Island
Ed Snyder, Nags Head Planning
Mike Strader, Currituck County stakeholder
Donna Creef, Dare County stakeholder – Outer Banks Association of Realtors
Noah Gillam, Dare County Planning
John Finelli, Dare County stakeholder – Martin's Point
Rob Testerman, Kitty Hawk Planning
Skip Jones, Kill Devil Hills stakeholder – Outer Banks Home Builders Association
Barton Grover, Dare County Planning
Kevin Wright, Duck stakeholder
Mike Talley, Kitty Hawk Fire
David Bradley, Southern Shores Public Works
Andrea Webster, NCORR
Olivia Doherty, Currituck County EM
Sandy Cross, Duck Planning
Joe Heard, Duck Planning
Mike Palkovics, Kitty Hawk Police
Melissa Dickerson, Manteo Planning
Josh Honston, Manteo Planning
Holly White, NCORR
Kelly Hoeltzel, SBP
Helene Wetherington, NCORR
Jason Litteral, Currituck County Planning
Anthony Dickinson, Currituck County, NC Farm Bureau Insurance Agent
Mike McGuire, Dare County stakeholder – Hatteras Island
Shari Fiveash, Dare County stakeholder – Room in the Inn
Tom Amatucci, Dare County stakeholder – Salvo
Cameron Ray, Kill Devil Hills, Assistant Planning Director
Mark Bissell, Kitty Hawk Stakeholder
Kevin Zorc, Manteo EM
Kelly Wyatt, Nags Head Planning
Carl Baker, NCEM
John Mello, NCEM, Hazard Mitigation Planner
Chris Smith, NCEM Area 1 Coordinator
David Stroud, WSP
Abby Moore, WSP
Ranger Ruffins, WSP
Kimmy Hansen, WSP

AGENDA

- Introductions
- Project Overview & Where we are in the Planning Process
- Hazard Identification
- Asset Inventory
  - iRisk Inventory: People, Property, and Critical Facilities
  - Current Property Estimate
- Hazard Profiles: Risk & Vulnerability
  - Summary of key findings for each hazard
  - Extreme Heat (Andrea Webster, NCORR)
- Discussion
- Next Steps

INTRODUCTIONS

Drew Pearson, Dare County Emergency Manager, kicked off the meeting with an introduction to the plan update process and the importance of hazard mitigation. David Stroud with WSP facilitated the rest of the meeting following the agenda above.

PROJECT OVERVIEW

David began the presentation by explaining where we are in the planning process. Currently, the plan update is in Phase 2 of the four-phase planning process which includes identifying hazards and assessing the problems. David proceeded to describe the steps taken during the Hazard Identification & Risk Assessment (HIRA) process which are shown to the right. David noted that a Hazard Mitigation Plan is required to maintain eligibility for FEMA mitigation funding and that the plan must include the projects that the community plans to apply for funding to implement. Drew mentioned that having a Hazard Mitigation Plan makes the community eligible for funding, but it is never guaranteed. Overall, the mitigation action plan should include all mitigation projects you want to pursue, regardless of funding source.

HAZARD IDENTIFICATION

David noted that there has been a total of 28 Disaster and Emergency Declarations within the Outer Banks Region. Around 78% of those declarations have been caused due to Hurricanes. As shown in slides 10 and 11 of the presentation, a comprehensive list of all existing hazards that are being carried forward and reevaluated in the plan update was provided and reviewed. David explained that a few of these hazard profiles have been consolidated to mirror the State HMP. He presented the hazards that have been included and not included in the plan update. A question was raised on why infectious disease was not being included as a hazard profile. Drew noted that the Public Health Department already maintains a plan for infectious disease that was effectively implemented during COVID-19. Therefore, infectious disease was not deemed necessary to include in the hazard mitigation plan update.

ASSET INVENTORY

David briefly reviewed the data that has been collected to represent the asset inventory for both Currituck and Dare Counties. The data was collected using the NCEM iRisk platform to collect information about population demographics, building counts and values, and critical facilities. Critical facilities are buildings and infrastructure that support continuity of operations and are essential to health and safety.

David reminded HMPC members to provide critical facility updates by September 6th. James Wooten is handling all of unincorporated Dare County's updates. Dare County's new incident management system will include critical facility updates. It was suggested that each community choose a point person to provide the critical facility updates.

HAZARD PROFILES

David reviewed the Priority Risk Index (PRI) methodology and results. He asked HMPC members to review the PRI ratings (found on slide 18) for each hazard and provide feedback if any changes are recommended. David suggested Terrorism impact rating might need to be lowered and Drew suggested the Cyber Attack impact rating be increased. David briefly reviewed current draft findings for the hazard profiles listed below.

Drought

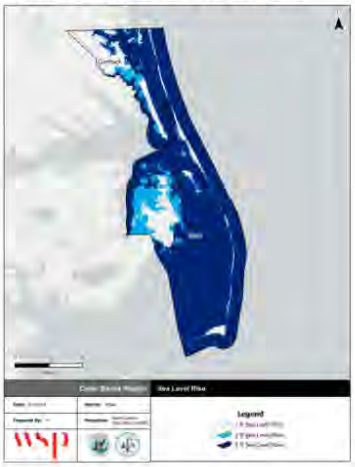
According to the U.S. Drought Monitor, from 2000-2023, Currituck County was in some level of drought 35% of the time, or 443 of 1,252 weeks, and Dare County was in some level of drought condition 33% of the time, or 418 of 1,252 weeks. David mentioned that drought can increase wildfire risk and may become more frequent and severe due to climate change.

Earthquake

The overall risk and probability of an earthquake occurring in the Outer Banks Region is relatively low. Since 1970, four earthquakes have occurred within 100 miles of the Region; all less than 4.0 magnitude.

Flood

David noted that coastal flooding, sea level rise, and localized stormwater flooding were all considered under the flood hazard profile. David reviewed the effective FIRMS for both Currituck and Dare counties and shared how they differ from the 2006 FIRMs. An exposure analysis was conducted for the plan update and provides an estimate of buildings that would be impacted by an additional 1-, 2-, and 3-feet of flooding above the current estimated base flood elevation. This FFRMS exposure analysis will also be done using the 2006 FIRM data as a baseline. NOTE: The building exposure counts that were presented included duplicated parcel counts in error. The numbers have been corrected in the presentation that will be sent to the committee and posted online.



Data from iRisk estimates that 14.3% of property is at risk to the 1% annual chance flood event with an estimated damage of over $69 million.

Percent of total buildings at risk is highest in:

- Dare County (25.1%)
- Kitty Hawk (21.2%)
- Nags Head (12.8%)
- Currituck County (12.3%)
- Manteo (11.0%)

While reviewing storm surge maps, Drew noted that there is a new basin and that the SLOSH maps have been updated to better reflect the sound side flooding.

Hurricane & Coastal Hazards

This hazard profile includes information on hurricanes and Nor'easters, erosion, and rip currents. NCEI reports 6 new hurricane and tropical storm events reported since the last plan update shown in the table below.

Date	Storm	Deaths/ Injuries	Property Damage	Crop Damage
9/5 - 9/6/2019	Hurricane Dorian	0/0	$150,000	$0
8/4/2020	Hurricane Isaias	0/0	$500,000	$0
7/8/2021	Tropical Storm Elsa	0/0	$20,000	$0
9/30/2022	Hurricane Ian	0/0	$0	$0
8/31/2023	Hurricane Idalia	0/0	$0	$0
9/22/2023	Tropical Storm Ophelia	0/0	$0	$0

There have been 30 reported rip current events in NCEI, which have caused 28 deaths since 2002. Questions were asked concerning the total number of lives lost to ocean hazards from NCEI. It was suggested that this number is much lower than what the HMPC has experienced, and it may be beneficial to add a note in the plan to indicate that the NCEI tables are not comprehensive.

Tornado & Thunderstorm

The Outer Banks Region has experienced 20 tornado incidents between 1996 and 2023, causing 6 injuries and $1,397,000 in property damage. Based on past occurrences, there is a 68% annual probability of a tornado occurring somewhere in the region. David described how occurrences of hail, high winds, strong winds, and thunderstorm winds have been recorded within the Outer Banks Region. It was also noted that these separate wind events will be defined within the plan update. In total the Outer Banks Region averages 8.5 thunderstorm wind events, 15 lightning events, and 1.5 hail events per year.

Severe Winter Storm

There has only been 1 emergency declaration due to severe winter storm in the Outer Banks Region. NCEI records show 54 severe winter storm related events during the 25-year period from 1999 through 2023.

Wildfire

David reviewed data collected from the Southern Wildfire Risk Assessment to show how Wildland Urban Interface (WUI), Fire Intensity, and Fire Burnability was measured within both Currituck and Dare Counties. It is estimated that 71.7% of the Region's population lives within the WUI. Over 32% of the Region is susceptible to Class 4 and 4.5 high intensity fires, which pose significant harm or damage to life and property. Most of the Outer Banks Region has a relatively low burn probability of 5 or less, however, approximately 43% of the Region has a burn probability of 6 or 7.

Burn Probability

Class	Acres	Percent
1	38,039	12.7%
2	33,901	11.4%
3	37,115	12.4%
4	16,466	5.5%
5	43,380	14.5%
6	117,198	39.3%
7	12,386	4.1%
8	0	0.0 %
9	0	0.0%
10	0	0.0%
Total	298,487	100.0%

Hazardous Materials Incident

The Toxic Release Inventory reports 4 sites with hazardous materials in the planning area shown in the table below. Between 1990 and 2023 there were 8 recorded hazardous materials incidents in the Outer Banks Region. Of these events, 2 were flagged as serious incidents and caused 4316,891 in damages. The most common materials spilled in the planning area are Class 2 (Gases) and Class 3 (Flammable Combustible Liquids). David also noted the Buxton Beach underground petroleum tanks that have started to release hazardous materials due to erosion.

Facility Name	County	Chemicals Reported	Most Recent Release
Tidewater Agricorp Central Fertilizer	Currituck	Ammonium Sulfate, Ammonia, Phosphoric Acid	1988
W S Clark & Sons Inc	Currituck	Ammonia, Phosphoric Acid	1990
Us Air Force Dare County Bomb Range	Dare	Lead	2023
Us Natl Park Service Cape Hatteras Natl Seashore (Caha)	Dare	Lead	2018

Source: US EPA

Currituck and Dare counties participated in a Commodity Flow Study since the last HMP update. James Wooten will provide information on this study.

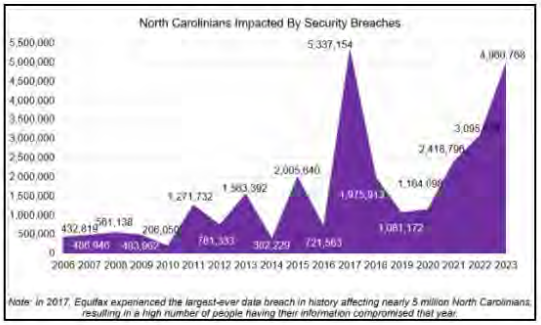
There are several FUD (Formerly Utilized Defense) sites in the region. Buxton Beach came to light because of erosion, but other sites could pose a risk in future. Drew will provide information on these sites.

Radiological Emergency

Overall, there is a low probability of a radiological emergency occurring within the Outer Banks Region. A very small portion of northeastern Currituck County is within the 50-mile Ingestion Pathway Zone (IPZ) of Surry Power station in Surry, VA.

Cyber Threat

In 2023, NC Department of Justice received 2,033 data breach notices from organizations. These breaches impacted more than 4,960,768 North Carolinians. David noted that while the majority of breaches were not specifically targeted at the Outer Banks Region, some of them almost certainly included information on individuals who live in the region.



Drew indicated that foreign actors have been successful in cyber attacks against the county. It's important to be able to track and report threats prevented.

Terrorism

In 2023, 50 active hate groups were reported by Southern Poverty Law Center in North Carolina. Hate groups were defined as any group with "beliefs or practices that attack or malign an entire class of people." None of the identified hate groups have a specifically identified footprint in the Currituck or Dare counties. It was mentioned that the gunfire attack on two electrical substations in Moore County in 2022 should be noted in the plan update as an example of terrorism attacks on local infrastructure.

Transportation Infrastructure Failure

The Region depends on several key bridges, roads, and ferry crossings for access and services – integral for the functioning of the planning area. David noted that the loss of major highway or key bridges could

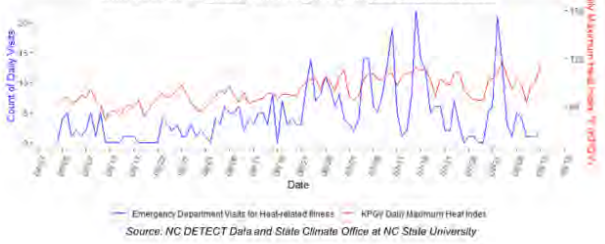
cause significant disruption for residents. There are 15 bridges built prior to 1995 in the Outer Banks Region. Two of these bridges were rated as "Structurally deficient" and 5 were rated as "Functionally Obsolete."

James asked to broaden the Transportation Infrastructure Failure profile to include other types of infrastructure. Dare County has been tracking failure of fiber optic lines and water lines. The NC-12 Task Force Report provides hot spots for infrastructure.

NCORR HEAT

Andrea Webster presented on heat vulnerability in the Outer Banks. She noted that it is likely that temperatures will continue to increase which will impact the rate of heat-related illness. Higher temperatures will specifically impact infants and children, pregnant persons, persons taking certain medications, older adults (65+), outdoor workers, low income, people with underlying health conditions, and athletes. Additionally, it was noted that high temperatures will not only impact human health but utility costs, infrastructure, and agriculture.

Figure 3. Count of Emergency Department Visits for Heat-related Illness and Maximum Heat Index Northeastern NC (NC DETECT Region 1): May 1 - August 10, 2024



Source: NC DETECT Data and State Climate Office at NC State University

NEXT STEPS

David discussed the key milestones and upcoming meetings that will be facilitated by WSP. David briefly reviewed the public survey results which has received 379 responses so far. The HMPC was asked to provide any critical facility updates to the WSP team by Friday, September 6th and to begin reviewing existing mitigation action plans to provide a status update for each action. WSP will post an updated draft HIRA on the plan website for review by Friday, September 13th. The next HMPC meeting will be tentatively scheduled in October.

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #2 (Dare and Currituck County Group) – August 28, 2024, 1:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
DREW PEARSON	DARE	EM	drew.pearson@darenc.gov
DAVID STROUD	WSP	WSP	david.stroud@wsp.com
James Wooten	Dare EM	EM	james.wooten@darenc.gov
MaryEllon Ballance	Hatteras Island	Citizen/Stakeholder	maryellon@me.com
Ed Snyder	Nags Head	Planning/Code Compliance	ed.snyder@nagsheadnc.gov
MIKE STRADER	CURRITUCK	WITHERS RAVENEL	MStrader@withersravenel.com
Donna Creef	OBAR		dvcreef@gmail.com
NOAH GILLAM	DARE	Dare Planning	noah.gillam@darenc.gov
John Finelli	Dare	Martin's Point	JLF9000z@gmail.com
ROB TESTERMAN	KITTY HAWK	PLANNING	rob.testerman@kittyhawktown.net
SKIP JONES	KILL DEVIL HILLS	COMMISSION	skip@seacountryhomesobx.com
Barton Grover	Dare	Planning	barton.grover@darenc.gov
KEVIN WRIGHT	DARE (DUCK)	Town of Duck citizen volunteer	kvwkmw@gmail.com
MIKE TALLEY	KITTY HAWK	FIRE DEPT.	mike.talley@kittyhawktown.net
David Bradley	Southern Shores	Public Works	dbradley@southernshores-nc.gov

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Sandy Cross	Duck	Planning	scross@townofduck.com
Joe Heard	Duck	Planning	Jheard@townofDuck.com
MIKE PALKOVICS	KITTY HAWK	POLICE	MIKE.PALKOVICS@KITTY HAWK TOWN. NOT
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Josh Honston	Manteo	Planning	jhouston@manteonc.gov
Holly White	NCORR		holly.b.white@ncdps.gov
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Helene Wetherington	NCORR -	NCORR - CDRZ	helene.wetherington@ncdps.gov

HMPC Meeting 2 Online Attendees

HMPC MEETING 3: OCTOBER 21, 2024 & OCTOBER 22, 2024

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE – MEETING #3

October 21, 2024, 2pm, Currituck County Public Safety Center

ATTENDANCE

There were seven attendees in person and nine online. The following individuals were in attendance:

Mary Beth Newns, Currituck EM Director
Olivia Doherty, Currituck County EM Deputy Director
Jason Litteral, Currituck County Planning
Patrick Leary, Currituck, Planner I
Millicent Ott, Currituck, Planner II
Tab Winborne, Currituck Stakeholder
Michael Strader, Currituck Stakeholder
Andrea Webster, NCORR
Holly White, NCORR
Carl Baker, NCEM
John Mello, NCEM, Hazard Mitigation Planner
Chris Crew, NCEM
David Stroud, WSP
Abby Moore, WSP
Ranger Ruffins, WSP
Kimmy Hansen, WSP

AGENDA

- Project Overview & Where we are in the Planning Process
- Capability Assessment
  - New Capabilities
  - Substantial Damage Estimate Procedures
- Mitigation Strategy
  - Review Goals & Objectives
  - Mitigation Action Updates
- Discussion
- Next Steps

PROJECT OVERVIEW

Abby Moore with WSP began the presentation by explaining where we are in the planning process. Currently, the plan update is in Phase 3 of the four-phase planning process which involves development of the mitigation strategy, including setting goals, reviewing possible activities, and drafting an action plan. Abby reminded the committee that there will be one more committee meeting and one more public meeting where WSP will present the draft plan. Afterwards, the plan will be sent to the State for review.

CAPABILITY ASSESSMENT

A capability assessment measures local resources and tools available to support or implement mitigation projects. It identifies gaps, conflicts, and opportunities in existing local plans, policies, and programs. Additionally, a capability assessment identifies mitigation measures already in place or underway.

Indicators of capability in this plan update include the following:

- Plans and Regulatory – plans, programs, ordinances
- Administrative & Technical – staff, training, expertise
- Fiscal Resources – bonds, fees, taxes, CIP, grants
- Education and Resources – engaged stakeholders, public outreach, warning & notification
- Mitigation Resources – grants, past mitigation projects performance
- Political Will – public and leadership support for mitigation, investments, regulation enforcement

Previous Capability Self-Assessment Results

Abby reviewed the previous capability self-assessment results which can be found in the table below. Abby asked if these ratings should be changed and reminded the committee that all comments or revisions about the capability self-assessment results can be emailed directly to Abby.

Jurisdiction	Plans, Ordinances, Codes and Programs	Administrative and Technical	Fiscal	Education and Outreach	Mitigation	Political	Overall
Currituck County	High	High	High	Moderate	Moderate	Moderate	**High**
Dare County	High	High	High	High	High	High	**High**
Duck	High	Moderate	Moderate	High	Limited	Moderate	**Moderate**
Kill Devil Hills	High	High	Moderate	High	Limited	Moderate	**Moderate**
Kitty Hawk	Moderate	Limited	Moderate	Limited	Moderate	Moderate	**Moderate**
Manteo	Moderate	Moderate	Moderate	Limited	Limited	Moderate	**Moderate**
Nags Head	High	High	High	High	High	High	**High**
Southern Shores	High	High	High	High	High	High	**High**

Changes Since the Last Plan Update

Abby reviewed the changes in capability that have occurred since the last plan update and mentioned other new resources such as comprehensive plan updates, flood damage prevention ordinance updates, the Albemarle Regional Resilience Portfolio, the NC 12 Task Force & Report, and the Joint Hazardous Material Commodity Flow Study. Abby asked the committee if there were any changes that were missing from the list. The HMPC indicated that Emergency Management has expanded the use of social media for outreach, and Everbridge participation is increasing. Additionally, seven homes were elevated through an HMGP grant. It was also noted that the Soil & Water Conservation District received grant funding for ditch maintenance and Currituck County applied for a BRIC grant for stormwater improvements in Corolla; this application was not selected but the County will apply again during the next BRIC cycle.

New FEMA Requirements

Abby briefly noted that there is a new FEMA requirement for substantial damage estimate procedures. The plan must include information on how participating communities use the NFIP to reduce risk after a disaster through substantial damage and substantial improvement (SD/SI) procedures.

Capability Vs. Mitigation

Abby emphasized the difference between capability and mitigation actions and gave examples of different scenarios found on slide 13. Mitigation actions should be applicable to the next five years and should be specific actions that help achieve the plans goals and objectives. It is important to focus on projects that reduce risk and vulnerability. Abby noted that the jurisdictions do not need to include actions that focus on established or ongoing practices.

MITIGATION STRATEGY

A mitigation strategy is meant to reduce the impact of hazards on existing development and ensure future development occurs in a way that minimizes vulnerability.

Goals & Objectives

David reviewed the existing goals and objectives from the previous plan update and discussed potential revisions to implement with the committee for the current plan update.

Goal 1: Reduce the risk of loss of life and personal injury from hazards.

- Objective 1-1: Educate citizens to encourage individual responsibility to protect themselves and their families from hazards.
- Objective 1-2: Reduce the risk and impact of future hazards by mitigating risk of development in both known hazard areas and areas expected to face future hazard risk.

David suggested rewriting objective 1.2 to make it more concise.

Goal 2: Maintain critical facilities and infrastructure and protect them from damage.

- Objective 2-1: Retrofit or otherwise protect critical facilities and infrastructure.
- Objective 2-2: Increase redundancy of critical systems and services.

There was discussion surrounding the wording of objective 2.2 between committee members. David clarified that the definition of critical facilities and infrastructure is not finite and can cover other types of systems such as water infrastructure. Some committee members felt that this objective should remain. Holly White with NCORR noted that by adding EV chargers or solar panels to critical facilities it may open the doors to additional sources of funding through the EPA.

Goal 3: Ensure that hazard mitigation practices, construction techniques, policies, and ordinances are integrated for both new development and post-disaster development to enhance resiliency and enable speedy recovery.

- Objective 3-1: Adopt protective development standards and establish post-disaster redevelopment policies.
- Objective 3-2: Preserve and protect natural and beneficial floodplain functions and key natural resources.
- Objective 3-3: Explore, develop, and implement new pre-disaster opportunities that build community resilience.

David suggested removing the "pre" and "post" development language from this goal.

Goal 4: Improve inter-jurisdictional cooperation and coordination, especially regarding the reduction of hazard impacts.

- Objective 4-1: Coordinate development standards across jurisdictions.
- Objective 4-2: Encourage and enable inter-jurisdictional communication.

Chris Crew encouraged the committee to consider adding an objective to goal 4 that will provide a regional resilience approach for both counties to participate in. If one doesn't currently exist, Chris suggested adding a new regional project. It was noted that it will be important to properly represent all jurisdictions in the region.

Mitigation Action Requirements

David informed the committee that FEMA requires at least one mitigation action for each identified hazard in the plan update. All mitigation actions will need to be organized into the categories found below. David noted that to maximize CRS credit they should include flood-related actions in at least five of the six mitigation categories.

1. Prevention (land development plans & zoning, freeboard requirements)
2. Property Protection (acquisition, elevation, floodproofing, backup generators)
3. Structural Projects (floodwalls, stormwater improvements, harden critical infrastructure)
4. Emergency Services (warning systems, response capacity & capability improvements)
5. Natural Resource Protection (dune or wetland restoration, vegetative management, open space preservation)
6. Public Education (mailings, websites, social media campaigns, interactive map tools, hazard disclosure requirements, targeted outreach and engagement)

Current Action Plans

David reviewed the current action plans in terms of what mitigation categories they cover and what hazards they address. The tables found on slides 19 and 20 include the status updates that have already been sent to Abby. Drought, earthquake, extreme heat, and severe winter storm have the fewest hazard-specific actions.

PRI Summary Results

David briefly reviewed the PRI summary results with the committee. Flood, hurricane and coastal hazards, and excessive heat were the only hazard profiles to be rated a "High Risk" for the Outer Banks Region. David reminded the committee that it is important to consider adding more mitigation actions for the high priority hazards. A question was asked concerning the spatial extent of cyber attack and that it should be rated higher than "small" as it has the potential for impacting the whole community. David pointed out that spatial extent was taken from a physical context to represent a cyber attack on single buildings such as hospitals. Additionally, it was noted that FEMA and the State will not be evaluating cyber attack as they only look at the natural hazard profiles. Comments on the HIRA can be sent to Abby.

High Risk (≥ 3.0)	Flood Hurricane & Coastal Hazards Excessive Heat
Moderate Risk (2.0 - 2.9)	Tornadoes & Thunderstorms Severe Winter Storm Terrorism Transportation Infrastructure Failure Wildfire Drought Cyber Attack Hazardous Materials Incident
Low Risk (< 2.0)	Earthquake Radiological Emergency

New Mitigation Action Ideas

David discussed potential new mitigation action ideas that could be added into the plan update. He reminded the committee that these are only ideas to help them think of new actions and have not been added to the plan update. The action ideas presented can be found on slides 23-27. David encouraged the committee to look for plan integration opportunities by incorporating actions from comprehensive plans, capital improvement plans, and RCCP Resilience Strategy Project Portfolios.

Survey Results

David reviewed results of the public survey which received a total of 475 responses. Abby will send a copy of the survey responses, which can be sorted by jurisdiction to help give specific feedback to the different communities regarding proposed mitigation action ideas.

DISCUSSION

Holly noted that Currituck County has drainage/stormwater requirements for subdivisions and commercial development. A new action could be to update those requirements to the Atlas 14/15 numbers. That would bring them up to planning for the rainfall of today. If trying to be more resilient, they could explore how future rainfall might impact that numbers as well. The climate office is working on this and would have that data to help inform that.

NEXT STEPS

David discussed the key milestones and upcoming meetings that will be facilitated by WSP. The HMPC was asked to review all mitigation actions and send updates to Abby by the end of November. WSP will provide a draft plan for the committee to review at the next meeting which will be tentatively scheduled in December. Following the committee's review of the plan WSP will send the plan to the State for review. The existing plan is set to expire in June of 2025.

