Increasing Hurricane Awareness and Improving Hurricane Preparedness in Sea Bright, New Jersey

Submitted by:
Greg Machos
Webmaster/Owner
www.hurricaneville.com

Submitted to:
Joe Picciano
Acting Director
Federal Emergency Management Agency—Region II
26 Federal Plaza, Suite 1311
New York, NY 10278

December 12, 2001

Final Proposal for Scientific and Technical Writing
If found, please return to:
Mark Waren
Department of English
Loree Hall, Room 110
Cook College Campus, Rutgers University

INTRODUCTION

Over the past several years, forecasters have been warning people about the increased possibility of a major hurricane making landfall across a portion of the East Coast of the United States between Maine and Texas. Hurricane activity over the last eight years has increased dramatically from what it had been in the early 1990s, and researchers indicate that this trend of increased activity is expected to continue for the next few decades. (http://typhoon.atmos.colostate.edu/forecasts/1998/press98ver.html)

Still, not too many residents in the New York and New Jersey area have experienced a major hurricane. The last time such a storm happened was in 1938 when the infamous Long Island Express slammed into Central Long Island and carved a path of destruction well into New England. Could this scenario repeat itself? (Fincher, 2000) Well, while experts believe it will, a large percentage of the population doesn't believe that a major hurricane is possible in the New York Metropolitan area. So it is very important to learn from disasters such as the 1938 hurricane and Andrew in order that "future events can be mitigated". (Fincher, 2000)

Since many of this region's economic assets are close to the water, the New York City Metro area is the third most vulnerable city to a major hurricane behind Miami, Florida and New Orleans, Louisiana. Places such as Asbury Park, New Jersey, which is located some 12 miles to the south of Sea Bright in Monmouth County, would suffer approximately $50 billion dollars in losses if it were hit by a major hurricane. (Jacob, 2000)

A Look at the Town of Sea Bright, New Jersey…

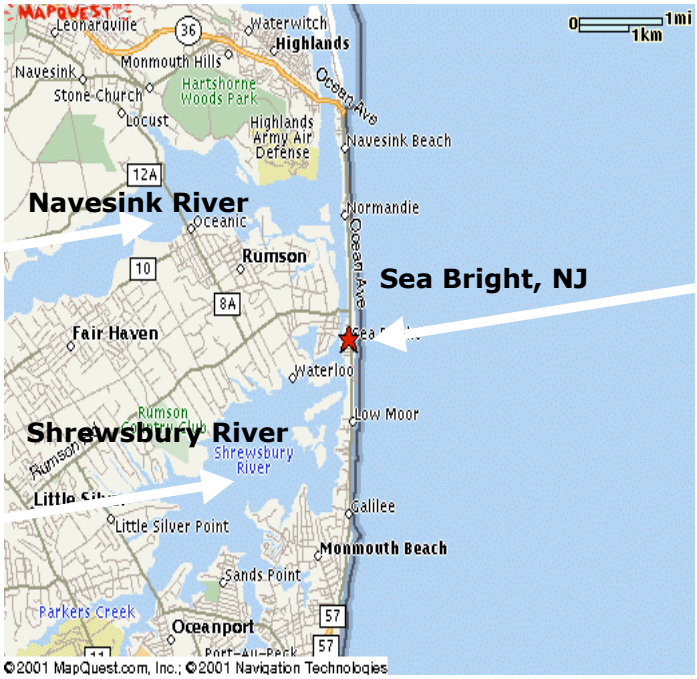
The town of Sea Bright may be a small community according to its most recent census data (http://www.census.gov), but numbers be deceiving. Although its population has increased by 6.9% since 1990 in the 2000 census report, the number of residents during much of the year is only a bit more than 1,800 people. However, during the months of July, August, and September, which are the heart of hurricane season, the population increases dramatically from an influx by thousands of vacationers from other parts of the area.

Another important fact that must be considered when looking at Sea Bright is its geographic location along the New Jersey shoreline (Figure 1). To the west of Sea Bright are both the Navesink and Shrewsbury Rivers. To the east of course is the Atlantic Ocean. Being surrounded on several sides by water makes Sea Bright a prime location for tidal surges coming in from the ocean as a hurricane approaches from the south, and then from the rivers as the storm moves away to the north.

Finally, we have the problem with the current sea wall, which was built by the town of Sea Bright to protect many of the homes there. However, it has become too costly to maintain in recent years. In 1984, a coastal storm caused some $84 million dollars in damage to the sea wall, and that damage today would probably be much more costly in today's economy.

Moreover, recent coastal storms such as the Halloween Storm in 1991 and Superstorm '93 have also done plenty of damage to the town of Sea Bright, and have since forced residents to pack up and leave (Great Storms Collection, 1994). The scenario for Sea Bright can potentially be a disastrous one if the right storm comes along. That is why a plan must be put forth to help this coastal community become better prepared for hurricanes to prevent a disaster from occurring.

Figure 1: Map of the Sea Bright, New Jersey Area

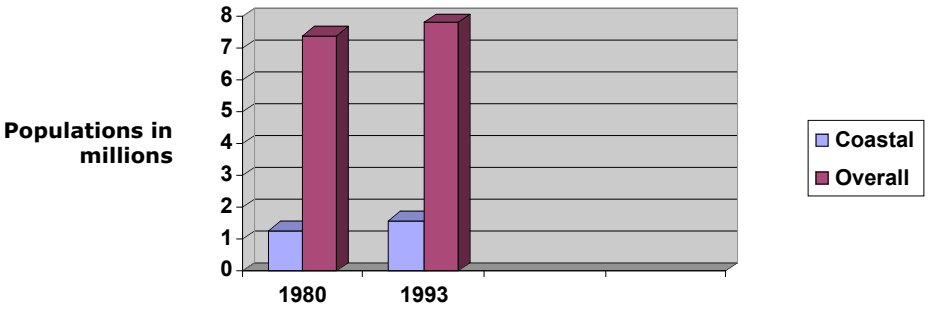


The Hurricane Problem In Sea Bright, New Jersey...

Looking at the Sea Bright problem more closely, it was discovered that it has been approximately 180 years since a major hurricane has had a direct impact the New Jersey coastline (O' Hanlon, 2001). During that time, coastal populations have grown dramatically. As of 1980, there were approximately 265,000 New Jersey residents living in coastal communities (NJDEP, 1985) while there were 1.3 million people living throughout the four coastal New Jersey counties (IRC, 1995).

