

Pre-Disaster Mitigation Plan For the County of Dukes County 2007



(Final Approval May 13, 2008)

**Prepared by:
The Martha's Vineyard Commission
In conjunction with the emergency managers of
Dukes County**

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ACKNOWLEDGEMENTS

This plan was prepared with the input and guidance of a Community Hazard Mitigation Planning Team, with representatives from the seven towns in Dukes County and from the County. Those representatives included:

| | |
|--------------|---|
| Aquinnah | Spencer Booker |
| Chilmark | Dan Bryant and Bill Smith |
| Dukes County | Chuck Cotnoir |
| Edgartown | Peter Shemeth |
| Gosnold | Seth Garfield |
| Oak Bluffs | Peter Martell |
| Tisbury | Richard Townes |
| West Tisbury | Judy Sibert (early participant), Chris Cini, and John Early (final participant) |

A note on participation by the Town of Chilmark: Chilmark does not participate in the National Flood Insurance Program, and was ineligible for funding for this project. No MEMA funds were used to support Chilmark's participation, which was sponsored by MVC in the spirit of preparing a plan for the community as a whole.

This report was prepared by staff of the Martha's Vineyard Commission:

| | |
|-------------------------------------|-----------------------------------|
| Jo-Ann Taylor, Coastal Planner..... | Project Manager, Principal Author |
| Chris Seidel, GIS Coordinator..... | Maps and data synthesis |
| Maeve Turner, GIS Intern..... | Maps and data synthesis |
| Jonathan Pollak, GIS Intern..... | Maps |
| Jeffrey Wooden, Administrator..... | Administration |

Thanks to Caroline Fenske for spot logistical support.

Cover photo of storm surge by United States Geological Survey

EXECUTIVE SUMMARY

Development of a Pre-Disaster Mitigation Plan is important in order to prepare a community for the natural hazards that every community faces sooner or later. By being adequately prepared, the community has a chance to cut its losses, in terms of both safety and hardship. An approved Pre-Disaster Mitigation Plan brings the community eligibility for funding for implementation of the mitigation measures included in the plan.

The Pre-Disaster Mitigation Plan for the County of Dukes County was prepared by a planning team consisting of emergency managers representing the seven towns and the County. Staff from the Martha's Vineyard Commission coordinated the planning and produced the report and maps. Funding was provided by The Massachusetts Emergency Management Agency (MEMA) in cooperation with the Department of Homeland Security – Federal Emergency Management Agency. Because the Town of Chilmark does not participate in the National Flood Insurance Program (NFIP), no grant funds were used to sponsor Chilmark's participation.

Dukes County is no stranger to natural hazards, particularly flood hazards. Hurricanes strike rarely, but with extensive damage done in a few short hours. Nor'easters strike more frequently, last longer, and are responsible overall for more damage and shoreline erosion and modification. Dam failure is a potential flood threat in the Town of West Tisbury alone. Drought is a potential threat to all the communities of Dukes County, particularly to those with public water supplies. Wildfire is a potential natural hazard, particularly where development meets forest land (the wildland-urban interface).

Vulnerability is determined by the threat of a natural hazard striking a particular location, and what level of intensity may be expected. As of June 30, 2007, 114 claims have been filed under the National Flood Insurance Program (NFIP), totaling \$1,603,746.70. Of that total, 17 properties have been responsible for 41 of those claims (36%) and for 64% of the total damages in dollars. 123 critical facilities were identified, with 20 of those found to be vulnerable to flood damage. Most of the properties found vulnerable to flooding are critical water-dependent facilities such as ferry terminals.

Vulnerability to wildfire is determined by proximity of development to forested lands, and fuel type. Much of Martha's Vineyard is potentially vulnerable, and there is no wildfire management plan outside of the State Forest.

Planning to protect Dukes County includes shore protection strategies such as beach nourishment, drought mitigation in the form of improved water supply infrastructure, and an outreach campaign to better prepare homeowners and homeowners' associations with wildfire defense strategies.

Section 1. Introduction

Purpose:

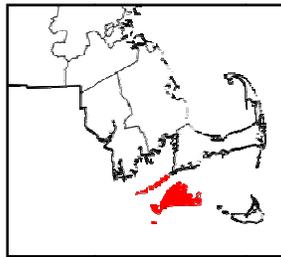
A Pre-Disaster Mitigation Plan examines the natural hazards likely to impact the community, assesses the vulnerabilities associated with those hazards, and makes recommendations on ways to mitigate the negative effects of typical natural hazards.

The actions recommended in the plan should translate into savings; fewer lives lost, less property destroyed, and minimal disruption to essential services. An additional impetus for planning is that communities with approved Pre-Disaster Mitigation Plans are eligible for federal funding for the implementation measures named in the plan.

In order to prepare a Pre-Disaster Mitigation Plan, hazards and critical facilities are identified, vulnerability assessed, and actions recommended mitigating the vulnerability.

Section 2. Community Profile

The County of Dukes County consists of islands off the southeast coast of Massachusetts. All of the islands in Dukes County owe their origin to glacial activity, with resultant hilly, morainal areas of boulders, gravel, sand and clay, drained by a very few streams. The remainder of the land mass consists of outwash plains spreading out from the morainal areas. The outwash plains are flat or gently sloping lands made of highly porous sand and gravel. A number of great ponds are found where the outwash plains meet the sea, most fronted by barrier beaches. Travel to and between the islands and the mainland is entirely by boat or plane.



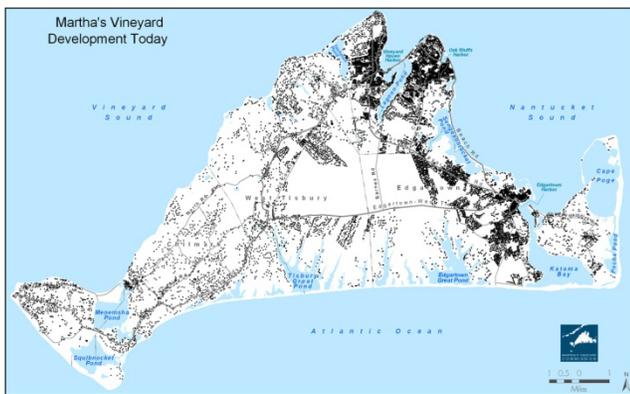
locus of the County of Dukes County

Seven towns comprise the County of Dukes County, including the Elizabeth Islands, lying several miles west of the Vineyard across the waters of Vineyard Sound. Although the islands are perhaps best known as recreational destinations, there is also significant island life year 'round. The year 'round residents tend to be independent but with strong community interest and response in need. Most of the population inhabits the largest island, Martha's Vineyard. The Vineyard's

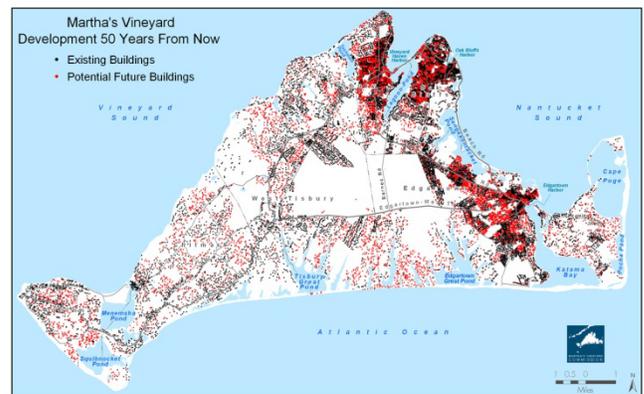
| Estimated Average Summer Population - 2000 | | | | | | | |
|---|-----------------|-----------------|------------------|-------------------|----------------|---------------------|---------------|
| | Aquinnah | Chilmark | Edgartown | Oak Bluffs | Tisbury | West Tisbury | Total |
| Year-round | 344 | 843 | 3,779 | 3,713 | 3,755 | 2,467 | 14,901 |
| Guests of Year-round | 141 | 382 | 1,582 | 1,590 | 1,646 | 1,034 | 6,375 |
| Seasonal / Vacationers | 1,536 | 4,894 | 13,251 | 10,637 | 5,123 | 3,888 | 39,329 |
| Transients | | | | | | | |
| lodging rooms | 42 | 158 | 1,944 | 1192 | 860 | 190 | 4,386 |
| on boats | | | 408 | 504 | 600 | | 1,512 |
| camping | | | | | 432 | | 432 |
| Day Trippers | | | 500 | 5,000 | 2,500 | | 8,000 |
| Cruise Passengers | | | | 1,000 | | | 1,000 |
| Total | 2,063 | 6,277 | 21,464 | 23,636 | 14,916 | 7,579 | 75,035 |

year-round population of 15,000 swells to more than 75,000 on a summer day, when the Vineyard becomes a destination for summer residents, vacationers, and relentless multitudes of visitors.

On Martha’s Vineyard, covering 87 square miles, the three “down-island” towns of Tisbury, Oak Bluffs and Edgartown are more densely inhabited and include village centers with modest commercial activities, much of which is focused on the waterfront of each. The “up-island” towns of West Tisbury, Chilmark and Aquinnah are comparatively rural and sparsely populated. The Martha’s Vineyard Commission has identified how many houses are presently on the Vineyard and projected how many houses would be built on the Vineyard in the next fifty years, if current zoning is maintained and past rates of construction continue.



Present development on Martha’s Vineyard



Projected development on Martha’s Vineyard

The table below corresponds to the two maps above, showing the numbers represented by the above graphics.

| Projection of Future Development | | | | |
|---|--------------|----------------------------------|---------------------------|--------------------|
| | Houses Today | Projected New Houses in 50 Years | Projection in Fifty Years | Projected Increase |
| Aquinnah | 496 | 450 | 946 | 91% |
| Chilmark | 1,304 | 750 | 2,054 | 58% |
| Edgartown | 4,617 | 2,944 | 7,561 | 64% |
| Oak Bluffs | 3,817 | 1,342 | 5,159 | 35% |
| Tisbury | 2,801 | 1,400 | 4,201 | 50% |
| West Tisbury | 2,098 | 1,150 | 3,248 | 55% |
| | 15,133 | 8,036 | 23,169 | 53% |

Note: It does not account for limits on potential development on some properties from conservation restrictions or agricultural restrictions. Nor does it account for possible additional development on properties with comprehensive permits or zoning changes.

Section 3. Critical Facilities

123 critical facilities were identified from MassGIS data, in conjunction with the emergency managers.

DUKES COUNTY CRITICAL FACILITIES

| SITE NAME | TOWN | DAILY USE | EMERGENCY USE |
|---|--------------|------------------|---|
| Dukes County Courthouse | Edgartown | Courthouse | |
| Dukes County Juvenile Courthouse | Edgartown | Courthouse | |
| Aquinnah Town Hall | Aquinnah | Town Hall | MassCare Center, Alt. Emergency Operations Center |
| Chilmark Town Hall | Chilmark | Town Hall | Pri. Emergency Operations Center |
| West Tisbury Town Hall | West Tisbury | Town Hall | |
| Edgartown Town Hall | Edgartown | Town Hall | |
| Tisbury Town Hall | Tisbury | Town Hall | |
| Oak Bluffs Town Hall | Oak Bluffs | Town Hall | |
| Chilmark Police Station | Chilmark | Police Station | MassCare Center, Alt. Emergency Operations Center |
| Oak Bluffs Police Station | Oak Bluffs | Police Station | |
| State Police Station, Oak Bluffs | Oak Bluffs | Police Station | |
| Tisbury Police Station | Tisbury | Police Station | Alt. Emergency Operations Center |
| Edgartown Police Station | Edgartown | Police Station | Pri. Emergency Operations Center |
| West Tisbury Police Station | West Tisbury | Police Station | |
| Dukes County Police Headquarters | Edgartown | Police Station | |
| Aquinnah Fire Department | Aquinnah | Fire Department | |
| Chilmark Fire Department | Chilmark | Fire Department | |
| Chilmark Fire Department - North Rd | Chilmark | Fire Department | |
| Edgartown Fire Department - Chappaquiddick | Edgartown | Fire Department | |
| Edgartown Fire Department | Edgartown | Fire Department | |
| Oak Bluffs Fire Department | Oak Bluffs | Fire Department | Pri. Emergency Operations Center |
| Tisbury Fire Department | Tisbury | Fire Department | |
| West Tisbury Fire Department - State Rd | West Tisbury | Fire Department | Alt. Emergency Operations Center |
| West Tisbury Fire Department - Edgartown Rd | West Tisbury | Fire Department | Pri. Emergency Operations Center |
| Martha's Vineyard Hospital | Oak Bluffs | Medical Facility | |
| Martha's Vineyard Hospital Child Center | Oak Bluffs | DayCare Center | |
| Windemere Nursing & Rehab Center | Oak Bluffs | Nursing Home | |
| Edgartown Walk-In Clinic | Edgartown | Medical Facility | |
| Tisbury Walk-In Clinic | Tisbury | Medical Facility | |
| Martha's Vineyard Community Services | Oak Bluffs | Medical Facility | DayCare Center |
| Long Hill Assisted Living | Edgartown | Nursing Home | |
| Katama Airfield | Edgartown | Airfield (grass) | |
| Chilmark Elementary | Chilmark | School | |

| SITE NAME | TOWN | DAILY USE | EMERGENCY USE |
|---|---------------------|---------------------|---|
| Cuttyhunk Elementary | Gosnold | School | |
| Edgartown Elementary | Edgartown | School | MassCare Center, Alt. Emergency Operations Center |
| Island Montessori School | West Tisbury | School | |
| Martha's Vineyard Public Charter School | West Tisbury | School | |
| Martha's Vineyard Regional High School | Oak Bluffs | School | MassCare Center |
| Oak Bluffs Elementary | Oak Bluffs | School | MassCare Center |
| Penikese Island School | Gosnold | School | |
| Tisbury Elementary | Tisbury | School | Pri. Emergency Operations Center, MassCare Center |
| Vineyard Montessori | Tisbury | School | DayCare Center |
| West Tisbury Elementary | West Tisbury | School | MassCare Center |
| Gosnold Town Hall | Gosnold | Town Hall | Pri. Emergency Operations Center, MassCare Center |
| Cuttyhunk Church | Gosnold | MassCare Center | |
| Tisbury Senior Center | Tisbury | MassCare Center | |
| American Legion | Tisbury | MassCare Center | |
| St. Augustine's Church | Tisbury | MassCare Center | |
| Aquinnah Police Department | Aquinnah | Police Station | |
| Grace Church | Tisbury | DayCare Center | MassCare Center |
| Christ United Methodist Church | Tisbury | MassCare Center | |
| Martha's Vineyard Boys & Girls Club | Edgartown | MassCare Center | |
| Chilmark Community Center | Chilmark | MassCare Center | |
| Martha's Vineyard Agricultural Hall | West Tisbury | MassCare Center | |
| Island Children's School | West Tisbury | DayCare Center | |
| The Rainbow Place | Edgartown | DayCare Center | |
| Garden Gate Child Development Center | Tisbury | DayCare Center | |
| Plum Hill School @ Featherstone Farm | Oak Bluffs | DayCare Center | |
| Donna Creighton's Day Care | Tisbury | DayCare Center | |
| K. Sally Devine's Day Care | Tisbury | DayCare Center | |
| Cynthia Aguilar's Day Care | West Tisbury | DayCare Center | |
| Patricia DeFelice's Day Care | Oak Bluffs | DayCare Center | |
| Nancy Nevin's Day Care | Tisbury | DayCare Center | |
| Patricia Waller's Day Care | Edgartown | DayCare Center | |
| Mary Johnson's Day Care | Edgartown | DayCare Center | |
| Bea Lawry's Day Care | Edgartown | DayCare Center | |
| Katrina L. Araujo's Day Care | Oak Bluffs | DayCare Center | |
| Chappaquiddick Ferry Docks (2 sides) | Edgartown | Ferry Terminals | |
| Highway Departments/DPWs (5) | Edg,OB,WT,Tis,Chil. | Emergency equipment | |
| Harbor Master's Offices (4) | Edg,Tis,OB,Chil. | | |

| SITE NAME | TOWN | DAILY USE | EMERGENCY USE |
|---|--------------|----------------------|---------------|
| Joanne C. Lambert's Day Care | Oak Bluffs | DayCare Center | |
| Charlene Maciel's Day Care | Oak Bluffs | DayCare Center | |
| Deborah Jernegan's Day Care | Edgartown | DayCare Center | |
| Laura L. Entner's Day Care | West Tisbury | DayCare Center | |
| Bernadette D. Ponte's Day Care | Tisbury | DayCare Center | |
| Micaela Hickman's Day Care | Tisbury | DayCare Center | |
| Aline S. Reder's Day Care | Edgartown | DayCare Center | |
| Jennifer Lynn Weiland's Day Care | Oak Bluffs | DayCare Center | |
| Naomi Higgins' Day Care | Edgartown | DayCare Center | |
| Oak Bluffs SSA Ferry Terminal | Oak Bluffs | Ferry Terminal | |
| Hy-Line Ferry Terminal | Oak Bluffs | Ferry Terminal | |
| Island Queen Ferry Terminal | Oak Bluffs | Ferry Terminal | |
| Tisbury SSA Ferry Terminal | Tisbury | Ferry Terminal | |
| Patriot Ferry Dock | Edgartown | Ferry Terminal | |
| Martha's Vineyard Airport | West Tisbury | Airport | |
| Vineyard Veterinary Clinic | Edgartown | Vet/Animal Shelter | |
| Woodside Village Complex | Oak Bluffs | Assisted Living | |
| My Pet's Vet | Tisbury | Vet/Animal Shelter | |
| Dr. Michele Jasny | West Tisbury | Vet/Animal Shelter | |
| Animal Health Care Associates | West Tisbury | Vet/Animal Shelter | |
| Dukes County Jail | Edgartown | Jailhouse | |
| Oak Bluffs Wastewater Treatment Plant | Oak Bluffs | Wastewater Treatment | |
| Tisbury Wastewater Treatment Plant | Tisbury | Wastewater Treatment | |
| Edgartown Wastewater Treatment Plant | Edgartown | Wastewater Treatment | |
| Dukes County Wastewater Treatment Plant | West Tisbury | Wastewater Treatment | |
| Wampanoag Tribal Wastewater Treatment Plant | Aquinnah | Wastewater Treatment | |
| Farm Neck Well | Oak Bluffs | Public Well | |
| Lagoon Pond Well | Oak Bluffs | Public Well | |
| Lily Pond Well | Edgartown | Public Well | |
| Manter Well | Tisbury | Public Well | |
| Meshaket Well | Edgartown | Public Well | |
| Wintucket Well | Edgartown | Public Well | |
| Quenomica Well | Edgartown | Public Well | |
| State Forest Well | Oak Bluffs | Public Well | |
| Sanborn Well | Tisbury | Public Well | |
| Tashmoo Well | Tisbury | Public Well | |
| Alwardt Well | Oak Bluffs | Public Well | |
| Menemsha Well | Chilmark | Public Well | |

Section 4. Hazard Identification and Assessment

(Note: the vulnerabilities associated with each of these hazards are addressed in the next section.)

FEMA defines a natural hazard as “an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss”¹.

Wind and Flood-Related Hazards:

The flood-related hazards historically and potentially impacting Dukes County include hurricanes, nor'easters, coastal erosion and shoreline change, heavy rainstorms and thunderstorms, and dam breaches. The wind-related hazards include hurricanes, nor'easters, winter storms and tornadoes.

Coastal Storms (Nor'easters):

Nor'easters are low pressure centers with sustained winds of 10-40 mph and gusts up to 70 mph circulating in a counter-clockwise fashion in our hemisphere (just as hurricanes do). The storms are typically large in lateral extent, with a radius as much as 1,000 miles, and travel up the east coast with a speed of about 25 mph. Nor'easters are frequent visitors to our shores, striking at least once or twice in any year. Although these storms don't have the punch of hurricanes, they last longer, typically 12 hours to 3 days, as sometimes the storms will stall over New England, bringing significant damage and peril. There is often little warning to prepare for these storms, in comparison with the ample warnings that typically precede impending hurricanes. Because of greater frequency and duration, nor'easters have been responsible for more overall damage than hurricanes here. A number of Nor'easters are particularly well-remembered for their damage to our area, including the 1898 gale, the Blizzard of '78 and the October '91 storm.

Significant modification of the coastline may take place during these storms, as evidenced by the breach that occurred at Norton Point Beach during the recent April 2007 storm, and by at least one other breach during a January 1886 storm. Most such breaches occur during hurricanes, but the ingredients may also certainly be present during a nor'easter, with water piling up on the bay side of the barrier beach with enough hydraulic head to create an opening.

The duration is important in determining the damage wrought by these storms. Significant coastal erosion may take place if high tides and wave action continue for several days, as in the following photos taken at Sylvia State Beach on December 19 and 20, 1995.

¹ FEMA, First Edition 1997, *Multi-Hazard Identification and Risk Assessment: A Cornerstone of the National Mitigation Strategy*



Sylvia State Beach, December 19, 1995



Sylvia State Beach, December 20, 1995

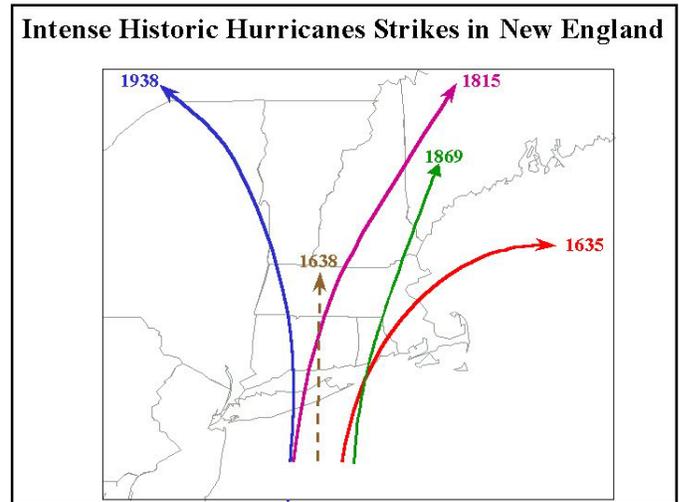
Nor'easters most often strike in winter, and excessive snowfall may accumulate, although that is usually not an issue in our community. Icing can be a very real danger to vessels and their crews, and has historically been responsible for significant loss of life, particularly in the heyday of coastal shipping, with a number of reports of sailors frozen in the rigging.