Name	Jurisdiction	Title and Department/Organization	Email
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Millicent Ott	Currituck	Planner 2	millicent.ott@currituckcountync.gov
JASON LITTERAL	Currituck	Senior Planner	jason.litteral@currituckcountync.gov
PATRICK LEARY	Currituck	Planner 1	patrick.leary@currituckcountync.gov
Olivia Doherty	Currituck	Deputy EM coordinator	olivia.doherty@currituckcountync.gov

HMPC Meeting 3 Currituck County Online Attendees

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE - MEETING #3

October 22, 2024, 10am, Dare County EOC, 370 Airport Rd, Manteo

ATTENDANCE

There were 12 attendees in person and 15 online. The following individuals were in attendance:

James Wooten, Dare County – Emergency Management Planner
Drew Pearson, Dare County – EM Director
Shari Fiveash, Dare County stakeholder – Room in the Inn
Ed Snyder, Nags Head Planning
Meredith Guns, Kill Devil Hills – Planning Director
John Finelli, Dare County – HOA and Planning Board Member
Shane Hite, Nags Head – Deputy Fire Chief
Joe Heard, Duck – Director of the Department of Community Development
Barton Grover, Dare County Planning – Grants and Waterways Administrator
Skip Jones, Kill Devil Hills Stakeholder
Wes Haskett, Southern Shores Planning Director – Deputy Town Manager
Joe Costello, Nags Head – Deputy Planning Director
Rob Testerman, Kitty Hawk Planning
Sandy Cross, Duck Planning
Melissa Dickerson, Manteo Planning
Holly White, NCORR
Kelly Hoeltzel, SBP
Mark Bissell, Kitty Hawk Stakeholder
Kevin Zorc, Manteo EM
Kelly Wyatt, Nags Head Planning
Carl Baker, NCEM
John Mello, NCEM – Hazard Mitigation Planner
John Crew, NCEM
Chris Smith, NCEM Area 1 Coordinator
David Stroud, WSP
Abby Moore, WSP
Kimmy Hansen, WSP

AGENDA

- Project Overview & Where we are in the Planning Process
- Capability Assessment
  - New Capabilities
  - Substantial Damage Estimate Procedures
- Mitigation Strategy
  - Review Goals & Objectives
  - Mitigation Action Updates
- Discussion
- Next Steps

PROJECT OVERVIEW

Abby Moore with WSP began the presentation by explaining where we are in the planning process. Currently, the plan update is in Phase 3 of the four-phase planning process which involves development of the mitigation strategy, including setting goals, reviewing possible activities, and drafting an action plan. Abby reminded the committee that there will be one more committee meeting and one more public meeting where WSP will present the draft plan. Afterwards, the plan will be sent to the State for review.

CAPABILITY ASSESSMENT

A capability assessment measures local resources and tools available to support or implement mitigation projects. It identifies gaps, conflicts, and opportunities in existing local plans, policies, and programs. Additionally, a capability assessment identifies mitigation measures already in place or underway.

Indicators of capability in this plan update include the following:

- Plans and Regulatory – plans, programs, ordinances
- Administrative & Technical – staff, training, expertise
- Fiscal Resources – bonds, fees, taxes, CIP, grants
- Education and Resources – engaged stakeholders, public outreach, warning & notification
- Mitigation Resources – grants, past mitigation projects performance
- Political Will – public and leadership support for mitigation, investments, regulation enforcement

Previous Capability Self-Assessment Results

Abby reviewed the previous capability self-assessment results which can be found in the table below and asked if these ratings should be changed. All comments or revisions regarding the capability self-assessment results can be emailed directly to Abby.

Jurisdiction	Plans, Ordinances, Codes and Programs	Administrative and Technical	Fiscal	Education and Outreach	Mitigation	Political	Overall
Currituck County	High	High	High	Moderate	Moderate	Moderate	**High**
Dare County	High	High	High	High	High	High	**High**
Duck	High	Moderate	Moderate	High	Limited	Moderate	**Moderate**
Kill Devil Hills	High	High	Moderate	High	Limited	Moderate	**Moderate**
Kitty Hawk	Moderate	Limited	Moderate	Limited	Moderate	Moderate	**Moderate**
Manteo	Moderate	Moderate	Moderate	Limited	Limited	Moderate	**Moderate**
Nags Head	High	High	High	High	High	High	**High**
Southern Shores	High	High	High	High	High	High	**High**

Changes Since the Last Plan Update

Abby reviewed the changes that have occurred and new resources that have been developed since the last plan update, including the following:

- All communities completed Comprehensive/Land Use Plan updates
- Flood Damage Prevention Ordinance Updates; minimum elevation requirements
- RCCP Resilience Strategies: Currituck County, Dare County, Duck, Nags Head, Kitty Hawk
- Albemarle Regional Resilience Portfolio
- NC 12 Task Force & Report
- Joint Hazardous Material Commodity Flow Study
- Nags Head VCAPS Report

- Southern Shores now has a full-time building inspector

Abby asked the committee if there were any changes that were missing from the list. HMPC members shared that Nags Head completed a full rewrite of their Emergency Operations Plan in the last eight months. It was confirmed from the committee that all EOPs are updated on an annual basis. Sandy Cross noted that Duck now has a Community Planner and a second assistant inspector who is also the town's maintenance technician. Duck completed a neighborhood stormwater study through RCCP and a Flood Warning and Response Plan. Manteo and Dare County are designated as Community Disaster Resilience Zones (CDRZ) which means they may have advantages in some federal grant programs. Dare County completed 27 elevations post-Florence and is currently working on 31 elevations post-Dorian using HMGP funds; this includes some properties in incorporated areas, but the county applied for and manages the grants.

New FEMA Requirements

Abby briefly noted that there is a new FEMA requirement for substantial damage estimate procedures. The plan must include information on how participating communities use the NFIP to reduce risk after a disaster through substantial damage and substantial improvement (SD/SI) procedures.

Committee members noted that SD/SI forms are a process that often occurs after the damage assessments have been completed during permit applications. Abby said that this will be noted and that we will show that they are meeting the NFIP requirements for substantial damage. Sandy noted that crisis track software should be included as part of the SI/SD process. Chris Crew noted that to satisfy this requirement the state is pushing for communities to create a substantial damage plan, but currently they only need a narrative description of how and when they do substantial damage estimates. This includes looking at substantial improvements. The narrative needs to show what they do and who is responsible.

Capability vs. Mitigation

Abby emphasized the difference between capability and mitigation actions and gave examples of different scenarios found on slide 13. Mitigation actions should be applicable to the next five years and should be specific actions that help achieve the plans goals. It is important to focus on projects that reduce risk and vulnerability. Abby noted that the jurisdictions do not need to include actions that focus on established or ongoing practices if these practices would be completed anyway.

MITIGATION STRATEGY

A mitigation strategy is meant to reduce the impact of hazards on existing development and ensure future development occurs in a way that minimizes vulnerability.

Goals & Objectives

David reviewed the existing goals and objectives from the previous plan update and discussed potential revisions to implement with the committee for the current plan update.

Goal 1: Reduce the risk of loss of life and personal injury from hazards.

- Objective 1-1: Educate citizens to encourage individual responsibility to protect themselves and their families from hazards.
- Objective 1-2: Reduce the risk and impact of future hazards by mitigating risk of development in both known hazard areas and areas expected to face future hazard risk.

David suggested rewriting objective 1.2 to make it more concise. A committee member asked if the homes that are being demolished before collapse should be considered under this objective. David confirmed that this action is reducing risk and would fall within this goal. The objective can be revised to acknowledge current hazards as well as future hazards. The committee discussed how the park service has recently bought a few houses to tear them down. Chris Crew noted that it's not just the property owners

that need protection, but these homes are a public risk to the community. It may be helpful to identify individuals who would be willing to take down these homes on their properties before they fall. Drew noted that within objective 1.1 we should consider underserved communities and vulnerable populations who need additional support to protect themselves. It was agreed to include underserved populations in objective 1.1 and consider buildings that are at risk currently and in the future for objective 1.2.

Goal 2: Maintain critical facilities and infrastructure and protect them from damage.

- Objective 2-1: Retrofit or otherwise protect critical facilities and infrastructure.
- Objective 2-2: Increase redundancy of critical systems and services.

James indicated that water system vulnerability is a very important issue to consider, and private wastewater treatment presents a challenge that should be addressed within this goal. Joe Heard shared that it is also important to plan for resilience in terms of being able to quickly resume operations of critical facilities that fail during hazard events.

Goal 3: Ensure that hazard mitigation practices, construction techniques, policies, and ordinances are integrated for both new development and post-disaster development to enhance resiliency and enable speedy recovery.

- Objective 3-1: Adopt protective development standards and establish post-disaster redevelopment policies.
- Objective 3-2: Preserve and protect natural and beneficial floodplain functions and key natural resources.
- Objective 3-3: Explore, develop, and implement new pre-disaster opportunities that build community resilience.

David suggested removing the "pre" and "post" development language from this goal.

Goal 4: Improve inter-jurisdictional cooperation and coordination, especially regarding the reduction of hazard impacts.

- Objective 4-1: Coordinate development standards across jurisdictions.
- Objective 4-2: Encourage and enable inter-jurisdictional communication.

Drew noted that goal 4 should also reflect coordination and leveraging resources of the state and other partners, such as Albemarle COG.

Mitigation Action Requirements

David informed the committee that FEMA requires at least one mitigation action for each identified hazard in the plan update. All mitigation actions will need to be organized into the categories found below. David noted that to maximize CRS credit they should include flood-related actions in each of the six mitigation categories.

1. Prevention (land development plans & zoning, freeboard requirements)
2. Property Protection (acquisition, elevation, floodproofing, backup generators)
3. Structural Projects (floodwalls, stormwater improvements, harden critical infrastructure)
4. Emergency Services (warning systems, response capacity & capability improvements)
5. Natural Resource Protection (dune or wetland restoration, vegetative management, open space preservation)
6. Public Education (mailings, websites, social media campaigns, interactive map tools, hazard disclosure requirements, targeted outreach and engagement)

David noted that it is important to think long-term while reviewing the action plans. It is okay to add actions that may not be completed in the next 5 years. This may help avoid the need for amendments to the plan in the future.

Current Action Plans

David reviewed the current action plans in terms of what mitigation categories they cover and what hazards they address. The tables found on slides 19 and 20 include the status updates that have already been sent to Abby. Drought, earthquake, extreme heat, and severe winter storm have the least amount of action plans to address these hazards.

PRI Summary Results

David briefly reviewed the PRI summary results with the committee. Flood, hurricane and coastal hazards, and excessive heat were the only hazard profiles to be rated a "High Risk" for the Outer Banks Region. David reminded the committee that it is important to consider adding more mitigation actions for the high priority hazards. Committee members discussed changing the duration of flooding to more than a week, as the water levels take time to lower. David noted that FEMA and the State will only evaluate the natural hazard profiles.

High Risk (≥ 3.0)	Flood Hurricane & Coastal Hazards Excessive Heat
Moderate Risk (2.0 - 2.9)	Tornadoes & Thunderstorms Severe Winter Storm Terrorism Transportation Infrastructure Failure Wildfire Drought Cyber Attack Hazardous Materials Incident
Low Risk (< 2.0)	Earthquake Radiological Emergency

New Mitigation Action Ideas

David discussed potential new mitigation action ideas that could be added into the plan update. He reminded the committee that these are only ideas to help them think of new actions and have not been added to the plan update. The action ideas can be found on slides 23-27. The HMPC also suggested raising roads, factoring sea level rise and future flood risk into infrastructure projects. Abby also indicated that the Elizabethan Gardens is interested in supporting public outreach projects and pursuing a living shoreline project.

David encouraged the committee to look for plan integration opportunities by incorporating actions from comprehensive plans, capital improvement plans, and RCCP Resilience Strategy Project Portfolios.

Survey Results

David reviewed results of the public survey which received a total of 475 responses. Abby will send a copy of the survey responses, which can be sorted by jurisdiction to help give specific feedback to the different communities regarding proposed mitigation action ideas.

NEXT STEPS

David discussed the key milestones and upcoming meetings that will be facilitated by WSP. The HMPC was asked to review all mitigation actions and send updates to Abby by the end of November. WSP will provide a draft plan for the committee to review at the next meeting which will be tentatively scheduled in December. Following the committee's review of the plan WSP will send the plan to the State for review. The existing plan is set to expire in June of 2025.

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #3 (Dare County Group) – October 22, 2024, 10:00am

Name	Jurisdiction	Department/Agency/Organization	Email
James Wooten	Dare EM	Dare EM	james.wooten@darenc.gov
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ABBY MOORE	—	WSP	ABIGAIL.MOORE@WSP.COM
SHARI FUEASH	—	OBX ROOM IN THE INN	OBXROOMINTHEINN@GMAIL.com
Ed Snyder	Nags Head	Code Compliance	ed.snyder@nagsheadnc.gov
Meredith Guns	KDH	Planning Director	meredith@kdhnc.com
John Finelli	Martin's Point	Dare	JLF9002@gmail.com
Shane Hilke	Nags Head	Nags Head Fire	shane.hilke@nagsheadnc.gov
Joe Heard	Duck	Duck Planning	joe.heard@~~townofduck~~ducknc.gov
Barton Graver	Dare	Dare Grants	barton.graver@darenc.gov
Skip Sorey	KDH	Commerce	skip@seacountryhomes.com

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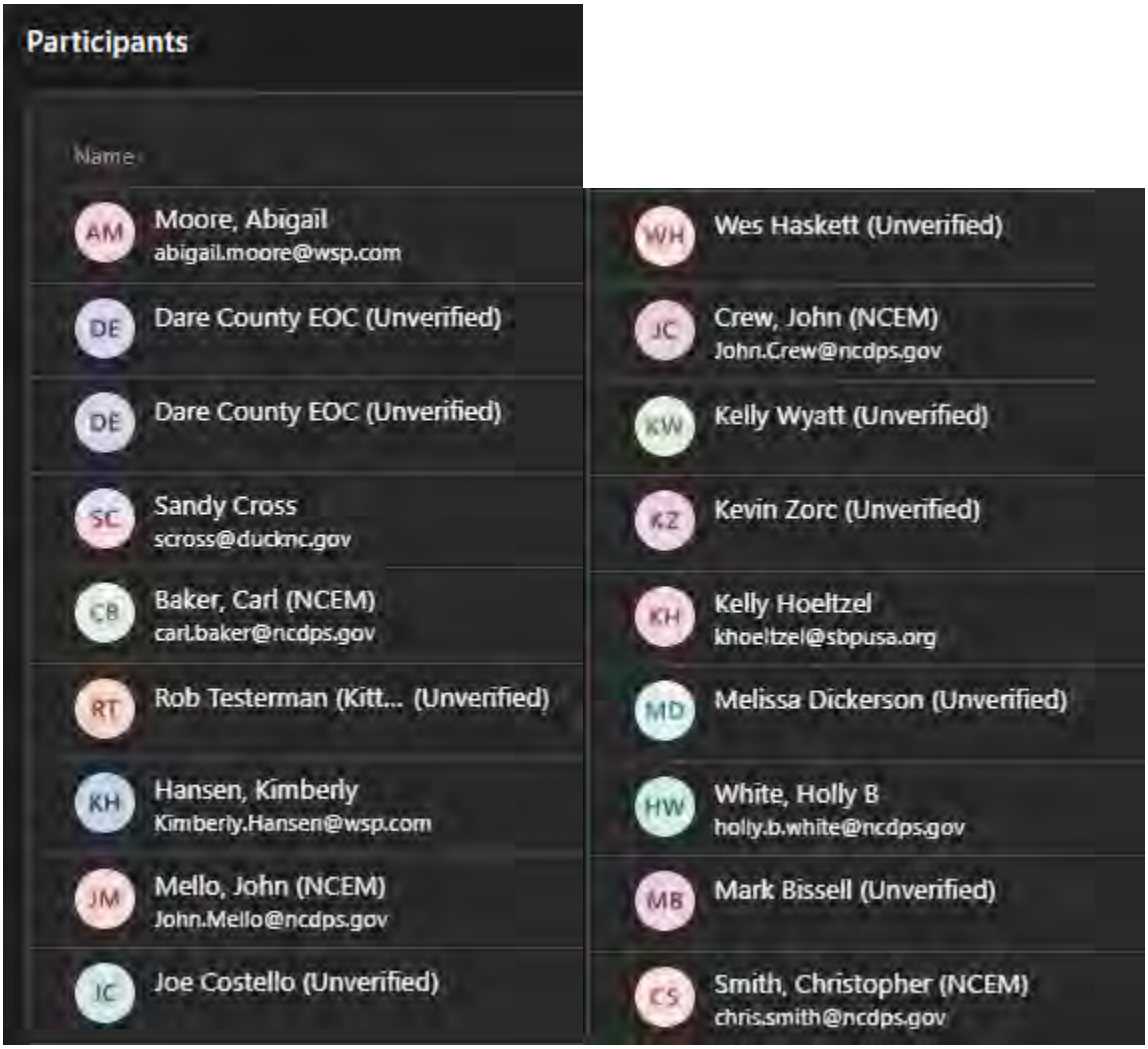
HMPC Meeting 3 Dare County Online Attendees



HMPC MEETING 4: JANUARY 28, 2025

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE – MEETING #4

January 28, 2025, 11am, Currituck County Public Safety Center

ATTENDANCE

There were four attendees in person and ten online. The following individuals were in attendance:

Mary Beth Newns, Currituck County EM Director
Olivia Doherty, Currituck County EM Deputy Director
Jason Litteral, Currituck County Planning
Patrick Leary, Currituck, Planner I
Millicent Ott, Currituck, Planner II
Michael Strader, Currituck Stakeholder
Barbara Heffernan, Currituck County resident
Chris Crew, NCEM, Mitigation Plans Manager
Carl Baker, NCEM, Hazard Mitigation Planner
John Mello, NCEM, Hazard Mitigation Planner
Chris Smith, NCEM Area 1 Coordinator
Kymberly Kudla, FEMA Region 4
David Stroud, WSP
Abby Moore, WSP

AGENDA

- Planning Process Update
- Structure of the Plan
- Review of Key Plan Components
  - Planning Process
  - Risk Assessment
  - Mitigation Strategy
- Plan Adoption & Implementation
- Next Steps
- Discussion / Feedback on Draft Plan

PLANNING PROCESS UPDATE

David Stroud with WSP began the presentation by explaining where we are in the planning process. We are nearing the end of the planning process as we have drafted the plan and now need to finalize it with any new mitigation actions that the communities wish to add. The plan will then need to be adopted and the HMPC and communities will work on implementation for the next five years.

STRUCTURE OF THE PLAN

David provided an overview of the structure of the draft plan including a summary of each section of the plan, as follows.

Section 1 Introduction provides background information on the plan, including context and justification for planning and the scope of the plan.

Section 2 Planning Process summarizes how the planning process was conducted and how all planning requirements were met, including how the communities, public, and stakeholders were involved in the

plan. This section also documents implementation progress of the last plan in terms of completed and deleted mitigation actions.

Section 3 Planning Area Profile for summary information on the region and participating communities, including geographic, climate, demographic, and economic characteristics of the region.

Section 4 Risk Assessment contains the bulk of the plan. This section presents the hazard identification and profiles each hazard with information on the location at risk, past occurrences, probability of future occurrence, and vulnerability of people, property, and critical facilities.

Barbara Heffernan asked for an explanation of iRisk, which David explained is a state database with information on buildings throughout the state and modeled hazard risk vulnerability. There was a discussion of the accessibility of this database; Chris Crew and David Stroud explained that the pertinent data for the communities in the Outer Banks Region is included in summary tables in the draft plan.

Section 5 Capability Assessment summarizes each community's existing tools, staff, and other resources that can support the implementation of mitigation projects.

Section 6 Mitigation Strategy reviews the goals and objectives of the plan and details how mitigation actions were identified and prioritized. David explained that existing mitigation actions from the previous plan were reviewed and project status updates are reported in the plan. Some projects were carried forward. The HMPC also reviewed new mitigation projects to include in this plan update.

Section 7 Mitigation Action Plans presents the action plan tables for each community.

Section 8 Plan Maintenance describes past plan integration, opportunities for future plan integration, and the process for regular monitoring, maintenance, and implementation of the plan, including ongoing responsibilities of the HMPC.

Section 9 Plan Adoption will document each community's adoption of the plan update.

Annexes are provided for each participating community. The annexes provide an asset inventory with a full critical facility list, risk assessment data with vulnerability assessment results specific to the community for spatially defined hazards, and the mitigation action plan.

Appendix A provides the Local Mitigation Plan Review Tool, which documents for the plan reviewers where the planning requirements were met.

Appendix B provides planning process documentation demonstrating how the HMPC, public, and stakeholders were involved and engaged in the planning process.

Appendix C provides mitigation alternatives analysis, documenting the review of mitigation action options, which is important for the CRS program planning requirements.

Appendix D lists data and resources that were referenced in the plan.

KEY PLAN COMPONENTS

David reviewed key parts of the planning process, including the HMPC meetings, the public meetings, and all the participating communities' public outreach efforts.

David reviewed some high level survey results, which were previously presented to the HMPC. There were 475 responses overall, including 50 responses from residents of Currituck County. The hazard risk ratings from the public aligned with the findings of the risk and vulnerability assessment. Regarding past hazard experiences, many responses reference past hurricanes and flooding. Regarding recommended steps local governments could take to reduce hazard impacts, responses include suggestions for drainage improvements, beach nourishment, development policies, and emergency response support.

David presented the Priority Risk Index results as a summary of the risk and vulnerability assessment. He explained that the PRI is a methodology for comparing the hazards based on five categories: probability,

severity, spatial extent, warning time, and duration. Flood, hurricane and coastal hazards, and excessive heat were rated as "High Risk" for the Outer Banks Region.

Barbara noted the significance of infrastructure failure as a hazard for barrier island communities like Corolla and asked if there has been any planning for the possibility of bridge failure and lack of access to these communities.

David presented the goals and objectives which were largely carried forward from the previous plan with some small revisions. The goals and objectives are as follows:

Goal 1: Reduce the risk of loss of life and personal injury from hazards.

- Objective 1-1: Educate citizens to encourage individual responsibility to protect themselves and their families from hazards. Recognize that vulnerable populations and underserved communities may need additional resources and support.
- Objective 1-2: Reduce the risk and impact of current and future hazards by mitigating risk of development.

Goal 2: Maintain critical facilities and infrastructure and protect them from damage.

- Objective 2-1: Retrofit or otherwise protect critical facilities and infrastructure to prevent damage or enable operations to resume quickly after impacts.
- Objective 2-2: Increase redundancy of critical systems and services.

Goal 3: Ensure that hazard mitigation practices, construction techniques, and development policies and ordinances are integrated to enhance resiliency and enable speedy recovery.

- Objective 3-1: Adopt protective development standards and establish post-disaster redevelopment policies.
- Objective 3-2: Preserve and protect natural and beneficial floodplain functions and key natural resources.
- Objective 3-3: Explore, develop, and implement new pre-disaster opportunities that build community resilience.

Goal 4: Improve inter-jurisdictional cooperation and coordination, especially regarding the reduction of hazard impacts.

- Objective 4-1: Coordinate development standards across jurisdictions.
- Objective 4-2: Encourage and enable inter-jurisdictional communication.
- Objective 4-3: Pursue regional approaches to building resilience.

David reviewed a sample of the mitigation action plan to explain the organization of the table and the information included for each project, such as the lead agency, timeline for implementation, and potential funding sources.

David noted that at a minimum, every community in the region should have an elevation and acquisition project in the plan. He also suggested that every community should have a general drainage improvement project in the plan. Mary Beth agreed we should add these projects. Mary Beth will look into any other projects that Currituck County may wish to pursue grant funding for.

Carl suggested that the communities include an action that describes pursuing funding for mitigation and resilience projects

PLAN ADOPTION AND IMPLEMENTATION

David explained that every community will need to adopt the plan. A template adoption resolution from NCEM will be provided to all communities. Once NCEM approves the plan, which is expected soon because NCEM has already completed a preliminary review, the communities are cleared to adopt the plan. WSP will follow up with guidance.

Moving forward, the HMPC should meet quarterly to report on progress toward implementation.

DISCUSSION

Carl noted that the State Hazard Mitigation Plan and all regional hazard mitigation plans are hosted on NCEM's website.

There was a question about wildfire planning and whether it would address risk associated with drought and marsh areas. This could be addressed during the planning for a Community Wildfire Protection Plan, but David noted that analysis would be based on state and regional wildfire data and resources. These resources were also used for the wildfire hazard profile in this plan.

NEXT STEPS

The HMPC was asked to send any final mitigation actions or comments to Abby by the end of the week. WSP will provide an updated draft plan for the State to review and for all communities to adopt.

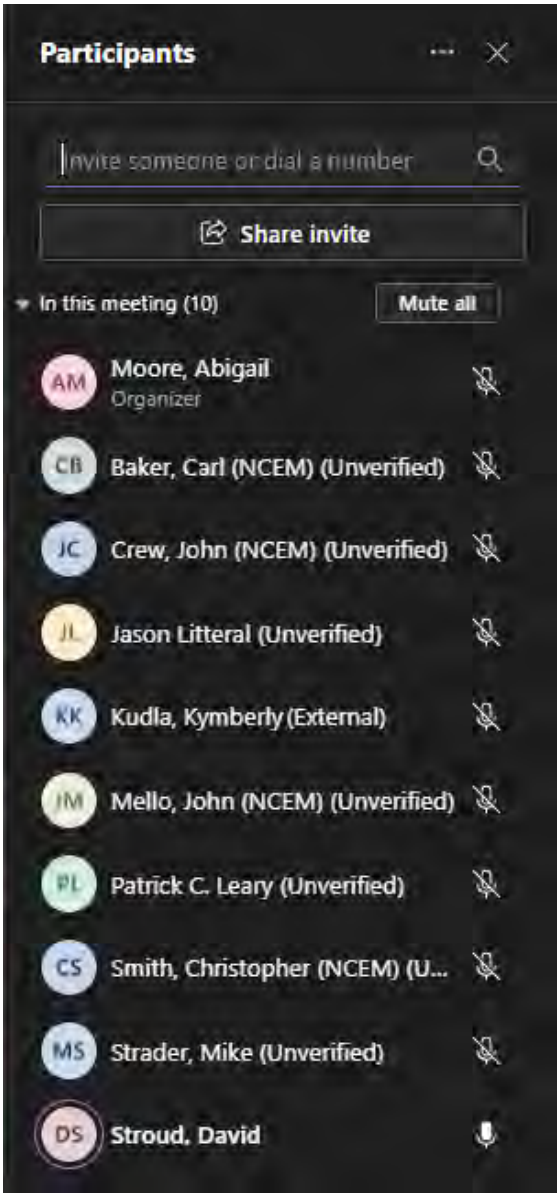
Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #4 (Currituck County Group) – January 28, 2025, 11:00am

Name	Jurisdiction	Department/Agency/Organization	Email
David Stroud	—	WSP	david.stroud@wsp.com
Olivia Doherty	Currituck	Currituck EM	olivia.doherty@currituckcountync.gov
Mary Beth Newns	Currituck	EM	mary.newns@currituckcountync.gov
Barbara Hefferan	"	Resident	barbaraduffyheffernan@gmail

1

HMPC Meeting 4 Currituck County Online Attendees



OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

HAZARD MITIGATION PLANNING COMMITTEE – MEETING #4

January 28, 2025, 3pm, Dare County Emergency Operations Center

ATTENDANCE

There were 11 attendees in person and 14 online. The following individuals were in attendance:
James Wooten, Dare County Emergency Management Planner
Drew Pearson, Dare County Emergency Management Director
Barton Grover, Dare County Planning, Grants and Waterways Administrator
Jack Kovach, Dare County EM Intern
Shari Fiveash, Dare County stakeholder, Room in the Inn
Donna Creef, Dare County stakeholder
Cameron Ray, Kill Devil Hills, Planner
Joe Heard, Duck Department of Community Development, Director
Sandy Cross, Duck Department of Community Development, Permit Coordinator
Kevin Wright, Duck Stakeholder
Rob Testerman, Kitty Hawk Planning
Mike Talley, Kitty Hawk Fire Department, Emergency Manager
Mike Palkovics, Kitty Hawk Police Department, Police Chief
Melissa Dickerson, Manteo, Town Manager
Kevin Zorc, Manteo Fire Department, Emergency Manager
Kelly Wyatt, Nags Head Planning Department, Director
Joe Costello, Nags Head Planning Department, Deputy Director
Wes Haskett, Southern Shores Planning Director, Deputy Town Manager
Holly White, NCORR
Kelly Hoeltzel, SBP
Chris Crew, NCEM, Mitigation Plans Manager
Carl Baker, NCEM, Hazard Mitigation Planner
Chris Smith, NCEM Area 1 Coordinator
David Stroud, WSP
Abby Moore, WSP

AGENDA

- Planning Process Update
- Structure of the Plan
- Review of Key Plan Components
  - Planning Process
  - Risk Assessment
  - Mitigation Strategy
- Plan Adoption & Implementation
- Next Steps
- Discussion / Feedback on Draft Plan

PLANNING PROCESS UPDATE

David Stroud with WSP began the presentation by explaining where we are in the planning process. We are nearing the end of the planning process as we have drafted the plan and now need to finalize it with

any new mitigation actions that the communities wish to add. The plan will then need to be adopted and the HMPC and communities will work on implementation for the next five years.