Since that time, these populations have continued to grow. In 1993, about 1.6 million people living in the coastal counties New Jersey (IRC, 1995) while vacationers continued to visit the Jersey shore causing the populations to peak even further during the summer months, which is also prime hurricane season. According to a study done in 1984, peak populations in these coastal communities range between 700,000 to about 1.6 million during the summer season (NJDEP, 1985). This figure has probably increased in the last 20 years as well since the overall New Jersey population increased 6% to nearly 7.8 million in 1993. (IRC, 1995)

Figure 2



Population Growth in New Jersey

As mentioned earlier, the town of Sea Bright is a prime location for a disaster since it is situated near both the Atlantic Ocean and the Navesink and Shrewsbury Rivers. On top of that, the town of Sea Bright is situated in the Northern Headlands region of the New Jersey shore, which is characterized by narrow beaches at the base of deteriorated bluffs and dunes that have been eroded by years of storm damage (NJDEP, 1985).

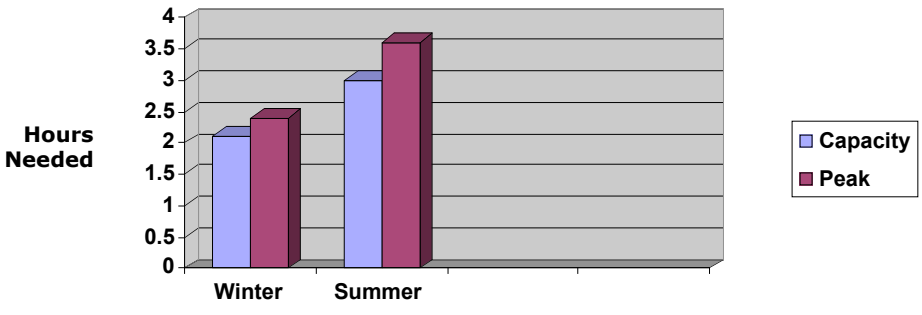
The most recent data obtained as of the writing of this report was taken after the coastal storm that pummeled Sea Bright in 1984, the New Jersey Department of Environmental Protection categorized the erosion classification in this particular area of the Northern Headlands critical (NJDEP, 1985). This classification indicates that this portion of the Northern Headlands region contains the least suitable natural and artificial protection from erosive forces, and is also continuing to receive damage from coastal storms. (NJDEP, 1985).

What this means is that as more coastal storms strike the Northern Headlands region of the New Jersey shore, more and more property will become vulnerable to storm surges and waves brought on by a nor'easter or hurricane (NJDEP, 1985). With that in mind, coastal communities in New Jersey including Sea Bright are now even more vulnerable to a high amount of damage from storm surge in a hurricane or nor'easter (NJDEP, 1985).

In addition to the problems presented by the geography and geology of the Sea Bright area, there was also a problem with evacuation routes as well. The most recent data from 1985 indicated that the New Jersey coastal areas were in a precarious position. This was due to the fact that the National Hurricane Center was unable to issue a Hurricane Warning to the New Jersey shore for at least 12 hours before landfall (NJDEP, 1985). Moreover, some coastal communities such as Sea Bright have evacuation routes that already flood several hours prior to the center of the eye passing. (NJDEP, 1985)

Then, there is the issue of evacuation time in a storm or hurricane scenario for the town of Sea Bright. As of 1985, these times were slightly higher than what the town's normal traffic flow capacity could handle (NJDEP, 1985). As Figure 3 indicates, evacuation times during low peak and high peak population times are above what capacity can handle. Most importantly, the evacuation time during the peak population season is more concerning since it is during the prime months of the hurricane season. Furthermore, this doesn't take into account people in the inland locations such as the Highlands as well as the possibility of large numbers of people in Sandy Hook on a nice summer weekend.

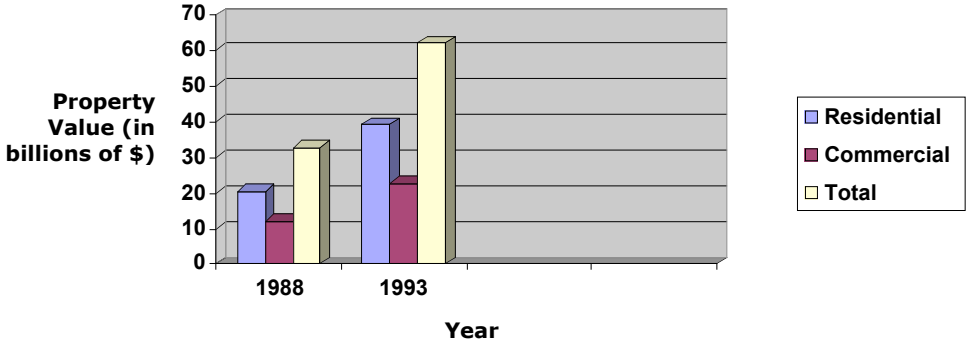
Figure 3



Evacuation Times for Sea Bright (1985)

Finally, we have the issue of insurance costs. In 1985, almost 75% of all residences in New Jersey with flood insurance were located along the coast (NJDEP). Furthermore, in the four coastal counties in New Jersey, the total value of the flood insurance policies was approximately 4.3 billion dollars. These costs and percentages have probably increased up to this point in time as more and more people migrate toward the New Jersey shore.

Figure 4



Value of Insured Coastal Property Exposures in Monmouth County, New Jersey

As a matter of fact as of 1997, there were a total of 16 coastal communities in New Jersey that were among the top 200 municipalities throughout the United States with multiple insurance losses. The community of Ocean City, New Jersey located in Atlantic County ranked 18th on that particular list (Pielke, 1997). Meanwhile, as shown in Figure 4, Monmouth County's Value Of Insured Coastal Property Exposures totaled over 62 billion dollars in 1993, which was up 88% from only five years earlier (IRC, 1995). Put all of these factors together, and you have a terrible disaster on hand if the right storm were to come along.

In summary, the New York City Metropolitan area including the New Jersey shoreline is more vulnerable to hurricanes than ever, and the problem has not been taken seriously enough. This precarious situation has developed due to apathy, heavy development, rising property insurance values and coastal erosion. As a result, this region is the third most vulnerable metro area to hurricanes in the United States, and the next time a storm of Hurricane Andrew's strength comes around, it could be an even bigger disaster than in South Florida in 1992. However, research and data show that this problem can be fixed.