Henry Norton wrote this account of the 1898 Nor'easter, also known as the Portland Storm "The most disastrous storm ever known on the island commenced on Saturday night November 28, 1898, and before daybreak of the 29th one of the worst northeast snow blizzards was raging. Vineyard Haven harbor was for many ships a port of refuge from the storm. The next morning found over fifty in a wrecked condition. The number of lives lost were few in comparison with the number of ships destroyed, because of the bravery of Isaac C. Norton, Alvin H. Cleveland, Frank Golart, Stanley Fisher and F. Horton Johnson. Cleveland and Golart, with Norton as captain, dared the wind and sea in a dory. They first went out to the schooner Hamilton, which was ashore near the breakwater, rescuing five sailors. The boat was unable to make the western shore so they went across the harbor, landing near the Standard Oil tanks. The half-frozen sailors were taken to Chadwick's blacksmith shop where they were revived sufficiently to be conveyed to the Marine Hospital. A schooner was ashore near the old Norris wharf at Eastville. The people on land could see the men in the rigging. The dory was launched again, with Fisher, Johnson and Cleveland as crew, Norton in command. This time the dory was towed far to the windward of the schooner and let go by a tug. They managed to get to the Thurlow and save five men, one having frozen in the rigging. These sailors were taken to homes at Eastville where they received the best of care. By this time the storm was at its height, and against the judgment and protest of all, Norton, Cleveland and Golart went out the third time and rescued five more sailors, thereby showing the daring and bravery for which their forefathers were noted when they came to this cold and inhospitable climate and made their homes."²

² *The History of Martha's Vineyard*, 1923, Henry Franklin (H.F.) Norton

Hurricanes and Tropical Storms (Tropical Cyclones):

Hurricanes and tropical storms are formidable storms, a number of which have visited the islands making up Dukes County. Hurricanes are powerful storms with winds of 74 – 200 MPH circulating counter-clockwise about a relatively calm eye. Tropical storms are the same (often literally the same storm varying in intensity) with wind speeds 39-73 MPH. North Atlantic hurricanes and tropical storms typically form in the Caribbean or off the coast of Africa and will continue to grow and strengthen as long as they are over water of at least 79 degrees surface temperature, drifting toward our East Coast on the Trade Winds until being steered to the north by the prevailing offshore winds. So, the storms which don't enter the Gulf of Mexico are turned up the East Coast, and the storms which reach the vicinity of Dukes County are frequently moving north at substantial speeds, which may add significant forward speed to the wind speed within the system. The forward speed of the 1938 (Great New England) hurricane is believed to have been in excess of 50 MPH. The most damage is likely on the right shoulder of the storm, eastward of the eye, where the forward speed adds to the wind speed. The speed which with the hurricanes move through our area increases the intensity, causing further damage, but also moves the storms quickly through and thus reduces the impacts when compared to the damage caused by a long-term pounding. Our area will typically be impacted with hurricane-force winds for about 6-12 hours.



Intense Historic Hurricane Strikes³

The strength of a hurricane is rated by its wind speed, according to the Saffir/Simpson Scale:

| Scale No. (Category) | Winds (mph) | Potential Damage |
|---------------------------------|------------------------|-----------------------------|
| 1 | 74-95 | Minimal |
| 2 | 96-110 | Moderate |
| 3 | 111-130 | Extensive |
| 4 | 131-155 | Extreme |
| 5 | >155 | Catastrophic |

³ <http://www.geo.brown.edu/georesearch/esh/QE/Research/CoastStd/NEHurric.htm>

HURRICANES IN SOUTHERN NEW ENGLAND⁴

| NAME | DATE | INTENSITY |
|---------|--------------|-----------|
| Unnamed | 7/21/1916 | CAT 1 |
| Unnamed | 9/21/1938 | CAT 3 |
| Unnamed | 9/14-15/1944 | CAT 3 |
| Carol | 8/31/1954 | CAT 3 |
| Edna | 9/11/1954 | CAT 3 |
| Diane | 8/18-20/1955 | TS |
| Donna | 9/12/1960 | CAT 2 |
| Belle | 8/9-10/1976 | CAT 1 |
| Gloria | 9/27/1985 | CAT 2 |
| Bob | 8/19/1991 | CAT 2 |
| Bertha | 7/12-13/1996 | TS |
| Floyd | 9/18/1999 | TS |

Records are available for the most recent hurricanes and tropical storms. Note that our area has not been visited by a category 3 storm since 1954. Significant development has occurred since that time, creating greater potential for safety and property risks.

In addition to the records, there's anecdotal information (stories) that bring our collective memory back a few more years. Trap fisherman Captain Norman G. Benson told this tale of the intensity of the 1938 hurricane at Lambert's Cove, undoubtedly referring to storm surge "Right at that moment, I see another big sea comin' in, much higher even than the first one. It was so big I never seen anythin' like it. I dropped the boat an' quick as I could I ran up a high bank just behind where I'd been standing. Even so, I got soaked by the wave, but I was high enough so it didn't knock me down. That sea took the boat I'd been hauling an' the bath house an' all the other boats, too. It tipped 'em up and raised 'em way up in the air an' crunched 'em all to pieces, an' when the wave went out, away they went, bath house an' boats an' all. And down along the whole Cove it was like that. It took six houses an' all the boats that had been there every single one of them. Next day, Franklin an' I walked the beach, an' we never found a trace — not even a trace o' them — not a stick!"⁵



Capt. Norman G. Benson

To remember the earliest storms, we have only the stories, in stark contrast to the meticulous documentation of modern storms. In 1891, Sidney Perley wrote about damage from the "Gale"

⁴ Vallee, D. *A Centennial Review of Major Landfalling Tropical Cyclones in Southern New England* (Available at www.erh.noaa.gov/er/box/tropical_cyclones.htm)

⁵ *Saltwater in My Veins*, 1972, Tales by Captain Norman G. Benson Trap Fisherman of Martha's Vineyard as told to William L. Peltz 1972

of 1815 (In the 19th century, the term "hurricane" was used interchangeably with "tornado") "...caused more damage than any other since the settlement of the country....just how many lives were lost, many of them being those of husbands and fathers, and how much property was destroyed cannot be ascertained. Neither can any one know how many fond hopes were forever blasted, how many changes in life and its plans were caused, nor the pain of body and heart that followed." He wrote of the intensity of the wind "The gale swept away buildings of all sizes and varieties from churches to sheds, unroofed an exceedingly great number of others, and damaged many thousand more to a greater or less extent. On the roofs of some of the structures shingles were stripped off in rows from the eaves to the ridge-poles. In some places the air seemed to be full of shingles and fragments of timbers and boards, forced hither and thither by the blasts"... and of the tremendous numbers of trees felled "Probably New England never knew another season of such building activity as prevailed in 1817 and 1818, the logs having been sawed in the winter of 1815-16, and the lumber seasoned during the following summer"...and of the vessels lost "At New Bedford, all the vessels in the port, except two, were driven ashore, and several of them beaten to pieces. One ship was left on a wharf, and another one on one of the islands. All the warehouses on the lower wharves were swept off, many houses being injured, and four men and women perished."

The most damaging and dangerous flood impacts by far are caused by storm surge. Storm surge waters come up very suddenly with the landfalling storm, with enough force to remove structures from their foundations and with enough surprise to endanger those unfortunate enough to be trapped by the quickly rising waters. In 1900, in what has come to be known as the "Galveston Hurricane", the entire island city of Galveston, Texas was submerged by storm surge, taking about 8,000 lives. More recently, thousands of lives were taken by Hurricane Katrina in 2005. Closer to home, but farther back in our history, a powerful hurricane in 1635 brought storm surge measured at 20 feet in Boston. The new colonists who survived to rebuild must have harbored second thoughts about settling here. The perseverance of the settlements, with such calamity so soon after arrival, says a lot about the courage and determination of the settlers. Storm surge from the 1938 hurricane, known as the "Great New England Hurricane", was about 9 feet in open areas and more like 15 feet in Narragansett Bay and Buzzards Bay, where the funnel-shaped topography compounded the surge with a sloshing affect.



In this USGS photo of storm surge, the damaging power of this type of flood is readily apparent.

Hurricanes have been responsible for significant coastal modification as well. It was during the Gale of September, 1815 that the location of the inlet to Lagoon Pond shifted from near Ferry Boat Island (named for the old crossing), at the other end of the barrier beach, to its present position at the drawbridge (Although known as the "Gale" of 1815, this storm was a hurricane. Writers of the day used the term "hurricane" interchangeably with "tornado"). Norton Point Beach, most recently breached by the April 2007 Nor'easter, has been repeatedly breached by hurricanes, in 1938 and 1954, and in 1991 (a minor breach that healed itself within several days).

Coastal Erosion and Shoreline Change:

Although the more dramatic incidents of shoreline modification occur as results of violent storms, most erosion happens very quietly as the result of day-to-day coastal processes. Banks erode every day in response to wave action, rain runoff and inappropriate development. The unconsolidated sediments that make up a coastal beach are much more mobile, and beaches are features that change with each tide. Wave runup sets the sand in motion, and currents pick up the suspended sand and move it laterally along the beach in a process called longshore transport. Beach sand moves offshore for the winter as well, when more intense wave action pulls the sand away from the beach into offshore bars, only to return with the more gentle waves of summer, to rebuild the beach.



Erosion is most often not a life-threatening condition, but the economic impacts are significant in a community that relies on its harbors for almost all its transportation needs and where the summer vacation industry is linked very closely to the prosperity of the inhabitants. At left, the red line marks the former extent of popular Pay Beach in Oak Bluffs.

Coastal structures play an important role in the impacts of erosion. A number of important breakwaters and jetties have been constructed in the community, particularly in connection with navigation and harbor protection. Maintenance and improvement of these structures is critical to the infrastructure of the islands.

Dam Failures:

Hadlock Pond Dam, in Fort Ann, New York, failed in 2005. Similar in scale to our local sites, the pond was enlarged by the dam to 220 acres.



There were no casualties, but lots of property damage...



Hadlock Pond Dam, Fort Ann, NY damage

...and general misery.



Hadlock Pond Dam, Fort Ann, NY damage

Although much of the terrain is well-drained outwash plain sediments, and streams are few, there are some dams in Dukes County, at least in West Tisbury and Chilmark, remnants of our early use of hydrologic power (for the colonists' mills).

Heavy Rainstorms and Thunderstorms:

Heavy rain generates stormwater runoff that has significant potential for localized flooding and for erosion of beaches and other waterfront areas where the collection system outlets, particularly for systems which discharge directly to a water body with no treatment. The thunderstorms which are common in our area in the spring and summer may bring flash flooding and also damaging winds and lightning. According to the National Weather Service, a thunderstorm is severe if it produces hail at least $\frac{3}{4}$ inch in diameter, brings winds of 58 mph or greater, or has the potential to produce a tornado.

Tornadoes, Waterspouts and Downbursts:

Tornadoes and waterspouts form when thunderstorms form a spinning circulation that gets tipped upright. According to the State Hazard Mitigation Plan⁶, the most destructive tornado ever to strike New England was the Worcester tornado of 1953. With wind speeds of 200 to 260 mph, the F5 tornado took 94 lives and holds the rank of 20th deadliest tornado in the United States.



⁶ Commonwealth of Massachusetts State Hazard Mitigation Plan, 2004, Prepared by The Massachusetts Emergency Management Agency (MEMA) and the Department of Conservation and Recreation (DCR)

Waterspouts are tornadoes that form over water, and are rare in our area. Harmless water devils are sometimes seen in our waters on hot days, similar to dust devils on land. More capable of damage, downbursts (including microbursts and macrobursts) are much localized columns of sinking air, with wind speeds up to 75 mph.

Winter-related Hazards:

Snow Events:

Winter storms in our area may be accompanied by rain or by snow, depending on the temperature. If the system stalls, snow may accumulate to troubling depths.

Ice:

Ice storms could cause significant interruption of services such as electricity. Ice can restrict ferry service, impacting delivery of vital goods and services such as food and fuel.

Fire-related Hazards:

Drought:

Drought conditions exist when an area experiences an extended period of deficient water supply. The fire hazards associated with drought are closely associated with the time of year. Drought conditions in spring, when trees have not leafed out, may be particular cause for concern for wildfires.

Wildfires:

We are less familiar with wildfires as a hazard, maybe thinking that they are more likely to occur in the vast western wildernesses of our nation. Wildfires have happened closer to home. In 1957, a fire burned 18,000 acres from Carver to Plymouth, burning all the way to the sea, which is the only reason that it stopped. In the first 6 hours, 12,500 acres burned at the rate of 53 acres/minute. For scale, the Martha's Vineyard State Forest is about 5,200 acres (Imagine an area more than twice the size of the State Forest burning in 6 hours). On Martha's Vineyard, between 1867 and 1929, there were 16 fires greater than 1,000 acres, including the largest (known) 12,000 acres in 1916, which burned from West Tisbury to Farm Neck, Ocean Heights and Edgartown. Since then, fires have generally been smaller. The last big fire was in 1965, 1,200 acres from Great Plains to Katama.

This type of natural disaster would strike quickly and with potential for great loss of life and property.

Geologic-related Hazards:

Earthquakes:

There have been earthquakes recorded and remembered here. Sidney Perley wrote about the earthquake in 1638, the strongest of the seventeenth century, that shook the new settlements and probably the settlers too, particularly following so closely on the heels of the very intense hurricane of 1635



San Francisco, 1906

“The shaking of the earth increased to such a violent extent that people could not stand erect without supporting themselves by taking hold of posts or pilings and other fixtures. Not only the mainland, but the islands in the ocean were shaken violently, and the vessels that rode in the harbors and those sailing along the coast were acted upon as if a series of tidal waves had passed under them...Earthquakes are always fearful and impressive, but the people of the time when this one occurred must have had many doubts and fears in their minds. They were not only superstitious, but this was a new and unknown world, which but a few years before was pictured with the most awful terrors.”⁷

Other Potential Hazards:

Sea Level Rise:

Sea level fluctuates in response to natural processes such as glaciation and plate tectonics, and in response to man-made influences on the atmosphere. Sea level is rising in our area, with the result that erosion is increasing, and that development and infrastructure in flood-prone areas is more and more at risk.

Landslides:

Landslides occur when unstable areas slip, due to environmental factors such as rainfall or freeze/thaw action. This hazard is most problematic in developed areas where homes, businesses or roadways may be at risk.

⁷ *Historic Storms of New England*, 1891, Sidney Perley

Section 5. Vulnerability & Risk Assessment/Analysis

Areas Vulnerable to Flood-related Hazards:

Coastal flooding from storms (hurricanes and Nor'easters):

According to the Massachusetts DCR Flood Hazard Management Program, the following National Flood Insurance Program policies are in effect and claims have been made for properties in Dukes County. Note that the costs for the NFIP are borne partially by the property owners and partially by the U.S. taxpayers.

POLICY STATISTICS AS OF APRIL 30, 2008

| Community Name | Policies In-force | Insurance In-force whole \$ (whole dollars) | Written premium in force (annual) |
|----------------|-------------------|--|--------------------------------------|
| Aquinnah | 16 | 4,355,300 | 23,368 |
| Edgartown | 339 | 108,598,100 | 346,146 |
| Gosnold | 7 | 2,055,700 | 7,520 |
| Oak Bluffs | 183 | 50,517,500 | 237,528 |
| Tisbury | 151 | 42,975,500 | 199,837 |
| West Tisbury | 21 | 6,540,500 | 12,092 |
| Totals: | 717 | \$215,042,600 | \$826,481 |

Note: Chilmark does not participate in the NFIP and has 0 policies and claims.

LOSS STATISTICS AS OF APRIL 30, 2008

| Community Name | Total Losses | Total Payments | Repeat Claims Properties | Repeat Claims Claims | Repeat Claims Total Paid |
|----------------|--------------|----------------|--------------------------|----------------------|--------------------------|
| Aquinnah | 2 | 13,462.39 | 1 | 2 | 13,462.39 |
| Edgartown | 33 | 606,587.69 | 4 | 10 | 301,823.68 |
| Gosnold | 1 | 2,214.00 | 0 | 0 | 0 |
| Oak Bluffs | 54 | 723,872.98 | 9 | 23 | 559,418.42 |
| Tisbury | 24 | 257,608.95 | 3 | 6 | 148,302.98 |
| Totals | 114 | \$1,603,746.03 | 17 | 41 | \$1,023,007.47 |

It is interesting to note that, as of August 29, 2007, 17 properties have been responsible for 41 of 114 claims (36%) and for 64% of the dollar value of the claims, all for private residences and

businesses. In one case, five claims were filed for a single business property, totaling \$257,803.72.

A summary follows of the critical facilities that are located within flood hazard areas. Note that there are two different flood hazard representations, both on the maps and in the statistical summary to follow.

The 100-year and 500-year storm areas are those that would be covered by still flood waters, probably most relevant to a nor'easter type of storm. There is no indication of the impacts of storm surge in the event of a landfalling hurricane. Those flood hazard areas are shown on the FIRM maps (Flood Insurance Rate Maps) and are used to price flood insurance policies and by others such as mortgage lenders to determine risk.

- The SLOSH (Sea, Lake and Overland Surges from Hurricanes) maps were made by modeling storm surge, which is often the most destructive part of a hurricane and the first quick hit that would impact critical resources and imperil citizens very early and quickly in the event of a hurricane landfall in the area. Elevation at a particular location is only part of the storm surge vulnerability. Topography is very important in determining risk. Low-lying areas with long, gently slopes are likely to be impacted by the funneling effect of the storm surge, almost like a tidal wave. This is readily apparent upon examination of the maps. An excerpt here shows the funneling effect of storm surge on the coves of Tisbury Great Pond, with the blue indicating inundation. The SLOSH hazard areas are noted by hurricane category (1,2,3,4). These maps (see appendix) are models only, for planning purposes. The only true and accurate map of storm surge is made after the hurricane has come and gone.

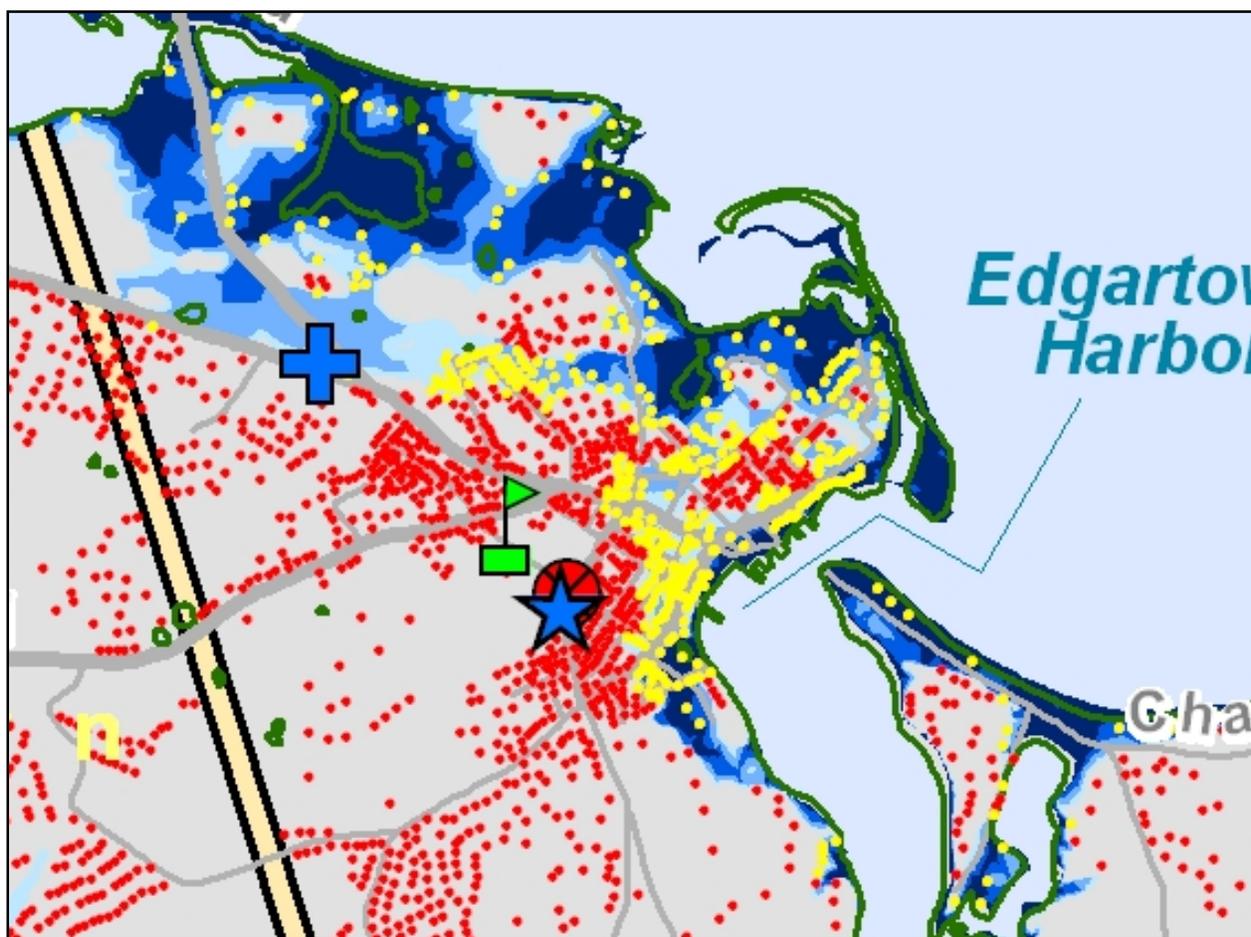


Portion of SLOSH map

In the statistical summaries to follow, vulnerabilities are examined with respect to both floodplain (100, 500-year storms, Nor'easters) and storm surge (hurricanes). Vulnerabilities of critical facilities were determined for both types of flooding, for all of Dukes County. In addition, statistics were developed regarding numbers of buildings vulnerable to storm surge, for Dukes County, and assessed values for those residences on Martha's Vineyard (assessment data was not available in digital form for Gosnold).

