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Reducing Risks from Natural Disasters in Rhode Island: A Case Study of Local Hazard Mitigation Planning in North Kingstown

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Reducing Risks from Natural Disasters in Rhode Island: A Case Study of Local Hazard Mitigation Planning in North Kingstown

By

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A research project submitted in partial fulfillment of the requirements for the degree of Master of Community Planning

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Master of Community Planning

Research Project

of

Bonnie M. Dixon

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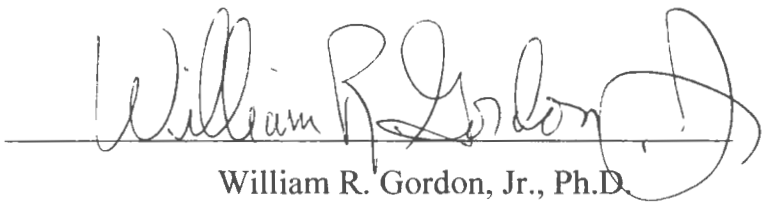
Major Professor 

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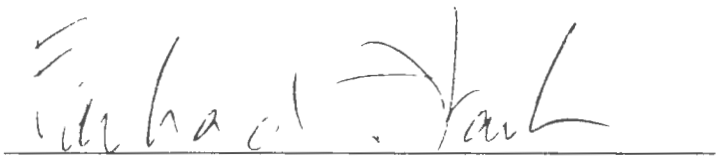
Director 

Farhad Atash, Ph.D.

Abstract

The Disaster Mitigation Act of 2000 provided strengthened federal incentives for local hazard mitigation planning. In Rhode Island, this process is currently being carried out by each municipality with guidance from the Rhode Island Emergency Management Agency (RIEMA). This analysis of the local hazard mitigation planning process in Rhode Island is based on the author's participation in hazard mitigation planning in North Kingstown, and a review of the scholarly literature.

Six points are identified on which Rhode Island's process could be improved: 1) more use of specialized expertise, 2) continuous staffing of planning and implementation, 3) greater coordination between jurisdictions, 4) use of measurable evaluation criteria, 5) more public education, and 6) use of computerized analysis techniques. In order to achieve these improvements, it is recommended that RIEMA consider organizing multi-jurisdictional hazard mitigation planning, as is done in many other states. This would make it possible for plans to be authored and implemented by permanently employed professional hazard mitigation specialists. The result of this would be plans of higher quality with more effective implementation. With this approach, risks and vulnerabilities from natural hazards could be more effectively reduced for residents and businesses in Rhode Island.

Acknowledgements

This project was made possible by the North Kingstown Planning Department, which provided the opportunity for me to work on revising the town's hazard mitigation plan. Thanks especially to Becky Pellerin, who supervised the project. She made working on the project an enjoyable experience. Marilyn Cohen, the Planning Director, also provided valuable input and guidance. Under her direction, the town benefits from first-class planning, and working for her department was a highly valued educational experience for me.

Thanks also to Professor William Gordon for review and commentary on drafts. His instruction and moral support were invaluable throughout my masters program of study. Guidance and instruction from Professor Farhad Atash was also essential in my education and development as a planner. Thanks also to Professor Robert Thompson for instruction in GIS techniques useful for hazard mitigation.

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Preface

In the summer of 2004, the author, working as a Planning Intern for the town of North Kingstown, Rhode Island, carried out major revisions to the town's natural hazard mitigation plan. The plan had originally been written by an intern in 2002, but had subsequently failed to be approved by the Federal Emergency Management Agency (FEMA) due to deficiencies in some of the elements required under the Interim Final Rule (44 CFR Parts 201 and 206) which became effective in the same year. The 2004 revision of the plan took approximately two months and involved adding sections and information and reorganizing the document to match the contents required by the Rule, as well as updating information in the document.

This report is an analysis of the local hazard mitigation planning process as it is currently carried out in Rhode Island. The analysis is partly based on the experience of revising a town's hazard mitigation plan and partly on a review of the scholarly literature about the local role in mitigation planning. Particular attention is paid to the question of whether the procedure followed by towns in Rhode Island effectively generates significant substantive improvements in hazard risk or vulnerability in the towns. Using the hazard mitigation planning process of North Kingstown as a representative example, this report takes a case study approach, reflecting on the strengths and weaknesses of the process and suggesting changes which could improve its effectiveness.

Introduction

Natural Hazards in Rhode Island

A review of the history of Rhode Island is sufficient testimony to the significant impact that natural disasters have had on life in the state. Most notable in the record was the Great New England Hurricane of 1938, a category 3 storm with 121 mile per hour (mph) winds. The hurricane affected the Narragansett Bay area most strongly due to a storm surge 12-15 feet higher than normal maximum high tides (University of Rhode Island, Office of Marine Programs, 2005). Many whole neighborhoods were washed away, including over 100 beach cottages at Quonset Point, where nine people were killed. The death toll across the state was significant. Subsequent strong hurricanes occurred in 1954, 1955, 1985, and most recently in 1991, when hurricane Bob caused $115 million in property damage with its 105 mph winds (National Oceanographic and Atmospheric Administration, Coastal Services Center, 1999).

Blizzards have also caused substantial damage in Rhode Island. The Blizzard of 1978 made roads impassible for five days and left some areas without electricity for up to a week. The Narragansett Bay is also a regional hot spot for earthquake activity with 15 quakes recorded since 1928.

Rhode Island's current vulnerabilities to natural disasters remain considerable. The risk from hurricanes alone has been estimated to include a one percent chance each year of losing $600-800 million in property damage (Institute for Business and Home Safety, 2000). Extensive redevelopment of coastal areas

where development was previously destroyed by hurricanes has set the stage for a potential repeat of the destruction the state experienced in 1938 (National Oceanographic and Atmospheric Administration, 2005). The probability of a named storm directly striking Rhode Island in any given season is approximately 22% (Atlantic Oceanographic and Meteorological Laboratory, 2004). Rhode Island's position along a generally southward facing stretch of coastline makes it particularly susceptible to being hit by hurricanes, which generally move up the Atlantic coast from the south. The configuration of Narragansett Bay increases the likelihood of flooding in a hurricane due to funneling of high storm surge tides. Rhode Island is also considered to be at risk for droughts, blizzards, earthquakes, wildfires, and tornados.

Hazard Mitigation

The management of emergencies and natural disasters is generally considered to include four types of activities (O'Connor, 2005): 1) mitigation is the reduction or elimination of future risk, 2) preparedness is a practiced state of readiness to respond, 3) response is an immediate action or relief that saves lives, and 4) recovery is the process of repair and restoration. Mitigation planning for natural hazards involves assessing a community's risks and vulnerabilities and enacting programs or policies designed to avoid, reduce, or offset the impacts of natural disasters on people and property. It includes both structural and non-structural activities. Examples of hazard mitigation activities include public education about hazard risks, emergency preparedness planning, implementation of land use and building regulations designed to reduce exposure and vulnerability to hazards, acquisition of properties in hazardous locations, and structure relocation or retrofitting

(Randolph, 2004). It has been estimated that for every dollar spent on hazard mitigation, two dollars are saved in disaster losses. Hazard mitigation makes a community more resilient and environmentally sustainable (Monday, 2004).

The Federal Mandate

The primary role of the federal government in disasters has traditionally been to provide local communities with assistance in emergency response and recovery after a disaster. In many cases, federal assistance has been provided repeatedly to the same properties for the same type of disaster loss, and used to rebuild structures in the same hazardous locations where losses are likely to recur, in effect subsidizing development in hazardous locations. Such experiences during the 1990's, along with advances in scientific abilities to predict risks and impacts of natural hazards, stimulated federal interest in pre-disaster planning for prevention of hazard impacts. In particular, hazard mitigation includes the concept that the most hazardous locations should be left undeveloped. Local land use planning is an essential component of the mitigation process.

In 1998 FEMA established a Hazard Mitigation Planning Division to promote and support the mitigation planning process by providing guidance to state, local, and tribal governments (FEMA, 2005). The Disaster Mitigation Act of 2000 (DMA 2000, P.L. 106-390) amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act, P.L. 93-288) by creating incentives for states and local governments to develop and implement hazard mitigation plans. Specifically, DMA 2000 makes the availability of federal funds through its Hazard Mitigation Grant Program (HMGP) and Pre-Disaster

Mitigation (PDM) program contingent upon the existence of an approved local hazard mitigation plan. The act also established funding programs to assist communities in the development of these plans.

FEMA guidance (FEMA, 2004; FEMA, 2002) encourages communities to integrate hazard mitigation planning with comprehensive planning by systematically identifying and carrying out actions that will reduce long term risks to life and property, and doing so in an open, public process. The mitigation planning process is described as having four phases: 1) organize resources, 2) assess risks, 3) develop a mitigation plan, and 4) implement the plan and monitor progress. In 2002 the Interim Final Rule (44 CFR Parts 201 and 206) was published clarifying the contents required in a local hazard mitigation plan. An outline of the required contents is as follows:

1. Documentation of the planning process
2. Risk assessment
    i. Description of all natural hazards that can affect the jurisdiction
    ii. Description of the jurisdiction's vulnerability to the hazards described
        A. Buildings and facilities located in hazard areas
        B. Estimate of potential dollar losses to vulnerable structures
        C. Description of land uses and development trends
    iii. For multi-jurisdictional plans, the risks of each jurisdiction
3. Mitigation strategy
    i. Mitigation goals
    ii. Analysis of mitigation actions

iii. Action plan, including prioritization according to cost-benefit review
iv. For multi-jurisdictional plans, action items specific to the jurisdiction requesting approval

4. Plan maintenance process
   i. Monitoring, evaluation and updating within a five year cycle
   ii. Incorporation of the plan into other planning mechanisms
   iii. Public participation in the plan maintenance process
5. Formal adoption of the plan by the governing body of the jurisdiction

Local hazard mitigation plans must be approved by the state emergency management agency as being consistent with the state hazard mitigation plan before going to FEMA for final review and approval.

Hazard Mitigation in Rhode Island

The Rhode Island Emergency Management Agency (RIEMA) is currently coordinating the development or implementation of local hazard mitigation plans in all of the 39 towns and cities in the state (RIEMA, 2005). Funding from FEMA's Project Impact have been applied to this effort, and FEMA recently gave Rhode Island its Outstanding State award in recognition of the state's success in incorporating hazard mitigation into the local planning process. Additionally, Rhode Island is one of two Showcase States, working with the Institute for Business and Home Safety, an insurance industry group, to demonstrate how states can take on comprehensive hazard mitigation planning (Institute for Business and Home Safety, 2000).

Rhode Island's quickness to embrace local hazard mitigation planning has made each of its municipalities pioneers in the fulfillment of FEMA's new mandate. The hazard mitigation plan of the town of North Kingstown is included in Appendix B as an example of the results of this effort. The town's planning process involved the creation of a hazard mitigation committee, which met throughout the spring and summer of 2002 to assess the town's vulnerabilities and decide on an action plan. The resulting document, which after revision, has been approved by RIEMA and FEMA and incorporated into the town's comprehensive plan, contains information about historical disasters which struck the town, a survey of emergency response resources available at each of the businesses in the town, an assessment of risks and vulnerabilities, and an action plan listing 72 actions the town is taking to reduce these risks. The effectiveness with which this planning process has addressed the goals of hazard mitigation can be assessed by first reviewing the relevant scholarly literature on effective local hazard mitigation planning.

Literature Review

Elements Contributing to Effective Local Hazard Mitigation

Scholarly writings on the topic of hazard mitigation planning are in agreement that local land use planning is essential and can be a highly effective approach to reducing hazard risks and losses if done well (Burby, 1999; Prater, 1999, Hazard Reduction and Recovery Center, 2005, Natural Hazards Center, 2005). State emergency management agencies are reportedly quite satisfied with the effects of federal grant programs available for local mitigation projects (General Accounting Office, 2002).

Research shows that strong state or federal incentives or mandates are necessary in order to induce local jurisdictions to take up hazard mitigation planning and that these policies are effective at reducing hazard losses (May and Burby, 1996; Burby, 2005). Some scholars have called upon the federal government to have restraint in paying for disaster losses so as to break the cycle of subsidizing development in hazard vulnerable locations. The federal government has also been called upon to resolve the legal issues that currently prevent local jurisdictions and states from using strong, non-compensatory land use controls to prevent hazard vulnerable development, due to the fear of "takings" litigation (Platt, 1999 and 1996; Burby, 1999).

Unfortunately, studies conducted in the 1990's found many problems with the state of local hazard mitigation planning during that decade, including lack of planning in many areas or reactive plans of poor quality (Godschalk, 1999). Additionally, one expert source noted that implementation of plans is often

poorly carried out (Gordon, 2005), sometimes due to short term staffing of hazard mitigation planning and lack of knowledge of the plan on the part of town officials. This low level of implementation can cause hazard mitigation to be a process lacking in substance.

The recipe for highly successful hazard mitigation planning, according to research, is to incorporate it into local comprehensive planning. Evaluation methods should be determined early on in the planning process, so that benchmarks for improvement can be established (Gordon, 2005).

Because hazard risks vary according to natural geography, such as coastlines and watersheds, and not jurisdictional boundaries, it is necessary that the process include cooperation between jurisdictions and among all levels of government (May and Burby, 1996; Platt, 2005).

A public process is ideal since it increases public awareness of risks (Burby, 1999). However, this is difficult to achieve, since public interest in natural hazards is generally low (Godschalk, Brody, and Burby, 2003). Therefore, an active approach to public education and soliciting participation is necessary.

Sophisticated software and quantitative methods are helpful tools for the assessment and quantification of risks and vulnerabilities. They are also helpful in the prioritization of mitigation activities according to their costs and benefits (Flax, Jackson, and Stein, 2002; Odeh, 2002). These methods are currently under development, most notably FEMA's HAZUS software (FEMA, 2005). General GIS software can also be used for conducting vulnerability analysis.

The quality of local hazard mitigation plans has been found to increase with increasing investment of resources in the process (Prater, 1999). The availability of professional staff with specialized expertise in hazard mitigation is essential to the success of the process (Gordon, 2005; Platt, 2005).

Analysis

Critique of Hazard Mitigation in Rhode Island

Comparing the characteristics of ideal local hazard mitigation planning as described in the literature to how it is actually being done in Rhode Island reveals both strengths and weaknesses. Most notably, it is impressive that all of the 39 towns and cities in the state have committed to write a hazard mitigation plan. This high rate of participation has been achieved through RIEMA's outreach efforts to the municipalities in combination with the strengthened incentives provided in the DMA 2000, and has earned for Rhode Island FEMA's Outstanding State award. In this way, hazard mitigation has become an accepted part of local comprehensive planning and been added to the agenda of the planning community in the state. The production of the North Kingstown Hazard Mitigation Plan and formation of the town's hazard mitigation committee, for example, has stimulated greater awareness and understanding of hazards and the inclusion of hazard considerations in the town's comprehensive plan and emergency operations.

Public participation in production of the plan included a public workshop, at least two public hearings before the town council, and the inclusion of members of the public on the hazard mitigation committee. Thus, ample opportunity was provided for members of the public to give input. Public education is also included in the town's action plan in the form of information brochures for property owners and renters informing them of their hazard risks. Given the low level of public interest in natural hazards and the importance of mitigation actions taken by individuals and businesses

(Godschalk, Brody, and Burby, 2003), the scholarly literature would seem to suggest that towns should also consider promoting hazard and risk awareness more actively through public workshops, school presentations, etc. Training sessions for key town staff should also be undertaken.

Intergovernmental cooperation was achieved by sending the plan to neighboring municipalities for their review and through state level review by RIEMA and federal review by FEMA. This element of the planning process could certainly be taken to a higher level through collaborative planning between neighboring municipalities. Given the common geographies and hazard risks of neighboring towns and the specialized knowledge and skills necessary to plan for hazards, common hazard mitigation planning could result in efficiencies for all municipalities involved. The planning of evacuation routes would also benefit from multi-jurisdictional cooperation.

The resources that were invested in the planning process primarily consisted of full-time paid interns working on the plan over the course of many months. These interns were graduate students in the planning program at the University of Rhode Island, and the creation of the hazard mitigation plan partly served as an educational experience for them. Limited technical assistance was available from RIEMA and FEMA Region 1, and hazard maps were provided by the URI Environmental Data Center. However the work was, for the most part, an independent effort by the town, making the limitations on resources available a very real concern.

This process produced a plan of sufficient quality in time for the applicable deadline using resources readily available to the town. Given the complexity

of natural hazards, it can certainly be argued that the quality of a plan and efficiency with which it is produced could be higher if it is authored by a professional hazard mitigation specialist, although this approach would be more expensive and would sacrifice the educational value of the process for student interns. Hazard mitigation planning has excellent educational value for students. However, given its complexity; a student would perhaps be more appropriate in an assisting role rather than authoring a plan. Alternatively, the quality and efficiency of the process could be improved by the provision of more extensive technical assistance from the state. At the very least, staff members should be available, who have detailed familiarity with FEMA's requirements and can advise towns on methods of achieving these.

Ongoing implementation of the planning process is overseen by a principal planner of the town, who also supervised the interns in writing and revising the plan. The Police Department also took an active interest in the implementation called for in the plan. It can be argued, however, that implementation might be improved if carried out by the same staff that wrote the plan, and therefore has intimate familiarity with it, and if this were a permanent employee of the town.

The challenge of using sophisticated techniques to assess hazard vulnerabilities and generate quantitative estimates of potential losses was not accomplished in the current plan and remains in the town's plans for the future. This is an example of one aspect of hazard mitigation planning in which professional authorship, or more extensive technical assistance is needed, since these calculations require specialized training and software. Quantified estimates of hazard risks help to better inform cost-benefit review

and decisions regarding the prioritization of mitigation actions. Unfortunately, the limited resources of a town working independently do not generally make this high level of rigorous analysis a reasonable expectation.

Committee meetings to evaluate and update the plan are required twice yearly. This schedule will provide good opportunities for the plan to be continuously improved. The protocol for evaluation could be improved further with the addition of specific methods of evaluation including measurable criteria. These criteria could take the form of reductions to risk or vulnerability ratings relative to benchmarks set by the initial vulnerability analysis. This is another example in which extensive technical assistance or professional staff expertise would be helpful. It is also an example of the importance of substantive content in hazard mitigation plans as opposed to simply following the process and using the required terminology. FEMA reviewers should carefully evaluate plans for such important elements of substantive content.

Overall, local hazard mitigation planning is clearly progressing and improving rapidly in Rhode Island and in the town of North Kingstown. However, further improvements could be achieved on the following points:

1) More specialized expertise either doing the planning or providing extensive technical assistance to the planner,
2) Long-term, continuous staff for plan writing and implementation,
3) More coordination between towns sharing common geographies,
4) Ongoing public education and staff training,
5) Measurable criteria for evaluation of plans, and
6) More sophisticated methods of risk and vulnerability analysis.

The following procedural change is suggested as a way of simultaneously addressing all of these points and achieving more substantive and effective hazard mitigation planning.

Recommendation for improvement

Given the limited resources that municipalities have available to put towards hazard mitigation, the state and its municipalities should consider multi-jurisdictional hazard mitigation planning, in which groups of towns that share common geographic situations would share a common hazard mitigation plan. The multi-jurisdictional approach is commonly used in hazard mitigation in other states, sometimes including over forty jurisdictions in one plan, and many areas plan at the county level rather then by individual municipalities. Hazard mitigation planning at the town level is in fact rare outside Rhode Island, as it is generally recognized that hazard mitigation is a more specialized activity than can be reasonably be expected of all but the largest municipalities.

Multi-jurisdictional planning should be coordinated and partly funded by RIEMA, which would organize the towns into "hazard mitigation zones" and provide a hazard mitigation expert to work for each zone. By grouping together into "hazard mitigation zones", towns would be better able to afford a full-time hazard mitigation specialist to write their hazard mitigation plans and oversee ongoing implementation. This would be a boon to already overextended town planners, who would have more time available for other planning concerns. It would also improve the quality and consistency of hazard mitigation planning. Each town would be represented on the hazard

mitigation committee and the town planners would remain involved in the process. RIEMA's role would be merely organizational and supportive, while the towns, acting as a group within each zone would be in control of the planning and implementation process. An example of how the state could be divided into hazard mitigation zones is shown below in Figure 1.

FEMA guidance specifies that multi-jurisdictional plans must document how each jurisdiction was involved in the planning process, must specify which hazard risks apply in which jurisdictions, and must include action items assigned to each jurisdiction. In this way it is ensured that the local details of each municipality are accounted for in the planning. The major challenge of the multi-jurisdictional approach would be coordinating and funding the process. RIEMA's guidance and active involvement with this would be essential for success.

Figure 1. Possible hazard zone groupings.

This reorganization of the planning process would give the benefits of professional quality and efficiency to the planning effort while still keeping

each town in control of decisions about actions for which it will be responsible. Each of the points where improvement is needed, as highlighted by the preceding critique, could be more easily addressed with this approach.

The hazard mitigation officer responsible for each hazard zone would author a multi-jurisdictional plan for the towns in that zone and would carry out ongoing implementation and updates of the plan. This officer would also be responsible for conducting ongoing public education and staff training sessions. This individual would be part of the emergency response command structure. This approach would achieve far better follow-through and institutional memory than interns or consultants can provide by giving responsibility to a full-time permanent staff person. A specialist in hazard mitigation would also have more detailed knowledge about hazards and how to evaluate and prioritize hazard mitigation actions, as well as greater capacity to use sophisticated tools such as HAZUS and GIS software. Figures 2 and 3 show examples of how GIS generated graphics can be highly effective for analyzing and communicating hazard risks. Since the hazard mitigation specialist would be working for a group of towns, cooperative programs and planning between the jurisdictions would happen automatically where appropriate.

Figure 2. The flood zone predicted by the SLOSH model in a category 3 hurricane at high tide along the Charlestown shore. The maximum predicted surge height is approximately 15 ft. above normal high tide with wave heights additional.

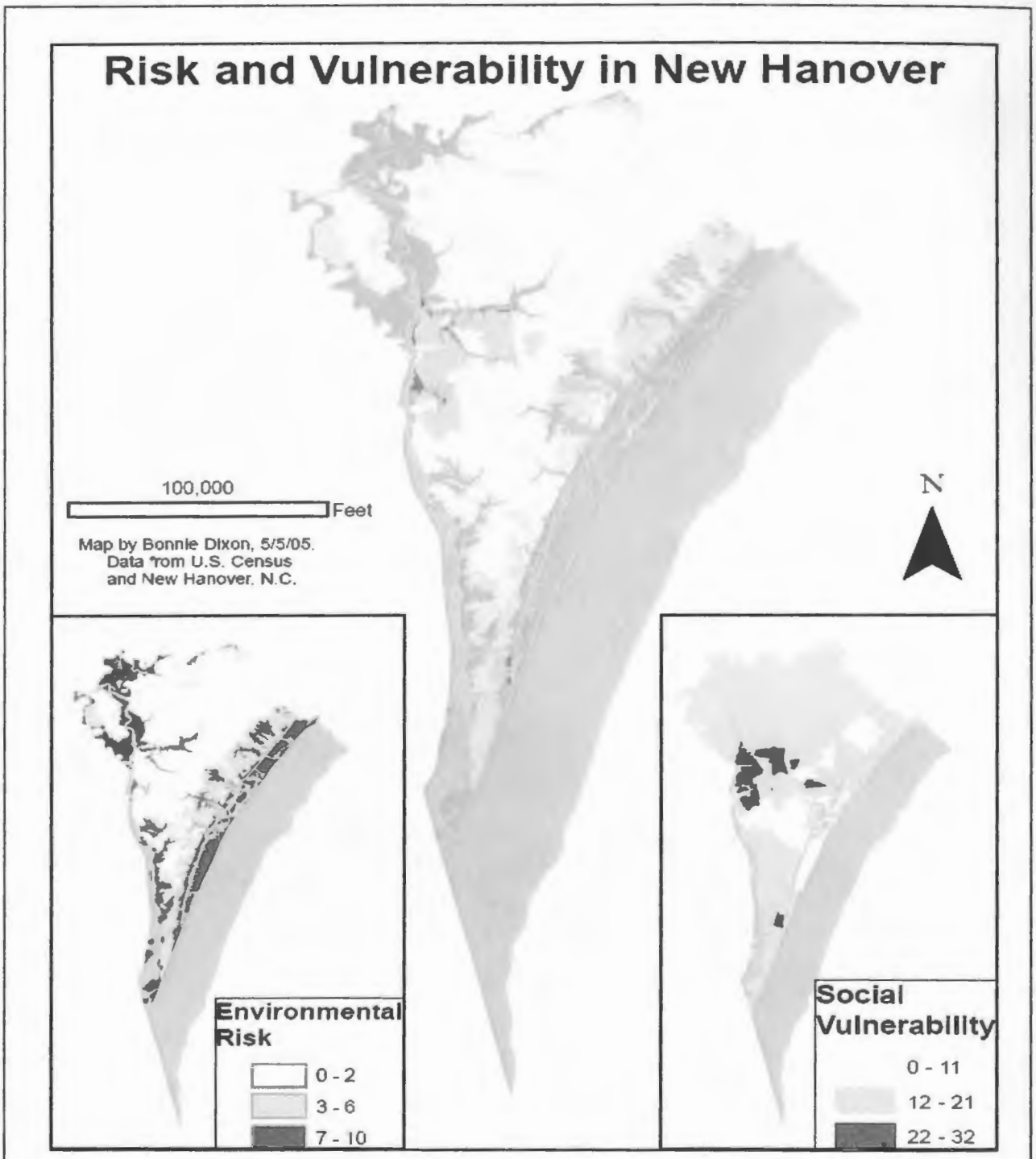

Figure 3. A GIS analysis like this one for New Hanover, NC, displays the locations where environmental risks, such as flooding, overlap with social vulnerabilities, such as low rates of car ownership.

Conclusion

Hazard mitigation planning can be a highly effective approach to the protection of life and property from natural disasters, and it is an important component of sustainable development. Rhode Island's advances in local hazard mitigation planning are progressing well and are likely to reap significant benefits for the state. Nevertheless, potential exists to continue refining and improving the way the process is carried out in order to achieve even greater quality of planning and long term benefits.

The results of this assessment suggest that Rhode Island's local hazard mitigation process should ideally take place at a slightly larger geographic scale, while leaving control in the hands of the municipalities. This can be achieved through coordinated multi-jurisdictional planning. Hazard mitigation is a complex and information intensive undertaking, which benefits from more specialized knowledge and techniques than municipalities realistically have the capacity to provide. Expert leadership would ensure that the hazard mitigation process results in substantive improvements to the level of risk and vulnerability in Rhode Island towns. With RIEMA coordinating the process and a professional hazard mitigation specialist working for the towns of each hazard mitigation zone, local hazard mitigation planning could be taken to a higher level of rigor, continuity, and effectiveness.

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Appendix A

Changes Made to Hazard Mitigation Plan, Summer 2004:

In response to reviewer comment:

Documentation of the Planning Process

- Added Appendix E on Committee membership and meetings, etc.

Profiling Hazard Events

- Added new info on future probability for each hazard according to instructions in How-To Guide and some more historic info on past events.

Assessing Vulnerability: Overview

- Added Vulnerability Overview Section organized by hazard.

Assessing Vulnerability: Highlighted Sections

- Created section on development trends including map of Quonset, added Action #18 (detailed analysis of vulnerabilities and estimation of potential losses).

Identification and Analysis of Mitigation Measures

- Prioritized action items. Added discussion in section 3.0 on how ideas were generated, selected for implementation, and prioritized.