STRUCTURE OF THE PLAN

David provided an overview of the structure of the draft plan including a summary of each section of the plan, as follows.

Section 1 Introduction provides background information on the plan, including context and justification for planning and the scope of the plan.

Section 2 Planning Process summarizes how the planning process was conducted and how all planning requirements were met, including how the communities, public, and stakeholders were involved in the plan. This section also documents implementation progress of the last plan in terms of completed and deleted mitigation actions.

Section 3 Planning Area Profile for summary information on the region and participating communities, including geographic, climate, demographic, and economic characteristics of the region.

Section 4 Risk Assessment contains the bulk of the plan. This section presents the hazard identification and profiles each hazard with information on the location at risk, past occurrences, probability of future occurrence, and vulnerability of people, property, and critical facilities.

Section 5 Capability Assessment summarizes each community's existing tools, staff, and other resources that can support the implementation of mitigation projects. David noted that most communities in the region have fairly high capability, including past mitigation experience.

Section 6 Mitigation Strategy reviews the goals and objectives of the plan and details how mitigation actions were identified and prioritized. David explained that existing mitigation actions from the previous plan were reviewed and project status updates are reported in the plan. Some projects were carried forward. The HMPC also reviewed new mitigation projects to include in this plan update.

Section 7 Mitigation Action Plans presents the action plan tables for each community.

Section 8 Plan Maintenance describes past plan integration, opportunities for future plan integration, and the process for regular monitoring, maintenance, and implementation of the plan, including ongoing responsibilities of the HMPC.

Section 9 Plan Adoption will document each community's adoption of the plan update.

Annexes are provided for each participating community. The annexes provide an asset inventory with a full critical facility list, risk assessment data with vulnerability assessment results specific to the community for spatially defined hazards, and the mitigation action plan.

Appendix A provides the Local Mitigation Plan Review Tool, which documents for the plan reviewers where the planning requirements were met.

Appendix B provides planning process documentation demonstrating how the HMPC, public, and stakeholders were involved and engaged in the planning process.

Appendix C provides mitigation alternatives analysis, documenting the review of mitigation action options, which is important for the CRS program planning requirements.

Appendix D lists data and resources that were referenced in the plan.

KEY PLAN COMPONENTS

David reviewed key parts of the planning process, including the HMPC meetings, the public meetings, and all the participating communities' public outreach efforts.

David reviewed some high level survey results, which were previously presented to the HMPC. There were 475 responses overall, including responses from residents of each participating community. The hazard risk ratings from the public aligned with the findings of the risk and vulnerability assessment. Regarding past hazard experiences, many responses reference past hurricanes and flooding. Regarding recommended steps local governments could take to reduce hazard impacts, responses include suggestions for drainage improvements, beach nourishment, development policies, and emergency response support.

David noted that it will be important to include drainage improvement projects in the mitigation action plan, especially because the BRIC program may prioritize this type of project.

Carl suggested adding BRIC as a potential funding source for several actions in the mitigation action plan. Drew asked whether we need to be that specific if the action plan says grants more broadly. Carl confirmed you do not need to identify the specific grant.

David presented the Priority Risk Index results as a summary of the risk and vulnerability assessment. He explained that the PRI is a methodology for comparing the hazards based on five categories: probability, severity, spatial extent, warning time, and duration. Flood, hurricane and coastal hazards, and excessive heat were rated as "High Risk" for the Outer Banks Region.

David presented the goals and objectives which were largely carried forward from the previous plan with some small revisions. The goals and objectives are as follows:

Goal 1: Reduce the risk of loss of life and personal injury from hazards.

- Objective 1-1: Educate citizens to encourage individual responsibility to protect themselves and their families from hazards. Recognize that vulnerable populations and underserved communities may need additional resources and support.
- Objective 1-2: Reduce the risk and impact of current and future hazards by mitigating risk of development.

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Goal 4: Improve inter-jurisdictional cooperation and coordination, especially regarding the reduction of hazard impacts.

- Objective 4-1: Coordinate development standards across jurisdictions.
- Objective 4-2: Encourage and enable inter-jurisdictional communication.
- Objective 4-3: Pursue regional approaches to building resilience.

David reviewed a sample of the mitigation action plan to explain the organization of the table and the information included for each project, such as the lead agency, timeline for implementation, and potential funding sources.

David noted that at a minimum, every community in the region should have a general elevation project and a general acquisition project in the plan. He also suggested that every community should have a general drainage improvement project in the plan. Drew shared that he felt beach nourishment and keeping water out is more important to the Outer Banks but these projects aren't supported by BRIC. David noted that also engineered beaches may not be funded by BRIC, living shoreline projects are supported.

Abby also shared an action for Community Wildfire Protection Plans recommended by NC Forest Service. Drew asked who would own that action and would NC Forest Service be the lead agency. Carl suggested local fire departments and NC Forest Service as the responsible agencies.

Abby also noted that WSP will update a few communities' actions that reference joining the Firewise program. NC Forest Service advised that Firewise is a resident led program, so these actions will be updated to reflect supporting resident efforts to identify and plan for wildfire risk.

PLAN ADOPTION AND IMPLEMENTATION

David explained that every community will need to adopt the plan. A template adoption resolution from NCEM will be provided to all communities. Once NCEM approves the plan, which is expected soon because NCEM has already completed a preliminary review, the communities are cleared to adopt the plan. WSP will follow up with guidance.

Moving forward, the HMPC should meet quarterly to report on progress toward implementation.

NEXT STEPS

The HMPC was asked to send any final mitigation actions or comments to Abby by the end of the week. Afterwards, WSP will provide an updated draft plan for the State to review and for all communities to adopt.

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #4 (Dare County Group) – January 28, 2025, 3:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
James Wooten	Dare County	EM	jameswooten@darenc.gov
DAVID STROUD	—	WSP	david.stroud@wsp.com
Jack Kovach	—	EM	jack.kovach11@gmail.com
Kevin Wright	Duck	Stakeholder/citizen	kvwkmw@gmail.com
Kevin Zork	Manteo	EM	kzork@manteonc.gov
Joe Heard	Duck		jheard@ducknc.gov

1

Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #4 (Dare County Group) – January 28, 2025, 3:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
Barton Graves	Dare	Planning	barton.graves@darenc.gov
Cameron Ray	Kill Devil Hills	Planning	Cameron@KDHNC.com
Rob Testerman	Kitty Hawk	Planning	rob.testerman@kittyhawktown.net
Shari Fivekash	DCRE	OBX Room In The Inn	OBXROOMINTHEINN@gmail.com

1

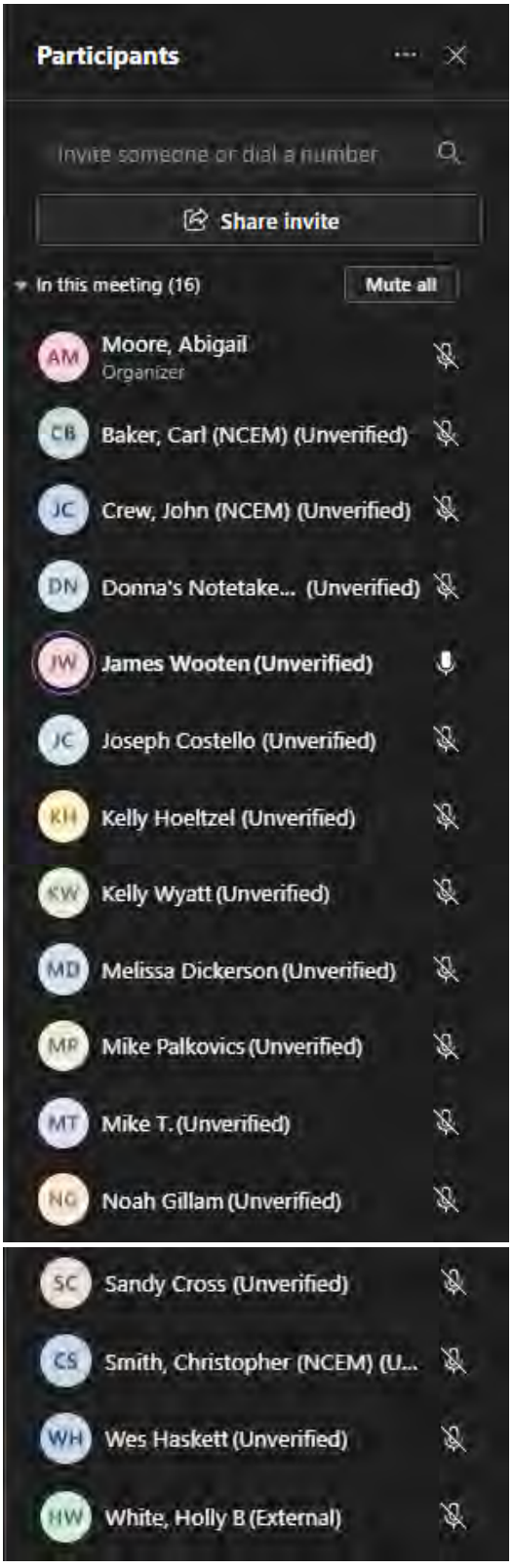
Outer Banks Regional Hazard Mitigation Plan Update

Hazard Mitigation Planning Committee (HMPC) Meeting #4 (Dare County Group) – January 28, 2025, 3:00pm

Name	Jurisdiction	Department/Agency/Organization	Email
DREW PEARSON	DARE	E M	drew.pearson@darenc.gov

1

HMPC Meeting 4 Dare County Online Attendees



B.2 PLANNING STEP 2: INVOLVE THE PUBLIC

Table B.2 – Public Meeting Topics, Dates, Locations

Meeting Title	Meeting Topic	Meeting Date	Meeting Location
Public Meeting #1 (Kick-Off) – Dare County	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Explanation of mitigation 3) Review of the project schedule. 4) Review of hazard identification	April 22, 2024 5pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo
Public Meeting #1 (Kick-Off) – Currituck County		April 23, 2024 5:30pm	Currituck County Public Safety Center, 125 College Way, Barco
Public Meeting #2 – Dare County	1) Introduction to DMA, CRS, and FMA requirements and the planning process 2) Explanation of mitigation 3) Review of the project schedule 4) Review of preliminary risk & vulnerability assessment updates	August 28, 2024 5pm	Avon Volunteer Fire Department, 40159 Harbor Rd, Avon
Public Meeting #2 – Currituck County		August 29, 2024 11am	Corolla Public Library, 1123 Ocean Trail, Corolla
Public Meeting #3	1) Review "Draft" Hazard Mitigation Plan 2) Solicit comments and feedback	January 28, 2025 5 pm	Dare County Emergency Operations Center, 370 Airport Road, Manteo & Microsoft Teams

PUBLIC MEETING MINUTES, SIGN-IN SHEETS, AND ADVERTISEMENTS

PUBLIC MEETING 1: APRIL 22, 2024 & APRIL 23, 2024

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #1 – MANTEO, NC

April 22, 5pm, Dare County Emergency Operations Center

ATTENDANCE

There were seven attendees in person and one online. The following individuals were in attendance:
James Wooten, Dare County EM
Drew Pearson, Dare County EM
Aida Havel, Resident
Bill Massie
Marta Berglund, WVEC
Harry Morgan, WVEC
David Stroud, WSP
Abby Moore, WSP

AGENDA

- Introductions
- Why Plan?
- Project Overview
- Planning Process
- Project Schedule
- Next Steps
- Q & A

INTRODUCTIONS

Drew Pearson, Dare County Emergency Manager, kicked off the meeting with an introduction to the plan update process and the importance of hazard mitigation. David Stroud with WSP facilitated the rest of the meeting following the agenda above.

WHY PLAN?

David began the presentation with why we plan in the first place. David explained that plan updates ensure preparedness and continued eligibility for FEMA grant funding through programs like the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Building Resilient Infrastructure & Communities Program. Additionally, the plan update is an opportunity to identify and understand changes in risk due to greater exposure, new or changing populations, changes to hazards from development, and the impacts of climate change. The plan update is an opportunity to increase resilience through mitigation.

David discussed that the Disaster Mitigation Act (DMA) of 2000 which is codified in 44 CFR 201.6 requires local governments to update their hazard mitigation plans every five years to receive FEMA pre- and post-disaster mitigation funding through the Hazard Mitigation Assistance funding programs. David reviewed some trends in disasters including that we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). In 2023 there were 28 billion-dollar disasters, more than any prior year. Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio for federally funded projects is 6:1. Mitigation is sustained action taken to reduce risk and break the damage/rebuild cycle. Approaches to mitigation include altering, averting, adapting to, or avoiding the hazard.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we will integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding, guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance premium reductions are community-wide.

Overall, the WSP team will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

David described the planning process in more detail. Phase 1 is already underway and involves reconvening the planning committee, planning for public involvement, and coordinating with stakeholders. A priority is to identify stakeholders that should be invited to participate in the planning process, especially those that may be able to represent underserved communities and/or vulnerable populations.

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. The hazards that were addressed in the previous plan were presented.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. Actions will fall within the six FEMA/CRS mitigation categories: Prevention, Property Protection, Structural Projects, Emergency Services, Natural Resource Protection, and Public Education. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements.

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC will meet quarterly to review the action plan and look for funding and opportunities to implement projects. The plan will continue to be updated every five years.

PROJECT SCHEDULE

David presented a tentative schedule for the planning process, which includes additional public meetings around June/July, and November. The draft plan is due to NCEM in December. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in June 2025.

NEXT STEPS

David discussed public outreach efforts which include public meetings facilitated by WSP, a public survey, and an informational flyer. The plan website used for the previous plan update will be rebooted and shared once it is available.

WSP has begun work on the risk and vulnerability assessment update. The public was asked to share any new data or input relevant to the plan update.

QUESTIONS/ANSWERS

Aida noted that a big concern for residents in Hatteras Island is the environmental disaster in Buxton, which resulted from erosion exposing chemicals from a formerly utilized defense site in the Cape Hatteras National Seashore. Aida asked whether this is relevant to the hazard mitigation plan or if it's a

separate issue. It was explained that currently there is a sheen of petroleum on the beach and 0.3 miles of the beach was closed by the National Park Service and Dare County Public Health. This is an environmental and health issue and it's affecting tourism and the local economy.

Aida indicated that this will not be solved by beach nourishment. The County has done an initial beach nourishment project and a maintenance project in Buxton.

Drew noted that erosion is opening up a formerly utilized defense site that wasn't properly cleaned up. Drew added that there's a lot of information on the National Park Service's website. This is affecting unincorporated communities. Two letters were released last week from representatives at NCDEQ.

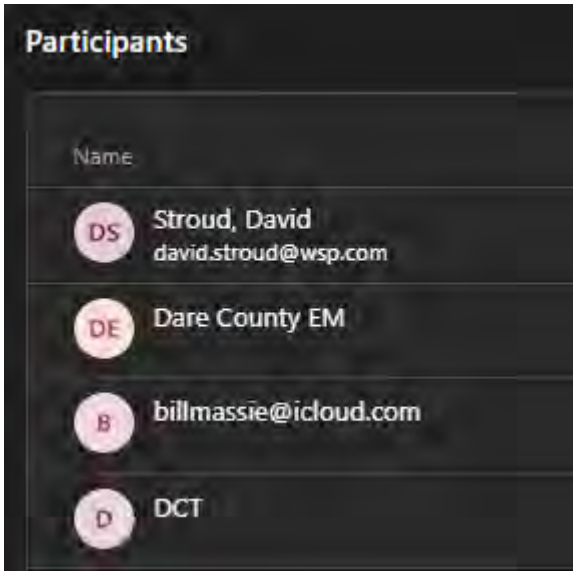
Outer Banks Regional Hazard Mitigation Plan Update

Public Meeting #1 – April 22, 2024, 5:00pm

Name	Agency/Organization/Affiliation	Email
Abby Moore	WSP	abigail.moore@wsp.com
James Wooten	Dare Co EM	james.wooten@darenc.gov
DAVID STROUD	WSP	david.stroud@wsp.com
Aiden Havel	—	aidahavel@gmail.com
DREW POMSON	DARE	
Marta Berglund	WVEC	mbergluned@13newsnow.com
Harry morgan	WVEC	hmorgan1@13newsnow.com

1

Public Meeting 1 Dare County Online Attendees



OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #1 – BARCO, NC

April 23, 5:30pm, Currituck County Public Safety Center

ATTENDANCE

There were five attendees in person and three online. The following individuals were in attendance:
Mary Beth Newns, Currituck County EM
Olivia Doherty, Currituck County EM
Tab Winborne, Currituck HMPC stakeholder
Carl Baker, NCEM
Chris Crew, NCEM
David Stroud, WSP
Abby Moore, WSP
Ranger Ruffins, WSP

AGENDA

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guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance premium reductions are community-wide.

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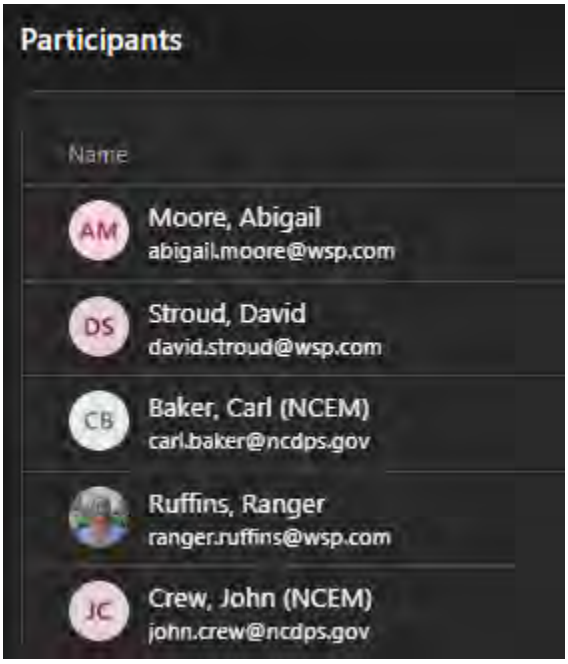
Outer Banks Regional Hazard Mitigation Plan Update

Public Meeting #1 – April 23, 2024, 5:30pm

Name	Agency/Organization/Affiliation	Email
TAB WINBORNE	TABWINBORNE CORPORATION	TABWINBORNE@GMAIL.COM
Abby Moore	WSP	abigail.moore@wsp.com
DAVID STROUD	WSP	david.Stroud@wsp.com
Olivia Doherty	Currituck EM	olivia.doherty@currituckcountync.gov
MARY BETH NEWNS	Currituck EM	mary.newns@currituckcountync.gov

Public Meeting 1 Currituck County Online Attendees



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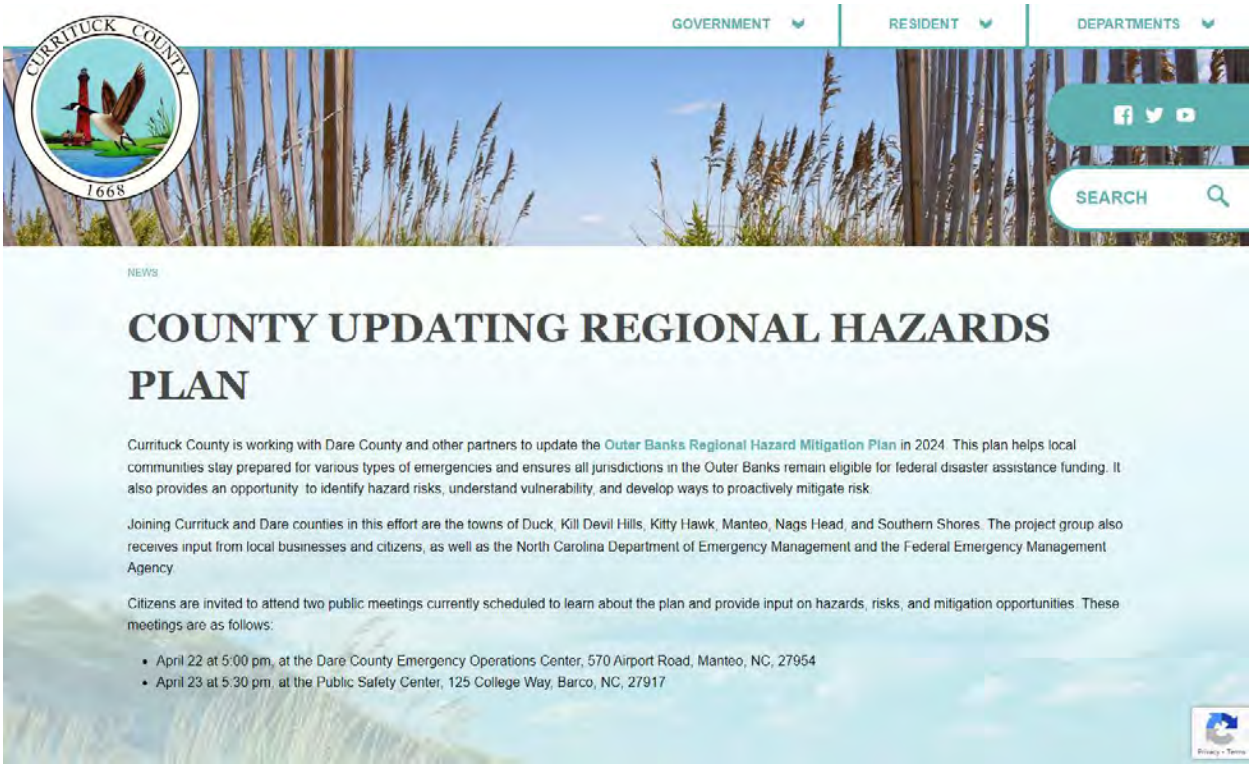
Currituck County is partnering with Dare County and its towns to update the OBX Regional Hazard Mitigation Plan. Citizens are invited to learn more about this plan and provide input during public meetings on April 22 and 23.
currituckcountync.gov/news/county-up...
2:18 PM · Apr 4, 2024 · 104 Views


GOVERNMENT
RESIDENT
DEPARTMENTS
SEARCH
NEWS
COUNTY UPDATING REGIONAL HAZARDS PLAN
Currituck County is working with Dare County and other partners to update the Outer Banks Regional Hazard Mitigation Plan in 2024. This plan helps local communities stay prepared for various types of emergencies and ensures all jurisdictions in the Outer Banks remain eligible for federal disaster assistance funding. It also provides an opportunity to identify hazard risks, understand vulnerability, and develop ways to proactively mitigate risk.
Joining Currituck and Dare counties in this effort are the towns of Duck, Kill Devil Hills, Kitty Hawk, Manteo, Nags Head, and Southern Shores. The project group also receives input from local businesses and citizens, as well as the North Carolina Department of Emergency Management and the Federal Emergency Management Agency.
Citizens are invited to attend two public meetings currently scheduled to learn about the plan and provide input on hazards, risks, and mitigation opportunities. These meetings are as follows:
• April 22 at 5:00 pm, at the Dare County Emergency Operations Center, 570 Airport Road, Manteo, NC, 27954
• April 23 at 5:30 pm, at the Public Safety Center, 125 College Way, Barco, NC, 27917

Dare County News

Public Meeting to Discuss Outer Banks Regional Hazard Mitigation Plan

Post Date: 04/09/2024 11:32 AM

Dare County and Currituck County—along with each county's incorporated communities—are currently in the process of updating the Outer Banks Regional Hazard Mitigation Plan in an effort to better protect people and property from the potential effects of natural and human-caused hazards.

This plan update is required for all communities to maintain their eligibility to receive pre-disaster and post-disaster mitigation funding from FEMA, and the effort will also help the counties and incorporated communities identify hazard risks, understand their vulnerability and develop ways to proactively mitigate risks.

To kick off the planning process this spring, two public meetings will be held to provide information on the Outer Banks Regional Hazard Mitigation Plan, review the identified hazards and gather feedback from the public.

Members of the community are invited to attend a public meeting in Dare County to learn about the proposed updates to the plan and to provide their feedback and input on hazards, risks and mitigation opportunities. This public meeting will be held at 5 p.m. on Monday, April 22, 2024 at the Dare County Emergency Operations Center, which is located at 370 Airport Road in Manteo, NC.

Those who are unable to attend the public meeting in Dare County are invited to attend a second public meeting in Currituck County to discuss updates to the Outer Banks Hazard Mitigation Plan and to provide feedback. This meeting will be held at 5:30 p.m. on Tuesday, April 23, 2024 at the Currituck County Public Safety Center within the Emergency Operations Center, which is located at 125 College Way in Barco, NC.

Additional public meetings will be scheduled later in the planning process. More information regarding future meetings will be announced when it becomes available.

For more information about the upcoming planning meetings, as well as the Outer Banks Regional Hazard Mitigation Plan, please contact Dare County Emergency Management Planner James Wooten at **James.Wooten@DareNC.gov** or 252-475-5894.

The view or download a copy of the current Outer Banks Regional Hazard Mitigation Plan, please click the button below.

Outer Banks Regional Hazard Mitigation Plan

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OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

April 5, 2024

Currituck and Dare Counties and incorporated communities are updating the **Outer Banks Regional Hazard Mitigation Plan**. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help the counties and incorporated communities to identify hazard risks, understand vulnerability, and develop ways to proactively mitigate risk. To kick off the planning process, two public meetings will be held to provide information on the plan update process, review the identified hazards, and gather feedback from the public. Additional public meetings will be scheduled later in the planning process. The public kickoff meetings will be held on April 22nd and 23rd as follows:

- Dare County: **Monday, 4/22 at 5pm** at the Emergency Operations Center, 370 Airport Road, Manteo, 27954
- Currituck County: **Tuesday, 4/23 at 5:30pm** at the Public Safety Center, Emergency Operations Center, 125 College Way, Barco, 27917

These meetings are open to the public, so we encourage you to come learn about the plan update and provide input on hazards, risks, and mitigation opportunities!