The table *Dukes County Critical Facilities Affected by Storms* lists critical facilities vulnerable to both still-water flooding *Flood Hazard Area*, identified by 100-year or 500-year storm, and SLOSH labeled *Hurricane Category*, identified by categories 1-4. It is important to note that most of the vulnerable facilities are water-dependent critical infrastructure such as ferry terminals.

The table *SLOSH zone statistics* sums up the numbers of properties and the numbers of homes within SLOSH zones (that is, may be subject to storm surge during a landfalling hurricane), by town and for the County as a whole, and further sums the assessed values of residences within the SLOSH zones. There were 76 residences found vulnerable to storm surge on the islands making up the Town of Gosnold, with no information available regarding assessed value. The Hurricane "Dot Map" shows individual residences vulnerable to storm surge as yellow dots (residences outside the vulnerable area are shown as red dots), critical facilities, storm surge, and historic hurricane tracks. In the excerpt shown below, vulnerable homes in the village area of Edgartown are shown, with the blue representing inundation.



A portion of the "hurricane dot map"

LOSS ESTIMATES/VULNERABILITY ASSESSMENT MATRIX ASSUMPTIONS

| | | | | | | | | | | |
|------------------------|--|--|--|--|--|--|--|--|--|--|
| Population | | | | | | | | | | |
| | The 2000 Census determined that, of the year-round residential units, Martha's Vineyard had 2.3 people per unit. | | | | | | | | | |
| | | | | | | | | | | |
| | The MVC increased this number to 3.3 people per unit given the frequency of Islanders having guests. | | | | | | | | | |
| | | | | | | | | | | |
| | The MVC estimates that of the seasonal units, the number is 5 people per unit in July & August | | | | | | | | | |
| | | | | | | | | | | |
| | The 2000 Census determined that Gosnold had 1.9 people per unit. | | | | | | | | | |
| | | | | | | | | | | |
| Building Values | | | | | | | | | | |
| <i>Aquinnah</i> | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all residential buildings (\$110,705,500.00) was divided by the total number of residential buildings in Aquinnah (478) to get an average building value of \$231,601.00 | | | | | | | | | |
| | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all commercial buildings (\$473,300.00) was divided by the total number of commercial buildings in Aquinnah (3) to get an average building value of \$157,767.00 | | | | | | | | | |
| | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all exempt buildings (\$675,000.00) was divided by the total number of exempt buildings in Aquinnah (15) to get an average building value of \$45,000.00 | | | | | | | | | |
| | | | | | | | | | | |
| <i>Oak Bluffs</i> | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all residential buildings (\$1,084,472,700.00) was divided by the total number of residential buildings in Oak Bluffs (3654) to get an average building value of \$296,791.00 | | | | | | | | | |
| | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all commercial buildings (\$76,430,500.00) was divided by the total number of commercial buildings in Oak Bluffs (136) to get an average building value of \$561,989.00 | | | | | | | | | |
| | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all industrial buildings (\$1,103,500.00) was divided by the total number of industrial buildings in Oak Bluffs (2) to get an average building value of \$551,750.00 | | | | | | | | | |
| | | | | | | | | | | |
| | Individual building values were not available. So the total building value for all exempt buildings (\$90,385,200.00) was divided by the total number of exempt buildings in Oak Bluffs (62) to get an average building value of \$1,457,826.00 | | | | | | | | | |

| | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
| | | | | | | | | | |
| <i>Gosnold</i> | 259 buildings total on Gosnold. Assumed all those inside the hazard areas were residential. | | | | | | | | |
| | Don't have parcel data for Gosnold. Therefore can't calculate the number of potential additional buildings. | | | | | | | | |
| | Individual building values were not available. So the total building value for all buildings (\$295,021,400) was divided by the total number of buildings in Gosnold (259) to get an average building value of \$1,139,079.00 - all buildings assumed to be residential | | | | | | | | |
| | | | | | | | | | |
| <i>Other Towns</i> | Total assessed building values for each parcel were provided by all other towns. | | | | | | | | |
| | | | | | | | | | |
| Building Values for Critical Facilities | | | | | | | | | |
| | Applied the average exempt building value for all exempt buildings within that town. | | | | | | | | |
| <i>Aquinnah</i> | \$45,000.00 | | | | | | | | |
| <i>Chilmark</i> | \$317,037.00 | | | | | | | | |
| <i>Edgartown</i> | \$424,061.00 | | | | | | | | |
| <i>Gosnold</i> | | | | | | | | | |
| <i>Oak Bluffs</i> | \$1,457,826.00 | | | | | | | | |
| <i>Tisbury</i> | \$889,674.00 | | | | | | | | |
| <i>West Tisbury</i> | \$817,061.00 | | | | | | | | |
| | | | | | | | | | |
| Building Counts | | | | | | | | | |
| | Buildings were on-screen digitized against the 2005 aerial photograph. The respective map and lot number was assigned to each building dot. Using the map & lot number as a linking field, the building dots were linked to the assessor's parcel database records. The assessor's info contains a use code and description for each parcel and aggregating by town and use, the building count was calculated for each use within each town. | | | | | | | | |
| | | | | | | | | | |

LOSS ESTIMATES/VULNERABILITY ASSESSMENT MATRIX FOR STORM SURGE

| SLOSH | | | | | | | | | | |
|----------|----------------|--|------------------|---------------------|-------------|-------------------|------------------------------|---------------------|-------------|-------------------|
| Town | | | Developed Land | | | | Developable Land (potential) | | | |
| | SLOSH Category | Use | # People (other) | # People (July-Aug) | # Buildings | Approximate Value | # People (other) | # People (July-Aug) | # Buildings | Approximate Value |
| Aquinnah | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 1 | Residential | 36 | 55 | 11 | \$2,547,611 | 59 | 90 | 18 | \$4,168,818 |
| | 1 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Residential | 59 | 90 | 18 | \$4,168,818 | 116 | 175 | 35 | \$8,106,035 |
| | 2 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non-profit) | | | 1 | \$45,000 | | | 0 | \$0 |
| | 3 | Residential | 36 | 55 | 11 | \$2,547,611 | 63 | 95 | 19 | \$4,400,419 |
| | 3 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Residential | 30 | 45 | 9 | \$2,084,409 | 66 | 100 | 20 | \$4,632,020 |
| | 4 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| Chilmark | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |

| | | | | | | | | | | |
|-----------|---|--|------------------|----------------|-----|---------------|------------------|----------------|-----|---------------|
| | 1 | Residential | 40 | 60 | 12 | \$1,885,100 | 89 | 135 | 27 | \$4,241,475 |
| | 1 | Commercial | | | 4 | \$197,800 | | | 0 | \$0 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 5 | \$0 |
| | 2 | Residential | 92 | 140 | 28 | \$4,586,100 | 139 | 210 | 42 | \$6,879,150 |
| | 2 | Commercial | | | 4 | \$686,000 | | | 0 | \$0 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 3 | \$0 |
| | 3 | Residential | 175 | 265 | 53 | \$12,029,400 | 125 | 190 | 38 | \$8,624,853 |
| | 3 | Commercial | | | 1 | \$130,700 | | | 0 | \$0 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$338,000 | | | 13 | \$2,197,000 |
| | 4 | Residential | 191 | 290 | 58 | \$15,236,150 | 155 | 235 | 47 | \$12,346,535 |
| | 4 | Commercial | | | 3 | \$738,350 | | | 1 | \$246,117 |
| | 4 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 6 | \$0 |
| Edgartown | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 1 | Residential | 462 | 700 | 140 | \$106,456,300 | 677 | 1025 | 205 | \$155,882,439 |
| | 1 | Commercial | | | 3 | \$2,171,200 | | | 36 | \$26,054,400 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$103,300 | | | 14 | \$723,100 |

| | | | | | | | | | | |
|------------|---|--|------------------|----------------|-----|---------------|------------------|----------------|-----|---------------|
| | 2 | Residential | 653 | 990 | 198 | \$138,084,200 | 452 | 685 | 137 | \$95,543,108 |
| | 2 | Commercial | | | 1 | \$1,081,000 | | | 9 | \$9,729,000 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 5 | \$0 |
| | 3 | Residential | 891 | 1350 | 270 | \$245,164,900 | 561 | 850 | 170 | \$154,363,085 |
| | 3 | Commercial | | | 7 | \$5,823,100 | | | 16 | \$13,309,943 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$1,658,500 | | | 6 | \$4,975,500 |
| | 4 | Residential | 1139 | 1725 | 345 | \$246,958,471 | 508 | 770 | 154 | \$110,236,535 |
| | 4 | Commercial | | | 16 | \$15,454,586 | | | 17 | \$16,420,498 |
| | 4 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Exempt (Municipal, Public, Non- profit) | | | 6 | \$3,507,200 | | | 11 | \$6,429,867 |
| Oak Bluffs | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 1 | Residential | 46 | 70 | 14 | \$4,155,074 | 76 | 115 | 23 | \$6,826,193 |
| | 1 | Commercial | | | 4 | \$2,247,956 | | | 0 | \$0 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non- profit) | | | 1 | \$1,457,826 | | | 0 | \$0 |
| | 2 | Residential | 498 | 755 | 151 | \$44,815,441 | 271 | 410 | 82 | \$24,336,862 |
| | 2 | Commercial | | | 16 | \$8,991,824 | | | 11 | \$6,181,879 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non- profit) | | | 6 | \$8,746,956 | | | 3 | \$4,373,478 |

| | | | | | | | | | | |
|---------|---|--|------------------|----------------|-----|--------------|------------------|----------------|----|--------------|
| | 3 | Residential | 591 | 895 | 179 | \$53,125,589 | 152 | 230 | 46 | \$13,652,386 |
| | 3 | Commercial | | | 13 | \$7,305,857 | | | 2 | \$1,123,978 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$2,915,652 | | | 0 | \$0 |
| | 4 | Residential | 1010 | 1530 | 306 | \$90,818,046 | 145 | 220 | 44 | \$13,058,804 |
| | 4 | Commercial | | | 14 | \$7,867,846 | | | 5 | \$2,809,945 |
| | 4 | Industrial | | | 0 | \$0 | | | 1 | \$551,750 |
| | 4 | Exempt (Municipal, Public, Non- profit) | | | 6 | \$8,746,956 | | | 3 | \$4,373,478 |
| Tisbury | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 1 | Residential | 145 | 220 | 44 | \$22,456,700 | 175 | 265 | 53 | \$27,050,116 |
| | 1 | Commercial | | | 58 | \$44,047,100 | | | 44 | \$33,415,041 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non- profit) | | | 5 | \$5,504,600 | | | 8 | \$8,807,360 |
| | 2 | Residential | 274 | 415 | 83 | \$36,334,250 | 135 | 205 | 41 | \$17,948,244 |
| | 2 | Commercial | | | 14 | \$14,417,350 | | | 10 | \$10,298,107 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$998,600 | | | 1 | \$499,300 |
| | 3 | Residential | 244 | 370 | 74 | \$32,178,833 | 46 | 70 | 14 | \$6,087,887 |
| | 3 | Commercial | | | 6 | \$4,520,666 | | | 3 | \$2,260,333 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non- profit) | | | 5 | \$5,106,300 | | | 2 | \$2,042,520 |

| | | | | | | | | | | |
|-----------------|---|--|------------------|----------------|----|--------------|------------------|----------------|----|--------------|
| | 4 | Residential | 248 | 375 | 75 | \$37,930,700 | 92 | 140 | 28 | \$14,160,795 |
| | 4 | Commercial | | | 9 | \$3,777,600 | | | 7 | \$2,938,133 |
| | 4 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Exempt (Municipal, Public, Non- profit) | | | 1 | \$100,600 | | | 0 | \$0 |
| West Tisbury | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 1 | Residential | 13 | 20 | 4 | \$1,202,800 | 79 | 120 | 24 | \$7,216,800 |
| | 1 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 1 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 1 | \$0 |
| | 2 | Residential | 46 | 70 | 14 | \$5,513,400 | 106 | 160 | 32 | \$12,602,057 |
| | 2 | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 2 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Residential | 122 | 185 | 37 | \$21,254,700 | 155 | 235 | 47 | \$26,999,214 |
| | 3 | Commercial | | | 0 | \$0 | | | 1 | \$0 |
| | 3 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 3 | Exempt (Municipal, Public, Non- profit) | | | 2 | \$239,500 | | | 1 | \$119,750 |
| | 4 | Residential | 139 | 210 | 42 | \$24,685,900 | 261 | 395 | 79 | \$46,433,002 |
| | 4 | Commercial | | | 0 | \$0 | | | 1 | \$0 |
| | 4 | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 4 | Exempt (Municipal, Public, Non- profit) | | | 0 | \$0 | | | 0 | \$0 |

| Gosnold | | | 1.9 per building | persons per building? | | | 1.9 per building | persons per building? | | |
|---------|---|--|------------------|-----------------------|----|--------------|------------------|-----------------------|--|--|
| | 1 | Residential | 51.3 | | 27 | \$30,755,133 | | | | |
| | 1 | Commercial | | | 0 | \$0 | | | | |
| | 1 | Industrial | | | 0 | \$0 | | | | |
| | | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |
| | 2 | Residential | 30.4 | | 16 | \$18,225,264 | | | | |
| | 2 | Commercial | | | 0 | \$0 | | | | |
| | 2 | Industrial | | | 0 | \$0 | | | | |
| | | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |
| | 3 | Residential | 41.8 | | 22 | \$25,059,738 | | | | |
| | 3 | Commercial | | | 0 | \$0 | | | | |
| | 3 | Industrial | | | 0 | \$0 | | | | |
| | | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |
| | 4 | Residential | 38 | | 20 | \$22,781,580 | | | | |
| | 4 | Commercial | | | 0 | \$0 | | | | |
| | 4 | Industrial | | | 0 | \$0 | | | | |
| | | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |

LOSS ESTIMATES/VULNERABILITY ASSESSMENT MATRIX FOR FLOOD

| Flood | | | | | | | | | | |
|----------|----------------------------|--|------------------|---------------------|-------------|-------------------|------------------------------|---------------------|-------------|-------------------|
| Town | | | Developed Land | | | | Developable Land (potential) | | | |
| | Flood Zone Category | Use | # People (other) | # People (July-Aug) | # Buildings | Approximate Value | # People (other) | # People (July-Aug) | # Buildings | Approximate Value |
| Aquinnah | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 100 Year | Residential | 66 | 100 | 20 | \$4,632,020 | 145 | 220 | 44 | \$10,190,444 |
| | 100 Year | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | | \$0 | | | | \$0 |
| | Velocity Zone (also 100yr) | Residential | 69 | 105 | 21 | \$4,863,621 | 56 | 85 | 17 | \$3,937,217 |
| | Velocity Zone (also 100yr) | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Residential | 30 | 45 | 9 | \$2,084,409 | 36 | 55 | 11 | \$2,547,611 |
| | 500 Year | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| Chilmark | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 100 Year | Residential | 142 | 215 | 43 | \$7,130,400 | 178 | 270 | 54 | \$8,954,456 |
| | 100 Year | Commercial | | | 8 | \$883,800 | | | 0 | \$0 |
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 1 | \$127,400 | | | 5 | \$637,000 |

| | | | | | | | | | | |
|------------|----------------------------|--|------------------|----------------|-----|---------------|------------------|----------------|-----|--------------|
| | Velocity Zone (also 100yr) | Residential | 0 | 0 | 0 | \$0 | 13 | 20 | 4 | \$0 |
| | Velocity Zone (also 100yr) | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 0 | | | | 1 | \$0 |
| | 500 Year | Residential | 30 | 45 | 9 | \$1,755,800 | 66 | 100 | 20 | \$3,901,778 |
| | 500 Year | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 2 | \$0 |
| Edgartown | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 100 Year | Residential | 848 | 1285 | 257 | \$35,031,020 | 812 | 1230 | 246 | \$33,531,638 |
| | 100 Year | Commercial | | | 4 | \$3,856,200 | | | 33 | \$31,813,650 |
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 6 | \$0 |
| | Velocity Zone (also 100yr) | Residential | 409 | 620 | 124 | \$122,182,600 | 264 | 400 | 80 | \$78,827,484 |
| | Velocity Zone (also 100yr) | Commercial | | | 1 | \$54,400 | | | 18 | \$979,200 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 3 | \$828,400 | | | 13 | \$3,589,733 |
| | 500 Year | Residential | 802 | 1215 | 243 | \$123,732,900 | 353 | 535 | 107 | \$54,483,211 |
| | 500 Year | Commercial | | | 1 | \$2,355,400 | | | 13 | \$30,620,200 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 1 | \$229,600 | | | 25 | \$5,740,000 |
| Oak Bluffs | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 100 Year | Residential | 459 | 695 | 139 | \$41,253,949 | 317 | 480 | 96 | \$28,491,936 |
| | 100 Year | Commercial | | | 17 | \$9,553,813 | | | 11 | \$6,181,879 |

| | | | | | | | | | | |
|---------|----------------------------|--|------------------|----------------|-----|--------------|------------------|----------------|----|--------------|
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 4 | \$5,831,304 | | | 2 | \$2,915,652 |
| | Velocity Zone (also 100yr) | Residential | 96 | 145 | 29 | \$8,606,939 | 40 | 60 | 12 | \$3,561,492 |
| | Velocity Zone (also 100yr) | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 1 | \$1,457,826 | | | 0 | \$0 |
| | 500 Year | Residential | 634 | 960 | 192 | \$56,983,872 | 198 | 300 | 60 | \$17,807,460 |
| | 500 Year | Commercial | | | 14 | \$7,867,846 | | | 3 | \$1,685,967 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 5 | \$7,289,130 | | | 5 | \$7,289,130 |
| Tisbury | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | 100 Year | Residential | 228 | 345 | 69 | \$37,648,180 | 188 | 285 | 57 | \$31,100,670 |
| | 100 Year | Commercial | | | 65 | \$75,754,680 | | | 49 | \$57,107,374 |
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 7 | \$6,503,200 | | | 6 | \$5,574,171 |
| | Velocity Zone (also 100yr) | Residential | 69 | 105 | 21 | \$6,029,200 | 66 | 100 | 20 | \$5,742,095 |
| | Velocity Zone (also 100yr) | Commercial | | | 1 | \$204,300 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Residential | 231 | 350 | 70 | \$32,517,650 | 106 | 160 | 32 | \$14,865,211 |
| | 500 Year | Commercial | | | 4 | \$737,250 | | | 5 | \$921,563 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 2 | \$2,464,900 | | | 5 | \$6,162,250 |

| West Tisbury | | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
|--------------|----------------------------|--|------------------|-----------------------|----|--------------|------------------|-----------------------|----|--------------|
| | 100 Year | Residential | 23 | 35 | 7 | \$1,689,600 | 99 | 150 | 30 | \$7,241,143 |
| | 100 Year | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 1 | \$211,200 | | | 1 | \$211,200 |
| | Velocity Zone (also 100yr) | Residential | 13 | 20 | 4 | \$1,973,100 | 63 | 95 | 19 | \$9,372,225 |
| | Velocity Zone (also 100yr) | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Residential | 30 | 45 | 9 | \$5,634,800 | 89 | 135 | 27 | \$16,904,400 |
| | 500 Year | Commercial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 0 | \$0 |
| Gosnold | | | 1.9 per building | persons per building? | | | 1.9 per building | persons per building? | | |
| | 100 Year | Residential | 81.7 | | 43 | \$48,980,397 | | | | |
| | 100 Year | Commercial | | | 0 | \$0 | | | | |
| | 100 Year | Industrial | | | 0 | \$0 | | | | |
| | 100 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |
| | Velocity Zone (also 100yr) | Residential | 9.5 | | 5 | \$5,695,395 | | | | |
| | Velocity Zone (also 100yr) | Commercial | | | 0 | \$0 | | | | |
| | Velocity Zone (also 100yr) | Industrial | | | 0 | \$0 | | | | |
| | Velocity Zone (also 100yr) | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |
| | 500 Year | Residential | 20.9 | | 11 | \$12,529,869 | | | | |
| | 500 Year | Commercial | | | 0 | \$0 | | | | |

| | | | | | | | | | | |
|--|----------|---|--|--|---|-----|--|--|--|--|
| | 500 Year | Industrial | | | 0 | \$0 | | | | |
| | 500 Year | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |

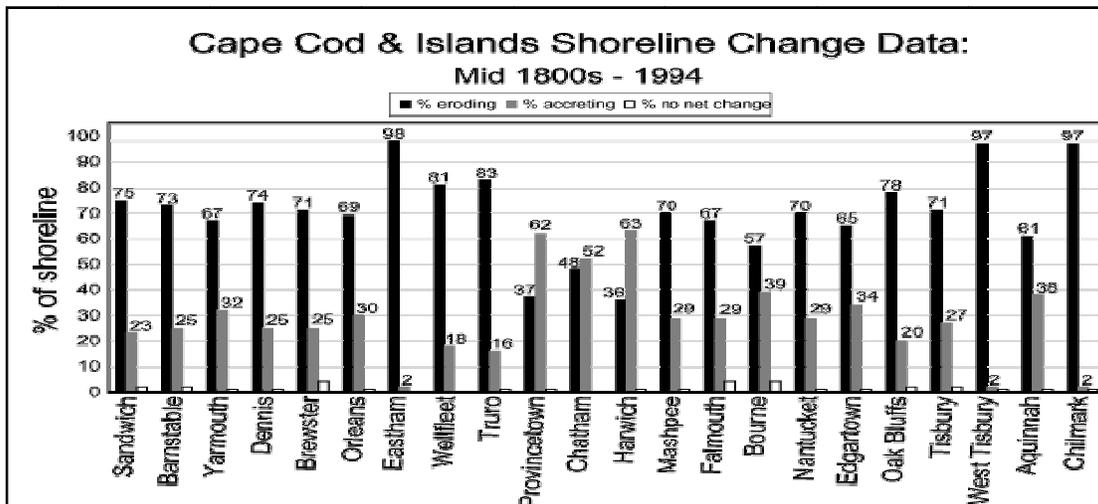
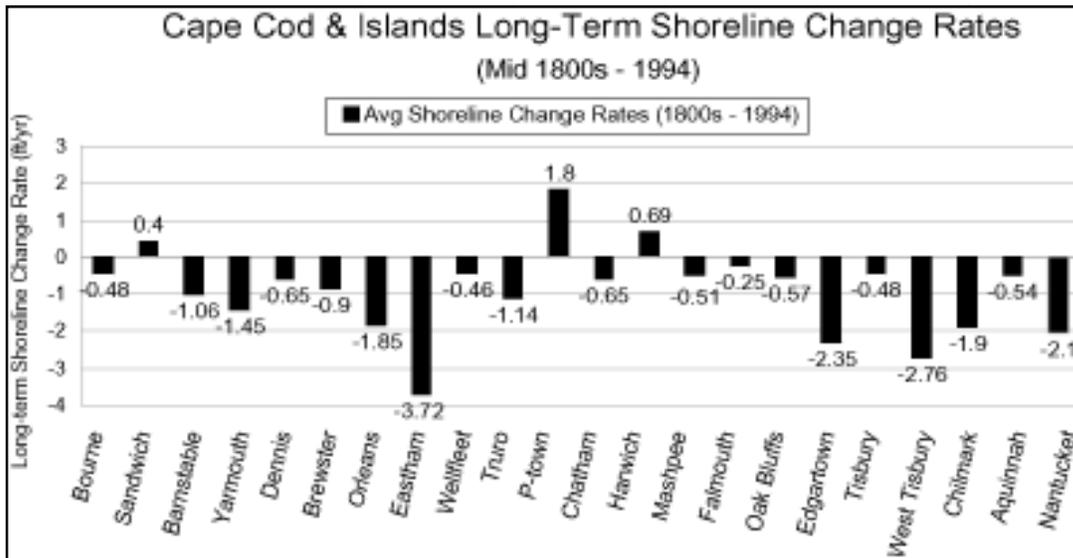
Coastal Erosion and Shoreline Change:

Due to sea level rise and general subsidence of the land, most of the shoreline of Dukes County is erosional. Parts of Martha's Vineyard, in particular, are eroding faster than others. The north shore, including the north sides of Aquinnah, Chilmark, West Tisbury, and most of Tisbury and Oak Bluffs, is relatively stable, with headlands and bluffs of stable morainal sediments, losing a foot or so each year. The sandy south shore, however, experiences much more loss and movement of the unconsolidated sandy outwash plain sediments. Longshore transport takes sand from the Aquinnah and Chilmark bluffs and moves it along the coast to Muskeget Channel. Erosion rates on the south side range from a foot or so per year at the Gay Head cliffs to more than 10 feet per year at the Edgartown end. Some spots are more dynamic than others, apart from the overall outcome of the play between accretion (building up) and erosion (losing ground). Wasque Point on Chappaquiddick is a good example, with interaction in a breach-and-heal cycle at Norton Point barrier beach.



