

Strengths that help mitigate impacts - examples

INFRASTRUCTURE

SOCIETAL

ENVIRONMENTAL

Critical road elevated and passable by emergency management
Hurricane roof installed at school with improved sheltering capacity.
Hardened utility lines reduce outages due to ice storms.
Undersized culvert replaced to reduce flooding in key intersection.

Reliable communications protocols across departments for all employees.
"Neighbor-helping-neighbor" program aligned with emergency operations.
Faith-based and civic groups with hazard preparedness plans.

Oyster reefs and tidal wetlands help reduce wave damage to property.
Forested watersheds maintain drinking water supply during droughts.
Native, vegetated slopes remain stable after intense 24hr rain events.
Floodplains provide stormwater storage and downstream flood reduction

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What Types of Actions Could We Take?

Engineering/Construction
Protection/Conservation
Retreat/Avoidance
Preparations/Planning
Policy/Regulatory Changes
[Short-term, Long-term, ongoing]



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Some Recommendations From Hazard Mitigation Plan for Tisbury

Improve natural defenses to minimize storm impacts (e.g., beach nourishment, dredging, structural reconfiguration of inlets)

Retrofit sewer pump stations to increase storm resiliency

Reduce flood impacts by identifying and correcting discharges from town and Commonwealth roadways

Reduce damaging volume of direct stormwater discharges to beaches and surface waters by infiltration

Increase capacity in adaptation to climate change, by incorporating 25-year storm calculations rather than 10-year volume into regulations and public infrastructure planning

Make long-range plans for public roads vulnerable to Sea Level Rise working with the Joint Transportation Committee

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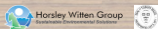
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The Plan for Today – share your thoughts

- Presentation to **set the stage** for our discussion
- Determine which **climate change natural hazards** to focus on
- Identify the most **vulnerable features** in Tisbury
- Identify the **features that provide strength**
- Develop **actions** – what can the Town do to address vulnerabilities and protect/enhance strengths
- Prioritize the **most important actions** for Tisbury

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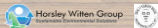


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Ground Rules for Discussions

- Share the stage:** Everyone should have an equal opportunity to talk.
- Focus:** Focus on the questions asked and your group's discussion.
- Land the Plane:** Respect limited time.
- Respect:** Listen, be honest, and avoid criticizing others' ideas.
- One mic:** One person speaks at a time.
- Phone etiquette.** Phones are off or on vibrate, take calls in the hall.

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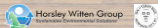


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Thank You!

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Tisbury Municipal Vulnerability Preparedness (MVP) Grant Project:
CLIMATE CHANGE PROJECTIONS¹

TEMPERATURE

HIGHLIGHTS:

- ✓ Temperature increases could make Tisbury feel like present-day Maryland by 2050 and present-day North Carolina by 2100.²
- ✓ By 2050, we could have more than 3 – 11 times as many very hot days (over 90°F) than we do today. By 2100, we could have almost 4 – 32 times as many.
- ✓ We will have far fewer days with temperatures below freezing.
- ✓ We will have to expend less energy on heating in the winter, and far more on air conditioning in the summer.
- ✓ The growing season will increase by almost 40% by 2050 and could almost double by the end of the century.

Table 1: TEMPERATURE PROJECTIONS

Martha's Vineyard Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
Average Annual Temperature (°F)	50.6	53.0 – 55.8	53.6 – 59.7
Maximum Annual Temperature (°F)	58.8	61.0 – 63.9	61.6 – 67.7
Minimum Annual Temperature (°F)	42.3	44.9 – 47.6	45.6 – 51.4
Annual Days with Max Temp over 90°F	1	3 – 11	4 – 32
Annual Days with Min Temp below 32°F	105	80 – 94	42 – 82
Annual Heating Degree-Days (Base 65°F)	5772	4,481 – 5,116	3,703 – 5,003
Annual Cooling Degree-Days (Base 65°F)	486	753 – 1,075	848 – 1628
Annual Growing Degree-Days (Base 50°F)	2,553	3,046 – 3,622	3,201 – 4,574

¹ Source: Northeast Climate Science Center, 2018. *Massachusetts Climate Change Projections*. University of MA Amherst. Published by MA Executive Office of Energy and Environmental Affairs. January. 213 p. Available at:

<http://www.massclimatechange.org/resources/resource::2152/massachusetts-climate-change-projections-statewide-and-for-major-river-basins>. Data is for the Martha's Vineyard Basin, which includes the land area of Tisbury.

