2019

Mashpee Wampanoag Tribe Multi-Hazard Mitigation Plan

Mashpee Wampanoag Tribe Multi-Hazard Mitigation Plan

Mashpee, Massachusetts

Acknowledgements

Charlie Baker – *Governor*

Massachusetts Emergency Management Agency

Samantha Phillips – *Director*

Members of the Mashpee Wampanoag Tribe

Hazard Mitigation Committee

Nelson Andrews Jr., Emergency Management Director

Chuckie Green, Natural Resources Director

Shelley Tobey, Housing Director

Unique A. Lopes Forde, Public Health Director

Willard Pocknett, Facilities Director

Kevin Frye, Police Chief

David Weeden, Historic Preservation Director

Trish Keliinui, Public Information Officer

Rachel Fleck – MEMA Region 2 Representative

Craig Pereira, Consultant – Horsley Witten Group, Inc.

Formal Adoption Letter
(Tribal Council)
Comes after FEMA approval of DRAFT

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Section 1 Introduction

1.1 Overview

Hazard mitigation is defined by the Federal Emergency Management Agency (FEMA) as "any sustained action taken to reduce or eliminate long-term risk to human life and property from a hazard event." The results of a three-year, congressionally mandated independent study to assess future savings from mitigation activities provides evidence that mitigation activities are highly cost-effective. On average, each dollar spent on hazard mitigation saves the nation an average of $6 in future disaster costs in addition to saving lives and preventing injuries (National Institute of Building Science Multi-Hazard Mitigation Council 2017).

Hazard mitigation planning is the process of determining how to reduce or eliminate the loss of life and property damage resulting from natural, human-caused, and technologic hazards such as floods, earthquakes, hurricanes, biological, chemical, or infrastructure failure. Hazard mitigation means to permanently reduce or alleviate injuries or the loss of life and property resulting from multi-hazards through long-term strategies. These long-term strategies include planning, policy changes, programs, projects, and other activities.

This plan update was prepared pursuant to the requirements of the Disaster Mitigation Act of 2000 (Public Law 106-390) and the implementing regulations set forth by the Interim Final Rule published in the *Federal Register* on February 26, 2002 (44 CFR §201.6) and finalized on October 31, 2007 (hereafter, these requirements and regulations will be referred to collectively as the Disaster Mitigation Act). The *Tribal Mitigation Plan Review Guide*, used by FEMA to assess tribal governments' mitigation plans in a fair and consistent manner and to ensure that approved tribal mitigation plans meet the requirements of the Robert T. Stafford Disaster Relief and Emergency Act (Public Law 93-288), was also utilized as a guide in developing the plan.

The Mashpee Wampanoag Emergency Management Director Nelson Andrews Jr., in collaboration with the Tribal Emergency Response Task Force, provided the lead in soliciting the participation of Tribal departments, state agencies, and other stakeholders to form the Mashpee Wampanoag Tribal Hazard Mitigation Committee (THMC) and undertaking a comprehensive planning process to create the 2019 plan. The Mashpee Wampanoag Tribe, with the assistance of the Horsley Witten Group, Inc. (HW), developed this Multi-Hazard Mitigation Plan with funds provided through a Pre-Disaster Mitigation grant from the Massachusetts Emergency Management Agency (MEMA). Tribal input on assets, vulnerabilities, preferred mitigation strategies, and the plan was also solicited throughout the evolution of the project. As a result, this plan represents the work of Tribal members, elected officials, and other interested stakeholders within the Mashpee Wampanoag Tribe's service area. This plan demonstrates

the Tribe's commitment to reducing risks from hazards and serves as a tool to help decision makers direct and coordinate mitigation activities and resources, including local land use policies.

1.2 What Hazard Mitigation Can Do for the Mashpee Wampanoag Tribe

A primary benefit of hazard mitigation is that preventative measures taken now can significantly reduce the cost of post-disaster cleanup tomorrow. In addition, mitigation actions conducted before hazards occur greatly reduces the impact and costs associated with the aftermath of a hazard event. By planning, the Tribe will minimize the economic and social disruption that can result from floods, snowstorms, and hurricanes and other natural disasters.

The adoption and implementation of this plan update will assist the Tribe in becoming eligible to receive assistance from FEMA in both pre- and post-disaster assistance such as: FEMA's Community Rating System (CRS), FEMA's Pre-Disaster Mitigation Program (PDM), Flood Mitigation Assistance (FMA) Program, and FEMA's Post-Disaster Hazard Mitigation Grant Program (HMGP).

1.3 Mashpee Wampanoag Tribe's Mission Statement

The purpose of the Mashpee Wampanoag Tribal Multi-Hazard Mitigation Plan is to preserve and enhance the quality of life, property values, and historic/cultural resources and traditions by identifying all potential natural hazards impacting the Tribe and mitigating their effects to reduce the loss of life, as well as, losses of economic, natural, historical, and cultural resources.

1.4 Goals

The THMC met to develop goals for the 2019 plan and determined that more broad-brush goals would be appropriate. The goals of the Tribal Multi-Hazard Mitigation Plan are to:

1. Protect the Tribal health, safety and welfare.
2. Reduce Tribal property damages caused by hazard impact.
3. Minimize social distress and economic losses/disruption.
4. Provide an ongoing forum for the education and awareness of natural hazard mitigation issues, programs, policies, projects and resources.

1.5 Planning Process

A hazard mitigation plan should be considered a living document that must grow and adapt, keeping pace with a community's growth and change. The DMA of 2000 places high priority on the continuation of the planning process after the initial submittal, requiring communities to seek and receive re-approval from FEMA in order to remain eligible for assistance. The evaluation, revision and

update process are also a means to create an institutional awareness and involvement in hazard mitigation as part of daily activities.

The Mashpee Wampanoag Tribe, with the assistance of the Horsley Witten Group, Inc. (HW) developed this Multi-Hazard Mitigation Plan.

Members of the Mashpee Wampanoag THMC include:

- Nelson Andrews Jr., Emergency Management Director
- Chuckie Green, Natural Resources Director
- Shelley Tobey, Housing Director
- Unique A. Lopes Forde, Public Health Director
- Willard Pocknett, Facilities Director
- Kevin Frye, Police Chief
- David Weeden, Historic Preservation Director
- Trish Keliinui, Public Information Officer
- Rachel Fleck – MEMA Region 2 Representative
- Craig Pereira, Consultant – Horsley Witten Group, Inc.

The Horsley Witten Group, Inc. (HW) conducted a series of meetings from May 2019 through October 2019 with the Mashpee Wampanoag THMC, Tribal elected officials and members, and representatives of the MEMA. The Tribal workshops were held in an open public forum and in accordance with M.A.G.L. c. 30A, Sections 18 - 25 in complying with the requirements of the Federal Disaster Mitigation Act of 2000 (DMA 2000), as part of the Tribal General Assembly meetings that occur the second Sunday of each month.

A project webpage was designed and hosted on the Tribe's website to announce the project, inform and engage the Tribe before, during and after plan development, and to serve as a repository of project documents, presentations, and summaries. A PDF of the project webpage layout is included in Appendix B.

A series of Tribal interviews (in-person, telephone and email correspondence) were conducted early in the update process for the development of the 2019 Multi-Hazard Mitigation Plan and preliminary identification of mitigation measures for consideration in the plan.

<u>Interviews:</u>

- Dale Oakley (for Chuckie Green, Natural Resources Director)
- Unique A. Lopes Forde, Public Health Director
- Willard Pocknett, Facilities Director
- Kevin Frye, Police Chief
- David Weeden, Historic Preservation Director

The THMC first met on April 26, 2019 to review the project scope and revised schedule, discuss project coordination, review proposed layout for the plan, and

discuss the plan's mitigation measures layout (utilization of hazard mitigation categories) and identification of risks content (to include climate change).

The first Tribal Workshop was held on June 9, 2019 during the Tribe's monthly General Assembly meeting. The meeting was held at the Tribal Government Center. Announcements were sent via email and posted in the June 2019 edition of the Mittark (monthly newsletter). The presentation included an overview of the project's scope of work, why plan for hazard mitigation, the hazard mitigation process, and preliminary hazards classification and probability. Tribal members were provided the opportunity to comment and ask questions. A complete set of meeting materials is included in Appendix B.

The THMC met for a second time on June 14, 2019 to confirm the THMC membership, review the revised project schedule, review data collection needs and discuss the Tribal outreach approach. A complete set of meeting materials is included in Appendix B.

The THMC met for a third time on September 6, 2019 to discuss development of the mission statement and goals for the plan, review the risk assessment, capability assessment and to initiate considerations for mitigation actions for inclusion in the plan. A complete set of meeting materials is included in Appendix B.

The THMC met for a fourth time on October 11, 2019 to conduct the Benefit Cost Analysis (BCA review). The Project Consultant reviewed the draft 2019 Mitigation Actions (Table 4-1). The THMC completed the BCA review to prioritize/rank the action items, assigned time frames and responsible parties, and agreed on the proposed methodology/schedule for plan maintenance and plan update (based on FEMA requirements). A complete set of meeting materials is included in Appendix B. The Tribal Council will adopt through resolution, the *Mashpee Wampanoag Tribe Multi-Hazard Mitigation Plan* following 'Approved Pending Adoption' status from FEMA.

The second Tribal Workshop was held on October 13, 2019 during the Tribe's monthly General Assembly meeting. Announcements were sent via email and posted on the project webpage. The meeting was held at the Tribal Government Center and included a review of the process to date, in addition to the mitigation actions for inclusion in the plan. A full set of meeting materials are included in Appendix B.

<u>Online Survey</u>

The survey link was opened and available beginning August 19, 2019 and closed on September 27, 2019 and included a total of ten responses. A brief summary of responses collected is included below. The full Survey Summary is included in Appendix B.

- Most respondents have experienced winter, wind, and extreme temperature-related hazard events in the past 20 years;
- Almost half (45%) of respondents feel they are adequately prepared to deal with a natural hazard event, with most getting their information from local news/social media or informational brochures (80%);
- Most respondents are equally 'Very Concerned' with winter and wind-related hazards (67% and 60% respectively), followed by extreme temperature and fire-related hazards (both at 44%);
- Approximately half of respondents are unsure whether their property is in/near a FEMA –designated floodplain;
- Just over (70%) of respondents are interested in making their home, business or neighborhood more resilient, with 70% willing to spend their own money to do so; and
- The top four choices to reduce damage/destruction of natural hazards on tribal lands and for tribal members living in the service area include:
    - Work to improve utility resilience: electric; communications; water/wastewater facilities (70%)
    - Inform property owners of ways they can reduce damage caused by natural events (60%)
    - Retrofit/Strengthen essential facilities such as Police, fire/emergency, schools (50%); and
    - Assist vulnerable property owners with securing funding to make their properties more resilient (50%).

With this information, the project consultant prepared the draft Mashpee Wampanoag Tribe Multi-Hazard Mitigation Plan which was available for Tribal/public comment from October 14, 2019 through October 28, 2019 (online, on the Tribe's website and hard copies available at the Tribe's Government Center. (see Appendix C for Notice of Availability of draft) with … comments returned.

This plan was also forwarded to the neighboring communities of Mashpee, Evan Lehrer – Planner; Falmouth, Thomas Bott – Planner; Barnstable, Elizabeth Jenkins – Director of Planning and Development and, Sandwich, Ralph Vitacco – Director of Planning and Economic Development. All received notice of the draft plan availability on the Tribe's website, with ….. comments returned. The draft was submitted to the Tribal Council for approval to forward on up to FEMA for consideration. It is the intention of the THMC that the Multi-Hazard Mitigation Plan be an available and pertinent source of information to a wide variety of individuals and interests. The plan also has a specific and pragmatic function. By identifying and prioritizing local mitigation needs, the plan has already served, and will continue to serve, as a basis for amendments to Tribal policies and regulations.

State authorities will incorporate information compiled in this document into the State Hazard Mitigation Plan, to strengthen the statewide knowledge and idea-

base for mitigation planning. A well-prepared and locally adopted plan can demonstrate understanding and commitment, two important variables when vying for limited, high-demand resources.

1.6 Tribal People, Lands, Facilities and Infrastructure

Who We Are

The Wampanoag are known as the People of the First Light. The Wampanoag Nation for over 12,000 years has inhabited southeastern Massachusetts from an area encompassing the present-day community of Provincetown to Narragansett Bay. Estimated to have once numbered about 45,000 with sixty-nine confederated tribes, Wampanoag ancestors greeted explorers from Europe, assisting pilgrims to survive their first harsh winters here.

The Mashpee Wampanoag Tribe retains deep roots in the area and connections to its natural resources. We are one of two federally recognized of the five Wampanoag tribes present today in Massachusetts, achieving recognition in 2007.

Tribal Members and Service Area

As a sovereign nation, the Mashpee Wampanoag Tribe works to provide housing, health care, education, cultural legacy and connections, and economic development services to its approximately 2,680 current enrolled members. About 1,500 of these members live on Cape Cod and the islands of Martha's Vineyard and Nantucket, the Service Area of the Tribe. The greatest concentration is in the Mashpee and Falmouth area, while a second large group lives in the New Bedford area. Others live in Boston and throughout southeastern Massachusetts. About four hundred members, 200-250 locally, are older than 55 years of age or have individual response needs (AKA: "individuals requiring additional assistance (IRAA)".

The People We Serve

The Tribe's highest concern in planning for, responding to, and recovering from an emergency is to serve:

- Enrolled members of the Mashpee Wampanoag Tribe, especially those living in our service area,
- Non-members living with Tribal members in our service area,
- Employees of the Tribe, and
- Non-members attending Tribal-sponsored events (e.g. Powwows) or using Tribal-owned facilities (e.g. Tribal Museum, Old Indian Meeting House)

Physical Setting

Cape Cod is a cape in the easternmost portion of the state of Massachusetts, in the Northeastern United States. Today it is co-extensive with Barnstable County, and is defined by the towns and tribes along the Cape Cod Canal, and those to

the east on the peninsula all the way to Provincetown, and several small islands right off Cape Cod, including Monomoy Island, Monomoscoy Island, Popponesset Island, and Seconsett Island. The island towns of Martha's Vineyard and Nantucket ("the Islands") are located to the south of the Cape. The Cape and Island's historic and maritime character and ample beaches attract heavy tourism during the summer months.

Cape Cod and the Islands were formed by a pause in the retreat of the last glacier, resulting in a peninsula and outlying islands in the Atlantic Ocean. In 1914, the Cape Cod Canal was cut through the base or isthmus of the peninsula, forming what may be loosely described as an island. Unofficially, it is one of the biggest barrier islands in the world, shielding much of the Massachusetts coastline from North Atlantic storm waves. This protection erodes the Cape's shoreline at the expense of cliffs, while protecting towns from Fairhaven to Marshfield.

Tribal Government

The Mashpee Wampanoag Tribal Council governs the Tribe. The Tribe adopted its constitution on June 28th, 2004. The Council is composed of 11 Tribal members who are elected to serve four-year staggered terms. The Chairman, Vice-Chairman, Secretary, and Treasurer are the Executive Officers of the 11-member government board. The Traditional Leaders of the Tribe are a Tribal Chief and Tribal Medicine Man, both non-elected members of the Tribal Council. The Tribe has an Elders Tribal Council Board consisting of 11 Tribal elders who represent all the extended Tribal families in the Tribe. This Board works with the community and Tribal Council to advise and advocate on all Tribal issues that are brought before them. The Tribal Youth Council represents the Youth Leaders.

Tribal Lands and Facilities

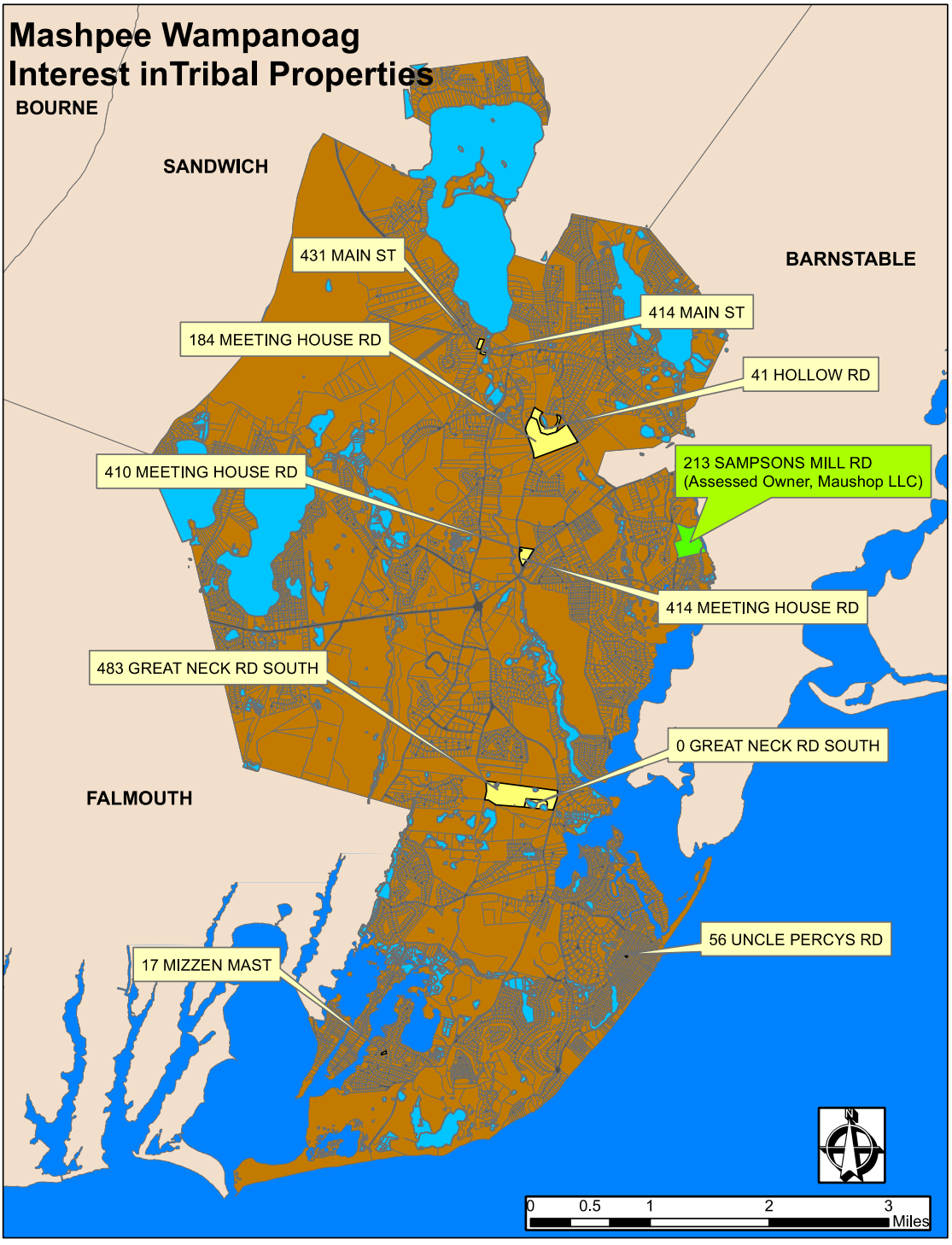
The Lands, Facilities, and Cultural Resources table and map below show the lands and facilities owned by the Tribe. Table 1-1 below shows the several properties for which the Tribe currently has trust status, including the land in Taunton for which the First Light Resort Casino will be constructed on.

Table 1-1 Tribal Lands, Facilities and Cultural Resources

Assets	Location	Tribal Property Size		Ownership Status
		Bldg Sq. Ft.	Acres	
Tribal Government Center 1. Forested Portion	483 Great Neck Rd	46,000	58.7	Mashpee Wampanoag Tribe - MWT
Indian Health Service Trailers 1. Tribal Clinic: Unit A 2. Health Admin. Office: Unit B	483 Great Neck Rd		Part of Tribal Government Center above	Bldgs: IHS Land: MWT
Wastewater Treatment Plant	184 Meetinghouse Rd			MWT
Tribal Museum	414 Main St		0.58	MWT
Old Indian Meetinghouse (OIM)	410 Meetinghouse Rd		0.15	MWT
OIM Parsonage	431 Main Street		2.03	MWT
Cemeteries (C) and Burial Grounds (BG) 1. Mizzenmast (BG) 2. Old Indian (C) 3. Popponesset (BG)	 17 Mizzenmast Rd 414 Meetinghouse Rd 56 Uncle Percy's Rd		 0.36 11.5 0.15	MWT
Maushop Farm 1. NR Dept Office 2. Tribal Garden 3. EPrep Office 4. Public Works Office	213 (and 188) Sampson's Mill Rd			MWT Maushop LLC
Casino (In Planning Stage)	Rte. 24, Taunton			MWT
Non-Tribal Resources and Infrastructure				
Herring Run *And Fish Ladders*	Quashnett River: Mashpee Pond Santuit Pond John's Pond			Dams: Town of Mashpee/DCR
Oyster Farm 1. Popponesset Bay 2. Ockway Bay	 Popponesset Bay			
Roads	Town of Mashpee			Barnstable County

Source: Mashpee Wampanoag Tribe Emergency Operations Plan Appendices and Annex, 2015 – 2020.

Figure 1-1 Mashpee Wampanoag Interest in Tribal Properties



Source: Mashpee Wampanoag Tribe Emergency Operations Plan Appendices and Annex, 2015 – 2020.

1.7 History of Disaster Declarations

Since 1953, FEMA Region 1 (the New England States) has endured more than 150 federal emergency (EM) and major disaster declarations (DR), 28 of which impacted Massachusetts. The following information (Table 1-2 below) gives an overview of the most significant past federal emergency and major disaster declarations for Massachusetts (and in Barnstable County, and including Tribal lands and Tribal members living in the service area):

Table 1-2 Significant Federal Emergency and Major Disaster Declarations, Barnstable County

ID Number	Type	Date
DR-546	Coastal Storms, Flood, Ice, Snow	February 1978
DR-751	Hurricane Gloria	September 1985
DR-914	Hurricane Bob	August 1991
DR-975	Winter Coastal Storm	December 1992
EM-3103	Blizzard/High Winds	March 1993
DR-1090	January Blizzard	January 1996
EM-3175	Snowstorm	March 2003
EM-3191	Snow	January 2004
EM-3201	Snow	February 2005
DR 1701	Severe Storms/Inland and Coastal Flooding	May 2007
EM-3315	Hurricane Earl	September 2010
EM-3330	Tropical Storm Irene	August 2011
DR - 4028	Tropical Storm Irene	August 2011
EM-3350	Tropical Storm Sandy	October 2012
DR-4097	Tropical Storm Sandy	October 2012
DR-4110	Severe Winter Storm/Snow/Flooding	February 2013
DR-4214	Severe Winter Storm/Snow/Flooding	January 2015

Sources: 2019 State Hazard Mitigation Plan, Commonwealth of Massachusetts, *NOAA National Climatic Data Center,* www.ncdc.noaa.gov.