This shoreline in Edgartown loses about 10-12 feet every year.

Jim O'Connell compared shoreline change data for the Cape and Islands, and charted the results, as shown in the accompanying graphs⁸. In terms of long-range planning, it would be well to remember the prognosis for the more highly erosional areas.



⁸WHOI Sea Grant Program, 2003, Marine Extension Bulletin, *New Shoreline Change Data Reveal Massachusetts is Eroding*, by Jim O'Connell, WHOI Sea Grant Program and Cape Cod Cooperative Extension

Although the south shore is more dynamic and loses more, it is really the more developed north shore harbors and beaches that are more vulnerable to damaging erosion, particularly where inlets have been stabilized by jetties that interfere with the longshore transport of sand, and must therefore be properly constructed and maintained. Much of the older infrastructure was built by the U.S. Army Corps of Engineers or the Commonwealth, and has not been properly maintained, or in some cases was never completed. An example is the stone dike on Canapitsit Beach, Cuttyhunk, Town of Gosnold, where the USACOE is returning some 40 years later with plans to complete this important project to protect the navigational channel into Cuttyhunk Harbor. In some cases, the older structures were not built with the best configuration to get the job done. Examples are the Oak Bluffs Harbor jetties, where reconfiguration of the dogleg on the northeast jetty would greatly improve the protection in the event of a storm, and Lake Tashmoo inlet, where reconfiguration of the southernmost jetty could greatly improve storm protection afforded the boats sheltered there.



*Shoreline change in the area of Oak Bluffs Harbor
Showing shorelines from 2005 and 1978 (CZM and MassGIS data)*



*Shoreline change in the area of Lake Tashmoos
Showing shorelines from 1955, 1978 and 1994 and 1978 (CZM data)*

Dam Failures:

The Office of Dam Safety rates dams in accordance with what kind of damage could be done by failure:

Significant Hazard: Dams located where failure or misoperation may cause loss of life and damage home(s), industrial or commercial facilities, and secondary highway(s) or railroad(s) or cause interruption of service of relatively important facilities.

Low Hazard: Dams located where failure or misoperation may cause minimal property damage to others. Loss of life is not expected.

- There are 12 dams in West Tisbury; 8 are rated low to moderate risk and 4 are rated significant risk (Old Mill Pond, Priester's Pond, Look's Pond and Fisher's Pond)
- There are also 4 dams in Chilmark; all are rated low to moderate risk.

Heavy Rainstorms and Thunderstorms:

MEMA has recorded a number of severe hailstorms and thunderstorms with wind in our area between 1973 and 2000. All occurred in Spring or Summer, with the exception of one thunderstorm which occurred in January, 1999 at Martha's Vineyard Airport (a critical facility). Hailstorms were recorded in Tisbury in 1997 and in Oak Bluffs in 2000. Thunderstorms were recorded in Tisbury, Oak Bluffs, Edgartown and West Tisbury.

Areas Vulnerable to Wind-related Hazards:

Tornadoes:

Tornadoes are found all over the world, but not with the intensity and destruction known in the United States. Fortunately, this American icon tends to spare our part of the world, and Dukes County is at low risk for tornadoes. There is, however, record of a single tornado that struck in the Katama plains area of Edgartown in 1951.

Areas Vulnerable to Winter-related Hazards:

Snow Events:

Snow events are rarely an issue for the islands.

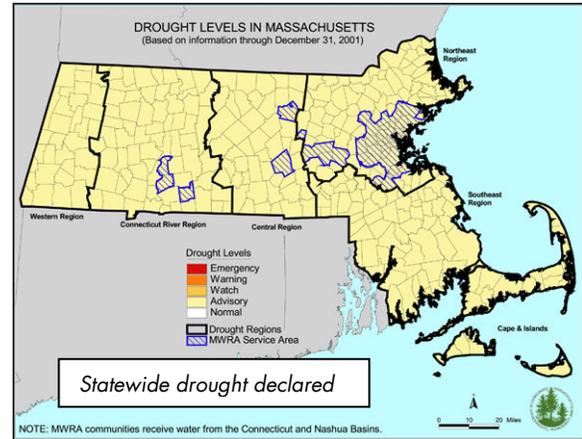
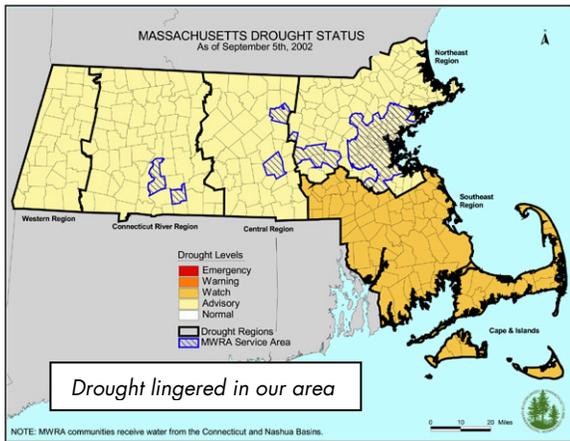
Ice:

Because of the open configuration of Vineyard Haven Harbor, icing severe enough to restrict ferry service is rare. Icing may also be a factor in Edgartown Harbor, where the Chappaquiddick Ferry runs year 'round between Chappaquiddick and Edgartown proper, as the only means of travel, particularly since the April 2007 breach of Norton Point Barrier Beach.

Areas Vulnerable to Fire-related Hazards:

Drought:

Vulnerability to drought is not a localized issue that can be pinpointed to a specific place or time. Unlike the more ephemeral natural hazards that quickly strike and leave, drought takes some time to establish itself and some time to depart. Drought levels intensify from normal conditions through the



range of drought advisory, drought watch, drought warning and drought emergency. According to the Massachusetts Department of Conservation and Recreation⁹, the most recent statewide drought began in 2001 and ended in 2003 "Steadily declining precipitation since August and an extremely dry November have resulted in dry conditions statewide. Though fall and winter months are not peak water use periods, they are typically the time when reservoirs and groundwater are recharged. Continued dry weather over the winter could quickly lead to more serious drought conditions when warmer weather and increased water

use begin in the spring. The National Weather Service has noted that, historically, the most severe droughts in New England have begun with drier than normal winters". In issuing the Drought Advisory in December 2001, D.C.R. (then the Department of Environmental Management) included Cape Cod and the Islands as among the most severely affected, noting "In particular, Cape Cod has experienced rainfall deficits and below normal groundwater levels since 1999 and has yet to recover. High fire danger levels and forest fires this fall were the result of a lack of rainfall and unseasonably warm temperatures". Drought status quickly moved to "Drought Watch" for the entire Commonwealth in February 2002 and remained there until May, to be then replaced by a "Drought Advisory" statewide. Conditions deteriorated again in the Southeast region and the Cape and Islands region, so that those regions were returned to "Drought Watch" status in August 2002 until October. In March, 2003, the drought was declared over "The Massachusetts Drought Management Task Force has recommended that the drought advisory level be eliminated for Cape Cod and the Islands. The entire state is now considered to be in the normal range. As of December 2002, Cape Cod and the Islands remained at a drought Advisory as a result of long-term below normal groundwater levels. As of January 31, 2003, ground water levels on Cape Cod had returned to normal."

⁹ <http://www.mass.gov/dcr/waterSupply/rainfall/rainfall.htm>

In 2003, the Martha’s Vineyard Commission produced *Martha’s Vineyard Source Water Protection Project*, which assessed the needs for protection of the three major public water supplies on Martha’s Vineyard, in part to be better prepared for emergencies like drought. The report recommended redundancy for the Oak Bluffs and Tisbury water supplies, to be prepared for emergencies, particularly establishing permission and infrastructure to cross the State Forest and possibly to drill wells there. The report recommended similar improvements for Edgartown, and also to add to the overall supply and infrastructure, which was not estimated to be adequate to meet the projected demand. In addition, the report recommended that plans be considered to bring public water supply to parts of Edgartown that are presently served by wells, and for the Town of West Tisbury to consider initiating its first public water supply service (The entire town is presently served by private wells). More recently, in order to meet existing demand and unable to use one well because of high iron content, Edgartown has reported pumping all available wells 17-24 hours per day last summer, with no redundancy available in case of emergency, which condition is expected to continue for the summer of 2007¹⁰, leaving Edgartown particularly vulnerable to emergencies like drought.

Wildfire:

According to the *Commonwealth of Massachusetts State Hazard Mitigation Plan*¹¹, Massachusetts’ forests are potential fuels for wildfires....“Particular areas at risk include the Southeastern area of Plymouth County, Cape Cod, and the Islands, where forested areas pose wildland fire and urban interface fire hazards. Sandy soils, which dry out quickly, increase the wildfire risk in this area”. The table which follows, *Major fires of Martha's Vineyard, 1855-1999*, lists the major fires that have occurred on Martha’s Vineyard, and their locations.

Major fires of Martha's Vineyard, 1855-1999¹²

| Year | Date | Size (ac) | Location |
|------|------|-----------|--|
| 1855 | 4/7 | large | Willis Plain |
| 1864 | 4/27 | 4,000 | near Lagoon (south central Martha's Vineyard) |
| 1875 | 7/2 | 7-10,000 | Quompacha Bottom |
| 1883 | 8/12 | | Vineyard Haven town fire |
| 1885 | 4/4 | small | Gay Head-Chilmark boundary |
| 1886 | 5/3 | 1,000 | near Vineyard Haven |
| 1889 | 3/25 | 4,000 | Quampeche Bottom |
| 1892 | 4/9 | 5-8,000 | near Middletown |
| 1894 | June | large | location unknown |
| 1900 | 4/27 | 5,000 | Scrubby Neck toward Edgartown |
| 1903 | 5/18 | | Inisfail Hotel |

¹⁰ Superintendent Fred Dumont, Edgartown Water Department, 2007, personal communication

¹¹ *Commonwealth of Massachusetts State Hazard Mitigation Plan*, 2004, Prepared by The Massachusetts Emergency Management Agency (MEMA) and the Department of Conservation and Recreation (DCR)

¹² *The Modern and Historic Fire Regimes of Central Martha’s Vineyard, Massachusetts*, 2002, A Thesis Presented by Adam Mow

| | | | |
|------|-------|--------|--|
| 1909 | 7/23 | 10,000 | on Plains |
| 1914 | 12/25 | 1,200 | western Great Plains to Katama (south eastern Martha's Vineyard) |
| 1916 | 5/19 | 12,000 | West Tisbury to Farm Neck, Ocean Heights, and Edgartown |
| 1920 | 8/6 | | large Vineyard Haven fire |
| 1926 | 5/14 | 6,400 | West Tisbury toward Ocean Heights |
| 1927 | 4/30 | 6,400 | from Dr. Fisher Road to Edgartown |
| 1927 | 5/24 | 6,400 | from Dr. Fisher Road towards Edgartown |
| 1928 | 4/28 | small | Indian Hill Road |
| 1929 | 4/6 | 2,500 | Watcha to Tiah's Cove, Waldron's Bottom, to Oyster Pond |
| 1929 | 5/4 | 2,560 | Waldron's Bottom |
| 1929 | 7/3 | small | Tashmoo/Herring Creek |
| 1930 | 5/10 | 200 | West Chop |
| 1930 | 5/17 | 5,000 | between Edgartown and Oak Bluffs |
| 1930 | 6/7 | 1,000 | north to northeast through State Forest |
| 1932 | | | two fires in State Forest |
| 1935 | 3/30 | 4,000 | Edgartown Great Pond to Katama |
| 1936 | | | 8 fires, none in State Forest |
| 1937 | | | Chappaquiddick |
| 1939 | 4/1 | 4,000 | Quampacha Bottom on Dr. Fisher Road to Vineyard Haven Road |
| 1940 | 5/18 | 1,000 | State Forest near Edgartown - Vineyard Haven Road |
| 1942 | 5/27 | 350 | Job's Neck Pond to Jayne's Cove |
| 1942 | | 1,200 | near Edgartown Great Pond |
| 1944 | | 240 | in State Forest |
| 1946 | 4/20 | 5,120 | Head of Tisbury Great Pond towards Edgartown/Oak Bluffs |
| 1948 | 9/4 | 300 | south & west towards Clevelandtown/Edgartown Airport |
| 1951 | | | 10 fires on the Island |
| 1954 | 4/10 | 1,000 | between Bames Road, Wing Road and Edgartown-Vineyard Haven Road |
| 1954 | 5/30 | 2,500 | Tiah's Cove, West Tisbury to Edgartown |
| 1954 | 7/17 | 100 | Chappaquiddick near four comers |
| 1957 | 4/20 | 35 | near state highway at Deep Bottom |
| 1957 | 5/4 | 100 | North of Chilmark cemetery, toward Chilmark Pond |
| 1958 | 6/14 | | east and north from State Forest |
| 1959 | 4/25 | 25 | between Old Courthouse Road and state Highway |
| 1959 | 5/9 | 500 | West Tisbury Road near Deep Bottom |
| 1960 | 4/23 | 25 | Katama |
| 1963 | 10/26 | 300 | Quampache Bottom to West Tisbury Road |
| 1965 | 12/19 | 1,200 | Great Plains to Katama |
| 1971 | 5/15 | 20 | Oklahoma, Tisbury |
| 1975 | 4/26 | 50 | Northeast from Edgartown dump |
| 1976 | 1/1 | 85 | Edgartown: Herring Creek Road to Katama Airfield |
| 1987 | 8/1 | 20 | Oak Bluffs behind Crosslands Nursery |
| 1987 | July | ~8 | State Forest |
| 1999 | July | -16 | State Forest, along Edgartown-West Tisbury Rd. |

On the MVC map *Wildland Urban Interface*, the green areas include more than 50 contiguous acres of forest, with the crossed lines showing a 1,000 foot buffer, and the orange areas are pitch pine and scrub oak (the most flammable). Each black dot represents a vulnerable dwelling, and the critical facilities are marked in red. An excerpt is shown below.



Excerpt of the map "Wildland-Urban Interface"

The following matrices include further vulnerability assessment regarding wildfire hazard, including the populations, values and buildout estimates for the vulnerable areas as identified in the map of the Wildland-Urban Interface.

LOSS ESTIMATES/VULNERABILITY ASSESSMENT MATRIX ASSUMPTIONS

| | | | | | | | | | |
|------------------------|--|--|--|--|--|--|--|--|--|
| Population | | | | | | | | | |
| | The 2000 Census determined that, of the year-round residential units, Martha's Vineyard had 2.3 people per unit. | | | | | | | | |
| | | | | | | | | | |
| | The MVC increased this number to 3.3 people per unit given the frequency of Islanders having guests. | | | | | | | | |
| | | | | | | | | | |
| | The MVC estimates that of the seasonal units, the number is 5 people per unit in July & August | | | | | | | | |
| | | | | | | | | | |
| | The 2000 Census determined that Gosnold had 1.9 people per unit. | | | | | | | | |
| | | | | | | | | | |
| Building Values | | | | | | | | | |
| <i>Aquinnah</i> | | | | | | | | | |
| | Individual building values were not available. So the total building value for all residential buildings (\$110,705,500.00) was divided by the total number of residential buildings in Aquinnah (478) to get an average building value of \$231,601.00 | | | | | | | | |
| | | | | | | | | | |
| | Individual building values were not available. So the total building value for all commercial buildings (\$473,300.00) was divided by the total number of commercial buildings in Aquinnah (3) to get an average building value of \$157,767.00 | | | | | | | | |
| | | | | | | | | | |
| | Individual building values were not available. So the total building value for all exempt buildings (\$675,000.00) was divided by the total number of exempt buildings in Aquinnah (15) to get an average building value of \$45,000.00 | | | | | | | | |
| | | | | | | | | | |
| <i>Oak Bluffs</i> | | | | | | | | | |
| | Individual building values were not available. So the total building value for all residential buildings (\$1,084,472,700.00) was divided by the total number of residential buildings in Oak Bluffs (3654) to get an average building value of \$296,791.00 | | | | | | | | |
| | | | | | | | | | |
| | Individual building values were not available. So the total building value for all commercial buildings (\$76,430,500.00) was divided by the total number of commercial buildings in Oak Bluffs (136) to get an average building value of \$561,989.00 | | | | | | | | |
| | | | | | | | | | |
| | Individual building values were not available. So the total building value for all industrial buildings (\$1,103,500.00) was divided by the total number of industrial buildings in Oak Bluffs (2) to get an average building value of \$551,750.00 | | | | | | | | |
| | | | | | | | | | |
| | Individual building values were not available. So the total building value for all exempt buildings (\$90,385,200.00) was divided by the total number of exempt buildings in Oak Bluffs (62) to get an average building value of \$1,457,826.00 | | | | | | | | |

| | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|
| | | | | | | | | | |
| | | | | | | | | | |
| <i>Gosnold</i> | 259 buildings total on Gosnold. Assumed all those inside the hazard areas were residential. | | | | | | | | |
| | Don't have parcel data for Gosnold. Therefore can't calculate the number of potential additional buildings. | | | | | | | | |
| | Individual building values were not available. So the total building value for all buildings (\$295,021,400) was divided by the total number of buildings in Gosnold (259) to get an average building value of \$1,139,079.00 - all buildings assumed to be residential | | | | | | | | |
| | | | | | | | | | |
| <i>Other Towns</i> | Total assessed building values for each parcel were provided by all other towns. | | | | | | | | |
| | | | | | | | | | |
| Building Values for Critical Facilities | | | | | | | | | |
| | Applied the average exempt building value for all exempt buildings within that town. | | | | | | | | |
| <i>Aquinnah</i> | \$45,000.00 | | | | | | | | |
| <i>Chilmark</i> | \$317,037.00 | | | | | | | | |
| <i>Edgartown</i> | \$424,061.00 | | | | | | | | |
| <i>Gosnold</i> | | | | | | | | | |
| <i>Oak Bluffs</i> | \$1,457,826.00 | | | | | | | | |
| <i>Tisbury</i> | \$889,674.00 | | | | | | | | |
| <i>West Tisbury</i> | \$817,061.00 | | | | | | | | |
| | | | | | | | | | |
| Building Counts | | | | | | | | | |
| | Buildings were on-screen digitized against the 2005 aerial photograph. The respective map and lot number was assigned to each building dot. Using the map & lot number as a linking field, the building dots were linked to the assessor's parcel database records. The assessor's info contains a use code and description for each parcel and aggregating by town and use, the building count was calculated for each use within each town. | | | | | | | | |
| | | | | | | | | | |

LOSS ESTIMATES/VULNERABILITY ASSESSMENT MATRIX FOR WILDFIRE

| Wildland-Urban Interface | | | | | | | | | |
|--------------------------|--|------------------|---------------------|-------------|-------------------|------------------|---------------------|-------------|-------------------|
| Town | | Developed Land | | | | Undeveloped Land | | | |
| | Use | # People (other) | # People (July-Aug) | # Buildings | Approximate Value | # People (other) | # People (July-Aug) | # Buildings | Approximate Value |
| Aquinnah | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 426 | 645 | 129 | \$29,876,529 | 660 | 1000 | 200 | \$46,320,200 |
| | Commercial | | | 1 | \$157,767 | | | 0 | \$0 |
| | Industrial | | | 0 | \$0 | | | 0 | \$0 |
| | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | 2 | \$90,000 |
| Chilmark | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 1733 | 2625 | 525 | \$169,952,500 | 2211 | 3350 | 670 | \$216,891,762 |
| | Commercial | | | 5 | \$1,728,000 | | | 6 | \$2,073,600 |
| | Industrial | | | 1 | \$58,600 | | | 0 | \$0 |
| | Exempt (Municipal, Public, Non-profit) | | | 12 | \$4,652,400 | | | 13 | \$5,040,100 |
| Edgartown | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 5722 | 8670 | 1734 | \$690,396,950 | 5382 | 8155 | 1631 | \$649,387,212 |
| | Commercial | | | 7 | \$2,113,350 | | | 33 | \$9,962,936 |
| | Industrial | | | 4 | \$643,200 | | | 14 | \$2,251,200 |
| | Exempt (Municipal, Public, Non-profit) | | | 4 | \$761,500 | | | 141 | \$26,842,875 |
| Oak Bluffs | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 2977 | 4510 | 902 | \$267,705,482 | 1726 | 2615 | 523 | \$155,221,693 |
| | Commercial | | | 5 | \$2,809,945 | | | 16 | \$8,991,824 |
| | Industrial | | | 1 | \$551,750 | | | 0 | \$0 |

| | | | | | | | | | |
|--------------|--|------------------|-----------------------------|-----|---------------|------------------|-----------------------------|-----|---------------|
| | Exempt (Municipal, Public, Non-profit) | | | 16 | \$23,325,216 | | | 46 | \$67,059,996 |
| Tisbury | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 2099 | 3180 | 636 | \$302,730,800 | 1614 | 2445 | 489 | \$232,760,002 |
| | Commercial | | | 16 | \$4,750,500 | | | 23 | \$6,828,844 |
| | Industrial | | | 1 | \$237,500 | | | 10 | \$2,375,000 |
| | Exempt (Municipal, Public, Non-profit) | | | 7 | \$1,463,700 | | | 5 | \$1,045,500 |
| West Tisbury | | 3.3 per building | 5 per building | | | 3.3 per building | 5 per building | | |
| | Residential | 2406 | 3645 | 729 | \$321,322,700 | 2538 | 3845 | 769 | \$338,953,575 |
| | Commercial | | | 0 | \$0 | | | 3 | \$0 |
| | Industrial | | | 0 | \$0 | | | 1 | \$0 |
| | Exempt (Municipal, Public, Non-profit) | | | 11 | \$2,505,800 | | | 11 | \$2,505,800 |
| Gosnold | | 1.9 per building | persons per building? | | | 1.9 per building | persons per building? | | |
| | Residential | 95 | | 50 | \$56,953,950 | | | | |
| | Commercial | | | 0 | \$0 | | | | |
| | Industrial | | | 0 | \$0 | | | | |
| | Exempt (Municipal, Public, Non-profit) | | | 0 | \$0 | | | | |

Vulnerability to Geologic-related Hazards:

Earthquakes:

Fortunately, Dukes County is at low risk for damaging earthquakes. Earthquakes may be felt at times, but our location is far from the fault zones where the more damaging quakes are nearly inevitable.