For more information about the Town's current Hazard Mitigation Plan, please visit: https://www.townofduck.com/frequently-visited/community-development/hazard-mitigation-planning/

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kittyhawknc.gov/news/outer-banks-hazard-mitigation-plan-update/

TOWN PLANNING BOARD SCHEDULE TO MEET APRIL 25, 2025. CLICK HERE FOR MORE INFORMATION.

TOWN OF KITTY HAWK

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Outer Banks Hazard Mitigation Plan Update

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Public Safety Center, Emergency Operations Center
125 College Way, Barco, 27917

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CONTACT THE TOWN OF KITTY HAWK
101 Veterans Memorial Drive
Post Office Box 549
Kitty Hawk, NC 27949
252-261-3552

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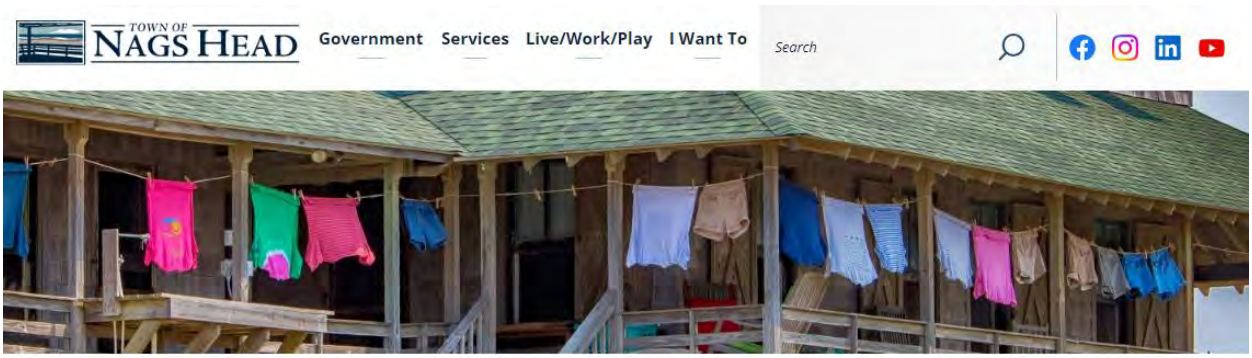

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Planning and Development

Posted on: April 4, 2024 | Last Modified on: April 10, 2024

Hazard Mitigation Plan Update Meeting April 22

Currituck and Dare Counties, and incorporated communities, are updating the Outer Banks Regional Hazard Mitigation Plan. As part of the update, which FEMA requires so we can maintain eligibility for pre-and-post disaster mitigation funding, **a meeting will be held April 22** to provide information on the plan update process, review the identified hazards, and gather feedback from the public.

During the update process, we identify natural disaster risks and vulnerabilities common in our area and then develop long-term strategies for protecting people and property from similar events.

Hazard Mitigation Plan Kickoff Meeting
Monday, April 22 | 5pm
Dare County Emergency Operations Center
370 Airport Road | Manteo

Learn about the plan update and provide input on hazards, risks, and mitigation opportunities!

Additional public meetings will be scheduled later in the planning process.

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Public invited to attend meeting to discuss updates to Outer Banks Regional Hazard Mitigation Plan

April 10, 2024 (/2024/04/) | Local News (https://islandfreepress.org/./outer-banks-news/)

Rodanthe on March 26, 2024. Photo by Brad Hanson.

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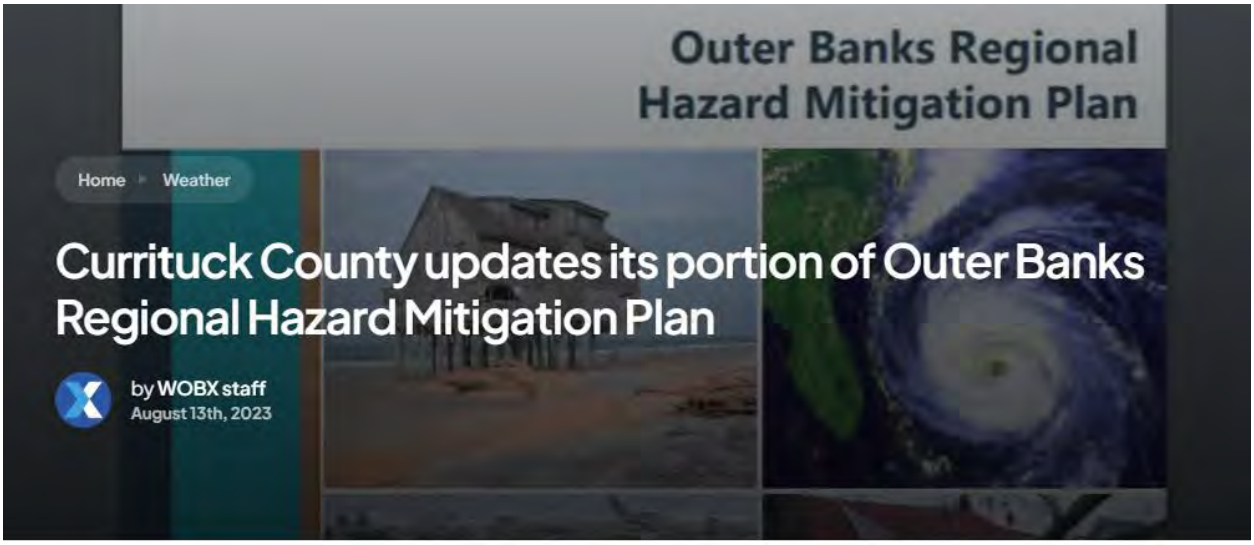
The view or download a copy of the current Outer Banks Regional Hazard Mitigation Plan, click here. (https://drive.google.com/file/d/1B0WbV-0aNltZbyMcxO1XTw23WLf-v7e8/view)



Currituck County staff, in coordination with regional partners, has compiled the 2023 update for the county's portion of the Outer Banks Regional Mitigation Plan.

The purpose of this document is to track progress toward implementing the goals and actions set forth by the Hazard Mitigation Planning Committee.

An updated progress report is required yearly as part of the Currituck County's recertification process for the Community Rating System (CRS) Program. Participating in the CRS program provides discounted flood insurance premiums for Currituck residents.

The planning area for the Outer Banks Region includes all incorporated municipalities and unincorporated areas in Currituck and Dare Counties. More information can be found at https://currituckcountync.gov/hazard-mitigation-plan/.

Updating the Outer Banks Regional Hazard Mitigation Plan; 2 public meetings to be held

Currituck and Dare Counties and incorporated communities are updating the Outer Banks Regional Hazard Mitigation Plan. This plan update is required for all communities to maintain eligibility for pre and post disaster mitigation funding from FEMA. This effort will also help the counties and incorporated communities to identify hazard risks, understand vulnerability, and develop ways to proactively mitigate risk.

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LOCAL NEWS

Dare County emergency management officials hear from public on planned hazard mitigation plan updates

Emergency management officials must update their hazard mitigation plan every five years to receive grant funds from the Federal Emergency Management Agency (FEMA).

Author: **Marta Berglund**
Published: **11:33 PM EDT April 22, 2024**
Updated: **11:33 PM EDT April 22, 2024**

MANTEO, N.C. — Hurricane season will be here before we know it, and Dare County emergency management officials are planning ahead for that and a variety of other potential emergencies.

Officials discussed updating the hazard mitigation plan they shared with Currituck County with the public Monday night.

Emergency management officials must update their hazard mitigation plan every five years to receive grant funds from the Federal Emergency Management Agency (FEMA). The current Outer Banks report is over 650 pages long and was published in 2020. It prepares for everything from natural disasters to cyber security threats and transportation infrastructure failures.

"It makes us eligible for FEMA grant funding," explained Dare County emergency management director Drew Pearson. "But more importantly, it helps mitigate the risks and hazards to our people, to our towns and to our community."

Outer Banks resident Aida Havel stopped by the meeting, held in Manteo.

"I wanted to learn more about Dare County's hazard mitigation approach and what this plan was all about," she said.

Havel has lived on the Outer Banks for eight years and says, though it's beautiful, living on the oceanfront comes with its risks.

"I've had to evacuate twice from potential hurricanes. I was very happy to follow the advice of people who know much better than me," Havel explained.

Emergency officials just began the process of updating the Outer Banks Regional Hazard Mitigation Plan. Pearson says the best way to start is with the public's input.

"We really look forward to getting their feedback and getting their insights on it," he said. "They live in our community and know the hazards that they've faced, and we just want to make sure we didn't miss something."

Because every county in North Carolina has a hazard mitigation plan, it has an enhanced hazard mitigation distinction. This means it's eligible for a larger share of federal funds if disaster strikes.

"As a result of that, [the state] hires a contractor to help us with our plan update," said Pearson. "It's a benefit to have every county covered by a hazard mitigation plan."

Havel says she also wanted to check in with the county's response to petroleum contamination at Buxton Beach on Hatteras Island where she lives. Portions of the beach are currently closed. The pollution comes from yearslong use of the beach as a U.S. Navy and Coast Guard site.

"It's a real environmental disaster," she said. "On the federal level it appears that various agencies are pointing fingers at each other instead of just working together to clean up the problem."

Because the beach is federal land, Pearson says the county has limited ability to act but is doing everything it can.

"The comments we hear from our public are spot on," said Pearson. "The county's doing everything we can. We're engaging our elected officials, we're telling people that it needs to get done, we're doing everything we can. We just can't go out and do the work to actually stop it."

For those who may have missed Monday's meeting, there's another Tuesday evening at 5:30 at the Currituck County Public Safety Center, 125 College Way, Barco, N.C.

PUBLIC MEETING 2: AUGUST 28, 2024 & AUGUST 29, 2024

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #2 – AVON, NC

August 28, 2024, 5pm, Avon Volunteer Fire Department

ATTENDANCE

There were 5 attendees in person. The following individuals were in attendance:
James Wooten, Dare County EM
Steve Basnight, Dare County Schools
Mary Helen Goodloe-Murphy, Resident
Donald Rice, Resident
David Stroud, WSP

AGENDA

- Introductions
- Why Plan?
- Project Overview
- Planning Process
- Risk & Vulnerability Assessment Update
- Project Schedule
- Next Steps
- Q & A

WHY PLAN?

David began the presentation with why we plan in the first place. David explained that plan updates ensure preparedness and continued eligibility for FEMA grant funding through programs like the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the Building Resilient Infrastructure & Communities Program. Additionally, the plan update is an opportunity to identify and understand changes in risk due to greater exposure, new or changing populations, changes to hazards from development, and the impacts of climate change. The plan update is an opportunity to increase resilience through mitigation.

David discussed that the Disaster Mitigation Act (DMA) of 2000 which is codified in 44 CFR 201.6 requires local governments to update their hazard mitigation plans every five years to receive FEMA pre- and post-disaster mitigation funding through the Hazard Mitigation Assistance funding programs. David reviewed some trends in disasters including that we now have more frequent and intense hazard events and greater exposure to risk (people, property and critical infrastructure). In 2023 there were 28 billion-dollar disasters, more than any prior year. Hazard mitigation is a priority for multiple reasons, including that the cost of doing nothing is too high, many events are predictable and repetitive, loss reduction can be effective, cost-beneficial, and environmentally-sound, there are legal and moral responsibilities to prevent disasters, and there are federal funds available to support mitigation. The average benefit-cost ratio for federally funded projects is 6:1. Mitigation is sustained action taken to reduce risk and break the damage/rebuild cycle. Approaches to mitigation include altering, averting, adapting to, or avoiding the hazard.

PROJECT OVERVIEW

David explained that we must follow the DMA planning process and we will integrate Community Rating System (CRS) Activity 510 planning steps into the DMA four-phase planning process to meet the requirements of both programs. The DMA process provides continued eligibility for mitigation funding, guides mitigation activities in a coordinated and economical manner, integrates hazard mitigation with

other planning mechanisms, directs future development in a safe manner, and helps make communities more disaster resistant. The CRS program provides policy holders in participating communities with flood insurance discounts based on the number of CRS points the communities earn. The flood insurance premium reductions are community wide.

WSP will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

David described the planning process in more detail. Phase 1 is already underway and involves reconvening the planning committee, planning for public involvement, and coordinating with stakeholders. A priority is to identify stakeholders that should be invited to participate in the planning process, especially those that may be able to represent underserved communities and/or vulnerable populations.

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. A draft of the Risk Assessment is scheduled to be posted by WSP by September 13th for the HMPC and public to review. The hazards that were addressed in the previous plan were presented.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. David reviewed different approaches to mitigation, the six FEMA/CRS mitigation categories, and the count of actions by category for each jurisdiction in the existing HMP. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements and should include a flood-related action for at least 5 of the 6 mitigation categories to maximize CRS credit.

Phase 4 is where the communities must adopt and implement the plan. The communities and HMPC will meet quarterly to review the action plan and look for funding and opportunities to implement projects. It was suggested that the Currituck County working group select one person to lead this effort and set up a recurring call so that quarterly meetings are already scheduled. The plan will continue to be updated every five years.

There were several questions on the mitigation projects currently in the existing hazard mitigation plan and proposed projects in the update. James Wooten indicated the status of mitigation projects and some of the projects completed, and grant funding received. Beach nourishment was brought up and Drew Person talked about the approach in Dare County. Drew indicated that Dare creates engineered beaches which requires an engineer certification and makes an eroded beach available for FEMA Public Assistance monies to restore the beach. There was a concern about flooded roads and drainage in the Avon area.

RISK & VULNERABILITY ASSESSMENT UPDATE

David reviewed the Priority Risk Index (PRI) methodology and results. The purpose of the PRI is to categorize and prioritize all potential hazards for the Outer Banks planning area as high, moderate, or low risk. David briefly reviewed current draft findings for the hazard profiles included in the plan update.

PROJECT SCHEDULE

David presented a tentative schedule for the planning process, which includes additional HMPC meetings around September/October and November. The draft plan is due to NCEM in December. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in June 2025.

NEXT STEPS

David discussed public outreach efforts which includes public meetings facilitated by WSP, a public survey, and an informational flyer. Community staff were asked to post outreach on local websites and social media and consider ways to advertise the plan or bring the survey and flyer to community events. The plan website has been rebooted and can be found at www.OBX-HMP.com.

WSP is working on the risk and vulnerability assessment update and a draft will be posted by September 13th. David noted that input from public meetings will be reviewed, discussed with the HMPC, and incorporated into the plan update. Currently, the public survey has received 379 responses and David encouraged the group to make sure their input has been shared.

OUTER BANKS REGIONAL HMP

PUBLIC MEETING - AVON, NC
8/28/2024 5PM

NAME	EMAIL
DAVID STROUD	david.stroud@wsp.com
James Wooten	james.wooten@dcnc.gov
STEVE BASNIGHT	basnightst@daretolearn.org
MARY/HELEN GOODLUCK-MURPHY	atmmhgm@aol.com
Derek Rice	yorktownrices@gmail.com

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #2 – COROLLA, NC

August 29, 2024, 11am, Corolla Public Library

ATTENDANCE

There were seven attendees in person. The following individuals were in attendance:
Deb Spillman, Corolla Fire & Rescue
Olivia Doherty, Currituck County Emergency Management
Mary Beth Newns, Currituck County Emergency Management
Paul Sabadash, Outer Banks Association of Realtors
Meghan Agresto, Resident
Christine Smack, Currituck County
David Stroud, WSP

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WSP will ensure that the updated hazard mitigation plan meets all FEMA planning requirements, coordinates with the natural hazards in the updated State Hazard Mitigation Plan, includes natural and

human-caused hazards as identified by the HMPC, incorporates local climate change data and findings, and addresses equitable outcomes.

PLANNING PROCESS

David described the planning process in more detail. Phase 1 has been completed. The HMPC was reconvened with some new members and was asked to attend four meetings, provide input on risk and capability, update mitigation actions, and review plan drafts. HMPC members, especially staff, were also asked to consider ways to involve the public throughout the planning process. To maximize CRS credit and support awareness of the plan, 30 outside stakeholders were invited to participate and provide input. The HMPC suggested including faith-based organizations and adult services.

Phase 2 covers the risk assessment, which includes the hazard identification, the vulnerability assessment, and the capability assessment. A draft of the Risk Assessment is scheduled to be posted by WSP by September 13th for the HMPC to review. The hazards that were addressed in the previous plan were presented and the planning committee reviewed and discussed potential additional hazards. There was a question about whether offshore wind farms pose a risk relevant to the HMP. For flood risk, WSP discussed an alternate methodology for estimating exposure and potential future risk using the Federal Flood Risk Management Standard Freeboard Value Approach. Regarding the asset inventory, David noted that NCEM iRisk data will be used and communities will be asked to review and update their critical facility list; critical facilities will be categorized by FEMA lifeline in the plan update, which may be helpful to communities when preparing FEMA grant applications. For the capability assessment, WSP will update the existing report and request feedback from each community on any additional changes.

Phase 3 involves developing a mitigation strategy by reviewing and updating the plan goals and objectives, evaluating mitigation alternatives, including existing and new projects, and drafting an action plan with prioritized projects. David reviewed different approaches to mitigation, the six FEMA/CRS mitigation categories, and the count of actions by category for each jurisdiction in the existing HMP. In the plan update communities must have at least one action for each natural hazard to meet FEMA requirements and should include a flood-related action for at least 5 of the 6 mitigation categories to maximize CRS credit.

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David reviewed the Priority Risk Index (PRI) methodology and results. The purpose of the PRI is to categorize and prioritize all potential hazards for the Outer Banks planning area as high, moderate, or low risk. David briefly reviewed current draft findings for the hazard profiles included in the plan update. There were several questions from the public ranging from the base flood elevation and mitigation projects to erosion and vegetation overgrowth of the dunes and in the Corolla area. Several questions were provided by Sam Walker who was not present at the meeting; questions and answers are below.

1. Is there a better way for residents to hear about things like this as opposed to reading about it from Sam Walker. Answer: The Currituck County website and other social media such as Facebook publishes information about the Hazard Mitigation Plan Update and there is a website dedicated to this effort at www.OBX-HMP.com.
2. Why doesn't the RHMP survey reflect Corolla as a distinct area instead of lumping it in with Currituck? Is this stereotypical of the plan? Answer: The planning requirements indicate that we have to look at the either incorporated cities and towns and/or the unincorporated county the same as the FEMA Flood Insurance Rate Map (FIRM).

3. What hazards are being planned for? Are ransomware attacks part of the mix. Answer: A hazard mitigation plan by federal law (44 CFR 201.6) only requires looking at a community's natural hazards. Cyber/ransomware is a human-caused and technological hazard and is generally covered in emergency operations and other plans. It is covered in the present HMP and is covered in this updated HMP.
4. The RHMP survey called out a pretty good sample of hazards to be planned for. Are they all factored into planning or is enunciating them in the survey aspirational to the plan. Answer: The hazards mentioned in the survey are the natural hazards listed in the current and updated RHMP.
5. Almost every hazard mitigation plan has some kind of idea to quickly move people out of harms way. That is tricky in the OBX area because housing is such a problem. Does the RHMP have a plan to move people away from the hazard besides saying, "Get out of here." Answer: The purpose of a hazard mitigation plan is not a plan to evacuate people from OBX and no mitigation plan does that. Evacuation and requiring people to the mainland, is an emergency management function and part of an emergency operations plan. Emergency managers in the OBX area coordinate and hold exercise in the event of a hurricane evacuation.
6. Turning infrastructure off before a looming disaster happens is a common mitigation facet, e.g. it is better to turn the power grid off than to have it be damaged under load. Do utilities in our area publicize that data and does the RHMP factor into it. How will residents be told? Should this be widely publicised now? Answer: This issue is outside the domain of a hazard mitigation plan. Utilities are not controlled any community unless they own a utility and cannot independently tell a utility what to do. There are local messages on websites sometimes addressing property protection measure which indicate to homeowners and business owners to shut off gas and electricity.
7. What is the timeline for when county and state officials/facilities will be shut down for what type of hazard? Should also reflect medical facilities. Answer: Each community makes its own decision about which facilities will be shut down (ferries, bridges, roads, etc.) based on the particular hazard. The hazard mitigation plan does not address this issue. This issue most likely is addressed through an emergency operations plan.
8. Does the RHMP call for drills/tests for specific hazards When are they? Where are the results published? Answer: A hazard mitigation plan is not about drills or tests; those are most likely part of an emergency operations plan. Emergency Managers regularly conduct tabletop exercises for various hazards. A hazard mitigation plan is about implementing mitigation projects to reduce the impacts from future hazards.

PROJECT SCHEDULE

David presented a tentative schedule for the planning process, which includes additional HMPC meetings around September/October and November. The draft plan is due to NCEM in December. The plan must be approved by NCEM and FEMA and adopted by all communities before the current plan expires in June 2025.

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OUTER BANKS PUBLIC MEETING
8/29/24 COROLLA, NC 11:00 AM

Name	Agency/Organization/Affiliation	Email
DAVID STROUD	WSP	david.stroud@wsp.com
Deb Spillman	Corolla Fire & Rescue	dwspillman59@gmail.com
Olivia Doherty	Currituck EM	olivia.doherty@currituckcountync.gov
Mary Beth Newns	Currituck EM	mary.newns@currituckcountync.gov
[illegible]	[illegible]	[illegible]
Meghan Agresto	WSP/CBLH?/resident	Magresto@gmail.com
Christine Smack	County of Currituck	christine.smack@currituckcountync.com

Dare County News

NEW DATE: Public Meeting to Provide Input on Outer Banks Regional Hazard Mitigation Plan on August 28, 2024

Post Date: 08/14/2024 3:37 PM

Dare County has announced that a public meeting designed to give members of the community an opportunity to provide input on the Outer Banks Regional Hazard Mitigation Plan has been **rescheduled for 5 p.m. on Wednesday, August 28, 2024 at the Avon Volunteer Fire Department** (40159 Harbor Road, Avon, NC 27915).

The meeting, which was originally scheduled to be held on Wednesday, August 7, 2024, was previously postponed due to potentially hazardous weather impacts from Tropical Storm Debby.

About the Outer Banks Regional Hazard Mitigation Plan:

The Outer Banks Regional Hazard Mitigation Plan update is currently underway, and Dare County and Currituck County—as well as each county's incorporated communities—are seeking input from the public on changes in risks and vulnerabilities as well as new opportunities for mitigation.

This Outer Banks Regional Hazard Mitigation Plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. In addition, this effort will help local communities to understand their vulnerability and develop ways to proactively mitigate risk, helping to better protect people and property from the potential effects of natural and human-caused hazards.

Public Meetings in Avon and Corolla:

Members of the Dare County community are encouraged to attend the public meeting that will be held at 5 p.m. on Wednesday, August 28, 2024 at the Avon Volunteer Fire Department to learn about the planning process and to provide their feedback and input on hazards, risks and mitigation opportunities.

For those who are unable to attend the meeting in Dare County, a second public meeting will be held at 11 a.m. on Thursday, August 29, 2024 at the Corolla Public Library in Currituck County (1123 Ocean Trail, Corolla, NC 27927) to provide feedback on the plan updates.

Survey:

Members of the community are also invited to take a short survey that provides an opportunity to share their opinions and participate in the mitigation planning process. The information provided will help those involved in the Outer Banks Regional Hazard Mitigation Plan update to better understand local hazards, risks and problems and can lead to mitigation activities that help lessen the impacts of future hazards. To complete the survey, which has a deadline of August 30, 2024, please **click here**.

For more information about the Outer Banks Regional Hazard Mitigation Plan or the public meeting that will be held in Dare County, please contact Dare County Emergency Management Planner James Wooten at **James.Wooten@DareNC.gov** or 252-475-5894. For more information about past and upcoming planning meetings, draft documents, and a survey on hazards, risks and vulnerabilities, please visit **www.obx-hmp.com**.

Return to full list >>

Town of Southern Shores, NC
Posted by Wes Haskett
Just now
The Outer Banks Regional Hazard Mitigation Plan update is underway! Public meetings will be held on 8/7 at 5pm at the Avon Volunteer Fire Department (40159 Harbor Rd, Avon, NC 27915) and 8/8 at 11am at the Corolla Public Library (1123 Ocean Trail, Corolla, NC 27927). Come learn about the plan update and provide input on hazards, risks, and mitigation opportunities!
People are more likely to interact with posts that include photos.
Add photo
Like
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Town of Southern Shores, NC
Posted by Wes Haskett
Just now
The Outer Banks Regional Hazard Mitigation Plan update is underway! Public meetings will be held on 8/28 at 5pm at the Avon Volunteer Fire Department (40159 Harbor Rd, Avon, NC 27915) and 8/29 at 11am at the Corolla Public Library (1123 Ocean Trail, Corolla, NC 27927). Come learn about the plan update and provide input on hazards, risks, and mitigation opportunities!
People are more likely to interact with posts that include photos.
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TOWN OF KITTY HAWK

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Home / News / Outer Banks Hazard Mitigation Plan Update

Outer Banks Hazard Mitigation Plan Update

APRIL 22, 2024 / MELODY CLOPTON / NEWS

Currituck and Dare Counties along with incorporated communities are updating the Outer Banks Regional Hazard Mitigation Plan. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help the counties and incorporated communities to identify hazard risks, understand vulnerability, and develop ways to proactively mitigate risk.

Join us for a public meeting August 28th at 5pm at the Avon Volunteer Fire Department or August 29th at 11am at the Corolla Public Library. Come learn about the plan update and provide input on hazards, risks, and mitigation opportunities.

Avon: Wednesday, 8/28 at 5pm at the Avon Volunteer Fire Department

40159 Harbor Road, Avon NC 27915

Corolla: Thursday, 8/29 at 11am at the Corolla Public Library

1123 Ocean Trail, Corolla NC 27927

QUICK LINKS

- TRASH & RECYCLING
- BEACH INFO
- PARKS & BIKE PATHS
- TOWN CODE

CONTACT THE TOWN OF KITTY HAWK

101 Veterans Memorial Drive
Post Office Box 549
Kitty Hawk, NC 27949
252-261-3552

PUBLIC MEETING 3: JANUARY 28, 2025

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE

PUBLIC MEETING #3 – MANTEO, NC

January 28, 2024, 5pm, Dare County EOC and Microsoft Teams

ATTENDANCE

There were three attendees in person and three online. The following individuals were in attendance:
James Wooten, Dare County EM
Drew Pearson, Dare County EM
Kyle Breslin, Dare County Ranger, NC Forest Service
David Stroud, WSP
Ranger Ruffins, WSP
Abby Moore, WSP

DISCUSSION

Based on attendee input and interest, the meeting focused on discussion of wildfire risk and mitigation.