1.8 Recent Disaster Declarations

The communities of Barnstable County (including Tribal lands and Tribal members living in the service area) have experienced significant losses during several recent storms that have warranted FEMA to declare these storms as disasters. The following are descriptions of each of the recent storms that have been declared as disasters by FEMA and which have affected Barnstable County, Tribal lands and Tribal members living in the service area.

1.8.1 Tropical Storm Irene – August 2011 (FEMA EM-3330/DR-4028)

Tropical Storm Irene formed east of the Caribbean Island of Dominica, part of the Lesser Antilles region, on the afternoon of August 20, 2011. Irene moved through the Caribbean and up the east coast of the United States making landfall twice. She first made landfall as a Category 1 Hurricane near Cape Lookout, North Carolina around 7:30 am on August 27th, then moved offshore again during the evening. She then made a 2nd landfall, again as a Category 1 Hurricane at 5:40 am on August 28th near Little Egg Inlet in New Jersey. She moved over New York City and then into southeastern New York State and Connecticut as a Tropical Storm a few hours later. By the end of the evening of the 28th, Irene was crossing the U.S./Canada border having produced significant amounts of rain, storm surge, inland and coastal flooding, and wind damage across southern New England and much of the east coast of the United States.

The collective effects of Tropical Storm Irene on August 28th, resulted in 1 fatality, 0 injuries, and $127.3M in property damage in the following counties: Barnstable, Cumberland, Essex, Franklin, Hampden, Hampshire, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester (all in MA), Hartford, Tolland, and Windham (all in CT), Cheshire and Hillsborough (all in NH), and Providence, Kent, Washington, and Newport (all in RI).[1]

1.8.2 Tropical Storm Sandy – October 2012 (FEMA EM-3350/DR-4097)

Sandy, a hybrid storm with both tropical and extra-tropical characteristics, brought high winds and coastal flooding to southern New England. Easterly winds gusted to 50 to 60 mph for interior southern New England; 55 to 65 mph along the eastern Massachusetts coast and along the I-95 corridor in southeast Massachusetts and Rhode Island; and 70 to 80 mph along the southeast Massachusetts and Rhode Island coasts. A few higher higher gusts occurred along the Rhode Island coast. A severe thunderstorm embedded in an outer band associated with Sandy produced wind gusts to 90 mph and concentrated damage in Wareham early Tuesday evening, a day after the center of Sandy had moved into New Jersey. In general, moderate coastal flooding occurred along the Massachusetts coastline, and major coastal flooding impacted the Rhode Island coastline. The storm surge was generally 2.5 to 4.5 feet along the east coast of Massachusetts, but peaked late Monday afternoon in between high tide cycles. Seas built to between 20- and 25-feet Monday afternoon and evening just off the Massachusetts east coast. Along the south coast, the storm surge was 4 to 6 feet and seas from 30 to a little over 35 feet were observed in the outer coastal waters. The very large waves on top of the storm surge caused destructive coastal flooding along stretches of the Rhode Island exposed south coast.

[1] National Climatic Data Center, www.ncdc.noaa.gov

1.8.3 Severe Winter Storm/Snow/Flooding – February 2013 (FEMA DR-4110)

An historic winter storm deposited tremendous amounts of snow over all southern New England, mainly from the mid-afternoon on Friday, February 8 and lasting into the daylight hours of Saturday, February 9. What made this an amazing storm was the widespread coverage of heavy snowfall. Most locations received 2 to 2.5 feet of snow. A stationary band of even heavier snowfall persisted from southwest NH through central MA and on to the southwest across central and western CT. In those areas, reports averaged closer to 2.5 to 3 feet. Along the southeast MA coast, average amounts ranged from 1 to 2 feet. Only on Martha's Vineyard and Nantucket were snowfall totals less than 1 foot (6 to 12 inches). Isolated thunderstorms were common across the entire region during the height of the storm.

A low-pressure system advancing from the Great Lakes region combined forces with a very moist low-pressure system moving northeast from the Gulf Coast states. Explosive deepening took place Friday evening, February 8, as a low center moved from the North Carolina coast to south of Nantucket. Strong high pressure to the north of New England helped ensure that cold air remained in place over the area. Snowfall gained intensity during the afternoon, but during the night, 2 to 3 inch per hour amounts were common throughout the region. The band of heaviest snowfall, with 3 to 5 inches per hour for several hours, extended from southwest NH to central and western CT. The precipitation started as mainly snow, although a brief period of rain at the onset was common on the Islands. Snow ended in the morning in western and central MA, southwest NH, most of CT and RI, and in the early afternoon across eastern MA. It lingered during the whole afternoon over Cape Cod and Nantucket, aided by some ocean-effect bands of snowfall.

1.8.4 Severe Winter Storm/Snow/Flooding – January 2015 (FEMA DR-4214)

An historic winter storm brought heavy snow to southern New England with blizzard conditions to much of Rhode Island and Massachusetts, beginning during the day on Monday, January 26, 2015 and lasting into the early morning hours of Tuesday, January 27th. The highest snowfall totals, averaging two to three feet, extended from extreme northeast Connecticut and northwest Rhode Island into much of central and northeast Massachusetts, including greater Boston. Much of southeast Massachusetts and the rest of Rhode Island received one to two feet of snow. Totals dropped off dramatically west of the Connecticut River Valley where totals of 4 to 8 inches were observed.

The storm was well-forecast, with Blizzard Watches and Winter Storm Watches issued 2 days before the snow began. Low pressure tracked northeast from the Carolinas and strengthened rapidly as it slowly passed southeast of Nantucket on Monday evening, January 26. All the precipitation fell as snow with this storm. At its peak, snowfall rates of 2 to 3 inches per hour were common.

Daily snowfall records were set for January 27th in Boston (22.1 inches, previous record 8.8 inches in 2011), Worcester (31.9 inches, previous record 11.0 inches in 2011), and Providence (16.0 inches, previous record 6.7 inches in 2011). In Providence, the total of 19.1 inches was the fourth highest on record (dating back to 1904), while in Boston the total of 24.6 inches was the sixth highest on record (dating back to 1872).

The Blizzard of January 2015 produced very strong winds late Monday into Tuesday near the Massachusetts and Rhode Island coasts where gusts of 50 to 65 mph were common.

Section 2 Risk Assessment

2.1 Introduction

Identifying potential hazards is the first step in any effort to reduce vulnerability. The subsequent identification of the risk and vulnerability for a community are the primary factors in determining how best to allocate finite resources to address what mitigation might take place. The FEMA document titled Tribal Mitigation Plan Review Guide, dated December 5, 2018 was used in developing this strategy plan as a basic template to identify the various natural hazard types. The hazard identification and analysis involve all those hazards that potentially threaten the Tribe's lands, facilities, natural and cultural resources.

By collecting and analyzing information for each potential hazard that may affect the Tribe, several determinations have been made:

- Which hazards merit special attention
- What actions might be taken to reduce the impact(s) of those hazards
- What resources are likely to be needed

2.2 Hazard Identification

The THMC evaluated each of the hazard types that may affect the Tribe, including climate change, and similarly to those identified in the State Hazard Mitigation Plan and Mashpee Multi-Hazard Mitigation Plan (July 2017 draft). The THMC elected to organize natural hazards into the following categories:

- Flood-Related Hazards
- Winter-Related Hazards
- Wind-Related Hazards
- Geologic-Related Hazards
- Drought/Extreme Heat-Related Hazards
- Urban Fire/Wildfire-Related Hazards
- Invasive Species-Related Hazards

HW created new Geographical Information Systems (GIS) mapping (Appendix A) including a Location Map (Map 2-1), Flood Hazard Areas Map (Map 2-2), Earthquakes Map (Map 2-3), Hurricanes/Tornadoes Map (Map 2-4), Average Annual Snowfall Map (Map 2-5), Hurricane Inundation Levels (Map 2-6, and Sea Level Rise - Various Scenarios (Map 2-7).

2.3 Hazard Profiles: Location, History and Probability of Future Occurrence

In assessing the hazards that may impact an area, both the risk and the vulnerability must be considered. A hazard is the actual event that poses danger to Tribal property and Tribal members living in the service area (e.g. the hurricane, tornado, earthquake, etc. that threatens the Tribe). The term "risk" refers to the predicted impact that a hazard would have on the people, services, specific facilities and structures in the Tribe's service area. The term "vulnerability" refers to the characteristics of the society or environment affected by the event that resulted in the costs from damages (Heinz Center Report, 1999, p. 105). The vulnerability of an area refers to its susceptibility to a hazard. The areas of Tribal property and Tribal members living in the service area affected by extreme natural events are identified by the hazard risk assessment. In determining the risk and vulnerability of the Tribe, the likelihood, frequency and magnitude of damage from identified hazards are assessed.

In developing the Risk Assessment, the THMC defined the risks that the Tribe could face and followed up with an assessment of the vulnerability of the at-risk areas, and the implications of experiencing natural disasters (e.g., loss of life, damage to the natural environment, property damage, and economic losses). Risk assessment is the determination of the likelihood of adverse impacts associated with specific natural hazards, and vulnerability assessment is concerned with the qualitative or quantitative examination of the exposure of some societal component (i.e. economy, environment). The result of this process was the preparation of a Risk Assessment Matrix (Table 2.1) that lists the vulnerable areas and the primary effects from an event on these areas. The matrix was then used to establish mitigation benefits and develop mitigation strategies (Section 4).

Hazard Index

The THMC evaluated each of the flood, winter, wind, fire and geologic-related hazards and collectively determined the likelihood of occurrence, locations affected, and potential impacts of each, starting with Map 2-1 Location Map. This information was used to establish a Hazard Index (HI) value (HI=1 being lowest impact and HI=10 being highest impact) for each of the types of natural hazards and is presented in Table 2-2. The highest hazard index values were assigned to those natural hazards that were deemed to have the highest level of impact to Tribal lands and Tribal members living in the service area. These hazards include flood-related hazards such as inland/urban flooding/heavy rain and coastal erosion/shoreline change (HI=7), winter-related hazards such as snow/nor'easter/blizzards (HI=7), and wind-related hazards such as high winds (HI=6).

The Hazard Index for this 2019 plan update utilizes language used in the FEMA State and Local Mitigation Planning How-to-Guide Series for frequency and severity categorization:

Criteria for Frequency Categorization:

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 categorization, based on past hazard events includes:

Criteria for Severity Categorization (based on past hazard events):

Minor: Limited and scattered property damage; no damage to private/public infrastructure; contained geographic area; essential services not interrupted; no injuries or fatalities.
Serious: Scattered major property damage; some minor infrastructure damage; wider geographic area; essential services are briefly interrupted; some injuries/fatalities.
Extensive: Consistent major property damage; major damage to private/public infrastructure; essential services are interrupted for several hours to several days; many injuries and fatalities.
Catastrophic: Private/public infrastructure destroyed; essential services stopped; thousands of injuries and fatalities.

Table 2-1
2019 Risk Assessment Matrix, Mashpee Wampanoag Tribe

Ranking	Vulnerable Area	Location	Ownership	Natural Hazard	Primary Problems/Effects	Mitigation Benefits	Risk H-Historical P- Potential
	Tribal Government Center/Tribal Records Storage Facility	483 Great Neck Road	Private	Wildfires (forested portion); Flooding; Hurricanes; Climate Change	Loss of Life/Property/Historic Records; Damage to private property; Costs of cleanup	Public safety; Reduce liability for damage to private property/historic records; Decrease costs of cleanup	H and P
	Tribal Museum	414 Main Street	Private	Hurricanes; Wildfires; Dam Failures	Economic and social hardship; Loss of life/property; Cost of cleanup	Public safety; Prevent/minimize economic and social damage, loss of life	H and P
	Old Indian Meeting House	410 Meeting House Road	Private	Hurricanes; Wildfires; Climate Change	Economic and social hardship; Loss of life/property; Cost of cleanup	Public safety; Prevent/minimize economic and social damage, loss of life	H and P
	Parsonage	431 Main Street	Private	Hurricanes; Wildfires; Climate Change	Economic and social hardship; Loss of life/property; Cost of cleanup	Public safety; Prevent/minimize economic and social damage, loss of life	H and P
	Tribal Housing (when completed)	0 Meetinghouse Road	Private	Hurricanes; Wildfires; Climate Change	Economic and social hardship; Loss of life/property; Cost of cleanup	Public safety; Prevent/minimize economic and social damage, loss of life	H and P
	Cemeteries/Burial Grounds: Mizzenmast, Old Indian, Popponesset	Mizzenmast: 17 Mizzenmast Road Old Indian: 414 Meeting House Road Popponesset: 56 Uncle Percy's Road	Private	Hurricanes; Coastal Erosion/Shoreline Change; Climate Change	Impacts to cultural resources/traditions	Minimize cultural resources/traditions impacts	H and P
	Maushop Farm: NR Dept Office, Tribal Garden, Eprep Office, and Public Works Office	213 (and 188) Sampson Mill Road	Private	Severe Wind Storms; Drought; Extreme Heat; Dam Failures; Climate Change	Impacts to natural resource/economic	Minimize natural resource/economics impact	P
	Herring Run/Fish Ladders/Dams	Quashnet River: Mashpee Pond, Santuit Pond, and John's Pond	Public	Floods; Drought; Dam Failures; Climate Change	Impacts to natural resource/economic	Minimize natural resources/economics impacts	H and P
	Oyster Farm	Popponesset Bay	Public	Coastal Erosion	Impacts to natural resources/economics	Minimize natural resource/economic impacts	H and P

Table 2-1
2019 Risk Assessment Matrix, Mashpee Wampanoag Tribe

Ranking	Vulnerable Area	Location	Ownership	Natural Hazard	Primary Problems/Effects	Mitigation Benefits	Risk H-Historical P- Potential
	Individual Tribal Member's Health	Tribal lands/Cape-wide	Private	Extreme Heat/Cold	Economic and social hardship; Compromised health; Loss of Life	Minimize economic and social hardship; Maintain health; Minimize loss of life	P
	Pow-wow/Annual Events	Tribal lands and Barnstable County Fairgrounds	Private/Public	Severe Weather	Economic and social hardship; Loss of Life	Minimize economic and social hardship; Minimize loss of life	P

Table 2-2 Hazard Index Mashpee Wampanoag Tribe

Natural Hazard	Frequency (i.e. Very Low, Low, Medium, High)	Location (i.e. small/local, medium/regional, large/multiple communities)	Severity (i.e. minor, serious, extensive, catastrophic)	Hazrd Index (i.e. ranked by combining frequency and severity; 10 - high, 1 - low)
Flood-Related Hazards				
- Riverine/Flash Flooding	High	Medium/Regional	Serious	6
- Inland/Urban Flooding/Heavy Rain	High	Medium/Regional	Extensive	7
- Coastal Erosion/Shoreline Change	High	Medium/Regional	Extensive	7
- Dam Failure	Low	Small/Local	Extensive	5
- Sea Level Rise	High	Large/Multiple	Serious	6
- Coastal Flooding	High	Large/Multiple	Serious	6
Winter-Related Hazards				
- Blizzards/Snow/Nor' easter	High	Large/Multiple	Extensive	7
- Ice	Low	Medium/Regional	Minor	3
- Extreme Cold	Low	Large/Multiple	Minor	3
Wind-Related Hazards				
- Hurricanes	High	Large/Multiple	Serious	6
- Tornadoes*/High Winds	High	Medium/Regional	Extensive	7
- Lightning/Thunderstorm	High	Local	Serious	6
- Hail	High	Local	Serious	6
Geologic-Related Hazards				
- Earthquake	Very Low	Medium/Regional	Catastrophic	5
- Landslide	Low	Medium/Regional	Serious	4
- Tsunami	Low	Medium/Regional	Serious	4
Drought				
- Drought	High	Medium/Regional	Minor	5
- Extreme Heat	Low	Medium/Regional	Minor	3
Urban Fire/Wildfire				
- Urban Fire/Wildfire	High	Small/Local	Serious	6

* Tornadoes not a major issue for tribal lands/tribal members in service area

For the purposes of this 2019 plan, based on the Hazard Index, the THMC determined that Tribal lands and Tribal members living in the service area are most at risk to the following hazards (and has advanced the assessment of the vulnerability of the at-risk areas, and the implications of experiencing these natural hazards):

- ✓ Riverine/Flash Flooding
- ✓ Heavy Rain/Inland and Urban Flooding
- ✓ Climate Change
- ✓ Coastal Erosion/Shoreline Change
- ✓ Coastal Flooding
- ✓ Dam Failure
- ✓ Sea Level Rise
- ✓ Blizzards/Heavy Snow/Winter Weather/Nor'easters
- ✓ Ice Storms
- ✓ Extreme Cold
- ✓ Hurricanes
- ✓ Tornadoes/High Winds
- ✓ Lightning/Thunderstorms
- ✓ Hail
- ✓ Earthquakes
- ✓ Drought
- ✓ Extreme Heat
- ✓ Urban Fire/Wildfires

The THMC formed the consensus that: flood-related hazards such as flooding/heavy rain and coastal erosion/shoreline change; winter-related hazards such as snow/nor'easters; and, wind-related hazards such as strong winds, are the major causes of risk to Tribal lands and Tribal members living in the service area.

It should be noted that the above hazards are not a complete listing of hazards that may impact Tribal lands and Tribal members living in the service area. The THMC agreed that this listing accurately represents those hazards that could impact Tribal lands and Tribal members living in the service area most frequently and have the potential to cause fatalities, injuries, property and infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss. The following hazards will not be addressed in this 2019 plan:

- Avalanche
- Expansive Soils
- Land Subsidence
- Landslides
- Volcanoes
- Tsunamis

- Invasive Species

These hazards were considered and discussed during THMC meetings, where it was determined these hazards would not be considered for the following reasons:

- Lack of frequency in which they occur;
- The minimal probability of their occurrence; and/or
- The lack of resources to devote any amount of time to further research the likelihood or potential occurrence or impact.

The hazard-specific tables that follow after each section represent the various significant natural hazard events that have occurred in and around Tribal lands and Tribal members living in the service area, utilizing National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable), unless otherwise noted.

Climate Change

Climate change is one of the most pressing issues of our time and its effects are increasingly impacting Massachusetts. Since climate change has both direct and indirect impacts on the range of natural hazards that Tribal lands and Tribal members living in the service area are vulnerable to, the THMC determined it was most appropriate to include a 'climate change impacts on' section to each natural hazard profiled in this plan.

2.3.1 Flood-Related Hazards

Flooding is the accumulation of water within a water body and the overflow of excess water onto adjacent floodplain lands (FEMA, Multi Hazard Identification and Risk Assessment, 1997). The floodplain is the land adjoining the river/stream channel, ocean or other watercourse or water body that is susceptible to flooding.

Flooding results from: large-scale weather systems generating prolonged rainfall; onshore winds; locally intense thunderstorms; dam failures; or significant snow melt. Floods are capable of undermining buildings and bridges, eroding shorelines and stream banks, uprooting trees, washing out access roads, and causing loss of life and injuries. Also, flash floods (characterized by rapid onset and high velocity waters) carry large amounts of debris that further exacerbate conditions.

Under the NFIP, FEMA is required to develop flood risk data for use in both insurance rating and floodplain management. FEMA develops this data through Flood Insurance Studies (FIS). Detailed analyses are used to generate flood risk data only for developed or developing areas of communities. For undeveloped

areas FEMA uses approximate analyses to generate flood risk data. Flood hazard areas are identified in the FEMA FIRMs. Flood hazard areas are divided into zones (V, X, AO, etc.) depending on the severity and type of flood threat. These zones are those areas subject to inundation (shallow or deep) by a flood (and/or velocity wave action) that has a 1 percent chance of occurring during any given year.

Floodplains in Mashpee include 'AE', 'VE', and 'X' Zones (Map 2-2 Flood Hazard Areas). 'AE' Zones are areas that would be inundated by the 100-year flood. The 100-year flood is a regulatory standard used by federal agencies and most states to administer floodplain management programs and is also used by the NFIP as the basis for insurance requirements nationwide. 'VE' Zones are velocity zones that are subject to breaking wave action where waves greater than 2.9 feet are forecasted during a 100-year flood or storm surge. 'X' Zones are areas that would be inundated by the 500-year flood.

Table 2-3 below represents the various significant flood-related hazard events that have occurred in and around Tribal lands and Tribal members living in the service area over time, utilizing NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable County), unless otherwise noted.

Table 2-3 Significant Flood-Related Events, Barnstable County

Hazard Type	Date	Level/Description	Damages
Flood			
	3/5/2001	15" to 30"	Downed trees and wires; transportation disruptions
	6/7/2006	3" to 5"	$10 K
	4/16/2007		$10 K; wind gust of 60 mph; downed trees and power lines;
	9/3/2010		
	4/13/2011	2" to 6"	$40 K
	9/3/2013	5" to 6"	
	11/17/2014		$10 K
	7/1/2015		
	8/11/2015		
	1/10/2016		Scattered trees and power line damage
	7/7/2017		
	9/6/2017		
	10/25/2017	2" to 6.5"	
	10/25/2017		
	10/30/2017		

	1/23/2018		Wind gusts 50 to 55 mph
	8/4/2018	6.5"	$5 K
	8/9/2018	4.5"	$15 K
	8/18/2018	1" to 3"	$15 K
	10/29/2018		
Riverine/Flash Flooding			
	9/15/2005	$7 K	Cars stuck, Sagamore bridge partially closed.
	9/12/2009	$5 K	Route 130 flooded; businesses and basements flooded; several cars stuck
	9/3/2013		Route 6A, 28, 151 flooded; basements flooded
	7/7/2017		Road closures; vehicle flooding
	8/18/2017	$50 K	Several cars stuck; flooded basements
	8/19/2017	$7 K	Cars stuck; parking lot flooded
Inland/Urban Flooding/Heavy Rain			
	9/2/1996		
	9/18/1996		
	10/8/1996		
	10/20/1996		
	12/7/1996	1.5" to 2"	Rain/snow like resulting in damage to trees and power lines; 500,000 people lost power; wind gust to 64 mph; $4million damages.
	3/29/1997	1 to 3"	
	7/25/1997	3" +	Wind gusts to 30 to 50 mph;
	11/1/1997	2" to 3.6"	Wind gust 50 to 65 mph; $32 K; power outages
	2/18/1998	2" to 3.37"	Wind gusts 44 to 54 mph
	2/23/1998	3" to 4.26"	Wind gust s40 to 63 mph; tree limb fell; loss of 20ft of dunes; basements flooded
	3/8/1998	2" to 5.44"	Basements flooding; road closures; wind gusts 74 mph
	4/1/1998	2"+	
	5/6/1998	2" to 4"	Basements flooded; road damage; Route 186 flooded; stranded cars
	6/13/1998	6" to 12"	$13 M; $64 M; MBTA flooded; transportation disruption; power outage; bridge knocked out; road closures

	8/29/1998	1.23" to 4"	Wind gust 25 to 52 mph; 1 fatality
	9/22/1998	2.75" to 4.13"	
	10/8/1998	4" to 6"	Route 18 flooded
	9/16/1999	6" to 13"	Wind gusts 60 to 70 mph; downed trees; power lines
	10/18/1999	2" to 5.37"	Wind gusts 45 to 55 mph, downed trees; power line; minor injuries
	3/30/2001	3" to 5.74"	Wind gusts 40 to 50 mph; road closures
	9/22/2002	2.25" to 3.04"	
	3/29/2003	2" to 4"	Drainage flooding;
	4/11/2003	1" to 3"	
	3/8/2008	2" to 3"	$50 K; collapse of wooden structure
Coastal Flood			
	2/24/1998	3"	Loss of 20ft of dunes
	1/31/2006		$20 K
	4/15/2007	1-3"	$5 K
	4/16/2007	1-3"	$5 K
	4/17/2007	1-3"	$10 K
	11/3/2007		
	1/28/2008		$30 K
	6/22/2009		$3 K; transportation disruptions
	10/30/2011	18-24"	6 fatalities
	6/3/2012		$50 K; cars stranded
	6/4/2012	2.5ft to 4.55ft	Wind gusts 90 mph
	10/29/2012		$435 K
	12/27/2012		
	2/9/2013	2 to 2.5 ft snow	$5.3 M; wind gusts 4 mph;
	3/7/2013		$250 K; road flooding
	1/3/2014	6"	
	1/3/2014		
	3/26/2014		
	11/2/2014	1" to 2"	
	1/27/2015		$750 K; wind gusts 50 to 65 mph; two fatalities
	2/15/2015		Several indirect fatalities;
	1/4/2018		$200 K
	1/30/2018		
	3/2/2018		
	10/27/2018		

Source: NOAA National Climatic Data Center, www.ncdc.noaa.gov.
Data current through May 2019.