Other Potential Hazards:

Sea Level Rise:

According to the Intergovernmental Panel on Climate Change, eustatic (world-wide) sea level rose 6.7 inches in the last 100 years and "...there is high confidence that the rate of sea level rise increased from the 19th to the 20th century" and that sea level rise is accelerating in response to our increased dispersion of greenhouse gases, so that we may expect eustatic (world-wide) sea level rise of about 7-15 inches (for a temperature increase of 1.8 degrees C) to 10-23 inches (for a temperature increase of 4 degrees C), in the next century.¹³ Locally, subsidence of the land has added to the submergence felt world-wide, so that in the last 100 years, sea level has risen in our area between 10.2 inches (recorded at Woods Hole) and 11.9 inches (recorded at Nantucket)¹⁴, compared to the 6.7 inch world-wide rise in sea level. Considering that local sea level has risen 40% more than world-wide sea level, that could mean that local sea level may be expected to rise significantly higher than the IPCC's projections (probably not as much as 40% higher, because only part of our local sea level rise is due to world-wide sea level rise, with the remainder due to subsidence of the land).

Landslides:

Minor landslides have occurred in the high sea cliffs of Aquinnah and Chilmark. This is most often due to freeze/thaw action, runoff, or undermining of the cliff by erosion. Fortunately, this type of hazard does not threaten developed parts of the planning area, and it is unlikely that these landslides would pose a safety hazard.

¹³ *Summary for Policymakers, 2007, Contribution of Working Group 1 to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*

¹⁴ *Risk and Vulnerability Assessment Martha's Vineyard Hospital, Oak Bluffs, Massachusetts, 2006, Woods Hole Group, Inc.*

Overall Vulnerability of Critical Facilities (with loss estimates):

The following matrices identify loss estimates for vulnerable critical facilities. It is important to note that many of the identified facilities are essential, most of those critically important for response to natural hazards, so that their significance goes far beyond the dollar value attached to the facility.

| SLOSH | | | | |
|---------------------|----------------|---------------------------------------|-------------|-------------------|
| | Slosh Category | Critical Facility Category | # Buildings | Approximate Value |
| Chilmark | | | | |
| | 1 | Harbor Master Office | 1 | \$317,037 |
| Edgartown | | | | |
| | 1 | Ferry Terminal (3 of them) | 3 | \$1,272,183 |
| | 1 | Harbor Master Office | 1 | \$424,061 |
| | 3 | Public Well | 1 | Not Applicable |
| | 3 | Airfield - Katama | 1 | Not Applicable |
| | 4 | Courthouse | 1 | \$424,061 |
| | 4 | Medical Facility | 1 | \$424,061 |
| | 4 | Town Hall | 1 | \$424,061 |
| Gosnold | | | | |
| | 1 | School | 1 | |
| Oak Bluffs | | | | |
| | 1 | Ferry Terminal | 3 | \$4,373,478 |
| | 1 | Harbor Master Office | 1 | \$1,457,826 |
| | 4 | Police Station | 1 | \$1,457,826 |
| Tisbury | | | | |
| | 1 | Ferry Terminal | 1 | \$889,674 |
| | 1 | Fuel Storage | 1 | \$339,600 |
| | 2 | Fuel Storage | 1 | \$538,100 |
| | 2 | Harbor Master Office | 1 | \$889,674 |
| | 3 | Fire Department | 1 | \$889,674 |
| | 4 | Alternate Emergency Operations Center | 1 | \$889,674 |
| | 4 | Police Station | 1 | \$889,674 |
| West Tisbury | | | | |
| | 4 | Police Station | 1 | \$817,061 |

| Flood | | | | |
|---------------------------------|----------------------------|---------------------------------------|-------------|-------------------|
| | Flood Zone Category | Critical Facility Category | # Buildings | Approximate Value |
| Chilmark | | | | |
| | 100 Year | Harbor Master Office | 1 | \$317,037 |
| Edgartown | | | | |
| | 100 Year | Ferry Terminal | 1 | \$424,061 |
| | 100 Year | Public Well | 1 | Not Applicable |
| | Velocity Zone (also 100yr) | Ferry Terminal | 2 | \$848,122 |
| | Velocity Zone (also 100yr) | Harbor Master Office | 1 | \$424,061 |
| | 500 Year | Town Hall | 1 | \$424,061 |
| Oak Bluffs | | | | |
| | 100 Year | Ferry Terminal | 2 | \$2,915,652 |
| | 100 Year | Harbor Master Office | 1 | \$1,457,826 |
| | Velocity Zone (also 100yr) | Ferry Terminal | 1 | \$1,457,826 |
| Tisbury | | | | |
| | 100 Year | Ferry Terminal | 1 | \$889,674 |
| | 100 Year | Fuel Storage | 2 | \$877,700 |
| Wildland-Urban Interface | | | | |
| | | Critical Facility Category | # Buildings | Approximate Value |
| Aquinnah | | | | |
| | Yes - inside | MassCare Center | 2 | \$90,000 |
| | Yes - inside | Public Well | 1 | Not Applicable |
| | Yes - inside | Wastewater Treatment Plant | 1 | \$45,000 |
| Chilmark | | | | |
| | Yes - inside | Alternate Emergency Operations Center | 1 | \$317,037 |
| | Yes - inside | Fire Department | 2 | \$634,074 |
| | Yes - inside | MassCare Center | 2 | \$634,074 |
| | Yes - inside | Police Station | 1 | \$317,037 |
| | Yes - inside | Primary Emergency Operations Center | 1 | \$317,037 |
| | Yes - inside | School | 1 | \$317,037 |
| | Yes - inside | Town Hall | 1 | \$317,037 |

| | | | | |
|--|----------------|-------------------------------------|-------------|-------------------|
| Edgartown | | | | |
| | Yes - inside | Assisted Living | 1 | \$825,900 |
| | Yes - inside | DayCare Center | 2 | \$848,122 |
| | Yes - inside | Fire Department | 1 | \$424,061 |
| | Yes - inside | Nursing Home | 1 | \$424,061 |
| | Yes - inside | Public Well | 4 | Not Applicable |
| | Yes - inside | Public Works Equipment Storage | 1 | \$424,061 |
| Oak Bluffs | | | | |
| | Yes - inside | Assisted Living | 1 | \$1,457,826 |
| | Yes - inside | DayCare Center | 4 | \$5,831,304 |
| | Yes - inside | MassCare Center | 2 | \$2,915,652 |
| | Yes - inside | Medical Facility | 1 | \$1,457,826 |
| | Yes - inside | Public Well | 4 | Not Applicable |
| | Yes - inside | Public Works Equipment Storage | 1 | \$1,457,826 |
| | Yes - inside | School | 2 | \$2,915,652 |
| Tisbury | | | | |
| | Yes - inside | Public Well | 1 | Not Applicable |
| West Tisbury | | | | |
| | Yes - inside | DayCare Center | 2 | \$1,634,122 |
| | Yes - inside | Fire Department | 1 | \$817,061 |
| | Yes - inside | MassCare Center | 2 | \$1,634,122 |
| | Yes - inside | Primary Emergency Operations Center | 1 | \$817,061 |
| | Yes - inside | School | 1 | \$817,061 |
| | Yes - inside | Vet/Animal Shelter | 1 | \$817,061 |
| Critical Facilities Affected by Hazards | | | | |
| SLOSH | | | | |
| | Slosh Category | Critical Facility Category | # Buildings | Approximate Value |
| Chilmark | | | | |
| | | 1 Harbor Master Office | 1 | \$317,037 |
| Edgartown | | | | |
| | | 1 Ferry Terminal (3 facilities) | 3 | \$1,272,183 |
| | | 1 Harbor Master Office | 1 | \$424,061 |
| | | 3 Public Well | 1 | Not Applicable |
| | | 4 Courthouse | 1 | \$424,061 |
| | | 4 Medical Facility | 1 | \$424,061 |
| | | 4 Town Hall | 1 | \$424,061 |

| | | | | |
|---------------------------------|----------------------------|---|-------------|-------------------|
| Gosnold | | | | |
| | | 1 School | 1 | |
| Oak Bluffs | | | | |
| | | 1 Ferry Terminal | 2 | \$2,915,652 |
| | | 1 Harbor Master Office | 1 | \$1,457,826 |
| | | 4 Ferry Terminal | 1 | \$1,457,826 |
| | | 4 Police Station | 1 | \$1,457,826 |
| Tisbury | | | | |
| | | 2 Harbor Master Office | 1 | \$889,674 |
| | | 3 Fire Department | 1 | \$889,674 |
| | | 4 Alternate Emergency Operations Center | 1 | \$889,674 |
| | | 4 Police Station | 1 | \$889,674 |
| West Tisbury | | | | |
| | | 4 Police Station | 1 | \$817,061 |
| Flood | | | | |
| | Flood Zone Category | Critical Facility Category | # Buildings | Approximate Value |
| Chilmark | | | | |
| | 100 Year | Harbor Master Office | 1 | \$317,037 |
| Edgartown | | | | |
| | 100 Year | Ferry Terminal | 1 | \$424,061 |
| | 100 Year | Public Well | 1 | Not Applicable |
| | Velocity Zone (also 100yr) | Ferry Terminal | 2 | \$848,122 |
| | Velocity Zone (also 100yr) | Harbor Master Office | 1 | \$424,061 |
| | 500 Year | Town Hall | 1 | \$424,061 |
| Oak Bluffs | | | | |
| | 100 Year | Ferry Terminal | 2 | \$2,915,652 |
| | 100 Year | Ferry Terminal, Harbor Master Office | 1 | \$1,457,826 |
| | Velocity Zone (also 100yr) | Ferry Terminal, Harbor Master Office | 1 | \$1,457,826 |
| Tisbury | | | | |
| | 100 Year | Ferry Terminal | 1 | \$889,674 |
| | | | | |
| Wildland-Urban Interface | | | | |
| | | Critical Facility Category | # Buildings | Approximate Value |
| Aquinnah | | | | |
| | Yes - inside | MassCare Center | 2 | \$90,000 |

| | | | | |
|---------------------|--------------|---------------------------------------|---|----------------|
| | Yes - inside | Public Well | 1 | Not Applicable |
| | Yes - inside | Wastewater Treatment Plant | 1 | \$45,000 |
| Chilmark | | | | |
| | Yes - inside | Alternate Emergency Operations Center | 1 | \$317,037 |
| | Yes - inside | Fire Department | 2 | \$634,074 |
| | Yes - inside | MassCare Center | 2 | \$634,074 |
| | Yes - inside | Police Station | 1 | \$317,037 |
| | Yes - inside | Primary Emergency Operations Center | 1 | \$317,037 |
| | Yes - inside | School | 1 | \$317,037 |
| | Yes - inside | Town Hall | 1 | \$317,037 |
| Edgartown | | | | |
| | Yes - inside | DayCare Center | 2 | \$848,122 |
| | Yes - inside | Fire Department | 1 | \$424,061 |
| | Yes - inside | Nursing Home | 1 | \$424,061 |
| | Yes - inside | Public Well | 4 | Not Applicable |
| | Yes - inside | Public Works Equipment Storage | 1 | \$424,061 |
| Oak Bluffs | | | | |
| | Yes - inside | Assisted Living | 1 | \$1,457,826 |
| | Yes - inside | DayCare Center | 4 | \$5,831,304 |
| | Yes - inside | MassCare Center | 2 | \$2,915,652 |
| | Yes - inside | Medical Facility | 1 | \$1,457,826 |
| | Yes - inside | Public Well | 4 | Not Applicable |
| | Yes - inside | Public Works Equipment Storage | 1 | \$1,457,826 |
| | Yes - inside | School | 2 | \$2,915,652 |
| Tisbury | | | | |
| | Yes - inside | Public Well | 1 | Not Applicable |
| West Tisbury | | | | |
| | Yes - inside | DayCare Center | 2 | \$1,634,122 |
| | Yes - inside | Fire Department | 1 | \$817,061 |
| | Yes - inside | MassCare Center | 2 | \$1,634,122 |
| | Yes - inside | Primary Emergency Operations Center | 1 | \$817,061 |
| | Yes - inside | School | 1 | \$817,061 |
| | Yes - inside | Vet/Animal Shelter | 1 | \$817,061 |

Vulnerability to Future Natural Hazards:

Based on the identification and profile of the natural hazards that have occurred throughout the region over time, a vulnerability matrix has been developed. The following criteria, adapted from the Massachusetts Pre-Disaster Mitigation Plan developed by MEMA, were used for frequency characterization:

- Very Low Frequency: events that occur less frequently than once in 1,000 years (less than 0.1% per year)
- Low Frequency: events that occur from once in 100 years to once in 1,000 years (0.1 to 1% per year)
- Medium Frequency: events that occur from once in 10 years to once in 100 years (1% to 10% per year)
- High Frequency: events that occur more frequently than once in 10 years (greater than 10% per year)

The criteria used for severity characterization, based on past hazard events, includes the following:

- Minor: Limited and scattered property damage; no damage to public infrastructure (roads, bridges, parks, etc.); contained geographic area (i.e., one or two towns); essential services (utilities, hospital, schools) not interrupted; no injuries or fatalities
- Serious: Scattered major property damage; some minor infrastructure damage; wider geographic area (several towns); essential services are briefly interrupted; some injuries and/or fatalities
- Extensive: Consistent major property damage; major damage to public infrastructure (taking up to several days for repair); essential services are interrupted from several hours to several days; many injuries and fatalities
- Catastrophic: Property and public infrastructure destroyed; essential services stopped; hundreds of injuries and fatalities

A vulnerability matrix was prepared for each community, using numeric points (one point for each step of higher frequency or impact) and the resulting scores were averaged for the following table of vulnerability for the overall area (Dukes County):

OVERALL VULNERABILITY FOR DUKES COUNTY

| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
|------------------------------|--------------------------------|---|---|--|
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (rank by combining how much impact & how frequently this affects the community - average for all planning areas) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | large | serious | 7.4 |
| Dam Failures | very low | local | serious | 1 |
| Thunderstorms | medium | local | minor | 4.1 |
| Winter Storms (snow) | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | serious | 9.4 |
| Hurricanes | medium | large | extensive | 9 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9.1 |
| Coastal Storms | high | large | serious | 9.1 |
| Winter Storms (snow) | low | local | serious | 5 |
| Downspouts | very low | local | serious | 3 |
| Tornadoes | very low | local | serious | 4.1 |
| Fire-Related Hazards | | | | |
| Drought | medium | medium | serious | 6 |
| Wildfires | low | local | serious | 6 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3.6 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3.4 |
| Sea Level Rise | high | large | serious | 6.6 |

Individual vulnerability assessments for each community appear on the following pages.

VULNERABILITY ASSESSMENT FOR THE TOWN OF AQUINNAH

The Town of Aquinnah is the smallest town in the planning area, both in terms of area (5.4 square miles of land area) and of year 'round population (344 as of the 2000 census). Aquinnah (formerly known as Gay Head) is also the least commercially developed and has no town center. The sparse population is scattered across the rugged topography of this morainal land, with a density of 64.1 persons per square mile.

| Town of Aquinnah | | | | |
|------------------------------|--------------------------------|---|---|------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impact & frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | local | minor | 6 |
| Dam Failures | n/a | n/a | n/a | 0 |
| Thunderstorms | very low | local | minor | 3 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | medium | medium | extensive | 9 |
| Hurricanes | high | large | extensive | 10 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | serious | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | low | local | minor | 4 |
| Wildfires | very low | local | minor | 3 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | medium | local | minor | 5 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | local | minor | 6 |

VULNERABILITY FOR THE TOWN OF CHILMARK

The Town of Chilmark includes a year 'round population of 843 (2000 census) on a land area of 19.1 square miles, for a density of 44 persons per square mile. With 3-acre zoning, development has spread over the hilly morainal land, and property values are quite high, in 2005 the highest average property value in the Commonwealth, with most of that cost based on the land value rather than the buildings. One exception is the closely-quartered fishing village of Menemsha, which includes a number of water-dependent facilities for the resident fishing fleet and visiting recreational craft in summer, and shore facilities such as fuel and restrooms.

| Town of Chilmark | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | local | minor | 6 |
| Dam Failures | very low | local | minor | 3 |
| Thunderstorms | very low | local | minor | 3 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 10 |
| Hurricanes | medium | medium | extensive | 9 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 10 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | minor | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | low | local | minor | 4 |
| Wildfires | low | local | minor | 4 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | medium | local | minor | 5 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | local | minor | 6 |

VULNERABILITY FOR THE TOWN OF EDGARTOWN

Edgartown is the largest in land area of the towns in the County, with 27 square miles of land area and a year 'round population of 3,779 (2000 census) and a density of 140 persons per square mile.

Much of Edgartown's land area is very low and flat, made of unconsolidated outwash plain sediments that are susceptible to erosion. The south side of Edgartown experiences erosion at rates of 10-12 feet per year, and the low-lying plains with periglacial valleys are also highly susceptible to storm surge, with considerable risk to developed areas. Part of Edgartown lies on the nearby Island of Chappaquiddick, accessible by ferry year 'round, with associated transfer facilities to load vehicles. There have been times when Chappaquiddick has been accessible by 4-wheel drive vehicle across the barrier beach which sometimes connects Chappaquiddick to Edgartown proper, but an April 2007 storm breached the barrier, and the barrier is expected to remain open for at least 10-15 years in the future, during which time, ferry and boat travel are the only links to Chappaquiddick. Part of Edgartown is also in a direct line for wave action from Nor'easter storms, with potential for significant beach erosion and coastline modification.