Implementation of Mitigation Measures

- Created section on prioritization

In response to How-To Guide:

Identify Hazards: Tasks A and B

- Re-categorized hazards according to event type rather then impact type.
- Followed instructions for evaluating the risk of each hazard.
- Identified hurricanes and costal storms as the focus of the plan.
- Rated level of risk from each hazard.

Profile hazards:

- Added info on costal erosion during hurricanes.
- Added info on hurricane activity cycles of tropical Atlantic.

In response to 2004 Guidance:

Assess Vulnerability:

- Added general discussion of hypothetical storm losses.

Mitigation Strategy

- Added goals.
- Moved objectives to right hand column of matrix.

Implementation of Actions

- Added description of prioritization of actions including costs and benefits.

Monitoring, Evaluating, and Updating the Plan

- Changed headings to match guidance terminology.
- Added paragraph on evaluation criteria.

In response to RIEMA checklist:

Identifying Hazards:

- Added section on tornadoes.

General:

Organization:

- Inserted maps and risk assessment matrix into text.
- Spilt up cultural and recreational resources.
- Improved organization of action plan.
- Changed organization to better mirror FEMA guidance.

Additions:

- Added streets to infrastructure section of action plan.
- Added docks to recreation section.
- Added map of historic storm tracks and chart of population increase from NOAA website.
- Added RIEMA stats. on percentage of acreage and population in flood and storm surge zones
- Updated national flood insurance stats.
- Updated building code info.
- Added references section.
- Described applicability to man-made hazards.
- Added action item for improvements to repetitive loss properties.
- Included town's CRS rating.

Deletions:

- Deleted action item on relocation of Quonset wastewater facility at request of EDC.

Appendix B

The North Kingstown Hazard Mitigation Plan

Strategy for Reducing Risks From Natural Hazards in North Kingstown, Rhode Island

A Multi-Hazard Mitigation Strategy

2004

Purpose: The purpose of this report is to recommend actions and policies for the Town of North Kingstown to minimize the social and economic loss and disruption associated with natural hazard events. Hazard mitigation is an ongoing process that will require continued implementation, evaluation, and revision. This report, coupled with an ongoing commitment to hazard mitigation from the Town and committee, is intended to preserve and enhance the safety, quality of life, and natural resources of North Kingstown.

This document should be referenced as:

Town of North Kingstown. Strategy for Reducing Risks from Natural Hazards in North Kingstown, Rhode Island: A Multi-Hazard Mitigation Strategy, Town of North Kingstown, Rhode Island, 2002, Revised 2004.

Cover picture is an aerial view of Wickford village and its harbor.
Courtesy:

This document is available electronically at www.state.ri.us/riema and www.northkingstown.org.

Strategy for Reducing Risks From Natural Hazards in North Kingstown, Rhode Island

A Multi-Hazard Mitigation Strategy

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1.0 – Introduction

Hazard mitigation is a set of actions and policies designed to reduce the impacts of naturally occurring disasters on people and property. Advances in the ability to predict the occurrence and effects of natural disasters, from severe storms to earthquakes, have provided government bodies with an opportunity to prepare for them. Although many of the actions described in this plan are also applicable to man-made hazards, such as terrorism and technological accidents, mitigation of these hazards is primarily covered in the town's Emergency Operations Plan. Disaster preparation can have enormous benefits in lessened loss of life, economic and social impacts, and post-disaster recovery time. This process is an important part of the effort to develop a sustainable community, which is resilient and continues to thrive over time.

Benefits of Hazard Mitigation

The most immediate benefit of natural hazard mitigation planning is the reduction and elimination of the negative impacts of natural disasters in terms of lost life and property. With adequate preparation the Town can significantly reduce the economic and social disruptions caused by natural disasters and reduce the costs of recovery for the town, local businesses, and residents. It has been estimated that for every dollar spent on hazard mitigation, two dollars are saved in disaster losses.

The Federal Emergency Management Agency (FEMA) offers three distinct incentives for the adoption of local hazard mitigation plans. Firstly FEMA's Pre-Disaster Mitigation (PDM) grant program and Flood Mitigation Assistance (FMA) program provide grants for activities designed to mitigate the effects of floods and other disasters in a community. Funds from these grants can go to acquisition, relocation, and retrofitting of structures but are only available if an approved hazard mitigation plan is in place. Secondly, a hazard mitigation plan can expedite the approval process for receiving money after a federally declared disaster through the FEMA Post-Disaster Hazard Mitigation Grant Program (HMGP). Finally, a mitigation plan can be counted towards credit points in FEMA's Community Rating System (CRS). Points are awarded for having the plan, as well as for going through the various steps involved in creating the plan, including having community involvement and coordinating with other agencies. The better a community's CRS score, the greater the discounts provided on individual property owner's National Flood Insurance Program (NFIP) premiums. Currently, North Kingstown has a CRS rating of 9, which entitles property owners to a 5% discount on flood insurance.

Goal Statement

The goal of this hazard mitigation plan is to identify areas at risk from natural hazards and develop policies and plans of action that could be implemented to reduce the impacts of natural hazards on the residents, properties, and natural resources of North Kingstown. A high priority is placed on protecting the safety of residents and visitors alike. The town's many historic buildings and coastal resources are of special concern.

Planning Process

The North Kingstown Hazard Mitigation Committee was convened in January of 2002 and included the Town Manager, Town safety officials, Department of Public Works, the Building Official, town planners, an RIEDC representative, community members, and representatives from the North Kingstown Chamber of Commerce. Meetings held on a monthly basis featured discussions of the goals of hazard mitigation, the risks North Kingstown faces from natural hazards, the Town's vulnerabilities, and steps the Town could take to reduce its vulnerabilities to those hazards. Technical aid, research, and meeting facilitation were provided by the North Kingstown Department of Planning and Development. Maps developed by the University of Rhode Island Environmental Data Center using Geographic Information System data detail both hazard risks and vulnerabilities. These maps were reviewed by the committee and used as a guide in the initial plan discussions (Maps 1 & 2).

Public participation is an integral part of the planning process. In the data gathering stage and throughout the planning process, public input was achieved through additional committee members including representatives from South County Nursing and Rehabilitation Center, RI Air National Guard, and Amateur Radio. A workshop was held on September 19, 2002 to gather further input from the public at-large. Additional public comment was received when the Town Council reviewed the plan for submission to RIEMA and FEMA. This action required a public hearing before the town council. The plan was also distributed to the surrounding communities of South Kingstown, East Greenwich, Exeter, Warwick, Narragansett and Jamestown for their review and consideration.

The creation of the North Kingstown Hazard Mitigation Plan implements Action NC.1.18.1 of the Town's Comprehensive Plan, which states, "Prepare a hazard mitigation plan." This action is included in the Natural and Cultural Resources element of the comprehensive plan under Goal NC.1Protect, Preserve, and Where Possible, Restore the Natural Resources of North Kingstown. The plan specifically addresses Objective NC.1.18, which calls for developing strategies to protect the community from the impacts of natural hazards. After approval by RIEMA and FEMA, the Hazard Mitigation Plan will be adopted by the North Kingstown Town Council and Planning Commission and be incorporated as an amendment to the town's Comprehensive Plan.

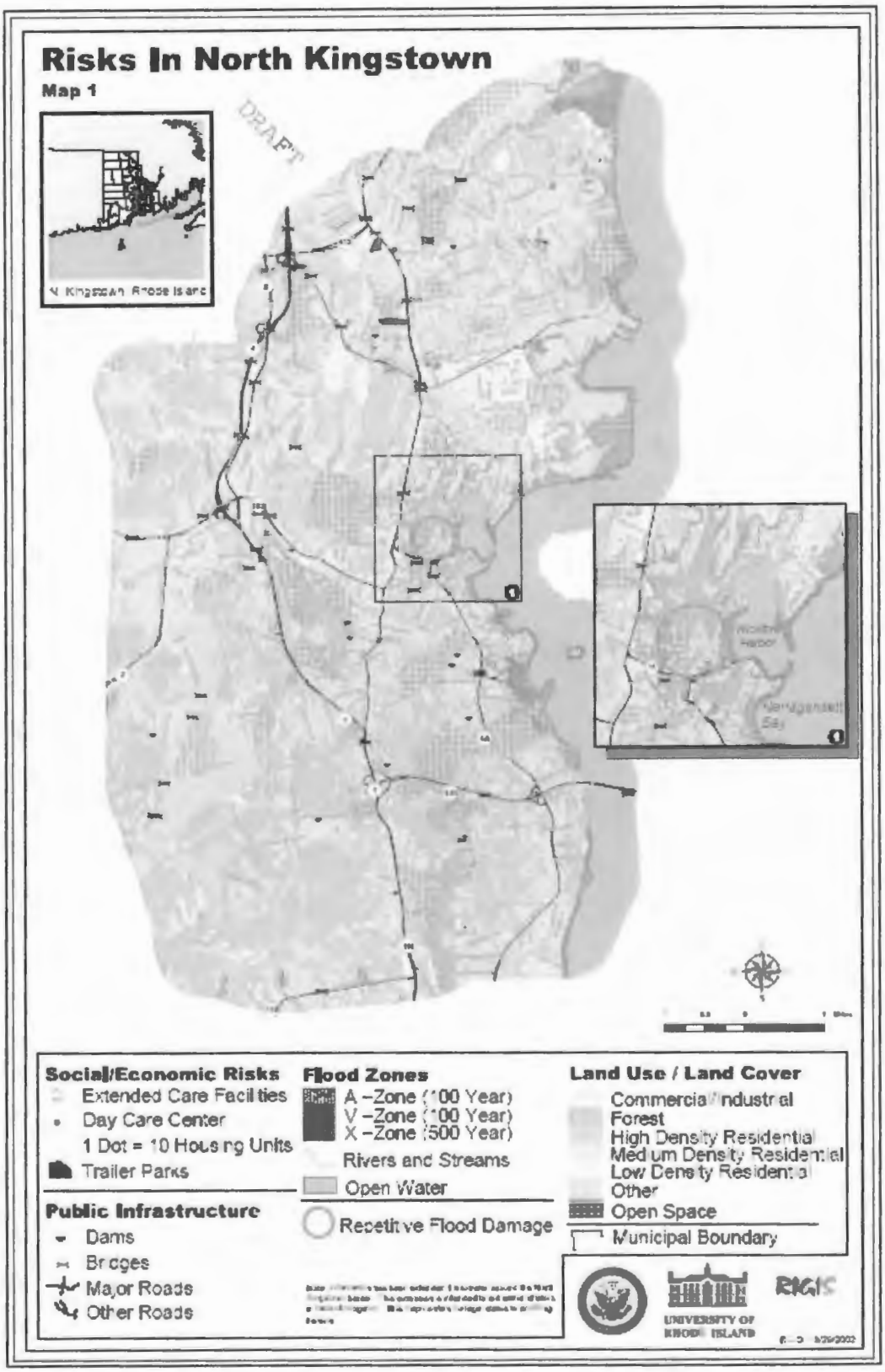
2.0 – Risk and Vulnerability Assessment

The risk of and vulnerability to various forms of natural hazards is determined by a myriad of factors. The geographic and natural features of the town play an important role in determining to what extent the town is at risk from natural hazards. The natural hazards that pose risks to North Kingstown are, in order of risk level, hurricanes (high risk), severe winter weather (medium risk), droughts (medium risk), wildfires (low risk), earthquakes (low risk), and tornadoes (minimal risk). Vulnerability is essentially determined by identifying the town's weak points; weak points are those locations and features most susceptible to serious disruption or damage from natural hazards. These areas of greatest vulnerability are shown in maps 1 and 2.

Table 1. Historic Natural Hazard Events in North Kingstown

Name/Date of Storm	Damaged Areas
Hurricane of 1938	Historical marker in on the Gregory Building in Wickford village shows the high water mark from this storm. One hundred small cottage homes on Quonset Point were destroyed and nine people died there. Homes in Wickford were flooded, some destroyed. Many boats from the harbor were destroyed including the fishing fleet.
Earthquake - 1951	Epicenter in Kingston, measured 4.6 on the Richter Scale
Hurricane Carol - 1954	Historic Marker on the West Main Street Highway Garage in Wickford village shows the high water mark from this storm. Homes stripped from their foundations and upended at Poplar Point. Military facilities at Quonset Point flooded.
Wildfire - 1968	500 acres in the Slocum area
Wildfire - 1974	300 acres in the Slocum area
Blizzard - 1978	Town Services shut down for a week.
Hurricane Gloria - 1985	Boathouse at Town Beach was blown down and much sand was washed away. Salt spray led to extensive defoliation of trees.
Hurricane Bob - 1991	Boats washed ashore and piled on lawns fronting Wickford Harbor. Docks damaged.

North Kingstown is a coastal community in the northeastern portion of the United States situated on the Narragansett Bay in the State of Rhode Island. The town is landlocked on three sides with the Bay forming its eastern boundary. The Hunt River forms the northern border of the town while the Annaquatucket and Pettaquamscutt (Narrow) Rivers both run through the southern portions of the town. Significant coastal features along the town's approximately 30 mile coast include Allen Harbor, Quonset Point, Wickford Harbor, and Bissel Cove. There are approximately 6,343 acres of wetlands (22.6%) and 14,085 acres of forest (49.8%) in the town.


Risks In North Kingstown
Map 1
DRAFT
Social/Economic Risks
Extended Care Facilities
Day Care Center
1 Dot = 10 Housing Units
Trailer Parks
Public Infrastructure
Dams
Bridges
Major Roads
Other Roads
Flood Zones
A –Zone (100 Year)
V –Zone (100 Year)
X –Zone (500 Year)
Rivers and Streams
Open Water
Repetitive Flood Damage
Land Use / Land Cover
Commercial/Industrial
Forest
High Density Residential
Medium Density Residential
Low Density Residential
Other
Open Space
Municipal Boundary
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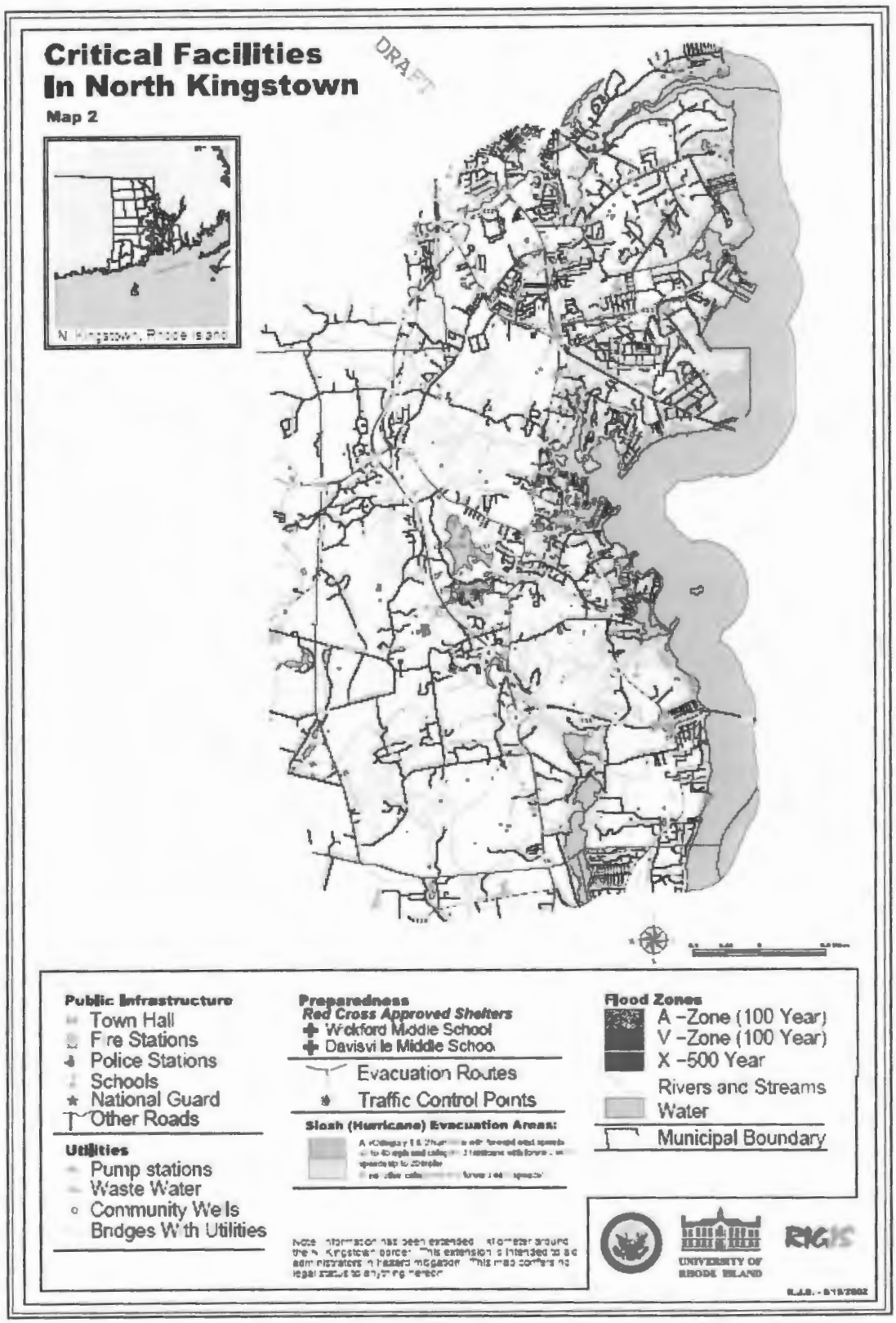
Critical Facilities
In North Kingstown
Map 2
DRAFT
Public Infrastructure
Town Hall
Fire Stations
Police Stations
Schools
National Guard
Other Roads
Utilities
Pump stations
Waste Water
Community Wells
Bridges With Utilities
Preparedness
Red Cross Approved Shelters
Wickford Middle School
Davisville Middle School
Evacuation Routes
Traffic Control Points
Slosh (Hurricane) Evacuation Areas:
Flood Zones
A -Zone (100 Year)
V -Zone (100 Year)
X -500 Year
Rivers and Streams
Water
Municipal Boundary
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2.1 Risks Assessment

Hurricanes and Coastal Storms

As a coastal community, North Kingstown is highly susceptible to the effects of hurricanes and nor'easters, especially the coastal flooding associated with these events. Hurricanes are tropical based storms that travel north up the Atlantic coast and feature heavy rain and high velocity winds. Hurricanes occur in the late summer to early fall, as opposed to nor'easters, which are similar to hurricanes in effect but occur in the winter months. Both types of storm can cause large amounts of damage across a wide area. Because hurricanes and coastal storms are the major natural hazards that the town faces on a regular basis, they are the primary focus of this hazard mitigation plan.

The probability of a named storm directly hitting Rhode Island in any given hurricane season is currently estimated at approximately 22% (Atlantic Oceanographic and Meteorological Laboratory, 2004). Map 3 shows the storm tracks of the 24 major coastal storms that have made land fall within 100 miles of North Kingstown in the past 50 years. Rhode Island has had between 1 and 2 presidential disaster declarations due to hurricanes between 1965 and 2000 (FEMA, 2002). The town's history includes several severe storms, including hurricanes and nor'easters, which have caused significant levels of damage to North Kingstown (Table 1). Damage in these storm events came primarily from two elements, flooding and wind.

Floods are the most common type of natural disaster. Flooding during a hurricane can be caused by heavy rains and storm surge tides that rise from the sea up to 25 ft. higher than the normal high water level. Locations in North Kingstown that are vulnerable to flooding due to heavy rain events are indicated as flood zones on Maps 1 and 2. Those that are vulnerable to inundation from the sea are indicated on Map 2 as "SLOSH" hurricane evacuation areas

North Kingstown has land area in all three levels of flood zones as designated by FEMA (NFIP). Floodplains in the town include "A" zones subject to a 100-year flood, "V" zones subject to a 100-year flood characterized by breaking wave action, and "X" zones subject to a 500-year flood. A 100-year flood has a one percent chance of occurring in any given year, and a 500-year flood has a 0.2% chance of occurring in any given year. FEMA designated flood zones are determined based on the elevation of the land and indicate areas that would be flooded in the event of heavy rains. Development, including simply paving, can increase the height and extent of flooding due to the loss of ground permeability.

The National Hurricane Center's Sea, Lake, and Overland Surges from Hurricanes model (SLOSH) shows areas subject to inundation from the sea in the event of a hurricane (Map 2). The SLOSH model depicts the "worst case scenario" taking into account wind speed and direction, tides, and the topography of the land. Future sea level rise and coastal erosion will increase the area and extent of damage caused by coastal flooding.

Map 3. Historical storm tracks making landfall within 100 miles of North Kingstown in the past 50 years.

Legend

Hurricane Track

- Category 3-5
- Category 1-2
- Tropical Storm
- Tropical Depression
- Subtropical Storm
- Subtropical Depression
- Extratropical Storm
- Tropical Low
- Tropical Wave
- Tropical Disturbance

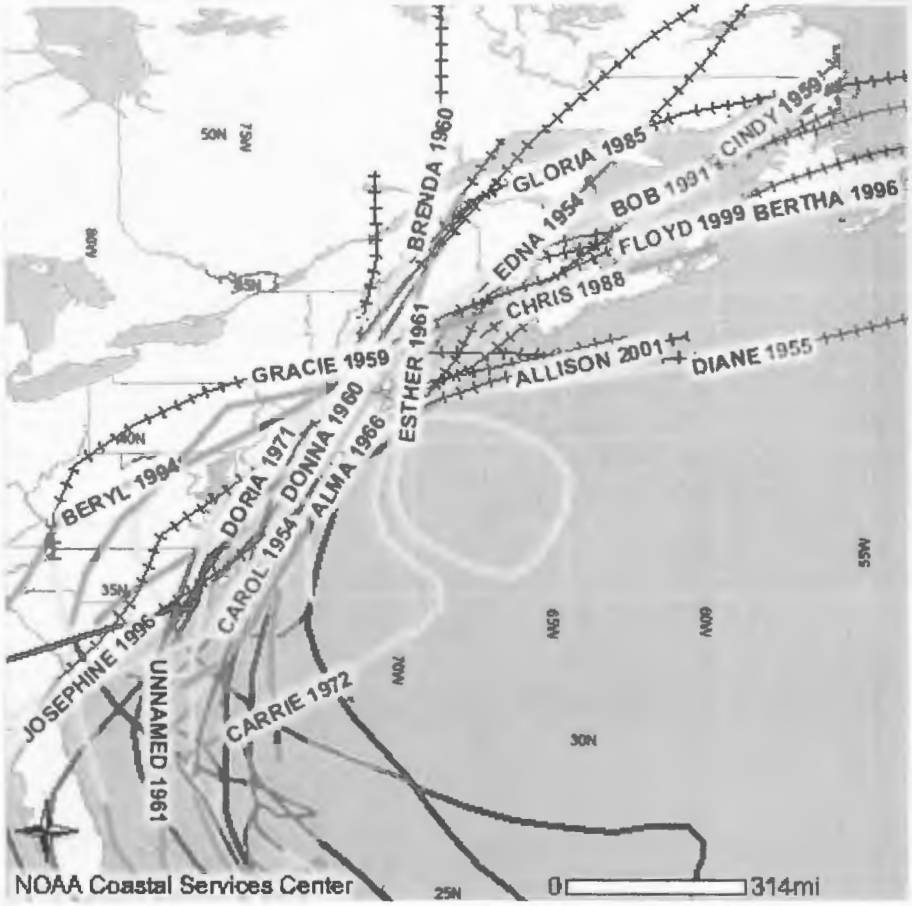
Road

Water

Country

County/Municipality

Latitude/Longitude



In addition to wind and flooding, erosion is a hazard that can threaten life and property during a coastal storm. The Coastal Resources Management Program has documented shoreline change and average erosion rates. The location with the most severe erosion in North Kingstown is the Narragansett Bay shoreline from Pojac Point to just north of the Mount View neighborhood. This area is considered to be a "Category A" critical erosion area (CRMC), and is eroding at an average rate of 2.2 ft. annually. Development in this area must be set back at least 75ft. from a coastal feature, or 150 ft. in the case of a development of more than four units. The rest of the town's shoreline either has an erosion rate of less than 2 ft. per year or is actually accreting. Narrow barrier beaches, such as those at Casey Point, Green Point, and Bissel Cove can also be affected by significant erosion. A single large storm event can drastically change the shoreline depending on coastal soil conditions.

Boat damaged and washed ashore during *the 1938 Hurricane. Photograph courtesy of Richard Bowen.*

Table 2. Hurricane Category*

Category	Wind Speed (MPH)	Storm Surge (FT)
1	74 - 95	4 - 5
2	96 - 110	6 - 8
3	111 - 130	9 - 12
4	131 - 155	13 - 18
5	> 155	> 18

* Based on the Saffir/Simpson Hurricane-Scale Ranges

Hurricanes are classified by wind speed into five types. Table 2 outlines these five hurricane categories. Rhode Island is considered to be susceptible to a direct landing of storms from categories I through IV. It has been estimated that North Kingstown's peak wind gust in a typical 100 year period is likely to be between 110 and 125 MPH (HAZUS-MH). Hurricanes reaching the New England region experience an increase in forward motion that compensates for decreased wind speeds so that lower class hurricanes can potentially cause considerably more damage than would normally be expected.

Rhode Island has an increased susceptibility to hurricanes due to its position, along with Connecticut and Massachusetts, on a landform that juts eastward into the Atlantic Ocean. Also, the configuration of the Narragansett Bay can have a funneling effect on the tidal surges accompanying hurricanes causing high levels of coastal flooding in the upper portions of the bay.

Poplar Point property after the 1938 Hurricane. Photograph courtesy of Richard Bowen.

The most significant storm to hit North Kingstown was the hurricane of 1938, a category three storm. Wind speeds as high as 121 miles per hour were reported and there was severe coastal flooding.

The following has been taken from a first-hand account of the 1938 hurricane written by Alice Armington of Poplar Point on September 21, 1938.

"...I wandered around from window to window looking out on a boiling ocean with wharves and boats and big timbers being towed about like rubber balls...Then the cellar doors on the water side blew in and the winds rushed up through the floors and all the linoleum rose up...I looked out the south window to where the Richardson house should be, nothing there...Both that house and garage and the Kilgus house and garage had been torn to kindling wood and carried across the road and into the lots beyond...About an hour after I got out of the larger house, it split up and was carried off into the lot across the road...By some miracle it didn't hit the cottage where I was as it went by."

In the hurricane of 1938, a summer colony at Quonset lost 100 cottages and nine people were killed. Many homes were destroyed throughout the town and Wickford village in particular was hard hit. Students were trapped overnight in Wickford Elementary School and many of the elm trees lining Main Street were downed. A bronze plaque at the corner of Main and Brown Streets shows the historic high water mark from this storm.

Poplar Point property after the 1938 Hurricane. Photograph courtesy of Richard Bowen.