Riverine/Flash Flooding

Riverine or inland flooding often occurs after heavy rain, particularly in areas of the state with high water tables. These areas are also particularly susceptible to flash flooding caused by rapid runoff occurring after heavy precipitation events, and in combination with spring snowmelt. Frozen ground conditions can also contribute to low rainfall infiltration and high runoff events that sometimes result in river flooding.

Flood magnitude increases with increasing recurrence interval. Tribal lands and Tribal members in service areas (similarly to the Town of Mashpee) can be uniformly affected by riverine flooding events, dependent upon the location (amount of impervious surfaces within the area), existing/incoming weather conditions, and time of year (frozen ground conditions exacerbate flooding). Based on the high frequency and serious severity of riverine and flash flooding events (six significant events since 2005)as reported by the National Climatic Data Center and indicated in Table 2-3, Tribal lands and Tribal members living in the service area are considered at high risk for future riverine/flash flooding events.

Climate Change Impacts on Riverine/Flash Flooding

Riverine flooding will likely be exacerbated by increased storm intensity, as well as by increased precipitation. The Intergovernmental Panel on Climate Change (IPCC) identifies inland flooding in some urban regions as a “key risk” in North America, which may result disrupt people’s livelihood and result in severe health risks. It is also important to note that riverine flooding and coastal flooding due to SRL can have a coupling effect. Rising seas can set a new flood stage in riverine systems, thus increasing flood risk in inland areas adjacent to rivers.

Inland and Urban Flooding/Heavy Rain

Heavy rains that cause inland and urban flooding are often exacerbated by stormwater-related issues. Thunderstorms, winter storms, coastal storms and nor’easters, and hurricanes all contribute to interior flood related hazards due to the large amounts of precipitation associated with them. Development often compounds the magnitude and frequency of urban flooding by increasing impervious surfaces, also increasing the rate of drainage collection, reducing the carrying capacity of the land, and often overwhelming sewer system infrastructure. Based on the high frequency and extensive severity of heavy rain and inland/urban flooding events over time (twenty four events since 1996), as reported by the National Climatic Data Center and indicated in Table 2-3, Tribal lands and Tribal members living in the service area are considered at high risk for future heavy rain/inland and urban flooding events.

Climate Change Impacts on Heavy Rain/Inland and Urban Flooding

Heavy precipitation events are becoming more frequent and intense. Whether a hurricane, tropical storm, or extra-tropical storm (e.g. a nor’easter), there has been a global increase in both the frequency and the intensity of heavy

precipitation events. This trend is consistent with physical responses to a warming climate, such as an increased amount of moisture in the atmosphere.

Within the US, this trend is most pronounced in the Northeast. For example, between 1958 and 2016, the Northeast region has experienced a 92% increase in the number of two-day events exceeding the largest amount that is expected to occur over a five-year period.

Coastal Erosion/Shoreline Change

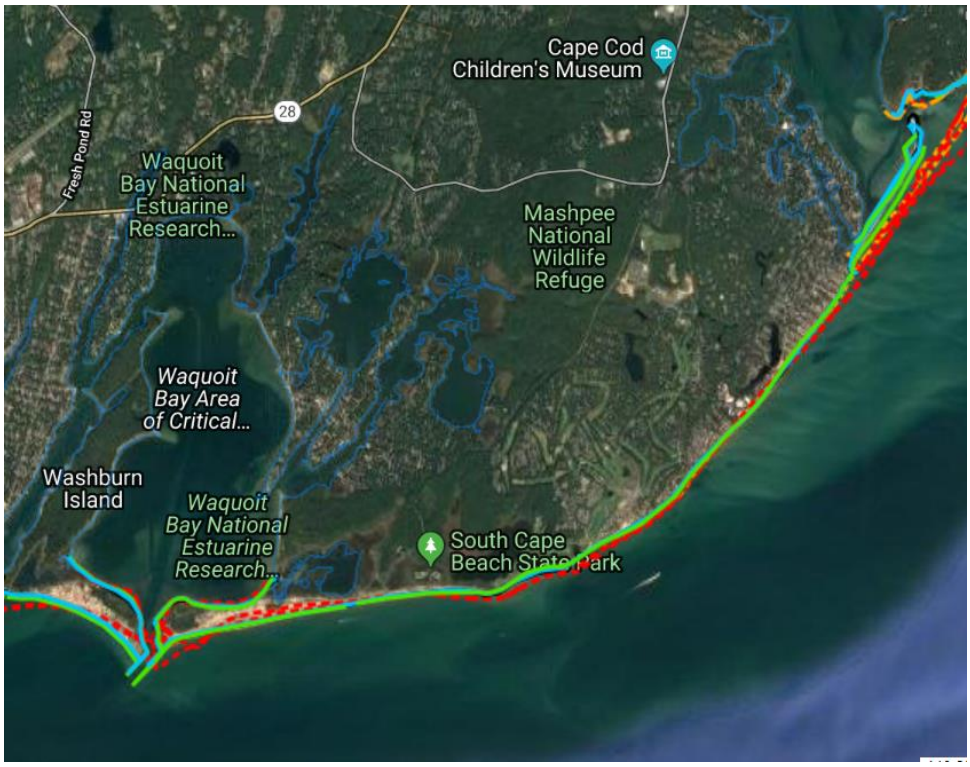
Coastal erosion is another hazard that occurs during large coastal storm events and through natural processes. Shorelines change constantly in response to wind, waves, tides, sea level fluctuation, seasonal and climatic variations, human interaction, and other factors that move sand and material within a coastal shoreline system.

Coastal erosion is expected to increase due to the increase in storm intensity and associated flooding. The IPCC found that coastal and low-lying areas have been experiencing increased erosion, and will continue to do so, due to SRL, in North America and throughout the world. Erosion has been noted to be of concern in the northeastern U.S. and in their study of climate change impacts in the northeastern U.S., Horton et al. (2014) noted that increased rates of coastal erosion are likely to compromise aging coastal infrastructure, including transportation, communications, and energy infrastructure.

Coastal erosion is an ongoing feature of the coastal dynamics of the Mashpee shoreline. Popponesset Spit, Popponesset Beach, and Seconset Point Bluffs Coast Guard Beach are particularly susceptible to beach erosion and eroding coastal banks. This dynamic is exacerbated during the annual winter storms and particularly when hurricanes and nor'easters pound the coastline. This is of concern to the Tribe: bodies of ancestors have washed out of the cliffs at Coast Guard Beach in past storms.

At the Massachusetts Office of Coastal Zone Management (CZM), through the Shoreline Change Project, ocean-facing shorelines along the Massachusetts coast were delineated and analyzed to illustrate trends from the mid-1800s to 2009. Offered for the general public's use through the Massachusetts Ocean Resource Information System (MORIS), the U.S. Geological Survey (USGS), the Woods Hole Oceanographic Institution sea grant Program, and Cape Cod Cooperative Extension calculated shoreline change rates, then CZM incorporated the shorelines and shore-perpendicular transects with the change rates. Figure 2-1 shows the entire coastline of Mashpee as vulnerable to shoreline change represented by a series of transects: 1897 – dashed red; 1982 – green; and 1994 – blue.

Figure 2-1 Historic Shoreline Change



Source: MORIS.

Dam Failure

A dam is any artificial barrier with the ability to impound water, wastewater, or any liquid-borne material for the purpose of storage or water control. Dam failure can be a catastrophic type of failure characterized by the sudden, immediate, and uncontrolled release of impounded water, or the likelihood of such an uncontrolled release with secondary impacts to downstream structures within the inundation zone.

There are four dams in Mashpee that are associated with the herring run on Quashnet River and classified as Regulated Dams by the Massachusetts Office of Dam Safety. Tribal members exercise aboriginal rights each spring in harvesting the herring run. The John's Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River. Table 2-4 provides existing information for each dam from the Massachusetts Office of Dam Safety.

- The John's Pond Dam is owned by the Mashpee Conservation Commission, rated as a low hazard dam, and inspected in April 2000 with a condition shown as fair.
- The Mashpee Pond Dam is owned by the Mashpee Conservation Commission, rated as a high hazard dam, inspected in April 2009 with a condition shown as fair.

- The Mashpee River Dam, owned by the Town of Mashpee, rated as a significant hazard, inspected July 29, 2008 with no condition shown.
- The Quashnet River Dam, owned by the Commonwealth of Massachusetts, Department of Conservation and Recreation, rated as a low hazard, no record of inspection with a condition shown as poor.

Table 2-4 Inventoried Dams in Mashpee, MA

Name	MADEM #	Body of Water (Impoundment)	Ownership	Hazard
Dams				
John's Pond Dam		Child's River	Mashpee Conservation Commission	Low
Mashpee Pond Dam		Quashnet River	Mashpee Conservation Commission	High
Santuit Pond Dam		Santuit River	Town of Mashpee	Significant
Quashnet River Dam		Quashnet River	Commonwealth of MA/DCR	Low

Source: Mashpee Wampanoag Tribe Emergency Operations Plan Appendices and Annex, 2015 – 2020.

Should there be a dam breach at any of the identified structures, the immediate areas surrounding the structure, as well as properties located downstream (within the inundation zone) of the structure are most vulnerable.

Climate Change Impacts on Dams
The increase in precipitation and frequency of intense rainfall events, which will cause an increase in river discharge and peak flows, may also lead to overtopping and damage of aging dams or structures in need of repair and maintenance.

Sea Level Rise
Sea level is the level of the sea's surface relative to the land. Sea level changes can be caused by absolute changes of the sea level and/or by absolute movements of the land either through post glacial isostatic re-adjustment of the lithosphere, the rigid upper layers of the earth, or by extraction of water or other resources that cause the land to sink.

The IPCC continues to better understand the science and implications of climate change and SRL. Rising sea levels, as a direct result of warmer temperatures and glacial ice melt, threaten low-lying coastal areas through coastal flooding, coastal erosion, wetland inundation and saltwater intrusion. Localized land subsidence, also on the rise, also contributes to accelerated impacts of SRL. Over the last 100 years, sea levels have risen 0.56 feet globally. The average rate of rise between 1961 and 2003 was 0.07 inches per year; however, that rate

nearly doubled to 0.12 inches per year between 1993 and 2003.[2] Although the rate of SRL is accelerating, it is not expected to be globally uniform, where some areas will be more substantially inundated than others.

NOAA's Office of Coastal Zone Management – Digital Coast developed a series of sea level rise data layers under various scenarios. The Horsley Witten Group developed Map 2-7 Sea level Rise – Various Scenarios which depicts projected sea level rise increases for one-foot, three-feet, five-feet, and seven-feet. Popponesset Bay (Tribal Oyster Farm) and Maushop Farm (Natural Resources Dept., Tribal Garden, Eprep Office, and the Public Works Office) are the two Tribal properties impacted through the various scenarios.

Coastal Flooding

Coastal storm surge is typically defined as the abnormal rise in water level caused by the wind and pressure forces of a hurricane and/or nor'easter. Mashpee experiences significant coastal flooding several times per year due to coastal storm surges resulting mainly from winter storms and nor'easters. Additionally, several interior locations experience flooding due to inadequate drainage during significant storm events.

Climate Change Impacts on Coastal Flooding

Future increases in relative sea level will intensify coastal flooding and will ultimately lead to the loss of recreation areas, public space, and wetlands along the coast. Residential and commercial structures, roads, and bridges on or near the coast will be more prone to flooding. SRL will also reduce the effectiveness and integrity of existing seawalls and revetments, which were designed for historically lower water levels. Lower elevations will become increasingly susceptible to flooding as storm surge reaches further inland due to both SRL in concert with a probable increase in the frequency and intensity of storms predicted from climate change.

The future rise in relative sea level will increase the extent of flood damage over time. Importantly, increased flooding means both an increase in the areas that are flooded and an increase in the depth of floodwaters. This is because SRL will expand existing floodplains, causing flooding in places which have not previously experienced flooding, as well as result in deeper floodwaters in previously flooded areas.

Nuisance flooding, also referred to as high tide flooding, increasingly occurs in coastal locations both locally and globally as a result of SRL, which causes high tides that are higher than they were historically. Nuisance flooding may affect individual coastal properties, as well as roads, parking lots, and other public or

[2] IPCC. (2007). *Climate Change 2007: The Physical Science Basis. Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Geneva, Switzerland: UNEP.

commercial infrastructure in low-lying areas. This type of flooding has increased five- to ten-fold since the 1960s in several U.S. coastal cities, and rates of increase are accelerating in dozens of cities on the U.S. Atlantic and Gulf coasts. Like other types of coastal flooding, nuisance flooding will continue increasing in depth, frequency and extent over the 21st century.

Flood Hazard Areas

FEMA Flood Zones

Inland flooding caused by major rainstorms combined with stormwater related issues and increasing development and impervious surfaces has been determined as one of the top risks of natural disaster to Tribal lands and Tribal members living in the service area. HW performed a Vulnerability Analysis that considered Tribal properties impacted by the various flood zones according to land use type, critical facilities, and critical infrastructure. An Economic Analysis of the impacts based on FEMA's flood zones follows later in this section (Tables 2-15 and 2-16).

AE/100-Year Flood Zone

The AE zone or 100-year flood zone (has a 1% chance of flooding occurring each year) is a regulatory standard used by federal agencies and most states to administer floodplain management programs and is also used by the NFIP as the basis for insurance requirements nationwide. Three Tribal properties (213 Sampson Mill Road, 17 Mizzen Mast and 56 Uncle Percy's Road are impacted (partially) by the 100-year flood zone.

X/500-Year Flood Zone

The X zone or 500-year flood zone is a flood that has a 0.2% chance of occurring each year. Two Tribal properties (17 Mizzen Mast and 0 Great Neck Hill Road) are both impacted (partially) by the 500-year flood zone.

VE/Velocity Flood Zone

The VE Zones are velocity zones that are subject to breaking wave action where waves greater than 2.9 feet are forecasted during a 100-year flood or storm surge. Popponesset Bay (Tribal Oster Farm) is impacted by the velocity flood zone.

Property at Risk from Flood-Related Hazards

Often, flooding problems in Mashpee occur where development occurs near flood plains or low-lying areas. Most of the flooding represents nuisance flooding and should not be considered catastrophic or a threat to public health, welfare or safety. However, this nuisance flooding poses significant financial hardship to individual property owners.

The entire coast of Mashpee is vulnerable to both coastal erosion/shoreline change and sea level rise. Although the Tribe does not currently own any waterfront property, the coastal shore is important to the Tribe's traditions.

Popponesset Spit, Popponesset Beach, and Seconset Point Bluffs Coast Guard Beach are particularly susceptible to beach erosion and eroding coastal banks. This dynamic is exacerbated during the annual winter storms and particularly when hurricanes and nor'easters pound the coastline. This is of concern to the Tribe: bodies of ancestors have washed out of the cliffs at Coast Guard Beach in past storms. The continued viability of the coastal ponds and inlets are also important to the Tribal fisheries.

Probability of Future Occurrence of Flood-Related Hazards

As new development and urbanization continues, with the increase of impervious surfaces increasing the rate of drainage collection and reducing the carrying capacity of the land, it is likely interior flooding and stormwater runoff events will also increase on a more frequent basis with even lower storm events.

Based on the high frequency and extensive severity of coastal erosion/shoreline change over time, Tribal lands and Tribal members living in the service area continue to be at high risk for future coastal erosion and shoreline change impacts at a medium/regional level. Based on the low frequency and extensive severity of dam failures, yet no record of dam failure in Mashpee, Tribal lands and Tribal members living in the service area are at low risk for future dam failure and impacts to the herring run. Based on the high frequency and serious severity of coastal flooding events in Mashpee/Barnstable County, (twenty five events since 1998), as reported by the National Climatic Data Center and indicated in Table 2.3, the Tribal lands and Tribal members living in the service area are considered at high risk for future coastal flooding at a large/multiple level (Table 2-2 Hazard Index).

2.3.2 Winter-Related Hazards

Winter weather events can include heavy snows, ice, and extreme cold and can affect Tribal lands and Tribal members living in the service area (in addition to the entire Town of Mashpee). Heavy snow can bring a community to a standstill by inhibiting mobility (transportation networks, pedestrian travel), knocking down trees and utility lines, and cause structural collapses in older buildings. Ice buildup can down utility lines and communication towers. The impacts of both events can cause indirect issues such as freezing/rupturing pipes from lack of heat, while also changing the ground's frost level, creating problems for underground infrastructure.

Table 2-5 below represents the various significant winter-related hazard events that have occurred in and around Tribal lands and Tribal members living in the service area over time, utilizing NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable County), unless otherwise noted.

Table 2-5 Significant Winter-Related Events, Barnstable County

Hazard Type	Date	Level/Description	Damages
Heavy Snow			
	1/7/1996	15-25"	$8 M; roof collapsed; 10 animal fatalities
	1/10/1996	4-8"	
	2/2/1996	1ft	School, Business, civic cancellations
	2/16/1996	3-5"	
	3/2/1996	6-12"	Transportation disruptions
	4/7/1996	6-10"	Power outages
	1/11/1997	6-9"	Transportation disruptions
	2/16/1997	6-7"	Wind gusts 30-40 mph
	4/1/1997	20-30"	Wind gusts 30- 50 mph; power outages; roof collapsed; transportation disruptions
	12/24/1998	9 " +	
	2/25/1999	2ft	Wind gusts 67 mph; 1 fatality;
	3/15/1999	11"	Transportation disruptions; schools closed;
	1/13/2000	4-6"	
	1/20/2000	5-7"	
	1/20/2001	10"	
	3/26/2001	5-10"	
	12/5/2002	2-5"	
	1/23/2003	2-7"	
	2/24/2005	4-8"	
	1/27/2008		$20 K; transportation disruptions
	12/19/2008	8-12"	$5 K; wind gusts of 30-40 mph; 1 fatality; trees and wires downed
	12/20/2010	2-4"	
	1/21/2012	8-12"	
	2/8/2013	8-17"	Wind gusts of 74 mph; trees downed; power outages;
	1/2/2014	7-16"	
	1/21/2014	3-12"	
	2/15/2014	5-15"	
	3/5/2015	6-2"	
	2/5/2016	4-8"	$5 K; downed trees
Winter Storm			
	2/7/2003	12-16"	Transportation disruptions;
	2/17/2003	1 to 2ft	

	3/6/2003	5-10"	$50 K; transportation disruptions;
	12/5/2003	1-2ft	Wind gusts of 58 mph; 1 fatality (indirect)
	2/18/2004	4-8"	
	12/26/2004	10-18"	Wind gusts 55 mph; power outages;
	1/22/2005	1-3ft	Wind gusts of 65 mph;
	3/1/2005	5-10"	$75 K; downed wires; transportation disruptions
	10/29/2005	1-3"	$35 K: downed trees; scattered power outages
	2/12/2006	6" +	$10 K; downed trees and wires
	12/19/2009	18-20"	$25 K; travel disruptions; wind gusts of 44 mph
	2/10/2010	2-9"	$15 K; downed trees; power outages
	1/7/2017	8-15"	
	2/9/2017	5-10"	
	3/10/2017	6-9"	
Blizzards			
	2/8/2013	2-2.5"	Wind gusts between 72 and 83 mph
	1/3/2014	6-2"	35 mph wind gusts
	3/26/2014	4-6"	$65 K; downed wires and trees;
	1/26/2015	2-3ft	2 fatalities; wind gusts of 50-65 mph
	2/14/2015	7-4"	Wind gusts of 64 mph; 3 indirect fatalities
	1/23/2016	6-16"	$70 K; wind gusts 63 mph; downed transformers, wires, limbs;
	2/8/2016	5-11"	
	3/13/2018	5-15"	$25 K; wind gusts of 70-80 mph
Extreme Cold/			
	2/14/2016	32 degrees below 0	
Winter Weather			
	3/3/1996		
	11/30/1999	1-3"	Transportation disruptions
	2/25/2001		2 fatalities
	2/17/2013	3-6"	
	3/21/2013	2-10"	
	2/2/2015	2-4"	
	2/8/2015	1-7"	Several roof collapses
	2/25/2015	2-5"	
	3/1/2015	1-5"	Several roof collapses

	4/4/2016	2-4"	
	12/17/2016	2-3"	
	1/30/2018	1-6"	

Source: NOAA National Climatic Data Center, www.ncdc.noaa.gov.
Data current through May 2019.

Snow/Blizzards/Winter Storms/Nor'easters

Winter storms often include natural hazards such as extreme winds, coastal erosion and flooding. Utility and power lines can break from the weight of snow or ice coupled with strong winds. This could put residents at risk of losing heat, electricity, and water (if using well water). Snow melting poses problems as well such as road flooding in low lying areas. Tribal lands and Tribal members living in the service area have experienced heavy snow and winter storms which have become more frequent over the past several years.