² NOAA National Centers for Environmental Information, Climate at a Glance: Statewide Mapping, Average Temperature, published September 2018 from <http://www.ncdc.noaa.gov/cag/>.

PRECIPITATION

HIGHLIGHTS:

- ✓ Average annual precipitation in Tisbury will increase up to 8% by 2050 and up to 11% by 2100.
- ✓ The largest increases in precipitation will occur in winter.
- ✓ The greatest increase in consecutive dry days will occur in the summer and fall.

Table 2: PRECIPITATION PROJECTIONS

Martha's Vineyard Basin Climate Parameter	Baseline (1971-2000)	Mid-Century (2050s)	End of Century (2090s)
<u>Total Precipitation (inches):</u>			
Annual	46.0	45.0 – 49.8	45.3 – 50.9
Winter	11.9	11.5 – 13.5	11.7 – 14.7
Spring	12.1	11.6 – 13.9	11.9 – 14.3
Summer	10.4	9.3 – 11.9	8.5 – 12.0
Fall	11.7	10.5 – 12.6	9.8 – 12.9
Annual Days with Precipitation over 1 inch	7	8 – 11	8 – 11
Annual Days with Precipitation Over 2 inches	1	1 – 2	1 – 2
Annual Days with Precipitation Over 4 inches	<1	<1	<1
Annual Consecutive Dry Days	18	18 – 20	17 – 22

SEA LEVEL RISE

Table 3: SEA LEVEL RISE PROJECTIONS

Year	Emissions Scenario	Boston Likely Range (feet relative to mean sea level in 2000)	Woods Hole Likely Range (feet relative to mean sea level in 2000)
2050	Medium	0.8 to 1.4	0.8 to 1.5
	High	0.8 to 1.5	0.9 to 1.6
2100	Medium	1.5 to 3.1	1.6 to 3.2
	High	2.0 to 4.0	2.1 to 4.1



Tisbury Municipal Vulnerability Preparedness (MVP) Grant Project:
SELECTED DEMOGRAPHIC DATA¹

Demographic Parameter	Result
Population	3,949 people
Age	0-19 = 20% 20-34 = 25% 35-64 = 41% 65+ = 14%
Income	<\$40K = 42% \$40-60K = 18% \$60K+ = 40%
% Below Poverty Line	10%
Race	White = 87% Black = 7% Asian = 1% Other = 5%
Ethnicity	Hispanic = 0% Not Hispanic = 100%
Percent of Population over 65 Living Alone	4.8
Environmental Justice	17.6%
Heart Attack Hospitalizations	48.8 (age-adjusted rate per 10,000 people)
Asthma Emergency Department Visits	128.8 (age-adjusted rate per 10,000 people)
Pediatric Asthma Prevalence	12.9% of all children enrolled in grades K-8
Heat Stress Emergency Department Visits	0.0 (age-adjusted rate per 10,000 people)

¹ Source: MA Dept of Public Health, 2018. MA Environmental Public Health Tracking Community Profile for Tisbury. Report Created on September 27, 2018. 11 pages.

Risk Matrix: Examples of Features that may be identified in this process:

INFRASTRUCTURE

Examples of Vulnerabilities:

- Main road floods during storms, blocking emergency response.
- Power outages during heat waves lead to health concerns.
- Wildfire and high winds resulting in supply chain interruptions.
- Sewer pump stations become submerged and inoperable.

Examples of Strengths:

- Critical road elevated and passable by emergency management
- Hurricane roof installed at school with improved sheltering capacity.
- Hardened utility lines reduce outages due to ice storms.
- Undersized culvert replaced to reduce flooding in key intersection.
- Improvement to communication systems during extreme weather.