Much of the town is serviced by municipal water, and the infrastructure is such that there is not enough redundancy to protect the service from unfortunate events such as drought.

| Town of Edgartown | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | large | serious | 9 |
| Dam Failures | very low | local | serious | 0 |
| Thunderstorms | low | local | minor | 4 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 10 |
| Hurricanes | medium | large | catastrophic | 10 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |

| | | | | |
|-----------------------------|----------|--------|-----------|----|
| Downspouts | very low | local | serious | 3 |
| Tornadoes | low | local | serious | 5 |
| Fire-Related Hazards | | | | |
| Drought | medium | medium | serious | 8 |
| Wildfires | high | large | extensive | 10 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | medium | serious | 8 |

VULNERABILITY FOR THE TOWN OF GOSNOLD

The Town of Gosnold includes the entire Elizabeth Island chain, They are named Nonamesset, Uncatena, Weepectet, Naushon, Pasque, Nashawena, Penikese and Cuttyhunk. According to the 2000 census, Gosnold had a year-round population of 86 on an area of 13 square miles of dry land, with a density of 6.6 persons per square mile. Settlement is centered, however, on the outermost island of Cuttyhunk, where most of the population resides. Ferry service for passengers and freight (no cars) is provided year 'round from New Bedford and in summer from Menemesha. Protection and functionality of harbor facilities are essential for the well-being of the residents.

| Town of Gosnold | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | large | minor | 8 |
| Dam Failures | n/a | n/a | n/a | 0 |
| Thunderstorms | low | local | minor | 4 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 9 |
| Hurricanes | medium | large | extensive | 9 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | serious | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | medium | local | minor | 5 |
| Wildfires | low | local | minor | 4 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | local | minor | 6 |

VULNERABILITY FOR THE TOWN OF OAK BLUFFS

The Town of Oak Bluffs holds a year 'round population of 3,713 (2000 census) on an area of 7.4 square miles of dry land, with a density of 541.4 persons per square mile. In summer, population increases dramatically, including day passengers from ferries and cruise ships. On any summer day, there might be an estimated 23,600 people in the town. In summer, a number of ferries ply the waters, carrying passengers and freight to and from Oak Bluffs, including one terminal for cars and trucks. In summer, the compact harbor is most often filled with boats on moorings and docks. In winter, much of Oak Bluffs, including the East Chop bluff, the harbor and east-facing beaches are all exposed directly to wave action generated by Nor'easter storms, and subject to significant shoreline and bluff erosion.

| Town of Oak Bluffs | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | large | serious | 9 |
| Dam Failures | n/a | n/a | n/a | 0 |
| Thunderstorms | very low | local | minor | 3 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 10 |
| Hurricanes | medium | large | extensive | 9 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | minor | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | medium | medium | serious | 8 |
| Wildfires | medium | medium | serious | 8 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | local | minor | 6 |

VULNERABILITY FOR THE TOWN OF TISBURY

The Town of Tisbury has a year 'round population of 3,755 (2000 census) on a land area of 6.6 square miles of dry land, with a density of 572.4 persons per square mile. Most of the year 'round waterfront activity takes place in Tisbury. Vineyard Haven Harbor is open year 'round for ferry passengers, freight, and vehicles, and the waterfront facilities include boatyards, fuel, etc. The harbor is protected somewhat by the "Chops", the high bluffs of West Chop and East Chop that form the mouth of the outer harbor, which is otherwise open to Vineyard Sound. Commercial and recreational boats fill the inner harbor all summer, spilling out to the outer harbor (outside the breakwater) and into nearby Lagoon Pond. In summer, recreational boats also berth in Lake Tashmoo, on the northwest side of the town, where there are approximately 600 moorings.

| Town of Tisbury | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | medium | minor | 7 |
| Dam Failures | n/a | n/a | n/a | |
| Thunderstorms | high | local | minor | 6 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 9 |
| Hurricanes | medium | large | extensive | 9 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 9 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | minor | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | medium | medium | serious | 7 |
| Wildfires | medium | local | minor | 5 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | medium | local | serious | 6 |
| Sea Level Rise | high | local | serious | 7 |

VULNERABILITY FOR THE TOWN OF WEST TISBURY

The Town of West Tisbury has a year 'round population of 2,467 (2000 census) on a land area of 25 square miles of dry land, with a density of 98.6 persons per square mile. West Tisbury is the fastest growing town in Dukes County, but still doesn't have municipal water or sewer service. The north side of West Tisbury is hilly, morainal land and the south side is lowland made of unconsolidated outwash plain sediments that are highly susceptible to erosion and disappearing at the rate of about 7 feet per year. The south side is also punctuated by periglacial valleys that are susceptible to storm surge and to sea level rise.

| Town of West Tisbury | | | | |
|------------------------------|--------------------------------|---|---|---------------------------------|
| Natural Hazard | Frequency of Occurrence | Location | Impacts | Hazard Index |
| | (very low, low, medium, high) | (local or small, medium, multiple towns or large) | (minor, serious, extensive, catastrophic) | (combine impacts and frequency) |
| Flood-Related Hazards | | | | |
| Riverine | very low | n/a | n/a | 0 |
| Coastal | medium | large | serious | 8 |
| Erosion | high | medium | minor | 7 |
| Dam Failures | very low | local | serious | 4 |
| Thunderstorms | high | local | minor | 6 |
| Winter Storms | low | local | minor | 4 |
| Coastal Storms/Nor'easters | high | medium | extensive | 9 |
| Hurricanes | medium | medium | serious | 7 |
| Wind-Related Hazards | | | | |
| Hurricanes | medium | large | extensive | 9 |
| Coastal Storms | high | large | serious | 10 |
| Winter Storms | low | local | serious | 5 |
| Downspouts | very low | local | minor | 3 |
| Tornadoes | very low | local | serious | 4 |
| Fire-Related Hazards | | | | |
| Drought | medium | medium | minor | 6 |
| Wildfires | high | medium | serious | 8 |
| Geologic Hazards | | | | |
| Earthquakes | very low | n/a | n/a | 0 |
| Landslides | very low | local | minor | 3 |
| Sink Holes | very low | n/a | n/a | 0 |
| Other Hazards | | | | |
| Ice | very low | local | serious | 3 |
| Sea Level Rise | high | medium | minor | 7 |

Section 6. Existing Hazard Mitigation Activities

Flood

Most Dukes County towns participate in the FEMA flood insurance program (NFIP) and have floodplain zoning by-laws associated with that program. Chilmark is the exception. That town does not participate in the program, doesn't have a floodplain by-law and property owners are not eligible to purchase flood insurance. It should be noted that the floodplain by-laws required for participation in the insurance program are minimal. The Vineyard towns also have the Coastal District DCPC (District of Critical Planning Concern) and several DCPC's specific to individual ponds, harbors and shores. These DCPC regulations are, in most cases, more restrictive than the FEMA floodplain by-laws.

Wildfire

The 5,700-acre Manuel F. Correllus State Forest was created in 1908 as a refuge for the last remaining population of heath hen, and was managed as heath hen habitat until the last one died in 1932. Since then, management practices have left considerable areas of exotic pines that are dead and dying, providing significant fuel for wildfires.

According to State Forest Supervisor John Varkonda, the State Forest has an active fire management program.

Here, a crew performs a controlled burn in the State Forest, part of keeping up fire breaks.



Here, a brush hog works on a test plot in the State Forest.



Grazing is used in the State Forest, following mowing/brushcutting.



Fire break prior to treatment. Note the person in the middle for scale.

Below is the same plot after mowing by the brushhog, and grazing.



DCR has established a Fire-wise program on the Vineyard, staffed 24/5 by an outreach worker who speaks to groups and distributes literature, as well as responding to wildfires.

A Note Regarding Bridges

The major bridges on Martha's Vineyard are all in the process of being replaced, and there is no need to plan for hazard mitigation associated with structurally deficient bridges.

EXISTING PROTECTION MATRIX AQUINNAH

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|---|---|--|--------------------------------|
| Town participation in the National Flood Insurance Program (NFIP) | Provides flood insurance for structures located in flood-prone areas | FEMA flood zones | Effective | None |
| Floodplain District Zoning Bylaw | Requires Flood Plain Permit for new construction, substantial improvement; addition of increased water, electric or septic systems to conform to rules and regs of Board of Health; alteration of landforms by Special Permit from ZBA; within V-Zone new construction to be located landward of Mean High Water and man-made alteration of sand dunes prohibited | Flood zones AE and VE as shown on Flood Insurance Rate Map dated September 29, 1996 | Enforced by zoning official; effective | None |
| Coastal District DCPC (District of Critical Planning Concern) | Underground utilities; height restrictions; special permit for construction within 200' of wetlands, waterbodies, beaches, dunes or crests of bluffs over 15' high, only fishing-related commercial structure within 100' of those features, for vehicular access wider than 12', or for pre-existing stone wall to be moved, removed or altered | Below 10-foot contour or within 500' of MHW or inland edge of beach or marsh grass, and most of seaward of State Road and Moshup Trail; except named tribal lands | Effective but could use updating Island-wide | Needs updating |
| Gay Head Cliff Area DCPC | Special permit from Planning Board Plan Review Committee required for any development, includes site plan review; height restriction 18' for a pitched roof and 13' for a flat roof, up to 24' by special permit from PBPRC; no cut/no build zone within 150' of the crest of bluffs and cliffs; no further subdivision within the district | Cliffs and environs landward to Lighthouse Road and Moshup Trail | Effective | None |

| | | | | |
|----------------------------------|---|--|-----------|---|
| Moshup Trail DCPC | site plan review for special permit to construct any building, driveway, fence (or stone wall) or private parking area; existing stone walls protected; height restrictions; no clearing of vegetation > 100square feet except by special permit with plan review; site design guidelines are available | lands adjacent to Moshup Trail and publicly visible | Effective | None |
| Town of Aquinnah DCPC | site plan review for most construction; specific regs for cutting, stone walls, etc | town-wide except named tribal lands | Effective | None |
| Rate of Development District | building permit limitation to 7 per year | town-wide, except for named tribal lands | Effective | None |
| Wild and Scenic North Shore DCPC | permitted uses- routine maintenance, uses such as recreational fishing and boating not involving the permanent placement of any new fill or structure; specially permitted uses - permanent placement of any fill or structure for municipal purposes or for purposes of commercial fishing, shellfishing or aquaculture; all other uses prohibited (including private piers) | waters and lands of north shore, lighthouse to lighthouse, extending 100' seaward from MLW | Effective | None |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |

EXISTING PROTECTION MATRIX CHILMARK

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|---|---|--|--------------------------------|
| Coastal District DCPC (District of Critical Planning Concern) | height and construction standards for inland zone, including site plan review; in shore zone, non-residential construction by special permit with site plan review and no residential construction | Below 10-foot contour or within 500' of MHW or inland edge of beach or marsh grass; includes the shore zone, from MLW to 100' inland of the inland edge of beach or marsh grass and 100' inland of the crest of a bluff >15' in height; the rest is the inland zone | Effective but could use updating Island-wide | Needs updating |
| Stonewall, Nashaquitsa and Menemsha Pond District | special permit required for municipal structures and fill for furthering the commercial fisheries or public access, for dredging activities other than those for navigational channels or to improve circulation for shellfish propagation, and non-municipal piers | Stonewall Pond, Nashaquitsa Pond, and the Chilmark side of Menemsha Pond, inland to MHW | Effective | None |
| Wild and Scenic North Shore DCPC | permitted uses- routine maintenance, uses such as recreational fishing and boating not involving the permanent placement of any new fill or structure; specially permitted uses - permanent placement of any fill or structure for municipal purposes or for purposes of commercial fishing, shellfishing or aquaculture; all other uses prohibited (including private piers) | waters and lands of north shore, lighthouse to lighthouse, extending 100' seaward from MLW | Effective | None |
| Squibnocket Pond District | Septic systems set back 500' from pond, 200' from other wetland, vertical separation from groundwater 6'; erosion and sedimentation plan for slope \geq 8%; new structures set back 200 from crest of bluff > 15' or inland edge of beach or | Squibnocket Pond and adjacent lands | Effective; enforced by Building and Zoning, SPDAC Advisory Committee | Effective |

| | | | | |
|--------------------|---|-------------------|-----|---|
| | marsh grasses; restricted uses and site plan review | | | |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |

EXISTING PROTECTION MATRIX EDGARTOWN

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|---|--|---|--------------------------------|
| Town participation in the National Flood Insurance Program (NFIP) | Provides flood insurance for structures located in flood-prone areas | FEMA flood zones | Effective | None |
| Floodplain District Zoning Bylaw | Requires Flood Plain Permit for new construction, substantial improvement; addition of increased water, electric or septic systems to conform to rules and regs of Board of Health; alteration of landforms by Special Permit from ZBA; within V-Zone new construction to be located landward of Mean High Water; within AO zones residential structures elevated | Flood zones as shown on Flood Insurance Rate Map dated July 20, 1998 | Enforced by Building Official; effective | None |
| Coastal District DCPC (District of Critical Planning Concern) | height and construction standards for inland zone, including site plan review; no residential construction in shore zone; underground utilities except by special permit; septic 200' from salt water body; minimum separation 200' between septic; septic at least 5' above groundwater; septic 600' from public water supply and 200' from private well; private well 200' from salt water body; no road > 10' except by special permit | Below 10-foot contour or within 500' of MHW of ocean or pond > 10 acres; includes the shore zone, from MLW to 100' inland of the inland edge of beach or marsh grass and 100' inland of the crest of a bluff > 15' in height; the rest is the inland zone; excludes village waterfront | Effective but could use updating Island-wide' administered by building inspector, special permit by planning board with site plan review by site review committee | Needs updating Island-wide |
| Edgartown Ponds Area DCPC | Restrictions on uses, no dwellings in first 100' and special permit from Planning Board for most uses there including additions of more than 10% to existing; restrictions on hazardous materials | Lands and waters adjacent to south shore great ponds within 700' of a coastal water body > 10 acres or the ocean, or within 300' streams and wetlands draining into ponds; zones to 100', to 200' and remainder | Effective; administered by Building Official with special permit by Planning Board with site plan review | None |

| | | | | |
|-----------------------------|---|--|---|---|
| Cape Poge DCPC | Prohibits subdivision, non-municipal piers, more than one dwelling on a lot, use of turfs chemicals; special permit from Planning Board for any development, includes site review | Cape Poge Bay, Poucha Pond and surrounding lands | Effective; administered by Building Official with special permit by Planning Board with a site review committee | None |
| Surface Water District | Site plan review and special permit from Planning Board for most uses requiring facilities such as piers | All town waters seaward of Mean High Water | Effective; administered by Planning Board | None |
| Fire Breaks in State Forest | Fire breaks maintained by grazing, brushbreaking, controlled burns | Within Manuel F. Correllus State Forest | DCR | Need continued management |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |

EXISTING PROTECTION MATRIX GOSNOLD

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|-------------|--|----------------------------------|--------------------------------|
| Floodplain District Zoning Bylaw | | Flood zones as shown on Flood Insurance Rate Map dated July 20, 1998 | Effective | None |
| Participation in the NFIP flood insurance program | | FEMA flood zones | Effective | None |

EXISTING PROTECTION MATRIX OAK BLUFFS

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|--|--|--|---|
| Town participation in the National Flood Insurance Program (NFIP) | Provides flood insurance for structures located in flood-prone areas | FEMA flood zones | Effective | None |
| Floodplain District Zoning Bylaw | Requires Flood Plain Permit for new construction, substantial improvement; addition of increased water, electric or septic systems to conform to rules and regs of Board of Health; alteration of landforms by Special Permit from ZBA; within V-Zone new construction to be located landward of Mean High Water; within AO zones residential structures elevated | Flood zones as shown on Flood Insurance Rate Map dated July 2, 1992 | Enforced by zoning official; effective | None |
| Coastal District DCPC (District of Critical Planning Concern) | height and construction standards for inland zone, including site plan review; no residential construction in shore zone; existing health in shore zone allowed; septic 200' from salt water body; minimum separation 200' between septic; septic at least 5' above groundwater; septic 600' from public water supply and 200' from private well; private well 200' from salt water body; no road > 10' except by special permit | Below 10-foot contour or within 500' of MHW of ocean or pond > 10 acres and all land within 100' of streams and wetlands flowing into great ponds; except around West Chop just land below 10' contour and faces of bluffs >15'; excludes developed area between Highland Dr (East Chop) and Canonicus Ave (near Farm Pond); segments include the shore zone, from MLW to 100' inland of the inland edge of beach or marsh grass and 100' inland of the crest of a bluff >15' in height and within 100' of streams or wetlands draining into a great pond; the rest is the inland zone | Effective but could use updating Island-wide' administered by Board of Health, Building Inspector, Special Permit by Planning Board with site plan review by site review committee | Needs updating Island-wide; particularly in Oak Bluffs the boundary for the East Chop bluff doesn't manage land uses on top of and just landward of the bluff |

| | | | | |
|--------------------------|---|---|--|---|
| Sengekontacket Pond DCPC | Water quality monitoring program; density 1 SFR/60,000 sf; growth restricted to 75 dwelling units/3 years with up to 15 more in a year by special permit from zba | Lands and waters adjacent to Sengekontacket Pond | Not Enforced; administered by Board of Health, Building Official with special permit by ZBA | Enforce the regulations, possible expansion to include Edgartown side |
| Oak Bluffs Harbor DCPC | Site plan review, special setbacks, special permit by zba for a privately-owned marina in B1; in R2 prohibits boat yards and boat services, conversion of SFR to more than 2 families, hotels, rooming houses, semi-detached 2-family dwellings | Oak Bluffs Harbor and adjacent lands, covers B1, R1 and R2 zoning districts | Effective; administered by Building Official with special permit by Zoning Board of Appeals with a site review committee | None |
| Lagoon Pond DCPC | Density restrictions; pier regulations | Lagoon Pond and inland 1500' | Effective; administered by Board of Health and Conservation Commission | None |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |
| | | | | |

EXISTING PROTECTION MATRIX TISBURY

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|---|---|---|--------------------------------|
| Town participation in the National Flood Insurance Program (NFIP) | Provides flood insurance for structures located in flood-prone areas | FEMA flood zones | Effective | None |
| Floodplain District Zoning Bylaw | Requires Flood Plain Permit for new construction, substantial improvement; addition of increased water, electric or septic systems to conform to rules and regs of Board of Health; alteration of landforms by Special Permit from ZBA; within V-Zone new construction to be located landward of Mean High Water; within AO zones residential structures elevated | Flood zones as shown on Flood Insurance Rate Map dated June 15, 1984 | Enforced by Building Official; effective | None |
| Coastal District DCPC (District of Critical Planning Concern) | height and construction standards for inland zone, including site plan review, may be modified by special permit from ZBA; no residential construction in shore zone; Special Permit by ZBA in shore zone for non-residential structures or for additions to existing residential structures ≤ 500 sf with no increase in plumbing or septic; septic 200' from salt water body; minimum separation 200' between septic; septic at least 5' above groundwater; septic 600' from public water supply and 200' from private well; private well 200' from salt water body; no road > 10' except by special permit | Below 10-foot contour or within 500' of MHW of ocean or pond > 10 acres, includes more lands around Lake Tashmoo and all of West Chop; excludes working waterfront; includes the shore zone, from MLW to 100' inland of the inland edge of beach or marsh grass and 100' inland of the crest of a bluff > 15' in height; the rest is the inland zone; excludes village waterfront | Effective but could use updating Island-wide administered by Board of Health, building inspector, special permit by ZBA | Needs updating Island-wide |
| Lagoon Pond DCPC | Density restrictions; pier regulations | Lagoon Pond and inland 1500' | Effective; administered by Board of Health and Conservation | None |

| | | | Commission | |
|----------------------------------|---|--|---|---|
| Cape Poge DCPC | Prohibits subdivision, non-municipal piers, more than one dwelling on a lot, use of turf chemicals; special permit from Planning Board for any development, includes site review | Cape Poge Bay, Poucha Pond and surrounding lands | Effective; administered by Building Official with special permit by Planning Board with a site review committee | None |
| Surface Water District | Site plan review and special permit from Planning Board for most uses requiring facilities such as piers | All town waters seaward of Mean High Water | Effective; administered by Planning Board | None |
| Vineyard Haven Harbor DCPC | Harbor Use Permit required for most uses | Vineyard Haven Harbor | Effective; administered by Board of Selectmen | None |
| Wild and Scenic North Shore DCPC | permitted uses- routine maintenance, uses such as recreational fishing and boating not involving the permanent placement of any new fill or structure; specially permitted uses - permanent placement of any fill or structure for municipal purposes or for purposes of commercial fishing, shellfishing or aquaculture; all other uses prohibited (including private piers) | waters and lands of north shore, lighthouse to lighthouse, extending 100' seaward from MLW | Effective | None |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |

EXISTING PROTECTION MATRIX WEST TISBURY

| Type of Existing Protection | Description | Area Covered | Effectiveness and/or Enforcement | Improvements or Changes Needed |
|---|--|--|---|--------------------------------|
| Town participation in the National Flood Insurance Program (NFIP) | Provides flood insurance for structures located in flood-prone areas | FEMA flood zones | Effective | None |
| Floodplain District Zoning Bylaw | Requires Flood Plain Permit for new construction, substantial improvement; addition of increased water, electric or septic systems to conform to rules and regs of Board of Health; alteration of landforms by Special Permit from ZBA; within V-Zone new construction to be located landward of Mean High Water; within AO zones residential structures elevated | Flood zones as shown on Flood Insurance Rate Map dated July 20, 1998 | Enforced by Building Official; effective | None |
| Coastal District DCPC (District of Critical Planning Concern) | height and construction standards for inland zone, including site plan review; no residential construction in shore zone; underground utilities except by special permit; special permit for road wider than 10'; special permit for alteration of bank or stream; perc test required for subdivision; for new lots average of 300' between septic or 5 per 1500' of shoreline; septic 200' from water body; septic at least 7' above groundwater if perc faster than 5 min/inch and 5' if slower than 5 min/inch; septic 600' from public water supply and 200' from well; separation well from saltwater body 200' | Below 10-foot contour or within 500' of MHW of ocean or pond or within 100' streams or wetlands draining into coastal ponds > 10 acres; includes the shore zone, from MLW to 100' inland of the inland edge of beach or marsh grass and 100' inland of the crest of a bluff > 15' in height; the rest is the inland zone | Effective but could use updating Island-wide' administered by Board of Health, Building Inspector, Special Permit by ZBA with site plan review by Plan Review Board | Needs updating Island-wide |
| Wild and Scenic North Shore DCPC | permitted uses- routine maintenance, uses such as recreational fishing and boating not involving the permanent placement of | waters and lands of north shore, lighthouse to lighthouse, extending 100' seaward from MLW | Effective | None |

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| | any new fill or structure; specially permitted uses - permanent placement of any fill or structure for municipal purposes or for purposes of commercial fishing, shellfishing or aquaculture; all other uses prohibited (including private piers) | | | |
| Dr. Fisher Mill DCPC | Special permit for alteration of mill; prohibits destruction or removal of any part of the mill or dam | Within 150' of Dr. Fisher Mill | Effective; administered by Planning Board | None |
| Fire Breaks in State Forest | Fire breaks maintained by grazing, brushbreaking, controlled burns | Within Manuel F. Correllus State Forest | DCR | Need continued management; this program could use some support |
| Fire-Wise Outreach | Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response | Martha's Vineyard | DCR | This program could use some support in order to reach more of the vulnerable homeowners |
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Section 7. Natural Hazard Mitigation Strategy

In developing the following Action Plan, the Community Hazard Mitigation Planning Team evaluated the hazard identification and analysis, the vulnerabilities and the existing protections to discover what goals and actions might be adopted to further lessen the impacts of natural hazards. The Team has chosen the term “community” to represent County-wide items, rather than the more ubiquitous “regional”, in order to better foster cooperation. The following goals were determined:

COMMUNITY (County-wide) GOALS:

OVERALL GOAL: To reduce the loss of or damage to life, property, infrastructure, and natural, cultural and economic resources from natural disasters.