Heavy snow affects the entire state, but the highest amounts typically occur in the northern and northwestern areas of the state. Usually, the impact and vulnerability of winter weather is measured in terms of the financial costs associated with preparing for, responding to, and recovering from the event. Tribal lands and Tribal members living in the service area uniformly continue to experience heavy snow and winter storms with greater frequency and severity, as reported by the National Climatic Data Center and indicated in Table 2-5. Based on the high frequency and extensive severity of coastal flooding events in Mashpee/Barnstable County, (sixty four events since 1996), as reported by the National Climatic Data Center and indicated in Table 2.5, Tribal lands and Tribal members living in the service area are considered at high risk for future snow, blizzards and severe winter storms.

Map 2-5 Average Annual Snowfall depicts the average snowfall totals expected for Tribal lands and Tribal members living in the service area (and Town of Mashpee overall). The southern portion of Mashpee averages 12.1 – 24.0 inches of snow each year, while the northern portion averages 24.1 – 36.0 inches of snow per year. Tribal lands and Tribal members living in the service area are split between the two divides.

Ice Storms

Ice storms result from the accumulation of freezing rain, or rain that becomes super-cooled and freezes upon impact with cold surfaces. Most commonly, freezing rain occurs in a narrow band within a winter storm that is also producing heavy amounts of snow and sleet in other locations. Tribal lands and Tribal members living in the service area are uniformly susceptible to the impacts of ice storms.

Infrastructure (utility lines/power outages, roads, and bridges) are at great risk from ice storms. Based on the low frequency and minor severity of ice storm events over time (no events reported by the National Climatic Data Center),

Tribal lands and Tribal members living in the service area are considered at low risk of any future ice storm events.

Extreme Cold

Extreme cold events often accompany winter storms, may be left in their wake, or occur without any associated storm activity, and can lead to hypothermia and frostbite. Extreme cold temperatures vary dependent on the normal climate of the region however, Tribal lands and Tribal members living in the service area can expect to be uniformly affected. For Massachusetts, extreme cold typically means temperatures below zero degrees Fahrenheit. Extreme cold can adversely affect people - some more than others, infants and residents 65 years of age or more are especially vulnerable. Based on the limited frequency and severity of extreme cold events over time (one event), as reported by the National Climatic Data Center and indicated in Table 2-5, Tribal lands and Tribal members living in the service area are considered at low risk to extreme cold.

Climate Change Impacts on Extreme Cold Temperatures

Climate change will result in increased average global temperatures, which will likely decrease the number of extreme cold days. This decrease in extreme cold days has already been documented and is expected to continue.

Property at Risk from Winter-Related Hazards

New England experiences winter storms in more extreme ways than most of the rest of the country. Winter storms cause coastal erosion, power outage, and roof-damage; they can bring excessive cold in their wake. This results in increased fuel oil/gas costs and heightened exposure for Tribal elders. Extended power outages pose serious health and housing dislocation impacts to Tribal members. The elderly and members with health problems or needing special assistance are particularly vulnerable. All Tribal lands and Tribal members living in the service area are susceptible.

Probability of Future Occurrence of Winter-Related Events

According to past history and climatic conditions, and the inability to predict extreme snow and temperature (very low frequency) events, Tribal lands and Tribal members living in the service area are considered to be at high risk for serious/extensive damages at a large/multiple community level for snow, blizzards, winter storms and nor'easters, while also at low risk of future ice storms and extreme cold events (Table 2-2 Hazard Index).

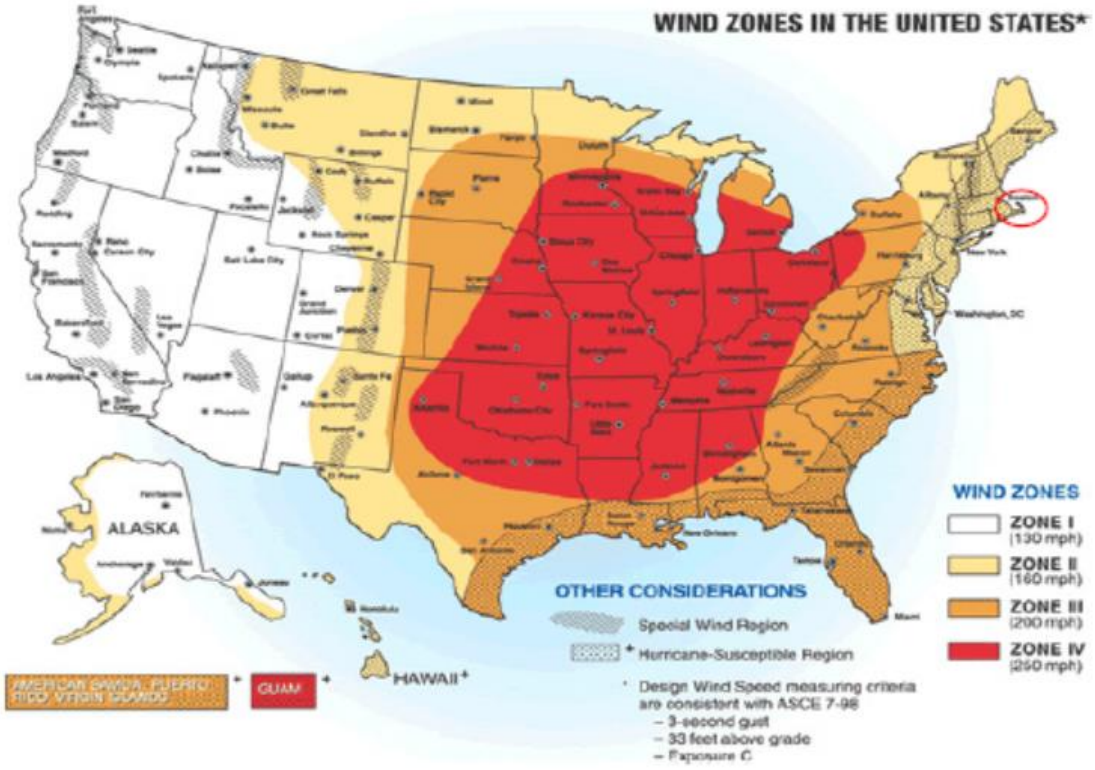
2.3.3 Wind-Related Hazards

Wind is the movement of air caused by a difference in pressure from one place to another. Local wind systems are created by the immediate geographic features in each area, such as mountains, valleys, or large bodies of water. Wind effects can include blowing debris, interruptions in elevated power and

communications utilities, and intensification of the effects of other hazards related to winter weather and severe storms.

Massachusetts is susceptible to high wind from several types of weather events: before and after frontal systems, hurricanes and tropical storms, severe thunderstorms and tornadoes, and Nor'easters. Sometimes, wind gusts of only 40 to 45 mph can cause scattered power outages from trees and wires being downed.[3] Based on historical tornado and hurricane data, FEMA has produced a map that depicts maximum wind speeds for design of safe rooms. The Commonwealth is located within Wind Zone II, with speeds up to 180 mph. The entire Commonwealth is also located within the hurricane-susceptible region. Massachusetts wind events can produce damage often associated with thunderstorms or tornadoes.

Figure 2-2 Wind Zones in the United States



Source: FEMA

Table 2-6 below represents the various significant wind-related hazard events that have occurred in and around Tribal lands and Tribal members living in the service area over time, utilizing NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable County),

[3] 2018 State Hazard Mitigation and Climate Adaptation Plan, Commonwealth of Massachusetts.

unless otherwise noted.

Table 2-6 Significant Wind-Related Events, Barnstable County

Hazard Type	Date	Level/Description	Damages
Hurricanes			
	9/1/1938	Category 3	
	9/1/1944	Category 4	
	8/31/1954	Carol	
	9/11/1954	Edna	
	9/12/1960	Donna	
	9/27/1985	Gloria	
	8/19/1991	Bob	
	9/1/2010	Earl	
	8/28/2011	Irene	$1.2 M
	10/29/2012	Sandy	
Tornadoes			
	8/9/1968	F1	$2.5 K
	8/22/1977	F1	$25 K
	10/29/2018	EF0	$30 K
Strong Winds			
	12/7/1996		$4 M; downed trees and wires; power outages
	12/24/1996	wind gust 40-50 mph	Power outages
	1/10/1997	wind gust 47-55 mph	
	2/17/1997	wind gust 30-40 mph	
	2/18/1997	wind gust 35-45 mph	
	3/6/1997	wind gust 50-77 mph;	Power outages
	3/26/1997	wind gust 50-55 mph	Scattered power outages
	D	wind gust 60-64 mph	downed trees; power outages
	4/1/1997	wind gust 30-50 mph	$6-7 M; power outages
	7/25/1997	wing gust 70 mph	
	8/21/1997	wing gust 40-45 mph	Trees downed; $9 K
	10/20/1997	60 kts	
	11/1/1997	wind gust 81 mph	Power outages; $3.13 K
	11/27/1997	wind gust 71 mph	$22 K; power outages
	12/2/1997	wind gust 35-45 mph	
	12/14/1997	wind gust 62 mph	
	12/29/1997	wind gust 68 mph	$31 K; downed trees and wires
	1/28/1998	wind gust 45 mph	
	2/4/1998	wind gust 44-58 mph	

	2/18/1998	wind gust 65 mph	
	2/24/1998		$1.25 K
	3/9/1998		
	3/21/1998		
	3/26/1998		
	4/9/1998		
	4/23/1998		Tree downed on phone lines
	5/9/1998		
	6/27/1998		$2 K
	11/11/1998		Power outages
	11/26/1998		1 fatality;
	12/1/1998		
	12/18/1998		
	12/22/1998		
	12/30/1998		
	1/3/1999		Downed trees and wires; power outages
	1/15/1999		
	1/18/1999		downed wires; power outages; lightning fire in home
	1/24/1999		
	2/2/1999		
	2/25/1999		1 fatality;
	3/4/1999		Power outages; downed wires
	3/8/1999		
	3/22/1999		Downed trees; power outages; transportation disruptions
	9/30/1999		
	10/14/1999		Downed tree branches; power outages
	10/18/1999		Downed trees and powerlines
	11/2/1999		Downed trees
	12/30/1999		
	1/10/2000		
	1/12/2000		Downed trees
	1/16/2000		
	1/21/2000		
	2/14/2000		

	3/17/2000		
	3/28/2000		
	4/4/2000		Downed trees
	4/8/2000		
	5/18/2000		Power outages; downed power lines
	6/6/2000		Power outages; downed power lines
	10/28/2000		Power outages; downed power lines
	10/31/2000		
	12/25/2000		
	12/30/2000		
	2/10/2001		
	2/11/2001		
	2/17/2001		
	3/30/2001	50-55 kts	
	12/16/2005	50 kts.	$40 K: downed trees and wires
	1/15/2006	31 kts.	$5 K; downed trees
	1/18/2006	47 kts.	$5 K; downed trees; 1 fatality
	2/17/2006	50 kts.	$10 K; 1 fatality; downed trees
	11/23/2006	30 kts.	$2 K; downed trees
	10/28/2008	44 kts.	$50 K; trees downed
	1/28/2009	46 kts.	$5 K;
	6/22/2009	40 kts.	$5 K; downed utility poles
	4/29/2010	40 kts.	$5 K; downed trees on power lines
	8/23/2010	42 kts.	$20 K; downed trees and wires
	1/12/2011	48 kts.	$15 K; power outages
	7/4/2014	39 kts.	$2 K; trees downed
	12/7/2014	40 kts.	scattered power outages
	1/10/2016	40 kts.	$5 K; scattered trees; downed trees
	9/5/2016	40 kts.	$70 K; downed trees
	12/18/2016	44 kts.	$10 K; scattered trees
	1/23/2017	36 kts.	$2 K; downed trees
	1/24/2017	36 kts.	$1 K; downed trees
	3/2/2017	45 kts.	$10 K; downed trees and wires

	3/5/2018	43 kts.	$2 K
	3/7/2018	35 kts.	$2 K; downed trees and wires
	4/16/2018	46 kts.	$3 K
	10/15/2018	45 kts.	$1 K; downed trees
	12/18/2018	40 kts.	$1 K; downed trees
Lightning/Thunderstorms			
	7/26/1999		Downed trees; house fires; power outages
	5/8/2000		1 injured
	5/27/2001		2 injuries;
	4/17/2002		1 injured
	8/5/2002		$5 K; power outages
	8/16/2003		$2.5 M; downed trees;
	7/2/2004		$20 K; downed trees and power lines; house fires
	11/10/2005	38 kts	$5 K; power outages
	6/20/2006		$100 K
	7/18/2006		$15 K; downed wires and trees;
	1/11/2008		$2 K
	8/12/2008		$5 K
	8/16/2008		$10 K; downed trees; house fire
	7/1/2009		1 fatality;
	7/2/2009		1 injured
	9/8/2011		$15 K; house fire;
	7/18/2012		$10 K; downed trees; power outages; house fire
	8/28/2012		2 injuries;
	7/3/2014		$75 K
	7/1/2016		$15 K; 1 house fire
	8/9/2018		$5 K
	8/18/2018		$5 K
High Winds			
	1/19/1996		
	1/24/1996	50 Kts	
	1/27/1996		
	3/3/1996	54 Kts	
	7/13/1996	50 Kts	
	9/2/1996	67 Kts	Downed trees;
	10/8/1996	50 Kts	Scattered power outages

	12/6/1996	56 Kts	Power outages
	1/28/1997	54 Kts	
	3/6/1997	55 Kts	$13.33 K; power outages
	3/12/1997	50 Kts	
	3/26/1997	54 Kts	Power outages
	4/19/1997	58 Kts	$16.67 K; power outages;
	11/1/1997	67 Kts	Downed trees; power outages;
	11/27/1997	59 Kts	Power outages: downed trees
	12/30/1997	56 Kts	Downed trees; power outages;
	11/11/1998	50 Kts	Power outages
	1/3/1999	62 Kts	Scattered power outages
	9/16/1999	63 Kts	Downed trees
	12/1/1999	35 Kts	
	12/10/1999	35 Kts	Downed trees and wires
	12/12/2000	50 Kts	Downed trees and powerlines
	12/17/2000	53 Kts	Downed trees and wires; power outages
	2/6/2001	50 Kts	1 fatality (indirect);
	3/5/2001	50 Kts	Power outages; $10 M +
	1/22/2003	52 Kts	
	10/15/2003	52 Kts	$25 K; power outages; 2 injuries
	11/13/2003	50 Kts	$50 K; downed trees and power lines
	12/7/2003	50 Kts	1 fatality (indirect);
	3/8/2005	56 Kts	Power outages; downed trees
	5/7/2005	50 Kts	$50 K; downed trees and power lines
	5/25/2005	50 Kts	$15 K; downed trees and power lines
	10/16/2005	58 Kts	$5 K; downed trees; power outages
	10/25/2005	58 Kts	$15 K; downed trees and power lines
	11/10/2005	38 Kts	Power outages
	12/9/2005	58 Kts	$50 K; downed trees
	1/18/2006	61 Kts	$100 K; downed wires and trees

	2/12/2006	69 Kts	$10 K; downed wires
	10/28/2006	57 Kts	$8 K;
	10/29/2006	50 Kts	$5 K;
	12/1/2006	54 Kts	$10 K; downed trees
	4/15/2007	58 Kts	$30 K; downed trees and power lines
	11/3/2007	77 Kts	$50 K; downed trees and power lines; fire
	3/8/2008	66 Kts	$10 K; downed wires
	12/25/2008	52 Kts	$5 K
	10/18/2009	36 Kts	$20 K; downed trees
	10/24/2009	52 Kts	$10 K
	1/25/2010	58 Kts	$5.00K; downed trees
	2/25/2010	50 Kts	$25 K; transportation disruptions; downed trees and wires
	3/13/2010	50 Kts	$50 K; downed trees and wires
	11/4/2010	35 Kts	
	12/26/2010	70 Kts	
	2/25/2011	52 Kts	
	10/30/2011	54 Kts	$30 K; power outages
	1/13/2012	51 Kts	$2 K
	2/25/2012	52 Kts	
	10/29/2012	69 Kts	$500 K; downed trees
	11/7/2012	52 Kts	$65 K; trees down
	12/27/2012	52 Kts	$3 K; downed trees
	1/31/2013	56 Kts	Downed trees and powerlines
	2/9/2013	50 Kts	$15 K; downed trees and wires
	2/17/2013	36 Kts	
	3/7/2013	53 Kts	
	11/27/2013	50 Kts	$5 K; downed telephone poles
	2/15/2014	50 Kts	$60 K; downed trees and wires
	11/2/2014	53 Kts	$100 K; downed trees
	12/9/2014	50 Kts	$15 K
	1/9/2015	36 Kts	
	1/27/2015	65 Kts	$50 K; downed trees and wires
	3/17/2015	50 Kts	$10 K; downed trees

	6/28/2015	50 Kts	$20 K; down trees and wires
	1/13/2016	50 Kts	$7.50 K
	4/3/2016	58 Kts	
	4/7/2016	52 Kts	
	10/9/2016	36 Kts	$1.50 K; downed trees
	10/22/2016	50 Kts	$1 K
	10/28/2016	50 Kts	
	12/15/2016	56 Kts	$1 K
	12/27/2016	50 Kts	$100
	1/23/2017	51 Kts	$2.50 K; downed trees and wires
	2/13/2017	50 Kts	$2.50 K; downed trees and wires
	3/2/2017	50 Kts	Downed trees and wires
	3/14/2017	69 Kts	$2 K; downed trees
	4/1/2017	54 Kts	
	10/25/2017	50 Kts	$1 K
	10/29/2017	81 Kts	$12 K
	12/25/2017	66 Kts	$20 K; trees and wires down
	1/4/2018	65 Kts	$8 K; downed trees
	1/12/2018	57 Kts	$5 K; trees down
	1/30/2018	36 Kts	
	3/2/2018	84 Kts	$40 K; trees and wires down
	10/16/2018	50 Kts	$1 K; downed tree and wire
	10/27/2018	56 Kts	Downed trees
	11/3/2018	51 Kts	$9 K; downed trees and wires
	11/13/2018	50 Kts	$500; trees downed
	11/16/2018	56 Kts	
	1/24/2019	52 Kts	
	1/30/2019	54 Kts	
	2/9/2019	50 Kts	$1 K
	2/25/2019	55 Kts	
Hail			
	5/24/1962		
	7/13/1981		
	5/28/1986		
	5/25/1994	.75in	
	7/3/1997	.75 in	Scattered power outages

	7/18/1997	1.75 in.	1 injured;
	11/4/1997	1.5 in	Telephone pole melted on houses
	6/26/1998	.75 in	
	6/30/1998	1.00 in.	Downed trees; wind gusts 75 to 85 mph;
	5/8/2000	0.88 in.	1 injured
	5/10/2000	0.88 in.	
	7/17/2001		
	5/24/2004	0.75 in.	House fires
	7/22/2005	0.75 in.	$5 K; downed trees and power lines
	6/20/2006	0.75 in.	Downed trees
	7/18/2006	0.75 in.	Downed trees
	7/6/2007	0.75 in.	
	8/18/2007	0.75 in.	
	4/12/2008	0.75 in.	
	6/24/2008	0.75 in.	
	8/16/2008	1.00 in.	$1 K; downed trees;
	8/19/2008	0.75 in.	
	7/1/2009	0.75 in.	1 fatality
	7/2/2009	0.75 in.	$1 K
	6/9/2011	0.75 in.	
	8/2/2011	0.75 in.	
	7/24/2012	0.75 in.	
	8/7/2014	0.88 in.	

Source: NOAA National Climatic Data Center, www.ncdc.noaa.gov.
Data current through May 2019.

Hurricanes

Hurricanes are defined as a large circulating windstorm covering hundreds of miles that forms over warm ocean water. To be officially classified as a hurricane, the wind speeds must exceed 74 miles per hour. In the northern hemisphere winds circulate in a counterclockwise direction. A great dome of water as much as fifty miles in diameter (called the “storm surge”) is pushed ahead of the storm by its winds. In some coastal locations, this can result in tides 20 feet higher than usual. Occasionally, storm surge is responsible for damage to property and potential deaths.

The winds that accompany hurricanes have the potential to cause serious damage. Downed power lines leave residents without electricity and can impede business for days. Fallen trees can damage buildings and block roadways. Unsecured building components including gutters, screened enclosures, roof coverings, shingles, car ports, porch coverings, overhangs, siding, decking, windows, walls, gables can be blown off structures and carried by the wind to

cause damage in other places. Wind driven rain often causes water damage in roof and wall envelopes.

Measuring the Intensity of a Hurricane

Hurricane damages come from wind, rain, tornadoes, floods/storm surge, and the effects of very low air pressure. The Saffir-Simpson Hurricane Wind Scale (SSHWS) intensity category system was developed in the 1970's to characterize a hurricane's destructive potential by indicating wind speeds and range of damage, see Table 2-7 below. The SSHWS category system measures sustained wind speed, central pressure, storm surge height, and coastal damage potential within five intensity categories.

Table 2-7 Saffir-Simpson Hurricane Wind Scale

Scale No. (Category)	Wind (mph)	Potential Damage
1	74 - 95	Minimal: Damage is primarily to shrubbery and trees, mobile homes, and some signs. No real damage is done to structures.
2	96 – 110	Moderate: Some trees topple, some roof coverings are damaged, and major damage is done to mobile homes.
3	111 – 130	Extensive: large trees topple, some structural damage is done to roofs, mobile homes are destroyed, and structural damage is done to small homes and utility buildings.
4	131 – 155	Extreme: Extensive damage is done to roofs, windows and doors; roof systems on small buildings completely fail; and some curtain walls fail.
5	> 155	Catastrophic: Roof damage is considerable and widespread, window and door damage are severe, there are extensive glass failures, and entire buildings could fail.
Additional Classifications: Tropical Storm 39 – 73, Tropical Depression < 38		

Source: NOAA.

The National Weather Service (NWS) will issue a hurricane warning when sustained winds of 74 mph or higher are reached and expected within a coastal area within 24 hours. On average, there are approximately 10 named tropical storms along the east coast of the U.S. each year, six of which are likely to develop into hurricanes, with only two or three likely to reach category 3 on the SSHWS. The SSHWS has undergone a minor modification for 2012 in order to resolve awkwardness associated with conversions among the various units used for wind speed in advisory products. The change broadens the Category 4 wind speed range by one mile per hour (mph) at each end of the range, yielding a new range of 130-156 mph.

Based on the high frequency and serious severity of hurricanes over time (two in the last few years), as reported by the National Climatic Data Center and indicated in Table 2-6, Tribal lands and Tribal members living in the service area are considered at medium-high risk to extreme cold. Map 2-4 Hurricanes depicts

those events (hurricane tracks) occurring in and around Tribal lands and Tribal members living in the service area.