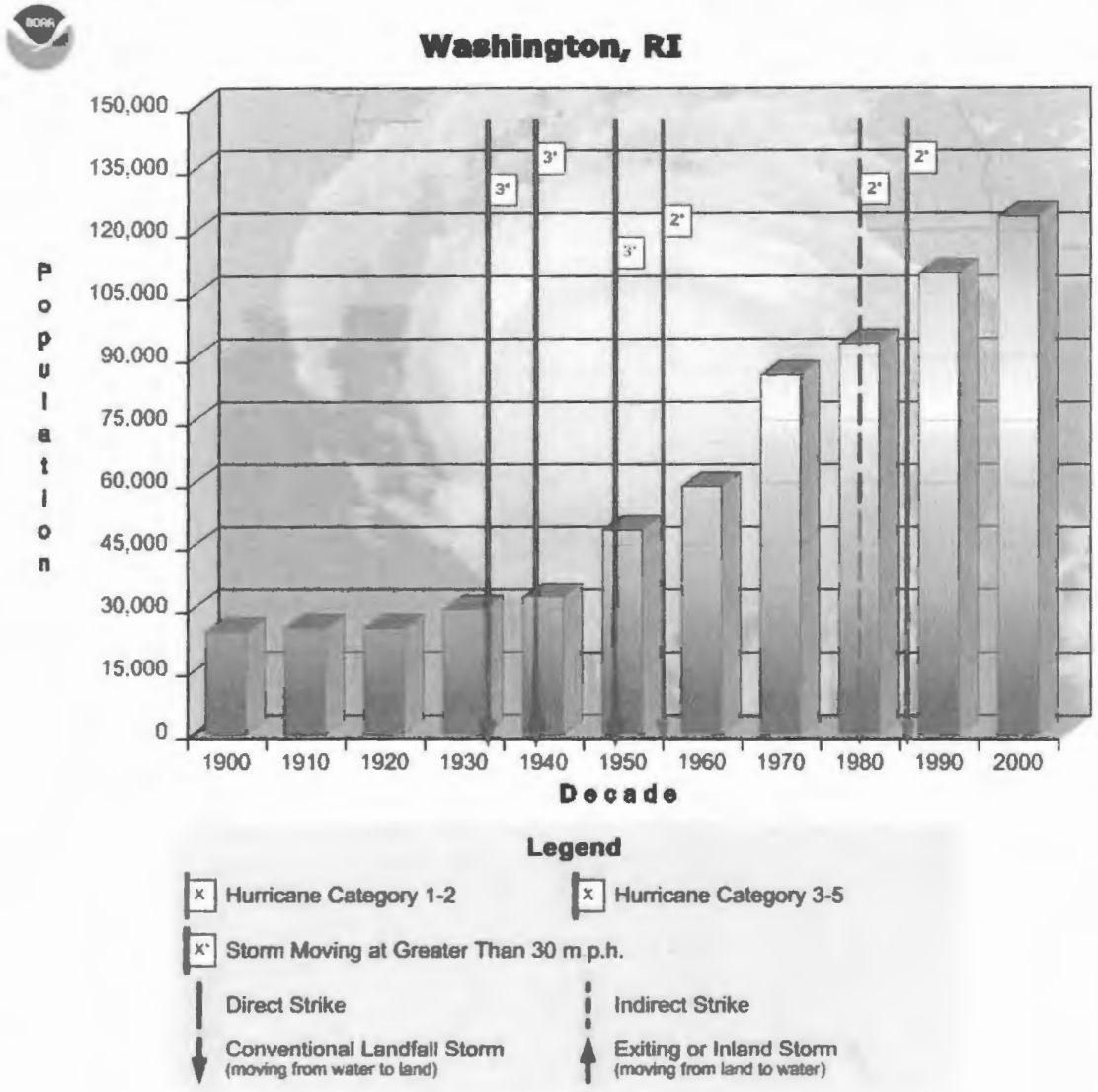
Since 1900, 33 hurricanes have directly or indirectly struck Rhode Island, so one can easily expect further hurricane activity in the future (Rhode Island Hurricane Evacuation Study Technical Data Report, 1995). If the predicted effects of global warming are correct, than hurricanes and other severe storms will occur with more frequency and intensity in the future, increasing the chances of a hurricane reaching Rhode Island's shores.

The devastating hurricanes that struck Rhode Island during the early and mid 1900s were part of a period of increased hurricane formation in the tropical Atlantic. Between 1970 and 1994 the Atlantic had a period of below normal hurricane formation. In the mid 1990s a new period of increased hurricane activity began due to warmer surface water temperatures in the tropical Atlantic. Therefore, the likelihood of a major hurricane striking Rhode Island is currently greater then it was during most of the past several decades.

Because the town's most damaging hurricanes occurred over fifty years ago, many new residents are unaware of the seriousness of the risk. As coastal population has increased, locations where development was previously destroyed by hurricanes have been redeveloped, some with particularly vulnerable structures. Figure 2 shows the increasing population of Washington County along with major hurricane strikes to the county.

The Town has registered for the HURREVAC 2000 software program developed jointly by FEMA and the Army Corp of Engineers. This program will alert the Town to approaching hurricanes through live data files from the National Hurricane Center via the Internet at www.hurrevac.com/about_win.htm. As these files are received, the program processes the data and analyzes the threat posed to the community from a particular storm allowing town officials to make informed decisions as to the Town's response.

Figure 1. The population of Washington County 1900 – 2000 and major hurricane strikes to the county.



NOTE: Population values may be missing in some counties particularly for earlier periods. This is most often attributable to the fact that the county had not yet been established.

Wildfire

While fire is now known to have an important regenerative role in many ecosystems, many factors, natural and manmade, can combine to create devastating natural disasters far beyond the effects of natural wildfire processes. Drought conditions, coupled with a build-up of dead underbrush and other kindling can lead to a fire, with the presence of a spark. Such a situation is especially dangerous when there are a number of homes present in forested areas, as is the case in parts of North Kingstown. Firefighters use different and often incompatible methods when fighting wildfires as opposed to home fires. In addition, the presence of homes precludes the ability to conduct controlled burns in order to keep the amount of kindling low and mitigate large-scale wildfires. Access to both the site and to a water source is another important issue that can affect how intense and potentially damaging a wildfire can be (Planning for Post-Disaster Recovery and Reconstruction, 1998).

As of 1999 almost 50 percent of North Kingstown's total acreage was forested. While this percentage has fluctuated over time, there have been very few wildfire occurrences in the town and none of these have caused great amounts of damage or burned on a large, uncontrolled scale. The two largest fires in North Kingstown's recent history occurred in 1968 and 1974 in the Slocum area. Sparks from the adjacent railroad tracks lit both of these fires, which burned in an area exceeding 500 and 300 acres respectively. Currently, North Kingstown is considered to be in a low fire danger class (U.S. Forest Service, 2004), and a recent state wide analysis prepared by the Rhode Island Department of Environmental Management Division of the Forest Environment concluded that, based on land cover, North Kingstown has a low risk of wildfire. Based on population the town has moderate risk.

Tornadoes

According to FEMA publications, North Kingstown is located in wind zone II, which has a design wind speed of 160 mph. The area has had an average of less than 1 strong tornado (categories F3-F5) per 3,700 sq. ft. According to FEMA's wind risk matrix, this means that the town has a low risk of tornadoes; however wind shelters are still advisable due to the region's susceptibility to hurricanes. The National Climatic data center reports an average of 0 tornadoes per year in Rhode Island, and the Tornado Project reports that there have been 0 tornadoes in Washington County between 1950 and 1995. Based on this history, it can be concluded that a tornado in North Kingstown would be a very rare event; however it cannot be ruled out because the conditions that generate tornadoes can happen anywhere.

Severe Winter Storms

Although generally outside of the extreme winter weather areas of the Northeast, Rhode Island is still subject to possible heavy winter weather events including significant snow and ice accumulation. Snow accumulation can cause serious damage to structures, especially those with flat roofs, and possibly cause roof collapse. The combination of ice and wind can bring down utility poles, leading to a variety of problems with communication and electricity loss. Snowmelt can lead to flooding well after the actual snowstorm has past.

Poplar Point home after a snowstorm event.

A snow-covered West Main Street in Wickford during the 1890s looking west towards Route 1.

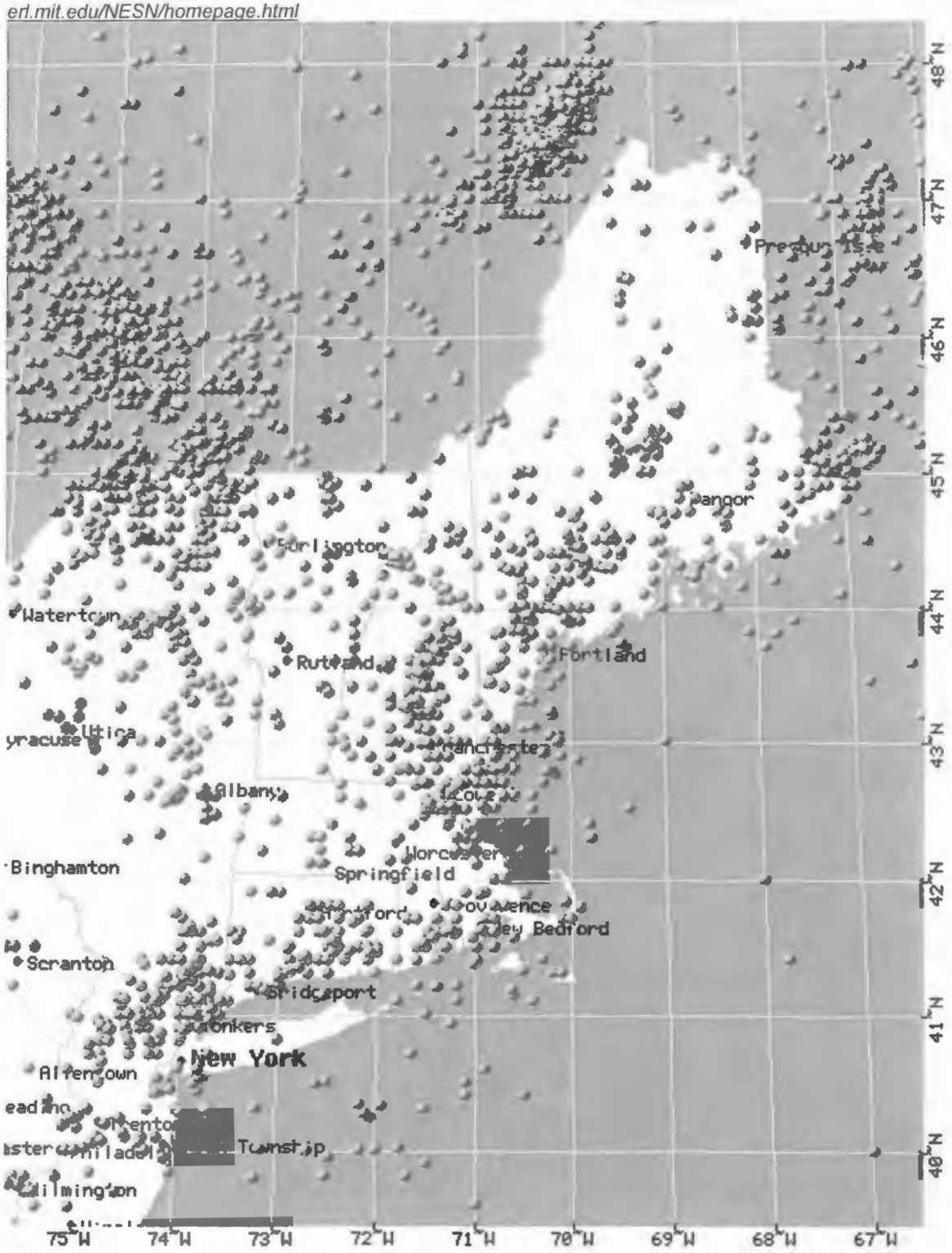
Blizzards in 1906 and 1978, along with an ice storm in 1966 are remembered as some of the town's worst winter storms. In the 1978 blizzard some residents were without electricity for up to a week and many roads remained impassable for up to five days. The National Climate Data Center storm events database contains records of 21 severe winter storms that have struck Washington County, Rhode Island between 1994 and 2004. No deaths or injuries are reported. Three of the records include estimates of property damage, which range from $290,000 to $700,000.

Earthquake

An earthquake is an abrupt release of accumulated strain on the Earth's tectonic plates occurring along a fault line. Damage in an earthquake stems from ground motion, surface faulting, and ground failure in which weak or unstable soils, such as those composed primarily of saturated sand or silts, liquefy. The effects of an earthquake are mitigated by distance and ground materials between the epicenter and a given location (Planning for Post-Disaster Recovery and Reconstruction, 1998). An earthquake in New England affects a much wider area than a similar earthquake in California due to New England's solid bedrock geology (NESEC).

According to the US Geological Survey website the seismic hazard for Rhode Island is 2-4%g (peak acceleration). While there is a low probability of an earthquake occurring in Rhode Island, it is not an impossible event. There have, in fact, been 15 earthquakes since 1928 with one in June 1951 registering a 4.6 on the Richter scale centered in Kingston. Narragansett Bay is considered a regional hot spot for earthquake activity, with many of the past quakes occurring in the bay or its immediate vicinity. Map 4 from the New England Seismic Network/MIT displays the past earthquake activity in New England.

Map 4: New England Seismic Network / MIT (NESN-MIT); *http://www-erl.mit.edu/NESN/homepage.html*



Drought

There are no universally accepted definitions of drought, and the conditions that are labeled as drought can vary from region to region. Drought can be generally defined as a period of drier than normal conditions over a large area, which, in some manner, reduces water levels. Droughts are different from other natural hazards in that they do not consist of a short, easily defined event such as a hurricane or an earthquake, but instead they gradually appear, last for a time period, and then gradually return to normal. Drought conditions can last for weeks, months, even years. Droughts can have serious economic, social and environmental effects on an area. Crops and livestock can be lost, industries can lose productivity, and wildlife habitat can be destroyed. Cumulatively these effects can easily equal the cost of a severe hurricane or other natural disaster. As aquifer levels are drawn down, seawater can be drawn into wells located near the coast (RI Drought Management Plan).

Precipitation levels vary widely from region to region and from year to year. In Rhode Island, the average yearly precipitation is 39 to 44 inches (Rhode Island Drought Management Plan). A drought becomes apparent after a period of time over which there are lower than normal precipitation levels. Stream and river flow is reduced, lake and reservoir levels fall, and groundwater is found at increasingly lower depths. As water availability becomes increasingly scarce, water use prioritization becomes necessary. Rhode Island is considered at risk to short-term droughts, which often occur in the summer months and long-term droughts, which on average appear once every eleven years. Droughts in Rhode Island most often begin with an abnormally dry winter (RI Drought Management Plan).

There have been at least seven major droughts in Rhode Island since 1929 including a long-term drought in the mid sixties and seasonal droughts in the summers of 1999 and 2002 (RI Drought Management Plan). During the 1999 drought many shallow wells in the state dried up. During summer of 2002 Rhode Island experienced increasing levels of drought as water levels dropped and water use restrictions were enacted all over the state

Currently, Rhode Island has mid-range hydrological conditions, meaning that it is not significantly drier or more moist than normal. The current town water plan predicts a rise in water use as the town's population increases. Water service connections increased by about 170 per year between 1995 and 2000. This increase in water use may lead to greater problems during drought conditions in the future.

2.2 Vulnerability Assessment Overview

Hurricanes and Coastal Storms

The major impact of a hurricane or coastal storm hitting North Kingstown would come from flooding of the flood zones and storm surge areas. When the areas of town that are vulnerable to rain caused flooding are combined with the areas that are vulnerable to storm surge inundation, they together cover approximately 5,500 acres, or 19% of the town (RIEMA). These flood hazard zones include all coastal areas and a large amount of the stream, river, and wetland areas of the interior of the town (Map 1 & 2). Approximately 7,280 people, or 30% of the town's total summer population, live in these flood vulnerable areas during hurricane season.

While the primary land use in these areas is residential, there are business uses mixed throughout. Together, the more than 3000 homes and businesses in coastal and riverfront areas have a total value of approximately $138,000,000. Wickford Village is particularly vulnerable to flooding. In addition to residences and businesses, many public facilities and utility lines are located in flood and storm surge areas. These include the Town Hall, Town Hall Annex, and Town Emergency Operations Center, as well as water lines that are carried across potentially vulnerable bridges.

Flood damage comes from both the presence of the water and its ability to carry large pieces of debris such as boats and houses into other houses and structures. Roads running perpendicular to the coast can act as surge channels, carrying the storm surge further inland at a higher rate and concentration. Coastal erosion during a storm event may also put structures at risk.

Wind damage is another significant aspect of coastal storms and has its most direct effect on coastal buildings. Wind speed can drop dramatically as one moves inland, falling 70 to 80 percent one-half mile to one mile inland (Planning for Post-Disaster Recovery and Reconstruction, 1998). Windblown debris broken free from buildings and trees can also be dangerous during a storm. Clean up and damage repair from wind can be very expensive.

Populations that would be of particular concern during a coastal storm include two daycare facilities in the evacuation 'A' areas, located in Wickford and near Bissel Cove, and one daycare center in the 'B' evacuation area in Quidnessett. There are also two day-care centers that are in close proximity to 'A' flood zones. There is no elderly housing or nursing homes located in either a flood zone or an evacuation area. While there are no mobile home parks in the evacuation areas, these locations can still be vulnerable to damage from high winds.

Wildfires

Because North Kingstown's land cover places it in a low fire danger class, it is unlikely that a fire would burn out of control and cause significant damage; however fires are especially dangerous in locations where many houses are present in a forested area. This is the case in parts of North Kingstown, especially the western and southern parts of town. According to the 2000 Census, census tract 504.01, which includes the southwestern corner of town, has 1,358 housing units. The comprehensive plan currently includes an objective to relocate one of the town's fire stations to better serve this portion of town.

Severe Winter Storm

All parts of the town can be affected by severe winter weather including significant snow and ice accumulation. Buildings with flat roofs are especially vulnerable to collapse due to snow accumulation; and ice accumulation can bring down utility lines and damage forests. Business functions and activities can be disrupted by temporary loss of electricity and impassable roads. The largest loss of property value caused by a winter storm within the past decade was $700,000 for all of Washington County (National Climate Data Center).

Earthquake

The buildings most vulnerable to earthquake damage are those built before 1977, when state building codes began requiring greater earthquake resistance. Masonry buildings are especially vulnerable, as well as structures located on deep or unconsolidated soils. Because North Kingstown's peak ground acceleration is approximately 3.6%, with a 10% chance of exceedence in 50 years (U.S. Geological Survey), an earthquake with enough intensity to cause damage would be unlikely.

Drought

A drought in North Kingstown would primarily be felt in the form of lost income to agricultural and tourist industries, damage to wildlife habitat, increased risk of wild fires, and well salinization. Residents would also be affected by water use restrictions. North Kingstown has 29 farms and nearly 1000 acres in agricultural production (Rhode Island Agricultural Digest 2003). As of 2001 132 residents of the town were employed in agriculture, forestry, and fishing (Rhode Island Economic Development Corporation).

Tornadoes

In the highly unlikely event of a strong tornado in North Kingstown, the structures that would be most susceptible to damage would be those built before 1990, when the state building code was amended to include requirements for wind load resistance. The four mobile home parks in the northern part of town would also be of special concern.

2.3 Land Uses and Development Trends in Hazard Areas

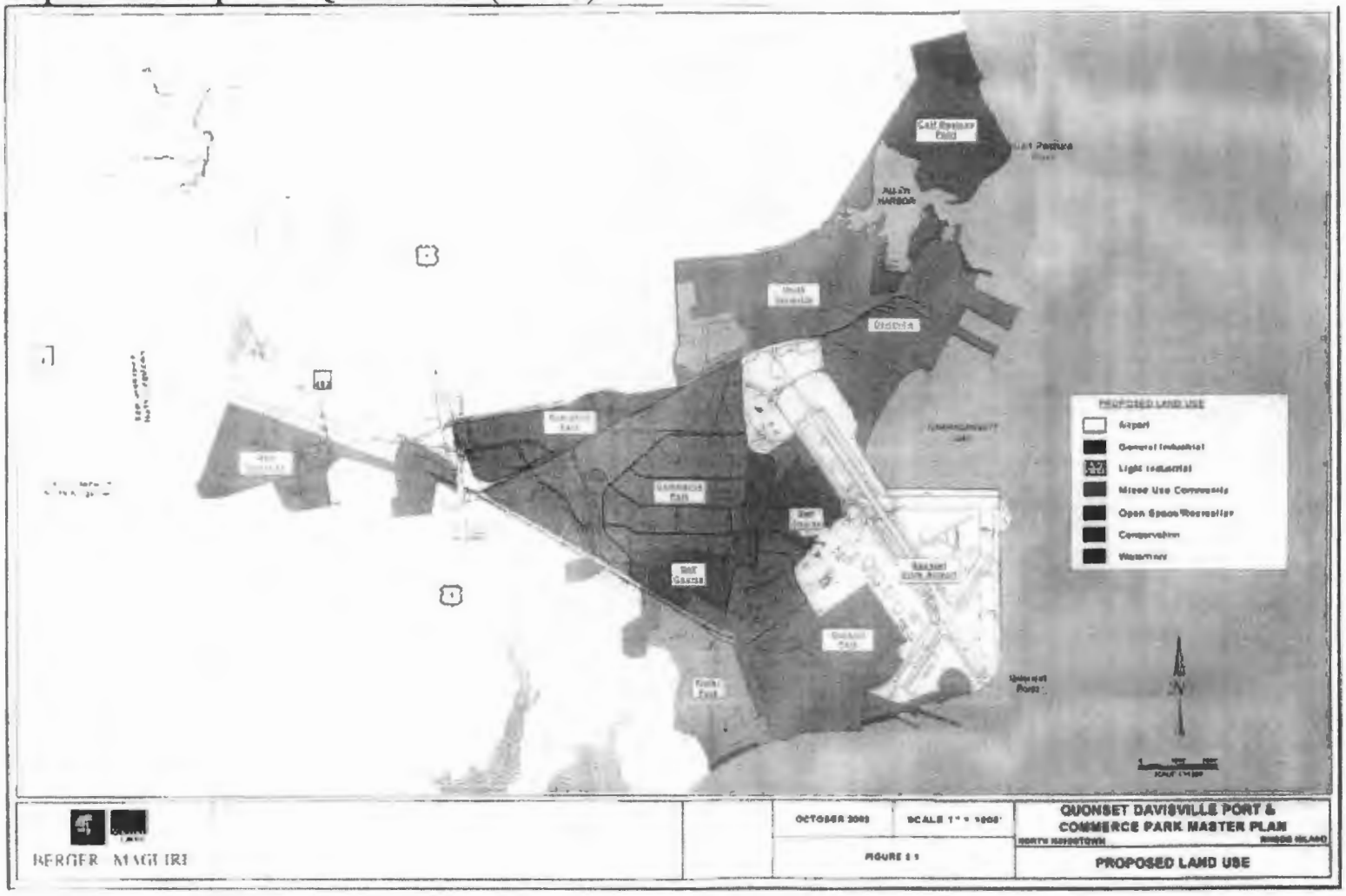
Development in the town varies from the large industrial/business park of Quonset Point to the turf farms and low-density residential areas of Slocum to historic village centers along the coast. The majority of development in the town is single family residential. In 2000 the population of North Kingstown was 26,326 and the town had approximately 10,617 housing units.

North Kingstown's scenic coastline has attracted residential, waterfront commercial, and other development for many years. Coastal buildings are primarily residential with more than 3000 homes and businesses in coastal flood or storm surge areas. Most of these areas are close to being fully built out, and it is expected that existing land uses will generally continue.

More recently development has moved towards the western portion of the town as the available land on the coast has become fully developed. During the decade between 1990 and 2000 the number of residential units in town increased 14%. Forty-two percent of these new units are located in the southwest corner of town. Nearly all are single family homes, and most are in cluster subdivisions with common open space. A build out analysis conducted in 2000 showed that there is potential for approximately 1,410 more housing units to be developed in North Kingstown. Twenty-three percent of the town's land area is zoned for open space or protected from development by purchase of development rights.

The only remaining large tract of developable land in the coastal area is the Quonset/Davisville Port and Commerce Park under the control of the Rhode Island Economic Development Corporation (RIEDC). This 3000 acre area includes an airport, a recreation area, and is the primary location for industrial land uses in town. Between 1990 and 2000, 2 million square feet of industrial development occurred there. Nearly seven hundred acres are still available in the park for future industrial development. The Quonset/Davisville Master Plan puts forward a vision for 12,000 new jobs to be generated at the park over the next 20 years in addition to the 6,000 that currently exist there. Transportation and infrastructure improvements to support this future development are underway. Parts of the industrial park are highly vulnerable to storm surge based on the SLOSH model and storm history in that area. Included in this plan are action items intended to promote disaster resistant design for future development in Quonset/Davisville and to reduce the vulnerabilities of existing structures there. The RIEDC is in the process of drafting an emergency response plan for the park.

Map 5. Land use plan for Quonset Point (RIEDC).



2.4 Assets and Potential Losses

The following sections provide a general description of the community's assets, which would be at risk in the event of a natural disaster. In order to better quantify North Kingstown's potential losses, the action plan also includes plans to conduct a detailed inventory of structures, infrastructure, and critical facilities vulnerable to damage (Action #18). The outcome of the analysis will be dollar estimates of potential losses due to damage to structures and their contents, and loss of function of structures. This analysis will also reveal in greater detail the structures or neighborhoods of town that are most susceptible to damage in the event of a natural disaster, so that actions can be taken to reduce these vulnerabilities.

Economic and Social

According to tax assessor's data, the total value of coastal and riverfront residential and commercial buildings in town is approximately $138,079,100. Therefore, if a hypothetical storm event were to result in an average of 25% damage to these structures, the structural damage would total $34, 519,775. Damage to building contents and functional down time of businesses would cause additional losses. A building can be damaged to 25% of its replacement cost in a flood of less then two feet depth.

FEMA indicates a total of 700 properties insured by NFIP and vulnerable to flooding (Table 3). There are four repetitive loss properties in North Kingstown, with a total of nine repetitive loss claims among them. All of the repetitive loss properties are located in Wickford. Since 1978 there have been $179,034 paid for losses. Specific vulnerabilities can be found on the risk matrix (Table 4) and on Maps 1 and 2.

Table 3. National Flood Insurance Information for North Kingstown*

Total Flood Insurance Policies	Polices in 'V' Zones	Policies in 'A' Zones	Total Coverage	Number of Claims Since 1978	Number of Repetitive Loss Claims
700	15	493	$128,797,500	119	9

There are several different historical and socially significant structures that are located in evacuation and flood zones. The historic district in Wickford and its harbor are particularly vulnerable to hurricane damage. The existing Harbor Management Plan only deals with the hazards produced by chemical or oil spills though, as previously stated; a storm preparedness plan will be added. The residential, commercial, and industrial areas subject to inundation during a flood or hurricane all pose the threat of introducing hazardous chemicals and wastewater into the environment and therefore represent a possible health risk after the event that can inhibit rescue operations. Large inundation areas can be found along the Hunt and Narrow Rivers, at Pojac Point, Quonset Point, Wickford, and around Bissel Cove.

As of July 2004 Rhode Island State Building Codes place North Kingstown in wind zone 2, which requires new constructions to be able to withstand winds up to 110 MPH. The previous design wind speed was 90 MPH. Flood proofing construction has been required in flood zones since the 1970's. Any buildings constructed before these codes went into effect are potentially vulnerable to severe storm events.

Since 1977, State building code has required that new buildings and major reconstructions be designed to withstand earthquakes measuring up to 3.0 on the Richter scale. Therefore, Buildings built before 1977 may be vulnerable to earthquakes of that scale. Old masonry buildings and large structures are most vulnerable to earthquake damage. Bridges, dams, and roadways are also susceptible to damage in the event of an earthquake.