LITERATURE REVIEW

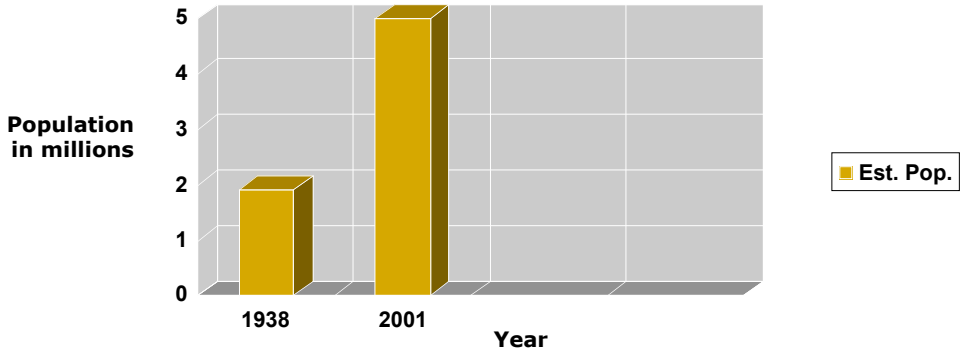
The Hurricane Problem In New York and New Jersey…

The Hurricane Problem in the town of Sea Bright is just a microcosm of the problem much of the New York Metropolitan area faces if a major hurricane happens to come along. Many coastal communities in this particular region are facing similar situations, and there are only a few such as Freeport, New York, Avalon and Ocean City, New Jersey that are making efforts to mitigate disaster.

It has been over sixty years since a major hurricane has had a direct impact on the New York and New Jersey area. The Long Island Express of 1938 was the last time such a storm occurred here. Much of the New York Metropolitan area including New Jersey was on the western side of this particular storm, which tends to be much weaker due to its counterclockwise rotation.

Moreover, many of the current residents of this region weren't alive in 1938, or were probably not old enough to remember that devastating storm. There are also more things to consider. For example, Long Island, was sparsely populated at the time of the 1938 Long Island Express with approximately 1.9 million residents in Queens, Nassau, and Suffolk counties (Mandias, 1998).

Figure 5: Population Growth in Long Island (1938-2001)



The next time a storm of this magnitude heads this way, it will hit a "highly urbanized" (Danger's Edge, 1991) Long Island with a population that approaches 5 million people (Mandias, 1998) while the entire New York City Metro area has a population of nearly 20 million people (Jacob, 2000). As a matter of fact, this current scenario leaves New York City behind Miami and New Orleans as the third most vulnerable major city for the next hurricane disaster. (Pielke, 1997)

The entire United States economy is also threatened because the New York City Metropolitan area has assets of approximately $2 trillion dollars (Jacob, 2000) while it "generates an annual economic output of nearly $1 trillion" dollars (Jacob, 2000). Many of the assets in the New York Metropolitan area are built close to water, and are vulnerable to coastal storms such as hurricanes and nor'easters. (Jacob, 2000). Much of the transportation and economic infrastructure in this region are only 6 to 20 feet above sea level, which puts their operations in severe jeopardy. (Jacob, 2000).

However, in spite of these facts, many residents who live along the coast of this region are apathetic toward the possibility of a landfalling major hurricane here. For example, approximately **78.5%** of current New York coastal residents have never experienced a major hurricane. (Hughes, 1998) Simply put, many in this region "believe that hurricanes cannot happen here." (Hughes, 1998) Then, there are those that just don't take them too seriously (Watson, 2000). Similarly, that is probably what many thought back in 1938 before the Long Island Express.

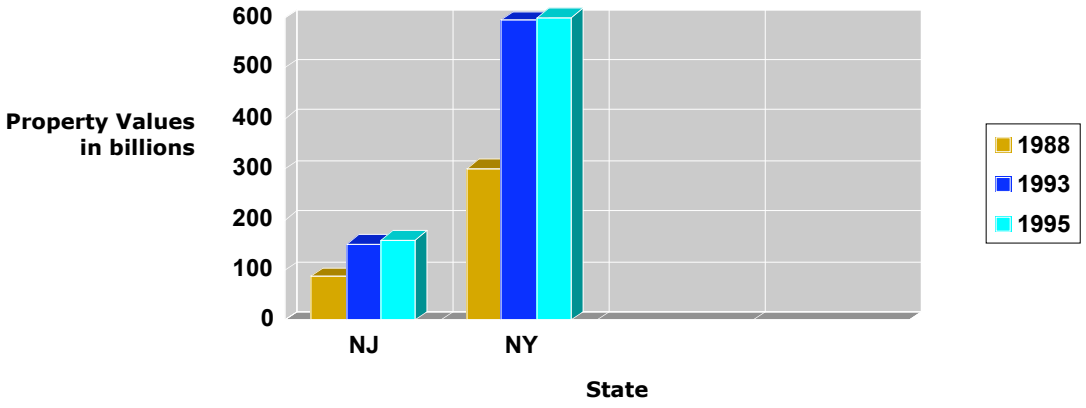
Understanding the New York and New Jersey Hurricane Problem…

People need to understand the enormity of the risk involved here. Just because hurricanes do not hit the New York Metro area frequently or aren't as strong when they do strike, it doesn't mean that they can't be a problem. According to Dr. Nicholas K. Coch, a Geology Professor at Queens College, New York in 1990, "a recurrence" of a major hurricane "on the now highly urbanized Long Island Shoreline would lead to greater property damage than Hugo caused in South Carolina." (Danger's Edge, 1991) Today, a storm similar to the 1938 Hurricane making an impact on the New York Metropolitan area could cause three times more damage than Hurricane Andrew did in South Florida. (Mandias, 1998)

In addition, the New Jersey shoreline is just as vulnerable. Places such as Sea Bright, which has a seawall that costs more to maintain than the property it protects, suffered an estimated $82 million dollars in damage from a nor'easter in 1984 that experts considered a 30-year storm (West Carolina University, 1999). How devastating will the damage be when a 100-year storm such as the Long Island Express of 1938 comes around? Meanwhile, nearby cities and towns such as Asbury Park could potentially suffer about $50 billion dollars in insured losses if impacted by a Category Four Hurricane (New Jersey State Legislature, 1998).

More importantly, Coastal New Jersey communities such as Ocean City have experienced multiple insurance losses due to flooding or coastal storms. In all four of New Jersey's coastal counties (Monmouth, Ocean, Atlantic, and Cape May), about half of all flood claims involve buildings that have suffered two or more losses. These particular flood claims have resulted in a total of $131 million dollars in losses. On top of that, sixteen coastal communities in New Jersey are among the top 200 cities and towns throughout the United States with multiple insurance losses. (Rutgers, 1998)

Figure 6

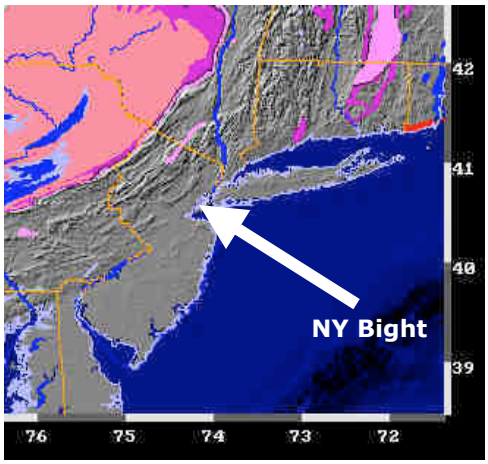


Coastal County Insured Property in New York and New Jersey (1988-1995)