Storm Surge

Of additional concern is hurricane storm surge. Storm surge refers to the rise of water levels caused explicitly by a storm and is measured as the height above the normal predicted tide. The combination of SRL and increased storm intensity will result in higher storm surges characterized that will extend further inland, potentially causing greater damage to property and infrastructure. The IPCC in 2014 found that increasing storm surges and other forms of coastal flooding have the potential to disrupt livelihoods and create severe health risks across various sectors.

Over time, as sea levels rise, water levels associated with what is thought of as today's 100-year return period storm will increase, because a higher base sea level will increase the extent and depth of storm-related flooding. As a result, the 100-year return period storm of the future could result in much more flood-related damage than the 100-year return period storm of today. Additionally, from the perspective of water levels, SLR will cause the flooding that would occur with today's 100-year return period storm to become a more regularly occurring event. For example, a future 20-year return period storm on top of a two-foot SLR will have the same water level and depth as today's 100-year return period storm.

Hurricane surge inundation areas for Categories 1 through 4 hurricanes striking the coast were developed by the National Oceanic Atmospheric Administration (NOAA) using the Sea Lake and Overland Surge from Hurricanes (SLOSH) Model. Map 2.6 Hurricane Inundation Areas shows those areas expected to be inundated by Categories 1 through 4 hurricanes. 213 Sampson Mill Road is impacted by a category 1 hurricane. Three Tribal properties (17 Mizzen Mast, 56 Uncle Percy's Road and 213 Sampson's Mill Road) are impacted by a category 2 hurricane. Four Tribal properties (17 Mizzen Mast, 56 Uncle Percy's Road, 213 Sampson's Mill Road and 0 Great Neck Road South) are impacted by a category 3 hurricane. Five Tribal properties (17 Mizzen Mast, 56 Uncle Percy's Road, 213 Sampson's Mill Road, and 43 Great Neck Road South) are impacted by a category 4 hurricane. Popponesset Bay (Tribal Oyster farm) is impacted under all four hurricane categories.

Climate Change Impacts on Hurricanes

Climate change is expected to result in the increased frequency and intensification of hurricanes and tropical storms worldwide. Rising sea levels, coupled with potentially higher hurricane wind speeds, rainfall intensity, and storm surges will combine to create more intense hurricanes, resulting in increased impacts to coastal communities. Research predicts a global increase in the intensity of such storms on average, by 2% to 11%, based on the IPCC mid-range emission scenario projections, as well as a poleward expansion in the

latitude at which storms will reach their highest intensity. Some experts have noted that the three massive storms from the 2017 hurricane season (Harvey, Irma, and Maria) are consistent with this expected intensification.

Hurricanes and tropical storms are expected to result in more rainfall. This increase has been observed and is expected both globally (IPCC 2014) and for the Atlantic basin, including the U.S. east coast. Based on a synthesis of current science, NOAA predicts that Atlantic hurricanes and tropical storms in the coming century will have higher rainfall rates than present storms, especially near the center of the storm. Hurricane Harvey, which resulted in a record 51.9 inches of rainfall at one station west of Houston, Texas, is one recent example of this trend.

Tornadoes/High Winds

Tornadoes are violently rotating columns of air in contact with and extending between a cloud and the surface of the earth. Generally, winds in most tornadoes are 100 mph or less, but can exceed 250 mph in the most violent and least frequent tornadoes. Several conditions are required for the development of tornadoes and associated thunderstorm clouds, including abundant low-level moisture to contribute to the development of a thunderstorm, along with a trigger/cold front to lift the moist air. Tornadoes usually form in areas where strong winds are turning in a clockwise direction and can be in the traditional funnel shape, or in a slender rope-like form. They typically begin in a supercell (severe thunderstorm), primarily in the month of May.

Measuring the Intensity of a Tornado

Typically, tornadoes are categorized by frequency values from historic data and area impacted based on the length and width of the damage path. Tornado damage severity is measured by the Fujita Tornado Scale, where wind speed is estimated from the amount of damage. As of February 1, 2007, the National Weather Service began rating tornadoes using the Enhanced Fujita-scale (Table 2-8). The Enhanced Fujita scale is more complicated than the original F-scale, allowing for more precise assessments of tornado severity.

Table 2-8 Enhanced Fujita Scale

Fujita Scale			Derived		Operational EF Scale	
F Number	Fastest ¼ mile (mph)	3-second gust (mph)	EF Number	3-second gust (mph)	EF Number	3-second gust (mph)
0	40 - 72	45 - 78	0	65 - 85	0	65 - 85
1	73 - 112	79 - 117	1	86 - 109	1	86 - 110
2	113 - 157	118 - 161	2	110 - 137	2	111 - 135
3	158 - 207	162 - 209	3	138 - 167	3	136 - 165

4	208 - 260	210 - 261	4	168 - 199	4	166 - 200
5	261 - 318	262 - 317	5	200 - 234	5	Over 200

Source: NOAA.

Electrical utilities and communications infrastructure are vulnerable to tornadoes. Damage to power lines or communication towers has the potential to cause power and communication outages for residents, businesses and critical facilities. In addition to lost revenues, downed power lines present a threat to personal safety. Further, downed wires and lightning strikes have been known to spark fires. A structure's tornado vulnerability is based on building construction and standards. In general, mobile homes and wood-framed structures are more vulnerable to damage in a tornado than steel framed structures. Other factors, such as location, condition and maintenance of trees also plays a significant role in determining vulnerability.

No tornadoes have made landfall in and around Tribal lands and Tribal members living in the service area to date.

Based on the low frequency and extensive severity of tornadoes over time (three since 1968), as reported by the National Climatic Data Center and indicated in Table 2-6, Tribal lands and Tribal members living in the service area are considered at low risk to future tornadoes.

Lightning/Thunderstorms

Thunderstorms are formed when the right atmospheric conditions combine to provide moisture, lift, and warm unstable air that can rise rapidly. Thunderstorms occur any time of the day and in all months of the year but are most common during summer afternoons and evenings and in conjunction with frontal boundaries. Thunderstorms affect a smaller area compared with winter storms or hurricanes, but they can be dangerous and destructive for several reasons. Storms can form in less than 30 minutes, giving very little warning; they have the potential to produce lightning, hail, tornadoes, powerful straight-line winds, and heavy rains that produce flash flooding.

All thunderstorms produce lightning, and therefore all thunderstorms are dangerous. Lightning often strikes outside of areas where it is raining and may occur as far as 10 miles away from rainfall. It can strike from any part of the storm and may even strike after the storm has seemed to pass. Hundreds of people across the nation are injured annually by lightning, most commonly when they are moving to a safe place but have waited too long to seek shelter. Tribal lands and Tribal members living in the service area are uniformly affected by lightning and thunderstorms, dependent upon the time of day, existing/incoming weather conditions, and time of year.

Building construction, location, and nearby trees or other tall structures will have a large impact on how vulnerable an individual facility is to a lightning strike. A rough estimate of a structure's likelihood of being struck by lightning can be calculated using the structure's ground surface area, height, and striking distance between the downward-moving tip of the stepped leader (negatively charged channel jumping from cloud to earth) and the object. In general, buildings are more likely to be struck by lightning if they are located on high ground or if they have tall protrusions such as steeples or poles which the stepped leader can jump to. Electrical and communications utilities are also vulnerable to direct lightning strikes. Damage to these lines has the potential to cause power and communications outages for businesses, residencies, and critical facilities. Based on the high frequency and serious severity of lightning/thunderstorm events over time (22 events since 1999), as reported by the National Climatic Data Center and indicated in Table 2-6, the risk of future lightning/thunderstorm events is considered medium-high.

Hail

Hail is formed in towering cumulonimbus clouds (thunderheads) when strong updrafts carry water droplets to a height at which they freeze. Eventually, these ice particles become too heavy for the updraft to hold up, and they fall to the ground at speeds of up to 120 MPH. Hail falls along paths called swaths, which can vary from a few square acres to up to 10 miles wide and 100 miles long. Tribal lands and Tribal members living in the service area can be uniformly affected by hail, dependent upon the existing/incoming weather conditions, and time of year.

Structure vulnerability to hail is determined mainly by construction and exposure. Metal siding and roofing is better able to stand up to the damages of a hailstorm than many other materials, although it may also be damaged by denting. Exposed windows and vehicles are also susceptible to damage. Crops are extremely susceptible to hailstorm damage, as even the smallest hail stones can rip apart unsheltered vegetation. Based on the limited frequency and severity of hail events over time (28 events since 1962), as reported by the National Climatic Data Center and indicated in Table 2-6, the risk of future hail events is considered medium-high.

Property at Risk from Wind-Related Events

Wind-related events are quite normal in New England and happen regularly each year. In the winter months, Tribal lands and Tribal members living in the service areas are susceptible to high winds from nor'easters and winter storms (both high frequency). Spring and summer seasons usually bring several severe thunderstorms to the region (high frequency). During the late summer and fall seasons, the area is at risk from a hurricane or tropical event (high frequency).

Hurricanes impact Tribal lands, fish structures/dams and Tribal members living in towns and cities of southeast Massachusetts. Hurricanes cause damage to walls,

decks and roofs of Tribal structures and homes. Flash flooding, basement flooding, damage to Tribal forestland, power outages, and coastal erosion are common occurrences during a hurricane. Elders and others who require assistance face heightened exposure to injury and illness from hurricanes. Extended power outages pose serious health and housing dislocation impacts to Tribal members. The elderly and members with health problems or needing special assistance are particularly vulnerable.

Tribal lands do not flood but coastal ponds (Johns Pond, Mashpee Pond, and Santuit Pond) and inlets upon which Tribal fisheries depend do. Coastal areas frequented by Tribal members in the Town of Mashpee most susceptible to flooding and subsequent flood damage are the beach at John's Pond, Popponesset and Deans Pond areas, and shorelines of Popponessett, Ochway and Waquoit Bays. Riverine flooding can occur also along the banks of inland streams in Mashpee.

Probability of Future Occurrence of Wind-Related Hazards

As previously stated, wind-related events are quite normal in New England, as evidenced throughout the year. Given the increase in frequency and severity of wind-related events realized over the last several years, Tribal lands and Tribal members living in the service area will continue to be at high risk for serious damages at a range of local to large/multiple levels for wind-related events (Table 2-2 Hazard Index).

2.3.4 Geologic-Related Hazards

For this plan, geologic-related events include earthquakes. There have been no significant geologic-related events impacting Tribal lands/Tribal members living in the service area/Barnstable County.

Earthquakes

An earthquake is the sudden release of strain energy in the Earth's crust, resulting in energy waves that radiate outward from the earthquake source. The point on the Earth's surface directly above the focus is called the earthquake epicenter. The severity of earthquake effects is dependent upon magnitude of energy released; proximity to the epicenter; depth to the epicenter; duration; geologic characteristics; and, type of ground motion.

When earthquakes occur, much of the damage is a result of structures falling under the stress created by the ground movement. Another significant effect is damage to the public and private infrastructure (i.e. water service, communication lines, drainage system). Because earthquakes are highly localized it is difficult to assign regional boundaries that share the same relative degree of risk.

Measuring the Intensity of an Earthquake

An earthquake's severity can be expressed in terms of intensity and magnitude. Intensity is defined by the observed effects of ground shaking on people, buildings, and the natural environment, which varies dependent upon the location of the observer with respect to the epicenter. Currently in the U.S., the Modified Mercalli (MMI) Intensity Scale is used to evaluate the effects of earthquakes – specifically, it describes how strongly an earthquake was felt at a location, Table 2-9 below. Magnitude is defined by the amount of seismic energy released at the hypocenter of the earthquake, based on the amplitude of the earthquake waves recorded on seismographs (using the Richter Magnitude Scale, Table 2-10). Another measure of the relative strength of an earthquake is the expanse of area the shaking is noticed**.**

Table 2-9 Modified Mercalli Intensity Scale

Mercalli Intensity	Description
I	Felt by very few people, barely noticeable.
II	Felt by few people, especially on upper floors.
III	Noticeable indoors, especially on upper floors, but may not be recognized as an earthquake.
IV	Felt by many indoors, few outdoors. May feel like passing truck.
V	Felt by almost everyone, people have trouble standing. Small objects move, trees and poles may shake.
VI	Felt by everyone, people have trouble standing. Heavy furniture can move, plaster can fall off walls. Chimneys may be slightly damaged.
VII	People have difficulty standing. Drivers feel cars shaking. Some furniture breaks. Loose bricks fall from buildings. Damage is slight to moderate in well-built buildings; considerable in poorly built buildings.
VIII	Buildings suffer slight damage if well-built; severe damage if poorly built. Some walls collapse.
IX	Considerable damage to specially built structures; buildings shift off their foundations. The ground cracks. Landslides may occur.
X	Most buildings and their foundations are destroyed. Some bridges are destroyed. Dams are seriously damaged. Large landslides occur. Water is thrown on the banks of canals, rivers, lakes. The ground cracks in large areas.
XI	Most buildings collapse. Some bridges are destroyed. Large cracks appear in the ground. Underground pipelines are destroyed.
XII	Almost everything is destroyed. Objects are thrown into the air. The ground moves in waves or ripples. Large amounts of rock may move.

Source: USGS, 2012.

Table 2-10 Richter Magnitude Scale

Richter Magnitude	Earthquake Effects
2.5 or less	Not felt or felt mildly near the epicenter, but can be recorded by seismographs
2.5 to 5.4	Often felt, but only causes minor damage
5.5 to 6.0	Slight damage to buildings and other structures
6.1 to 6.9	May cause a lot of damage in very populated areas
7.0 to 7.9	Major earthquake; serious damage
8.0 or greater	Great earthquake; can totally destroy communities near the epicenter

Source: USGS, 2012.

Based on the low frequency and severity of earthquake events over time (no events), as reported by the National Climatic Data Center, the risk of future earthquake events is considered low.

Property at Risk from Geologic-Related Hazards

Because earthquakes have been detected all over New England, seismologists suspect that a strong earthquake could be centered anywhere in the region. Furthermore, the mapped geologic faults of New England currently do not provide any indications detailing specific locations where strong earthquakes are most likely to be centered.[4] Map 2-3 Earthquakes depicts the one earthquake occurring in the general vicinity of Tribal lands and Tribal members living in the service area (Falmouth, September 12, 1981, Magnitude 2.1).

Tribal lands and Tribal members living in the service area are potentially vulnerable to seismic ground shaking. The most vulnerable are historic buildings constructed of unreinforced masonry. Other critical facilities or infrastructure at risk are unknown; their construction determines their ability to withstand seismic shaking. Barnstable County has only experienced secondary effects from both regional events and longer-distance events emanating from the northeast in general. However, since building codes do not require seismic proofing, the impact would be expected to be catastrophic if an earthquake were to strike in the area.

Probability of Future Occurrence of Geologic-Related Hazards

The Commonwealth has a 2% chance that an earthquake with a peak horizontal acceleration of 50 km above magnitude will occur within the next 50 years. A ‘G’ is the average acceleration produced by gravity at the earth’s surface (9.80665 meters per second squared). This measurement describes ground shake during earthquakes. New England is not considered to be a hot spot for earthquakes, especially when compared to the western United States. Given the historic pattern

[4] 2018 State Hazard Mitigation and Climate Adaptation Plan, Commonwealth of Massachusetts.

of earthquakes, or more specifically the secondary impacts of earthquakes felt across the region (which has been the historic pattern), Tribal lands and Tribal members living in the service area are considered to be at very low risk for shaking, with potential severity of catastrophic damage should one occur (Table 2-2 Hazard Index).

2.3.5 Drought - Related Hazards

Drought

Drought is a temporary irregularity characterized by long durations of below normal precipitation. Drought occurs in virtually all climatic zones yet varies significantly from one region to another, due to its relationship to normal precipitation in that specific region. Drought can affect agriculture, water supply, aquatic ecology, wildlife, and plant life.

Drought can be defined or grouped by the following:

- Meteorological drought is a measure of departure of precipitation from normal, defined solely on the degree of dryness.
- Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts with a focus on precipitation shortages, differences between actual and potential evapo-transpiration, soil water deficits, reduced groundwater or reservoir levels, etc.
- Hydrological drought is associated with the effects of precipitation (including snowfall) shortfalls on surface or subsurface water supply and when water supplies are below normal.
- Socioeconomic drought is associated with the supply and demand of some economic goods with elements of meteorological, hydrological, and agricultural drought.

Based on past events and current criteria outlined in the Massachusetts Drought Management Plan, it appears that western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions.[5] That being said, many factors, such as water supply sources, population, economic factors (i.e., agriculture based economy), and infrastructure, contribute to the severity and length of a drought event. Tribal lands and Tribal members living in the service area can expect to be uniformly affected by drought conditions. Table 2-11 below represents the significant drought-related hazard events that have occurred in and around Tribal lands and Tribal members living in the service area (Barnstable County) over time (6 events since 2012), utilizing NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable County), unless otherwise noted.

[5] 2018 State Hazard Mitigation and Climate Adaptation Plan, Commonwealth of Massachusetts.

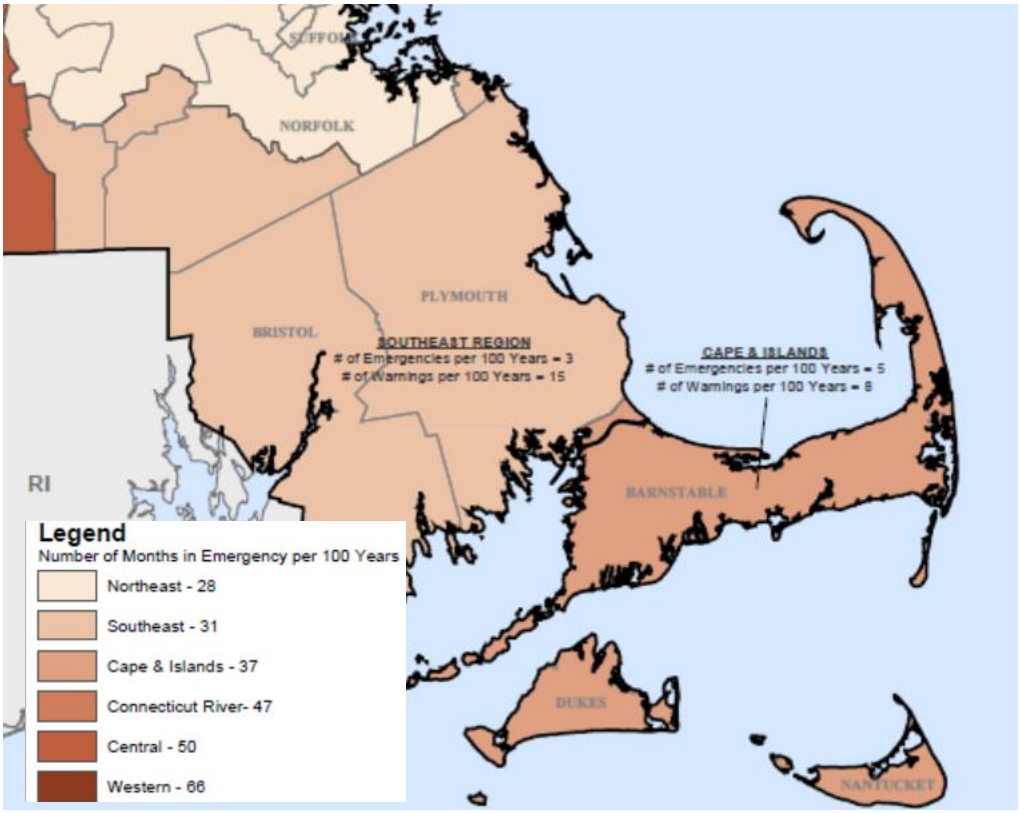
Table 2-11 Significant Drought-Related Events, Barnstable County

Hazard Type	Date	Level/Description	Damages
Drought			
	4/24/2012	Severe drought (4/24/12 to 5/15/ 2012)	
	5/1/2012	Severe drought (4/24/12 to 5/15/ 2012)	
	8/30/2016		
	9/1/2016	Severe drought (9/1/16 to 9/30/2016	
	10/1/2016	Severe drought (10/1/16 to 10/31/2016	
	11/1/2016		
Extreme Heat			
	7/22/2011		

Source: NOAA National Climatic Data Center, www.ncdc.noaa.gov.
Data current through May 2019.

Figure 2-3 shows that Barnstable County (and Cape and Islands overall) has been in a drought emergency for thirty-seven months over the last 100 years.

Figure 2-3 Drought Occurrences over the Past 100 Years



Source: 2019 State Hazard Mitigation Plan, Commonwealth of Massachusetts.

Extreme Heat

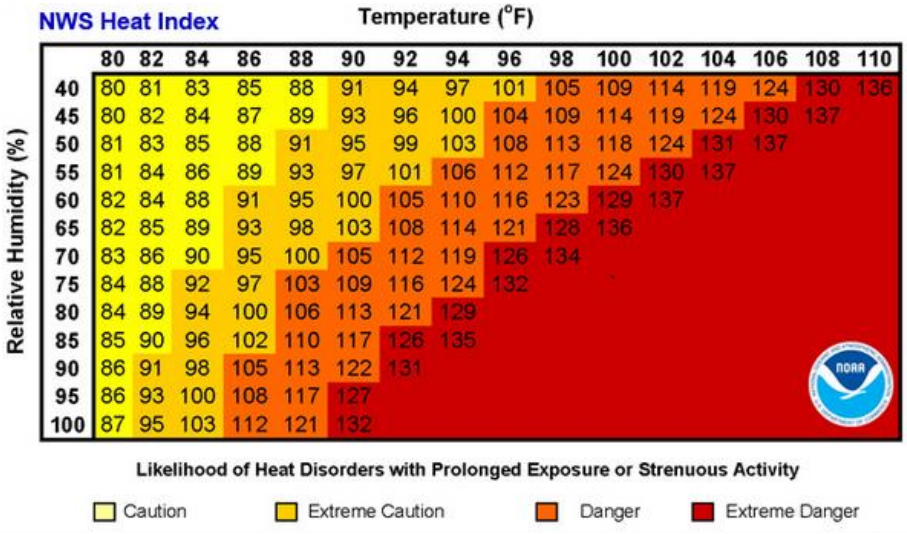
Extreme heat occurs when a system of high atmospheric pressure moves into an area. In such a high-pressure system, air from upper levels of our atmosphere is pulled toward the ground, where it becomes compressed and increases temperatures. This high concentration of pressure makes it difficult for other weather systems to move into the area, which is why periods of extreme heat can last for several days, or even weeks. The longer the system stays in an area, the hotter temperatures become. The high pressure inhibits winds, making them faint to almost non-existent. Because the high-pressure system also prevents clouds from entering a region, sunlight can become punishing, increasing temperatures even more. The combination of all these factors come together to create what is known as a heat wave. Typically, a heat wave can last two or more days with significant impacts on human health and/or infrastructure. Heat waves can also cause catastrophic crop failures, cause roads to crumble, and can cause the ground around residences to dry out, leaving them susceptible to subsidence.