- Protect critical public facilities and services from damage due to natural hazards.
- Ensure that critical infrastructure is protected from natural hazards.
- Promote strong natural shore defenses such as coastal beaches and dunes.
- Improve circulation for tidally restricted harbors, ponds and marshes.
- Develop programs and measures that protect residences and other structures from natural hazards.
- Develop mitigation strategies that consider area businesses, including marinas, and protect the economic vitality of the region.
- Protect and preserve irreplaceable cultural resources, particularly for recreation, located in hazard-prone areas.
- Implement a broad range of mitigation measures that protect the region’s vulnerable populations, critical facilities and infrastructure, and the cultural, recreational, environmental and economic resources, and reduce financial losses.
- Provide communities with information concerning hazard mitigation funding opportunities, and assist the communities in the identification and development of specific mitigation projects.
- Increase each town’s capacity for responding to a natural hazard event by promoting the adequate provision of emergency services capabilities.
- Increase awareness and support for natural hazard mitigation among municipalities, private organizations, and area residents through outreach and education.
- Discourage future development in vulnerable areas and encourage restoration of vulnerably-developed properties to more natural and defensible conditions or to open space.
- Reduce vulnerability to drought, by improving water supply infrastructure and by encouraging conservation measures such as low-maintenance landscaping.
- Reduce the premiums paid by businesses and residences for NFIP flood insurance.
- Increase coordination between the Federal, State, regional and local levels of government.
- Update and maintain the Plan as resources permit.

COMMUNITY (County-wide) MITIGATION ACTION ITEMS:

The Community Hazard Mitigation Planning Team developed actions and strategies intended to meet the Community Goals. The actions have been organized by project staff, as recommended in the MEMA Community Planning Guide, into categories as follows:

Categories:

Prevention: Activities including planning, zoning, District of Critical Planning Concern regulations, open space preservation, floodplain and wetland regulations, stormwater management, watershed protection measures and best management practices, erosion control, vegetation management for firewise strategies, and subdivision regulations

Protection: Activities including acquisition, building relocation, building elevation, flood-proofing and retrofitting, and insurance

Public information: Activities including providing informational mailings or workshops, education and technical assistance provided on disaster management and mitigation issues

Structural projects: Including dredging and beach nourishment, dune restoration, construction, maintenance of dams, floodwalls, channel improvements, drainage improvements, detention/retention basins

Emergency services: Including hazard recognition, emergency warning systems, emergency response, protection of critical facilities, and health and safety maintenance

Mitigation: those actions and projects which are in response to the April 2007 storm

The actions were categorized by staff of the Martha's Vineyard Commission and evaluated through a consensus-building process within the Community Hazard Mitigation Planning Team in order to establish priorities. Considerations used in evaluating priorities included: the relative expense compared to the benefits, the availability of funding, the timeframe involved in preparation and implementation, general feasibility and acceptability, and the need for institutional and interagency agreements.

Criteria for timeframe/prioritization:

Immediate or short-term: those projects or actions which can go forward with little or no cost, or for which a funding source or responsibility is easily identifiable. Immediate actions should go forward within one year; short term within 2-3 years

Long-term: generally more costly projects or actions involving lengthy permitting processes or establishment of complex infrastructure prior to implementation; requiring about 4 years or more

Ongoing: those actions which require application in everyday maintenance and decision-making

A number of abbreviations are used here to represent agencies and programs as follows:

| | |
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| MVC | Martha's Vineyard Commission |
| DCR | Department of Conservation and Recreation |
| USACOE | United States Army Corps of Engineers |
| FEMA | Federal Emergency Management Agency |
| MEMA | Massachusetts Emergency Management Agency |
| PDM | Pre-Disaster Mitigation |
| FMA | Flood Mitigation Assistance |
| HMGP | Hazard Mitigation Grant Program |
| NFIP | National Flood Insurance Program |
| WTGHA | Wampanoag Tribe of Gay Head (Aquinnah) |

PROPOSED COMMUNITY MITIGATION ACTIONS FOR ALL OF DUKES COUNTY

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|--------------------------------|---|--|----------------------------------|--|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation of storm surge waters, in order to minimize storm impacts; vegetation management for dune restoration | DCR, County, towns, USACOE, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, towns, County, USACOE |
| Prevention | Incorporate PDM plan proposals in other local and regional plans – Island Plan, master plans, transportation plans, open space plans, capital improvement programs, harbor plans; and DRI and MEPA reviews | MVC, Martha’s Vineyard towns, Island Plan Steering Committee, Joint Transportation Committee | Immediate, short-term, long-term | MVC, MassHighway |
| Prevention | Work with federal and state agencies and their contractors to develop improved mapping and estimates of structures located within the 100-year floodplain | MVC, towns, FEMA contractor, MEMA | Immediate (underway) | FEMA |
| Protection, emergency services | Flood-proof or relocate selected critical facilities in the floodplain (other than water-dependent uses) and flood-proof or remove/relocate selected repetitive-claim or otherwise vulnerable private facilities and residences, conversion to open space | Private and public owners | Short-term, long-term | FMA |
| Prevention | Review and possibly amend Coastal District and other overlay regulations for hazard mitigation | MVC, Martha’s Vineyard towns | Short-term | PDM planning |
| Prevention | Strengthen floodplain management and reduce flood insurance premiums by participating in the Community Rating System (CRS) | towns other than Chilmark, FHMP (MEMA) | Long-term | PDM planning, FMA |
| Structural, protection | Structural and non-structural retrofitting (e.g. storm shutters) of existing public or private structures | Private and public owners | Immediate, short-term | PDM |
| Emergency services | Generators and other retrofits for emergency shelters | Towns | Immediate | PDM |

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|--------------------|--|---|-----------------------|---------------------------------------|
| Structural | Reduce flood impacts by identifying stormwater systems that have potential to discharge hazardous materials in the event of a storm or flood and installing an emergency shut-off system in each of those systems | Commonwealth and towns | Immediate, short-term | MassHighway, towns, PDM, FMA |
| Structural | Reduce flood impacts by identifying and correcting discharges from town and Commonwealth roadways where they cross streams, including: Mill Brook (West Tisbury portion), Tiasquam (West Tisbury portion), Black Brook (Aquinnah and West Tisbury), Smith Brook (Tisbury) and Witch Brook (West Tisbury) | Commonwealth and town DPW's | Short-term | MassHighway, towns, PDM, FMA |
| Prevention | Map stormwater collection areas and discharges | Commonwealth and town DPW's, MVC | Immediate | MassHighway, MVC, towns, PDM planning |
| Prevention | Encourage the incorporation of Low Impact Development Techniques in local subdivision regulations | MVC, towns | Short-term | PDM planning |
| Prevention | Review and possibly revise local subdivision regulations for stormwater management to lessen the impacts of flooding | MVC, towns | Short-term | PDM planning |
| Public information | Encourage MassHighway and the towns to routinely clean and maintain drainage infrastructure | MassHighway, towns | Ongoing | MassHighway, towns |
| Prevention | In order to reduce the impacts of drought and wildfire, establish an overall management plan for the State Forest, including establishment of specific procedures or Memoranda of Agreement regarding the transfer of land for new public water supplies and for easements to install water supply lines | DCR and State Forest Advisory Committee | Short-term | DCR |
| Structural | In order to reduce the impacts of drought and wildfire, install new public water supplies and water supply lines within the State Forest | Town Water Departments and District | Short-term, Long-term | PDM |
| Structural | In order to lessen the impacts of drought and wildfire, establish plans and build infrastructure for water supply needs to alleviate future drought emergencies. The Towns of Tisbury and Oak Bluffs, nearly at buildout, should focus their attention on redundancy plans in response to potential emergencies such as drought. | Town Water Departments and District | Short-term, long-term | PDM |

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|--|--|-------------------------------------|----------------------------------|-------------------|
| | The Town of Edgartown has much greater needs for water supply beyond the capacity of the existing Edgartown wells, in addition to needs for redundancy to be prepared for emergencies such as drought | | | |
| Structural | Consider potential need for and options to provide water supply to areas with a development pattern that may not be compatible with continued private well water supplies, which may not be adequate in the event of emergencies such as drought and wildfire; build the necessary infrastructure. | Town Water Departments and District | Immediate, short-term, long-term | PDM |
| Structural, protection | Vegetation management to reduce the impacts of wildfire, including but not limited to the cutting, chipping and disposal (by shipment off-Island or by reuse as compost) of excess fuel materials in forests | DCR, private and public owners | Immediate | DCR, PDM |
| Prevention | Encourage the towns to revise local subdivision and building regulations to require fire-proof roofing materials in areas vulnerable to wildfire; and homeowners' association to include the same in covenants or in renewal of covenants, possibly including review by the Fire Chiefs. | Towns, MVC | Short-term | PDM planning |
| Public information | Encourage the towns and others to participate in the DCR/Fire Wise Program | DCR | Ongoing | DCR, PDM planning |
| Prevention, public information, structural | Educate public and private landowners and homeowners' associations concerning the importance of techniques for defensible space to reduce the risk of wildfire, such as utilization of low-maintenance native landscaping and removing fuel in forested areas; also consider issues of access to and through the developments for fire-fighting; fund implementation | DCR, MVC | Ongoing | DCR, PDM planning |
| Emergency services | Develop a dedicated on-Island fire cache that would allow prescribed fire teams to respond on very short notice and conduct preventive prescribed burns. | DCR | Short-term | PDM |
| Public information | Employ data-gathering (such as LIDAR), analysis and consensus-building to establish an Island-wide comprehensive plan for adaptations to climate change | MVC | Short-term | PDM |

COMMUNITY MITIGATION ACTIONS PROPOSED BY THE COUNTY OF DUKES COUNTY

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|------------------------|--|---|----------------------------------|--|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts, particularly beach nourishment at Joseph A. Sylvia State Beach; vegetation management for dune restoration | DCR, County, towns, USACOE, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, towns, County, USACOE |
| Public information | Establish a Dukes County Citizens Academy for the education of Martha's Vineyard residents, both full time and part time, in the areas of family and individual emergency preparation and response to natural and man-made hazards, including but not limited to hurricane preparedness, flood awareness, and wildfire risks. | County | Immediate | County, PDM planning |
| Emergency services | Establish an MOU with the public service entities of all island towns and the Wampanoag Tribe of Gay Head (Aquinnah) to provide incident support, whereby the Dukes County Emergency Management Agency would provide the services of the vehicles, manpower, and emergency management computer program services etc. that are owned or managed by the Dukes County Emergency Management Agency | County, towns, WTGHA | Short-term | County |
| Emergency services | Continue to support the Martha's Vineyard Medical Reserve Corps in partnership with the Island town Boards of Health, the Martha's Vineyard Hospital, the Wampanoag Tribe of Gay Head (Aquinnah), and the Cape & Islands Health Coalition and to continue to host the offices of the MVMRC | County, towns, WTGHA | Ongoing | County |
| Emergency services | Continue to work with the Island Boards of Health in their Emergency Dispensing Site and other program planning efforts for Pandemic outbreaks and other infectious disease outbreaks, both natural and man-made. | County | Ongoing | County |

TOWN ACTIONS:

**PROPOSED MITIGATION ACTIONS
FOR THE TOWN OF AQUINNAH**

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|------------------------|--|---|----------------------------------|--|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts; vegetation management for dune restoration | DCR, County, towns, USACOE, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, towns, County, USACOE |
| Emergency services | Generator and other retrofits for emergency shelter at Aquinnah Town Hall | Town of Aquinnah | Immediate | PDM |
| Structural | Reduce flood impacts by identifying and correcting discharges from town and Commonwealth roadways where they cross streams, including but not limited to: Black Brook in Aquinnah and a culvert on Lobsterville Road, where flooding is a known problem. The road surface at each crossing should be adjusted during repaving to divert as much runoff as possible into roadside vegetation before it reaches the road crossing. | Commonwealth and Town of Aquinnah | Short-term | MassHighway, towns, PDM, FMA |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF CHILMARK

(Note: Chilmark Does Not Participate In The National Flood Insurance Program)

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|------------------------|--|--|----------------------------------|---|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts | DCR, County, towns, USACOE, MassHighway | Immediate, short-term, long-term | DCR, MassHighway, towns, County, USACOE |
| Prevention | Incorporate PDM plan proposals in other local and regional plans – Island Plan, master plans, transportation plans, open space plans, capital improvement programs, harbor plans; and DRI and MEPA reviews | MVC, Martha’s Vineyard towns, Island Plan Steering Committee, Joint Transportation Committee | Short-term, long-term | MVC, MassHighway |
| Prevention | Work with federal and state agencies and their contractors to develop improved mapping and estimates of structures located within the 100-year floodplain | MVC, towns, FEMA contractor, MEMA | Ongoing | FEMA (FEMA does print NFIP maps for Chilmark) |
| Prevention | Review and possibly amend Coastal District and other overlay regulations for hazard mitigation | MVC, Town | Short-term | Local |
| Prevention | Map stormwater collection areas and discharges | Commonwealth and Town, MVC | Short-term | MassHighway, MVC, Town |
| Structural | Reduce flood impacts by identifying and correcting discharges from town and Commonwealth roadways where they cross streams, including: Mill Brook (Chilmark portion), Tiasquam (Chilmark portion), Fulling Mill Brook, Paint Mill Brook, and Roaring Brook (all in Chilmark) and unnamed stream flowing along portion of North Road that extends from the Menemsha Cross Road to Menemsha village. The road surface at each crossing should be adjusted during repaving to divert as much runoff as possible into roadside vegetation before it reaches the road crossing. | Commonwealth and town DPW’s | Short-term | MassHighway, Town |

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| Structural | Reduce flood impacts by identifying stormwater systems that have potential to discharge hazardous materials in the event of a storm or flood and installing an emergency shut-off system in each of those systems | MassHighway, Town | Short-term | MassHighway, Town |
| Structural | Reduce damaging volume of direct stormwater discharges to beaches and surface waters by infiltration of those segments of the systems where infiltration is possible back in the watershed, particularly in the vicinity of Menemsha. | MassHighway, Town | Long-term | MassHighway, Town |
| Prevention | Review and possibly revise local subdivision regulations for stormwater management to lessen the impacts of flooding | MVC, Town | Short-term | Local |
| Prevention | Encourage the incorporation of Low Impact Development Techniques in local subdivision regulations | MVC, Town | Short-term | Local |
| Prevention | Encourage MassHighway and the Town to routinely clean and maintain drainage infrastructure | MassHighway, Town | Ongoing | MassHighway, Town |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF EDGARTOWN

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|--|--|--|----------------------------------|---|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts; vegetation management for dune restoration | DCR, County, Town, USACOE, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, Town, County, USACOE |
| Structural, protection, emergency services | Retrofit two ferry landings for Chappaquiddick Ferry: a manual chain hoist for each side to raise or lower the transfer bridges in the event of storm-induced prolonged power outage | Private owner | Immediate | PDM |
| Structural, protection, emergency services | Retrofit Chappaquiddick Ferry facilities on both sides to lessen the impacts of storm damage: replace diesel fuel tank with flood-proof tank, anchor buildings on both sides, elevate electric circuits, emergency generators to power ramps and spotlights short-term | Private owner | Immediate | PDM, FMA |
| Structural | Purchase a redundant third boat for the Chappaquiddick Ferry in the event of storm damage, install a storm mooring for it in Caleb's Pond or other secure berth | Private owner | Long-term | PDM |
| Structural, protection | Install dolphins off corners of Chappaquiddick Ferry slips to fend off impact of rough landings due to vastly increased tidal flow following breach of Norton Point barrier beach | Private owner | Short-term | HMGP, PDM |
| Mitigation, structural | Repair storm damage to Chappaquiddick Ferry slips from increased impact of boats due to vastly increased tidal flow following breach of Norton Point barrier beach | Private owner | Immediate | HMGP |
| Structural | Reduce flood impacts by replacing culvert that currently restricts stormwater flow in and out of Trapp's Pond with one adequately sized and designed to lessen flood impacts | Commonwealth and Town | Short-term | MassHighway, PDM, FMA |

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| Structural | Reduce damaging volume of direct stormwater discharges to beaches and surface waters by infiltration of those segments of the systems where infiltration is possible back in the watershed | Town, MassHighway | Long-term | PDM, FMA |
| Prevention | In order to reduce the impacts of drought and wildfire, establish an overall management plan for the State Forest, including establishment of specific procedures or Memoranda of Agreement regarding the transfer of land for new public water supplies and for easements to install water supply lines | DCR and State Forest Advisory Committee | Long-term | DCR |
| Structural | In order to reduce the impacts of drought and wildfire, install new public water supplies and water supply lines within the State Forest | Town Water Department | Short-term, Long-term | PDM |
| Structural | In order to lessen the impacts of drought and wildfire, establish plans and build infrastructure for water supply needs to alleviate future drought emergencies. The Town of Edgartown has great need for water supply beyond the capacity of the existing Edgartown wells, in addition to needs for redundancy to be prepared for emergencies such as drought | Town Water Department | Short-term, long-term | PDM |
| Structural | Consider potential need for and options to provide water supply to areas with a development pattern that may not be compatible with continued private well water supplies, which may not be adequate in the event of emergencies such as drought and wildfire, particularly in the Arbutus Park, Ocean Heights and southern Katama Plains areas; build the necessary infrastructure. | Town Water Department | Short-term, long-term | PDM |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF GOSNOLD

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|------------------------|--|-------------------------------|----------------------------------|---------------------------------|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts; vegetation management for dune restoration | County, Town, USACOE | Immediate, short-term, long-term | PDM, HMGP, Town, County, USACOE |
| Structural, protection | Improve storm damage prevention for entrance to Cuttyhunk Harbor by extending the USACOE riprap by 1,000 ft along the southern/eastern stretch of Canapitsit barrier beach | USACOE | Immediate, short-term | USACOE, PDM |
| Structural | Improve access to critical harbor facilities in the event of a storm by dredging around the town-owned marina, probably an area that is 250x150 ft by 1 foot deep | Town | Immediate, short-term | PDM |
| Structural, protection | Retrofit/ replace existing Coast Guard dock (now owned by Town) for better access to critical harbor facilities in the event of a storm | Town | Long-term | PDM |
| Structural | Reduce flood impacts by identifying stormwater systems that have potential to discharge hazardous materials in the event of a storm or flood and installing an emergency shut-off system in each of those systems | Town | Immediate, short-term | Town, PDM, FMA |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF OAK BLUFFS

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|------------------------------------|--|---|----------------------------------|---|
| Structural, protection, mitigation | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and storm circulation, to protect infrastructure on shore and recreational/cultural beach facilities, in order to minimize storm impacts, particularly to reconfigure the dogleg jetty for better storm protection for Oak Bluffs Harbor, and to restore the beach between the harbor and south up to and including Inkwell Beach; vegetation management for dune restoration | DCR, County, Town, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, Town, County |
| Structural | Retrofit drainage in the vicinity of Waban Park/Inkwell Beach to prevent further beach erosion by stormwater discharge as occurred during the April 2007 storm | MassHighway | Immediate | PDM, HMGP, FMA |
| Structural | Reduce damaging volume of direct stormwater discharges to beaches and surface waters by infiltration of those segments of the systems where infiltration is possible back in the watershed | Town, MassHighway | Long-term | PDM, FMA |
| Structural | Reduce flood impacts by replacing culvert that currently restricts stormwater flow in and out of Farm Pond with one adequately sized and designed to lessen flood impacts | Commonwealth | Short-term | MassHighway, PDM, FMA |
| Structural, protection | Reconfiguration of armorment for vulnerable part of East Chop bluff for better storm damage protection, to protect the town-owned road at the top of the bluff | Private owner | Short-term, long-term | PDM |
| Prevention | In order to reduce the impacts of drought and wildfire, establish an overall management plan for the State Forest, including establishment of specific procedures or Memoranda of Agreement regarding the transfer of land for new public water supplies and for easements | DCR and State Forest Advisory Committee | Short-term | DCR |

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| | to install water supply lines | | | |
| Structural | In order to reduce the impacts of drought and wildfire, install new public water supplies and water supply lines within the State Forest | Town Water District | Short-term, Long-term | PDM |
| Structural | In order to lessen the impacts of drought and wildfire, establish plans and build infrastructure for water supply needs to alleviate future drought emergencies. The Town of Oak Bluffs, nearly at buildout, should focus its attention on redundancy plans in response to potential emergencies such as drought. | Town Water District | Short-term, long-term | PDM |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF TISBURY

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|--|---|--|----------------------------------|---|
| Structural, protection | Beach nourishment, dredging and structural reconfiguration of inlets and inlet protections to improve natural defenses and circulation, in order to minimize storm impacts, particularly to reconfigure the southern jetty at Lake Tashmoo to provide better protection for the town mooring field and private boatyard in the pond; vegetation management for dune restoration | DCR, County, Town, USACOE, MassHighway | Immediate, short-term, long-term | PDM, HMGP, DCR, MassHighway, Town, County, USACOE |
| Structural | Dredging in the harbor to provide better access to critical harbor facilities in the event of a storm and for storm damage prevention | Town, USACOE | Immediate, short-term | PDM (\$100,000) |
| Emergency Services | Homeland Security Training | DHS | Immediate | DHS (\$25,000) |
| Emergency Services | Police Department Search and Rescue Training | Town | Immediate | PDM planning (\$15,000) |
| Structural, protection, emergency services | Relocation of Fire/Ambulance Departments out of floodplain | Town | Short-term | FMA (\$5,000,000) |
| Emergency Services | Land purchase for new Emergency Services facility out of floodplain | Town | Short-term | FMA (1,800.000) |
| Structural, protection | Hardened utilities – electric lines on Main St, Union St. and Water St. | Town | Immediate (underway) | Town (\$2,000,000) |
| Emergency services | Generator for Tisbury School, which is the primary shelter in town | Town | Immediate | PDM (\$138,500) |
| Emergency services | Fire Department Water Vessel | Town | Immediate | Town, PDM (\$250,000) |