Kyle Breslin believes the PRI score for wildfire may be too low. The data for this section was pulled from August, when NC is pretty humid and has low fire risk and is on the heels of hurricane season. He noted that risk would look low during that time of year (August). He also explained that the data was also pulled from a national database rather than state. There was no drought on a national scale in August but there was low drought for NC. This assessment may provide a skewed view of what the OBX region is facing when it comes to drought and potential fire risk. For example, one event in 2016 burned thousands of acres burn in the County (Black Sunday). NC drought management council has current drought updates.

Abby responded that this is not meant to provide a point in time rating but rather an overall and general assessment of risk. We can add clarity to the hazard section to note that this is not a point in time. Add a note that based on current conditions there is a heightened risk of wildfire during this time period.

Kyle suggested raising impact from limited to moderate. He said that the urban interface section of the plan captures good information.

He also noted that Firewise is a dying program but he is trying to bring it back in Dare County. Drew noted that there have been efforts to reengage folks and improve the program and reduce risk. Drew suggested updating mitigation actions to capture these efforts and coordination with Kyle and the agency. Dare County could include an action aimed at NC Forest Service coordinating with local jurisdictions. Drew will reach out to Kyle to get him involved with the local jurisdictions and emergency management efforts.

Abby suggested that if they have any information on past fires that this information could be added to the hazard profile. Drew noted that it's hard to capture all local fires related to wildfires and only get a small picture of risk. Abby noted that we may not be able to capture every event, but to make sure that we are describing the type of event that can occur and what projects we need to pursue.

The NC Forest Service is working with Buxton Woods (private landowner) on cleaning up and reducing fuels in the area. They are working on cost share programs so they can support communities in this effort.

WSP will update Firewise language and grant opportunities in the action plan.

Public Meeting 3 Online Attendees

1. Summary		
Meeting title	Outer Banks Regional Hazard Mitigation Plan Public Meeting	
Registration page views	106	
Registered participants	4	
Canceled registrations	0	
Attended participants	7	
Start time	1/28/25, 4:30:45 PM	
End time	1/28/25, 5:48:39 PM	
Meeting duration	1h 17m 53s	
Average attendance time	34m 1s	
2. Participants		
Name	First Join	Last Leave
Moore, Abigail	1/28/25, 4:57:30 PM	1/28/25, 5:46:45 PM
Ruffins, Ranger	1/28/25, 5:00:25 PM	1/28/25, 5:46:44 PM
Stroud, David	1/28/25, 5:16:58 PM	1/28/25, 5:48:39 PM
Breslin, Kyle D	1/28/25, 4:30:47 PM	1/28/25, 5:46:41 PM
David Stroud (Unverified)	1/28/25, 5:03:36 PM	1/28/25, 5:09:17 PM
David Stroud (Unverified)	1/28/25, 5:20:39 PM	1/28/25, 5:46:42 PM

DRAFT PLAN AND FINAL PUBLIC MEETING OUTREACH

Currituck County Emergency Management's Post

Currituck County Emergency Management
January 10 at 10:10 AM ·

The Outer Banks Regional Hazard Mitigation Plan draft is now available for review. A public meeting will be held on January 28, 2025, at 11:00 am to discuss the plan and receive public feedback.

Register here to attend online or join us in person at the Public Safety Center, located at 125 College Way, Barco, NC, 27917. Visit https://obx-hmp.com to review the plan and learn more!

As always if you have an emergency call 9-1-1, text if you can't!

If you would like to contact our Emergency Management staff, please email emstaff@currituckcountync.gov or call 252-232-2115

OBX-HMP.COM
Outer Banks Regional Hazard Mitigation Plan Update
Welcome to the website for the 2024 update of the Outer Banks Regional Hazard Mitigation Plan. Currituck and Dare Counties and incorporated communities are updating the Outer Banks Regional Hazard Mitigation Plan...

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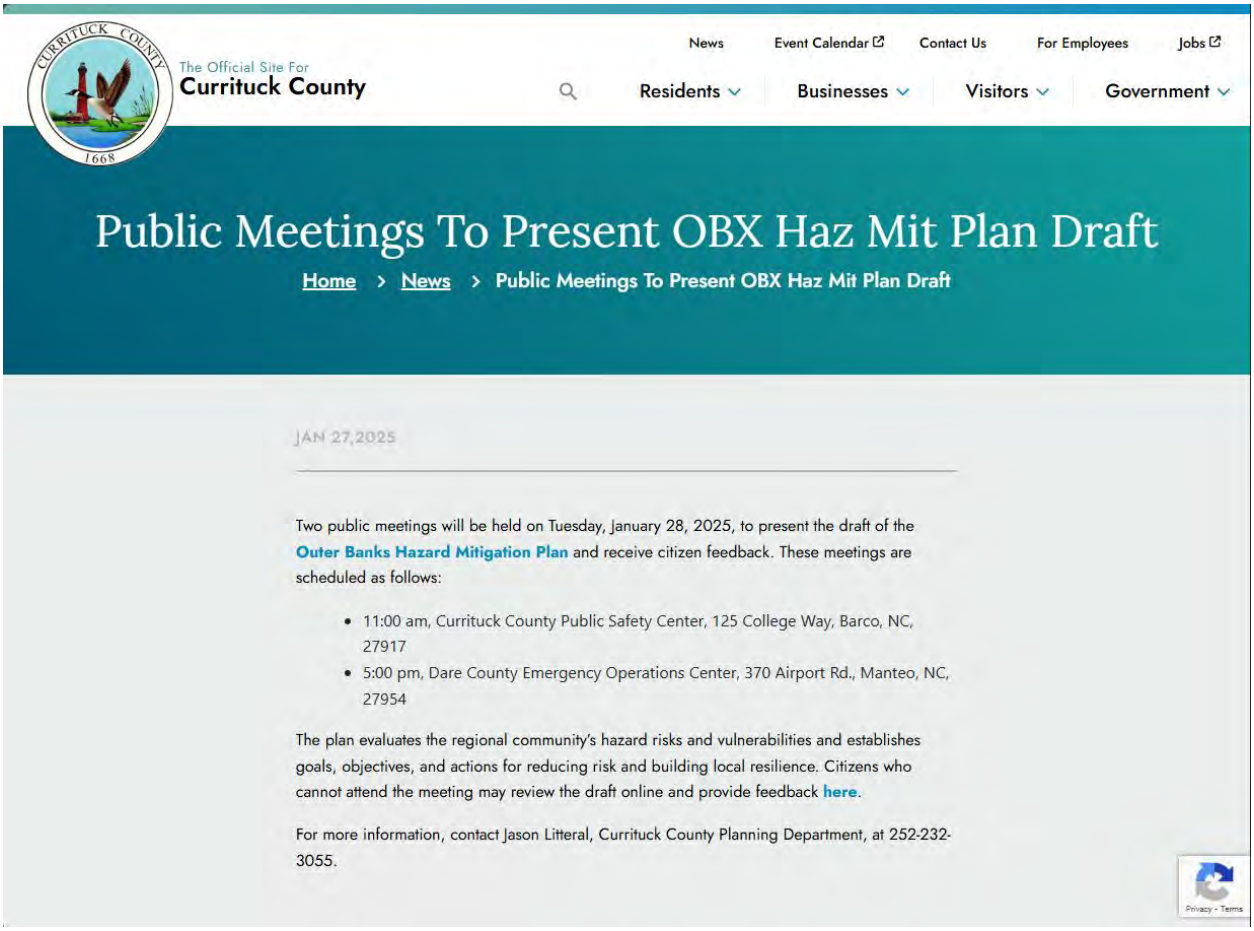
Currituck County Emergency Management limited who can comment on this post.



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Public Meetings To Present OBX Haz Mit Plan Draft

Home > News > Public Meetings To Present OBX Haz Mit Plan Draft

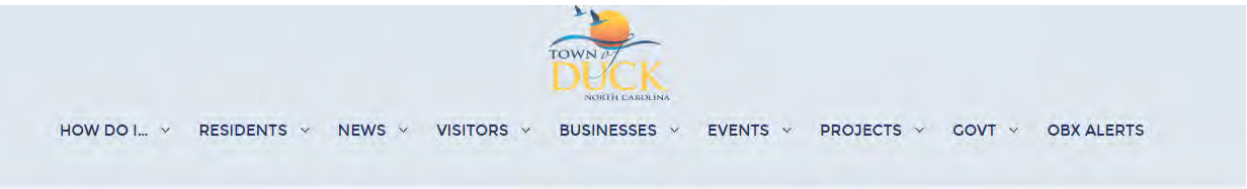
JAN 27,2025

Two public meetings will be held on Tuesday, January 28, 2025, to present the draft of the **Outer Banks Hazard Mitigation Plan** and receive citizen feedback. These meetings are scheduled as follows:

- 11:00 am, Currituck County Public Safety Center, 125 College Way, Barco, NC, 27917
- 5:00 pm, Dare County Emergency Operations Center, 370 Airport Rd., Manteo, NC, 27954

The plan evaluates the regional community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience. Citizens who cannot attend the meeting may review the draft online and provide feedback **here**.

For more information, contact Jason Litteral, Currituck County Planning Department, at 252-232-3055.



HAZARD MITIGATION PLANNING

OUTER BANKS REGIONAL HAZARD MITIGATION PLAN DRAFT

The Outer Banks Regional Hazard Mitigation Plan draft is now available. This plan evaluates our community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help our communities to understand vulnerability and develop ways to proactively mitigate risk.

Click here to submit comments on the draft plan by January 31st. We appreciate your input!

PUBLIC INPUT NEEDED

A public meeting is scheduled for January 28, 2025 at 5pm to present the draft plan and gather feedback. Register here to attend online or join us in person at the Dare County Emergency Operations Center (370 Airport Rd, Manteo, NC 27954).

For more information about the plan update, visit the project website at www.obx-hmp.com. On this site you will find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, draft documents, and other mitigation planning resources.

RETURN TO COMMUNITY DEVELOPMENT PAGE

DOCUMENTS AND REPORTS

FLOOD DAMAGE PREVENTION ORDINANCE 20-01

2022 TOWN OF DUCK OUTREACH LETTER

OBX FLOOD MAPS - MULTI-JURISDICTION WEBSITE

OUTER BANKS CRS USERS GROUP MEETING - A CONVERSATION WITH INSURANCE AND FINANCE STAKEHOLDERS JULY 2019

TOWN OF DUCK HAZARD MITIGATION PLANNING

HISTORICAL FLOOD MAPS

Island Free Press

Outer Banks Health

Outer Banks Family Medicine
40894 Hwy. 12 | Avon, NC
(252) 995-3073
Affiliated with ECU Health and Chesapeake Regional Healthcare

OBX Regional Hazard Mitigation Plan draft now available for review, public meetings on Tuesday

January 23, 2025 | Local News

The Outer Banks Regional Hazard Mitigation Plan draft is now available, and public meetings to provide input in Currituck and Dare counties are scheduled for January 28.

This plan evaluates our community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience.

Take this opportunity to review the plan that covers Currituck and Dare counties, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head and Manteo, and provide your feedback to the planning team.

Click here to submit comments on the draft plan by January 31st.

Public meetings will take place on January 28, to present the draft plan and gather feedback.

Register here to attend online, or join in person at the Currituck County Public Safety Center, 125 College Way, Barco, at 11 a.m., or the Dare County Emergency Operations Center 370 Airport Rd, Manteo, at 3 p.m.

Visit obx-hmp.com to learn more about the plan update process.

KILL DEVIL HILLS
North Carolina

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Posted on: January 20, 2025

Outer Banks Regional Hazard Mitigation Plan Draft

Outer Banks Regional Hazard Mitigation Plan Draft

The Outer Banks Regional Hazard Mitigation Plan draft is now available. This plan evaluates our community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience. Take this opportunity to review the plan and provide your feedback to the planning team. Click here or scan the QR code below to submit comments on the draft plan by January 31st. We appreciate your input!

A public meeting is scheduled for January 28, 2025 at 5pm to present the draft plan and gather feedback. Register here to attend online or join us in person at the Dare County Emergency Operations Center (370 Airport Rd, Manteo, NC 27954).

Visit https://obx-hmp.com to learn more about the plan update process.

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Town of Kitty Hawk
19h ·
The Outer Banks Regional Hazard Mitigation Plan draft is now available for review. Join us for a public meeting on January 28th at 5pm to learn m... See more
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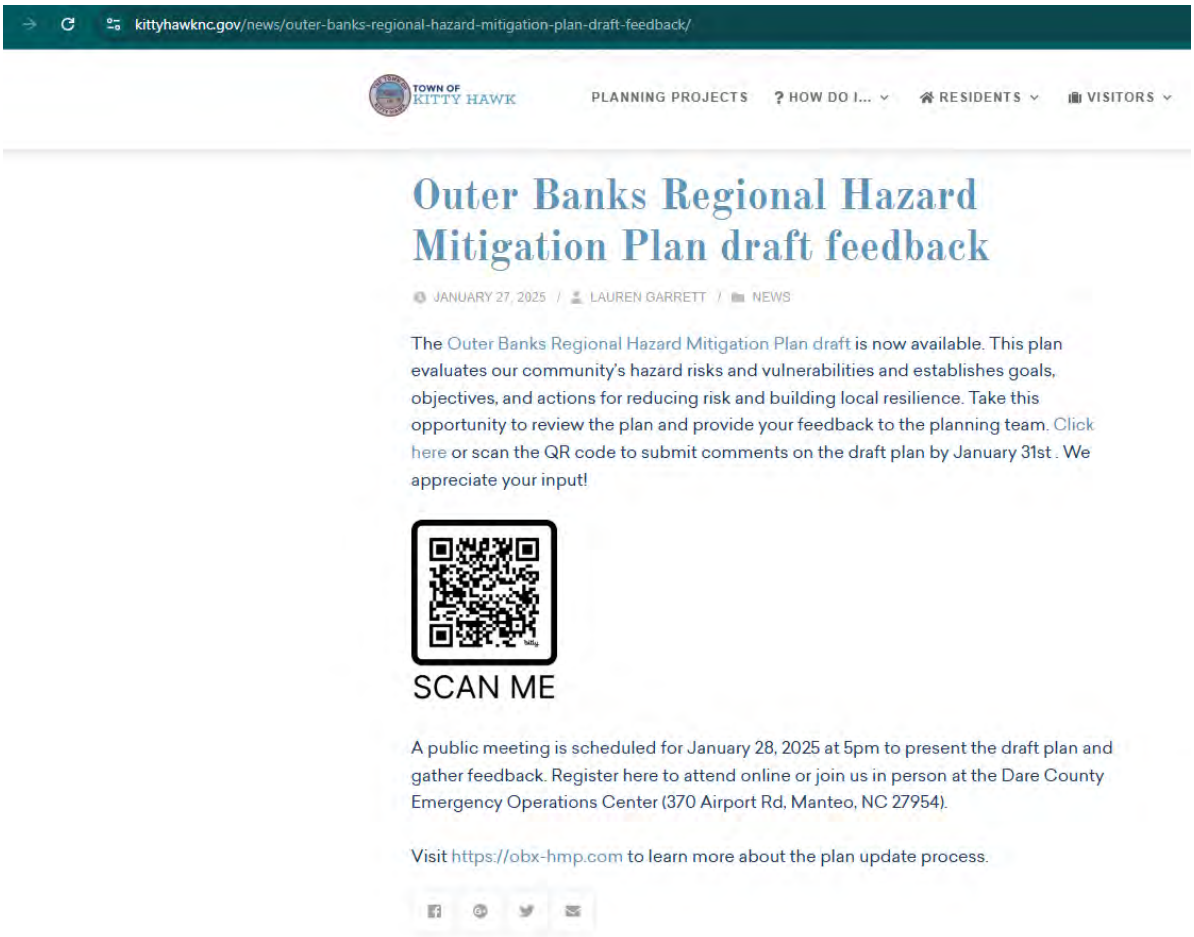

kittyhawknc.gov/news/outer-banks-regional-hazard-mitigation-plan-draft-feedback/

TOWN OF KITTY HAWK

PLANNING PROJECTS ? HOW DO I... RESIDENTS VISITORS

Outer Banks Regional Hazard Mitigation Plan draft feedback

JANUARY 27, 2025 / LAUREN GARRETT / NEWS

The Outer Banks Regional Hazard Mitigation Plan draft is now available. This plan evaluates our community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience. Take this opportunity to review the plan and provide your feedback to the planning team. Click here or scan the QR code to submit comments on the draft plan by January 31st . We appreciate your input!

SCAN ME

A public meeting is scheduled for January 28, 2025 at 5pm to present the draft plan and gather feedback. Register here to attend online or join us in person at the Dare County Emergency Operations Center (370 Airport Rd, Manteo, NC 27954).

Visit https://obx-hmp.com to learn more about the plan update process.

Town of Nags Head, NC's Post

Town of Nags Head, NC
January 9 at 8:54 AM

The Outer Banks is updating its Hazard Mitigation Plan to better protect the people and property of the region from the effects of natural and human-caused hazards and to maintain eligibility for mitigation funding from the Federal Emergency Management Agency (FEMA).

The draft plan is now available for review.

Join us for a public meeting on January 28th at 5pm to learn more about the plan and provide your feedback. Register to attend online or join us in person at the Dare County EOC at 370 Airport Road, Manteo.

https://events.teams.microsoft.com/.../65e113f2-3b8c-4e7d...

Visit https://obx-hmp.com to review the plan and learn more!

OBX-HMP.COM

Outer Banks Regional Hazard Mitigation Plan Update

Welcome to the website for the 2024 update of the Outer Banks Regional Hazard Mitigation Plan. Currituck and Dare Counties and incorporated communities are updating the Outer Banks Regional Hazard Mitigation Plan....

3 1 share

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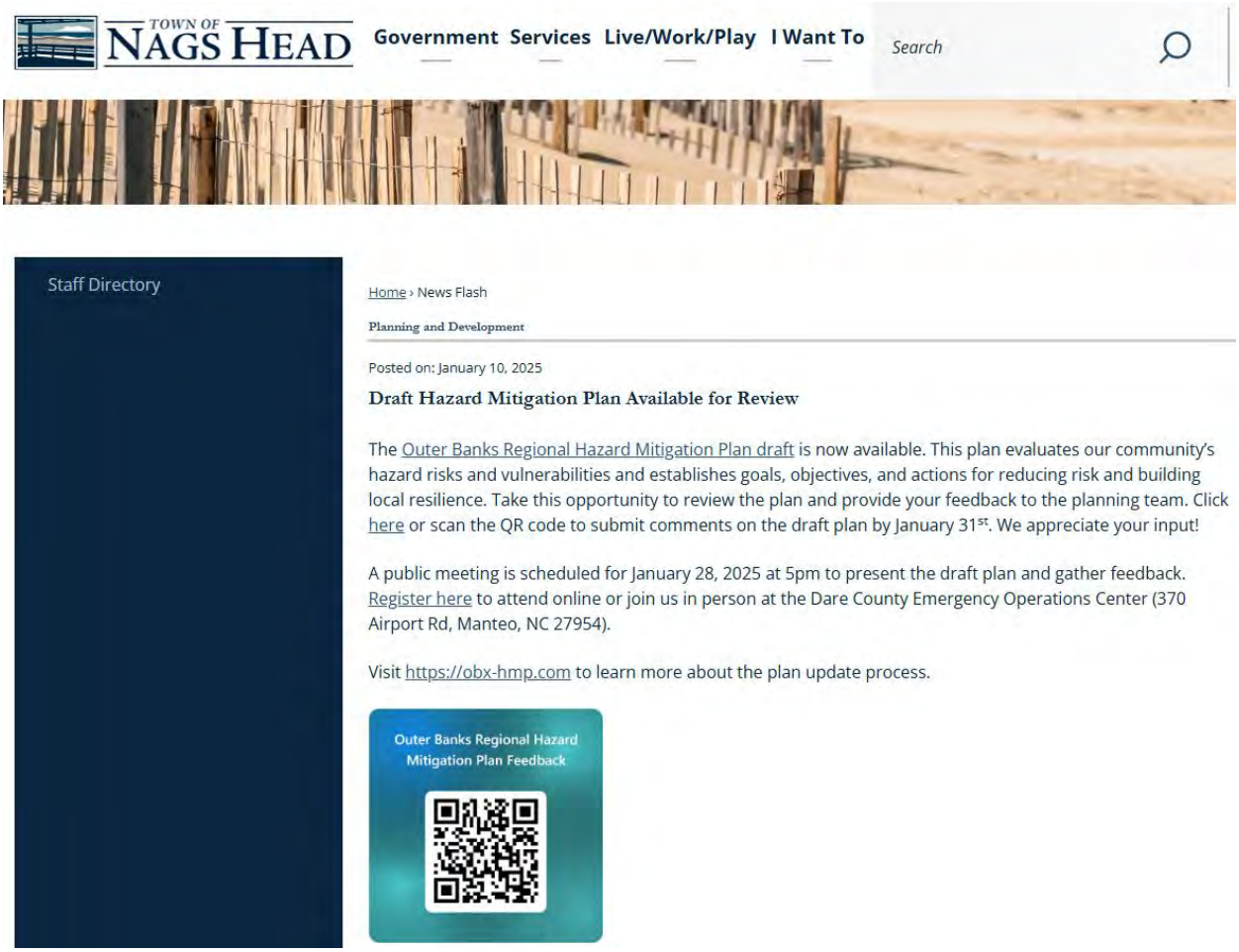
TOWN OF NAGS HEAD
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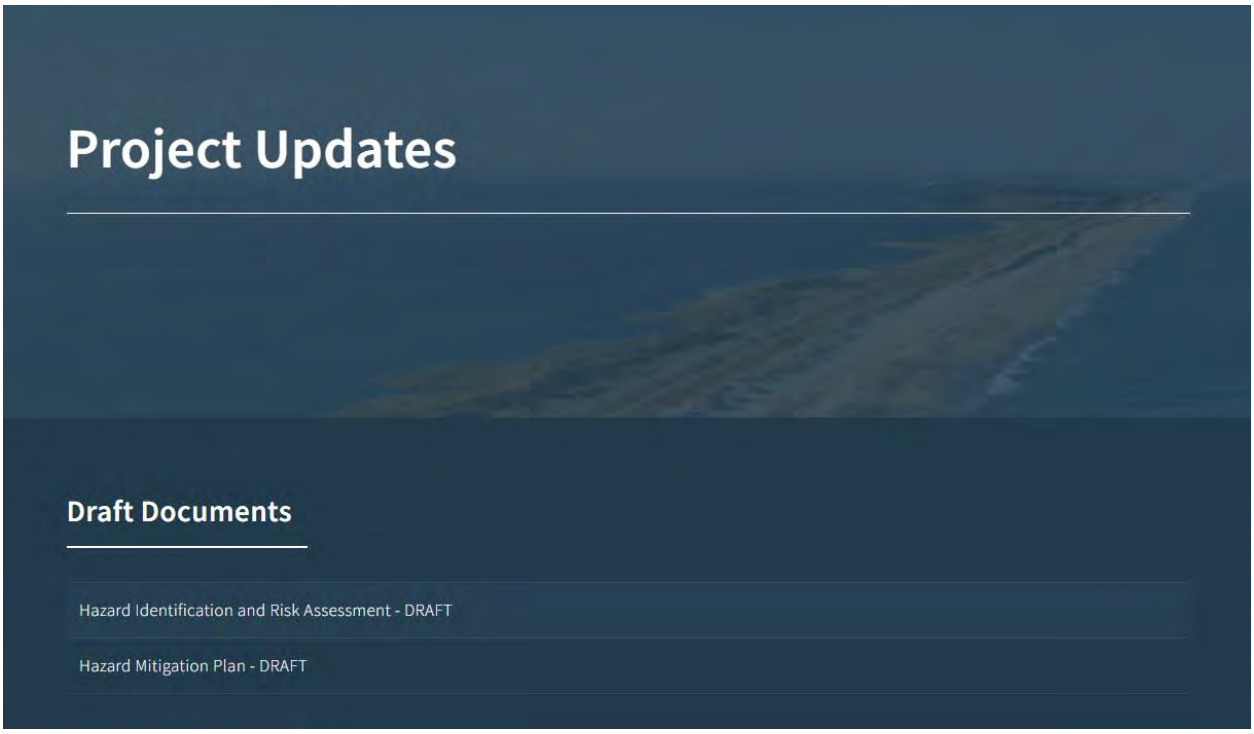
Planning and Development
Posted on: January 10, 2025
Draft Hazard Mitigation Plan Available for Review
The Outer Banks Regional Hazard Mitigation Plan draft is now available. This plan evaluates our community's hazard risks and vulnerabilities and establishes goals, objectives, and actions for reducing risk and building local resilience. Take this opportunity to review the plan and provide your feedback to the planning team. Click here or scan the QR code to submit comments on the draft plan by January 31st. We appreciate your input!
A public meeting is scheduled for January 28, 2025 at 5pm to present the draft plan and gather feedback. Register here to attend online or join us in person at the Dare County Emergency Operations Center (370 Airport Rd, Manteo, NC 27954).
Visit https://obx-hmp.com to learn more about the plan update process.
Outer Banks Regional Hazard Mitigation Plan Feedback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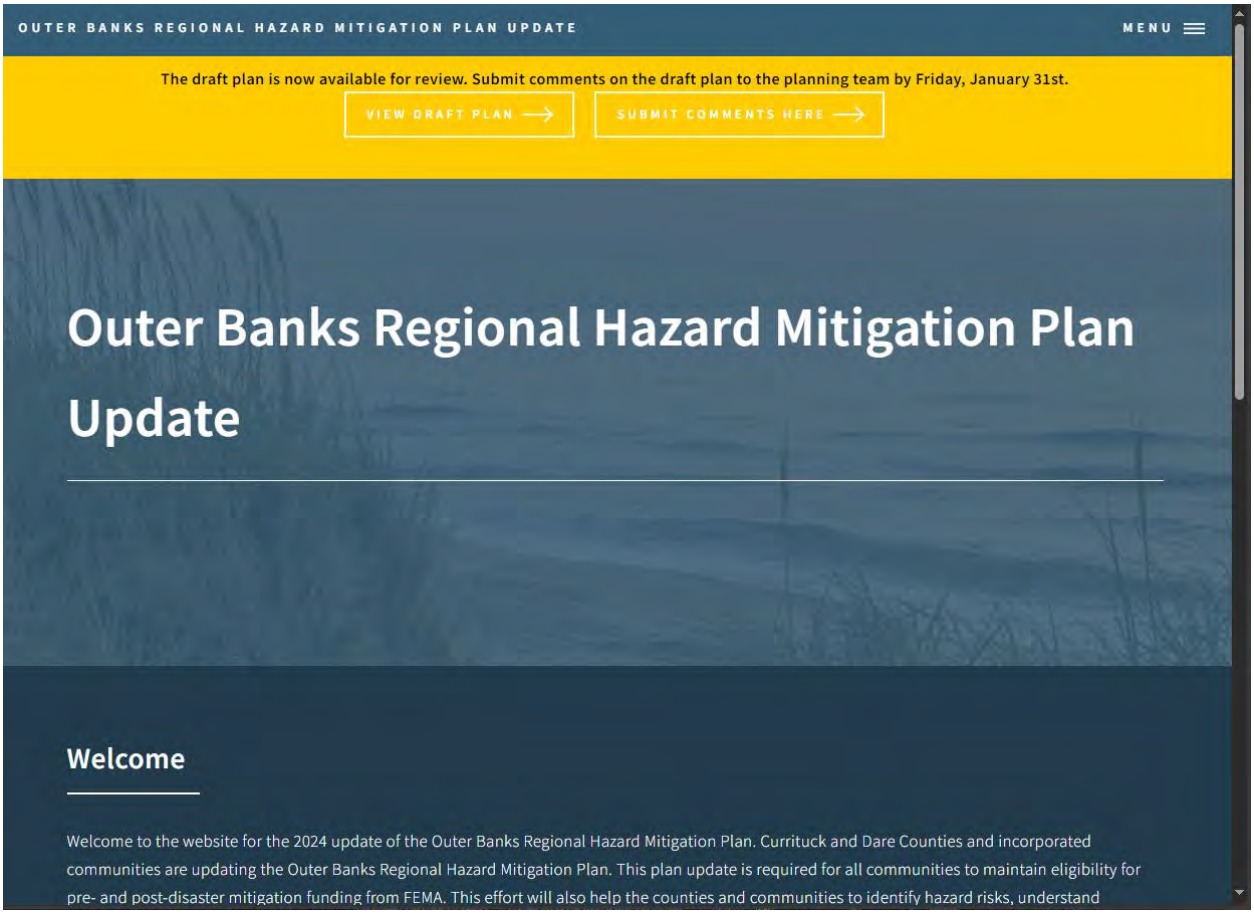
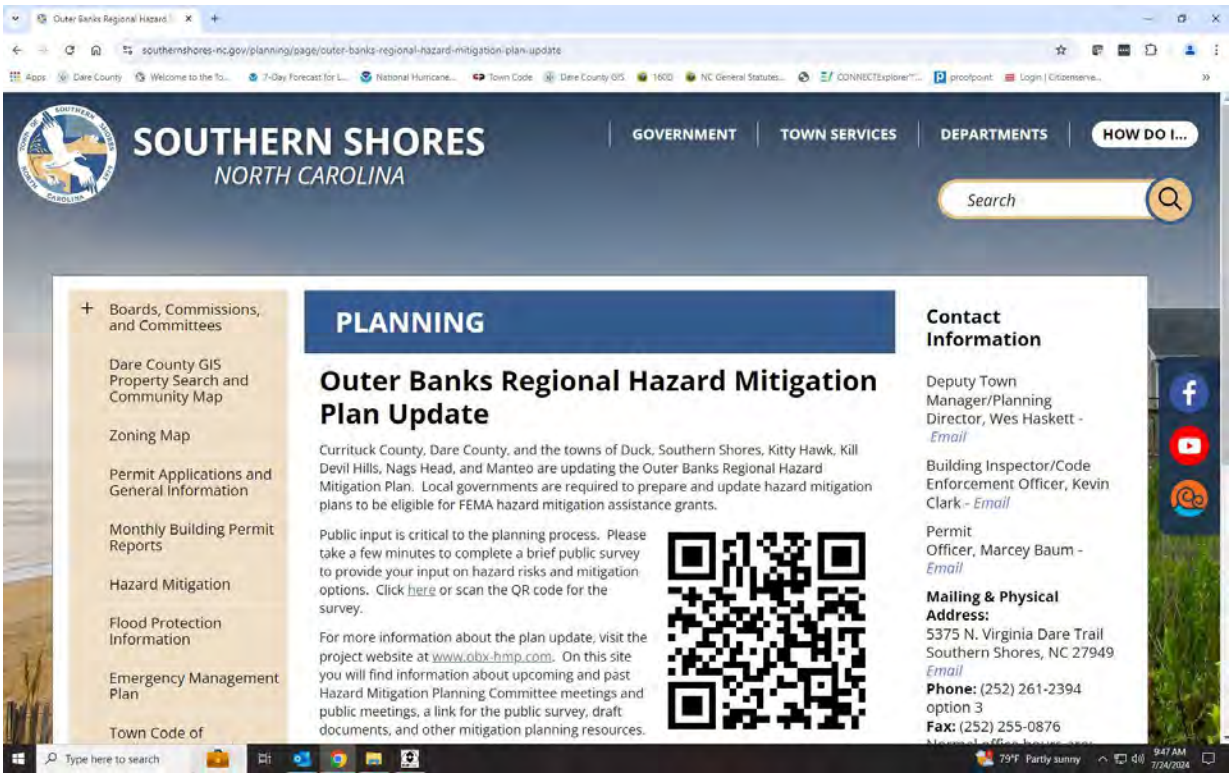
Draft Documents
Hazard Identification and Risk Assessment - DRAFT
Hazard Mitigation Plan - DRAFT