Public Infrastructure

The Town owns and operates a large number of facilities in coastal areas subject to flooding and storm surge. Most significant of these are the two town hall buildings; both are located in the hurricane surge area while the Main Town Hall is in an 'X' zone and the Town Hall Annex is in an 'A' zone (Map 2). In the event of a serious storm, sensitive equipment and important documents can both be destroyed leading to a variety of problems in town management including the loss of historic records. In addition, the town emergency operations center and the National Guard Stations at Quonset are within the hurricane evacuation areas designated for the most severe hurricane events (Map 2). Three elementary schools, Wickford, Fishing Cove, and Hamilton, face damage as well in the event of a severe storm (Map 2). The North Kingstown Free Library is another vulnerable town structure subject to storm surge and high winds.

Flooding can expose or otherwise compromise septic systems leading to contamination and public health concerns. The Town maintains two wastewater pumping facilities, one at Wickford Point and the other on Mark Drive, while the RIEDC has a wastewater facility in Quonset Point. All of these wastewater facilities are subject to flooding and storm surge presenting severe water contamination issues. Flooding can also wash out bridges leading to disruption in water provision at the point where it is carried over bridges. The Hussey and Brown Street Bridges in Wickford both carry water lines, as do bridges over Cocumscussoc Brook on Post Road and the Annaquatucket River on Boston Neck Road. The town has several different recreational facilities in coastal areas subject to flooding and storm surge including Allen Harbor Marina, the Town Dock in Wickford, the various buildings at the end of Beach Street, and Wilson Park. Finally, the highway garage on West Main Street is subject to both flooding and storm surge.

Utility lines represent another key vulnerability in the town. High winds and ice/snow storms can bring down phone and electric lines disrupting power and communication to parts of the community and affecting the operations of businesses. The town also has many dams that may be vulnerable to flooding or earthquake damage. An earthquake could also pose a threat to older town buildings such as the Town Hall and Wickford Elementary School.

Natural Resources

The most important natural resource upon which North Kingstown is dependent is its water supply. The town's water comes from three different aquifers, the Hunt, Annaquatucket, and Pettaquamscutt. Current water usage is well below safe yield levels and water is supplied to parts of both Narragansett and Jamestown. Volume II of the North Kingstown Water Supply System Management Plan deals extensively with emergency responses and mitigation actions for droughts, water contamination, supply disruption, and many other situations. Impermeable surfaces above the aquifer can severely restrict the amount of water infiltrating the ground and recharging the aquifer, exacerbating the effects of a drought.

With almost 50 percent of the town being forested, wildfire can be a concern, especially during drought conditions. Large areas of forested lands include the town owned parks, Cocumscussoc State Park, and private lands, mostly in the western and southern parts of the town.

The town's aquatic environments are significant not only for their high level of quality but also in their susceptibility to disruption from natural and manmade events. Flooding may also pose a significant risk to the RI Department of Environmental Management fish hatchery on Hatchery Road. In the event of septic failure due to flooding or storm surge, the resulting discharge could severely impact, and even destroy, important aquatic habitats such as eelgrass beds and shellfisheries. Large-scale coastal storms can also cause serious erosion to town beaches, thereby eliminating important coastal buffers and town recreational areas.

Shelters and Evacuation Routes

The number of people seeking emergency shelter in the event of a natural disaster is difficult to determine; it can be affected by the type and severity of the disaster, amount of forewarning, awareness of shelter locations, and the number of alternative destinations for individual residents. Severe storms with little forewarning can cause the most stress on shelter capacity, as people are more likely to seek shelter when they have less time to make alternative arrangements. Residents of nursing homes and mobile home parks are often the most likely groups to seek public shelter in the event of a natural disaster. Tourists visiting the town may also require shelter access, especially during the summer months that coincide with the hurricane season.

The Red Cross estimates that an average of 10 percent of the town's population will need to utilize public shelters in the event of an emergency situation. With a current population of 26,326 in North Kingstown, that would be approximately 2,632 town residents seeking public shelter. Currently the town has two Red Cross approved shelters, Davisville Middle School, accommodating 401 people and Wickford Middle School, accommodating 344 people. Together these shelters have a capacity of 735. The Red Cross has indicated that they may be considering some regional shelters to bolster town capacities, such as utilizing space at the University of Rhode Island during the summer months.

As with emergency shelter use, it is also difficult to determine how many residents will evacuate coastal areas in the event of a severe storm, except in cases in which evacuation is mandatory. Many people often decide to remain in their homes for the duration of a storm. Evacuation routes for residents leaving the coastal evacuation areas, designated using the SLOSH models, have been created by the North Kingstown Police Department (Map 2). To facilitate evacuation, traffic control points to be manned by police officers during an evacuation have been created at significant road crossings and bridges (Map 2). Evacuating some areas will be of special concern due to limited access, specifically those places with only a single access road that can potentially be blocked by flooding or downed trees. Loop Drive in Wickford, which can only be exited over the Loop Drive Culvert, is one such place where flooding could keep residents from evacuating.

2.5 Coordination with Neighboring Municipalities

North Kingstown borders on six other towns: East Greenwich, Exeter, Jamestown, Narragansett, South Kingstown, and Warwick. Issues concerning hazard mitigation transcend these boundaries requiring that planning for natural hazards coordinate with, and make considerations to, these neighboring municipalities. Water is one of the most important issues concerning North Kingstown and many of its neighbors regarding to both its source and supply. The aquifers from which the town draws its drinking water extend into East Greenwich and Exeter, requiring that mitigation issues concerning drought and water supply contamination be coordinated with these towns. In addition, the Town supplies water to Jamestown and Narragansett such that water use restrictions during a drought must be coordinated with these towns. The North Kingstown Water Supply Management Plan deals with many of these inter municipal issues.

Emergency evacuation is another important issue that in some places requires cooperation with neighboring towns. Residents of both Jamestown and Narragansett will be utilizing North Kingstown evacuation routes in the event of a natural disaster. Jamestown, in particular, could have many residents evacuating through North Kingstown on Route 138. Some North Kingstown residents may evacuate through Warwick and East Greenwich across the Forge Road Bridge or Warwick residents may come through North Kingstown over the same bridge. Evacuation routes and emergency shelters are issues that should be coordinated amongst all seven of these neighboring communities for the safety of all area residents.

Other areas for cooperation between towns have been identified in the actions portion of the plan. Before the plan can be amended into the comprehensive plan copies, will be provided to the neighboring communities for their review and comment

3.0 – Mitigation Actions

After reviewing the town's existing hazard mitigation activities and capabilities for expansion, the North Kingstown Hazard Mitigation Committee has created a set of actions in order to address the previously identified risks and vulnerabilities and achieve the town's hazard mitigation goals. These actions will serve as an implementation plan as the town attempts to reduce its vulnerability to natural disasters. The actions are intended to reduce risks to public safety and to existing structures as well as to future development in town.

3.1 Existing Hazard Mitigation Activities and Town Capabilities

There are many existing plans, policies, and reports that in some way contribute to or inform the hazard mitigation process in North Kingstown. In order to formalize and greatly expand the town's hazard mitigation program, the town will use the capital improvement program to schedule funding for implementation of the actions in this Hazard Mitigation Plan.

The comprehensive plan has several different objectives and actions that can contribute to hazard mitigation. In the Transportation element, the plan calls for the creation of a bridge management program (Action C.1.9.2), which will ensure the continuous management and upkeep of the town's bridges, in effect making them more hazard resistant. In addition, the plan calls for improving roadway drainage (Action C.1.9.6) and improved storm water systems (Action C.1.9.7). Both of these actions will decrease the effects of flooding. In the Natural and Cultural Resources Element, Action NC.1.3.14 addresses reducing the amount of impervious surfaces in the town. Reduced impervious surfaces in flood zones can lower flood levels. The Community Services Element has many actions and objectives that can serve hazard mitigation including a new fire station at Quonset Point (Action CS.9.1.2) and providing for the secure storage and protection of vital town records (Action CS.14.2.3). Protection of the town's water supply is a critical component of this element, as reflected in Goal CS.8 Protect and Conserve Town Water Supply.

Actions to protect the water supply appear frequently in the comprehensive plan and other Town plans and documents. The Town's Groundwater Protection Plan forms the basis of the groundwater protection overlay zone. This overlay zone regulates the uses and densities that can locate in the aquifer area in an effort to protect the Town's drinking water from contamination. The Water Supply System Management Plan has extensive actions that should take place in the event of natural or man-made disasters to protect the water supply from contamination. As an additional protection measure, the Town is committed to acquiring land and conservation easements in the groundwater protection areas. All of these actions limit the potential for groundwater contamination and ensure sufficient recharge of the aquifer, ultimately mitigating the effects of drought.

Other pertinent documents include the North Kingstown Tree Inventory Management Plan. This plan recommends regular tree trimming to reduce the potential for damage to utility lines from fallen limbs. The Emergency Operations Plan also includes a framework to assist Town officials in planning and performing their emergency functions during a disaster. In addition to hazard mitigation, other related issues addressed in the Emergency Operations Plan include preparedness -- aimed at saving lives and minimizing damage, response -- aimed at preventing the loss of lives, reducing property damage, and providing emergency assistance, and recovery -- aimed at returning all systems to normal post-disaster. The town also has a Hazardous Materials Plan, which lists locations in the town where hazardous materials are stored, and covers response and recovery in the event of a hazardous materials spill. In addition, the Harbor Management Plan will be updated to incorporate a Storm Preparedness Plan, which will include many of the actions developed in the Hazard Mitigation Plan.

3.2 Mitigation Goals

The town's mitigation goals, which these actions are intended to achieve, are, in order of priority, to:

1) Reduce risks from natural hazards to **life and property** in North Kingstown,
2) Ensure the **safety of children** from natural hazards,
3) Ensure that the town's **emergency services** will be operational during a natural disaster, and plans are in place to expedite **recovery after a disaster**.
4) Reduce the vulnerability of the town's **infrastructure and utilities** to natural hazards,
5) Reduce the vulnerability of **municipal facilities** to natural hazards,
6) Reduce the vulnerability of the town's **cultural resources** to natural hazards,
7) Reduce risks from natural hazards to the employees and facilities at **Quonset Point**, and
8) Reduce the vulnerability of the town's **recreational resources** to natural hazards.

The following Risk Assessment Matrix (Table 4) is organized into major categories corresponding to each of the hazard mitigation goals as listed above. Within each goal are more specific mitigation objectives. These are organized according to the vulnerable areas of town related to each goal, and are listed in the right hand column of the Risk Assessment Matrix. The mitigation actions that the town will take to achieve each of these objectives are listed in the action plan, which begins on page 42.

Table 4: Risk Assessment Matrix							
Vulnerable Areas *(in order of priority)*		**Location**	**Ownership**	**Natural Hazard**	**Risk** H=Historical P= Potential	**Primary Effects or Problem**	**Mitigation Objective**
Life and Property							
1	Coastal Neighborhoods (Actions #1-9)	Coastal/Riverside Quidnessett; Shore Acres; Camp Avenue; Wickford; Hamilton; Coastal Saunderstown; Narrow River Area; Mount View	Private & Municipal	Flooding (A,V); Storm surge; Wind	H - '38 and '54 Hurricanes	Public safety; Septic system exposure leading to pollution and health risks; Private property loss; Utility interruptions	Ensure the safety of current and future residents. Protect property from damage. Reduce the cost of disaster clean-up.
2	Wickford Commercial Districts (Actions #10-11)	Wickford Village	Municipal & Private	Flooding (A); Storm surge; Wind; Earthquake	H - '38 and '54 Hurricanes	Loss of services and revenue; Private & public property loss	Ensure post-disaster business continuation.
3	Elderly Housing (Action #12-14)	Town-wide	Private	Storm surge; Wind	P	Public safety; Structural damage; Housing unit loss	Ensure the safety of elderly residents. Reduce the cost of disaster clean-up.
4	Wickford Village Housing (Action #15)	Wickford	Private	Flooding (X); Storm surge; Wind	P	Public safety; Public health (potential inundation of housing's sewage treatment facility); Environmental health; Housing unit loss	Ensure the safety of current and future residents. Protect property from damage. Reduce the cost of disaster clean-up.

5	Masonry Apartment and Mill Buildings (Action #16)	Town-wide	Private	Earthquake	P	Public safety; Structural damage	Ensure the safety of current and future residents. Protect property from damage. Reduce the cost of disaster clean-up.
6	Mobile Home Parks (Action #17)	Off of Post Road	Private	Wind	P	Public Safety; Private property loss; Utility damage	Ensure the safety of current and future residents. Protect property from damage. Reduce the cost of disaster clean-up.
7	All Vulnerable Structures (Action # 18-19)	Town-wide	Municipal & Private	Flooding; Storm Surge; Wind	H & P	Public safety; Property loss and damage	Inventory all vulnerable structures and estimate expected losses from a major hazard event.
Child Safety							
1	Town Schools (Actions #20-23)	Town-wide	Municipal	Flooding (A); Storm surge; Wind; Earthquake	H - '38 and '54 Hurricanes	Public safety; Structural & property damage; Loss of services	Ensure the safety of children. Reduce the cost of disaster clean-up and repair.
2	Day Care Centers (Action #24)	N.K. Daycare - Boston Neck Rd; St. Paul's Nursery-Main St; Little Miracles at Scalabrini Villa	Private	Flooding (A); Storm surge; Wind	P	Public safety; Structural & property damage; Utility damage	Ensure the safety of children. Reduce the cost of disaster clean-up.

Emergency Services and Recovery Plans							
1	Evacuation Routes (Actions #25-28)	Town-wide	Town and State	Flooding; Storm surge; Wind	P	Public safety; Loss of evacuation ability	Ensure the viability of evacuation routes.
2	Emergency Shelters (Action #29)	Davisville Middle School; Wickford Middle School	Municipal			Lack of sufficient emergency shelter	Ensure available capacity for town residents in local emergency shelters.
3	Town Emergency Operations Center (Action #30)	Post Road	Municipal	Wind; Earthquake	P	Loss of emergency response capability; Loss of communications	Ensure the accessibility and operational status of the center during an emergency.
4	Rhode Island Air and Army National Guard (Action #31)	Quonset Point	State and Federal	Flooding; Storm surge; Wind	H - '38 and '54 Hurricanes	Structural & property damage; Loss of services; Utility damage	Ensure the accessibility and operational status of the base during an emergency.
5	Post-Disaster Plans (Actions #32-33)	Town-wide	Municipal & Private	Flooding; Storm surge; Wind; Ice and Snow; Earthquake; Drought	H & P	Public safety; Property damage; Loss of services and utilities	Expedite debris removal and recovery /reconstruction after a disaster.

Infrastructure and Utilities							
1	Dams (Action #34)	Town-wide	Municipal and Private	Flooding; Storm surge; Earthquake	P	Public safety; Debris; Structural damage; Major property damage	Ensure structural integrity and ability to withstand coastal and riverine flooding.
2	Town Bridges (with utilities) (Actions #35-37)	Hussey; Brown Street; Babbit Farm; and Hamilton Mill	Municipal and State	Flooding (A); Storm Surge	H - '38 and '54 Hurricanes P	Loss of access; Structural damage; Water service disruption; Gas service disruption	Ensure structural integrity and ability to withstand coastal and riverine flooding.
3	Town Bridges (without utilities) (Action #35)	Loop Drive; Gilbert Stuart; Jamestown; Library Pedestrian; and Bridges over the Potowomut	Municipal and State	Flooding (A); Storm Surge	H - '38 and '54 Hurricanes P	Loss of access; Structural damage	Ensure structural integrity and ability to withstand coastal and riverine flooding.
4	Town Roads and Streets (Action #38)	Town-wide	Municipal and State	Flooding; Storm surge; Snow and Ice	H - '38 and '54 Hurricanes P	Loss of access; Structural damage	Maintain pass ability and repair roads quickly after a disaster.
5	All Town and RIEDC Wells (Actions #39-41)	Town-wide and in East Greenwich and Warwick	Municipal	Flooding (A); Storm Surge; Drought	P	Public safety; Public health; Loss of services	Ensure protection of the water supply from contamination in the event of flooding. Ensure continued operation.

6	Electric Utility Lines and Facilities (Actions #42-43)	Town-wide	Narragansett Electric	Wind; Earthquake	P	Public safety; Loss of services	Ensure public safety and continued service.
7	RIEDC Wastewater Facility (Action #44)	Quonset Point/Davisville	State	Flooding (V); Storm surge; Wind	H - '54 Hurricane	Loss of operations and services; Pollution; Loss of shellfish beds	Prevent contamination of surrounding environment.
8	Town Sewage Pumping Facilities (Actions #45-47)	Wickford Point and Mark Drive	Municipal	Flooding (A); Storm surge	P	Public safety; Public health; Loss of services	Prevent contamination of surrounding environment.
9	Phone Lines and Cell Towers (Actions #48)	Town-wide	Various Private Utilities	Wind; Earthquake	P	Loss of services	Ensure continued service.
10	Wickford Service Stations (Mobil and Sunoco) (Actions #49-50)	West Main Street and Boston Neck Rd.	Private	Flooding (A); Storm surge; Wind	H - '54 (Mobil) Hurricane P	Loss of services; Pollution; Hazardous materials; Property loss	Prevent contamination of surrounding environment.

Municipal Facilities							
1	Town Hall (Actions #51-52)	80 Boston Neck Road	Municipal	Flooding (X); Storm surge; Wind; Earthquake	H - '38 and '54 Hurricanes	Loss of operations, records, and historic information; Structural damage; Loss of public services	Protect town records. Reduce the cost of disaster clean-up and repair.
2	Town Hall Annex (Actions #53-54)	55 Brown Street	Municipal	Flooding (A); Storm surge; Wind; Earthquake	H - '38 and '54 Hurricanes	Loss of operations, records, and historic information; Structural damage; Loss of public services	Protect town records. Reduce the cost of disaster clean-up and repair.
3	Senior Center; Cold Spring Community Center; and Art Association Building (Action #55)	Beach Street	Municipal	Flooding (A,V); Storm surge; Wind	H - '38 and '54 Hurricanes	Public safety; Loss of social services; Structural damage	Reduce the cost of disaster clean-up and repair. Reduce service disruption.
4	North Kingstown Free Library (Actions #56-57)	Boone Street	Municipal	Storm surge; Wind	P	Loss of Services; Structural damage	Reduce the cost of disaster clean-up and repair. Protect library resources.

5	Highway Department Facilities Building (Actions #58-59)	West Main Street	Municipal	Flooding (A); Storm surge; Wind	H - '38 and '54 Hurricanes	Debris; Hazardous materials; Loss of services; Property loss	Reduce the cost of disaster clean-up and repair. Prevent contamination of surrounding environment. Reduce service disruption.
Cultural Resources							
1	Wickford Historic District (Action #60)	Wickford Village	Municipal & Private	Flooding (A); Storm surge; Wind; Earthquake	H - '38 and '54 Hurricanes	Historic loss; Private and public property loss	Protect historic resources.
2	Gilbert Stuart Birthplace and Smith's Castle (Action #61)	Gilbert Stuart Road	Private	Flooding (A); Storm surge; Wind	H - '54 Hurricane	Structural damage; Historic loss	Protect historic resources.
Quonset Point							
1	Existing and Proposed Development at Quonset Point/ Davisville (Actions #62-66)	Quonset Point/Davisville	State and Private	Flooding (A,V,X); Storm surge; Wind	H - '38 and '54 Hurricanes	Hazardous materials; Loss of revenue	Prevent contamination of surrounding environment. Ensure post-disaster business continuation.
2	Quonset State Airport (Action #67)	Quonset Point/Davisville	State	Flooding (A,V); Storm surge; Wind	H - '38 and '54 Hurricanes	Loss of emergency response capability; Loss of transportation	Ensure continued operation. Reduce the cost of disaster clean-up.

Recreational Resources							
1	Town Harbors and Moorings (Actions #68-69)	Wickford Village Allen Harbor	Municipal and Private	Flooding (A); Storm surge; Wind	H - '38 and '54 Hurricanes	Public safety; Structural damage; Loss of boats; Damage to fishing industry; Utility damage	Protect property on land and water from damage. Reduce the cost of disaster clean-up and repair.
2	Town Beach, concession and restrooms (Action #70)	Beach Street	Municipal	Flooding (A,V); Storm surge; Wind	H - '38 and '54 Hurricanes	Public safety; Loss of recreational services; Erosion	Maintain beach integrity; Reduce seawall damage; Reduce structural damage.
3	Ryan Park, Rome Point, Wilson Park, Cocumscussoc State Park, and Calf Pasture Point (Action #71)	Belleville Pond, Boston Neck Rd., and W. Main St.	Municipal and State	Flooding (A,V); Storm surge; Wind; Fire	H	Structural damage; Pollution; Loss of services; Loss of trees; Loss of access	Reduce the cost of disaster clean-up and repair.
4	Municipal Golf Course (Action #72)	Quonset Point/Davisville	Municipal	Storm surge; Wind	H - '54 Hurricane	Debris; Loss of trees; Pollution; Hazardous materials; Loss of access; Structural damage; Economic loss	Reduce the cost of disaster clean-up and repair.

3.3 Action Plan

The action plan was created to achieve the mitigation objectives identified in the Risk Assessment Matrix (Table 4). The matrix is organized into major categories of concerns, such as life and property and child safety, drawn from the town's mitigation goals. Within each major category vulnerable areas are identified, such as coastal neighborhoods and schools. The mitigation actions in this plan are grouped according to the vulnerable area each is intended to protect.

Identification of Mitigation Actions

Mitigation actions are actions that are designed to reduce a town's vulnerability to the effects of natural disasters. Mitigation actions are different from emergency preparedness actions in that emergency actions address a town's response to a hazard event, while mitigation attempts to reduce the amount of damage a natural hazard can possibly cause in the first place. An emergency action in response to flooding would involve decisions about how to build an emergency sandbag levee while a mitigation plan would involve ensuring structures in the flood zone area are flood-proofed or even ensuring that there are no structures in the flood zone area to begin with. Essentially, mitigation is about reducing the dangers, costs, and need for emergency action that is usually associated with natural disaster events.

Actions were drawn from the FEMA approved hazard mitigation plans of other Rhode Island towns, the deliberations of the Hazard Mitigation Committee, suggestions from the public, and the research of the planning staff. Actions were chosen for implementation based on their being within the authority and ability of the town to enact, being feasible, and having mitigation benefits sufficient to justify their costs of implementation. An example of an action that was considered but not selected for implementation was the idea of assessing vulnerability of cell phone towers to high winds and retrofitting as necessary. This action was not included because this was seen as the jurisdiction of each individual cell phone service provider. All of the actions included in the following action plan are considered appropriate for implementation given local conditions.

Each action includes a brief description of what the action will accomplish, who the responsible parties are, how much it will cost, how the action will be financed, and in what time frame the action will be completed. Some actions include reference to an example of how the action has been implemented elsewhere. The actions identified include modifications to the built environment, changes in town policies, distribution of public information on hazard risks, and the creation of community based organizations. In addition, consideration has been made for actions to be taken both before and after a disaster occurs.

Prioritization of Actions

The vulnerable areas identified on the Risk Assessment Matrix were prioritized according to the town's hazard mitigation goals. The highest priority was assigned to areas where life and property or child safety would be at risk followed by emergency services, infrastructure, utilities, municipal facilities, cultural resources, Quonset Point, and recreational resources. Further prioritization was based on a variety of considerations including historical damage, number of residents potentially impacted, and the value of property, in economic as well as cultural/environmental terms. The priority assignment given to the vulnerable areas on the matrix plays a role in determining money allocation and the timeframe priority given to specific actions addressing those areas.

The Hazard Mitigation Committee's prioritization of each action was based partly on the prioritization of the vulnerable area each action is intended to protect and partly on the magnitude of benefit each action is likely to achieve as compared to its costs and overall feasibility. An example of an action that was selected for implementation and assigned high priority is the creation of a volunteer disaster assistance program. This program could be developed quickly without great expense and would be very beneficial for the preservation of life and property in the case of a natural disaster.

The Hazard Mitigation Committee created a set of time frames for the completion of each hazard mitigation action: Short term actions will be completed within six months, medium term actions within six to 18 months, and long term actions will be completed within 18 months to five years. In addition, some actions have been identified as ongoing, indicating that such an action requires continual implementation over time. In general, the time frame assigned to each action also corresponds to its priority. High priority actions were assigned a short term time frame and low priority actions were assigned a long term time frame.

Life and Property

Vulnerable Area #1: Coastal Neighborhoods

Action #1: Open Space Acquisition

Maintaining and securing land as open space in flood zones and coastal areas is one way to keep the number of people and homes vulnerable to severe storms and flooding from expanding. The town's CRS rating can be improved as more of this vulnerable land is kept from being developed. The Town has been actively acquiring open space to meet a variety of Town goals, one of which is to protect land in flood zone areas.

The Town will continue to take steps to protect land in flood zones and coastal areas. As a priority list of properties targeted for open space protection is developed, hazard mitigation, primarily targeting flood prone areas, will be an important part of the prioritization process. Attention will also be given to providing public coastal access and habitat protection. The North Kingstown Land Conservancy and Narrow River Land Trust could play significant roles in completing this action.

Lead:	Department of Planning and Development
Other responsible parties:	North Kingstown Land Conservancy, Narrow River Land Trust, Town Council, Conservation Commission, and RIDEM
Financing options:	FEMA FMAP grants, Land acquisition bonds (state and municipal), Land Bank, RI DEM, and other open space acquisition funding and strategies.
Cost:	Variable
Timeframe:	Ongoing
Priority:	High

Action #2: Volunteer Disaster Assistance Program

Volunteers working at the community level can be tremendous asset to hazard mitigation efforts before, during, and after a natural hazard event. A community member acting as a Volunteer Disaster Assistance officer could coordinate community mitigation activities, act as a local hazard information source, and offer assistance to residents not able to help themselves. In preparation for an impending disaster, volunteers could help residents prepare their homes and facilitate evacuations if necessary. After a disaster, qualified volunteers could provide an initial damage report to town agencies, perhaps help the building department in providing emergency building permits, and aid resident clean-up efforts. These volunteers could be associated with community homeowners associations or neighborhood watch groups.

The Town will provide the framework under which these organizations would be created, limited funding, and a weekend long training session. The training session would include discussion of liability issues, hazard mitigation techniques that homeowners can perform, a description of how the town would operate during and after an emergency, and any other information deemed necessary.

Lead:	Fire and Police Department
Other responsible parties:	Building Official's Office, Community Organizations, Town Solicitor, Public Works Department, and Department of Planning and Development
Financing options:	Town budget, Homeowner's association, FEMA, Red Cross
Cost:	Staff time, Overtime
Timeframe:	Short Term
Priority:	High

Action #3: Building Code Compliance Enforcement

The building inspector will continue to enforce regulations regarding coastal buffers, wind resistance, flood mitigation, and earthquake resistance. Information regarding natural hazard vulnerability will be provided to potential homeowners and considered as building permits are reviewed.

Lead:	Building Official's Office
Other responsible parties:	RI CRMC, Department of Planning and Development
Financing options:	Town budget, CDBG, NFIP ICC
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Action #4: Hazard Mitigation in Technical Review Committee Meetings

During the course of regular Technical Review Committee meetings consideration will be made of hazard mitigation opportunities when considering applications.

Lead:	Department of Planning and Development
Other responsible parties:	Other members of the TRC
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Action #5: Information Brochures

Property owners will be informed of their natural hazard vulnerabilities; this information will be passed on to renters as well. In addition, these brochures will encourage residents and businesses in vulnerable areas to form emergency plans and to assess the ability of their structures to withstand flooding, high winds, and earthquakes. Instructions for self-assessment of structure vulnerabilities will be included. Techniques homeowners can utilize on their properties for long-term hazard mitigation and for protection from impending storms will be compiled and distributed to properties located in vulnerable areas. Accompanying these brochures will be a description of town evacuation routes and shelters. The brochures will also be distributed to area builders and contractors. A GIS system will allow the quick and accurate production of maps showing hazard areas that can be given to property owners. Such maps could be easily updated for changing environmental conditions.