NOAA's NWS maintains a Heat Index (Figure 2.4), which is a measure of how hot it really feels when relative humidity is also factored in with actual air

temperatures. As an example, if the air temperature is 96°F and the relative humidity is 65%, the heat index, how hot it feels, is 121°F. The NWS also initiates alert procedures when the Heat Index is expected to exceed 105°-110°F (depending on local climate) for at least two consecutive days:

- Caution – fatigue possible,
- Extreme Caution – sunstroke, muscle cramps, and/or heat exhaustion possible,
- Danger – sunstroke, muscle cramps, and/or heat exhaustion likely, and
- Extreme Danger – heat stroke or sunstroke highly likely.

Figure 2.4 NOAA's National Weather Service Heat Index



Source: https://www.weather.gov/phi/heatcond

Table 2-11 represents the significant extreme heat-related hazard events that have occurred in and around Tribal lands and Tribal members living in the service area (Barnstable County) over time (1 event in 2011), utilizing NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/). All events are county wide (Barnstable County), unless otherwise noted.

Climate Change Impacts on Extreme Heat

More intense and prolonged heat waves are predicted with climate change. The frequency of days with high temperatures at or above 90°F has already increased (Vallee and Giuliano, 2014). The average number of days expected to be above 90°F in 1950 was about seven, while the new normal is 12.

Property at Risk from Drought-Related Hazards

Past drought events in Massachusetts have typically affected entire regions, and sometimes the entire state. Although western Massachusetts may be more vulnerable than eastern Massachusetts to severe drought conditions as previously stated, Tribal lands and Tribal members living in the service area are uniformly vulnerable to drought with varying impacts based on the degree of

moisture deficiency, the duration, and the size and location of the affected area. Future droughts may impact the levels of the ponds serving as herring nurseries, the flow of the herring runs, productivity of home water supply wells, home gardens, the Tribe's garden and other agricultural lands.

Tribal lands and Tribal members living in the service area are uniformly susceptible to extreme heat events. Extreme heat events can cause health problems for Tribal elders and others with health issues. They can also impact the Tribe's garden and home gardens.

Probability of Future Occurrence of Drought-Related Hazards

Although Massachusetts is relatively small, it has several distinct regions that experience significantly different weather patterns and react differently to the amounts of precipitation they receive.[6] Several drought events have occurred in Barnstable County, with one event lasting several months in 2016. For this plan, Tribal lands and Tribal members living in the service area are considered at high risk with minor expected damages at a medium/regional level for future drought-related events (Table 2-2 *Hazard Index*).

While extreme heat events occur periodically on the mainland, the ocean tends to moderate temperatures on the Cape by 10 degrees, reducing the number of extreme heat events in the area. For this plan, Tribal lands and Tribal members living in the service area are considered at low risk with minor expected damages at a medium/regional level for future drought-related events (Table 2-2 Hazard Index).

2.3.6 Urban Fire/Wildfire – Related Hazard

Urban fire or conflagration is a large destructive, sometimes uncontrollable, fire that spreads substantial destruction, typically as a result of other hazards, including storms, earthquakes, gas leaks, transportation accidents, hazardous material spills, criminal activity (arson), or terrorism.[7] Alternatively, smaller-scale structural fires often result from everyday events such as cooking, smoking, equipment/appliance malfunctions, etc.

Wildfires are defined as any non-structure fire that occurs in the vegetative wildland, including grass, shrub, leaf litter/debris, and forested tree fuels. Most susceptible to the hazard are pitch pine, scrub oak, and oak forests – the most flammable vegetative fuels. Small wildfires are common throughout the State, especially when drought or near-drought conditions warrant, the potential for spreading wildfires is real. The State's Wildland Urban Interface (WUI) – the area where structures and human development meet and intermingle with

[6] 2018 State Hazard Mitigation and Climate Adaptation Plan, Commonwealth of Massachusetts

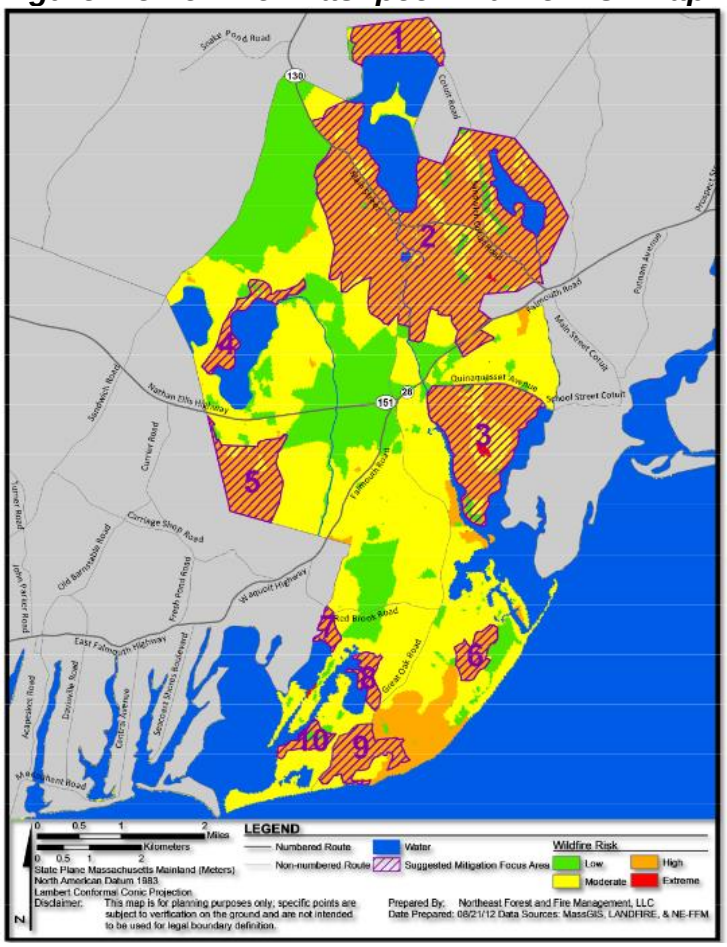
[7] Ibid.

undeveloped wildland, creates an environment in which fire can move readily between structural and vegetative fuels. The State's WUI includes the Intermix WUI – areas where housing and vegetation intermingle.

The Barnstable County Wildfire Preparedness Plan was developed in 2012 by the Cape Cod Cooperative Extension (and many other regional partners). As part of this plan, a town-wide risk assessment for wildfire in Mashpee was conducted, identifying ten sites in Mashpee that warrant a mitigation focus (Figure 2-5). This document indicates that Cape Cod is vulnerable to wildfires for several reasons:

- Cape Cod has a long history of wildfires. Pitch Pine barrens are the dominant vegetative community on the Cape, which contain several highly flammable plant species adapted to survive or regenerate post fire.
- As stated above, many residents live in the Wildland Urban Interface (WUI) – the line, area or zone where structures and other human development intermingle with undeveloped wildland or vegetative fuel. This area is dangerous because wildfires can move structure to structure, consuming developments.

Figure 2-5 Town of Mashpee Wildfire Risk Map



Source: Barnstable County Wildfire Preparedness Plan

Between 1982 and 1997, six wildfires burned about 7,500 acres at Camp Edwards. Wildfires have occurred in Mashpee regularly since the 1800s, with the largest burning 1,300 acres in town in 1935. Based on the high frequency and severity of urban/wildfires and given that more intense heat waves are predicted with climate change, the risk of future wildfires is considered medium-high.

Property at Risk from Urban Fire/Wildfire-Related Hazards

The Pitch Pine/Scrub Oak forest type found on Cape Cod and in Mashpee is one of the most flammable vegetation environments in the United States. Mashpee is especially at risk because of the presence of high-risk forest types and high rate of human-caused fires.[8] A 2001 national survey by the federal government listed the Town of Mashpee as a community that is at high risk from wildfire on federal lands (Mashpee National Wildlife Refuge). The Tribal Government Center property is one of the most susceptible places where the highest flames can be expected on the Cape. The Tribe manages one of the largest contiguous forests in Mashpee. A fire in this forest would not only endanger Tribal administrative and health buildings, it would damage a vital Tribal natural resource and possibly Tribal sacred sites.

In addition, all but three Tribal properties (excluding 410/414 Meeting House Road and 17 Mizzen Mast) identified in Figure 1-1 Mashpee Wampanoag Interest in Tribal Properties are located within several of the wildfire mitigation focus areas from the Barnstable County Wildfire Preparedness Plan (Figure 2-5).

Probability of Future Occurrence of Urban Fire/Wildfire Hazards

Most urban or wildfires are a result of negligent and/or intentional human behavior (arson, open flames, and cooking) and are preventable. Wildfire season in Massachusetts begins in late March and typically ends in early June, which also corresponds with the driest live fuel moisture periods of the year.

The probability of a fire occurring on Tribal lands is remote, however the threat is real and potential severity serious. Tribal lands and Tribal members living in the service area are considered at medium-high risk with expected damages at a small/local level for future urban fire/wildfire-related events.

2.4 Vulnerability

Vulnerability indicates what is likely to be damaged by the identified hazards and how severe that damage could be. After identifying types and areas of risk, a vulnerability analysis can help to determine the gaps in an area. This section

[8] Kent Nelson, Maine Forest Service, representing the Northeastern Forest Fire Protection Compact, at a press conference in Mashpee as reported in the Mashpee Enterprise, February 10, 2012.

examines the vulnerability of Tribal lands and Tribal members living in the service area, such as structures, utilities, roads, and bridges, as well as social and environmental vulnerability. A vulnerability analysis also estimates the number of Tribal members exposed to hazards, including Tribal elder populations and concentrated populations. This also includes such things as whether the shelter capacity is enough for the affected population, and whether businesses are likely to face temporary closure due to natural disasters. Historical damages are often good indicators for current exposure and potential damage.

A vulnerability chart was developed based on the identification and profile of the natural hazards that have occurred throughout Barnstable County and specifically, Mashpee as presented earlier in Section 2.3. Below, Table 2-12 Vulnerability Matrix 2020 describes the expected frequency of occurrence, and the potential severity of the damage resulting from each individual hazard evaluated for this plane. Coordination with the State Plan was also a consideration in the development of the Vulnerability Matrix.

Table 2 - 12 Vulnerability Matrix 2018 Update

Hazard	Frequency	Severity
Flood-Related Hazards	High	Extensive
Winter-Related Hazards	High	Extensive
Wind-Related Hazards	High	Extensive/Serious
Geologic-Related Hazards	Low	Catastrophic
Drought	High	Minor
Urban Fire/Wildfire	High	Serious

2.4.1 Development Trends

The Tribe enforces the Massachusetts State Building Code which includes many detailed regulations regarding wind and snow loads, earthquake-resistant design and development in floodplains. New development follows the updated State building codes, and in turn, these more restrictive codes help facilitate decreases in a structures' overall vulnerability.

Residential Development Trends

The mission of the Mashpee Wampanoag Housing Department is to provide safe affordable housing to eligible Tribal members, and other Native Americans who reside in the Tribe's service area.

In 2017, the Tribe received state and federal funding for an affordable housing development off Meetinghouse Road – Mashpee Wampanoag Village. This funding is intended for use in constructing 42 rental units, including 13 units reserved for very low-income Tribal members. The project will also include eight duplexes for tribal elders, to provide space for relatives to assist elders living in place. The remaining 26 units will be constructed as two- and three-bedroom

ranch houses, all deemed affordable. The project will also include office space and, potentially, a community center.

A road at the 57-acre Tribally owned piece of land has already been created, as well as a wastewater treatment facility that is visible from Meeting House Road. The Tribe received grants from a federal stimulus bill under President Barack H. Obama for the treatment facility, and funding from the Bureau of Indian Affairs for the road. To date, two units have been completed, with an October 2019 occupancy.[9] The entire housing development as proposed is not located in any identified hazard area.

Governmental Development Trends

On March 28, 2014, the Mashpee Wampanoag Tribe officially opened its new 46,000-square-foot, three-level, $15 million government and community center. Construction of the building began in October 2012 and was funded by a $12.7 million loan the Tribe received from a U.S. Department of Agriculture Rural Development program. The building sits on 57.8 acres of Tribal property, and only four acres needed to be cleared to accommodate the complex, which encompasses approximately seven acres.

The new government and community center replaces two small single-family, cottage-style homes that were moved from Popponesset to the Tribal lands on Great Neck Road South in the 1980s. Tribal government and operations had been dispersed between the two cottage buildings, modular trailers, and office space throughout Mashpee that the Tribe had been renting.

The building has 39 offices and 34 cubicles for Tribal leaders and departments such as finance, education, and human resources, tribal commissions and committees—including the housing commission, public safety commission, natural resource commission, and the pow wow committee—all housed in the new facility. There is a 400-seat gymnasium, council chambers, climate and humidity-controlled Tribal archives, an elders' lounge, a commercial-sized kitchen, youth craft room, exercise equipment room with men's and women's locker room facilities, a tribal courtroom complete with a peacemaker's room, and a food pantry for the tribal community. There are conference rooms with teleconferencing capabilities and online scheduling systems, state-of-the-art executive offices, and classrooms with SmartBoards. There are currently 73 employees working in the building.[10]

[9] The Mashpee Enterprise, December 28, 2017.

[10] The Mashpee Enterprise, March 28, 2014.

2.4.2 Economic Vulnerability

Several economic vulnerability analyses were conducted based on potential impacts for flood hazard areas, various sea level rise scenarios and hurricane surge inundation areas.

Impacts of FEMA Flood Zones

HW performed an analysis to estimate the total land and building values within FEMA 100- and 500-year flood zones. The number and types (residential, government, cemetery and vacant land) of Tribally owned structures are quantified in Table 2-13 Total Vulnerability FEMA Flood Zones.

Table 2-13 Total Vulnerability FEMA Flood Zones Summary

Flood Zone	VE Zone		AE Zone		X Zone	
Land Use	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**
Residential			1	$912,000		
Government Building						
Historic Cemetery			1	$224,900	1	$224,900
Vacant Land			1	$17,300		
Popponesset Bay	1	N/A	1	N/A	1	N/A
Total	1	N/A	4	$1,154,200	2	$224,900

Source: Mashpee Tax Assessor CAMA data, Massachusetts Property Tax Use Code (2019)

Impacts of Sea Level Rise

Concerns about the accelerated rate SRL in Massachusetts and the impacts on coastal areas, HW performed a second analysis to estimate the total assessed values of properties across a range of projected SRL scenarios. As discussed earlier, HW utilized NOAA's Office of Coastal Management – Digital Coast data to illustrate the potential for future impacts across the range of projected SRL scenarios for Massachusetts. The number and types of Tribally owned structures are quantified in Table 2-14 Total Vulnerability Sea Level Rise Scenarios.

Table 2-14 Total Vulnerability Sea Level Rise Scenarios

Scenario	MHHW Plus 1 FT.		MHHW Plus 3 FT.		MHHW Plus 5 FT.		MHHW Plus 7 FT.	
Land Use	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**
Residential	1	$912,000	1	$912,000	1	$912,000	1	$912,000
Popponesset Bay	1	N/A	1	N/A	1	N/A	1	N/A
Total	2	$912,000	2	$912,000	2	$912,000	2	$912,000

Source: Mashpee Tax Assessor CAMA data, Massachusetts Property Tax Use Code (2019)

Impacts of Hurricane Surge Inundation Areas

Wind-related hazards (hurricanes), are one of the top hazards impacting Tribal lands and Tribal members living in the service area. HW performed an analysis to estimate the total assessed values of properties located within the worst-case hurricane surge areas for Categories 1 through 4 hurricanes developed by the National Hurricane Center using the SLOSH Model. The number and types of parcels/structures are quantified in Table 2-15 Total Vulnerability Hurricane Categories 1 - 4.

Table 2-15 Total Vulnerability Hurricane Categories 1 - 4

Hurricane Category	Category 1		Category 2		Category 3		Category 4	
Land Use	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**	**No. of Parcels Impacted**	**Total Value**
Residential	1	$912,000	1	$912,000	1	$912,000	1	$912,000
Government Building							1	$13,978,800
Historic Cemetery			1	$224,900	1	$224,900	1	$224,900
Vacant Land			1	$17,300	1	$17,300	1	$17,300
Popponesset Bay	1	N/A	1	N/A	1	N/A	1	N/A
Total	2	$912,000	4	$1,154,200	4	$1,154,200	4	$15,133,000

Source: Mashpee Tax Assessor CAMA data, Massachusetts Property Tax Use Code (2019)

2.4.3 Social Vulnerability

A critical step in assessing risk and vulnerability of Tribal lands and Tribal members living in the service area to natural hazards is to identify the links between the potential destructive impacts to the built and natural environments and that relationship to the social structure of the Tribe. The social assets/potential losses continue to be key components of the community and include the closure of institutions, loss of vital services (communication and transportation systems), disruption in the movement of goods and services, loss of cultural assets and emotional strain from financial and physical losses.

The vulnerability of a community obviously includes the potential for direct damage to Tribal lands and Tribal members living in the service area. However, it also includes the potential for disruption of communication and transportation following disasters. Any disruption to the infrastructure, such as a loss of electric power or break in gas lines, can disrupt lives and cause stress to affected families. This is especially the case where Tribal members are forced to evacuate their homes and become subject to shortages of basic supplies.

Tribal Community Government Center

The Mashpee "Fifty-five Aces" property now houses a Tribal government and community center. The property lies adjacent to the 3,000-acre Mashpee National Wildlife Refuge.

The project has been financed through a Facilities Recovery Act Direct Loan (USDA Rural Development) awarded in August 2010 to construct the 46,000 square foot facility that houses Tribal Government and Administration, Health and Wellness Center, Educational, Cultural, Elder, Daycare and Youth Quarters as well as a Tribal Court, Enrollment, Housing, Auditorium, Gymnasium, and Library /Archives are all in the building. Space provided by the project will enable the Tribe to vastly expand essential services to current and future generations, including the Tribe's annual Powwow.

Cultural Properties

Among the first properties acquired by the Tribe were the Old Indian Meeting House and Wampanoag Museum. Housed in a fine example of an old half Cape Cod house, the Museum contains displays of ancient artifacts and other Native American heirlooms that form a chronological commentary on life among the Wampanoag for thousands of years. This building is one of the oldest remaining homesteads located near the historic center of town, adjacent to the Mashpee River and the Herring Run across from the Mill Pond and within proximity to the Mashpee Wakeby Lake. It was originally built in approximately 1793.

The Meetinghouse is likewise the cultural home for the Tribe. In the past three centuries, the Old Indian Meetinghouse has been a gathering place, a church, and a spiritual stronghold for the Tribe. Considered one of the most significant historic buildings on Cape Cod, it reopened in 2009 after being closed for six years. The $1 million-plus reconstruction project, which included money from the Tribe, the town, the state, the federal government, and other tribes, restored the building.

The Tribe also owns one cemetery and two burying grounds, and maintains other sacred sites historically, archeologically and spiritually important to the Tribe, including about 130 small marked burying grounds in the town of Mashpee.

Tribal Housing

The Tribe is developing land between Meetinghouse Road and Noisy Hole Road for housing and a social center/club house for the people who will live there. The project also consists of building a Community Center and a FEMA approved Emergency Shelter, in addition there will be An Emergency Operations Center located within the Tribal housing complex. The project will include 44 housing buildings containing 56 housing units, including 8 for elders, in a clustered layout sited amidst open space.

Wastewater Treatment Facility

The Tribe constructed a wastewater treatment facility in 2011 to serve the new Tribal affordable apartment complex and its social center. The facility, equipped with back-up generator, also has the capacity to serve future on-site affiliated uses; it is also slated to serve the town of Mashpee Town Hall.

Non-Tribal Infrastructure and Emergency Lifelines

Roads and Bridges

The Town of Mashpee roads provide access and egress to Tribal properties. The Tribe provides financial support, from the Bureau of Indian Affairs, to help the Town of Mashpee maintain and improve local roads. Two bridges, the Bourne and Sagamore, provide ground access to Cape Cod, at least when wind speeds are less than 70 mph. The two bridges are parallel some four miles apart, with the Bourne Bridge to the west, and the Sagamore to the east. In addition, the Cape Cod Canal Railroad Bridge carries railway freight as well as passenger services.

The Barnstable County Regional Emergency Planning Committee has developed and maintains a plan to manage traffic in times of emergency because of the limited capacity of the bridges to accommodate evacuating traffic from the Cape, and when the bridges are closed due to high winds.

Utilities - Electrical Power/Gas

The utility company Eversource provides gas and electric power to Tribal lands and Tribal members living in the service area. The company provides electricity and natural gas to 1.4 million customers in eastern and central Massachusetts, including Mashpee and other towns on Cape Cod. Post Hurricane Irene, the Massachusetts Department of Public Utilities, the Massachusetts s Legislature and Eversource have focused on improving the utility's ability to restore power quickly and to communicate better with the affected communities. The Barnstable County Regional Emergency Planning Committee has developed a closer relationship with the company so that during any future emergency events an Eversource representative will be in the Barnstable County Multi-agency Coordination Center.

Communications

- Tribal Elders Emergency Contact. Elders occupy approximately 40 homes in the vicinity of the Tribal Administrative Building in Mashpee. During an emergency the Emergency Management Coordinator and Outreach Specialist contact these elders via phone and/or four-wheel vehicles.
- Commercial Telephone Service. This is available throughout the Town of Mashpee through the facilities of Comcast and Verizon with connection to several long-distance carriers and high-speed internet.

- County-wide Communications. As part of the Multi-agency Coordination Center group, the Tribe has re-banned its radios to achieve county-wide 800 MHz radio capability.
- Commercial Radio Broadcast. During emergencies the Tribe could also access the Amateur Radio Emergency System (ARES), Health & Homeland Alert Network (HHAN), and short-wave radios.
- NOAA Weather Radio. The National Weather Service (Taunton, MA) operates two NOAA Weather Radio Transmitters covering Cape Cod and the Islands. Each broadcasts weather forecasts and current conditions 24 hours a day. A radio that receives VHF-FM signal is required to receive NOAA Weather Radio Bulletins. The frequency of the Boston-Blue Hill transmitter is 162.475 MHz and frequency of the Hyannis-Camp Edwards transmitter is 162.550 MHz This guide is ideal for those establishing or repairing emergency communications in a disaster area.
- State Emergency Alert System. In case of an emergency, the MEMA, the State Police, the Governor or the National Weather Service can activate the Emergency Alert System (EAS). Cape Cod's designated regional recipient of the EAS is WQRC 99.9 FM. Other Cape Cod stations monitor WQRC for these emergency broadcasts and then rebroadcast the information. WBZ 1030 AM is the state alternate primary regional recipient of the EAS.
- Health and Homeland Alert Network (HHAN). The HHAN is an Emergency Alert notification system provided by the state. The Tribe currently utilizes the HHAN. In the event of an Emergency and for notification purposes the Emergency Management coordinator will send out mass alerts to the Community Emergency Response Team (CERT), the Tribal Emergency Response Task Force (TERTF) as well as the Tribal Community.