OUTER BANKS REGIONAL HAZARD MITIGATION PLAN UPDATE
MENU
The draft plan is now available for review. Submit comments on the draft plan to the planning team by Friday, January 31st.
VIEW DRAFT PLAN
SUBMIT COMMENTS HERE
Outer Banks Regional Hazard Mitigation Plan Update
Welcome
Welcome to the website for the 2024 update of the Outer Banks Regional Hazard Mitigation Plan. Currituck and Dare Counties and incorporated communities are updating the Outer Banks Regional Hazard Mitigation Plan. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help the counties and communities to identify hazard risks, understand

PLAN WEBSITE & SURVEY OUTREACH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PLANNING
Outer Banks Regional Hazard Mitigation Plan Update
Currituck County, Dare County, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and Manteo are updating the Outer Banks Regional Hazard Mitigation Plan. Local governments are required to prepare and update hazard mitigation plans to be eligible for FEMA hazard mitigation assistance grants.
Public input is critical to the planning process. Please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options. Click here or scan the QR code for the survey.
For more information about the plan update, visit the project website at www.obx-hmp.com. On this site you will find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, draft documents, and other mitigation planning resources.
Contact Information
Deputy Town Manager/Planning Director, Wes Haskett - Email
Building Inspector/Code Enforcement Officer, Kevin Clark - Email
Permit Officer, Marcey Baum - Email
Mailing & Physical Address:
5375 N. Virginia Dare Trail
Southern Shores, NC 27949
Email
Phone: (252) 261-2394 option 3
Fax: (252) 255-0876

Town of Southern Shores, NC
25m ·
The Outer Banks Regional Hazard Mitigation Plan update is underway and we need your input! Respond to this survey to share your concerns about hazard risks and ideas for mitigation. Visit www.obx-hmp.com for more information about the plan update. The survey can be found at https://forms.office.com/e/jSgqtjaHUc. Responses will be collected through August 30, 2024.
obx-hmp.com
Outer Banks Regional Hazard Mitigation Plan Update

KILL DEVIL HILLS
North Carolina

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Posted on: July 29, 2024

Outer Banks Regional Hazard Mitigation Plan Survey

Currituck County, Dare County, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and Manteo are updating the Outer Banks Regional Hazard Mitigation Plan. Local governments are required to prepare and update hazard mitigation plans to be eligible for FEMA hazard mitigation assistance grants.

Public input is critical to the planning process. Please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options. Click **here** or scan the QR code in the above graphic for the survey.

For more information about the plan update, visit the project website at **www.obx-hmp.com**. On this site you will find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, draft documents, and other mitigation planning resources.

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What's happening in Kill Devil Hills

Outer Banks Regional Hazard Mitigation Plan Survey

Local governments are required to prepare and update hazard mitigation plans to be eligible for FEMA hazard mitigation assistance grants. Please help with this process by taking a brief survey.

Read on...

KDH Fire Department Station 14 Ribbon Cutting

The Town of Kill Devil Hills, in partnership with Dare County, will host a ribbon cutting ceremony to celebrate the recent completion of the new Kill Devil Hills Fire Department Station 14 and Dare County EMS Station 1 on Monday, August 5, 2024.

Read on...

RETURN TO COMMUNITY DEVELOPMENT PAGE

HAZARD MITIGATION PLANNING

OUTER BANKS HAZARD MITIGATION PLAN UPDATE

The Outer Banks Regional Hazard Mitigation Plan update is underway, and Currituck County, Dare County, and the incorporated communities are seeking public input on changes in risks and vulnerabilities as well as new opportunities for mitigation. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA. This effort will also help our communities to understand vulnerability and develop ways to proactively mitigate risk. To learn more about the planning process and provide your input, attend one of these upcoming meetings:

These meetings are open to the public, so we encourage you to come learn about the plan update and provide input on hazards, risks, and mitigation opportunities!

PUBLIC INPUT NEEDED

Public input is critical to the planning process. Please take a few minutes to complete a brief public survey to provide your input on hazard risks and mitigation options. Click here for the survey. Responses are being collected until September 30, 2024.

For more information about the plan update, visit the project website at www.obx-hmp.com. On this site you will find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, draft documents, and other mitigation planning resources.

DOCUMENTS AND REPORTS

FLOOD DAMAGE PREVENTION ORDINANCE 20-01

2022 TOWN OF DUCK OUTREACH LETTER

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OUTER BANKS CRS USERS GROUP MEETING - A CONVERSATION WITH INSURANCE AND FINANCE STAKEHOLDERS JULY 2019

TOWN OF DUCK HAZARD MITIGATION PLANNING

HISTORICAL FLOOD MAPS

Southern Shores News

August 9, 2024

Town Website

Southern Shores August Planning Board Meeting-cancelled

Notice is hereby given that the August 19, 2024 Southern Shores Planning Board meeting has been cancelled. The next regular meeting is scheduled for September 16, 2024 at 5:00 p.m. at the Pitts Center located at 5377 N. Virginia Dare Trl.

Outer Banks Regional Hazard Mitigation Plan Update

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Review:

Click to take the public survey.

Town of Southern Shores CRS Activity:

OUTER BANKS
REGIONAL HAZARD
MITIGATION PLAN
SURVEY
YOUR INPUT IS NEEDED!
KILL DEVIL HILLS
NORTH CAROLINA
Currituck County, Dare County, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and Manteo are updating the Outer Banks Regional Hazard Mitigation Plan. Local governments are required to prepare and update hazard mitigation plans to be eligible for FEMA hazard mitigation assistance grants.
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For more information about the plan update, visit the project website at www.obx-hmp.com. On this site you will find information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, draft documents, and other mitigation planning resources.

PUBLIC SURVEY

The Region distributed a public survey, shown below, that requested public input into the Hazard Mitigation Plan and the identification of mitigation activities that could lessen the risk and impact of future flood hazard events. The survey was announced at the first public meeting, made available in hard copy format, provided via a link on participating jurisdictions web and social media accounts, and made available online on the plan website. The Region received 475 responses to the survey.

Outer Banks Regional Hazard Mitigation Plan Public Survey

Currituck and Dare Counties are beginning to update the Outer Banks Regional Hazard Mitigation Plan to identify and assess the region's risks from hazards such as flooding, drought, heat, hurricane, severe weather, and other hazards. This plan will help determine how to best minimize or manage those risks.
This survey is an opportunity for you to share your opinions and participate in the mitigation planning process. The information you provide will help us better understand local hazard risks and problems and can lead to mitigation activities that help lessen the impacts of future hazards.
Please help us by completing this survey by September 30th.

1. Where do you live?
   - ☐ Currituck County
   - ☐ Unincorporated Dare County
   - ☐ Duck
   - ☐ Kill Devil Hills
   - ☐ Kitty Hawk
   - ☐ Manteo
   - ☐ Nags Head
   - ☐ Southern Shores
   - ☐ I live outside of Dare and Currituck Counties but work or recreate in the Outer Banks.
   - ☐ Other: _____

2. Have you ever experienced or been impacted by a hazard or disaster in the Outer Banks Region?
   - ☐ Yes
   - ☐ No

   If yes, please explain your experience & where it occurred.

3. On a scale of 1-5, where 1 = not at all concerned and 5 = very concerned, how concerned are you about the possibility of your community being impacted by a hazard event?

4. Please review the list of hazards below and rate each hazard from 0-3 based on how much risk you think it poses to your community.
   0 = no risk, 1 = low, 2 = moderate, 3 = high
   - ___ Coastal Hazards
   - ___ Drought
   - ___ Earthquake
   - ___ Extreme Heat
   - ___ Flood
   - ___ Hurricane
   - ___ Severe Weather
   - ___ Winter Storm
   - ___ Tornado
   - ___ Wildfire
   - ___ Hazardous Materials Incident
   - ___ Radiological Emergency
   - ___ Cyber Threat
   - ___ Terrorism
   - ___ Transportation Infrastructure Failure

5. Is your home located in a floodplain?
   - ☐ Yes
   - ☐ No
   - ☐ No, but I still experience flooding
   - ☐ I don't know

6. Do you have flood insurance for your home and/or personal property?
   - ☐ Yes
   - ☐ No
   - ☐ I don't know

7. If you do NOT have flood insurance, what is the reason?
   - ☐ It's too expensive
   - ☐ I never really considered it
   - ☐ I don't need it because my home is elevated or otherwise protected
   - ☐ Other: _____

Outer Banks Regional Hazard Mitigation Plan Public Survey

8. Have you taken any actions to protect your home or neighborhood from hazards?

   ☐ Yes
   ☐ No

   If yes, please explain what you implemented.

9. Do you know what government office to contact to learn more about your hazard risks and how to reduce vulnerability in your area?

   ☐ Yes
   ☐ No

10. What are some steps your local government could take to reduce the risk of future hazard damages in your neighborhood?

11. What is the best way for you to receive information about how to make your home or neighborhood more resistant to flood damage? Please select your top three choices.

    ☐ Newspaper
    ☐ TV Ads/Programming
    ☐ Radio Ads/Programming
    ☐ Public library
    ☐ Public workshop/meetings
    ☐ School meetings
    ☐ Mail
    ☐ Email
    ☐ Text message
    ☐ Local government website
    ☐ Local government social media

12. Many community-wide activities can reduce our risk from hazards. These activities generally fall into one of six broad categories. Please rank these categories from 1 (most important) to 6 (least important) by how important you think each one is for your community to consider pursuing.

    ___ **Prevention:** administrative and regulatory actions, plans, policies, and ordinances that influence how land is developed and buildings are built. *Examples include planning and zoning, building codes, open space preservation, land use, and floodplain regulations.*

    ___ **Property Protection**: actions that involve the modification of existing buildings to protect them from a hazard or remove them from a hazardous area. *Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.*

    ___ **Natural Resource Protection**: actions that minimize hazard losses and preserve or restore the functions of natural systems. *Examples include floodplain protection, habitat preservation, slope stabilization, stream buffers, wetland and marsh protection, and forest management.*

    ___ **Structural Projects**: actions that lessen the impact of a hazard by modifying the natural progression of a hazard. *Examples include dams, levees, floodwalls, berms, drainage infrastructure, detention/retention basins, channel modifications, retaining walls, and storm sewers.*

    ___ **Emergency Services**: actions that protect people and property during and immediately after a hazard event. *Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.*

    ___ **Public Education and Awareness**: actions to inform the public about hazards and techniques they can use to protect themselves and their property. *Examples include outreach projects, school education programs, library materials, and demonstration events.*

Figure B.1 – Survey Response, Place of Residence

1. Where do you live?

More Details

Currituck County	50
Unincorporated Dare County	81
Duck	94
Kill Devil Hills	51
Kitty Hawk	27
Southern Shores	45
Manteo	11
Nags Head	29
Southern Shores	45
I live outside of Dare and Currit...	37
Other	42

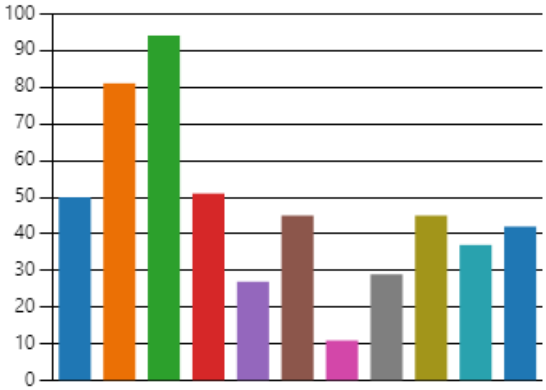


Figure B.2 – Survey Response, Past Hazard Impact

2. Have you ever experienced or been impacted by a hazard or disaster in the Outer Banks Region?

More Details Insights

Yes	270
No	205

Figure B.3 – Survey Response, Past Hazard Experience

3. If you answered "Yes" to question 2, please explain your experience and where it occurred.

More Details Insights

264
Responses

Latest Responses

"2 feet water 2014 18 inches water 2024 September Water drains in neighborhood to...

"Gererally, the many hurricanes that have passed through OBX over the past 40 years...

"Experienced a grade II hurricane in our home in Corolla. A lot of wind and flooding o...

130 respondents (**49**%) answered **hurricanes** for this question.

Figure B.4 – Survey Response, Concern About Hazard Impacts

4. On a scale of 1-5, how concerned are you about the possibility of your community being impacted by a hazard event?

More Details Insights

4.02
Average Rating

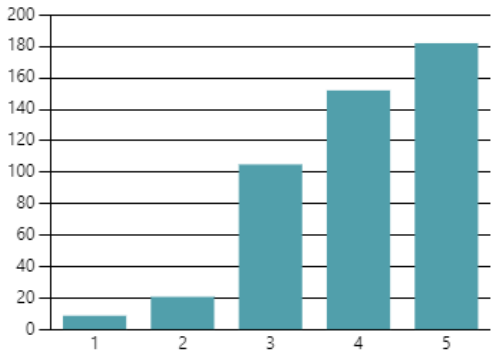


Figure B.5 – Survey Response, Hazard Risk Ratings

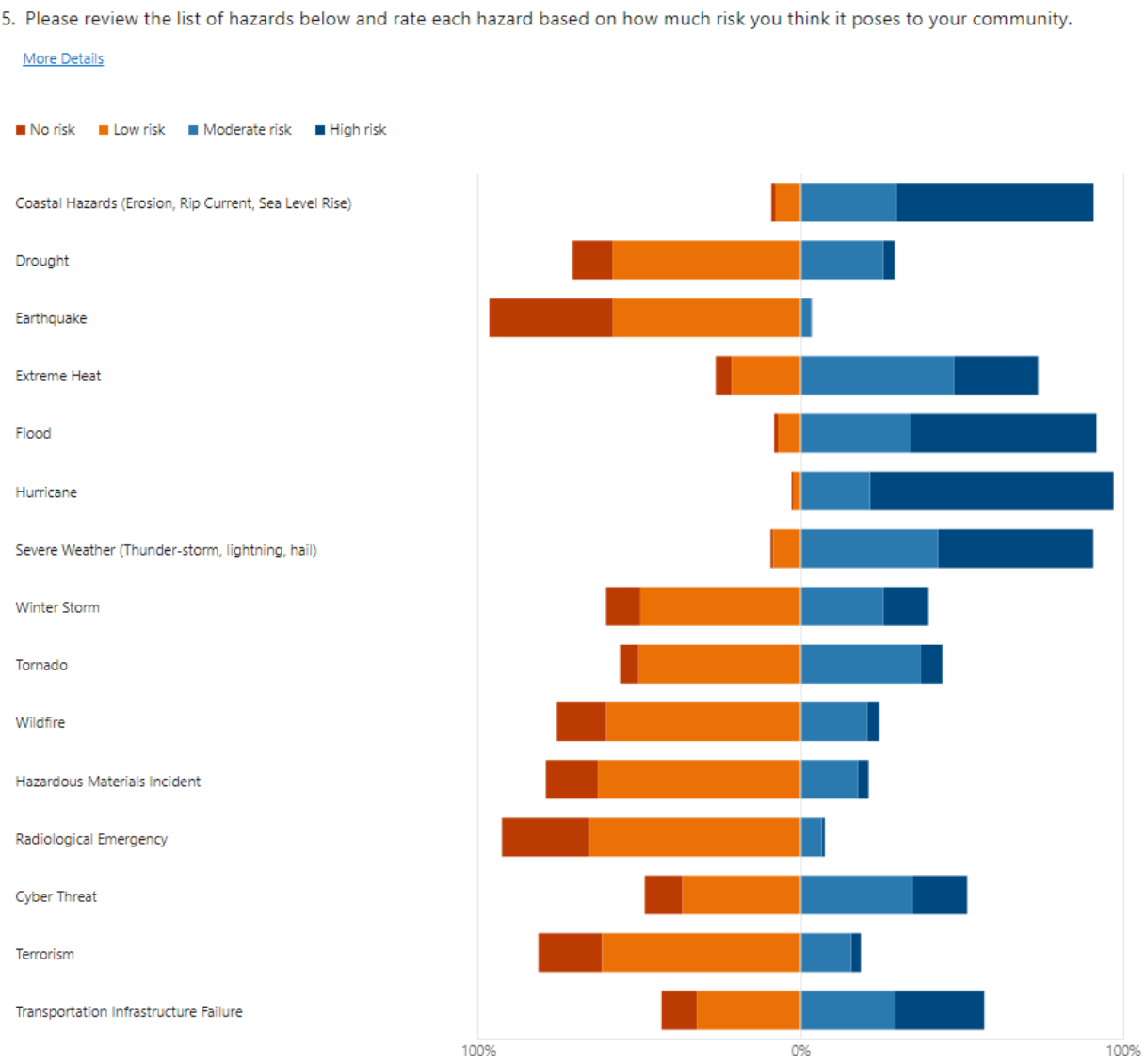


Figure B.6 – Survey Response, Home in Floodplain

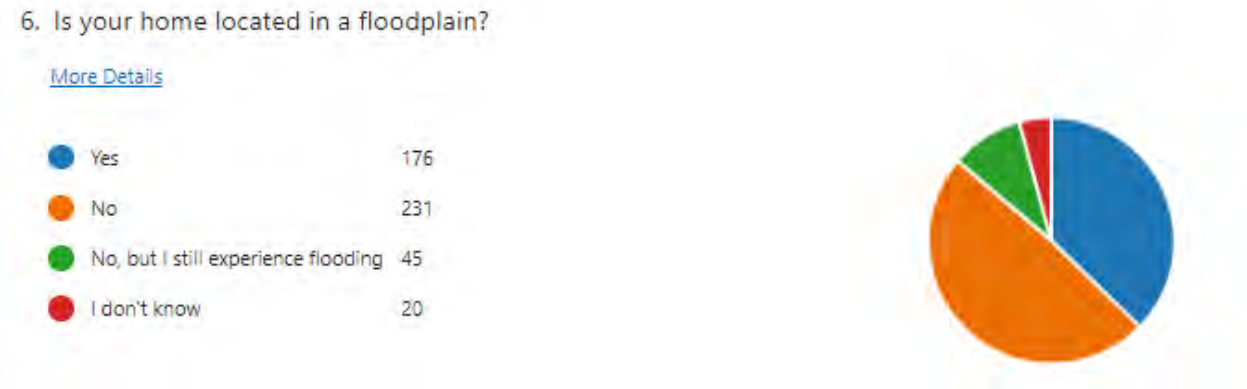


Figure B.7 – Survey Response, Flood Insurance

Figure B.8 – Survey Response, No Flood Insurance Explanation

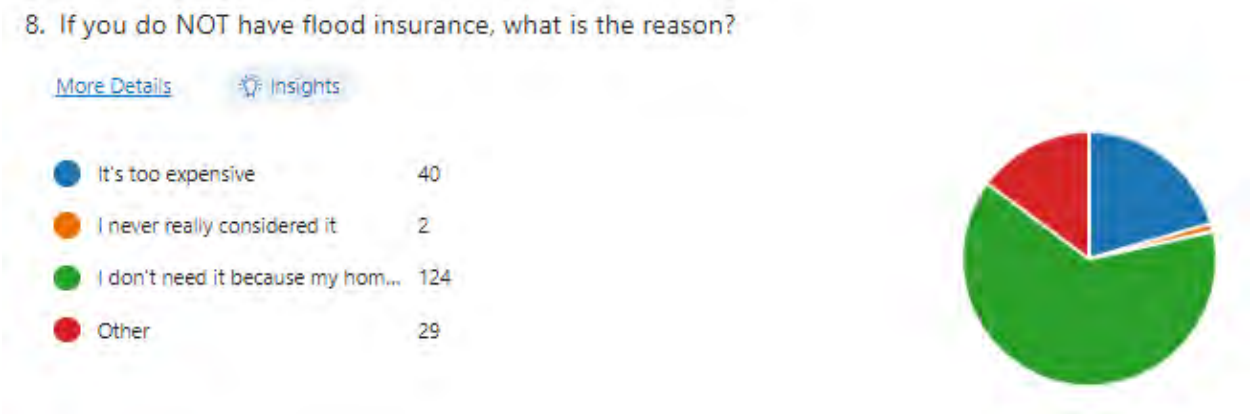


Figure B.9 – Survey Response, Personal Actions Taken for Mitigation

Figure B.10 – Survey Response, Personal Actions Taken for Mitigation, Details

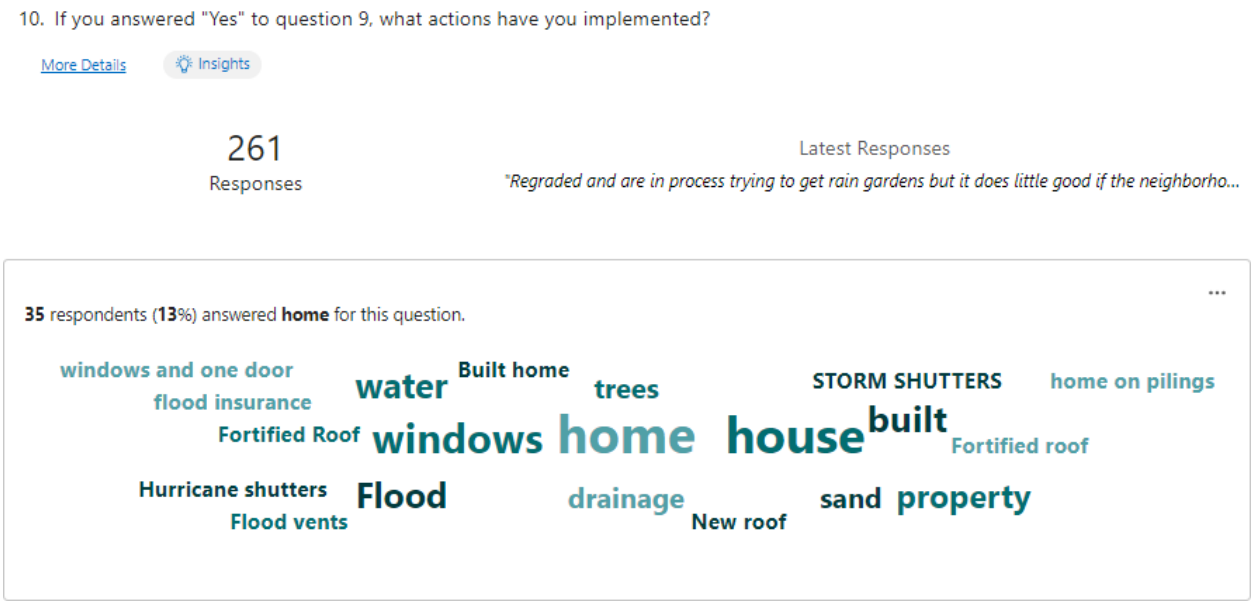


Figure B.11 – Survey Response, Knowledge of Where to Find Hazard Information

Figure B.12 – Survey Response, Recommendations for Mitigation

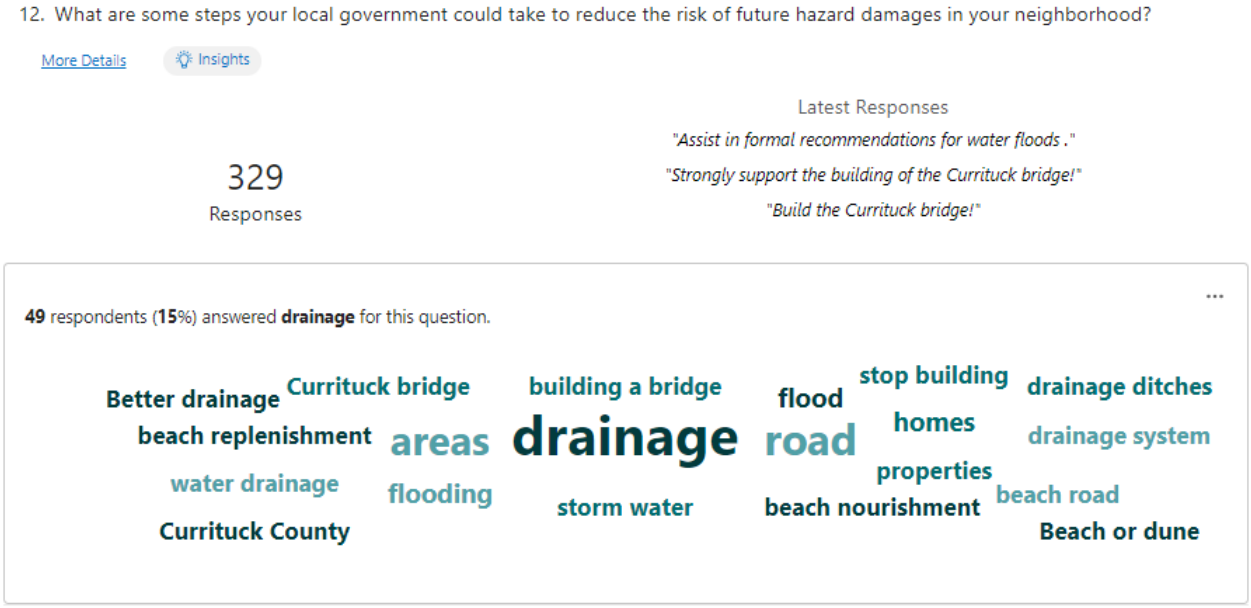


Figure B.13 – Survey Response, Recommendations for Mitigation

13. Many community-wide activities can reduce our risk from hazards. These activities generally fall into one of the following six broad categories:

- **Prevention:** administrative and regulatory actions, plans, policies, and ordinances that influence how land is developed and buildings are built. *Examples include planning and zoning, building codes, open space preservation, land use, and floodplain regulations.*
- **Property Protection**: actions that involve the modification of existing buildings to protect them from a hazard or remove them from a hazardous area. *Examples include acquisition, relocation, elevation, structural retrofits, and storm shutters.*
- **Natural Resource Protection**: actions that minimize hazard losses and preserve or restore the functions of natural systems. *Examples include floodplain protection, habitat preservation, slope stabilization, stream buffers, wetland and marsh protection, and forest management.*
- **Structural Projects**: actions that lessen the impact of a hazard by modifying the natural progression of a hazard. *Examples include dams, levees, floodwalls, berms, drainage infrastructure, detention/retention basins, channel modifications, retaining walls, and storm sewers.*
- **Emergency Services**: actions that protect people and property during and immediately after a hazard event. *Examples include warning systems, evacuation planning, emergency response training, and protection of critical emergency facilities or systems.*
- **Public Education and Awareness**: actions to inform the public about hazards and techniques they can use to protect themselves and their property. *Examples include outreach projects, school education programs, library materials, and demonstration events.*

Please rank these categories by how important you think each one is for your community to consider pursuing.

More Details

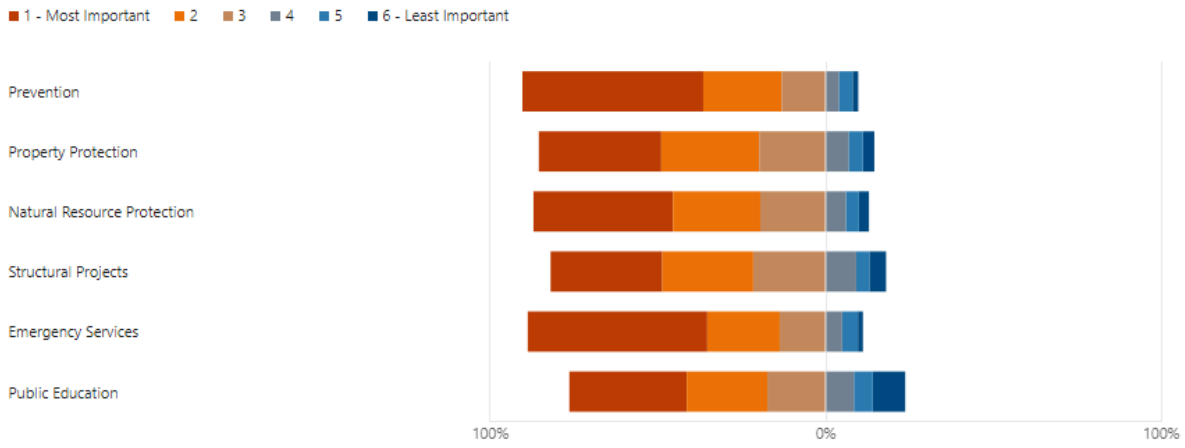
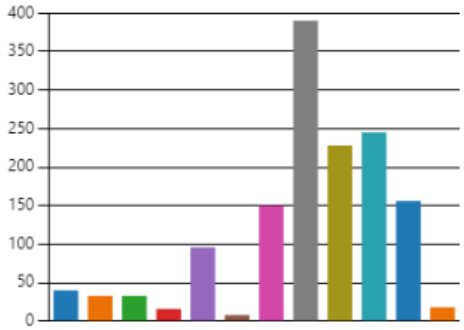


Figure B.14 – Survey Response, Preferred Methods of Communication

14. What is the best way for you to receive information about how to make your home or neighborhood more resistant to flood damage? Please select your top three choices.

More Details

Newspaper	40
TV Ads/Programming	33
Radio Ads/Programming	33
Public library	16
Public workshop/meetings	96
School meetings	8
Mail	150
Email	390
Text message	228
Local government website	245
Local government social media	156
Other	18



B.3 PLANNING STEP 3: COORDINATE

This planning step credits the incorporation of other plans and other agencies' efforts into the development of the Hazard Mitigation Plan. Other agencies and organizations must be contacted to determine if they have studies, plans and information pertinent to the Hazard Mitigation Plan, to determine if their programs or initiatives may affect the community's program, and to see if they could support the community's efforts. To incorporate stakeholder input into the plan, a variety of stakeholders were identified and sent an email inviting them to attend a public meeting, provide data or other input relevant to the plan update, and stay involved in the planning process, including to review the draft plan and provide feedback and comments. The coordination letter sent via email is provided below. A list of the stakeholders who were contacted is provided in Table B.3.

Stakeholders were also involved through specific requests for data to support the development of the plan as well as through participation on the HMPC.

From: Moore, Abigail
Sent: Monday, August 26, 2024 2:24 PM
Cc: Drew Pearson; Mary.Newns@CurrituckCountyNC.gov; James Wooten; Olivia Doherty; Stroud, David
Subject: Outer Banks Hazard Mitigation Plan Stakeholder Outreach

Good afternoon,

Currituck County, Dare County, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and Manteo are in the process of updating the Outer Banks Regional Hazard Mitigation Plan and are seeking stakeholder input and expertise to assist with this process. You are receiving this email because the plan participants have identified you as a stakeholder of this plan. This plan update is required for all communities to maintain eligibility for pre- and post-disaster mitigation funding from FEMA, and it will also help our communities to understand vulnerability and develop ways to proactively mitigate risk. If you have data or information that might be relevant to the plan update, or that you would like the Hazard Mitigation Planning Committee to consider, you can send it to me at abigail.moore@wsp.com.

To learn more about the plan update, we also invite you to attend one of the following public information meetings:

- Wednesday, August 28th at 5pm at the Avon Volunteer Fire Department, 40159 Harbor Rd, Avon, NC 27915
- Thursday, August 29th at 11am at the Corolla Public Library, 1123 Ocean Trail, Corolla, NC 27927

Additional public meetings will be held at the end of the planning process to gather feedback on the draft plan. To stay involved in the planning process, visit www.obx-hmp.com. This website contains information about upcoming and past Hazard Mitigation Planning Committee meetings and public meetings, a link for the public survey, and other mitigation planning resources. Draft documents will also be posted on this website for review and feedback.

We appreciate any input you may wish to share and thank you for your assistance in this effort!

Abby Moore, AICP, CFM
Hazard Mitigation & Resilience Planner
Senior Consultant
she/her

M+ 1 919-767-1112

Table B.3 – Stakeholder List

First Name	Last Name	Organization
Non-Profit Organizations		
Lorelei	Costa	Outer Banks Community Foundation, Executive Director
William	Parker	Outer Banks Conservationists
Robert	Fearn	Pine Island Audubon Sanctuary
Michael	Flynn	NC Coastal Federation
Jennifer	Albanese	Interfaith Community Outreach
Sabrina	Hatfield	RWS Civic Association
Brian	Harris	Buxton Civic Association
Karla	Jarvis	Hatteras Village Civic Association
Terry	Ponton	Avon Property Owners Association
Rolfe	Jennette	Kinnekeet Shores Property Owners Assoc
Rick	Barto	Kinnekeet Shores Property Owners Assoc
Kenny	Brite	Hatteras Island CERT
Dennis	Carroll	Cape Hatteras United Methodist Men
-	-	Outer Banks Home Builders Association
-	-	Hatteras Island Meals
Educational Institutions		
Stephen	Basnight	Dare County Schools, Superintendent
Matt	Lutz	Currituck County Schools, Superintendent
Dr. Jack	Bagwell	College of the Albemarle, President
Don	Harris	College of the Albemarle, Security Supervisor
Reide	Corbett	Coastal Studies Institute, Executive Director
Surrounding Municipalities		
Brian	Parnell	Pasquotank-Camden-Elizabeth City Emergency Management, Coordinator
Joey	Williams	Hyde County Emergency Services Director
Wesley	Hopkins	Tyrrell County Emergency Management Coordinator
Rhonda	Repanshek	Perquimans Planning and Zoning
Robert	Gelormine	Chesapeake, VA Emergency Management, Senior Planner
Renee	McKinnon	Virginia Beach, VA Emergency Management, Coordinator
Federal Government		
Jason	Hunter	FEMA Region IV, Chief, Floodplain Management & Insurance Branch
Valerie	Anderson	FEMA Region IV, Natural Hazards Program Specialist
Dewana	Davis	FEMA Region IV, Insurance Specialist
Roy	McClure	FEMA NFIP/CRS Specialist
Kymberly	Kudla	FEMA Mitigation Planning Specialist
David	Holcomb	ISO/CRS Specialist
Mike	Bratcher	ISO/CRS Specialist
Sherry	Harper	ISO/CRS Technical Coordinator
Katherine	Smith	USGS Climate Adaptation Science Center
David	Hallac	National Parks of Eastern North Carolina, Superintendent
Rebekah	Martin	Coastal NC National Wildlife Refuge Complex, Project Leader

First Name	Last Name	Organization
State Government		
Steve	Garrett	State NFIP Coordinator
Steve	McGugan	State Hazard Mitigation Officer
Chris	Crew	State Hazard Mitigation Plans Manager
Andrea	Webster	Resilience Policy Advisor
Holly	White	Resilience Planner
Helene	Weatherington	Resilient Communities Specialist
Hannah	Thompson-Welch	NC Forest Service, Wildfire Mitigation Specialist
Allen	Moran	NCDOT, Division 1 Representative
Business Community		
Robert	DeFazio	The Outer Banks Chamber of Commerce, Chair
Mark	Jurkowitz	Outer Banks Voice, Editor
Theresa	Schneider	The Coastland Times
Tim	Kesler	Dominion Energy
Colleen	Kakretz	The Outer Banks Hospital
Mike	Daniels	Currituck County Chamber of Commerce, Chair

APPENDIX C MITIGATION ALTERNATIVES

44 CFR Subsection D §201.6(c)(3)(ii): [The mitigation strategy section shall include] a section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new buildings and infrastructure. All plans approved by FEMA after October 1, 2008, must also address the jurisdiction's participation in the NFIP, and continued compliance with NFIP requirements, as appropriate.

As part of the process of developing the mitigation action plans found in Section 7, the HMPC reviewed and considered a comprehensive range of mitigation options before selecting the actions identified for implementation. This section summarizes the full range of mitigation measures evaluated and considered by the HMPC, including a review of the categories of mitigation measures outlined in the 2017 CRS Coordinator's Manual, a discussion of current local implementation and CRS credits earned for those measures, and a list of the specific mitigation projects considered and recommended for implementation.

Mitigation alternatives identified for implementation by the HMPC were evaluated and prioritized using the criteria discussed in Section 6 of this plan.

C.1 CATEGORIES OF MITIGATION MEASURES CONSIDERED

The HMPC analyzed viable mitigation options that addressed each of the identified hazards and supported the identified goals and objectives. As part of the review of mitigation alternatives, the HMPC was presented with the following list of mitigation categories which are utilized as part of the CRS planning process.

- Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Public Information and Outreach

Action ideas within each of these categories were discussed and considered for inclusion in the plan. The HMPC was encouraged to select actions to pursue within most if not all of these categories so as to develop a comprehensive approach to hazard mitigation.

C.2 ALTERNATIVE MITIGATION MEASURES PER CATEGORY

This section presents a summary review of the mitigation measures that were considered by the HMPC. Note: the CRS credit recommendations are based on the 2017 CRS Coordinator's Manual and the 2021 Addendum.

C.2.1 PREVENTATIVE AND REGULATORY MEASURES

Preventative measures are designed to keep a problem, such as flooding, from occurring or from getting worse. The objective of preventative measures is to ensure that future development is not exposed to damage and does not cause an increase in damages to other properties. Building, zoning, planning and code enforcement offices usually administer preventative measures. Some examples of types of preventative measures include:

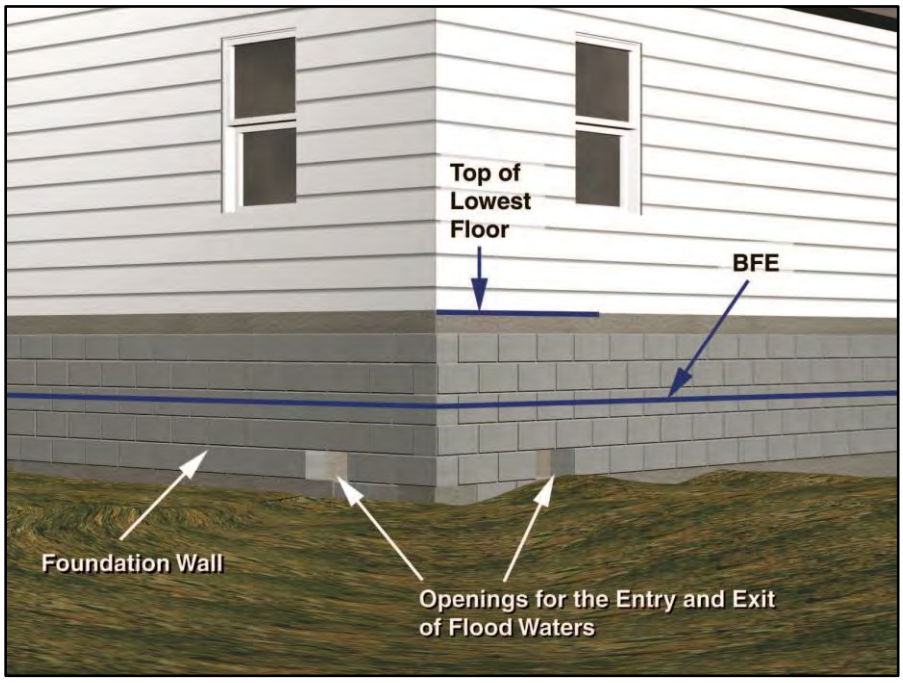
- Building codes
- Comprehensive or land use planning
- Zoning ordinance
- Open space preservation
- Floodplain regulations
- Subdivision regulations
- Stormwater management regulations

BUILDING CODES

Building codes provide one of the best methods for addressing natural hazards. When properly designed and constructed according to code, the average building can withstand many of the impacts of natural hazards. Hazard protection standards for all new and improved or repaired buildings can be incorporated into the local building code. Building codes can ensure that the first floors of new buildings are constructed to be higher than the elevation of the 100-year flood (the flood that is expected to have a one percent chance of occurring in any given year). This is shown in Figure C.1.

Just as important as having code standards is the enforcement of the code. Adequate inspections are needed during the course of construction to ensure that the builder understands the requirements and is following them. Making sure a structure is properly elevated and anchored requires site inspections at each step.

Figure C.1 – Building Codes and Flood Protection Elevations



Source: FEMA Publication: *Above the Flood: Elevating Your Floodprone House, 2000*

ASCE 24 is a referenced standard in the International Building Code. Any building or structure that falls within the scope of the IBC that is proposed in a flood hazard area is to be designed in accordance with ASCE 24. Freeboard is required as a function of the nature of occupancy and the flood zone. Dwellings and most other buildings have 1-foot of freeboard; certain essential facilities have 2-3 feet; only agricultural facilities, temporary facilities and minor storage facilities are allowed to have their lowest floors at the BFE.

COMPREHENSIVE OR LAND USE PLANNING

Building codes provide guidance on how to build in hazardous areas. Planning and zoning activities direct development away from these areas, particularly floodplains and wetlands. They do this by designating land uses that are compatible with the natural conditions of land that is prone to flooding, such as open space or recreation. Communities in the Outer Banks Region prepare land use plans in compliance with North Carolina Coastal Area Management Act (CAMA) requirements. All communities updated their comprehensive land use plans within the past five years.

ZONING ORDINANCE

Zoning enables a community to designate what uses are acceptable on a given parcel. Zoning can ensure compatibility of land use with the land's level of suitability for development. Planning and zoning activities can also provide benefits by allowing developers more flexibility in arranging improvements on a parcel of land through the planned development approach. Zoning regulations describe what type of land use and specific activities are permitted in each district, and how to regulate how buildings, signs, parking, and other construction may be placed on a lot. Zoning regulations also provide procedures for rezoning and other planning applications. The zoning map and zoning regulations provide properties with certain rights to development. Zoning is tied to land use planning; rezonings generally must be in agreement with a community's future land use map.

OPEN SPACE PRESERVATION

Keeping the floodplain and other hazardous areas open and free from development is the best approach to preventing damage to new developments. Open space can be maintained in agricultural use or can serve as parks, greenway corridors and golf courses.

Comprehensive and capital improvement plans should identify areas to be preserved by acquisition and other means, such as purchasing an easement. With an easement, the owner is free to develop and use private property, but property taxes are reduced or a payment is made to the owner if the owner agrees to not build on the part set aside in the easement.

Although there are some federal programs that can help acquire or reserve open lands, open space lands and easements do not always have to be purchased. Developers can be encouraged to dedicate park land and required to dedicate easements for drainage and maintenance purposes.

FLOODPLAIN REGULATIONS

A Flood Damage Prevention Ordinance sets development standards for Special Flood Hazard Areas (SFHAs). Communities participating in the National Flood Insurance Program (NFIP) are required to adopt a flood damage prevention ordinance that meets at least the minimum standards of the NFIP; however, a community can incorporate higher standards for increased protection. For example, communities can adopt higher regulatory freeboard requirements, cumulative substantial damage definitions, fill restrictions, and other standards.

Another important consideration in floodplain regulations is the protection of natural and beneficial functions and the preservation of natural barriers such as vegetation. Vegetation along a stream bank is extremely beneficial for the health of the stream. Trees and other plants have an extensive root system that strengthen stream banks and help prevent erosion. Vegetation that has sprouted up near streams should remain undisturbed unless removing it will significantly reduce a threat of flooding or further destruction of the stream channel.

SUBDIVISION REGULATIONS

Subdivision regulations govern how land can be divided into lots for sale and development and can include design standards and improvement requirements. Subdivision regulations can tie to mitigation in variety of ways, such as by incorporating open space conservation, encouraging cluster development, or requiring certain stormwater management standards and infrastructure.

STORMWATER MANAGEMENT REGULATIONS

Stormwater runoff is increased when natural ground cover is replaced by urban development. Development in the watershed that drains to a river can aggravate downstream flooding, overload the community's drainage system, cause erosion, and impair water quality. There are three ways to prevent flooding problems caused by stormwater runoff:

1. Regulating development in the floodplain to ensure that it will be protected from flooding and that it won't divert floodwaters onto other properties;
2. Regulating all development to ensure that the post-development peak runoff will not be greater than it was under pre-development conditions; and
3. Set construction standards so buildings are protected from shallow water.

REDUCING FUTURE FLOOD LOSSES

Zoning and comprehensive planning can work together to reduce future flood losses by directing development away from hazard prone areas. Creating or maintaining open space is the primary way to reduce future flood losses.

Planning for open space must also be supplemented with development regulations to ensure that stormwater runoff is managed and that development is protected from flooding. Enforcement of the flood damage prevention ordinance and the flood protection elevation requirement provides an extra level of protection for buildings constructed in the planning area.

Stormwater management and the requirement that post-development runoff cannot exceed pre-development conditions is one way to prevent future flood losses. Retention and detention requirements also help to reduce future flood losses.

LOCAL IMPLEMENTATION RECOMMENDATIONS

The CRS encourages strong building codes. It provides credit in two ways: points are awarded based on the community's Building Code Effectiveness Grading Schedule (BCEGS) classification and points are awarded for adopting the International Code series. In North Carolina, communities are limited by the State Building Code Council which has not implemented the most current version of the International Building Code.

CRS credits are available for regulations that encourage developers to preserve floodplains or other hazardous areas away from development. There is no credit for a plan, only for the enforceable regulations that are adopted pursuant to a plan. Communities in the Outer Banks Region could receive credit for Activity 430 – Higher Regulatory Standards and for Activity 420 – Open Space Preservation for preserving parcels within the SFHA as open space. Preserving flood prone areas as open space is one of the highest priorities of the CRS. The credits in the 2017 manual have doubled for OSP (Open Space Preservation). The participating communities could also receive credit for Activity 450 – Stormwater Management for enforcing regulations for stormwater management and soil and erosion control. Several prevention actions considered by the HMPC are detailed below.

Table C.1 – Prevention Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Prevention Measures Considered by HMPC and Not Recommended			
-	Update the Flood Damage Prevention Ordinance to include higher regulatory standards.	This has been completed to include elevation standards for all zones.	n/a
-	Continue to enforce the zoning ordinance and amend when necessary	This is an established capability of all communities.	n/a
Prevention Measures and Funding Recommended for Implementation			
CUR4	Direct development away from high-risk and vulnerable areas and establish redevelopment standards that decrease hazard risk	The new Coastal Resilience Tool, created for Currituck County by The Nature Conservancy, is used during subdivision review to encourage development away from high-risk areas.	General Fund
KDH5	Storm Water Management - Continue to implement the storm water management plan. Local Planning and Regulations.	Town implemented stormwater regulations for large single family dwellings. Maintenance requirements are being enforced on all engineered stormwater designs. Additional regulations and amendments will be considered.	General Fund

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
NGH2	Explore seeking authority and adopting regulations which would allow qualified Town staff to inspect sewer treatment facilities and on-site septic systems after a storm. These regulations should also allow staff to request the corrective actions necessary to ensure proper operation of these systems.	Septic system impacts from flooding and sea level rise are a major vulnerability. This would give the Town information and leverage to encourage mitigation.	General Fund

C.2.2 PROPERTY PROTECTION MEASURES

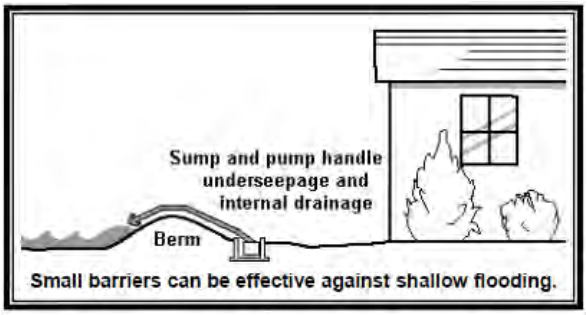
Generally, natural hazards do not damage vacant areas; the major impact of hazards is to people and improved property. Property protection measures are used to modify buildings or property that are subject to damage in order to reduce their vulnerability. Property protection measures fall under three approaches:

- Modify the site to keep the hazard from reaching the building;
- Modify the building (retrofit) so it can withstand the impacts of the hazard; and
- Insure the property to provide financial relief after the damage occurs.

Property protection measures are normally implemented by the property owner, although in many cases technical and financial assistance can be provided by a government agency.

KEEP THE HAZARD AWAY

In some cases, properties can be modified so the hazard does not reach the damage-prone improvements. For example, a berm can be built to prevent floodwaters from reaching a house.



Small barriers can be effective against shallow flooding.

BARRIERS

A flood protection barrier can be built of dirt or soil (a "berm") or concrete or steel (a "floodwall"). Careful design is needed so as not to create flooding or drainage problems on neighboring properties. Depending on how porous the ground is, if floodwaters will stay up for more than an hour or two, the design needs to account for leaks, seepage of water underneath, and rainwater that will fall inside the perimeter. This is usually done with a sump or drain to collect the internal groundwater and surface water and a pump and pipe to pump the internal drainage over the barrier. Barriers can only be built so high. They can be overtopped by a flood higher than expected. Barriers made of earth are susceptible to erosion from rain and floodwaters if not properly sloped, covered with grass, and properly maintained.

This low floodwall has landscaping to minimize the adverse impact on the property's appearance.

MODIFY THE BUILDING

There are several common methods to keep a flood from damaging a building:

- Move the building out of the flood-prone area.
- Elevate the building above the flood level.
- Demolish the building.
- Replace the building with a new one that is elevated above the flood level.
- Retrofit the building to reduce the impact of flooding when it occurs.

Elevation, acquisition, and pilot reconstruction are the most effective types to consider for the planning area.