Lead:	Department of Planning and Development
Other responsible parties:	Police Department, North Kingstown Chamber of Commerce, CRMC, Institute for Business and Home Safety, RI Red Cross, Building Official's Office
Financing options:	CDBG, NFIP ICC, NESEC
Cost:	Staff time
Timeframe:	Short Term
Priority:	High

Action #6: Evacuation of Tourists

The police department will distribute information on town evacuation routes and emergency shelters to hotels, bed and breakfasts, and any other facilities hosting tourists and out of town visitors in flood zones and hurricane evacuation areas. The information is then made available to visitors in the event of a natural hazard or other emergency.

Lead:	Police Department
Other responsible parties:	Department of Planning and Development, Chamber of Commerce
Financing options:	Town budget
Cost:	Variable
Timeframe:	Short
Priority:	High

Action #7: Reduce and Manage Storm Water

Impermeable surfaces such as asphalt and concrete reduce the amount of water passing into the soil and increase the amount of run-off. This leads to higher levels of flooding and erosion. The Town will encourage the use of permeable paving materials and other creative means for controlling storm water by residential, commercial, and industrial landowners. A packet will be developed containing a selection of best management practices for storm water management. The Town is in the process of developing a storm water management plan. As this plan is developed, priority will be given to those storm water management improvements that coincide with evacuation routes and roads that offer a single point of access to flood vulnerable neighborhoods.

Lead:	Department of Public Works
Other responsible parties:	Department of Planning and Development, Engineering Department, Landowners
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Medium Term
Priority:	Medium

Action #8: Post-Disaster Hazard Mitigation Opportunities

Develop a list of properties in flood prone areas, especially coastal 'V' zones, for potential acquisition after a severe storm event in which the structure has been seriously damaged or destroyed. Repetitive loss properties should be prioritized on this list. NFIP requires that if a property is damaged or renovated totaling more than 50 percent of the property's market value it must be rebuilt to meet flood zone regulations. Coastal properties in the same situation would also have to meet CRMC requirements.

Lead:	Building Official's Office
Other responsible parties:	Department of Public Works, State floodplain manager and building code commissioner, CRMC
Financing options:	FEMA, RIEMA
Cost:	Variable
Timeframe:	Medium Term
Priority:	Medium

Action #9: Encourage ISDS Upgrades

Upgrading coastal individual sewage disposal systems (ISDS) systems would benefit the long-term protection of Narragansett Bay from nitrate leaching as well as mitigate the amount of pollutants introduced into the bay if the system is exposed during a storm event. Education efforts are underway to encourage homeowners in the Wickford Harbor watershed to maintain and upgrade their systems. Property owners in the flood plain who install advanced treatment systems should consider incorporating anti-floatation measures. The resulting brochure could be used wholly or in part to educate other coastal property owners. Upgraded systems should include an emergency shut-off feature with instructions on how and when to use it.

Lead:	Department of Planning and Development
Other responsible parties:	RIDEM, RI Cooperative Extension
Financing options:	CDBG, RI Cooperative Extension
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Vulnerable Area #2: Wickford Village

Action #10: Business Continuation

The Chamber of Commerce will develop strategies to help local businesses in flood prone and coastal areas recover from the effects of a natural disaster. These strategies will include organizing business owners for collective clean-up of their properties after a disaster and the creation of a list of businesses and the people connected with those businesses that are authorized to enter the business in the period of time immediately after a disaster. This list would be for the use of the police department in their role of guarding properties after a disaster. The police department will develop criteria for determining when safety considerations outweigh the right of a given business owner to access their property.

Lead:	North Kingstown Chamber of Commerce
Other responsible parties:	Police Department, RIEDC, Wickford Village Association, Building Official's Office
Financing options:	Town budget, NK Chamber of Commerce
Cost:	Staff time
Timeframe:	Medium Term
Priority:	Medium

Action #11: Protection of Repetitive Flood Loss Properties

The town will consider seeking funds to offer assistance to the owners of repetitive flood loss properties in town to be used to flood proof, elevate, or relocate these structures.

Lead:	Planning Department
Other responsible parties:	Building Officials Office
Financing Options:	FEMA Flood Mitigation Assistance grant program
Cost:	Variable
Timeframe:	Short Term
Priority:	High

Vulnerable Area #3: Elderly Housing

Action #12: Protecting Coastal Facilities

The Scalabrini Villa Nursing Home is the only elderly housing facility in North Kingstown vulnerable to the effects of a severe storm. The facility is located in a SLOSH evacuation area indicating that it is susceptible to damage from the storm surge and wind associated with a hurricane. The building official will notify the facility of its vulnerability and an evacuation plan will be developed by the facility with the support of the police department. In the event of destruction, or damage equaling more than 50 percent of the structure, consideration should be given to moving the facility to a new location.

Lead:	Building Official's Office
Other responsible parties:	Police Department
Financing options:	Town budget, Scalabrini Villa Nursing Home
Cost:	Staff time
Timeframe:	Short Term
Priority:	High

Action #13: Ensuring the Safety of Elderly Housing and Nursing Homes

Natural Hazards occurring on a town-wide basis are a threat to all elderly housing and nursing home facilities in the town. The building official will provide assistance towards self-assessment of these structures as to their vulnerability to flood, high winds, earthquake, extreme winter weather, and power loss. Retrofitting will be conducted as necessary.

Lead:	Building Official's Office
Other responsible parties:	Senior Services
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Medium Term
Priority:	Medium

Action #14: Elderly and Handicapped Residents

The police and fire departments will maintain their list of elderly and handicapped residents living independently in the Town. The list will be divided by evacuation area and susceptibility to flooding or storm surge.

Lead:	Police and Fire Departments
Other responsible parties:	Senior Services Department, GIS
Financing Options:	Town budget
Cost:	Staff Time
Timeframe:	Ongoing
Priority:	High

Vulnerable Area #4: Wickford Village Housing

Action #15: Protecting Wickford Village Housing from Flooding and Storm Surge

The Wickford Village Housing complex is in the Five Hundred Year Flood Zone and the SLOSH (B) evacuation area. The planning department will inform the facility of its vulnerabilities and provide assistance towards self-assessment of the building as to its structural vulnerability to flood, high winds, earthquake, extreme winter weather, and power loss. Retrofitting will be conducted as necessary. The building's wastewater system is connected to the town police station as well. In addition, an evacuation plan coordinated with the town plans should be developed by the facility for senior and disabled residents.

Lead: Department of Planning and Development
Other responsible parties: Police Department, Building Official's Office, Senior Services
Financing options: Town budget
Cost: Staff time
Timeframe: Short
Priority: High

Vulnerable Area #5: Masonry Apartments and Mill Buildings

Action #16: Earthquake Mitigation

There are many apartment and mill buildings in the town built before the 1977 state building codes regarding earthquake resistance were adopted. The building official's office will provide assistance to property owners conducting self-evaluations of their property's structural vulnerability to earthquakes. A collection of retrofit techniques will be compiled and made available to property owners.

Lead: Building Official's Office
Financing options: Town budget
Cost: Staff time
Timeframe: Ongoing
Priority: Medium

Vulnerable Area #6: Mobile Home Parks

Action #17: Protecting Mobile Home Parks from High Winds

Mobile homes are traditionally identified as the type of housing most vulnerable to severe weather. None of the mobile home parks in North Kingstown are located in flood zones or coastal areas, but high winds from either a hurricane or tornado could cause serious damage. Park owners will be encouraged to provide information to their residents on what they can do to protect their property and where they need to go if a severe storm is approaching.

Lead:	Building Official's Office
Financing options:	Town budget, Red Cross
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Vulnerable Area #7: All Hazard Vulnerable Structures

Action #18: Inventory Assets and Estimate Potential Losses

In order to better inform the town's hazard mitigation efforts, an inventory of vulnerable assets will be conducted. The top priority for this analysis will be the natural hazard of greatest concern to the town, hurricanes, following which, other hazards will be analyzed. The inventory will make use of FEMA's HASUZ-MH software and will include structures, infrastructure, and critical facilities including any anticipated future developments. As a result of this analysis, dollar estimates will be generated of potential losses due to damage to structures, their contents, or loss of function. The information generated will be made available to the public and included in the next update of this Hazard Mitigation Plan.

Lead:	Planning Department
Other responsible parties:	Building Officials Office, Department of Public Works, Tax Assessors Office
Financing options:	FEMA Pre-Disaster Mitigation or other grant program
Cost:	Staff time
Timeframe:	Medium
Priority:	Medium

Action #19: GIS Acquisition and Development

A Geographic Information System (GIS) would allow the town a number of opportunities for map analysis purposes. A much more precise analysis of town risks and vulnerabilities could be done with GIS, including additional information on the number of people and property values at risk. Informative and easily updated maps could be provided to town residents regarding hazard zones. Finally, GIS could be a great asset in implementing the actions identified in this plan; it would allow easy identification of what properties and buildings need what level of action relative to a given natural hazard.

Lead:	Town Information Systems Department
Other responsible parties:	Department of Planning and Development
Financing options:	Town budget, user fees, and grants.
Cost:	$64,800 for software and initial consultant services.
Timeframe:	Medium Term
Priority:	Medium

Child Safety

Vulnerable #1: Town Schools

Action #20: Protecting Schools in the Flood Zone

There are four elementary schools located in a flood zone (A), Wickford, Fishing Cove, Forest Park, and Hamilton. Three of those schools are coastal and therefore susceptible to storm surge as well. The schools will be inspected to determine their vulnerability to damage and steps will be taken to make these schools more flood and storm resistant. Important school records should be stored in a manner to protect them from flood damage.

Lead:	School Department
Other responsible parties:	Building Official's Office Town Information Systems Department
Financing Options:	Town budget, FEMA
Cost:	Staff time, Variable depending on renovations needed
Timeframe:	Medium Term
Priority:	Medium

Action #21: Safety Procedures for School Children

Evacuation procedures will be developed for the town's schools. Children will be transported by bus to the nearest public shelter if necessary. The school department will coordinate with the Jamestown school department for emergency procedures for the high school students from that town. A notification plan will be in place for notifying the children's parents in the event of an evacuation. These planning steps are most important for the four schools in flood zones. The school department will acquire early warning weather radios from New England States Emergency Consortium (NESEC).

Lead:	Police Department
Other responsible parties:	School Department, RI Red Cross, Jamestown School Department
Financing options:	Town budget, NESEC
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Action #22: Earthquake Preparation

The schools will be inspected to determine their vulnerability to earthquakes. As necessary, the buildings will be retrofitted for earthquake resistance.

Lead:	Building Official's Office
Other responsible parties:	School Department
Financing options:	Town budget, FEMA, RIEMA
Cost:	Staff time, Variable, depending on needed renovations
Timeframe:	Medium Term
Priority:	Medium

Action #23: Post-Disaster Relocation

In the event of one of the schools in the flood zone being destroyed or severely damaged such that repair would cost at least 50 percent of the value of the property, consideration will be made of moving the school's location to an area outside the flood zone. If the school is not moved, than it will be rebuilt according to FEMA standards for structures in flood zones.

Lead:	School Department
Other responsible parties:	Department of Planning and Development, Planning Commission, Town Council, Building Official's Office
Financing options:	FEMA, RIEMA
Cost:	Variable
Timeframe:	Long Term
Priority:	Low

Vulnerable Area #2: Day-Care Centers

Action #24: Protecting Day-Care Centers in the Flood Zone

There are two day-care centers in North Kingstown located in areas prone to flooding and storm surge, North Kingstown Daycare on Boston Neck Road and St. Paul's Nursery on Main Street. In addition, the Little Miracles Day-Care center is located in a SLOSH area on the Scalabrini Villa property. The building official will inform these facilities of their vulnerabilities and provide them with information on steps they can take to reduce their structural vulnerability to flooding and storm surge. In addition, post disaster relocation will be considered. Each facility will be responsible for developing an evacuation plan, with the assistance of the police department and coordinated with the town-wide plan for schoolchildren.

Lead:	Multi Department
Other responsible parties:	Police Department, Department of Planning and Development, Day-Care Centers, Building Official's Office
Financing options:	Town Budget
Cost:	Staff time
Timeframe:	Short Term
Priority:	High

Emergency Services and Recovery Plans

Vulnerable Area #1: Evacuation Routes

Action #25: Evacuation Route Markers

The Town will cooperate with Rhode Island Department of Transportation in placing signs at significant egress points to aid residents in the event of an evacuation. Though evacuation is generally not mandatory, early evacuation of certain neighborhoods with limited access, or in vulnerable coastal areas, will be considered. Placards will be placed on the emergency shelters identifying them as such.

Lead:	Police Department
Other responsible parties:	Fire Department, RIDOT, School Department, Town Highway Department, Department of Public Works
Financing options:	Town budget, RIEMA
Cost:	Staff Time
Timeframe:	Short Term
Priority:	High

Action #26: Maintain Viable Evacuation Routes

As a part of the town's tree maintenance plan, priority will be placed on trimming and maintaining the health of trees identified as running along evacuation routes and roads offering a single point of access to coastal and flood prone neighborhoods; one example are the trees along the road entering the Mount View neighborhood.

Lead:	Department of Public Works
Other responsible parties:	Police Department, Town Tree Warden
Financing options:	Town budget
Cost:	Staff Time
Timeframe:	Short Term and Ongoing
Priority:	High

Action #27: Publish Evacuation Routes

The Planning Department will contact the Verizon Phone Company in regards to putting the North Kingstown Evacuation Routes Maps, including emergency shelter locations, in the Community Section of the local phone book.

Lead:	Department of Planning and Development
Other responsible parties:	Police Department, Verizon Phone Company
Financing Options:	Town Budget
Cost:	Staff Time
Timeframe:	Short Term
Priority:	High

Action #28: Coordinate Evacuation Plans with Neighboring Towns

The police department will work with neighboring towns to coordinate evacuation plans. Jamestown, Narragansett, and possibly some Warwick residents would potentially evacuate during a severe storm event through or into North Kingstown. To ensure the safe and timely evacuation of all coastal residents these towns should ensure that their individual evacuation plans are compatible.

Lead:	Police Department
Other responsible parties:	Fire Department
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Short Term
Priority:	High

Vulnerable Area #2: Emergency Shelters

Action #29: Additional Emergency Shelters

By Red Cross estimations, shelter capacity in North Kingstown needs to accommodate 1,897 more people than it currently does. The Town will work with the Rhode Island Chapter of the American Red Cross to designate more shelters in the town and on a regional basis, to accommodate all town residents who might be seeking shelter in the event of a natural disaster. The Town will continue to maintain the current shelters based on the standard requirements for emergency shelters as determined by the Red Cross. As the town population increases in the future, the Town will ensure that adequate emergency shelter capacity exists.

Lead:	RI Chapter of the American Red Cross
Other responsible parties:	Police Department, Fire Department, School Department
Financing options:	Town budget, Red Cross
Cost:	Staff time
Timeframe:	Short Term
Priority:	High

Vulnerable Area #3: Town Emergency Operations Center

Action #30: Ensure Operation Ability of the Town Emergency Operations Center

The Emergency Operations Center is located in a SLOSH (B) area indicating that it may be susceptible to damage during a category 3 or stronger hurricane. The police and fire departments will take steps to ensure that the operational ability of the center will not be impaired during such a storm event. One critical role this facility plays is as a communication center. The Town will look at the feasibility of a disaster emergency help line based at this center that town residents can call for information and help in preparing their homes for an approaching storm.

Lead:	Police Department
Other responsible parties:	Fire Department, Department of Public Works
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Ongoing
Priority:	High

Vulnerable Area #4: Rhode Island Air and Army National Guard

Action #31: Ensure Operation Ability of the National Guard Base

The Air and Army National Guard Units stationed at Quonset Point would be an important asset to the town and state in the event of a natural hazard event. The base is located in a flood zone (A) and in a SLOSH (B) area. To ensure that National Guard units will be able to respond during a natural hazard, steps will be taken to protect the base structures and equipment. Structures will be inspected for their flood and earthquake vulnerability and structural renovations will be made as necessary. Procedures for shifting the operational base during a severe storm if necessary will be developed.

Lead:	RI Air and Army National Guard Units
Other responsible parties:	Building Official's Office
Financing options:	RIAC Budget
Cost:	Staff time
Timeframe:	Medium term
Priority:	Medium

Vulnerable Area #5: Town-wide Post-Disaster Plans

Action #32: Debris Management Plan

The Town will develop a plan for collecting and disposing of debris after a storm event. Locations where debris can be collected will be determined, with different locations for potentially hazardous debris, such as propane tanks, made separate. A list of hazardous material handlers regulated by the EPA can be found at http://www.epa.gov/enviro/html/em/index.html. As hazardous waste handlers and treatment facilities will be in high demand during a natural hazard event, the Town should actively seek an agreement with one or more such vendors in order to ensure a timely response at a reasonable price. Even with this precaution, the site for hazardous material containment should be able to hold that material for an extended duration.

Lead:	Department of Public Works
Other responsible parties:	RIDEM
Financing options:	Town Budget
Cost:	Staff Time
Timeframe:	Medium Term
Priority:	Medium

Action #33: Recovery and Reconstruction Ordinance

The Town will consider adopting a recovery and reconstruction ordinance that will expedite the rebuilding of the town and the recovery of town services after a storm or other natural hazard event.

Lead:	Department of Planning and Development
Other responsible parties:	Building Official's Office
Financing options:	Town Budget
Cost:	Staff Time
Timeframe:	Medium Term
Model:	Model Recovery and Reconstruction ordinance in PAS report, Planning for Post-Disaster Recovery and Reconstruction, page 149
Priority:	Medium

Utilities and Infrastructure

Vulnerable Area #1: Dams

Action #34: Dam Inspection and Classification

All dams will be inspected to determine their vulnerability to failure during a flood. Each dam will be classified by town or private ownership and by the level of risk associated with dam failure. As dams in need of repair, replacement, or removal are identified, these actions will be carried out by the town for town-owned dams. A plan for remediation of privately owned dams should be developed by the state. A schedule for dam inspection will be set so that there will be continued monitoring of the dams in town.

Lead:	Public Works Department
Other responsible parties:	RIDEM
Financing options:	Town Budget, FEMA, RIEMA, RIDEM, FMA ICC
Cost:	Staff Time, Retrofits dependent on design and engineering
Timeframe:	Ongoing for publicly owned dams, Short term for privately owned dams
Priority:	High

Vulnerable Areas #2 and 3: Town Bridges

Action #35: Bridge Inspection

All town bridges will be inspected for structural integrity to determine their individual vulnerability to damage in the event of flood or earthquake. Bridges will be retrofitted as needed. A schedule of inspection will be developed to ensure that all bridges are maintained at a high level of safety.

Lead:	RIDOT
Other responsible parties:	Department of Public Works
Financing options:	Local and State funds, FEMA
Cost:	Staff Time, Retrofits dependent on design and engineering
Timeframe:	Ongoing
Priority:	Medium

Action #36: Emergency Procedure for Gas Lines Running on Bridges

Work with New England Gas to create a plan for timely shut down of gas lines in the event of bridge collapse and line disruption. The bridges carrying gas lines are the Hussey Bridge, the Brown Street bridge, the Babbit Farm bridge over Cocumscussoc Brook and the Hamilton Mill bridge on Boston Neck Road.

Lead:	New England Gas
Other responsible parties:	Department of Public Works, RIDOT, North Kingstown Hazard Mitigation Committee
Financing options:	New England Gas
Cost:	Staff Time
Timeframe:	Short Term
Priority:	High

Action #37: Emergency Procedure for Water Lines Running on Bridges

The North Kingstown Water Department already has emergency plans in place to respond to broken water lines. These plans deal with shutting down the water and protecting the water from contamination. The Water Department will review these plans and determine if they adequately cover the possibility of a bridge being washed out by flooding and the possibility of water supply contamination that could result from floodwaters entering the system. Isolation block valves will be identified on either side of these bridges in order to separate a breached area from the rest of the water system. In addition, the water department will analyze the water service maps in order to ensure that water can be adequately supplied to all customers even after a bridge has been washed out. The bridges that carry water lines are the Hussey bridge, the Brown Street bridge, the Babbit Farm bridge over Cocumscussoc Brook, the Hamilton Mill bridge on Boston Neck Road, the Stony Lane and Drybridge Road bridges over the railroad tracks, and the Forge Road bridge over the Potowomut River.

Lead:	Water Department
Other responsible parties:	RIDOT
Financing options:	Town budget
Cost:	Staff time
Timeframe:	Ongoing
Priority:	Medium

Vulnerable Area #4: Town Roads and Streets

Action #38: Keep Roads Passable During a Hazard Event

The town already has a program in place for keeping roads cleared during winter storms. A plan will be created for keeping roads passable in the event of flooding or other hazards, and timely repair of roads after a disaster.

Lead:	Highway Department
Financing options:	Town Budget
Cost:	Staff Time
Timeframe:	Ongoing
Priority:	Medium

Vulnerable Area #5: Wells

Action #39: Protect Town Wells from Flood Waters

Wells number 9 and 10 are located in Flood (A) areas. In the past, well #10 has experienced bacterial contamination that may have been the result of floodwaters. The water department will identify methods by which to flood proof town wells.

Lead:	Water Department
Financing options:	FEMA, RIEMA
Cost:	Staff Time
Timeframe:	Ongoing
Priority:	High

Action #40: Private Well Protection

Loss of electrical utility service can lead to a loss of access to private wells as electric pumps are no longer able to function. The water department will develop a list of properties with private wells, highlighting those properties that are not connected to the municipal water system. Those property owners not connected to the municipal water system will be informed of the risk they face in the event of electrical utility loss and the cost and availability of connecting to the municipal water system where possible. The benefits and costs of purchasing an individual generator versus maintaining the existing conditions will be outlined as well.

Lead:	Water Department
Other responsible parties:	Department of Planning and Development
Financing Options:	Town Budget
Cost:	Staff Time
Timeframe:	Medium Term
Priority:	Medium

Action #41: Protect the Town Water Supply from Contamination and Drought

The water department has developed extensive plans for dealing with emergencies and protecting the water supply from contamination. One important part of these plans is protecting undeveloped land over the town's aquifers. By protecting this land, the water supply is protected from contamination and the recharge ability of the aquifer is maintained, increasing its ability to resist the effects of a drought. The Town will continue to preserve land and limit development around the wells and over the aquifers. In addition, the Town will work with East Greenwich, Exeter, and Warwick to coordinate land protection over the portions of the aquifers that are in those towns and to protect land around the wells in East Greenwich.

Lead:	Department of Planning and Development
Other responsible parties:	Water Department, Towns of East Greenwich, Exeter, and Warwick
Financing options:	FEMA grants, Land acquisition bonds (state and municipal), Land Bank, RI DEM, and other open space acquisition funding and strategies.
Cost:	Variable
Timeframe:	Ongoing
Priority:	High

Vulnerable #6: Electric Utility Lines and Facilities

Action #42: Tree Trimming

The Town and the Narragansett Electric Company will continue to maintain street trees and other trees close to utility lines in a manner that will protect those lines in the event of a storm. This action will serve the additional benefit of reducing the amount of debris generated during the storm thereby reducing clean-up costs. The town Tree Inventory Management Plan calls for the removal of many different trees across town. Those trees from this list that pose a threat to utility service or other property in the event of a natural hazard will be prioritized for removal.

Lead:	Department of Public Works
Other responsible parties:	Narragansett Electric Co., Town Tree Warden
Financing options:	Town budget, RIEMA, Utility companies
Cost:	Staff time - variable based on cost of tree removal
Timeframe:	Ongoing
Priority:	Medium

Action #43: Underground Utility Lines

As the opportunity arises, the town will move utility lines underground, with first priority on lines in coastal areas.

Lead:	Department of Planning and Development
Financing options:	Transportation Improvement Program Grants, FEMA, RIEMA, Special Tax Areas
Cost:	Variable, dependent on design and area.
Timeframe:	Long Term
Priority:	Low

Vulnerable Area #7: RIEDC Wastewater Treatment Facility

Action #44: Investigate Vulnerability and Retrofit as Necessary

The RIEDC wastewater treatment facility is in a 'V' flood zone indicating that it is susceptible to breaking wave action during a serious storm. In addition it is in a SLOSH (A) area such that any hurricane will potentially impact the facility. The facility is elevated and designed for operation in the flood zone. The Town will work with the RIEDC to ensure that the facility is inspected for its ability to withstand these impacts and retrofitted as necessary. If the facility is determined to be vulnerable to damage a plan for protecting the facility, perhaps using a portable dike and pumping equipment, will be developed by the RIEDC in conjunction with the Town.

Lead: RIEDC
Other responsible parties: RIDEM
Financing options: RIEMA, RIEDC, FMAP
Cost: Staff time
Timeframe: Medium term
Priority: Medium

Vulnerable Area #8: Town Wastewater Pumping Facilities

Action #45: Shutting Off Service

During a flood or severe storm event, the town engineer and/or water department should consider shutting down the wastewater pumping facilities at Wickford Point and Mark Drive.

Lead: Engineering Department
Other responsible parties: Water Department
Financing options: Town budget and FEMA Flood Mitigation Assistance Program
Cost: Staff time
Timeframe: Short Term
Priority: High

Action #46: Flood-proofing

The pumping facilities will be flood proofed, with priority placed on the Wickford Point facility, due to its greater vulnerability.

Lead:	Water Department
Financing options:	Town budget and FEMA Flood Mitigation Assistance Program
Cost:	Dependent of design and engineering
Timeframe:	Medium Term
Priority:	Medium

Action #47: Emergency Pumping

A plan for pumping wastewater into a temporary or portable container in the event of flooding will be developed exclusively for town-owned facilities

Lead:	Department of Public Works
Other responsible parties:	Water Department
Financing Options:	Town Budget
Cost:	Staff Time
Timeframe:	Long-term
Model:	Narragansett
Priority:	

Vulnerable Area #9: Phone Lines

Action #48: Protecting Land Line Phone Service

The Town and the Narragansett Electric Company will continue to maintain street trees and other trees close to utility lines in a manner that will protect those lines in the event of a storm. This action will serve the additional benefit of reducing the amount of debris generated during the storm thereby reducing clean-up costs. The town Tree Inventory Management Plan calls for the removal of many different trees across town. Those trees from this list that pose a threat to utility service or other property in the event of a natural hazard will be prioritized for removal. If electric lines are put underground, than the phone lines should be considered for this treatment as well.

Lead:	Department of Public Works
Other responsible parties:	Phone Company, Town Tree Warden, Narragansett Electric Co.
Financing options:	RIEMA, TIP, Phone Company
Cost:	Staff Time
Timeframe:	Ongoing
Priority:	Medium

Vulnerable Area #10: Wickford Service Stations

Action #49: Contain Hazardous Materials

Property owners will be contacted and these businesses will be requested to develop plans that ensure the containment of hazardous materials in the event of a severe storm or hurricane. Special attention will be paid to underground storage tanks that could float or rupture in the event of flooding.

Lead: Building Official's Office
Financing options: Town Budget, the Service stations
Cost: Staff Time
Timeframe: Long Term
Priority: Low

Action #50: Investigate Vulnerability and Retrofit

The property owners will be given information on how to assess the structural integrity of the two service stations in terms of resistance to flood and winds.