The bottom line here is that property values and insurance for coastal areas in New York and New Jersey are quite high as shown on the previous page in Figure 4. As a matter of fact, Coastal New York State is second only behind Florida for the amount of insured coastal property (Mandias, 1998). Looking at the most destructive hurricanes on record and setting up a scenario of them hitting today, Hurricane Researcher Chris Landsea and Roger A. Pielke, a social scientist at NCAR indicated that the New York Metropolitan area would suffer greatly in terms of damage. (Mandias, 1998)

One of the primary reasons for all of these problems is what they call the "New York Bight" (Hughes, 1998). The fact that New York and New Jersey meet at a right angle (Figure 4) could have disastrous consequences if a major hurricane were to strike in the right location. For example, if a strong Category Two or Category Three Hurricane was to make landfall in the vicinity of Atlantic City, it would leave much of Central and Northeast New Jersey as well as New York City under water. (Hughes, 1998)

Figure 7



The New York Bight

There is also a false sense of security among residents of the coastal New York Metropolitan area that they can withstand a major hurricane. Due to near misses by Hurricanes Gloria (1985) and Bob (1991), many, particularly in Long Island, have "a misguided sense that Long Island can withstand 'strong' hurricanes with only minor inconveniences." (Mandias, 1998) However, it is important to point out that Gloria was only a Category One Hurricane when it came ashore on Long Island (Mandias, 1998) while Bob only struck the far eastern end of the island as it impacted much of New England as a Category Two storm.

Finally, there are the evacuation routes. According to a study done in 1990 by the U.S. Army Corps of Engineers, the New York Metropolitan area has several features that could be deadly in the event of a major hurricane. Bridges such as the George Washington and Verrazano Narrows are so high that these structures would experience hurricane force winds long before such winds were felt at sea level locations (Mandias, 1998).

In addition, other modes of transportation such as the Staten Island Ferry would have to shut down some 12 hours before a storm's arrival due to the surge

(Danger's Edge, 1991). We already know how difficult it can be just traveling into and out of New York City during rush hour, let alone for a hurricane evacuation procedure. So, without some of these bridges and ferries being able to function prior to the storm's arrival, evacuation from hurricane prone regions such as the Rockaways and Long Island would be almost impossible. (Danger's Edge, 1991)

South Florida Prior to Hurricane Andrew…

Believe it or not, despite its geography, a similar situation existed in South Florida before Hurricane Andrew struck the Homestead area in August, 1992. Prior to Andrew, South Florida residents had not seen a major hurricane in a remarkably long time. The last time such a storm hit the Miami and South Florida region was in 1965 when Hurricane Betsy, a Category Three Hurricane tore through there.

Many Floridians living there in 1992 also had not experienced a major hurricane. On top of that, there had been a population explosion throughout the state as about 1,500 people a day were moving into the Sunshine state, and many of these folks were headed toward a life along the coast. (Danger's Edge, 1991) Other problems also developed as complacency had set in to the building industry toward hurricanes as a result of a relatively inactive period between 1970 and 1994. (Pielke, 1997)

Consequently, new homes that had been built in the 15 to 20 years prior to Hurricane Andrew's landfall didn't adhere to the strict building codes that existed in Dade County, Florida. (Pielke, 1997) These building codes were and still are the strictest in the entire country (Pielke, 1997), which makes one wonder what could happen in places such as New York and New Jersey, where mitigation plans have failed to include the important role of the local building inspector. Without the involvement of the local building official, proper enforcement of these building codes is not implemented, and hazards aren't mitigated. (Gross, 1997)

The factors of tremendous growth in coastal population coupled with complacency in the building industry led to the costliest natural disaster in United States history as Hurricane Andrew barreled into South Florida, and caused some $27 billion dollars in damage (Great Storms Collection, 1994). It was, and still remains the costliest natural disaster on record in the United States. However, what happened in South Florida from Andrew can happen anywhere along the United States coastline from Maine to Texas.

The South Florida area was just one among many Metropolitan areas in the Southeast and Gulf Coast that seemed to have forgotten the fact that they are in perhaps the most hurricane prone regions of the United States. For example, prior to Hurricane Hugo in September, 1989, many of South Carolina's coastal communities didn't have strict building codes (Unnewehr, 1990) while places like Gulf Shores, Alabama, which was directly impacted by Hurricane Frederic in 1979, now have hundreds of condominium complexes near the coast. (Pielke, 1997)

There were other problems even prior to Andrew and Hugo in other parts of the Southeast and Gulf Coast regions. For example, in 1985, Hurricane Elena's unpredictable storm track caused changes in evacuation plans for the Gulf Coast from Mississippi to Florida prior to the storm's landfall over Biloxi, Mississippi on Labor Day of that year (Committee on Natural Disasters, 1991). Events surrounding Elena forced many emergency management officials to re-evaluate their evacuation plans. Problems like this existed as far back as prior to the Great Galveston

Hurricane of 1900. However, back in the early 20th Century, part of the problem was a lack of tools and technology that we have at our disposal today, not large coastal populations. (Fincher, 2000). Residents and officials in coastal communities throughout New York and New Jersey need to learn from these lessons and equip themselves better handle such events in the future (Fincher, 2000).

National Hurricane Response Programs…

Since Andrew, South Florida has taken many steps to improve its hurricane awareness and preparedness from improvements to an already strict building code in Dade County to better coordinate of evacuation efforts. In addition, South Carolina has implemented and improved building codes in coastal regions of that state as well (Danger's Edge, 1991). Officials, forecasters, and residents in the New York and New Jersey area need to learn from the lessons of South Florida as well as South Carolina, and immediately take action to improve its state and hurricane awareness and preparedness.

In addition, the federal government has become increasingly involved with coastal communities in mitigating hazards brought about by storms such as hurricanes. The National Weather Service has implemented a storm readiness program called StormReady, which certifies communities as such once they've met specific criteria needed to improve communication and dissemination of information in case severe weather breaks out in their area (Franklin, 2001). Avalon, New Jersey is an active participant in this program having been certified in August, 2001.

Meanwhile, FEMA, the Federal Emergency Management Agency has created a program called Project Impact. Project Impact is a program where the government encourages and supports communities all around the country to participate so that they can effectively mitigate future disasters and prevent heavy financial losses. So far there are a total of forty-eight communities involved with Project Impact.