SOCIETAL

Examples of Vulnerabilities:

- Senior housing without backup generators during heat waves.
- Residents without access to transportation during hurricane evacuation.
- Household contamination and sewage mobilization during flooding.
- Limited areas of refuge in elementary schools during severe weather.

Examples of Strengths:

- Reliable communications protocols across departments for all employees.
- “Neighbor-helping-neighbor” program aligned with emergency operations.
- Well-supported volunteer organizations (fire, ambulance, CERTs).
- Faith-based and civic groups with hazard preparedness plans.

ENVIRONMENTAL

Examples of Vulnerabilities:

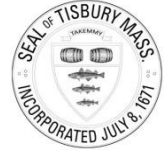
- Beachfront development reducing protection provided by dunes.
- Proliferation of subdivisions in flood prone areas.
- Lack of urban tree canopy increasing heat island effect.

Examples of Strengths:

- Oyster reefs and tidal wetlands help reduce wave damage to property.
- Forested watersheds maintain drinking water supply during droughts.
- Native, vegetated slopes remain stable after intense 24hr rain events.
- Floodplains provide stormwater storage and downstream flood reduction



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Sustainable Environmental Solutions



Tisbury Municipal Vulnerability Preparedness (MVP) Grant Project:

KEY RECOMMENDATIONS FROM 2015 HAZARD MITIGATION PLAN

CATEGORY OF ACTION	RECOMMENDATION	HAZARD
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.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge
Structural	Dredging in the harbor to provide better access to critical harbor facilities in the event of a storm and for storm damage prevention.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge
Structural	Retrofit main sewer pump station and generator in town parking lot on Water St. for storm resiliency and sea level rise.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Structural	Retrofit sewer pump station in Steamship Authority (SSA) lot for resiliency.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Prevention	Develop a prognosis and suitable plan for Beach Road and the adjacent seawall.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Prevention	Ensure that outdoor storage materials are secured from creating a flood hazard.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
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.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding

Attachment B: Workshop Handouts

CATEGORY OF ACTION	RECOMMENDATION	HAZARD
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	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
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.	Drought, Fire
Structural	In order to reduce the impacts of drought and wildfire, install new public water supplies and water supply lines within the State Forest	Drought, Fire
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.	Drought, Fire
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.	Drought, Fire
Structural, prevention	Increase capacity in adaptation to climate change, by incorporating 25-year storm calculations rather than 10-year volume into regulations and public infrastructure planning.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Adaptation	Work with the Joint Transportation Committee to make long-range plans for public roads vulnerable to Sea Level Rise.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding

SOURCE: Hazard Mitigation Plan For Seven Towns in Dukes County 2015

EXISTING PROTECTIONS FROM 2015 HAZARD MITIGATION PLAN

TYPE OF EXISTING PROTECTION	DESCRIPTION	HAZARD
Town participation in the National Flood Insurance Program (NFIP)	Provides flood insurance for structures located in flood-prone areas.	Hurricanes and Nor'Easters, Coastal Flooding, Storm Surge, Intense Rain/Flooding
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.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
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 nonresidential 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.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Lagoon Pond DCPC	Density restrictions; pier regulations.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Fire Wise Outreach	Outreach and response person on Martha's Vineyard 24/5; outreach to groups and available for response.	Fire
Structural protection, emergency services	Relocation of Fire/Ambulance Departments out of floodplain	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Emergency Services	Land purchase for new Emergency Services facility out of floodplain.	Hurricanes and Nor'Easters, Sea Level Rise, Coastal Flooding, Storm Surge, Intense Rain/Flooding
Structural, protection	Hardened utilities – electric lines on Main St, Union St., Beach St., and Water St.	All Hazards
Emergency Services	Generator for Tisbury School, which is the primary shelter in town.	All Hazards
Emergency Services	foam trailer for fighting ethanol-based fires.	Fire