Lead: Building Official's Office
Financing options: Town Budget
Cost: Staff Time
Timeframe: Long Term
Priority: Low

Municipal Facilities

Vulnerable Area #1: Town Hall

Action #51: Investigate Vulnerability and Retrofit

The Town Hall is located in the 500-year flood zone and in a SLOSH (A) area. The building will be inspected to determine its need for flood proofing and earthquake retrofit. Renovations will be made as necessary. Records will be stored in such a way that they are protected from flooding in the building.

Lead:	Department of Public Works
Other responsible parties:	Town Information Systems Department, Building Official's Office
Financing options:	FEMA, RIEMA, Town Budget
Cost:	Staff Time, variable depending on renovations needed.
Timeframe:	Investigation – Short Term Remediation – Long Term
Priority:	High

Action #52: Post-Disaster Relocation

If the Town Hall is subject to serious damage or destruction a new location will be found for rebuilding.

Lead:	Town Manager
Other responsible parties:	Building Official's Office, Department of Planning and Development
Financing options:	FEMA Post-Disaster Recovery Assistance
Cost:	variable, in millions.
Timeframe:	Long Term – Post Disaster
Priority:	Low

Vulnerable Area #2: Town Hall Annex

Action #53: Investigate Vulnerability and Retrofit

The Town Hall Annex is located in an (A) flood zone and in a hurricane surge area that has experienced repeated flooding during past storms. The town will take steps to protect the records and documents currently stored in the basement of that building. Past flooding has damaged some of those records. The annex building will also be inspected and opportunities for flood, wind, and earthquake proofing identified. Retrofitting will be done as necessary with attention to maintaining the building's historical character.

Lead:	Building Official
Other responsible parties:	Town Information Systems Department, Department of Public Works
Financing options:	FEMA, RIEMA, Town Budget
Cost:	Staff Time, variable depending on renovations needed.
Timeframe:	Investigation – Short Term Remediation – Long Term
Priority:	High

Action #54: Post-Disaster Relocation

If the Town Hall Annex is seriously damaged or destroyed then a new location will be found for the departments located in this building. In the event of the destruction of the main Town Hall consideration should be made for rebuilding the Town Hall building to accommodate all town departments.

Lead:	Town Manager
Other responsible parties:	Building Official, Department of Planning and Development
Financing options:	FEMA Post Disaster Recovery Assistance
Cost:	variable, in millions
Timeframe:	Long Term – Post Disaster
Priority:	Low

Vulnerable Area #3: Senior Center, Cold Spring Community Center, and the Art Association Building

Action #55: Investigate Vulnerability and Retrofit

The Beach Street facilities are in a Flood (A) zone and a hurricane surge area. All three buildings will be investigated for their structural vulnerabilities and retrofitted as needed. Attention will be given towards maintaining their historical character. In the event of destruction, the town will consider rebuilding these structures in another location.

Lead:	Building Official's Office
Other responsible parties:	Senior Center Director, Recreation Director
Financing options:	FEMA, RIEMA, Town Budget
Cost:	Staff Time, variable depending on renovations needed.
Timeframe:	Investigation – Short Term Remediation – Long Term
Priority:	Medium

Vulnerable Area #4: North Kingstown Free Library

Action #56: Investigate Vulnerability and Retrofit

The library is located in the storm surge area. The Town will ensure that the library building will be able to resist the high winds and flooding associated with a severe storm or hurricane. The trees surrounding the building, with special attention to those on the waterside, will be well maintained with the removal of dead limbs and trees to prevent their being blown into the building during a storm. Trees removed will be replaced such that a natural wind-block is maintained.

Lead:	Building Official's Office
Other responsible parties:	Library Director, Tree Warden
Financing options:	FEMA, RIEMA, Town Budget
Cost:	Staff time, variable depending on renovations needed.
Timeframe:	Investigation – Short Term Remediation – Long Term
Priority:	Medium

Action #57: Protect Library Resources

A plan for protecting the library's resources, with priority on those that are irreplaceable, will be developed. Consideration will be given for evacuating some of the more important resources to a safe location.

Lead:	Library Director
Financing options:	Town Budget, private library related grants
Cost:	Staff Time
Timeframe:	Medium Term
Priority:	Medium

Vulnerable Area #5: Highway Department Facilities Building

Action #58: Contain Hazardous Materials

All hazardous materials, including fuel and other automotive fluids, will be stored in such a manner that they will not be spilled or leak in the event of flooding.

Lead:	Department of Public Works
Financing options:	Town Budget
Cost:	Staff Time
Timeframe:	Long Term
Priority:	Low

Action #59: Investigate Vulnerability and Retrofit

The garage's specific structural vulnerability will be assessed in terms of flood and winds. Steps will be taken to retrofit the structure as needed. Relocation of the garage will be considered in the event of its destruction or severe damage.

Lead:	Department of Public Works
Financing options:	Town Budget, FEMA, RIEMA, FMA ICC
Cost:	Staff Time, variable depending on renovations needed.
Timeframe:	Long Term
Priority:	Low

Cultural Resources

Vulnerable Area #1: Wickford Historic District

Action #60: Retrofitting Historic Homes

The Building Official's Office will research retrofitting techniques that mitigate flood and wind damage while maintaining the historic integrity of the home. The Historic District Commission may make reasonable allowances for changes that may alter appearance but ultimately will protect the home and its residents. Historic homeowners should be instructed in self-inspection to determine how vulnerable their structures are to storm damage.

Lead:	Building Official's Office.
Other responsible parties:	Historic District Commission, Historic Wickford, Department of Planning and Development
Financing options:	Town budget, Private Grants for Historic Preservation
Cost:	Staff time
Timeframe:	Medium
Priority:	Medium

Vulnerable Area #2: Gilbert Stuart Birthplace and Smith's Castle

Action # 61: Retrofitting the Buildings

The Building Inspector's Office, in cooperation with the Gilbert Stuart Birthplace and Smith's Castle, will research retrofitting techniques that mitigate flood damage while maintaining the historic integrity of the home. These techniques will be used as necessary. The museum will develop a plan for removing or otherwise protecting valuable exhibit pieces when there is a threat of flooding.

Lead:	Gilbert Stuart Birthplace, Smith's Castle
Other responsible parties:	Building Official's Office, RIHPHC, Department of Planning and Development
Financing options:	RIEMA, FMA ICC, Gilbert Stuart Birthplace, Smith's Castle
Cost:	Staff time, variable depending on design and engineering.
Timeframe:	Short
Priority:	High

Quonset Point

Vulnerable Area #1: Existing and Proposed Development at Quonset Point

Action #62: New Development

Quonset Point is an area that has in the past been hard hit by hurricanes and severe storms. All new development will be required to meet at least the current flood, wind, and earthquake resistance building codes, however for additional protection, businesses will be encouraged to go beyond what is required. The RIEDC will develop a list of further structural changes that could be incorporated into these buildings including building orientation related to primary wind direction. Where possible, impermeable surfaces will be kept to a minimum.

Lead: State Building Code Commissioner
Other responsible parties: RIEDC, CRMC
Financing options: RIEDC, developers
Cost: Staff Time
Timeframe: Ongoing
Priority: High

Action #63: Current and New Development

A large percentage of the Quonset Point coastal area is in fact filled land put in by the Navy in 1940 when the base was built. The RIEDC will determine the extent of that fill and its stability in the event of an earthquake. Measures to protect structures and utilities from earthquake damage will be implemented as necessary.

Lead: RIEDC, State Building Code Commissioner
Other responsible parties: Building Official, CRMC
Financing options: RIEDC, Private businesses, developers
Cost: Staff Time, variable depending on renovations needed.
Timeframe: Ongoing
Priority: Medium

Action #64: Outreach

Current businesses in the flood and surge areas of Quonset Point will be informed of their location relative to natural hazards, primarily hurricanes, and given information on how they can protect their property and employees.

Lead: RIEDC
Financing options: RIEDC
Cost: Staff time
Timeframe: Ongoing
Priority: High

Action #65: Hazardous Material Containment

Businesses operating with hazardous materials will be identified. These businesses will be requested to develop plans that ensure the containment of those materials in the event of a severe storm or hurricane.

Lead:	Fire Marshall (State and Local)
Other responsible parties:	RIEDC, ARCH CAP
Financing options:	RIEDC, Private businesses
Cost:	Staff Time
Timeframe:	Ongoing
Priority:	High

Action #66: Business Continuation

The Chamber of Commerce will develop strategies to help businesses located in Quonset in flood prone and coastal areas recover from the effects of a natural disaster. These strategies will include organizing business owners for collective clean-up of their properties after a disaster and the creation of a list of businesses and the people connected with those businesses that are authorized to enter the business in the period of time immediately after a disaster. This list would be for the use of the police department in their role of guarding properties after a disaster. The police department will develop criteria for determining when safety considerations outweigh the right of a given business owner to access their property.

Lead:	North Kingstown Chamber of Commerce
Other responsible parties:	Police Department, RIEDC, Building Official's Office
Financing options:	NK Chamber of Commerce, RIEDC
Cost:	Staff time
Timeframe:	Medium Term
Priority:	Medium

Vulnerable Area #2: Quonset State Airport

Action #67: Investigate Vulnerability and Retrofit

The airport is located in a coastal flood zone and in a storm surge area. The Rhode Island Airport Corporation will be asked to assess the airport's structural vulnerability to flood, wind, and earthquake and retrofit as necessary. The Town will also request that a plan for securing hazardous materials such that they are not vulnerable to flooding be created.

Lead:	Rhode Island Airport Corporation
Financing options:	RIAC
Cost:	Staff Time
Timeframe:	Medium term
Priority:	Medium

Recreational Resources

Vulnerable #1: Town Harbors, Docks, and Moorings

Action #68: Storm Preparedness Plan

The Harbor Management Commission will prepare a storm preparedness plan. The plan will address mitigating the effects of severe storms on boats, marina infrastructure, and docks. Attention will be paid to the fact that there are many residential and commercial properties surrounding Wickford Harbor that could be damaged by boats and debris from the harbor carried by storm winds and waves. Attempts will be made to mitigate the damage that storm-carried debris can cause.

Lead:	Harbor Management Commission
Other responsible parties:	Harbor Division, Department of Planning and Development, Individual Marina Owners
Financing Options:	Town budget
Cost:	Staff time
Timeframe:	Medium Term
Priority:	Medium

Action #69: Wickford Harbor Breakwater

The Town will analyze the feasibility of replacing or enlarging the breakwater at the entrance to Wickford harbor. This analysis will include considerations of environmental impacts, including tidal exchange and aquatic life habitat, as well as a cost/benefit assessment. One of the concerns with increasing the size of the breakwater has to do with the ability of the harbor to cleanse itself through tidal exchange; the harbor is already under a great deal of pressure from pollution. In addition, the channel is federally maintained so that all proposed changes would require approval from the Army Corp of Engineers.

Lead:	Planning Department
Other responsible parties:	Harbor Division
Financing options:	Army Corp of Engineers, FEMA
Cost:	Subject to design and engineering.
Timeframe:	Long Term
Priority:	Low

Vulnerable Area #2: Town Beaches

Action #70: Beach Maintenance

Beaches can play an important role in preventing erosion and protecting coastal properties. The Town will work with the CRMC to research the possibility of and necessity of beach renourishment and even establishment of new beaches in various locations including Wickford Harbor, Quonset Point, and the Town Beach. If possible sand washed onto roads from beaches during a storm will be returned to those beaches; otherwise, a specific location will be determined where the sand can be temporarily stored until a permanent location can be found. Dredged sand may also be used for beach renourishment, with CRMC approval.

Lead:	CRMC
Other responsible parties:	Department of Planning and Development, Department of Public Works, Department of Leisure Activities
Financing options:	RIDEM, CRMC
Cost:	Variable with amount of sand displaced
Timeframe:	Long Term
Priority:	Low

Vulnerable Area #3: Ryan Park, Chafee Nature Preserve (Rome Point), Wilson Park, Cocumscussoc State Park, Calf Pasture Point

Action #71: Fire Protection

During periods of dry weather and drought, the fire department will monitor large forested areas in an attempt to catch a fire before it is able to grow and cause significant damage. The water department already runs a similar patrol during drought conditions in the western part of the town over the aquifer. The fire department will also ensure that there is adequate access to forested parcels and a local source of water. Quantities of underbrush and dead limbs can allow a fire to quickly become very large and burn out of control. The fire department will assess the level of underbrush in these parks and determine if a controlled burn or other means of removal is necessary.

Lead:	Fire Department
Other responsible parties:	Water Department
Financing options:	Town budget, RIDEM
Cost:	Staff time
Timeframe:	Medium term
Priority:	Medium

Vulnerable Area #4: Municipal Golf Course

Action #72: Investigate Vulnerability and Retrofit

The North Kingstown Municipal Golf Course is located in a flood zone and a storm surge area. Golf Course facilities will be inspected for their structural vulnerability to flood, wind, and earthquake and retrofits will be made as necessary. Plans for the secure storage of hazardous materials will be made. Loss of revenue from lost playing time due to a natural disaster would cause problems and a loss of revenues for many of the Town's recreation activities.

Lead:	Building Official's Office
Other responsible parties:	Leisure Activities Director
Financing options:	Town Budget
Cost:	Staff Time
Timeframe:	Investigation – Short Term Remediation – Long Term
Priority:	Low

4.0 – Implementation

In any plan, the implementation section is one of the most important. Without a clear sense of who is responsible for a given action and in what timeframe it should be completed, many important goals can be lost. A plan must include a clear course for action.

Each action description in the previous section includes a brief statement of responsible parties, funding sources, and expected timeframe for completion. These descriptions form the basis for implementation. From this basis, actions will be incorporated into departmental work plans. Individuals, organizations, and other groups outside of town departments with responsibility for plan actions will work with the appropriate town department to form a schedule for implementation and coordination with town activities. The Capital Improvement Program will be used to schedule the funding of actions from the town budget.

Plan Adoption and Incorporation into Existing Plans

Upon receiving approval from FEMA and RIEMA the plan was submitted to the North Kingstown Town Council and Planning Commission for final approval and adoption into the town's comprehensive plan.

The adoption of the North Kingstown Hazard Mitigation Plan into the North Kingstown Comprehensive Plan will ultimately have an affect on all nine elements of the comprehensive plan. In the land use section, further development will be directed away from hazard areas, such as the flood zones, as well as away from groundwater recharge areas. The evacuation routes and bridge maintenance make up the additions to the circulation element. Economic development is affected in many ways, from placing development away from hazard areas to forming cooperative agreements with businesses to ensure that adequate supplies are available to the town in the event of an emergency. The hazard mitigation plan will have some of its greatest influence in the community services and facilities element as outreach programs are developed to inform and prepare residents for natural hazards; as important building and site plan review processes incorporate hazard mitigation into their reviews; and as town facilities are retrofitted to protect them and the important records they contain from damage or destruction during a natural hazard. Natural and cultural resources will also be protected as plans are developed for park clean-up after a storm and methods of protecting historic buildings are researched and distributed. The open space, conservation, and recreation element will benefit from both the preserved open space in hazard vulnerable areas and the storm hazard plans that will be developed for the town's harbors. The Post Road corridor element will be influenced in the storm water management techniques and underground utility lines that will be encouraged for the purpose of hazard mitigation. Finally, the hazard mitigation plan will strongly affect the Quonset Point element in that, much of Quonset Point is located in flood zones and storm surge areas therefore requiring that new construction respect that fact and build to avoid and resist storm damage.

4.1 Monitoring, Evaluation, and Updates

The North Kingstown Hazard Mitigation Committee will meet at the end of the first and second six-month time period to assess progress on action completion and the effectiveness of actions already completed. Changes in timeframe or other aspects of implementation will be made as necessary.

The North Kingstown Hazard Mitigation Committee will continue to meet twice yearly to assess the effectiveness of the plan, and make revisions as necessary to improve its effectiveness. The yearly updated plan will be submitted to and reviewed by RIEMA following local approval. In addition, the committee will meet following a natural hazard event to discuss the effectiveness of plan elements and to review community input based on their experiences during and after the event.

Evaluation of the plan will consider whether there have been any changes to the nature, magnitude, or type of risks and whether the goals and objectives of the plan are still current and appropriate. Any need for new actions will be considered. Outcomes of implementation, thus far, will also be considered, including participation and coordination of all involved agencies, resources available for plan implementation, and any problems that have arisen in implementation.

Future sea level rise will have a tremendous impact on the extent of damage caused by flooding and storms. At a minimum of 10-year intervals, the Hazard Mitigation Committee will assess the need for changes in the flood and storm surge maps and implement those changes as available technology permits. Actions and policies pertaining to properties in the current flood zones and storm surge areas will be extended to any properties falling within these new areas. In addition, hazard mitigation should be an integral part of any considerations for protecting coastal properties from sea level rise, whether by structural or non-structural methods.

Continued Public Involvement

The public will continue to be involved in the hazard mitigation planning process through our regular meetings of the Local Hazard Mitigation Committee to be held twice a year. The public can also stay involved through the use of the Town's web site www.northkingstown.org, where updates to the plan, upcoming meetings and other hazard mitigation topics, will be posted.

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Town of North Kingstown. February 2004. *Emergency Operations Plan.*

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US Geological Survey. July 2004. *www.usgs.gov*

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APPENDIX A: TECHNICAL AND FINANCIAL ASSISTANCE FOR MITIGATION

STATE RESOURCES

Rhode Island Emergency Management Agency
645 New London Avenue
Cranston, RI 02920
Phone: (401) 946-9996

Coastal Resources Center
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882
Phone: (401) 874-6224

Coastal Resources Management Council
Stedman Government Center
4808 Tower Hill Road
Wakefield, RI 02879
Phone: (401) 277-2476

Department of Administration/Division of Planning
One Capitol Hill
Providence, RI 02908
Phone: (401) 277-6478

State of Rhode Island Building Committee Office
Building Commissioner's Office
One Capitol Hill
Providence, RI 02903
Phone: (401)277-3529

Rhode Island Builders Association
The Terry Lane Corporation
Terry Lane
Gloucester, RI 02814
Phone: (401) 568-8006

Department of Transportation-Design Section/Bridges
2 Capitol Hill, Room 231D
Providence, RI 02903
Phone: (401) 277-2053

Rhode Island Department of Business Regulations
233 Richmond Street
Providence, RI 02903
Phone: (401) 277-2246

State Fire Marshal's Office
272 West Exchange Street
Providence, RI 02903
Phone: (401) 277-2335

Rhode Island Banking Commission/Associate Director
233 Richmond Street
Providence, RI 02903
Phone: (401) 277-2405

Public Utilities Commission
100 Orange Street
Providence, RI 02903
Phone: (401) 277-3500 Ext. 153

Department of Environmental Management
Division of Parks and Recreation
2321 Hartford Avenue
Johnston, RI 02919
Phone: (401) 277-2635

FEDERAL RESOURCES

Federal Emergency Management Agency
Mitigation Division, Region I Office
J.W. McCormack POCH, Room 462
Boston, MA 02109
(617) 223-9561

U.S. Army Corps of Engineers
New England District
424 Trapelo Road
Waltham, MA 02254
(617) 647-8505

Department of Agriculture
Natural Resources Conservation Service
(formerly Soil Conservation Service)
451 West Street
Amherst, MA 01002
(413) 253-4362

Department of Commerce National Weather Service
Forecast Office
445 Myles Standish Boulevard
Taunton, MA 02780
(508) 823-2262

Economic Development Administration
143 North Main Street, Suite 209
Concord, NH 03301
(603) 225-1624

Department of the Interior
1849 C St., NW
Washington, DC 20240
(202) 208-3100

National Park Service
Rivers and Trails Conservation Program
Regional Office
15 State Street
Boston, MA 02109
(617) 223-5203

U.S. Fish and Wildlife Service
New England Field Office
22 Bridge Street, Unit #1
Concord, NH 03301-4986

Department of Housing and Urban Development
Community Development Block Grants
Region I - O'Neill Federal Building
10 Causeway Street
Boston, MA 02222
(617) 565-5354

Small Business Administration
360 Rainbow Boulevard South, 3rd Floor
Niagara Falls, NY 14303
(716) 282-4612 or (800) 659-2955

Environmental Protection Agency
Region I - JFK Federal Building
Government Center
Boston, MA 02203
(617) 565 3400

OTHER RESOURCES

The Association of State Floodplain Managers (ASFM)
Professional association with a membership of almost 1,000 state employees that assist communities with the NFIP. ASFPM has developed a series of technical and topical research papers and a series of proceedings from their annual conferences. Many mitigation "success stories" have been documented through these resources and provide a good starting point for planning.

Floodplain Management Resources Center
Free library and referral service of the ASFPM for floodplain management publications. Co-located with the Natural Hazards Center at the University of Colorado in Boulder, staff can use keywords to identify useful publications from the more than 900 flood-related documents in the library.

Institute for Business and Home Safety (IBHS)
(formally Insurance Institute for Property Loss Reduction)
An insurance industry-sponsored, nonprofit organization dedicated to reducing losses—deaths, injuries, and property damage—resulting from natural hazards. IBHS efforts are directed at five specific hazards: flood, windstorm, hail, earthquake, and wildfire. Through its public education efforts and information center, IBHS communicates the results of its research and statistical gathering, as well as mitigation information, to a broad audience.

Volunteer Organizations
Organizations, such as the American Red Cross, the Salvation Army, Habitat for Humanity, Interfaith, and the Mennonite Disaster Service, are often available to help after disasters. Service organizations, such as the Lions, Elks, and VFW are also available. These organizations have helped others with food, shelter, clothing, money, etc. Habitat for Humanity and the Mennonite Disaster Service provide skilled labor to help rebuild damaged buildings incorporating mitigation or flood-proofing concepts. The offices of individual organizations can be contacted directly, or the FEMA Regional Office may be able to assist.

Flood Relief Funds
After a disaster, local businesses, residents, and out-of-town groups often donate money to local relief funds. They may be managed by the local government, one or more local churches, or an ad hoc committee. No government disaster declaration is needed. Local officials should recommend that the funds be held until an applicant exhausts all sources of public disaster assistance. Doing so allows the funds to be used for mitigation and other projects that cannot be funded elsewhere.

New England States Emergency Consortium (NESEC)
Lakeside Office Park
NESEC conducts public awareness and education programs on natural disaster and emergency management activities throughout New England. Brochures and videotapes are available on such topics as earthquake preparedness, mitigation, and hurricane safety tips. NESEC maintains a web page that is accessible at http://www.serve.com/NESEC.

The New England Floodplain and Stormwater Managers Association (NEFSMA)

Professional organization for New England floodplain and stormwater managers. Provides workshops, conferences, and a newsletter to membership and interested individuals and companies. Contact: Nicholas Winter, chairman, at (617) 727-0488 or NEFSMA's homepage on the Web at http://www.seacoast.com/~nefsma.

APPENDIX B: EXISTING PROTECTION SYSTEMS - FEDERAL AND STATE

National Flood Insurance Program:

All of Rhode Island's 39 municipalities participate in the NFIP. This program is a direct agreement between the federal government and the local community that flood insurance will be made available to residents in exchange for community compliance with minimum floodplain management regulations. Communities participating in the NFIP must:

1. Adopt the Flood Insurance Rate Maps as an overlay regulatory district.
2. Require that all new construction or substantial improvement to existing structures in the flood hazard area be elevated or (if nonresidential) flood-proofed to the identified flood level on the maps.
3. Require design techniques to minimize flood damage for structures being built in high hazard areas, such as floodways or velocity zones

In return for community adoption of these standards, any structure in that community is eligible for protection by flood insurance, which covers property owners from losses due to inundation from surface water of any source. Coverage for land subsidence, sewer backup and water seepage is also available subject to the conditions outlined in the NFIP standard policy (see Appendix A, Federal Resources, for contacts regarding insurance coverage and purchase). Since homeowners' insurance does not cover flooding, a community's participation in the NFIP is vital to protecting property in the floodplain as well as being essential to ensure that federally backed mortgages and loans can be used to finance flood prone property.

Increased cost of compliance (ICC) coverage has recently been implemented for all new NFIP policies and renewals and is intended to be "mitigation insurance" to allow homeowners whose structures have been repeatedly or substantially damaged to cover the cost of elevation and design requirements for rebuilding with their flood insurance claim up to a maximum of $15,000.

Community Rating System:

A voluntary initiative of the NFIP, the CRS was developed to encourage communities to perform activities that exceed the minimum NFIP floodplain management standards. If a community participating in the CRS performs activities that include maintaining records for floodplain development, publicizing the flood hazard, improving flood data, and floodplain management planning, then the flood insurance premiums paid by policy holders in the community will be reduced by 5 to 45 percent. Developing a flood mitigation plan will help communities gain additional credit under the CRS.

Coastal Barrier Resource Act:

Administered by the U.S. Fish and Wildlife Service, this program has mapped public and private land identified as undeveloped coastal barrier areas. These areas may be denoted as "Otherwise Protected Areas" if they are owned by public entities. In the coastal barrier areas shown on FEMA's Flood Insurance Rate Maps, structures newly built or substantially improved after the date shown on the maps are ineligible for federal flood insurance. This serves to restrict new development in these areas because the purchase of flood insurance is required to obtain federal-backed mortgages and improvement loans for structures located in special flood hazard areas.

State Barrier Beaches:

Your community may have barrier beaches, as defined by the state's R.I. Coastal Resources Management Program. The regulations applying to these areas are enforced by CRMC. These regulations restrict alteration of the beach and/or dunes and the construction of coastal engineering structures. New or substantially reconstructed buildings generally must be elevated to a minimum of one foot above base flood elevation. No new commercial development is allowed on barrier beaches. If a structure is damaged more than 50 percent, it cannot be rebuilt.

Warning Systems and Emergency Operations Plans:

Your community may have a flood warning system in place and should have a plan for response to flooding. In addition, RIEMA has offices throughout the state that maintain area-wide plans for flood events.

Evacuation Plans and Systems:

Your community's emergency operations center should have evacuation plans in place. For communities near a nuclear power plant, evacuation plans are required, and may also be used for flood evacuation. RIEMA may have additional evacuation plan information.

Land Use Restrictions:

There are several federal and state regulations that serve to restrict land use in certain areas that may help reduce flood hazard vulnerability. If your community has open land owned by the state or federal government, examine what restrictions are placed on its development. In addition, the state Wetlands Protection Act regulates the development of all lands identified as significant to the protection of resources identified in the Act.

Septic Systems:

If there are areas in the community not served by a public sewer system, state septic system regulations influence development and may be a consideration for mitigation alternatives that include rebuilding and elevation of structures. Specific design requirements must be met for any construction in coastal velocity zones or river floodways. Generally, an inspection of a septic system is required if there is a change in use of the structure, an increase in flow, or failed system. Limited inspections are required if the footprint of the structure is being changed. Upgrades are required by the state if an inspection reveals a failed system. However, local regulations may be more restrictive than state requirements, requiring inspections or upgrades in other cases.

Economic/Community Development:

There may be programs existing to help flood proof homes using Community Development Block Grant funds. There may be housing assistance programs in the community that can be used following a major flood, achieving both the objectives of reducing flood damage and improving the community's housing stock (see Appendix A, federal resources, for more information).

Hazard Mitigation Grant Program:

Also known as the 404 Program or HMGP, this program is available only after a federally declared disaster occurs. It represents an additional 15 percent of all the infrastructure and individual assistance funds that are provided to states to repair damages and recover from losses, and is administered by the state in partnership with FEMA. Having a plan or completed mitigation action matrix prior to a disaster event is extremely helpful in meeting the state's deadlines for applications and ensuring the project is eligible and technically feasible. It provides 75/25 matching grants on a competitive basis to state, local, and tribal governments, as well as certain nonprofit organizations that can be matched by either cash or in-kind services. The grants are specifically directed toward reducing future hazard losses, and can be used for projects protecting property and resources against the damaging effects of floods, earthquakes, wind, and other hazards. Specific activities encouraged under the HMGP include acquiring damaged structures to turn the land over to the community for open space or recreational use, relocating damaged or damage-prone structures out of the hazard area, and retrofitting properties to resist the damaging effects of disasters. Retrofitting can include wet or dry flood-proofing, elevation of the structure above flood level, elevation of utilities, or proper anchoring of the structure.