Among these communities are the towns of Ocean City and Avalon, New Jersey, and Freeport, New York on Long Island. As you will see in the following sections, Project Impact has had a tremendous impact on the towns of Freeport, Avalon, and Ocean City. All of these towns have been affected quite a bit over the years by coastal storms such as nor'easters and hurricanes, and have suffered significant economic losses.

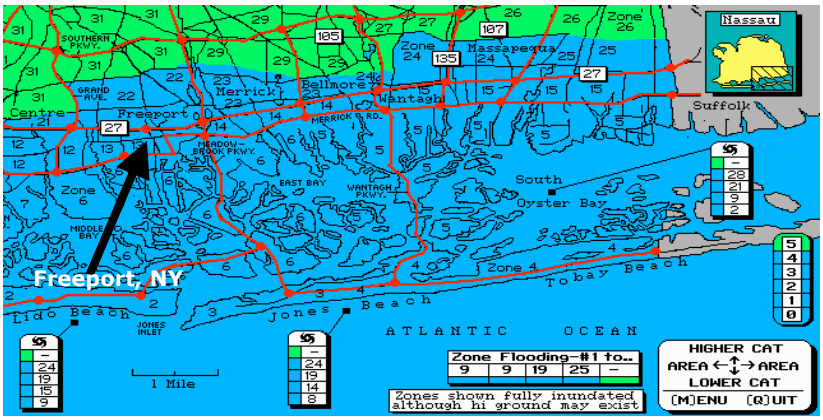
Project Impact in Freeport, Long Island…

One of the first towns to implement a version of the Project Impact program is Freeport, New York, which is on the south shore of Long Island in Nassau County. The project has been very successfully in mitigating hazards in flood prone areas of the town, and the village of Freeport itself has taken the lessons learned from this prgram to assist neighboring coastal towns in Long Island such as East Rockaway. "Embracing the principles of Project Impact wholeheartedly, the Village of Freeport is activeʼy building a disaster resistant community." (**http://www.fema.gov**)

Freeport, which is in Nassau County, New York and has a population of approximately 45,000 people, has had its share of beach erosion and coastal property damage from weather events such as coastal flooding, hurricanes, and nor'easters. That is because Freeport is particularly vulnerable to the effects of hurricanes, nor'easters, back-bay flooding, and high winds. As a matter of fact,

according to the storm surge model, HURREVAC, Freeport would be under water if a storm such as the Long Island Express would hit today. (Mandias, 1998)

Figure 8



Storm Surge For Freeport, NY from a Category Four Hurricane

Consequently, the coastal Long Island village has suffered multiple insurance losses over the years. (**http://www.fema.gov**) Since joining the Project Impact program, Freeport has made significant changes. First the town has hired a full time Emergency Management official to manage Freeport's disaster prevention programs. This newly created position created various projects that provided residents with a 10 percent reduction in flood insurance premiums through the National Flood Insurance Program's Community Rating System.

Some of these projects included raising streets of hurricane and flood prone areas, using an $890,000 Flood Mitigation Assistance Grant to help some 30 or so homeowners in prone areas affordably raise their homes several feet above the flood base. (**http://www.fema.gov**) Other efforts are underway to combat problems ranging from bulkhead issues to elevations in commercial areas, and general public awareness. Another benefit of Project Impact is that it has coerced the town of Freeport to form a partnership with local businesses in the town to work together on improving reducing their vulnerability to these monster storms as well as other coastal threats.

Places such as Freeport and East Rockaway on Long Island are quite vulnerable to all kinds of coastal hazards. In response, Mayor Glicken has instituted a plan to educate the public by having a presentation on hurricane awareness in the town library, lectures provided in the public schools for children, adults and senior citizens as well as hands on workshops. In addition, there is also a Hurricane Preparedness Guide on Freeport's town web site, (**www.freeportny.com**) as well as emergency contact and evacuation information. (**http://www.fema.gov**)

The results of these initiatives have been tremendous. Freeport has become a more disaster resistant community. As of this time, 23 homes in flood prone areas throughout the town have been elevated while town officials are working together to raise another 10 homes in the future. Meanwhile, many of the town's roads have been repaired and repaved. Consequently, the Meister Beach area of the town is no longer threatened by coastal flooding. (**http://www.freeportny.com**)

The Project Impact program in Freeport, New York is probably the best solution for Sea Bright to model itself after because it is one of the more prominent ones. However, it is important to point out that Freeport is doing many of the things that this proposal wants to incorporate. The community has a very extensive education and awareness program, undertaken many different mitigation projects, and has accomplished a lot of what they have done with the help of federal money.

Project Impact in Avalon, New Jersey…

Similar results have occurred with the Project Impact program in the town of Avalon, New Jersey, which is located in Cape May County in the far southern portion of the state. Avalon, specifically located on the northern end of the Seven-Mile Beach Island, has a population of close to two thousand people during the winter and approximately 35,000 people in the summer months. Like Freeport, it is particularly vulnerable to coastal storms such as hurricanes. (**http://www.fema.gov**)

As a matter of fact, the town has experienced a number of hits from coastal storms in recent years. In addition to nor'easters in 1962, 1991, 1992, and 1996, the town of Avalon has also been impacted by hurricanes in 1985 and 1999. Of course, it is important to point out that both of these storms were much weaker than they were originally so it could have been much worse for Avalon. However, Avalon is not taking that lightly. They have made big strides in improving their hazard mitigation program.

Avalon has worked on various projects under Project Impact such as improving storm drain functions, water pumping stations, building designs, traffic flow, beach and dune designs, seawall design criteria, and warning systems. Most importantly, according to Harry DeButts, the head of Public Works in Avalon, all of these projects as well as others have taken into consideration the level of storm readiness and disaster preparedness.

Consequently, in October, 2000, the town received a reduction in its Flood Rating from an 8 to a 7 by the Community Rating System of the National Flood Insurance Program. (**http://www.fema.gov**) This means that residents of this community can save money by paying less for flood insurance as a result of these mitigation efforts. Furthermore, Avalon has done much, if not all of it, without federal dollars.

While Avalon's program has been very successful, much of the funding as come without the help of FEMA. According to Harry DeButts, much of what has been accomplished in Avalon was completed prior to the community joining the Project Impact program. So, the brunt of the work and funding has been done at the state and local levels. Considering the Sea Bright's proposal plans the renovation of its sea wall, more funding is going to be needed and that must come from the federal level.

Project Impact in Ocean City, New Jersey…

Similar results have occurred with the Project Impact program in the town of Ocean City, New Jersey, which is located in Cape May County in the far southern portion of the state. Ocean City, specifically located on an island in the northernmost end of Cape May County. Like Sea Bright, Ocean City is situated near three bodies of water: the Atlantic Ocean to the east and both Peck's Harbor and Great Egg Harbor to the west.