RELOCATION

Moving a building out of a flood prone area to higher ground is the surest and safest way to protect it from flooding. While almost any building can be moved, the cost increases for heavier structures, such as those with exterior brick and stone walls, and for large or irregularly shaped buildings. Relocation is also preferred for large lots that include buildable areas outside the floodplain or where the owner has a new flood-free lot (or portion of the existing lot) available.

Small, wood frame buildings are the easiest to relocate

Source: Kennedy House Movers, Huntsville, AL

BUILDING ELEVATION

Raising a building above the flood level can be almost as effective as moving it out of the floodplain. Water flows under the building, causing little or no damage to the structure or its contents. Raising a building above the flood level is cheaper than moving it and can be less disruptive to a neighborhood. Elevation has proven to be an acceptable and reasonable means of complying with floodplain regulations that require new, substantially improved, and substantially damaged buildings to be elevated above the base flood elevation.

DEMOLITION

Some buildings, especially heavily damaged or repetitively flooded ones, are not worth the expense to protect them from future damages. It is cheaper to demolish them and either replace them with new, flood protected structures, or relocate the occupants to a safer site. Demolition is also appropriate for buildings that are difficult to move – such as larger, slab foundation or masonry structures – and for dilapidated structures that are not cost-beneficial to protect.

Demolishing a repetitively flooded home

PILOT RECONSTRUCTION

If a building is not in good shape, elevating it may not be worthwhile or it may even be dangerous. An alternative is to demolish the structure and build a new one on the site that meets or exceeds all flood protection codes. FEMA funding programs refer to this approach as "pilot reconstruction." It is still a

pilot program, and not a regularly funded option. Certain rules must be followed to qualify for federal funds for pilot reconstruction.

RETROFITTING

An alternative to keeping the hazard away from a building is to modify or retrofit the site or building to minimize or prevent damage. There are a variety of techniques to do this, as described below.

- **Dry Floodproofing**

  Dry floodproofing means making all areas below the flood protection level watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings, such as doors, windows and vents, are closed, either permanently, with removable shields, or with sandbags. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing of existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Owners of buildings located outside the regulatory floodplain can always use dry floodproofing techniques.

  Dry floodproofing is only effective for shallow flooding, such as repetitive drainage problems. It does not protect from the deep flooding along lakes and larger rivers caused by hurricanes or other storms.

- **Wet Floodproofing**

  The alternative to dry floodproofing is wet floodproofing: water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater and laundry facilities are permanently relocated to a higher floor. Where the flooding is not deep, these appliances can be raised on blocks or platforms.

INSURANCE

Technically, insurance does not mitigate damage caused by a natural hazard. However, it does help the owner repair, rebuild, and hopefully afford to incorporate some of the other property protection measures in the process. Insurance offers the advantage of protecting the property, so long as the policy is in force, without requiring human intervention for the measure to work.

- **Private Property**

  Although most homeowner's insurance policies do not cover a property for flood damage, an owner can insure a building for damage by surface flooding through the NFIP. Flood insurance coverage is provided for buildings and their contents damaged by a "general condition of surface flooding" in the area. Most people purchase flood insurance because it is required by the bank when they get a mortgage or home improvement loan. Usually these policies just cover the building's structure and not the contents. Contents coverage can be purchased separately. Renters can buy contents coverage, even if the owner does not buy structural coverage on the building. Most people don't realize that there is a 30-day waiting period to purchase a flood insurance policy and there are limits on coverage.

- **Public Property**

  Governments can purchase commercial insurance policies. Larger local governments often self-insure and absorb the cost of damage to one facility, but if many properties are exposed to damage, self-insurance can drain the government's budget. Communities cannot expect federal disaster assistance to make up the difference after a flood.

LOCAL IMPLEMENTATION RECOMMENDATIONS

The CRS provides the most credit points for acquisition and relocation under Activity 520, because this measure permanently removes insurable buildings from the floodplain. Communities in the Outer Banks Region could receive credit for Activity 520 – Acquisition and Relocation, for acquiring and relocating buildings from the SFHA. The HMPC recommended that communities pursue the purchase of repetitive loss buildings and other buildings which are subject to flood damage in order to return this land to open space.

The CRS also credits barriers and elevating existing buildings under Activity 530. The credit for Activity 530 is based on the combination of flood protection techniques used and the level of flood protection provided. Points are calculated for each protected building. Bonus points are provided for the protection of repetitive loss buildings and critical facilities. Communities could receive credit for Activity 360 – Flood Protection Assistance by providing advice and assistance to homeowners who may want to flood proof their home or business. Advice is provided both on property protection techniques and on financial assistance programs to help fund mitigation.

Flood insurance information for each community is provided in Section 5. There is no credit for purchasing flood insurance, but the CRS does provide credit for local public information programs that, among other topics, explain flood insurance to property owners. The CRS also reduces the premiums for those people who do buy NFIP coverage. Communities in the Outer Banks Region could receive credit for Activity 330 – Outreach Projects.

A selection of property protection mitigation options considered by the HMPC are described below.

Table C.2 – Property Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Property Protection Measures Considered by HMPC and Not Recommended			
-	Flood barriers	Due to the nature of flooding in this region, barriers are not a preferred mitigation technique	n/a
Property Protection Measures and Funding Recommended for Implementation			
CUR7	Support individuals and Homeowners Associations in acquiring funding for green stormwater infrastructure to mitigate nuisance flooding.	The County has the capabilities to secure funding and can support property owners mitigation efforts that benefit the wider community.	General Funds and Grants
KDH13	Substantial Damage/Substantial Improvement - Lower Threshold	This would support the Town's CRS rating and encourage property protection measures.	General Fund
SOS8	Encourage the use of Low Impact Development (LID), vegetative buffers to filter stormwater, impervious surface limits, and innovative stormwater management alternatives to reduce runoff and to improve environmental water quality.	These measures can provide on site property protection and support natural resource protection.	General Fund, NCDEQ

C.2.3 NATURAL RESOURCE PROTECTION

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas. These activities enable the naturally beneficial functions of fields, floodplains, wetlands, and other natural lands to operate more effectively. Natural and beneficial functions of watersheds, floodplains and wetlands include:

- Reduction in runoff from rainwater and stormwater in pervious areas
- Infiltration that absorbs overland flood flow
- Removal and filtering of excess nutrients, pollutants and sediments
- Storage of floodwaters
- Absorption of flood energy and reduction in flood scour
- Water quality improvement
- Groundwater recharge
- Habitat for flora and fauna
- Recreational and aesthetic opportunities

As development occurs, many of the above benefits can be achieved through regulatory steps for protecting natural areas or natural functions. This section covers the resource protection programs and standards that can help mitigate the impact of natural hazards, while they improve the overall environment. Six areas were reviewed:

- Wetland protection
- Erosion and sedimentation control
- Stream/River restoration
- Best management practices
- Dumping regulations
- Farmland protection

WETLAND PROTECTION

Wetlands are often found in floodplains and topographically depressed areas of a watershed. Many wetlands receive and store floodwaters, thus slowing and reducing downstream flows. They also serve as a natural filter, which helps to improve water quality, and they provide habitat for many species of fish, wildlife and plants.

EROSION AND SEDIMENTATION CONTROL

Farmlands and construction sites typically contain large areas of bare exposed soil. Surface water runoff can erode soil from these sites, sending sediment into downstream waterways. Erosion also occurs along stream banks and shorelines as the volume and velocity of flow or wave action destabilize and wash away the soil. Sediment suspended in the water tends to settle out where flowing water slows down. This can clog storm drains, drain tiles, culverts and ditches and reduce the water transport and storage capacity of river and stream channels, lakes and wetlands.

There are two principal strategies to address these problems: minimize erosion and control sedimentation. Techniques to minimize erosion include phased construction, minimal land clearing, and stabilizing bare ground as soon as possible with vegetation and other soil stabilizing practices.

STREAM/SHORELINE RESTORATION

There is a growing movement that has several names, such as "stream conservation," "bioengineering," or "riparian corridor restoration." The objective of these approaches is to return streams, stream banks and adjacent land to a more natural condition, including the natural meanders. Another term is "ecological restoration," which restores native indigenous plants and animals to an area.

A key component of these efforts is to use appropriate native plantings along the banks that resist erosion. This may involve retrofitting the shoreline with willow cuttings, wetland plants, or rolls of landscape material covered with a natural fabric that decomposes after the banks are stabilized with plant roots.

In all, restoring the right vegetation to a stream has the following advantages:

- Reduces the amount of sediment and pollutants entering the water
- Enhances aquatic habitat by cooling water temperature
- Provides food and shelter for both aquatic and terrestrial wildlife
- Can reduce flood damage by slowing the velocity of water
- Increases the beauty of the land and its property value
- Prevents property loss due to erosion
- Provides recreational opportunities, such as hunting, fishing and bird watching
- Reduces long-term maintenance costs

Communities are required by state and federal regulations to monitor storm water drainage outfalls and control storm water runoff.

BEST MANAGEMENT PRACTICES

Point source pollutants come from pipes such as the outfall of a municipal wastewater treatment plant. They are regulated by the US EPA. Nonpoint source pollutants come from non-specific locations and harder to regulate. Examples of nonpoint source pollutants are lawn fertilizers, pesticides, other chemicals, animal wastes, oils from street surfaces and industrial areas, and sediment from agriculture, construction, mining and forestry. These pollutants are washed off the ground's surface by stormwater and flushed into receiving storm sewers, ditches and streams.

The term "best management practices" (BMPs) refers to design, construction and maintenance practices and criteria that minimize the impact of stormwater runoff rates and volumes, prevent erosion, protect natural resources and capture nonpoint source pollutants (including sediment). They can prevent increases in downstream flooding by attenuating runoff and enhancing infiltration of stormwater. They also minimize water quality degradation, preserve beneficial natural features onsite, maintain natural base flows, minimize habitat loss, and provide multiple usages of drainage and storage facilities.

DUMPING REGULATIONS

BMPs usually address pollutants that are liquids or are suspended in water that are washed into a lake or stream. Dumping regulations address solid matter, such as shopping carts, appliances and landscape waste that can be accidentally or intentionally thrown into channels or wetlands. Such materials may not pollute the water, but they can obstruct even low flows and reduce the channels' and wetlands' abilities to convey or clean stormwater.

Many cities have nuisance ordinances that prohibit dumping garbage or other "objectionable waste" on public or private property. Waterway dumping regulations need to also apply to "non-objectionable" materials, such as grass clippings or tree branches, which can kill ground cover or cause obstructions in channels. Regular inspections to catch violations should be scheduled.

Many people do not realize the consequences of their actions. They may, for example, fill in the ditch in their front yard without realizing that is needed to drain street runoff. They may not understand how re-grading their yard, filling a wetland, or discarding leaves or branches in a watercourse can cause a problem to themselves and others. Therefore, a dumping enforcement program should include public information materials that explain the reasons for the rules as well as the penalties.

FARMLAND PROTECTION

Farmland protection is an important piece of comprehensive planning and zoning throughout the United States. The purpose of farmland protection is to provide mechanisms for prime, unique, or important agricultural land to remain as such, and to be protected from conversion to nonagricultural uses.

Frequently, farm owners sell their land to residential or commercial developers and the property is converted to non-agricultural land uses. With development comes more buildings, roads and other infrastructure. Urban sprawl occurs, which can lead to additional stormwater runoff and emergency management difficulties.

Farms on the edge of cities are often appraised based on the price they could be sold for to urban developers. This may drive farmers to sell to developers because their marginal farm operations cannot afford to be taxed as urban land. The Farmland Protection Program in the United States Department of Agriculture's 2002 Farm Bill (Part 519) allows for funds to go to state, tribal, and local governments as well as nonprofit organizations to help purchase easements on agricultural land to protect against the development of the land.

LOCAL IMPLEMENTATION RECOMMENDATIONS

There is credit for preserving open space in its natural condition or restored to a state approximating its natural condition. The credit is based on the percentage of the floodplain that can be documented as wetlands protected from development by ownership or local regulations. Communities in the Outer Banks Region could receive credit for Activity 420 – Open Space Preservation for preserving a portion of the SFHA as open space.

Additionally, credit is available for Activity 540 – Drainage System Maintenance. Having a portion of the drainage system inspected regularly throughout the year and maintenance performed as needed would earn a community credit. Communities could also get credit under this activity for providing a listing of problem sites that are inspected more frequently, and for implementing an ongoing Capital Improvements Program.

Table C.3 – Natural Resource Protection Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Natural Resource Protection Measures Considered by HMPC and Not Recommended			
-	Consider incentives rewarding developers, property owners, and builders that set aside additional open space in perpetuity.	An incentive program was not considered the most effective way to achieve open space preservation.	n/a
Natural Resource Protection Measures and Funding Recommended for Implementation			
CUR12	Currituck Sound Coalition will prioritize marsh restoration planning and design for storm surge mitigation benefits.	This action can be achieved with a partner/stakeholder organization. Pilot projects are already identified.	General Funds

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
KH6	Construct and maintain living shoreline projects in most vulnerable soundside areas	Living shorelines provide ecosystem services and can protect vulnerable coastal property from erosion and wave action.	Town Budget, Grants, Private
DCK12	Increase the amount of open space throughout the town by seeking land donations or making land purchases. Develop an open space plan to further enhance these areas.	Town led land acquisition and preservation enables the Town to be strategic about where land is acquired and how it is used, such as for education and community engagement.	General Fund

C.2.4 EMERGENCY SERVICES MEASURES

Emergency services measures protect people during and after a disaster. A good emergency management program addresses all hazards, and it involves all local government departments. This section reviews emergency services measures following a chronological order of responding to an emergency. It starts with identifying an impending problem (threat recognition) and continues through post-disaster activities.

THREAT RECOGNITION

The first step in responding to a flood is to know when weather conditions are such that an event could occur. With a proper and timely threat recognition system, adequate warnings can be disseminated.

The National Weather Service (NWS) is the prime agency for detecting meteorological threats. Severe weather warnings are transmitted through NOAA's Weather Radio System. Local emergency managers can then provide more site-specific and timely recognition after the Weather Service issues a watch or a warning. A flood threat recognition system predicts the time and height of a flood crest. This can be done by measuring rainfall, soil moisture, and stream flows upstream of the community and calculating the subsequent flood levels.

On smaller rivers and streams, locally established rainfall and river gauges are needed to establish a flood threat recognition system. The NWS may issue a "flash flood watch." This is issued to indicate current or developing hydrologic conditions that are favorable for flash flooding in and close to the watch area, but the occurrence is neither certain nor imminent. These events are so localized and so rapid that a "flash flood warning" may not be issued, especially if no remote threat recognition equipment is available. In the absence of a gauging system on small streams, the best threat recognition system is to have local personnel monitor rainfall and stream conditions. While specific flood crests and times will not be predicted, this approach will provide advance notice of potential local or flash flooding.

WARNING

The next step in emergency response following threat recognition is to notify the public and staff of other agencies and critical facilities. More people can implement protection measures if warnings are early and include specific detail.

The NWS issues notices to the public using two levels of notification:

— Watch: conditions are right for flooding, thunderstorms, tornadoes or winter storms.
— Warning: a flood, tornado, etc., has started or been observed.

A more specific warning may be disseminated by the community in a variety of ways. The following are the more common methods:

- CodeRED countywide mass telephone emergency communication system
- Commercial or public radio or TV stations
- The Weather Channel
- Cable TV emergency news inserts
- Telephone trees/mass telephone notification
- NOAA Weather Radio
- Tone activated receivers in key facilities
- Outdoor warning sirens
- Sirens on public safety vehicles
- Door-to-door contact
- Mobile public address systems
- Email notifications

Just as important as issuing a warning is telling people what to do in case of an emergency. A warning program should include a public information component.

STORMREADY

The National Weather Service (NWS) established the StormReady program to help local governments improve the timeliness and effectiveness of hazardous weather-related warnings for the public. To be officially StormReady, a community must:

- Establish a 24-hour warning point and emergency operations center
- Have more than one way to receive severe weather warnings and forecasts and to alert the public
- Create a system that monitors weather conditions locally
- Promote the importance of public readiness through community seminars
- Develop a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises

Being designated a NWS StormReady community is a good measure of a community's emergency warning program for weather hazards.

RESPONSE

The protection of life and property is the most important task of emergency responders. Concurrent with threat recognition and issuing warnings, a community should respond with actions that can prevent or reduce damage and injuries. Typical actions and responding parties include the following:

- Activating the emergency operations center (emergency preparedness)
- Closing streets or bridges (police or public works)
- Shutting off power to threatened areas (utility company)
- Passing out sand and sandbags (public works)
- Holding children at school or releasing children from school (school superintendent)
- Opening evacuation shelters (the American Red Cross)
- Monitoring water levels (public works)

— Establishing security and other protection measures (police)

An emergency action plan ensures that all bases are covered and that the response activities are appropriate for the expected threat. These plans are developed in coordination with the agencies or offices that are given various responsibilities.

Emergency response plans should be updated annually to keep contact names and telephone numbers current and to ensure that supplies and equipment that will be needed are still available. They should be critiqued and revised after disasters and exercises to take advantage of the lessons learned and of changing conditions. The end result is a coordinated effort implemented by people who have experience working together so that available resources will be used in the most efficient manner possible.

EVACUATION AND SHELTER

There are six key components to a successful evacuation:

— Adequate warning
— Adequate routes
— Proper timing to ensure the routes are clear
— Traffic control
— Knowledgeable travelers
— Care for special populations (e.g., disabled persons, prisoners, hospital patients, schoolchildren)

Those who cannot get out of harm's way need shelter. Typically, the American Red Cross will staff a shelter and ensure that there is adequate food, bedding, and wash facilities. Shelter management is a specialized skill. Managers must deal with problems like scared children, families that want to bring in their pets, and the potential for an overcrowded facility.

LOCAL IMPLEMENTATION RECOMMENDATIONS

Flash flood warnings are issued by National Weather Service Offices, which have the local and county warning responsibility. Flood warnings are forecasts of coming floods, are distributed to the public by the NOAA Weather Radio, commercial radio and television, and through local emergency agencies. The warning message tells the expected degree of flooding, the affected river, when and where flooding will begin, and the expected maximum river level at specific forecast points during flood crest.

Communities in the Outer Banks Region could receive credit for Activity 610 – Flood Warning Program for maintaining a program that provides timely identification of impending flood threats, disseminates warnings to appropriate floodplain residents, and coordinates flood response activities. Community Rating System credits are based on the number and types of warning media that can reach the community's flood prone population. Depending on the location, communities can receive credit for the telephone calling system and more credits for additional measures, like telephone trees. Being designated as a StormReady community also provides additional credits.

Table C.4 – Emergency Services Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Emergency Services Measures Considered by HMPC and Not Recommended			
-	Local evacuation planning	This is not necessary, as evacuation planning is managed at the county level	n/a

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Emergency Services Measures and Funding Recommended for Implementation			
DCK20	Participate in the Dare/Currituck County Local Emergency Preparedness Committee (LEPC)	Town Staff completed a 2024 HUREX, hurricane simulation event, training exercises in coordination with Dare County in June with a final report anticipated in the near future.	General Fund
SOS14	Continue to have a standing Reconstruction Task Force	The Task Force will incorporate mitigation into the response and recovery process by reviewing damage reports and identifying mitigation opportunities.	General Fund

C.2.5 STRUCTURAL PROJECTS

Four general types of flood control projects are reviewed here: levees, reservoirs, diversions, and dredging. These projects have three advantages not provided by other mitigation measures:

- They can stop most flooding, protecting streets and landscaping in addition to buildings.
- Many projects can be built without disrupting citizens' homes and businesses.
- They are constructed and maintained by a government agency, a more dependable long-term management arrangement than depending on many individual private property owners.

However, as shown below, structural measures also have shortcomings. The appropriateness of using flood control depends on individual project area circumstances.

Advantages

- They may provide the greatest amount of protection for land area used
- Because of land limitations, they may be the only practical solution in some circumstances
- They can incorporate other benefits into structural project design, such as water supply and recreational uses
- Regional detention may be more cost-efficient and effective than requiring numerous small detention basins

Disadvantages

- They can disturb the land and disrupt the natural water flows, often destroying wildlife habitat
- They require regular maintenance
- They are built to a certain flood protection level that can be exceeded by larger floods
- They can create a false sense of security
- They promote more intensive land use and development in the floodplain

LEVEES AND FLOODWALLS

Probably the best-known flood control measure is a barrier of earth (levee) or concrete (floodwall) erected between the watercourse and the property to be protected. Levees and floodwalls confine water to the stream channel by raising its banks. They must be well designed to account for large floods, underground seepage, pumping of internal drainage, and erosion and scour.

RESERVOIRS AND DETENTION

Reservoirs reduce flooding by temporarily storing flood waters behind dams or in storage or detention basins. Reservoirs lower flood heights by holding back, or detaining, runoff before it can flow downstream. Flood waters are detained until the flood has subsided, and then the water in the reservoir or detention basin is released or pumped out slowly at a rate that the river can accommodate downstream.

Reservoirs can be dry and remain idle until a large rain event occurs. Or they may be designed so that a lake or pond is created. The lake may provide recreational benefits or water supply (which could also help mitigate a drought).

Retention pond

Flood control reservoirs are most commonly built for one of two purposes. Large reservoirs are constructed to protect property from existing flood problems. Smaller reservoirs, or detention basins, are built to protect property from the stormwater runoff impacts of new development.

DIVERSION

A diversion is a new channel that sends floodwaters to a different location, thereby reducing flooding along an existing watercourse. Diversions can be surface channels, overflow weirs, or tunnels. During normal flows, the water stays in the old channel. During floods, the floodwaters spill over to the diversion channel or tunnel, which carries the excess water to a receiving lake or river.

LOCAL IMPLEMENTATION RECOMMENDATIONS

Structural flood control projects that provide at least 100-year flood protection and that result in revisions to the Flood Insurance Rate Map are not credited by the CRS so as not to duplicate the larger premium reduction provided by removing properties from the mapped floodplain. Other flood control projects can be accepted by offering a 25-year flood protection.

Table C.5 – Structural Projects Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Structural Project Measures Considered by HMPC and Not Recommended			
-	New stormwater reservoirs	New large-scale reservoirs are not currently recommended	n/a
Structural Project Measures and Funding Recommended for Implementation			
NGH16	Investigate innovative solutions to unconventional drainage problems. This may include the implementation of groundwater management techniques and low impact development practices which address stormwater runoff at or near its source.	The Town can pursue grant funding to improve stormwater management while supporting natural resource protection	General Fund/ Stormwater
DCK18	Improve stormwater drainage in vulnerable areas and provide funding for necessary stormwater improvements.	Multiple locations for improvements are identified and some funding has been secured for implementation.	General Fund

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
KH2	Implement projects identified in Kitty Hawk RCCP Plan.	These projects have been identified through a similar local planning effort and will support the goals of this plan and advance local resilience	NC DCM

C.2.6 PUBLIC INFORMATION

OUTREACH PROJECTS

Outreach projects are the first step in the process of orienting property owners to the hazards they face and to the concept of property protection. They are designed to encourage people to seek out more information in order to take steps to protect themselves and their properties.

Awareness of the hazard is not enough; people need to be told what they can do about the hazard. Thus, projects should include information on safety, health and property protection measures. Research has shown that a properly run local information program is more effective than national advertising or publicity campaigns. Therefore, outreach projects should be locally designed and tailored to meet local conditions.

Community newsletters/direct mailings: The most effective types of outreach projects are mailed or distributed to everyone in the community. In the case of floods, they can be sent only to floodplain property owners.

News media: Local newspapers can be strong allies in efforts to inform the public. Local radio stations and cable TV channels can also help. These media offer interview formats and cable TV may be willing to broadcast videos on the hazards.

LIBRARIES AND WEBSITES

The two previous activities tell people that they are exposed to a hazard. The next step is to provide information to those who want to know more. The community library and local websites are obvious places for residents to seek information on hazards, hazard protection, and protecting natural resources.

Books and pamphlets on hazard mitigation can be given to libraries, and many of these can be obtained for free from state and federal agencies. Libraries also have their own public information campaigns with displays, lectures and other projects, which can augment the activities of the local government. Today, websites are commonly used as research tools. They provide fast access to a wealth of public and private sites for information. Through links to other websites, there is almost no limit to the amount of up to date information that can be accessed on the Internet.

In addition to online floodplain maps, websites can link to information for homeowners on how to retrofit for floods or a website about floods for children.

TECHNICAL ASSISTANCE

HAZARD INFORMATION

Residents and business owners that are aware of the potential hazards can take steps to avoid problems or reduce their exposure to flooding. Communities can easily provide map information from FEMA's

FIRMs and Flood Insurance Studies. They may also assist residents in submitting requests for map amendments and revisions when they are needed to show that a building is located outside the mapped floodplain.

Some communities supplement what is shown on the FIRM with information on additional hazards, flooding outside mapped areas and zoning. When the map information is provided, community staff can explain insurance, property protection measures and mitigation options that are available to property owners. They should also remind inquirers that being outside the mapped floodplain is no guarantee that a property will never flood.

PROPERTY PROTECTION ASSISTANCE

While general information provided by outreach projects or the library is beneficial, most property owners do not feel ready to retrofit their buildings without more specific guidance. Local building department staffs are experts in construction. They can provide free advice, not necessarily to design a protection measure, but to steer the owner onto the right track. Building or public works department staffs can provide the following types of assistance:

- Visit properties and offer protection suggestions
- Recommend or identify qualified or licensed contractors
- Inspect homes for anchoring of roofing and the home to the foundation
- Explain when building permits are needed for home improvements.

PUBLIC INFORMATION PROGRAM

A Program for Public Information (PPI) is a document that receives CRS credit for organizing flood-related outreach. It is a review of local conditions, local public information needs, and a recommended plan of activities. A PPI consists of the following parts, which are incorporated into this plan:

- The local flood hazard
- The property protection measures appropriate for the flood hazard
- Flood safety measures appropriate for the local situation
- The public information activities currently being implemented within the community, including those being carried out by non-government agencies
- Goals for the community's public information program
- The outreach projects that will be done each year to reach the goals
- The process that will be followed to monitor and evaluate the projects

LOCAL IMPLEMENTATION RECOMMENDATIONS

Communities in the Outer Banks Region could receive credit under Activity 330 – Outreach Projects as well as Activity 350 – Flood Protection Information. Credit is available for targeted and general outreach projects. Credit is also provided for making publications relating to floodplain management available in the reference section of the local library.

Table C.6 – Public Information and Outreach Mitigation Options and Recommended Projects

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Public Information and Outreach Measures Considered by HMPC and Not Recommended			
-	Financial Assistance Advice	Administrative limitations	n/a

Action #	Mitigation Action	Reason for Pursuing / Not Pursuing	Funding
Public Information and Outreach Measures and Funding Recommended for Implementation			
DCK31	Provide residents information and links to technical assistance concerning soundfront property protection	Provides specific targeted information to increase property owner capability to pursue mitigation	General Fund
KDH30	Circulate brochure specifically on NFIP	Increases flood insurance awareness and coverage	General Fund
KH14	Provide information on flood damage protection techniques to citizens and property owners.	Increases property owner capability to pursue mitigation	Town Budget

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