Flood Mitigation Assistance:

The Flood Mitigation Assistance (FMA) program makes grants available on a pre-disaster basis for flood mitigation planning and activities, including acquisition, relocation, and retrofitting of structures. FMA grants for mitigation projects will be available only to those communities with approved hazard mitigation plans. A certain amount of funding is allotted to each state per year based on a risk formula for floods. Each state has the discretion to award funds to communities or to state government agencies. States may use whatever criteria or method they choose to award the funds as long as the applicant and the proposal are eligible. The program may fund up to 75 percent of the total cost of the proposed project, with a minimum of 25 percent of the cost coming from the community. A minimum of half the community share must be cash or "hard match." Funds can also be granted to communities to help them prepare local flood mitigation plans. The same match requirements apply. Once a community receives a planning grant, however, it is not eligible to receive additional planning grants for another five years. For further information on the FMA program or ICC coverage contact RIEMA at (401) 946-9996.

Pre-Disaster Mitigation:

FEMA's Pre-Disaster Mitigation (PDM) grant program is a nationally competitive program. Projects can be funded up to a maximum $3 million federal share. Up to 75% of the total project cost can be federally funded. The state or local community provides a 25% cost share, which can be "in-kind". Small, impoverished communities may be funded up to 90%. In order to be eligible to receive a PDM 2004 grant, the state or local community must have an approved hazard mitigation plan in place by Nov. 1 2004.

Earthquakes and Hurricanes:

A certain amount of funding is allotted to each state per year based on a risk formula for earthquakes. Coastal states are allocated funds based on a risk formula for hurricanes. Each state receiving such funds has the ability to grant project funds to a community. There is not a match requirement on the part of the community, but the funds are limited, and are generally only available once a year. The projects or products proposed for such funding must demonstrate that earthquake or hurricane risk will be reduced or eliminated, and the proposed project or product is a cost-effective measure (a stringent cost/benefit analysis need not be performed). Information about the amount of funding available per year and the state requirements for eligibility and performance may be obtained from RIEMA at (401) 946-9996.

APPENDIX C: Newspaper Clippings Related to Past Natural Disasters

Rhode Island Mother Says, 'Oh, We're Living'

How Hurricane 'Carol' Hit One Family

By JOHN WARD
(Providence Journal-Bulletin)

WICKFORD, R. I. (AP)—Mr. and Mrs. Malcolm Jenne and their four children go to bed at 9 p. m. by the light of a single kerosene lamp that their family physician gave them.

That's all the light they have.

They didn't have any light Tuesday night and had to go to bed at dusk. The hurricane had carried away power lines in this little village on Narragansett Bay, 18 miles south of Providence.

That storm had left them with their home but with a cellar full of water, a yard covered with puddles of salt water, no lights, no heat, no facilities for storing food and none for cooking it.

The Jennes, whose children range from three years to 22, are typical of hundreds of families braving it out in many of the flood areas of Rhode Island, leading a bare existence in their water-soaked homes, struggling along with makeshift meals, sleeping in makeshift beds, wearing what clothes the storm has left them.

Mr. and Mrs. Jenne were working at the Quonset Point Naval Air Station and their son Robert at a bank in Providence when the storm hit.

A nursemaid, Mrs. Ethel Rose of Allenton, got the three children, two boys and a girl, three to six years old, rushed them from the house and drove them in her auto through rising waters to refuge at her own home.

The Jenne family was reunited late Tuesday afternoon to find the flood waters had virtually destroyed all of their first-floor furnishings, including everything in two bedrooms.

Last night, Mrs Jenne, who perhaps typifies all the housewives and mothers in the area, said, "Oh, we're living."

"We have just one kerosene lamp. Dr. Patrick O'Brien loaned it to us. The first night we went to bed at eight, but now we go at nine.

"We have been cleaning up and cleaning up. We get food as we need it for each meal from a store four miles away.

"We finally got our gas man to hook up our bottled gas stove yesterday afternoon. Before that we had to eat cold food like frankfurters although Wednesday we had steaks cooked on our outdoor grill.

"We invited our neighbors, Mr. and Mrs. Gardner Willis and their children over that night. They're worse off than we are. They live on the first floor and had 36 inches of water. We only had 24 inches.

"We just threw out all the children's shoes—10 pairs—and bed slippers. When we get paid tomorrow, we've got to buy new shoes for everybody. We've got most of our spare clothes hanging on the line to dry.

"My husband has carried four trailer loads of stuff, including our studio couch and rugs, to the town dump and there's a lot more down the cellar to go."

The back and side yard at the Jenne place were typical—shortly before dark last night—of yards throughout the flood area, as families ate meager meals at makeshift picnic tables, mostly salvaged furniture, and cooked food nearby over charcoal fires.

A reporter inquired whether the Jennes had asked for assistance from the Red Cross. Mrs. Jenne answered, "We leave the Red Cross to the poor people. They need it a lot more than we do."

36 FOWLER STREET
WICKFORD

Hurricane *Carol* Lashes Rhode Island

August 31, 1954

Published by

PROVIDENCE JOURNAL COMPANY

Price: $1 a Copy

IN 1954 Rhode Island realized it must learn how to live with hurricanes. The hard fact was driven home, leaving no chance to rationalize. Another huge cyclonic storm, spawned in the subtropics, had come and gone. Banshee winds and massive tides had done their savage work once more.

Sixteen years before, on September 21, 1938, the greatest hurricane in Rhode Island history raged across the state leaving 317 dead and $100,000,000 in property damage in its wake. It was a freak, said many as they picked through the debris, and will never happen again.

But in 1944, in the predawn darkness of September 14, there was grim warning that this was not the case. Another hurricane zeroed in upon the state, smashed down thousands of trees, ripped at roofs and roared impotently along the shores, its power impaired by an unfavorable tide.

Then on August 31, 1954, the lesson was learned. Pouring out of the night, the winds of Hurricane *Carol* brought Rhode Island summer to a premature end. The storm arrived at express train speed and departed as fast, leaving the shores of the state a shambles, 19 dead, scores injured, and the business district of the state's largest city spitting out dirty flood water from its basements and street level shops for the second time in 16 years.

Carol, a pretty name for a monster, was the third hurricane of the year to form in the warm latitudes of the Atlantic. Some said the U.S. Weather Bureau chose women's names for the storms because they were unpredictable. *Carol* was unpredictable, lazing along the southern coast for days before taking deadly aim, but there its feminine characteristics stopped.

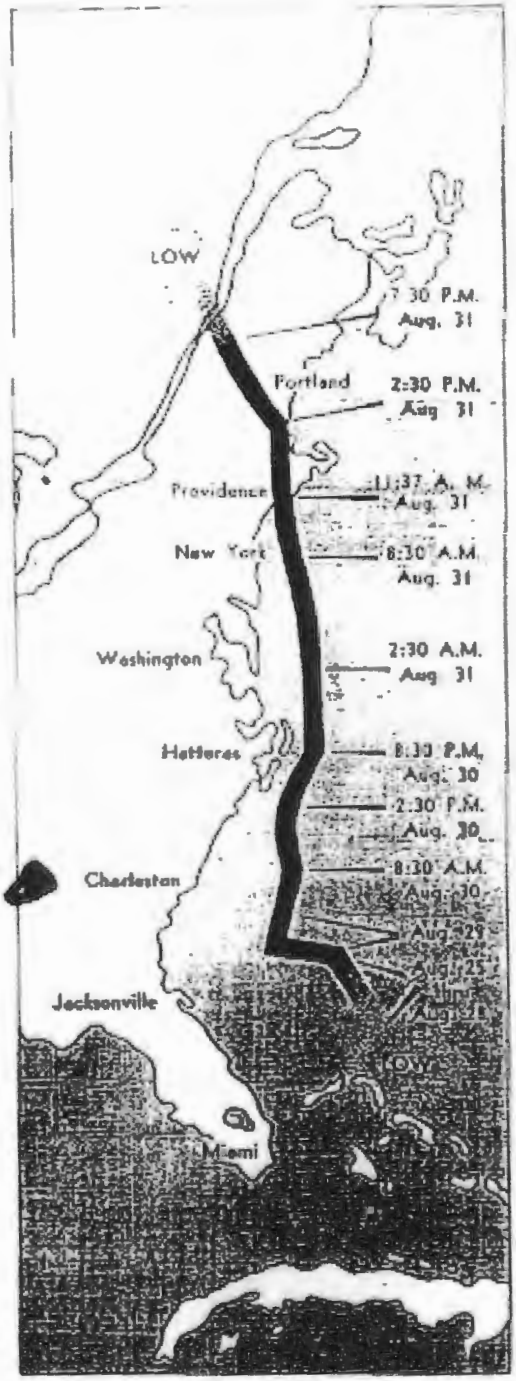
The forces of nature built a roadway for *Carol*, a low pressure area suitably moistened by rains, and the hurricane bored in. It caught Rhode Island and eastern Massachusetts in the outside arc of its counter-clockwise winds, with its center moving along the Rhode Island-Connecticut boundary line. The state lay in the zone where the speed of the violent storm, estimated at more than 50 miles an hour, is added to the speed of the winds whirling within it.

The result: devastation. Property damage totaled at least $200,000,000 in Rhode Island alone, possibly half a billion dollars in the entire Northeast. Nearly 3,800 Rhode Island homes simply disappeared or lay in shattered heaps along the beaches. More than 2,000 boats, skiffs, fishing craft and proud yachts were destroyed or seriously damaged.

But these are cold statistics.

The real story was in the hearts and eyes of the people who suffered, the waterfront home owners who clambered to rooftops in terror as great gray waves chewed out the insides of their neat dwellings, the boatowners who watched helplessly as their gallant craft fought at their moorings for hours and then disintegrated, the store owners in Providence who saw the flood tides thrust down the aisles, swell over countertops and destroy millions of dollars worth of choice merchandise.

After the storm the state gasped for breath for days, and those who lived and worked inland realized that they too had been hit. Almost all electric power, the life blood of a modern community, had ceased to flow over the wires. An estimated 200,000 workers were idle as repair crews sought to restore power to the business offices and manufacturing plants. Home



CAROL'S course, from its origin near the Bahama Islands to its breakup in Canada, shows rate the hurricane picked up speed in the hours before it hit Rhode Island.

owners ate suppe s cooked over charcoal or Sterno, by candlelight, and kept perishables and milk in tubs or picnic cold boxes filled with ice.

Some residents in the rural areas had no water. Their electric pumps were useless. And others found service through certain water systems reduced or interrupted for various reasons attributed to the storm.

The great storm and its heroes, hundreds of them, who waded swam and floundered through swirling water to bring their marooned fellows to safety. And along the shore areas it brought forth the best in human nature as neighbors pooled their meagre resources to help one another.

It spawned a small but ugly crop of human vultures too, the looters who moved into stricken homes and shops even before the waters completely receded to fatten on the possessions of the victims.

Police acted last in the days that followed to offer what protection they could. Aided by the full force of the National Guard, military reserve units and civil defense workers, they cordoned off the battered sections of the state to all except emergency workers.

Gradually order replaced chaos as bulldozers thrust back the deep sand dunes where once there had been roads and great cranes lifted the hulks of sunken boats. Carpenters beat a staccato symphony on thousands of damaged roofs while fleets of trucks, pressed into service from many sources, roamed the streets of city and hamlet alike gathering the mountainous piles of limbs and trunks which once spread a green canopy over the state. Gradually power returned. Lights winked on and the big factories summoned their workers back.

And in the talk of the veterans of the storm comparisons were made. Which was the greater, Hurricane *Carol* or the nameless fury of September 21, 1938? The facts were indisputable. The hurricane of 1938 was still without peer. Its flood tides mounted 13 feet nine inches above normal high water level in Providence. Hurricane *Carol* had pushed the tide up precisely 13 feet above normal.

The 1938 storm moved more slowly and poured its peak destruction on the state for about two hours, with sustained winds of 121 miles an hour and gusts of far greater force. Hurricane *Carol* lashed the state with its peak winds for about half as long, reaching full force at 11:37 a.m. when a gust estimated at 105 to 115 miles an hour thrust the anemometer needle off the dial at the U.S. Weather Bureau at Hillsgrove. Moments earlier the top sustained velocity of 90 miles an hour was recorded.

The 1938 storm was a massive doughnut with its center over the Connecticut River Valley. Its deadly eastern semicircle spread a wide band of destruction through the heart of New England. Hurricane *Carol* achieved its greatest fury in a band stretching from New London, Conn., to the Cape Cod Canal.

Loss of life was not comparable. Yet in this fact there was a puzzle. The shore areas where damage was greatest in both storms appeared to have suffered almost equal devastation. The surge of tide thrust up by Hurricane *Carol* was almost as high. And on August 31, 1954, the summer season at Rhode Island's beach resorts was at the zenith. Yet the death toll was low.

The reasons were several. Hurricane *Carol* struck in the morning. Visibility, vital when you are

struggling for the safety of a stairway, rooftop or improvised raft, was relatively high. The hurricane of 1938 reached its peak about 5:15 p.m., nearly a month later in the year. Almost complete darkness came with the storm. This time thousands fled from unprotected sections before the storm reached its full fury. Before, many refused to believe what they saw, clung to their exposed dwellings to the last and actually rushed to the shore to watch the water rise.

The lesson had been partially learned, but not completely.

On the afternoon of August 31 and the days that followed complaints arose that the U.S. Weather Bureau had provided insufficient warning of the storm's approach. Its bulletins had spoken of northeasterly gales and abnormal tides until too late to take full precautions for the southeast hurricane winds and flood tides which actually arrived.

Power failed over much of the state at 9:10 a.m. on August 31, and when the full import of the storm was realized radio warnings were almost useless.

Two days after the storm the season's fourth hurricane rushed harmlessly past, well out to sea, touching off brief panic in certain exposed coastal communities. Then on Friday, September 10, eleven days after Hurricane *Carol*, the state settled down to the business of living with the storms.

Hurricane *Edna*, a huge storm with 135 mile an hour winds near its center, rolled toward the battered shore. This time the state was ready.

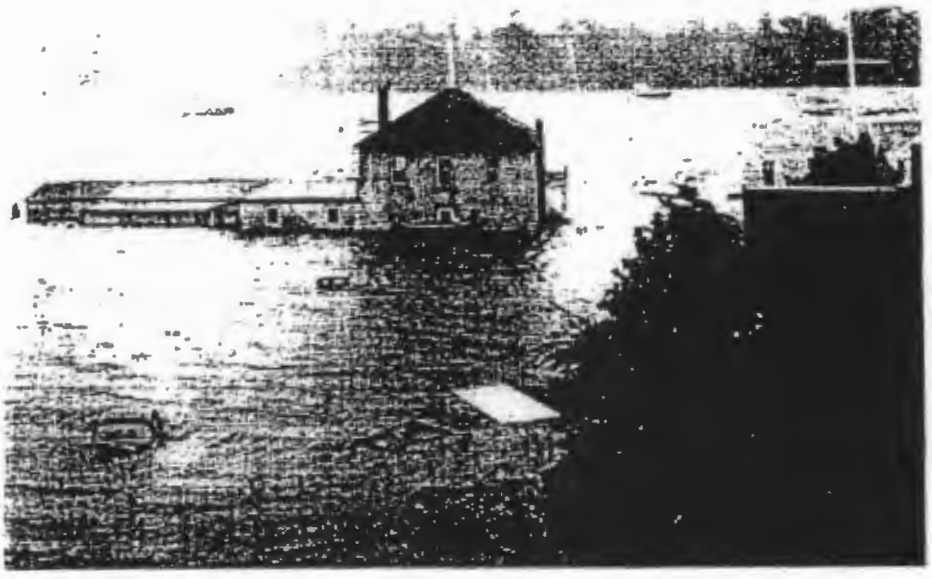
Through the daylight hours of Friday newspapers, radio and television warned of the storm's progress All radio and television stations went on night-long watch. Storm shutters and sandbags appeared. Waterfront districts were evacuated as sweating clerks in downtown stores cleaned out cellars only recently cleared of flood water, removed all merchandise to upper floors. Firemen, police, civil defense units, the Red Cross and other welfare agencies mobilized all personnel. Never in the history of Rhode Island had such complete preparations against disaster been made.

At the last moment the storm veered northeastward, arriving on an ebb tide. Rhode Island caught the backlash of its winds, suffering relatively minor damage.

A glancing blow. The state now knew that two facts are vital once hurricane warnings have gone out: the condition of the tide when the storm arrives and the location of its center.

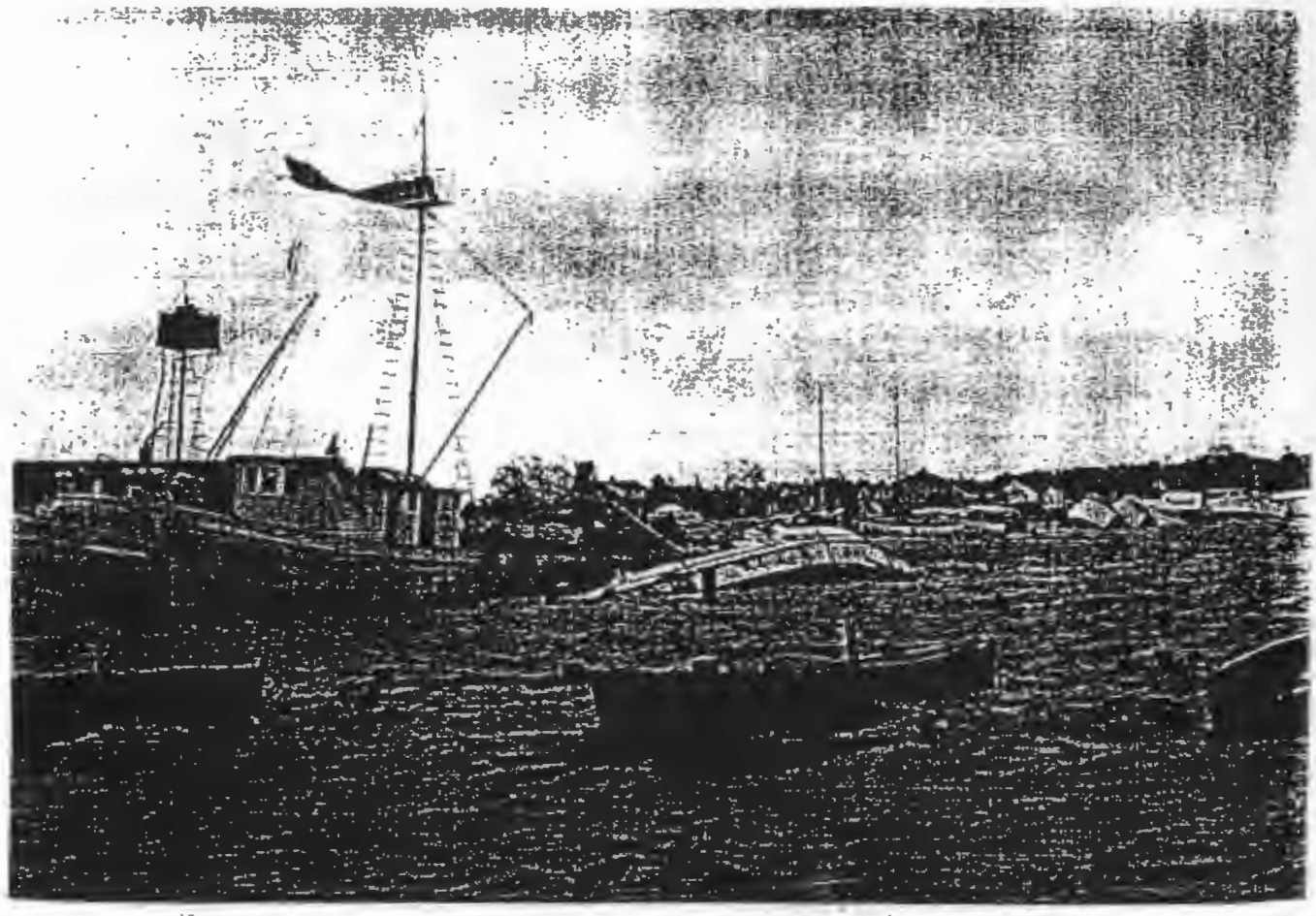
In 1815, 1938 and on August 31, 1954, the storm center had passed to the westward and the hurricane had arrived at high tide with destructive force. In 1869, 1944 and September 11, 1954, the tide was on the ebb.

The ledger was neatly balanced, three and three.



1954

EAST GREENWICH Cove water engulfed East Greenwich Yacht Club. The scene off Water Street looked like this at the storm's height.



POGIE BOATS tied up at Wickford took a fierce battering. Here's Wickford harbor when wind abated at noon.

The Providence Journal HURRICANE EXTRA

Hurricane Leaves 16 Dead, Scores Hurt, $100,000,000 Damage Along R. I. Coast

Rhode Island Casualties

DEAD

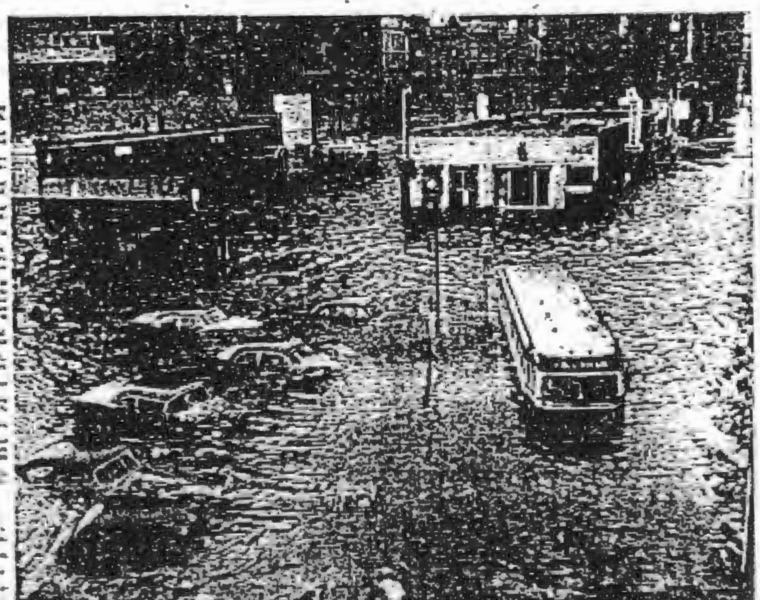
[illegible]

STILL MISSING

[illegible]

INJURED

[illegible]



Devastating Blow, High Tides Mash Houses, Piers, Boats

Rhode Island lies wounded this morning in the wake of a devastating hurricane which ripped its coastal communities into shreds, mashed houses, docks and boats to splinters and left a mounting toll of dead and injured.

Early today at least 16 persons were known dead and scores were injured.

[illegible] property damage at more than the $100,000,000 hurricane of Sept. 21, 1938, until yesterday the greatest storm to strike the state in modern times.

[illegible]

Warning Late On Hurricane

[illegible]

Westerly is Badly Battered; Nine Are Reported Missing

[illegible]

Electric Power Out In State

[illegible]

Minority Report Hits McCarthy

[illegible]

Horrors of Watching Parents Perish In Wild Sea Described

[illegible]

On the morning of August 31, 1954, about 10:30, a tropical hurricane struck Providence, roaring a symphony of death and destruction. The waters of the Providence River rose to a height of approximately 18 feet above the average low tide level in three hours' time. The entire central business section, an area nearly a mile in diameter, was flooded, as well as three miles of the industrial area along the waterfront.

By rare good fortune, a photographic account was made of the harrowing scenes and appalling damage in downtown Providence. These pictures are reproduced here without any retouching to provide a graphic historical record for posterity, and to portray the paralyzing blow that Providence has suffered and survived.

At this time the business establishments affected are working at their Herculean tasks of reconstruction needed for normal operation.

This booklet was placed in production Thursday, September 2, 1954 at 4:30 P. M. Halftones were made, assembled and plates completed for the presses to start printing at 2:00 A. M. Friday morning. Twenty thousand copies were placed on sale at 2:30 Friday afternoon.

This was all accomplished at Livermore and Knight Company and Bank Lithograph Company in the heart of the disaster area, although no commercial power was available and no other companies were manufacturing.

Both plants will be back to normal operation on Tuesday morning, September 7, 1954.

Providence September 3, 1954

Plated, lithographed, and bound in their own plant in the heart of the flood area.

Photographs by Adler's, Inc. and the Reproduction Service

Great hurricane left residents without potable water

The View from Swamptown

G.T. Cranston

If there's one thing that most folks take for granted these days, it's that when you turn on the faucet in your kitchen or bathroom, good clear drinkable water is going to come out. But it wasn't always that way. Back exactly 64 years ago this week the good people of the villages of Wickford and Hamilton were learning this lesson the hard way.

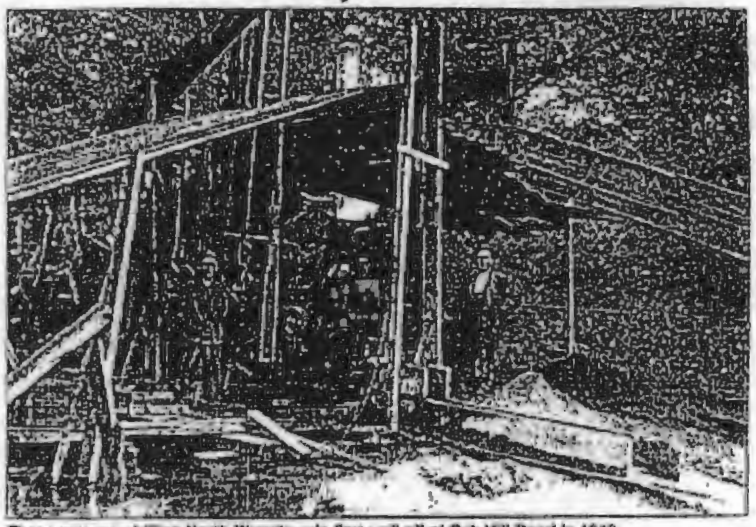
You see, 64 years ago, those folks had just gotten over the horror of the worst hurricane to ever hit these parts. The waters of the Narragansett Bay had subsided and left an awful mess. Trees were uprooted, homes were destroyed or moved off their foundations, boats were parked where no one ever imagined they could be, people were missing, families were separated, cars were swept away never to be seen again, and everything was covered in the most foul slimy mud that you could possibly imagine.

But that wasn't the worst of it, as these harried and overwhelmed folks were just realizing. Everywhere from Pleasant Street to Poplar Point to Salisbury Avenue people were realizing that the truly unthinkable had happened. Everyone's well had turned brackish. Nowhere across that wide swath of homes was there anyone with drinkable water. The delicate balance between the fresh groundwater of the land and the salty sea of the Narragansett Bay had been forever changed by the giant hurricane. It was a public health crisis of major proportions.

The elected and appointed officials of the town met in crisis mode. For the time being it was decided that the overworked men of the town's Fire Department would bear another burden. Each day they would make the rounds and fill up the pails and buckets that were left out on the front steps and porches of all the residents of the affected areas without water. That was for the short term; the long-term solution required something that seemed an enormous task. Some way would be found to provide the town's people with good drinking water again.