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| Emergency services | Chemical fire foam trailer | Town | Immediate | Town (\$250,000) |
| Structural | Reduce flood impacts by identifying and correcting discharges from town and Commonwealth roadways where they cross streams, including: Smith Brook in Tisbury. The road surface at each crossing should be adjusted during repaving to divert as much runoff as possible into roadside vegetation before it reaches the road crossing. | Town DPW | Immediate, short-term | Town, PDM, FMA |
| Structural | Reduce damaging volume of direct stormwater discharges to beaches and surface waters by infiltration of those segments of the systems where infiltration is possible back in the watershed | Town, MassHighway | Long-term | PDM, FMA |
| Prevention | In order to reduce the impacts of drought and wildfire, establish an overall management plan for the State Forest, including establishment of specific procedures or Memoranda of Agreement regarding the transfer of land for new public water supplies and for easements to install water supply lines | DCR and State Forest Advisory Committee | Short-term | DCR |
| Structural | In order to reduce the impacts of drought and wildfire, install new public water supplies and water supply lines within the State Forest | Town Water Department | Short-term, Long-term | PDM |
| Structural | In order to lessen the impacts of drought and wildfire, establish plans and build infrastructure for water supply needs to alleviate future drought emergencies. The Town of Tisbury, nearly at buildout, should focus its attention on redundancy plans in response to potential emergencies such as drought or wildfire. | Town Water Department and District | Short-term, long-term | PDM |
| Structural | Consider potential need for and options to provide water supply to areas with a development pattern that may not be compatible with continued private well water supplies, which may not be adequate in the event of emergencies such as drought and wildfire; build the necessary infrastructure. | Town Water Department | Short-term, long-term | PDM |

PROPOSED MITIGATION ACTIONS FOR THE TOWN OF WEST TISBURY

| Category of Action | Description of Action | Implementation Responsibility | Timeframe/Priority | Resources/Funding |
|--------------------|--|---|--------------------|---------------------------------------|
| Structural | Beach nourishment and dredging to improve natural defenses and circulation, in order to minimize storm impacts; vegetation management for dune restoration | Town | Long-term | PDM, Town |
| Structural | Reduce flood impacts by identifying and correcting discharges from Town and Commonwealth roadways where they cross streams, including: Mill Brook (West Tisbury portion), Tiasquam (West Tisbury portion), Black Brook (West Tisbury), and Witch Brook (West Tisbury). The road surface at each crossing should be adjusted during repaving to divert as much runoff as possible into roadside vegetation before it reaches the road crossing. | Commonwealth and Town | Short-term | MassHighway, Town, PDM, FMA |
| Structural | Consider potential need for and options to provide water supply to areas with a development pattern that may not be compatible with continued private well water supplies, which may not be adequate in the event of emergencies such as drought and wildfire; build the necessary infrastructure. | Town | Long-term | PDM |
| Prevention | In order to reduce the impacts of drought and wildfire, establish an overall management plan for the State Forest | DCR and State Forest Advisory Committee | Short-term | DCR |
| Structural | Work with DCR Office of Dam Safety, dam owners and the Town to ensure that significant hazard dams are inspected according to the prescribed schedule, that up-to-date evacuation plans are in place, and that needed repairs are implemented in a timely fashion. | Town, private owners | Ongoing | Town, private owners |
| Structural | Priester's Pond Dam The pond level should be recorded continuously so that water flow and spillway capacity can be | Town | Short-term | Town, PDM (annual cost about \$2,000) |

| | | | | |
|------------|---|--|------------|---|
| | <p>measured after every major storm event.</p> <p>An operation and maintenance manual should be developed.</p> <p>The brush on the entire dam should be cut yearly and the condition of the spillway and the masonry wall on the upstream face be determined and repairs made as necessary.</p> | | | |
| Structural | <p>Mill Pond Dam</p> <p>The brush on the upstream and downstream faces should be cut yearly and the condition of the spillway planks should be determined and replaced if necessary. (annual cost about \$2,000)</p> <p>Areas of potential erosion from road runoff should be protected with asphalt aprons.</p> <p>A simple static and seismic stability analysis of the dam should be done. (cost about \$5,000)</p> <p>An operation and maintenance manual should be developed.</p> <p>An emergency action plan for an alternative travel route should be prepared by the West Tisbury Emergency Planning Group.</p> | Town | Short-term | Town, PDM (annual cost of recommended analyses and maintenance about \$3,000) |
| Structural | <p>For Looks Pond Dam</p> <p>All saplings, vines and trees located on any part of the dam should be cut and removed from the site, especially near the primary and auxiliary spillways (the roots will rupture or crack the adjacent cement concrete). General or standard Dam Engineering practice calls for a tree-clear area extending 10 feet from the dam.</p> <p>Replace stoplogs within the auxiliary spillway</p> | Private owner | Short-term | PDM |
| Structural | <p>Work with the DCR Office of Dam Safety and the Town to ensure that DCR records are up-to-date and reflect work accomplished by the Town and private parties to inspect, repair, maintain and renovate dam structures.</p> | Town, private owners, DCR Office of Dam Safety | Ongoing | Town, private owners, DCR Office of Dam Safety |

Section 8. Plan Development

Staff from the Martha's Vineyard Commission began working with the Vineyard towns and Gosnold even before the project was really underway. MVC staff prepared and submitted an application for the important funding piece, and all the Boards of Selectmen endorsed the grant application. Funding for the project was awarded in December, 2005.

The first step was to assemble a planning team. Representatives from each town and from Dukes County were invited to participate. The seven towns reflect the independent spirit of the residents and are generally reluctant to form planning unions, although quick to respond cooperatively in emergency situations. Never the less, each of the seven towns and the County agreed to join in this effort and sent representatives. The kickoff meeting for that group took place in April 2006. Available materials were reviewed, and a draft work program was outlined.

Following the kickoff group meeting, MVC staff communicated one-on-one with town representatives while working on identification of hazards and critical facilities, primarily using MassGIS data. MVC staff followed that process with analysis to assess vulnerabilities.

Once the data had been digested and analyzed, it was time for the group to reconvene in order to review the findings and begin to formulate mitigation strategy. The planning group met in January 2007, reviewed the findings and established draft community goals and actions. Draft town actions were also presented to the town representatives with invitation to review and improve as needed.

Others were consulted and drawn into the planning process prior to release to the general public. John Varkonda, Superintendent of Manuel F. Correllus State Forest provided input regarding local wildfire management circumstances. The local electrical utility, NSTAR, was sent early drafts and invited to participate, but did not become involved. Potential goals and actions regarding electrical transmission were subsequently dropped from the draft.

The general public was presented with the findings and draft community goals and actions at 2 evening meetings, March 29, 2007 with a repeat on April 5. Both meetings were publicized on the MVC website www.mvcommission.org, on the widely-distributed MVC Extended Schedule, and in the calendar sections of the local newspapers. The April 5 presentation was part of a meeting that was later televised on the local government cable channel. Town actions were not presented, as those were still being reviewed by the towns.

MVC staff continued to work with the towns one-on-one on town actions, which were included in the draft plan that went into soft distribution in July. The draft plan was available on the MVC website, primarily for the towns to continue to refine the draft town actions. Later in July, a press

release, reported in the M.V. Times, announced availability of the draft plan for comment. None was received. Between June 28 and August 17, 2007, the draft plan was viewed on the website 119 times. The draft plan, complete with town actions, was presented at a public session on July 26, which was announced in the press coverage, on the MVC website and Extended Schedule. Comments were noted regarding specific facilities and vulnerabilities.

The draft plan began the non-local review process when submitted to MEMA representatives on August 20. The first draft was revised in accordance with MEMA comments and resubmitted on November 27.

MEETINGS AND PUBLIC SESSIONS

| DATE | MEETING OR CONTACT |
|------------------|--|
| 12/13/05 | MVC staff, staff from MEMA and DHS, staff from Dukes County met to discuss "crosswalk" and other project items |
| 4/27/06 | Kickoff meeting of planning group, including staff from MVC, emergency managers and others representing the Towns and County; review of available data and work plan |
| May-Dec. 2006 | one-on-one meetings and contacts between town personnel and MVC staff regarding mapping of critical facilities |
| 1/25/07 | Planning group met to review draft findings, community goals and actions |
| 3/29/07 | Public session to present draft findings, community goals and actions |
| 4/5/07 | Repeat of public session to present draft findings, community goals and actions |
| May-July 2007 | one-on-one contacts between MVC personnel and members of planning team to refine town actions |
| 6/28/07 | Draft plan available on MVC website |
| 7/26/07 | Public session to present draft plan |
| 8/20/07, 11/27/7 | Draft plans presented to MEMA for review |
| 5/13/08 | Final approval by FEMA |

Section 9. Implementation, Evaluation, Monitoring and Update

The action plan has a community (County-wide) component as well as outlining actions and projects to be undertaken by the individual towns. Both responsibility and potential funding sources have been noted, and it is understood that availability and securing of funding is very likely to affect the outcome of many of the proposals. Each action or project proposed in the action plan will be implemented by the party or parties noted in the action plan as being responsible. The action plan will be coordinated with other town and community priorities, as well as with mitigation goals of Commonwealth and federal agencies. Such coordination will improve access to technical assistance, provide broader support for implementation and reduce duplication of effort.

Hazard mitigation information from this plan is being included in the Island Plan currently being developed by the Island Plan Steering Committee, Work Groups and Network of Planning Advisors. <http://www.islandplan.org/> The maps are being used to help determine where future development should be encouraged or restricted. The actions will also be considered in the implementation phase of the Island Plan.

Hazard mitigation information from this plan has also been shared with the Dukes County Joint Transportation Committee for incorporation in the Regional Transportation Plan for Martha's Vineyard and to help prioritize TIP (Transportation Improvement Program) projects that will lessen the impacts of natural hazards.

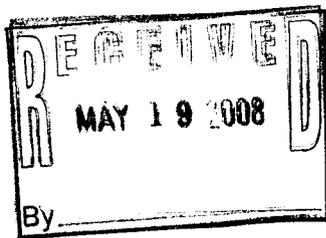
Hazard mitigation information from this plan is available to the town and county governments, who are encouraged to incorporate the findings in their local master plans, open space plans or harbor plans as they may be updated. The plan is available on the Martha's Vineyard Commission website <http://www.mvcommission.org/search.html>

Because the Martha's Vineyard Commission has been entrusted with development of this plan, the Commission will continue to take responsibility for evaluating, monitoring and updating the plan, using the following procedures:

- The Community Hazard Mitigation Planning Team will remain functional after adoption of the plan. Meetings of the Planning Team are open to the public and are advertized on the Commission website, where minutes are posted. Many of the meetings are televised on the local access station MVTV.
- The first evaluation will take place within one year, in the Fall of 2008, and will be performed by distributing a survey to the members of the Community Hazard Mitigation Planning Team, with a face-to-face meeting called as needed in accordance with the comments. The team and project staff will together review the status of actions, projects and funding options, as well as

note any new projects that may have become significant. Should the team find it necessary to update the plan, that will be done.

- Following the first year's evaluation, the plan will be evaluated at least every two years, with the next such evaluation to take place in the fall of 2010, and to be formally updated every five years, with the next such formal update to take place in 2013.
- Notwithstanding the scheduled evaluations and updates, the plan will be evaluated in the wake of a disaster, should one occur in Dukes County, and will be updated as needed in response to unexpected changes in conditions that may arise.



FEMA

May 13, 2008

Les Leland, Chairman
County of Dukes County
County Administration Building
P.O. Box 190
Edgartown, MA 02539

Dear Mr. Leland:

Thank you for the opportunity to review the Pre-Disaster Mitigation Plan for the County of Dukes County adopted on January 14, 2008. The Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) Region I has evaluated the plan for compliance with the Interim Final Rule published in the Federal Register on February 26, 2002 (44 CFR Parts 201 and 206). The plan satisfactorily meets all of the mandatory requirements set forth by the regulations. Congratulations on this achievement!

This plan approval extends to the following seven (7) participating jurisdictions that provided copies of their resolutions adopting the plan:

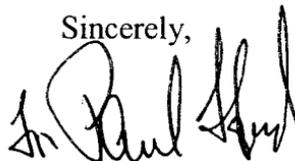
- Aquinnah
- Chilmark
- Edgartown
- Gosnold
- Oak Bluff
- Tisbury
- West Tisbury

With this plan approval, Aquinnah, Gosnold, West Tisbury, Oak Bluff, Edgartown, Tisbury, and West Tisbury are eligible to apply for Mitigation Grant Programs administered by FEMA. Please note, however; that all applicants applying for mitigation grant funding must be participating in the National Flood Insurance Program (NFIP) if they have been identified through the program as having a Special Flood Hazard Area (a Flood Hazard Boundary Map [FHBM] or Flood Insurance Rate Map [FIRM] has been issued). According to our records, Special Flood Hazard Areas were identified in the Town of Chilmark on December 6, 1974. In order to derive the full benefits of completing a local mitigation plan, we suggest that the Town of Chilmark's governing body consider the advantages of joining the NFIP.

The Pre-Disaster Mitigation Plan for the County of Dukes County must be reviewed, revised as appropriate, and resubmitted to FEMA for approval within five years of the **plan approval date** in order to maintain the eligibility to apply for mitigation project grants. Over the next five years, we encourage Dukes County and its participating jurisdictions to continue updating the plan's assessment of vulnerability, adhere to its maintenance schedule, and begin implementing, when possible, the mitigation actions proposed in the plan.

Once again, thank you for your continued dedication to public service demonstrated by preparing and adopting a strategy for reducing future disaster losses. Should you have any questions, please do not hesitate to contact Marilyn Hilliard at (617) 956-7536.

Sincerely,

A handwritten signature in black ink, appearing to read "Arthur W. Cleaves". The signature is stylized with a large initial "A" and "C".

Arthur W. Cleaves
Regional Administrator

Cc: Mark London, Executive Director, Martha's Vineyard Commission
Jo-Ann Taylor, Coastal Planner, Martha's Vineyard Commission
Carmille Rose, Chairman, Aquinnah Board of Selectmen
Warren M. Doty, Chair, Chilmark Board of Selectmen
Margaret E. Serpa, Chairman, Edgartown Board of Selectmen
Ginny Doran, Chairman, Gosnold Board of Selectmen
Kerry F. Scott, Chairman, Oak Bluffs Board of Selectmen
Thomas W. Pachio, Chairman, Tisbury Board of Selectmen
Glen R. Hearn, Chairman, West Tisbury Board of Selectmen

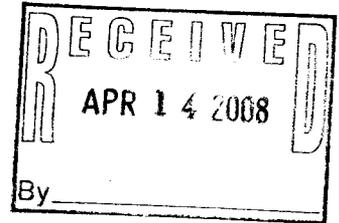
Enclosure



TEL. 508 645-2300
FAX 508 645-2310

TOWN OF AQUINNAH

65 STATE ROAD
AQUINNAH, MASSACHUSETTS 02535



April 8, 2008

Mr. Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th Floor
Boston MA 02210

Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its April 8, 2008 meeting, the Board of Selectmen voted officially to approve the plan.

Thank you.

Sincerely,

Jeffrey J. Burgoyne
Town Coordinator

TOWN CLERK
508-645-2304
ASSESSORS
508-645-2306

ACCOUNTANT
508-645-2305
BUILDING INSPECTOR
508-645-2307

TOWN COORDINATOR
508-645-2300
TAX COLLECTOR/TREASURER
508-645-2303

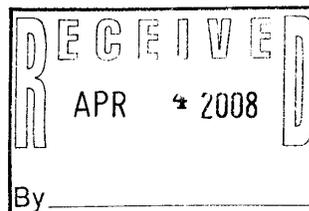


TOWN OF CHILMARK
CHILMARK, MASSACHUSETTS

TOWN OFFICES:
Beetlebung Corner
Post Office Box 119
Chilmark, MA 02535
508-645-2110 Fax

April 1, 2008

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th floor
Boston, MA 02210



Dear Mr. Cleaves:

This is to endorse the Pre-disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At their February 5, 2008 meeting the Chilmark Board of Selectmen voted officially to approve the plan.

Thank you.

Sincerely,

Warren Doty, Chairman



COUNTY OF DUKES COUNTY

County Administration Building
P. O. Box 190, Edgartown, MA 02539
508-696-3840, FAX 508-696-3841

COUNTY COMMISSIONERS

John S. Alley
Carlene Gattung
Tristan R. Israel
Leonard Jason, Jr.
Leslie H. Leland
Paul A. Strauss
Roger W. Wey

January 23, 2008

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th floor
Boston, MA 02210

Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its January 23, 2008 meeting, the Dukes County Commissioners voted officially to approve the plan.

Thank you.

Sincerely,

Les Leland, Chairman
Dukes County Commissioner

Roger Wey, Vice Chairman
Dukes County Commissioner

John Alley
Dukes County Commissioner
Leonard Jason, Jr.
Dukes County Commissioner
Tristan Israel
Dukes County Commissioner
Carlene Gattung
Dukes County Commissioner
Paul Strauss
Dukes County Commissioner



TOWN OF EDGARTOWN
OFFICE OF SELECTMEN

70 MAIN STREET, P.O. BOX 5158
EDGARTOWN, MASSACHUSETTS 02539-5158

TELEPHONE
(508) 627-6180

FAX
(508) 627-6123

January 14, 2008

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region I Office
99 High Street, 6th floor
Boston, MA 02210

Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its January 14, 2008 meeting, the Board of Selectmen voted officially to approve the plan.

Thank you.

Sincerely,

Margaret E. Serpa, Chairman

Arthur Smadbeck

Michael J. Donaroma
BOARD OF SELECTMEN

Town of Gosnold

CUTTYHUNK ISLAND
MASSACHUSETTS 02713

March 28, 2008

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High St. 6th Floor
Boston, MA 02210

Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its March 28, 2008 meeting, the Gosnold Board of Selectmen officially approved the plan.

Sincerely,

A handwritten signature in black ink, appearing to read "Virginia Doran". The signature is fluid and cursive, with the first name "Virginia" written in a larger, more prominent script than the last name "Doran".

Virginia Doran
Gosnold Board of Selectmen/Chair



TOWN OF OAK BLUFFS

Post Office Box 1327 • Oak Bluffs, MA 02557
Telephone 508-693-3554 • Fax 508-696-7736

Board of Selectmen

Kerry Scott, *Chairman*
Gregory A. Coogan
Ronald L. DiOrio
Duncan Ross
Roger W. Wey

Michael M. Dutton
Town Administrator

March 12, 2008

COPY

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th floor
Boston, MA 02210

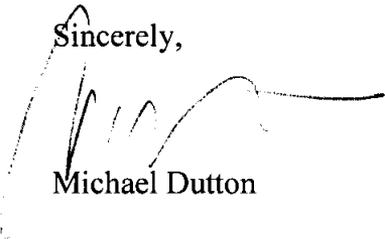
Re: Dukes County Pre-Disaster Mitigation Plan

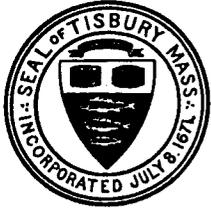
Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its March 11, 2008 meeting, the Board of Selectmen voted officially to approve the plan.

Please feel free to call with any questions or concerns.

Sincerely,


Michael Dutton



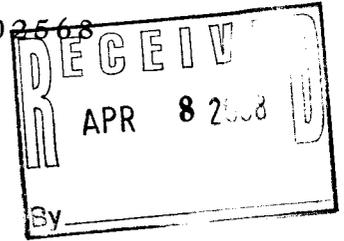
TOWN OF TISBURY

OFFICE OF THE SELECTMEN

BOX 1239 - 51 SPRING STREET
VINEYARD HAVEN, MASSACHUSETTS 02568

TEL: (508) 696-4200

FAX: (508) 693-5876



March 28, 2008

Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th Floor
Boston, MA 02210

Re: Endorsement of Pre-Disaster Mitigation Plan for the County of Dukes County

Dear Mr. Cleaves:

Please be advised that the Tisbury Selectmen at their meeting on February 12, 2008 voted to endorse the Pre-Disaster Mitigation Plan for the County of Dukes County as prepared on our behalf by the Martha's Vineyard Commission.

I regret the delay in providing this information to you and trust that this letter of approval will qualify the Town of Tisbury under the terms of the Homeland Security Act for applicable grants.

Sincerely yours,

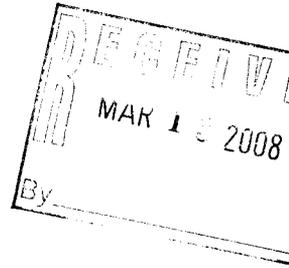
Thomas W. Pachico
Chairman, Board of Selectmen

Cc: Jo-Ann Taylor, Planner
Martha's Vineyard Commission

(*Texted copy on 4/3/08*)



Town of West Tisbury
Board of Selectmen
West Tisbury, MA 02575



March 6, 2008

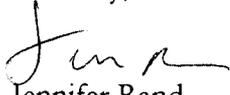
Arthur Cleaves
Regional Administrator
Federal Emergency Management Agency
Region 1 Office
99 High Street, 6th floor
Boston, MA 02210

Re: Pre-Disaster Mitigation Plan for Dukes County

Dear Mr. Cleaves:

This is to endorse the Pre-Disaster Mitigation Plan for Dukes County prepared on our behalf by the Martha's Vineyard Commission. At its March 5, 2008 meeting, the Board of Selectmen voted officially to approve the plan.

Sincerely,


Jennifer Rand
Executive Secretary

Cc. J. Taylor - MVC