It has a year round population of close to 15,500 people and only has an elevation of 4 to 7 feet above sea level. Within the community, there are about 400 homes and business that are included in the specially marked flood hazard area. They also include the town's airport, sewer plant, water pumping station, power distribution centers, and local telephone switching stations. So as you can see, if this town is impacted by a storm, it could cause damage to key pieces of infrastructure to the community. (**http://www.fema.gov**)

Ocean City is also a community that has experienced multiple insurance losses. As mentioned earlier in the introduction, this coastal community is listed as one of the 16 New Jersey towns on the top 200 list of communities in the United States that have suffered multiple losses (Pielke, 1997). As a matter of fact, in 1997, Ocean City was ranked 18th on the list. (Pielke, 1997). Due to its low elevation, flooding often occurs in Ocean City when there are heavy rains, astronomical tides, and coastal storms. (**http://www.fema.gov**)

The town is currently working on elevating flood prone properties that have been designated by FEMA as having suffered repetitive losses. It has also developed strong partnerships with the business community in the town, which has, in turn, produced many positive meetings and forums on protecting Ocean City from future disasters. Ocean City has begun to make major strides with Project Impact to improve on its multiple losses ranking, and with continued hard work, they will get there.

Ocean City's program is a step in the right direction for the community, but the program is still in its early stages, and is yet to bare the fruit of its labor. So, it is really difficult to evaluate how this particular program is doing, and whether or not the town of Sea Bright can benefit from. There maybe some projects currently being worked on as well as some information that Sea Bright could utilize, but other than that, there is very little at this point that Sea Bright can learn from.

StormReady in Avalon, New Jersey…

In addition to its work with FEMA's Project Impact, the town of Avalon has done a great deal with the folks at the local National Weather Service office in Mount Holly to become certified as StormReady. Basically, Avalon has developed a system of communication that will help disseminate critical information to the public when severe weather threatens their community. Their system has met the necessary criteria indicated by the NWS to be StormReady. Avalon obtained its certification in August, 2001, and will have it for two years. Within that time, it will have to continue to improve its current system to make it better and stay ahead of the curve. (**http://www.nws.noaa.gov/stormready**)

Similarly to its work with Project Impact, Avalon's storm readiness program has been done without much help from the federal goverenment. However, the National Weather Service doesn't participate directly in the implementation of whatever tool a town such as Avalon decides as its communication system for use in severe weather events. Therefore, the burden is on the community itself to acquire the tools it needs to make itself StormReady certified. So, Sea Bright would have to obtain the funding for this particular program on its own. Nevertheless, it is another element that this proposal believes is essential in order to be prepared for a hurricane.

PROPOSAL

The Plan…

Based upon the research of this report, a plan has been developed that would create a program to improve Hurricane Awareness and Preparedness for the coastal community of Sea Bright, New Jersey. This plan will follow something similar to FEMA's Project Impact initiative in Freeport, Long Island as well as add elements from the National Weather Service's StormReady program, and basic information about hurricanes at the web site, Hurricaneville located on the World Wide Web at **http://www.hurricaneville.com**.

The first phase of the program would be to better educate people in the town of Sea Bright what hurricanes are, where they come from, how they form, and most importantly where they end up. During this process, it would be strongly emphasized to local officials, community and business leaders as well as residents that an event such as a major hurricane can happen here, and with increased tropical activity starting to occur in recent years, it may just be a matter of time.

Similar to Mayor Glacken's approach in Freeport (**http://www.fema.gov**), there would be such things as presentations on hurricanes, lectures in town halls and schools by experts in the field of meteorology, emergency management, and development. There would also be pamphlets, brochures, and interactive multimedia presentations on hurricane awareness created so that the town could mail to all of its residents. Furthermore, special features will be created at the Hurricaneville web site that will be particularly tailored for those in Sea Bright in addition to information such as the latest hurricane news, data, and safety tips.

Once that phase is successfully completed, there would be seminars and meetings held within Sea Bright itself for officials, community and business leaders, and residents. During these meetings, all parties involved will work together to improve building standards, evacuation routes and procedures, and have an emergency management protocol in place if there isn't one already. However, if there were one, I would encourage the town to develop a storm readiness protocol to follow so that it can apply for StormReady certification from the National Weather Service.

In the spirit of the Project Impact programs in Freeport, Avalon, and Ocean City, it would be imperative to get the local businesses within Sea Bright involved and enthused on the idea of increasing hurricane preparedness. Once there is agreement on what is needed to be done in terms of hazard mitigation, efforts would begin immediately on improving such things as bulkheads, flood prone areas, dunes, sewer draining systems, and protecting homes and businesses from future coastal storms.

The most important component of this project would be to improve the town's sea wall, which has undergone some difficulty in recent years. Major renovation would be done to the sea wall so that it could better withstand the brunt of future storms while not being more costly to maintain than the homes and businesses that it is supposed to protect nearby. Having a rejuvenated sea wall may take a lot of money to become reality, but if it is completed, the long term results will be beneficial and outweigh the costs involved.

Projected Timeline for the Sea Bright Proposal…

The proposed program for Sea Bright must be implemented within two years. The portion of the program that deals with education would be most completed near the first quarter or the beginning of the second quarter of 2002. However, it should be stressed here that education must be an ongoing process for this program to work in the long term. In the second quarter of 2002, work would commence on creating a severe weather alert system. Once this system is put in place, the National Weather Service would evaluate it for StormReady Certification.

Starting in the second half of 2002, the renovation of the sea wall would begin to take place along with the hazard mitigation program. The hazard mitigation program would begin with staff training as well as an evaluation of roads, homes, businesses, and of course the sea wall to see what needs to be improved. The last quarter of 2002 will continue with sea wall renovation as well as getting into the hazard mitigation program in earnest. Upon completion of the hazard mitigation program, more focus will be put upon the renovation of the sea wall. Beginning in 2003, the work on the sea wall will be the only remaining project that needs to be completed, and that should finish by the summer.

Below is a more specific breakdown of the timeline.

- **January, 2002**—Sea Bright program commences.
- **February, 2002**—Education program begins.
- **May, 2002**—Education program completed. Work on storm readiness system begins.
- **June, 2002**—Hazard mitigation and sea wall renovation programs begin.
- **August, 2002**—Storm readiness system established and evaluated for StormReady Certification. Staff training on hazard mitigation completed.
- **October, 2002**—Hazard mitigation programs proceed in earnest. Work continues on sea wall.
- **December, 2002**—Hazard mitigation program completed. Work continues on sea wall.
- **June, 2003**—Sea wall renovation completed.