Water Supply

The Massachusetts Legislature formed the Mashpee Water District in 1987 by (Chpt.136 of the Acts of 1987). The District provides water to most of the residents of Mashpee and a small part of the Town of Sandwich from six ground water wells and the Upper Cape Regional Water Supply Cooperative and the Sandwich Water District. Tribal lands (Tribal Community and Government Center, the Health Center, the Museum) and Tribal members living in the service area receive their water supply from the District.

Evacuation/Population at Risk

The use of mass care facilities during an emergency is dependent on a variety of circumstances. These include warning time, Tribal member awareness of the hazard, the level of encouragement from Tribal and public officials and the availability of shelters. The Tribe currently has the Community and Government Center as a shelter/warming station in the event of a large-scale power outage for a 12 to 24-hour period within a 5-mile radius of the Community and Government Center. The Tribe has plans to make an emergency shelter within

the housing complex (pending funding). Tribal members living locally will find the Tribal shelter most convenient; others living more widely on Cape Cod and the Islands will also have access to six Regional Emergency Shelters listed below. All are Red Cross certified and operated and opened to all, with no residency requirements. The Barnstable County Emergency Shelter Committee conducts annual drills in which representatives of the Tribe participate. For the time being, the nearest regional shelter for Tribal members living in Mashpee is the Falmouth Regional Shelter. Those with pets may choose to go to one of the shelters that are pet friendly including Harwich, Sandwich, and Yarmouth.

Regional Shelters

- Barnstable Regional Shelter: Barnstable High School, 774W. Main Street, Hyannis—no pets
- Eastham Regional Shelter: Nauset Regional High School, 100 Cable Road, Eastham—no pets
- Falmouth Regional Shelter: Falmouth High School, 874 Gifford Rd, Falmouth—pets
- Harwich Regional Shelter: Cape Cod Regional Technical High School, 351 Pleasant Lake Avenue—pets
- Sandwich Regional Shelter: Sandwich High School, 365 Quaker Meeting House Rd, East Sandwich—pets
- Yarmouth Regional Shelter: DY Regional High School, 210 Station Avenue, South Yarmouth—pets

Shelter use is not easily predicted because each emergency has different variables such as the length of the warning period, official encouragement of the evacuation, Tribal member awareness of the location and availability of shelter, and the severity of the approaching hazard. Shelter use may be higher in the winter, such as an ice storm, since Tribal members living in the service area could be without heat. Historically, shelter use has not been high since Tribal members seek safety at the homes of friends or family.

2.4.4 Environmental Vulnerability

Hurricanes, earthquakes, nor'easters, floods or any weather-related hazard event, will have impacts on the natural and built environment. Differences in storm size, speed of movement, wind speeds, and landfall location relative to vulnerable resources makes for high variability in impacts and related costs associated with weather-related events.

When the natural environment is impacted there are both direct and indirect costs. Impacts of severe weather events to the natural environment include both direct (loss of habitat and salinization of land/ groundwater) and indirect costs (widespread inland damage to the built environment, threats to ecosystems/ species, and contamination of potable water supply).

Natural Resources and Environmental Facilities

The Natural Resources Department makes its base for stewarding ancestral resources at Maushop Farm where the Tribal Garden and several buildings are located. The buildings provide storage and workspace for supporting the Tribe's Oyster Farm on Popponesset Bay and conducting other initiatives such as environmental monitoring at the Mashpee National Wildlife Refuge. The oyster operation is an important economic resource for the Tribe.

In addition, Tribal members exercise aboriginal rights each spring in harvesting the herring run on the Quashnet River. There are four dams in Mashpee that are associated with the herring run and classified as Regulated Dams by the Massachusetts Office of Dam Safety. The Johns Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River and the Quashnet River dam is located on the Quashnet River at Route 28.

2.5 FEMA Disaster Grant Assistance

FEMA has provided the Mashpee Wampanoag Tribe with approximately $13,000 in grant assistance in recent years for the following disasters:

- Date: January 26, 2015
  Disaster Number: DR-4214
  $13,000.00

  Main Items for Funding Provided for:
  - Building Repairs, Personnel overtime

Section 3 Capability Assessment

3.1 Introduction

The Capabilities Assessment section has been restructured to better document Tribal, local, state, and federal department, agency and program capabilities in terms of pre- and post-disaster activities. It has been organized into three (3) main sections: Planning and Regulatory capabilities, Administrative and Technical capabilities, and Financial capabilities to better define the programs, policies, and funding opportunities each department or agency is implementing to reduce risk and work towards implementing hazard mitigation programs targeted at increased resiliency.

The Mashpee Wampanoag Tribe implements several hazard mitigation policies and procedures, current state laws, executive orders, and regulations to promote the safety of its Tribal members and minimize risk to Tribal assets. This section presents a brief description of each of the primary mitigation programs currently in place.

3.2 Planning and Regulatory Capabilities

Mashpee Wampanoag Tribal Threat and Hazard Identification and Risk Assessment

The Mashpee Wampanoag Tribal Threat and Hazard Identification and Risk Assessment (THIRA) was submitted to FEMA in November 2017. The THIRA was developed to help the Tribal community understand the risks and determine the level of capability needed to address those risks. The outputs from this process lay the foundation for determining the Tribe's capability gaps as part of the stakeholder review process. The THIRA includes:

- The threats and hazards that can affect the Tribe, which are also echoed in the Tribe's Emergency Operations Plan, under the vulnerability and risk assessment section.
- The potential impacts of both man-made and natural threats/hazards on the Tribe.
- The capabilities the Tribe should have to prevent, mitigate, respond and recover from those identified impacts.

FEMA Preparedness Case Study

The FEMA Headquarters office in Washington, DC, selected the Mashpee Wampanoag Tribe as the first Tribe to be selected for a Preparedness Case Study review. FEMA conducts grant effectiveness case studies to demonstrate how states and urban areas across the country use a mix of homeland security non-disaster grant programs to improve preparedness. FEMA chooses case study locations to ensure geographic diversity and to link grant investments with recent events.

The review took place on August 8, 2019 at the Tribal reservation properties in Mashpee. During the visit the Tribe's Emergency Management Director Nelson Andrews Jr. provided updates to the four FEMA representatives on previous successes as a result of being awarded the FEMA preparedness grant. Funds were used to provide emergency response vehicles that have assisted tribal elders during winter storms, drones for search and rescue that have been used for controlled wildfire burns and local search and rescue missions. In addition, various trainings to Tribal staff that have been provided, both current and ongoing.

Massachusetts State Building Code

The Tribe enforces the Massachusetts State Building Code which includes many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing and snow loads.

- Wind-Related Hazards
    - The Massachusetts State Building Code includes provisions adequate to mitigate against most wind damage. The code's provisions are the most cost-effective mitigation measure against tornadoes given the extremely low probability of occurrence.
- Geologic-Related Hazards
    - The State Building Code contains a section on designing for earthquake loads (780 CMR 1612.0) which states that the purpose of these provisions is "to minimize the hazard to life to occupants of all buildings and non-building structures, to increase the expected performance of higher occupancy structures as compared to ordinary structures, and to improve the capability of essential facilities to function during and after an earthquake." This section goes on to state that due to the complexity of seismic design, the criteria presented are the minimum considered to be "prudent and economically justified" for the protection of life safety. The code also states that absolute safety and prevention of damage, even in an earthquake event with a reasonable probability of occurrence, cannot be achieved economically for most buildings.

      Section 1612.2.5 sets up seismic hazard exposure groups and assigns all buildings to one of these groups according to Table 1612.5. Group II includes buildings which have a substantial public hazard due to occupancy or use and Group III are those buildings having essential facilities which are required for post-earthquake recovery, including fire, rescue and police stations, emergency rooms, power-generating facilities, and communication facilities.

3.3 Administrative and Technical Capabilities

Mashpee Wampanoag Tribe Emergency Operations Plan

The Mashpee Wampanoag Tribe maintains its own Emergency Response Task Force (TERTF), an Emergency Management Director/Coordinator and an Emergency Preparedness Outreach Coordinator.

Emergency Operations Plan Appendices and Annexes (2015 – 2020)

The Mashpee Wampanoag Tribe maintains an Emergency Operations Plan (EOP) approved by the Tribal Council on March 2016. The EOP serves as a guide of the Mashpee Wampanoag Tribal Government to plan for and execute emergency tasks necessary to ensure the safety of Tribal members, staff, and visitors and protection of property in the event of a human-caused or natural disaster. The Tribe will use it to anticipate, mobilize, and respond to emergency situations impacting Tribal lands, cultural resources, and Tribal members living in our service area, and strengthen Tribal capabilities over time. When a helping hand is needed, the EOP provides coordination mechanisms with neighboring communities, Barnstable County, other tribes, and the state and federal governments.

The plan describes the basic assumptions, strategies and mechanisms that the Tribe will rely upon from response through recovery. It also identifies the actions the Tribe plans to take to ensure that it is well prepared to implement this plan. In addition, it describes procedures for monitoring, evaluating, and updating the plan no less than every five years. Finally, the plan includes Standard Operating Procedures (SOP) for those Tribal departments that have already developed them.

Based on the functions and principles of the National Incident Management System (NIMS) and Incident Command System (ICS), it also identifies how the Tribal community will function as part of the overall NIMS structure that was initiated by a Presidential Directive in 2003.[11]

The Tribe's overarching goal is to protect Tribal people, property, staff and visitors, and resources from harm and reduce damages in the event of a human-caused or natural disaster. The Tribe intends to gradually strengthen its emergency management capabilities so that it may make all reasonable efforts to prevent and mitigate against hazards, prepare for and respond to emergencies, and initiate recovery activities on our own, whenever possible. Our objective is for the Tribe and our members to maintain self-sufficiency for at least 72 hours, if necessary. The focus of self-sufficiency will be to:

[11] The United States Department of Homeland Security coordinates this program under the authority of Homeland Security Presidential Directive-5 (HSPD-5) *Management of Domestic Incidents,* February 2003.

- Advise members in advance regarding individual and household preparedness and during a hazard event provide immediate outreach and emergency services to the Elders and other individuals requiring additional assistance.
- Secure and protect Tribal property and records and coordinate and communicate with emergency partners as necessary. The Tribal Emergency Manager will operate the Tribal Emergency Operations Center during an emergency. The primary EOC is located at the Mashpee Wampanoag Tribe Community & Government Center at 483 Great Neck Road, Mashpee MA 02648. Should the primary EOC become unusable, the emergency operations would be moved to Mashpee Wampanoag Tribe Public Works Department offices at 213 Sampson's Mill Road, Mashpee MA 02648.
- Open and operate a Tribal emergency warming and cooling station at the Community and Government Center.

In sum, this plan provides for an orderly means to prevent, minimize, prepare for, respond to and recover from emergencies or disasters that threaten life, property, and the environment by:

- Identifying major natural and human caused hazards;
- Determining and assigning emergency management responsibilities and tasks to Tribal officials, employees and members; and
- Describing actions to be taken by the Tribe in partnership with other Tribes, mutual aid partners, and organizations such as the Red Cross to:
    - Prevent or mitigate the effects of natural, technological or human-caused disasters,
    - Respond efficiently and effectively when an emergency arises, and
    - Assist in the recovery from an emergency

<u>Tribal Emergency Response Task Force</u>

The TERTF have key roles and responsibilities during an emergency requiring coordinated inter-department action. The Task Force will continue to work collectively to build and implement Tribal emergency management capacity. Task Force positions currently include:

- Emergency Preparedness /Emergency Management Director, Coordinator Nelson Andrews Jr.
- Emergency Preparedness Specialist, Allyssa Hathaway
- Tribal Administrator, Rita Lopez (Interim)
- Treasurer, Gordon Harris
- Public Works Director, Jason Steiding
- Natural Resources Director, Chuckie Green
- Shellfish Farm Manager, Corey Hendricks
- Tribal Historic Preservation Officer, David Weeden
- Tribal Police Chief /Public Safety Commission, Kevin Frye

- Tribal Police Captain /Public Safety Commission, Curtis Frye
- Facility Director, Willard Pocknett
- Security Lead, Erin Bassett
- Indian Health Services, Rita Gonsalves
- Housing Director, Shelley Tobey
- Assistant Housing Director, Melissa Phillips
- Health Director, Unique A. Lopes Forde
- Public Relations Manager, Trish Keliiinui
- Social Services Director, Unique A. Lopes Forde

Tribal Leadership

Incident Command. The Tribal Council Chairman and Mashpee Wampanoag Tribal Council will provide direction and control through all phases of an emergency through the Tribal Emergency Preparedness Planner. The Tribal Council will retain direction and authority on Tribal reservation and trust lands while partnering with town, county, state, and federal governments and/or other entities.

Emergency Preparedness Department Emergency Management Director. The Mashpee Wampanoag Tribal Emergency Preparedness /Emergency Management Director/Coordinator, appointed by the Tribal Council, is responsible for coordinating the implementation of this plan during an emergency as well as coordinating the actions of Tribal departments under the direction of the Chairman of the Tribal Council.

Extraordinary Circumstances. The Tribal Council Chairman may proclaim a declaration of Tribal emergency when Tribal Council has determined that the situation is likely to be beyond the response capability of Tribal departments and existing mutual aid partners. The Tribal Council may enact all necessary regulations to protect the health and safety of the community members and to preserve peace and order on Tribal property. These may include, but are not limited to the following:

- Closing public access to any Tribal building, street or land,
- Calling upon law enforcement agencies for assistance, and
- Requesting aid from eternal public and private agencies and organizations.

Request for Federal Disaster Declaration. The Stafford Act authorizes the President of the United States to make certain programs of assistance available to supplement Tribal, state, territorial, and local efforts to respond to and recover from an incident that *exceeds all available resources and overwhelms* the Tribal or state and local governments. The President makes Stafford Act assistance available after declaring an emergency or major disaster.

In all but unique circumstances, disasters affecting Tribal people and property are likely to also impact other parts of Barnstable County and the State: The Tribe's interests are likely to be covered when the Governor of Massachusetts requests the President for a Federal Disaster Declaration. However, the Tribe now also has the choice, when its capacity to manage a hazard event is exceeded, to request the President directly to declare a federal disaster on Tribal lands (reservation and trust lands). The Stafford Act was amended in January 2013 giving tribes this option as sovereign nations. Exercising this choice would be especially important if property of the Tribe is damaged heavily to the extent that a Federal Disaster Declaration is warranted but county or statewide damages do not. In such a situation or as otherwise desired, the Tribal Council Chairman and Tribal Council will request the FEMA Region 1 Regional Administrator to conduct a damage assessment and forward the Tribe's request to the President for a Declaration. FEMA R1's Tribal Liaison and/or Tribal Operations Officer is available to assist with such a request.

Departmental Readiness. Tribal departments will prepare emergency standard operating procedures that are consistent with this plan and will coordinate with the Mashpee Wampanoag Emergency Preparedness /Emergency Management Director/Coordinator to undertake necessary actions during an emergency. They will be trained in how to participate in either a Tribal or State-requested Presidential Disaster Declaration including a Preliminary Damage Assessment (PDA). During an emergency, the Tribal government will continue to function in the same manner as under normal circumstances. Department directors will continue to assume responsibility for the direction and control of their departments, incorporating emergency functions assigned to them by this Emergency Operations Plan as well as the following sources:

- Tribal Chairman and Tribal Council
- Tribal Emergency Preparedness /Emergency Management Director/Coordinator
- Departmental emergency standard operating procedures

Continuity of Government. To ensure continuity of government, if the Chairman of the Tribal Council is unavailable or unable to assume leadership, Vice Chairman/Chairwoman will assume command in event of a disaster under the provisions of the Mashpee Wampanoag Tribe Continuity of Government Plan (to be developed).

<u>Emergency Response Partners</u>
The Mashpee Wampanoag will continue to build and maintain strong ties with emergency management organizations in this region and with other governments. Starting with our own, these are listed in the general order of need from a small event that can be addressed fully by the Tribe, to large more severe events that require partnership with multiple organizations and utility companies.

Organization	Key Response Responsibility
Town of Mashpee	Emergency Services (fire and ambulance) and Mutual Aid (police)

The Tribe relies on the Town of Mashpee to provide emergency fire and medical services both every day and more importantly during emergency situations. The Tribe has developed excellent working relations with the Town's emergency service agencies and has entered a Memorandum of Understanding with the Town of Mashpee, which provides that the Town will deliver emergency fire and medical services to the Tribe and mutual aid related to law enforcement.

The *Mashpee Comprehensive Emergency Operations Plan* informs emergency operations in the event of a disaster in the Town of Mashpee. The Town Manager is responsible for developing all policy relating to emergency management. The Town Manager is responsible for implementing all policy decisions and the department heads are responsible for carrying out assigned tasks during an emergency. The Mashpee Harbormaster and Shellfish Department have primary local responsibility for oil and other hazardous waste spills in marine waters.

In the event of an emergency, the Tribal Emergency Preparedness Planner/Emergency Management Coordinator will initiate and maintain contact with the Mashpee Emergency Operations Center and help coordinate response to Tribal facilities and Tribal members.

Organization	Key Response Responsibility
Barnstable Co. Regional Emergency Planning Commission	Mutual Aid, specialized care, communications

The Barnstable County Regional Emergency Planning Commission (BCREPC) is a coalition of law enforcement, fire service, health care, public health, public works, EMS, military and other affiliated agencies. It represents the Towns of Barnstable, Bourne, Brewster, Chatham, Dennis, Eastham, Harwich, Mashpee, Orleans, Provincetown, Sandwich, Truro, Wellfleet and Yarmouth in Barnstable County, and the Town of Nantucket in Nantucket County. The purpose of the BCREPC is through planning, cooperation, and interoperability to assist Cape Cod communities to mitigate the threat from any hazard that may require the response of multiple jurisdictions. The BCREPC coordinates NOAA early weather alert communications and communications during an emergency.

Affiliated local preparedness resources are the:

- Cape Cod Citizens Corp Council,
- Cape Cod Medical Reserve Corps,
- Cape and Island Elder Services, and the
- Cape and Islands Red Cross.

The Tribal Emergency Preparedness /Emergency Management Director/Coordinator represents the Tribe on the BCREPC. In the event of an emergency, the Tribal Emergency Preparedness /Emergency Management Director/Coordinator will maintain contact with the BCREPC operations center and coordinate requests for mutual aid services.

Organization	**Key Response Responsibility**
Cape and Islands Red Cross	Regional shelters operation

The Cape Cod and Islands Chapter of the American Red Cross has provided emergency response service and health and safety training to the residents of Cape Cod, Nantucket and Martha's Vineyard since 1917.

The Red Cross is a critical part of the emergency response network on Cape Cod and the Islands. It provides relief to victims of disasters and helps people prevent, prepare and respond to emergencies. The Red Cross operates 13 Disaster Action Teams for different areas of Cape Cod and for different specialties. The specialized teams include health services, mass care, mental health, family services and disaster assessment and logistics. There are about 250 registered Disaster Action Team members.

The Red Cross is the lead partner with the Barnstable County Regional Planning Committee in support of the six regional shelters on Cape Cod. The regional emergency shelters are all Red Cross-certified and operated. They are opened to all, with no residency requirements. The Barnstable County Emergency Shelter Committee conducts annual drills in which representatives of the Tribe participate.

The nearest Regional Shelter's for Tribal members living in Mashpee are the Falmouth, Sandwich and Barnstable Regional Shelter's. The names and addresses of regional shelters and their availability for pets are listed below.

Organization	**Key Response Responsibility**
Massachusetts Emergency Management	State-wide coordination/ Agency assistance

MEMA is a separate agency within the Massachusetts Executive Office of Public Safety and Security. MEMA is the state agency with primary responsibility for ensuring the State's resilience to disasters.

At the state level, MEMA coordinates the mitigation (risk reduction) preparedness, response and recovery from emergencies and disasters such as floods, hurricanes, response and recovery from emergencies and disasters such as floods, hurricanes, earthquakes or hazardous materials spills.

MEMA also provides guidance and assistance to county and local governments, tribes, businesses and nonprofit organizations in their efforts to provide protection to citizens and property. The agency increases resiliency by assessing and mitigating hazards, enhancing preparedness, ensuring effective response and building the capacity to recover. Since 2001, MEMA has been the focal point for the implementation of programs regarding United States Homeland Security, integrating these concerns into its all-hazards approach to emergency management. MEMA is the lead state agency during times of actual emergency. Post disaster, MEMA hosts workshops on the availability of FEMA grant opportunities to repair damaged Tribal facilities and undertake mitigation projects to help lessen the impact of future storm events.

In the event of an emergency warranting assistance from MEMA that is above and beyond what the BCREPC can provide, the Tribe may ask the agency to provide back-up support, equipment and supplies.

Organization	**Key Response Responsibility**
Massachusetts State Police	Cape Cod Emergency Traffic Plan implementation

MEMA and the Massachusetts State Police issued an update of the *Cape Cod Emergency Traffic* Plan in August 2014. This plan update was prepared in close cooperation with emergency response organizations on Cape Cod. The Plan was developed to facilitate the egress of the high volume of traffic from Cape Cod in the event of a hurricane or other potential high hazards, particularly during peak tourist season. When the conditions dictate, the MEMA director, in consultation with the Governor, activates the Plan and the Massachusetts State Police Bourne Troop Emergency Planning Officer assumes duties of the Incident Commander.

In the event of the Plan being activated, the Tribal Emergency Preparedness Planner/Emergency Management Director/Coordinator will assist Tribal members who wish to leave Cape Cod with guidance and information.

Organization	**Key Response Responsibility**
Indian Health Services	Health-related disaster assistance

Organization	**Key Response Responsibility**
FEMA	Post-disaster individual and Tribal financial asst.

FEMA is a separate agency within the United States Department of Homeland Security. FEMA's mission is to support citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards. The Robert T. Stafford Disaster Relief and Emergency Assistance Act as

amended by the Disaster Relief Act of 1974 constitute the statutory authority for most Federal disaster response activities. FEMA responds to emergency situations by supporting the first responders in tribes, states, counties and local jurisdictions across the country. FEMA divides the country into ten regions. Region 1 consists of the six New England states. FEMA coordinates its activities with federal partners, Tribal, state and local officials, the private sector, non-profits and faith-based groups and the general public.