With this daunting task in mind, a group of prominent citizens began to meet informally at the beginning of 1939. By spring of that year, they were officially sworn in as members of the state-sanctioned North Kingstown Water Commission. Chairman Hiram Kendall, secretary Irving Hazard and committee members Wilfred Kingsley, Walter Cook and Edgar Burchell wasted no time. They immediately weighed all options and decided that designing and constructing a distribution system that would run from the North Kingstown-East Greenwich border at the Hunt River all the way down the Post Road to a standpipe at Juniper Hill and then into the affected areas would be the most expeditious. They negotiated a contract to purchase water from the neighboring town of East Greenwich at the rate of 7.5 cents per thousand gallons.

Although noted cartoonist and illustrator Paul Loring poked fun at the water system installation in September 1939, all of Wickford knew how serious a business the project was. Loring's artwork is used with permission of his family.



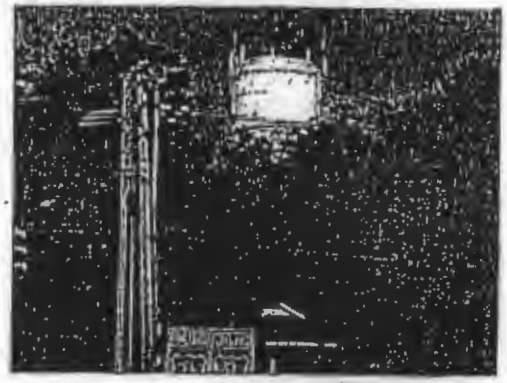
These men are drilling North Kingstown's first well off of Oak Hill Road in 1942.

Engineering firms and construction contractors were interviewed, plans were drawn up, contracts were signed, and work began post haste. All this was done in the evenings, night after night, as these men were volunteers and had full-time jobs to go to as well. All the while the tireless volunteers of the Fire Department continued their daily ritual of water deliveries door to door, one home at a time. It was an exhibition of community spirit at its finest.

After a mere nine months, in January 1940, in which time miles upon miles of 12-inch water main was lain, a 625,000-gallon riveted standpipe was constructed and countless homes were tied into the system. The valves were opened at the border and clean water again began to flow into the homes of Wickford, Poplar Point and Hamilton.

Eventually, in 1962, the town would sink its own well and end its dependence on its neighbor to the north. But that was not an issue then, for after 16 long months of waiting patiently for the man from the Fire Department to deliver a few gallons of clean water, people's lives finally got back to normal. But you can bet that folks who lived through that water crisis never again took that clean, clear water pouring out of the tap for granted. Something to think about when you're about to grumble over odd/even lawn watering, eh?

Write to Tim Cranston in care of this paper, either by e-mail at editorial@neindependent.com or at P.O. Box 244, North Kingstown, RI 02852.



Photos: James Rubin

The water tower at Juniper Hill, shown as it appears today, brought drinking water back to the residents of Wickford and Hamilton about 16 months after the Hurricane of 1938.

Providence Journal 9/19/02

Emergency plan would aid town during disasters

A plan drafted by a town committee will help the town deal with natural disasters, put it in line for emergency aid and save residents money on flood insurance.

BY ERIN EMLOCK
JOURNAL STAFF WRITER

NORTH KINGSTOWN — As the town faces record-low water levels and a ban on outdoor watering, the threat of a hurricane is probably the farthest thing from most residents' minds.

NORTH KINGSTOWN

But the town's Local Hazard Mitigation Committee has been working for the past eight months on a plan to better prepare the town for floods, wildfires and even earthquakes.

The committee recently completed a draft Hazard Mitigation Plan, which will

SEE DISASTER, B 5

Disaster

Continued from Page B-1

which will be discussed at the Town Council's work session tonight.

Once the plan is in place, the town will be eligible to get money from the Rhode Island Emergency Management Agency and the Federal Emergency Management Agency to implement strategies identified in the plan, according to committee member James Freas.

"The plan is meant to make the town less vulnerable to a natural disasters before they happen," Freas said.

And if a natural disaster does strike and a state of emergency is declared, towns that have Hazard Mitigation Plans have priority in getting state and federal funds to help deal with the disaster.

In North Kingstown, the biggest threat is coastal flooding associated with hurricanes and northeasters, according to Freas.

The plan also lists tornadoes, wildfires, ice and snow, earthquakes and droughts as potential hazards to the town.

North Kingstown borders East Greenwich, Exeter, Jamestown, Narragansett, South Kingstown and Warwick; the plan identifies ways the town can cooperate with those communities during an emergency.

Freas said one of the plan's goals is to ensure that buildings on the coast are able to withstand coastal flooding. He said that by creating this plan, the town will help residents in these areas potentially save money on their flood insurance.

'The plan is meant to make the town less vulnerable to natural disasters before they happen.'

James Freas, Local Hazard Mitigation Committee

The committee developed the plan in part by examining a map provided to the town by the Rhode Island EMA which shows flood and storm surge areas.

The committee then determined which areas of town could be vulnerable during a natural disaster.

The committee's members include representatives of the Police, Fire, Public Works and Planning Departments and the Rhode Island National Guard. The Town Council, town manager, harbormaster and a representative of the Chamber of Commerce are also on the committee.

APPENDIX D: North Kingstown Chamber of Commerce 2002 Business Resource Survey Results

ITEMS	DESCRIPTION	COMPANY NAME	TELEPHONE #
Backhoes	1-Bob Cat 853	Pleasant Street Wharf	294-2791
	2 - Ford	RI Economic Development Corp.	295-0044
	1	Sodco	294-3100
	1-Fuel-old-small	Specialty Diving Services, The	295-5256
	18-2 rubber tire excavators,8 Pippin, 8 Trach	D'Ambra Construction Co., Inc.	737-1300 265-4632
Bedding/Blankets	Yes	Hamilton Village Inn	884-1725
	24 cots, 24 blankets	RI Economic Development Corp.	295-0044
	Yes - Availability depends if we are in emerg. response as well	South County Hospital	782-8000 X1447
	20-30 Extra sheets - blankets	Sstar of Rhode Island	294-6160
	Maybe	Wickford Insurance	294-3304
	24 each-blankets, sleeping pads.	Toray Plastics (America)Inc.	294-1550 Est.4416
Chippers	I -light duty Chipper	Print World	885-6262
	I - gasoline wood chipper	RI Economic Development Corp.	295-0044
	1-Bear Cat	Sodco	294-3100
Emergency Fuel	3 -20# propane cylinders	International Dioxide, Inc.	295-8800
	as needed-gasoline & diesel	E. Greenwich, Quonset Pt., NK Getty	523-5775 (cell)
	Varies-87,89,93 octane Unl. gas.	NK Shell Food Market	267-0057
	1000 Diesel	Senesco	295-0373
	1-500 gals. - Diesel	RI Economic Development Corp.	295-0044
	I gas., 1 diesel-2 above grand storage tanks	Sodco	294-3100
	20,000 gals - diesel	Specialty Diving Services, The	295-5256
	Gas/Diesel	Wickford Shipyard, Inc.	884-1725
ITEMS	DESCRIPTION	COMPANY NAME	TELEPHONE #

Emergency Fuel (Continued)	4 Service trucks of fueling tanks	D'Ambra Construction Co., Inc.	737-1300,265-4632
	1000 gals. #2 fuel oil. Toray cannot provide a delivery truck	Toray Plastics (America) Inc.	294-1550 Ext.4416
Foodstuffs	Super Market	Dave's Marketplace	641-0401
	Fast Food	KFC	884-6550
	1 -Mineral water, usually 25 gals	Market Models, Inc.	294-1489
	Varies, Convenience type foods.	NK Shell Food Market	267-0057
	Yes-availability depends if we are in emerg. Response as well.	South County Hospital	782-8000 X1447
	Emergency menu for 70 for 3-5 days	Sstar of Rhode Island	294-6160
	Various food supplied are available if needed	Gillian's Ale House	667-0900
	Non-perishable foods (cans, etc.)	Ryan's Market	294-9571
	100 meals, ready to eat	Toray Plastics (America;)Inc.	294-1550-Ext.4416
Forklifts	1-30,000 lb-l-7000 lb	North Atlantic Marine Salvage	294-9661
	1-5000# Propane powered	International Dioxide, Inc.	295-8800
	May have available	JT'S Lumber	294-9661
	3-8000#6000#5000#	LJM Packaging Co., Inc.	295-8800
	2	The Lightship Group	884-5400
	1 - 3000 lb Max	Meister Grinding Tech.	295-2660
	l-1500 lb. capacity	Champlin's of Wickford	295-4600
	2 - 6,000 lb. lifts.	Quaker Lane Tool	295-5472
	7 -1 @ 48000#,1 @ 36000#, etc.	Senesco	295-0373
	2--l-6000 lb. and l-l5,000 lb.-Hiester	RI Economic Development Corp.	295-0044
	9-8 princetons (Sod handlers) l large conventional	Sodco	294-3100
	1-6,000 lb. Diesel	Specialty Diving Services, The	295-5256
	1	Wickford Shipyard, Inc.	884-1725
	3-15 Barrel truck	Anvil International	886-3030
	2 (1 Nissan 3 ton,1 Tow motor 9 ton)	D'Ambra Construction Co., Inc.	737-1300,265-4632
	1 fork lift	R. P. Morrison Company	295-3100
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Forklifts (Continued)	1 - 2 ton capacity	Ocean State Testing, Inc.	294-2258

Generators	May have inventory available	JT'S Lumber	884-5400
	Approx. 10 - 4-100 KW	The Lightship Group	295-2416
	60 - 6600 W. to 1000 W. (Ton)	Quaker Lane Tool	295-5472
	3- 2@1400, 1 @5000	Senesco	295-0373
	3 Portable,2,600 watts, I-I,500 wts, 3-trailer-60M,70M,30M watts	RI Economic Development Corp.	295-0044
	6 -60W, 20W, 5 W-(3) 4 W. Gas.	Specialty Diving Services, The	295-5256
	own generator for facility	Sstar of Rhode Island	294-6160
	2 (1 50KW, 1- 300Amp. Generator	D'Ambra Construction Co., Inc.	737-1300,265-4632
Haz-Mat Equipment	May have inventory available	JT'S Lumber	884-5400
	1-56 ft oil spill res. Boat Oil Boom	North Atlantic Marine Salvage	294-9661
	1 Oil spill Kit	Eric Collins	294-2791
	Yes	RI Economic Development Corp.	295-0044
	Yes, Availability depends if we are in emerg. response as well.	South County Hospital	782-8000 Ext. 1447
	2 Confined space entry system-gas detector	D'Ambra Construction Co., Inc.	737-1300,265-4632
	Some, Toray maintains material for on site emergency.	Toray Plastics (merica) Inc.	294-1550 Ext. 4416
Heavy Equipment	Crane (s) -may have available	JT'S Lumber	884-5400
	1-L53400 Link Belt Ex. 68,000 lbs	North Atlantic Marine Salvage	294-9661
	4 cranes,1-30T,2-250T,1 truck-180	Senesco	295-0373
	2- Bulldozer, Excavator	Sodco	294-3100
	5 Cranes, Barges, Tug boats-Boom truck, 21 ton crane	Specialty Diving Services, The	295-5256
Loaders	1	Sodco	294-3100
	I Front End loader	Anvil International	886-3030
	14 CAT 938, 950, 966,980,988	D'Ambra Construction Co., Inc.	737-1300,265-4632
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Medical Supplies/	First Aid Kits, AED	Senesco	295-0373

services	Yes. Availability depends if we are in emerg. response as well.	South County Hospital	782-8000 Ext. I447
	2-RN's and Aids on dutyj-24-7 minimum supplies	Sstar of Rhode Island	294-6160
	Physical Therapy Equipment only	Tente Physical Therapy	294-0455
	3 to 6 people for medical and dental service-vaccine	Bayside Family Health	295-9706
Portable lighting	May have inventory available	JT'S Lumber	884-5400
	1 flashlights	Market Models, Inc.	294-1489
	Many	The Lightship Group	295-2416
	2 light towers	Senesco	295-0373
	1 - 6,500 watts	RI Economic Development Corp.	295-0044
	2 Ingersoll Rand light generators	D'Ambra Construction Co., Inc.	737-1300,265-4632
Storage facilities	Limited	Colonial Liquor	932-9224
	Yes-Different types	The Lightship Group	295-2416
	2-400-000 sq. ft (Warehouse)	Maro Display, Inc.	294-5551
	Basement 7500 sq ft., cement floor Quaker Lasne Tool	Quaker Lane Tool	295-5472
	3 acres outside storage, QP / Davisville Industrial Park	Specialty Diving Services, The	295-5256
	Limited To small basement area	Sstar of Rhode Island	294-6160
	Large building with storage rooms	US Postal Service	884-3760
	2 -indoor warehouse/outdoor aggregate shed	D'Ambra Construction Co., Inc.	737-1300,265-4632
	Covered storage are is available, if needed	Gillian's Ale House	667-0900
	6 Box trailers can be used for storage	Toray Plastics (America) Inc.	294-1550-Ext. 4416
Sump pumps	May have inventory available	JT'S Lumber	884-5400
	Many	The Lightship Group	295-2416
	1-120 ac-300 gal. a minute		
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Sump pumps (continued)	30 - 1-l/2 D24 GPM	Quaker Lane Tool	295-5472
	3 -Electric submersible	RI Economic Development Corp.	295-0044

	several - diesel and gas	Specialty Diving Services, The	295-5256
Support Services	I Pastoral Care	Living Hope Christian Church	886-7692
	Yes, Availability depends of we are in emerg. response as well.	South County Hospital	782-8000 X1447
	Engineering/Trenching	D'Ambra Construction Co., Inc.	737-1300,265-4632
	4 to 5 people as possible	Bayside Family Health	295-9706
Trucks-digger	1 - Cram. Digger truck	North Atlantic Marine Salvage	294-9661
	1 - Grade-all	D'Ambra Construction Co., Inc.	727-1300,265-4632
Trucks-dump	1 dump truck	Apple Construction	885-4111
	5 trucks	RI Economic Development Corp.	295-0044
	2-Farm trucks-not suitable for the road	Sodco	294-3100
	LLV Postal Vehicles	US Postal Service	884-3760
	20 (10 Ten wheel/10 Trailer Dump/1lowbed)	D'Ambra Construction Co., Inc.	737-1300,265-4632
Trucks-pick-up	1 Pick-up truck	Apple Construction	885-4111
	8' Bed Pick up Truck	Paul Bailey's Dodge	884-3300
	15 Passenger Wagons	Paul Bailey's Dodge	884-3300
	1 ton with lift gate, capac. 2M lbs.	Barr Lobster	295-5959
	I ton-no 4 wheel drive 3500 series	Hammond Farm	295-5588
	Should have available	JT'S Lumber	884-5400
	Should have available	JT'S Lumber	884-5400
	2	Pleasant St. Wharf	294-2791
	4	The Lightship Group	295-2416
	1-5150 pick-up	McKay's Furniture	295-1915
	also 2-15' Box Body	McKay's Furniture	295-1915
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Trucks-pick-up (continued)	2 pick-up trucks	Pleasant St. Wharf	294-2791
	2 pick-up trucks	Senesco	295-0373
	2- Ford Rangers	Sodco	294-3100

	4	Specialty Diving Services, The	295-5256
		Anvil International	
	2	886-3030	886-3030
	4 pickup trucks	D'Ambra Construction Co., Inc.	737-1300,265-4632
	1	Heritage Homes, Inc.	884-7500
	2-short beds	Howes Lubricator Products	294-5500
	I - 1/2 ton pick-up	Ocean State Testing Inc.	294-2258
	2	Toray Plastics (America) Inc.	294-1550, Ext. 4416
Trucks-stake body	1-F350 444	North Atlantic Marine Salvage	294-9661
	2	RI Economic Development Corp.	295-0044
	1	Specialty Diving Services, The	295-5256
	1	Anvil International	886-3030
	2	The Lightship Group	295-2416
	16	D'Ambra Construction Co., Inc.	737-1300,265-4632
Turf/Lawn Equipment	Various - Field Prep.& mowing equipment, for large areas	Sodco	294-3100
	1 Bobcat	D'Ambra Construction Co., Inc.	737-1300,265-4632
	Lawnmowers	Heritage Homes, Inc.	884-7500
Volunteers	Possible	Advanced Pharmacy Concepts	295-7660
	2	Colonial Liquor	932-9224
	1-2	Joseph H. Conley, CPA	294-1555
	Some skilled-unlicensed & licensed.	Dave's Marketplace	641-0401
	May have available	JT'S Lumber	884-5400
	2	Key Accounts	295-0808
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Volunteers (continued)	20-Various skills & abilities	Living Hope Christian Church	886-7692
	8-each employee would help out	Market Models, Inc.	294-1489
	1	David Meegan, Esq.	294-1100
	From 2-10	The Lightship Group	295-2416

	Contact first	Maro Display, Inc.	294-5551
	1	Natelli Systems	294-4811
	1-6, myself, possibly avail. empl.	N.K. Shell Food Market	267-0057
	2-3	Print World	885-6262
	2	Quaker Lane Tool	295-5472
	1-myself	Sign-a-Rama	886-5000
	Operations Staff- Number assigned according to event	RI Economic Development Corp.	295-0044
	Depends on business needs at the time.	Sodco	294-3100
	Yes	South County Hospital	782-8000 X 1447
	4	Specialty Diving Services, The	295-5256
	Possibly	Sstar of Rhode Island	294-6160
	One-myself	Tente Physical Therapy	294;-0455
	10	US Postal Service	884-3760
	3	Washington Trust Co.	295-4700
	As required	Anvil International	886-3030
	Workforce- laborers, equipment operators, truck drivers	D'Ambra Construction Co., Inc.	737-1300,265-4632
	Up to 6 - Depending upon what request is for	Howes Lubricator Products	294-5500
	Two	Torgen & Callaghan, Esqs.	885-1200
	Yes - but unsure	Wickford Insurance	294-3304
	1	Richard B. Carpenter	294-3327
	4 volunteers	Wilson's of Wickford	294-9514
Water pumps	Many	The Lightship Group	295-2416
	3-5 3-350 gal. a min. 5- 450 gal	North Atlantic Marine Salvage	294-9661
	1-l0" Diesel	Senesco	295-0373
ITEMS	**DESCRIPTION**	**COMPANY NAME**	**TELEPHONE #**
Water pumps (continued)	4 - Gasoline 2-21/2" and 2-3"	RI Economic Development Corp.	295-0044
	Several-6" down to 1&l/2"-Diesel, Gas, Electric	Specialty Diving Services, The	295-5256
	own wells and storage	Sstar of Rhode Island	294-6160
	Many	The Lightship Group	295-2416
	I water pump	Wilson's of Wickford	294-9514

Misc.	36 ft. lobster boat	Barr Lobster	295-5959
	Subaru-Outback (all wheel drive	Key Accounts	295-0808
	12' Amesbury Runabout-8 hp	David R. Meegan, Esq.	294-1100
	4x4 Vehicle	LJM Packaging Co., Inc.	295-2660
	4x4 Vehicles	Maro Display	294-5551
	4x4 Vehicle	Natelli Systems	294-4811
	4x4 Vehicle	North Atlantic Marine Salvage	294-9661
	I-12' Refrigerated Box	Champlin's of Wickford	295-4600
	General Merchandise	Ocean State Jobbers	295-2672
	I Power Washer - gas	Print World	885-6262
	1-9 passenger Van	Senesco	295-0373
	Subaru-Outback (all wheel drive		
	Boats, chainsaws, air compressors, etc.	Specialty Diving Services, The	295-5256
	Pressure Washer & Water Recyl. Equipment	Hyland Equipment Co., Inc.	295-9700
	Graders, dozers, air compressors	D'Ambra Construction Co., Inc.	737-1300,265-4632
	Trenching - hydraulic jacks, misc. steel trench shields	D'Ambra Construction Co., Inc.	737-1300,265-4632
	1 Terea 30 ton crane - misc. steel plates	D'Ambra Construction Co., Inc.	737-1300,265-4632
	As needed-fuel additives, penetrating oil	Howes Lubricator Products	294-5500
	Legal Services	Torgen & Callaghan, Esqs.	885-1200
	Welding	Ocean State Testing, Inc.	294-2258
	1 Toray owned gymnasium, could be used as temp. shelter	Toray Plastics(America) Inc.	294-1550 Ext. 4416
	2 Mobile wastewater storage tanks (Frac Tanks)21000 gal. each	Toray Plastics(America) Inc.	294-1550-Ext. 4416
	3 up to 5 available	Toray Plastics(America) Inc.	294-1550-Ext. 4416

APPENDIX E: Documentation of the Planning Process

Local Hazard Mitigation Committee Membership

Richard Kerbel	Town Manager	294-3331, Extension 200
Rebecca Pellerin	Principal Planner	294-3331, Extension 311
John H. Lees	Building Official	294-3331, Extension 300
Phil Bergeron	Director of Public Works	294-3331, Extension 210
David Murray	Chief, Fire Department	294-3346, Extension 200
Steven D. Fage	Chief, Police Department	294-3316, Extension 201
Edward Charbonneau	Captain, Police Department	294-3316
Don Barrington	Patrol Officer, Police Department	294-3316
Steven St. Onge	Sergeant, Police Department	294-3316
Mark Knapp	Harbor Master	294-3316, Extension 255
James Freas	Intern – Planning Dept.	294-3331, Extension 312
Karla Driscoll	NK Chamber of Commerce	294-5566
Robert Whitaker	RIEDC Safety Officer	295-0044, Extension 142
Donald Colley	NK resident	294-7969
Richard Welch	NK Chamber of Commerce	294-5566
Jennifer Fairbank	South County Nursing Center	294-4545
Martin Mendelson	Amateur Radio	294-5585
Marcus Jannitto	143 Airlift Wing, RIANG	886-1288

Hazard Mitigation Meeting Schedule		
Date	**Type**	**Location**
18-Jan-02	Committee	Town Hall
18-Mar-02	Committee	Town Hall
15-Apr-02	Committee	Town Hall
9-May-02	W/ Red Cross	NKPD
14-May-02	Committee	Town Hall
18-Jun-02	Committee	Town Hall
16-Jul-02	Committee	Town Hall
13-Aug-02	Committee	Town Hall
19-Aug-02	Town Council Workshop	Town Hall
29-Jul-04	Committee	Town Hall

Local Hazard Mitigation Committee Member Attendance

Committee Member	1/2[illegible]/2002	3/[illegible]/2002	4/[illegible]/2002	5/14/2002	6/[illegible]/2002	7/[illegible]/2002	8/13/2002	9/19/2002	7/29/04
Jennifer Fairbank	☑	☑		☑	☑	☑	☑	☑	☑
Joseph Almeida	☑	☑	☑	☑	☑	☑	☑		
Karla Driscoll									
Robert Whitaker									
Martin Mendelson	☑			☑		☑			
Don Colley			☑	☑	☑	☑	☑	☑	
Dr. Jim Glover	☑	☑				☑	☑		
Mark Shovlin	☑	☑	☑	☑			☑		
Marcus Jannitto	☑	☑	☑	☑			☑		
Dick Welch									
Chief David Murray	☑							☑	
Jack Lees	☑	☑	☑	☑		☑	☑	☑	☑
Chief Steven Fage		☑	☑				☑		
Marilyn F. Cohen		☑	☑	☑	☑		☑	☑	
Richard Kerbel				☑	☑	☑	☑		☑
Phil Bergeron	☑	☑	☑	☑	☑	☑	☑	☑	☑
Mark Knapp	☑	☑			☑	☑	☑	☑	
Ed Charbonneau									☑
Steve St. Onge									☑
Rebecca Pellerin									
James Freas									
Bonnie Dixon									
Don Barrington									

Newsfront 11/01

First Hazard Meeting

The chamber is establishing an "in house" committee to create a resource list for the Town of North Kingstown to use in their hazard mitigation planning. The first meeting will be on Monday, January 7th 4-5 pm at the chamber office. If you are interested in participating, please let us know.

The Town of North Kingstown is establishing a town wide Hazard Mitigation Committee. The Town welcomes business participation in this process and is scheduling the first meeting for January 2002. If you are interested in participating at this level- call the chamber or Rebecca Pellerin at the Planning Dept.-294-3331. In recent communication with the town manager, he has described the chamber's role: " There may be chamber members who can best serve as resource people... ..when the Town is prepared to move on the implementation of the strategy plan or disaster readiness, we anticipate additional involvement of chamber members."

These are important first steps in creating a hazard mitigation plan for the Town of North Kingstown. This is an important process for you, your business, your employees and your customers. We anticipate a few meetings over the next several months and would welcome your input (or a representative from your company).

Standard Times 7/15/02:

NK hazard mitigation plan

The North Kingstown Planning Department will hold a public meeting to take input on the draft plan on Monday Aug. 19. The plan will then be sent to the state, who in turn will review it and forward it to FEMA.

After the state and federal agencies have completed their reviews and comments, the plan will be adopted, following public hearings, as a part of the North Kingstown Comprehensive Plan.

The Local Hazard Mitigation Committee has been meeting since January; the plan represents the effort of many town departments and local residents and business people.

The Town of North Kingstown

invites the public to participate in the creation of the

North Kingstown Hazard Mitigation Plan

A workshop is scheduled in the Cold Spring Community Center
30 Beach Street
from 7:00 PM-9:00 PM
on September 19, 2002

The goal of this hazard mitigation plan is to identify areas at risk from natural hazards and develop policies and actions that could be taken to reduce the impacts of natural hazards on the residents, properties, and natural resources of North Kingstown. Copies of the Draft Hazard Mitigation Plan are available in the North Kingstown Planning Department located at:

55 Brown Street
North Kingstown,
Rhode Island.

If individuals have questions about the plan or the workshop, please feel free to contact the Planning Department Staff at 294-3331, ext 310 or 311

9/5/02

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TOWN OF
NORTH KINGSTOWN, RHODE ISLAND

To: Stephen Lysik, South Kingstown Planning Director
Clarkson Collins, Narragansett Community Development Director
Lee Whitaker, East Greenwich Planning Director
Mark Carruolo, Warwick Planning Director
David Schweid, Exeter Town Planner
Lisa Bryer, Jamestown Planning Director

From: Marilyn F. Cohen, Director of Planning

Date October 4, 2002

Re. North Kingstown Hazard Mitigation Plan

cc: Richard Kerbel, Town Manager

Enclosed is a draft of the North Kingstown Hazard Mitigation Plan for your review and comment. The plan has been written in conjunction with a Local Hazard Mitigation Committee (LHMC) formed of town staff and community members. The purpose of the hazard mitigation plan is to reduce the town's vulnerability to the effects of natural disasters.

The plan can be divided into two parts, the first being an assessment of the town's risk of, and vulnerability to, a variety of different natural hazards and the second being a detailed set of actions in response to those risks and vulnerabilities. At the center of the plan is the risk assessment matrix, which takes the specific vulnerabilities identified for the town and connects them to actions that will be completed to reduce, and even eliminate, those vulnerabilities.

The Town has submitted the plan to the Rhode Island Emergency Management Agency (RIEMA); the RIEMA will then forward the plan to the Federal Emergency Management Agency (FEMA). Once FEMA comments on the plan and the Town incorporates these changes, the Planning Commission and the Town Council will both hold a public hearing to incorporate it as an amendment to the North Kingstown Comprehensive Plan as required by FEMA. You will have an opportunity to review the plan at that time as well.

If you should have any questions or comments about the plan or the planning process, please feel free to contact me or Rebecca J. Pellerin, Principal Planner at Extension 310 or 311.