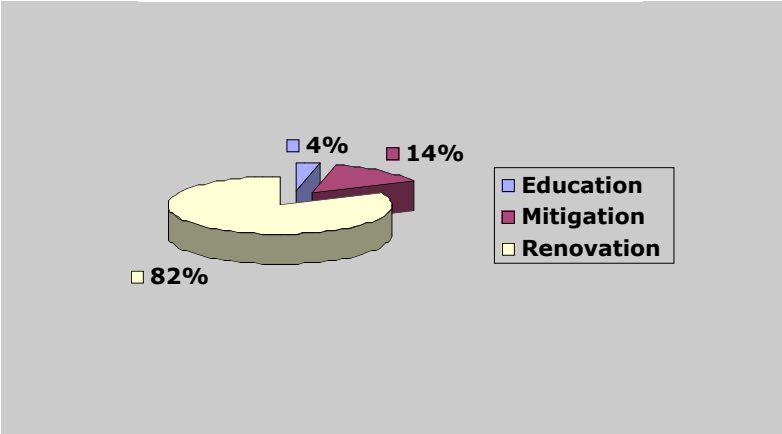
BUDGET

This program will be completely funded by FEMA with the exception of the Storm Ready Certification process, which will be undertaken by Sea Bright itself. Costs given are estimates based upon other models such as Freeport, Avalon and Ocean City as well as the cost of the damage to the Sea Bright Sea Wall in 1984.

Budget Breakdown…

The budget for the Sea Bright Project would basically have three components: Education, Hazard Mitigation, and Sea Wall Renovation. Below Figure 9 gives a percentage breakdown of the budget for each major component.

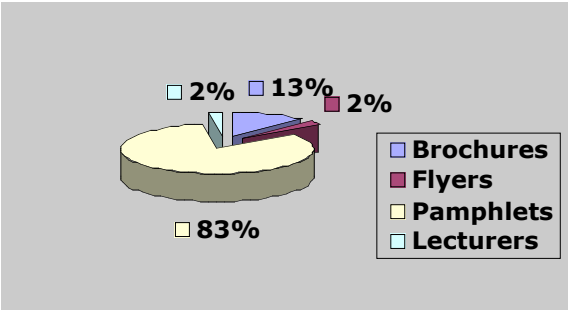
Figure 9



Percentage Breakdown of Proposed Budget

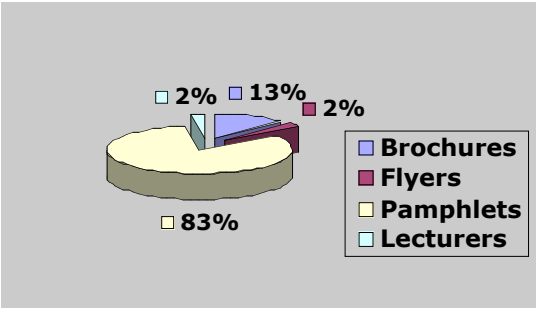
As shown in Figure 7, the bulk of the cost for this project would go towards renovating the sea wall in Sea Bright. The cost for the renovation is based upon similar work done in the town of Avalon, where they also have a sea wall. The other costs were based upon facts and figures developed by Hurricaneville for the creation of pamphlets, brochures, and flyers, and the budget given by the Village of Freeport for the work done with the Project Impact program in 1999. Figures 10 and 11 show a more detailed breakdown of the Education and Mitigation budgets.

Figure 10



Percentage Breakdown of Education Budget

Figure 11



Percentage Breakdown of Mitigation Budget

Now, the final graphic, Figure 10 shows an itemized budget for each major component of the project from Education to the Sea Wall Renovation. These items also provide some detail on how the costs were reached.

Figure 12

Education				
	Brochures--7,000 copies of 6 pages each			
		at $0.20 per page		$8,400
	Pamphlets--7,000 copies of 40 pages each			
		at $0.20 per page		$56,000
	Flyers--7,000 copies of 1 page each			
		at $0.20 per page		$1,400
	Web Site--Custom Info for Sea Bright			
				$0
	Guest Speakers & Presentations			
		7 total guest speakers		
		Plane		$400
		Hotel		$800
		Rental Car		$360
		Gas and Tolls		$100
	Subtotal			**$67,460**
Preparedness & Mitigation				
	Retrofitting			$90,000
	Staff Training			$35,000
	Tree Removal & Pruning			$30,000
	G.I.S. Update System			$15,000
	Road Design Consultant			$38,000
	StormReady Certification			$20,000
	Evacuation--Tidal Gauge			$35,000
	Subtotal			**$263,000**
Renovation				
	Sea Wall Renovation			$1,500,000
Bottom Line	**Grand Total**			**$1,830,460**

Total Itemized Cost for Project

Note: Still in the process of working out the final details for the cost. Still need to obtain more accurate figures on the costs for the sea wall renovation.

Budget Justification…

Although the project is significantly more money than either of the Project Impact programs in Freeport, New York, Avalon, New Jersey or Ocean City, New Jersey, one has to take into account the costs involved with renovating the sea wall in Sea Bright. Eliminating that portion of the proposal from the budget, and the costs are comparable to the plan developed for Freeport, New York.

(1) Education: Based upon a peak population of an estimated 7,000 people in Sea Bright during the summer months the costs for the Brochures, Flyers, and Pamphlets are based on the number of copies to be distributed, the number of pages there are in each, and the estimated cost of a sheet of paper, which is about $0.20 cents. The other education costs would be for the guest speakers, which would take into account their travel expenses for plane trips, hotels, car rentals, gas, and of course tolls on the New Jersey Turnpike and Garden State Parkway.

(2) Mitigation: Based upon budgetary information provided by the Village of Freeport, New York for the work done in their community through Project Impact in 1999, the costs for hazard mitigation in Sea Bright would involve retrofitting homes and businesses so that they meet strict building code standards. These standards would take into account effects brought on by a major hurricane. There would also be a tidal gauge, which would be used to trigger of a warning system when tides threaten flood prone areas, a system put in place to disseminate information when severe weather threatens Sea Bright, Tree removal, and a GIS System to track the progress of vulnerable areas. After establishing the communication system for severe weather events, Sea Bright would then be evaluated by the National Weather Service for StormReady certification. In addition, there would be staff training for certain aspects of the hazard mitigation process and an engineering consultant, which would be needed for redesigning the roads in flood prone areas.

(3) Renovation: Based upon some information obtained from Avalon, New Jersey, the costs for the renovation for the sea wall would involve refortifying portions of the sea wall in Sea Bright that have been damaged by recent storms.

DISCUSSION

It is essential to have an evaluation of the program, especially during the first year of operation. Upon establishing a storm readiness system, the town of Sea Bright will receive an evaluation by the National Weather Service once it has applied for StormReady certification. There will also need to be a periodic evaluation by the Army Corps of Engineers on the sea wall in Sea Bright to see that the improvements made to the sea wall are effective in preventing future damage to it.