SOURCE: Hazard Mitigation Plan For Seven Towns in Dukes County 2015

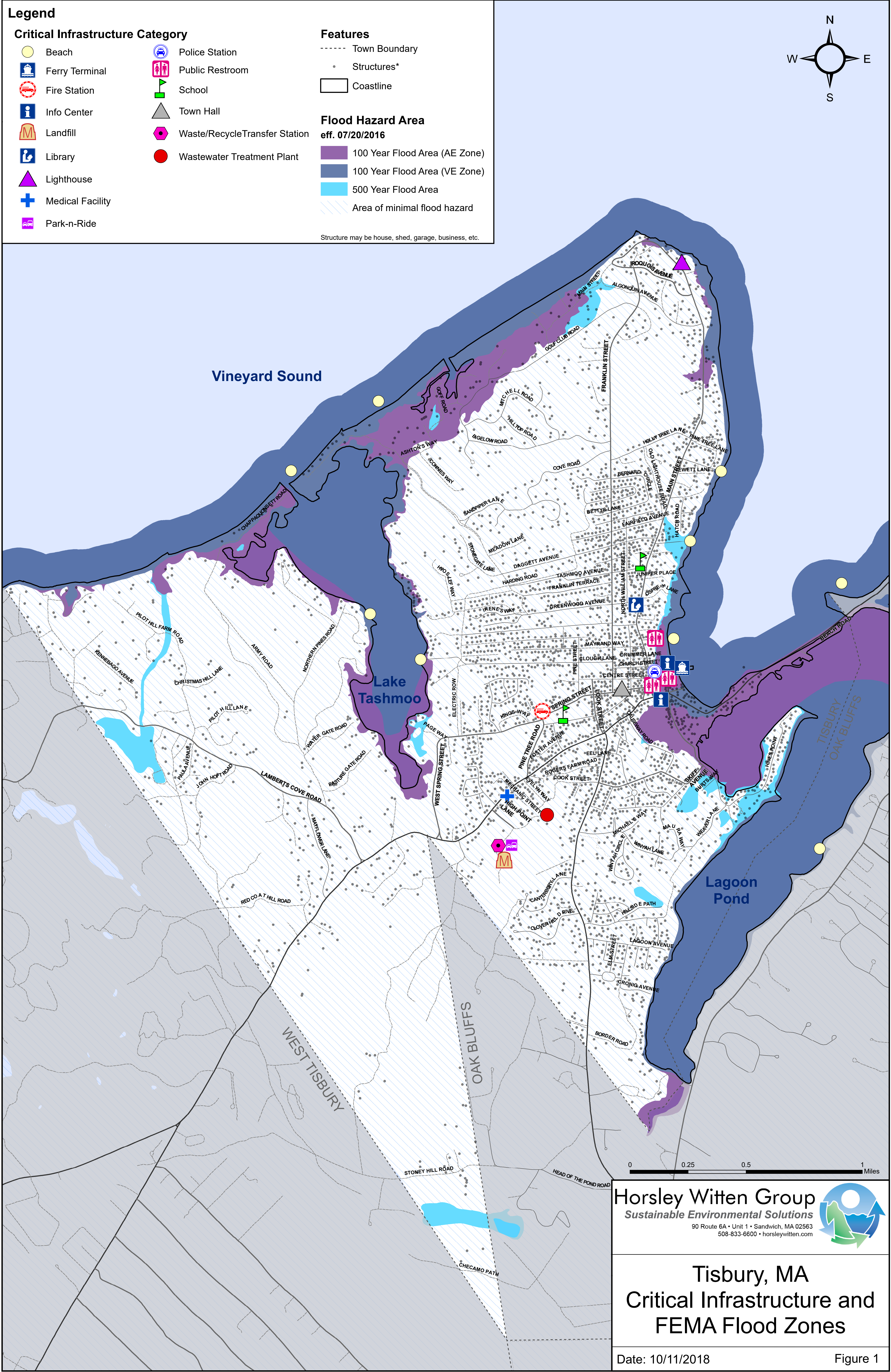
COUNTY WIDE GOALS FROM 2015 HAZARD MITIGATION PLAN

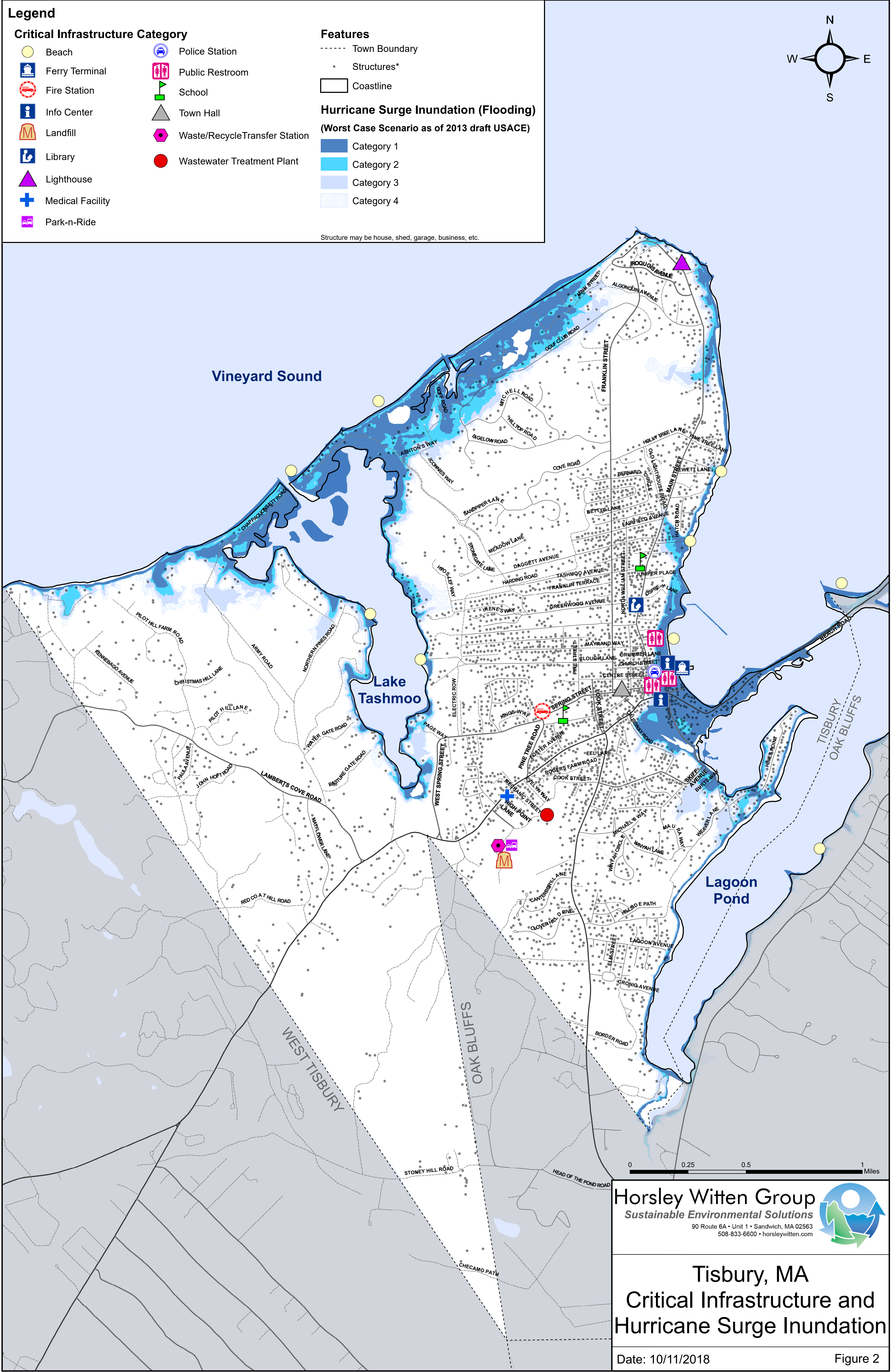
- Protect critical public facilities and services from damage due to natural hazards.
- Ensure that critical infrastructure is protected from natural hazards.
- Promote strong natural shore defenses such as coastal beaches and dunes.
- Improve circulation for tidally restricted harbors, ponds and marshes.
- 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.
- Support the 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.
- Support greater resiliency by developing and implementing climate change adaptation strategies.

SOURCE: Hazard Mitigation Plan For Seven Towns in Dukes County 2015

Attachment C: Tisbury Base Maps

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