In addition, building inspectors will have to evaluate the retrofitting that has been done to homes and businesses to make sure there effective, and most importantly, meet the tougher building standards. Since the engineering consultant will be brought in to assist in road design, he or she will have to periodically review road construction work that has been completed, and make sure that this too, is meeting required standards.

The project proposed here to can work with help from organizations such as FEMA and the National Weather Service. Educating the public on hurricanes is a very important part of trying to prevent such a disaster similar to Hurricane Andrew from happening here. There are benefits to such efforts as seen in places such as Freeport, Long Island, and even in Coastal New Jersey towns such as Ocean City and Avalon.

The towns of Freeport and Avalon have made major strides through their participation in FEMA's Project Impact. Both communities have developed programs that have significantly reduced storm hazards. As a result, these towns have been able to save their respective taxpayers money through lower flood insurance costs. In addition, these towns have taken the lessons that they have learn, and put them to good use by helping other communities improve their hurricane awareness, preparedness, and storm mitigation. In addition Avalon has taken further steps to protect itself from severe weather by becoming certified by the National Weather Service as StormReady.

By developing a program with these particular elements in the town of Sea Bright, New Jersey, work on the foundation for improving hurricane awareness and preparedness in the New York and New Jersey will continue, and the subject of Hurricane Awareness and Preparedness in one of the most vulnerable regions in the United States will draw more attention. More importantly, the benefits of using elements of both Project Impact and Storm Ready as well as information designed particularly for the residents and local officials in Sea Bright, will help this vulnerable community become better prepared for when the next storm comes.

REFERENCES

Allen, E. (1972). A wind to shake the world: The story of the 1938 Hurricane. Boston: Little, Brown.

Chambliss, L. (2001). Peril in paradise: The Northeast isn't risk free. [Online]. Retrieved October 28, 2001 from the World Wide Web: **http://www.weather.com/newscenter/specialreports/perilparadise/northeast.html**

Committee on Natural Disasters. (1991). Hurricane Elena, Gulf coast: August 29-September 2, 1985. Washington, D.C.: National Academy Press.

Fincher, L. (2000, April). The 1900 Great Galveston Storm and earlier disasters along the Gulf Coast: Have we learned our lesson yet? In 2000 National hurricane conference: Centennial of the 1900 Galveston storm. (pp. 1-16). National Hurricane Conference.

Franklin, D. (2001, July 23). National Weather Service StormReady program. [Online]. Retrieved October 28, 2001 from the World Wide Web: **http://www.nws.noaa.gov/stormready**

Gaul, G.M.. & Wood, A.R. (2000, March 10). In N.J. and elsewhere, back bays are under siege. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://www.phillynews.com/2000/Mar/10/coast10.htm**

Gross, R. (Spring, 1997). Mitigation matters: Building code enforcement. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://www.nysemo.state.ny.us/NYEMT/Spring97/mitmatters97b.htm**

Harbor Insurance. (1997, September 7). Natural Disaster Risk Map. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://www.harborinsurance.com/guides/disasterprofile.htm**

Hughes, J. E. (1998). Coastal storm evacuation procedures for the Rockaway Peninsula: PAD 747 term project. [Online]. Retrieved October 4, 2001 from the World Wide Web: **http://www.geocities.com/CapitolHill/Senate/3689/paper1.html**

Hurricane X. (1998, September 7). Time, pp. 64-66.

Insurance Institute for Property Loss Reduction and Insurance Research Council, Inc. (April, 1995). Coastal exposure and community protection: Hurricane Andrew's legacy. Boston: Author.

Jacob, K. (July, 2000). National Hazards Observer: Risk to the MEC. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://www.colorado.edu/hazards/o/julyo00/julyo00a.htm**

Mandias, S. (1998). The Long Island Express: The great hurricane of 1938. [Online]. Retrieved October 4, 2001 from the World Wide Web: **http://www2.sunysuffolk.edu/mandias/38hurricane**

National Oceanic and Atmospheric Administration. (March, 1996). *Hurricanes: Unleashing nature's fury* [Brochure]. Washington, DC: Author.

National Oceanic and Atmospheric Administration. (1999). Community vulnerability assessment tool: New Hanover County, North Carolina. Charleston, SC: NOAA Coastal Services Center. Retrieved from CD-ROM (Community Vulnerability Assessment Tool, CD-ROM, 1999 release).

National Oceanic and Atmospheric Administration. (July, 2001). *Tropical cyclones and inland flooding: An awareness guide* [Brochure]. Peachtree City, GA: Southeast River Forecast Center.

New Jersey Department of Environmental Protection. (1985). Coastal storm hazard mitigation: A handbook on coastal planning and legal issues. Trenton, NJ: Author.

New Jersey Department of Environmental Protection. (1983). Coastal storm vulnerability analysis: Ocean City and Cape May County, New Jersey, Part III. Trenton, NJ: Author.

New Jersey State Legislature. (1998, December 8). Task force on homeowner's insurance. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://www.njleg.state.nj.us/Pubhear/120898lb.htm**

O' Hanlon, L. (2001, July 3). Study: Jersey Shore due for major hurricane. [Online]. Retrieved October 28, 2001 from the World Wide Web: **http://dsc.discovery.com/news/briefs/20010702/jersey.html**

Pielke, R.A. Jr. & Pielke, R.A. Sr. (1997). Hurricanes: Their nature and impacts on society. New York: John Wiley & Sons.

Pioneer Productions. (1996). Wonders of weather: Hurricane. Bethesda, MD: The Learning Channel.

The Weather Channel. (1991). Danger's edge. [Video]. Atlanta: Author.

The Weather Channel. (1994). Great storms collection: Great weather catastrophes. [Video]. Atlanta: Author.

United States Geological Survey. (2000, October 2). Natural disasters: Forecasting hurricane occurrence, economic and life losses. [Online]. Retrieved October 4, 2001 from the World Wide Web: **http://catbert.er.usgs.gov/hurricane_forecast**

Unnewehr, D.L. (1990). Surviving the storm: Building codes and the reduction of hurricane damage. In Hurricane Hugo: One year later. (pp. 243-250). New York: American Society of Civil Engineers.

Village of Freeport, New York. (1998). Application for federal assistance. Freeport, New York: Author.

Watson, S. (2000). Vulnerable cities: Lessons learned. [Online]. Retrieved October 29, 2001 from the World Wide Web:

http://www.weather.com/newscenter/specialreports/hurricanes/vulnerablecities/lessons.html

Western Carolina University. (1999). Coastal hazards: The Sea Bright, NJ example. [Online]. Retrieved October 29, 2001 from the World Wide Web: **http://coastalhazards.wcu.edu/libroschapter5.htm**