The Tribe strives to plan, organize and train to improve its ability to respond to emergencies as part of the National Incident Management System (NIMS). As a participant in the system, the Mashpee Wampanoag Tribe will strive to ensure that procedures are in place to communicate with NIMS, train emergency personnel in the NIMS system and support our partnership on a government-to-government basis. The Tribe will work with the FEMA and other federal entities when circumstances warrant collaboration or assistance.

In the event of an emergency, the Tribe may access FEMA assistance directly on a government-to-government basis or indirectly through MEMA. FEMA assistance following a Federally Declared National Disaster includes Individual Assistance, Public Assistance and Mitigation. Individual Assistance provides financial assistance to Tribal members who have experience damages to their homes and property. Public Assistance provides financial assistance to the Tribe to repair damaged Tribal owned facilities back to their pre-disaster condition and (in some circumstances) to storm proof the facilities to make them more resilient. Mitigation provides the Tribe with financial assistance to undertake projects to strengthen structures so they can better withstand the stresses of future storm events.

Organization	**Key Response Responsibility**
U.S. Coast Guard	Hazardous Waste Spills in Marine Waters

The USCG Sector Southeastern New England has offices in Providence Rhode Island and Woods Hole, Massachusetts. The USCG ‘s Marine Environmental Protection Program develops and enforces regulations to avert the introduction of invasive species into the marine environment, stop unauthorized ocean dumping and prevent oil and chemical spills. The USGS is the lead federal agency to respond to oil and other hazardous waste spills in marine waters. In the event of a marine hazardous waste spill threatening the Tribal oyster farm in Popponesset Bay, the Tribal Emergency Preparedness Planner/Emergency Management Director/Coordinator will coordinate emergency preventive actions with the Mashpee Shellfish Warden and the USCG.

Organization	**Key Response Responsibility**
Eversource	Power outage restoration

The USCG Sector Southeastern New England has offices in Providence Rhode Island and Woods Hole, Massachusetts. The USCG 's Marine Environmental Protection Program develops and enforces regulations to avert the introduction of invasive species into the marine environment, stop unauthorized ocean dumping and prevent oil and chemical spills. The USGS is the lead federal agency to respond to oil and other hazardous waste spills in marine waters. In the event of a marine hazardous waste spill threatening the Tribal oyster farm in Popponesset Bay, the Tribal Emergency Preparedness Planner/Emergency Management Coordinator will coordinate emergency preventive actions with the Mashpee Shellfish Warden and the USCG.

Organization	**Key Response Responsibility**
United South and Eastern Tribes, Inc.	Tribal Emergency Mgt. Mutual Aid Compact

When outside help is needed, the Tribe may also seek assistance from other Tribes. Likewise, we will help other Tribes when called upon and have the resources and capability to do so. We will aim to make mutual emergency response agreements with the other Tribes in New England soon.

The Tribe participates as a member of Emergency Planning Exercise Planning Team with FEMA and other Tribes in New England to develop a Tribal tabletop emergency exercise and to coordinate its conduction at the Tribal level. During an emergency, the Tribal Emergency Preparedness Planner/Emergency Management Director/Coordinator will coordinate requests to other Tribes for assistance.

Tribal Emergency Management Mutual Aid Compact (TEMAC)
TEMAC is sponsored by the United South and Eastern Tribes, Inc. This agreement spells out the terms under which a participating Tribe will help other participating Tribes hit by a disaster. TEMAC's objective is to put in place a mechanism for providing tribe-to-tribe aid as effectively and efficiently as possible. TEMAC is modeled on the Inter-State Emergency Management Assistance Compact adopted by the 50 states. The Compact protects Tribal sovereignty and each tribe decides its own level of participation when aid is request by another Tribe.

The Tribe is a member of the United South and Eastern Tribes and Tribal Council has passed a unanimous vote on agreeing to become a participant tribe in TEMAC. During an emergency, the Tribal Emergency Preparedness /Emergency Management Director/Coordinator will facilitate requests for assistance via TEMAC.

Tribal Website

The Mashpee Wampanoag Tribe Emergency management Director/Coordinator maintains an emergency management webpage hosted on the Tribe's website

(https://mashpeewampanoagtribe-nsn.gov/emergency-preparedness) that includes a variety of Tribal, local, state and regional emergency program information for Tribal members including:

- 2019 Atlantic Hurricane Season notice
- June 4, 2019 Emergency Management press release
    - *Ready* Hurricane webpage (https://www.ready.gov/hurricanes)
    - MEMA *Know Your Zone* webpage (www.mass.gov/knowyourzone)
      Our state of Massachusetts has defined hurricane evacuation zones, designated as Zone A, Zone B and Zone C, for areas of the state at risk for storm surge flooding associated with tropical storms or hurricanes. If evacuations are necessary because of a tropical storm or hurricane, Tribal, local, county or state officials will notify the people living, working, or vacationing in evacuation zones to leave the area for their safety. Even areas not directly along a coastline may be at risk for storm surge flooding during a tropical storm or hurricane.
    - Make an Emergency Plan
      Develop a plan with the members of your household to prepare for what to do, how to find each other, and how to communicate in a tropical storm or hurricane.

      An emergency plan should include:
        - Meeting Locations
        - Emergency Contact Information
        - Evacuation Plans
        - Shelter-in-Place Plans
        - Considerations for Family Members with Access and Functional Needs, and Pets.
    - Build an Emergency Kit (https://www.mass.gov/service-details/build-an-emergency-kit)
      Build an emergency kit containing items that will sustain you and your family in the event you are isolated for three to five days without power or unable to go to a store. Emergency kits are particularly important during hurricane season, due to potential extended power outages, flooding, and impassable debris-covered roads. While it is important to customize your kit to meet the unique needs of you and your family, every emergency kit should include bottled water, food, a flashlight, a radio and extra batteries, a first aid kit, sanitation items, and clothing. Depending on your family's needs, emergency kits should also include medications, extra eyeglasses, medical equipment and supplies, children's items such as diapers and formula, food and supplies for pets and service animals, and other items you or your family members might need during a disaster. For a complete emergency kit checklist, visit: https://www.mass.gov/service-details/build-an-emergency-kit.

    - Stay Informed (https://www.mass.gov/service-details/be-informed-and-receive-emergency-alerts)
      Receiving advance warnings and timely emergency alerts and information from public officials is critical to staying safe during a tropical storm or hurricane. Every family should have multiple methods for receiving emergency alerts. Learn more about different types of alerting and information tools including the Emergency Alert System, Wireless Emergency Alerts, NOAA Weather Radio, Social Media & Traditional Media, 2-1-1 Hotline, Local Notification Systems.
- Hurricane Preparation and Evacuation Guidelines
- Carbon Monoxide & Smoke Detectors – Winter Safety
- Red Cross Home Fire Campaign (https://www.bcrepc.org/sheltering/)
- Winter Home and Car Heating Safety Tips
- List of Emergency Shelters in Barnstable County
- Project Repository for the Tribal Hazard Mitigation Plan development
    - Tribal Hazard Mitigation Plan overview
    - June 9, 2019 Tribal Workshop powerpoint (Hazard Mitigation Plan)
    - Tribal online survey

Tribal Emergency Preparedness Equipment

The Mashpee Wampanoag Tribe maintains emergency supplies, including:

- Generators (3) 3k Diesel , (3) 3k Gas , (1) 15k Diesel
- Cots (100)
- Blankets (150)
- Sleeping Bags (100)
- Electric Wheelchair (1)
- Motorola Handheld Radios (2)
- Red Cross Emergency Preparedness backpacks (40)
- 32’ flat screen television (2)
- Network Printer (1)

Community Emergency Response Team (CERT)

The CERT program educates Tribal members about disaster preparedness for hazards that may affect Tribal lands and Tribal members living in the service area and trains them in basic disaster response skills such as fire safety, light search and rescue, team organization and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others following an event when professional responders are not immediately available to help, or by taking a more active role in emergency preparedness projects in the community.

The Mashpee Wampanoag Tribe CERT was initially established with ten members, trained by the Emergency Management Director/Coordinator. A

second training consisted on ten Mashpee Wampanoag Tribe AmeriCorps members.

Coordination with Neighboring Municipalities

The Mashpee Wampanoag Tribe coordinates with the Towns of Mashpee, Sandwich, Falmouth and Barnstable periodically across municipal boundaries. The Tribe will continue to coordinate with these adjacent communities on natural hazard mitigation planning, specifically any shared resource plans and evacuation plans.

Tribal Administration and Staff

Tribal Administration and staff all work well together to develop, implement and update policies and plans to promote the safety of Tribal members and minimize risk to the Tribe.

Emergency Preparedness /Emergency Management Director/Coordinator:
The authorized representative of the Tribal Council Chairperson and Tribal Council during the performance of emergency operations. The EMD/EMC also has the following general responsibilities unless delegated to other Tribal employees, volunteers or Tribal Council members, as appropriate to the nature of an event:

1. Chairs the TERTF
2. Collaborates and coordinates planning, training, exercises, and emergency response with other Tribal nations and external cooperating organizations and agencies as appropriate
3. Coordinates implementation, operation, and update of this plan
4. Consider available E-PREP supplies and distribute in advance as appropriate
5. Coordinates closely with Emergency Outreach Coordinator and assists as necessary with Community Emergency Response Team (CERT)
6. Functions as incident commander for major emergency situations with the following responsibilities:
    a. Directs emergency response actions;
    b. Establishes immediate priorities and stabilizing measures, especially the safety of responders, other emergency workers, bystanders, and people involved in the incident, to manage resources efficiently and cost effectively;
    c. Determines incident objectives and strategy to achieve the objectives;
    d. Establishes and monitors incident organization, including adequate health and safety measures;
    e. Notifies and maintains regular contact with the Tribal chairperson, Tribal council, and all other relevant parties including local, county, state, and federal emergency agencies as appropriate;
    f. Requests aid, if necessary, from other tribes and organizations;

g. Coordinates the delivery of aid to other tribes and organizations as appropriate;
h. Coordinate other departments in the recording of staff hours and other resources expended in responding to an incident and in preparing after-action reports;

7. Develops and releases information as agreed with Tribal Council Chairperson about an incident to the news media, incident personnel, and other appropriate agencies and organizations;
8. Remains knowledgeable of Tribal community members that may need special assistance in the event of an evacuation;
9. Oversees the maintenance, storage, availability, redundancy, and security of Tribal emergency resources, facilities and equipment;
10. Arranges and assists in training Tribal staff members and volunteers, ensuring a record is kept of individuals' levels of training; and
11. Assists Tribal departments in preparing emergency (SOPs).

Tribal Administration: (Including Human Resource Director, Personnel Officer, Public Information Officer, Finance Director, Procurement Officer, Tribal Historic Preservation Officer):

1. Keeps Emergency Preparedness/Emergency Management Director/Coordinator informed of incident developments;
2. Develops and releases information about the incident to Tribal members, news media, incident personnel, and other appropriate agencies and organizations (Public Information Officer);
3. Keeps records of staff hours and other resources expended in responding to an incident;
4. Keeps all needed records for State and Federal reimbursement (Finance);
5. Processes purchase orders (Finance, Procurement);
6. Develops and updates Tribal Administration's SOPs (Tribal Administrator/Human Resource Director); and
7. Monitors security of Tribal records (Tribal Historic Preservation, TA).

Public Works:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments such as road, sewer system, and water supply conditions;
2. Reaches out to Tribal elders and others requiring special assistance during emergencies and coordinates with other departments and external partners to meet their needs;
3. Removes snow and debris from damages and alleviates or calls help to fix unsafe conditions;
4. Operates salvage depots for metal and wood;
5. Conducts basic facility repair and coordinates with external sources for heating and electrical and other utility repairs;

6. Provides and maintains emergency vehicles and other equipment needed in an emergency;
7. Monitors water quality and supply distribution system in coordination with Mashpee Water Company;
8. Conducts basic facility repair and monitors Tribal sewage treatment facility and collection system;
9. Coordinates with communities regarding street and bridge conditions as necessary;
10. Develops and updates department's standard operating procedures and emergency plans;
11. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
12. Assists other departments as necessary;
13. Keeps records of staff hours and other resources expended in responding to an incident;
14. Maintain current trainings/certifications for emergency response, i.e. Incident Command System (ICS) and cardiopulmonary resuscitation (CPR); and
15. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

Natural Resources Department:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Monitors water quality and assists with preliminary drinking water testing;
3. Monitors marine water quality and oyster production facilities;
4. Coordinates with external partners to provide preliminary air testing;
5. Advises on forestry issues/concerns and wildfires;
6. Assists in providing access to wooded areas;
7. Provides canoes, boats, and waders to access flooded areas;
8. Helps to advise the public and liaise with Department of Environmental Protection (DEP) and/or oil companies in the event of a chemical and/or oil spill or the release of other toxic substances;
9. Develops and updates SOPs;
10. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
11. Keeps records of staff hours and other resources expended in responding to an incident;
12. Maintain current trainings/certifications for emergency response, i.e. wildfire control, ICS and CPR;
13. Participates in after-action report of emergency operations plan(s) development and in periodic exercise; and
14. If Tribe establishes, provides geographic mapping system services.

Shellfish Farm Manager:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Monitors marine water quality and oyster production facilities;
3. Provides canoes, boats, and waders to access flooded areas;
4. Helps to advise the public and liaise with DEP and/or oil companies in the event of a chemical and/or oil spill or the release of other toxic substances;
5. Develops and updates SOPs;
6. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
7. Keeps records of staff hours and other resources expended in responding to an incident;
8. Maintain current trainings/certifications for emergency response i.e., ICS and CPR; and
9. Participates in after-action report of emergency operations plan(s) development and in periodic exercise.

Health Department:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Provides first aid triage and alerts hospitals of incoming cases;
3. Provides emergency medical care center(s);
4. Provides medical support to shelter(s) when operating and when requested by Tribal Council;
5. Maintains supply and monitors use of medical and health items;
6. Alerts Tribal members of dangers to health brought about by emergency and gives instructions;
7. Coordinates emergency health and medical operations with other health providers and agencies (or provides information to community members about emergency-related health hazards and issues.);
8. Provides special services as required to Tribal elders, disabled, and health impaired members;
9. Provides inoculations provided by the State and IHS;
10. Develops and updates Health Department emergency plans and standard operating procedures;
11. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
12. Keeps records of staff hours and other resources expended in responding to an incident;
13. Maintain current trainings/certifications for emergency response, i.e. ICS and CPR; and
14. Participates in after-action report development and in periodic Tribal exercise of emergency plan(s).

Indian Health Services (IHS):

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Provides first aid triage and alerts hospitals of incoming cases;
3. Provides emergency medical care center(s);
4. Provides medical support to shelter(s) when operating and when requested by Tribal Council;
5. Maintains supply and monitors use of medical and health items;
6. Alerts Tribal members of dangers to health brought about by emergency and gives instructions;
7. Coordinates emergency health and medical operations with other health providers and agencies (or provides information to community members about emergency-related health hazards and issues.);
8. Provides special services as required to Tribal elders, disabled, and health impaired members;
9. Provides inoculations provided by the State;
10. Develops and updates IHS emergency plans and SOPs;
11. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
12. Keeps records of staff hours and other resources expended in responding to an incident;
13. Maintain current trainings/certifications for emergency response, i.e. ICS and CPR; and
14. Participates in after-action report development and in periodic Tribal exercise of emergency plan(s).

Social Services Department:

1. Keeps Emergency Preparedness/Emergency Management Director/Coordinator informed of incident developments;
2. Provides emergency social and welfare services;
3. Provides emergency feeding, and clothing if available;
4. Provides or coordinates childcare for those working or volunteering during an emergency;
5. Coordinates with individual assistance groups including the Salvation Army and other groups;
6. Develops and updates department's SOPs;
7. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
8. Keeps records of staff hours and other resources expended in responding to an incident;
9. Maintains current trainings/certifications for emergency response, i.e. ICS and CPR; and

10. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

Historic Preservation Department:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Monitors condition of archival and historic artifacts and property;
3. Advises departments and external partners regarding protection of artifacts and property during response and recovery actions;
4. Develops and updates department's emergency plans and SOPs;
5. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
6. Keeps records of staff hours and other resources expended in responding to an incident;
7. Maintains current trainings/certifications for emergency response, i.e. ICS and CPR; and
8. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

Housing Department: (If responsible for facility that is designated as shelter)

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Provides shelter manager who:
    - Maintains shelter, equipment and supplies,
    - Takes charge in shelter and appoints needed personnel to monitor food, sleeping area, health, and other services and conditions,
    - Always has Tribal emergency shelter plan available (when developed),
    - Coordinates and arranges training for Tribal staff and volunteers servicing the shelter,
    - Keeps log of all emergency supplies available to shelter and implement plans for needed supplies,
    - Maintains register of shelter occupation;
3. Provides information during an emergency about special populations and number of residents living in Tribal housing (when developed);
4. Assesses and repairs damages to Tribal housing (when developed);
5. Coordinates temporary post-disaster housing (when developed);
6. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
7. Keeps records of staff hours and other resources expended in responding to an incident;
8. Develops and updates department's emergency plans and SOPs;
9. Maintains current trainings/certifications for emergency response, i.e. ICS and CPR; and

10. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

Facilities Department:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Provides access to Tribal facilities, including facility and security staff in the event of an emergency. i.e.; Utilizing facilities dept. staff to maintain area specific Tribal Government Center operations during an emergency;
3. Keeps records of staff hours and other resources expended in responding to an incident;
4. Assesses and repairs damages to specific Tribal facilities;
5. Works in conjunction with the Mashpee Wampanoag Tribe Emergency Preparedness section with the planning and coordination of Mashpee Wampanoag Tribe Employee drills and Exercises;
6. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
7. Develops and updates department's emergency plans and SOPs;
8. Maintains current trainings/certifications for emergency response, i.e. ICS and CPR; and
9. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

Public Safety Commission/Homeland Security Department:

1. Keeps Emergency Preparedness /Emergency Management Director/Coordinator informed of incident developments;
2. Serves in the Public Safety Officer capacity as necessary;
3. Works closely with and provides collaboration and participation from local Police, Medical and Fire Departments;
4. Keeps records of staff hours and other resources expended in responding to an incident;
5. Works in conjunction with the Mashpee Wampanoag Tribe Emergency Preparedness section with the planning and coordination of Mashpee Wampanoag Tribe Employee drills and Exercises;
6. Inventories and keeps up-to-date, accountable, available, secure, and in good condition departmental manpower, material and equipment required to implement plan;
7. Maintains current trainings/certifications for emergency response, i.e. ICS and CPR; and
8. Participates in after-action report development and in periodic exercise of emergency operations plan(s).

3.4 Financial Capabilities

Federal/State Grant Opportunities

The Tribe, across all Tribal departments, considers and pursues all applicable federal, state and local grant opportunities to assist in implementing hazard mitigation programs, such as FEMA, Housing and Urban Development (HUD CDBG Program, United States Department of Agriculture – Natural Resources Conservation Service (NRCS), and U.S. Economic Development Administration (EDA).

FEMA Hazard Mitigation Assistance (HMA) Program (HMGP, PDM, and FMA) - Over the past several years, the Tribe has applied and received approximately $13,000 in grant assistance from FEMA for various projects (see Section 2.5 for additional details).

USDA NRCS – provides Conservation Technical Assistance, Financial Assistance, and Conservation Innovation Grant programs.

HUD CDBG Program – a flexible program that provides communities with resources to address a wide range of unique community development needs, particularly the Disaster Recovery Assistance Program which provides grants to help cities, counties, and States recover from Presidentially-declared disasters, especially in low-income areas, subject to availability of supplemental appropriations.

3.5 Existing Protection Matrix

A summary of the main identified existing and future protection measures presented above are summarized on Table 3-1. These measures constitute the baseline protection that was further evaluated by the THMC to determine gaps in the Tribe's protection from natural disasters. Goal statements and specific actions were then developed to mitigate the identified gaps in the existing protection. These identified protection measures facilitate the Tribe to implement various hazard mitigation programs, ultimately making the Tribal community more resilient.

Table 3-2 Existing Protection Matrix Mashpee Wampanoag Tribe

Existing Protection	Description	Area Covered	Effectiveness and/or Enforcement	Improvements or Changes Needed
Planning and Regulatory				
Mashpee Wampanoag Tribe Threat and Hazard Identification and Risk Assessment				
	THIRA was developed to help the Tribal community understand the risks and determine the level of capability needed to address those risks.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe	Continue to Utilize
Massachusetts State Building Code				
	Includes many detailed regulations regarding wind loads, earthquake resistant design, flood-proofing and snow loads.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/Town of Mashpee	Continue to Utilize
Administrative and Technical				
Municipal Administration and Staff				
	Emergency Operations Plan Tribe maintains an Emergency Operations Plan (EOP) which addresses mitigation, preparedness, response, and recovery from a variety of natural, human, and technologic hazards.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe	Continue to Utilize
	Tribal Emergency Response Task Force (TERTF) The TERTF hold key roles and responsibilities during emergency situations.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe	Continue to Utilize
	Tribal Leadership Protocols for Incident Command, Emergency Management Director, Etraordinary Circumstances, Request for Federal Disaster Declaration, Departmental Readiness, and Continuity of Government	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe	Continue to Utilize
	Tribal Website The Tribe’s Emergency Management Department maintains a webpage hosted on the Tribe's website that includes a variety of local, state and regional emergency program information for Tribal members, business owners and tourists.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe's Emergency Management Director	Continue to Utilize

Table 3-2 Existing Protection Matrix Mashpee Wampanoag Tribe

Administrative and Technical				
Municipal Administration and Staff				
	Citizens Emergency Response Team (CERT) The CERT program educates Tribal members about disaster preparedness for hazards that may affect the Tribal lands and Tribal members living in the service area and trains them in basic disaster response skills such as fire safety, light search and rescue, team organization and disaster medical operations.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe's Emergency Management Director	Continue to Utilize
	Tribal Emergency Preparedness Equipment The Tribe maintain a number of emergency supplies for emergencies.	Tribal Lands	Effectiveness: Very Good Enforcement: Tribe's Emergency Management Director	Continue to Utilize
Emergency Response Partners				
	Town of Mashpee The Tribe relies on the Town of Mashpee to provide emergency fire and medical services every day and during emergency situations.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/Town of Mashpee	Continue to Utilize
	Barnstable County Regional Emergency Planning Commission Through planning, cooperation, and interoperability to assist Cape Cod communities to mitigate the threat from any hazard that may require the response of multiple jurisdictions.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/BCREPC	Continue to Utilize
	Cape and Islands Red Cross Provides relief to victims of disasters and helps people prevent, prepare and respond to emergencies. The specialized teams include health services, mass care, mental health, family services and disaster assessment and logistics.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/Cape and Islands Red Cross	Continue to Utilize
	Massachusetts Emergency Management Agency Provides guidance and assistance to county and local governments, tribes, businesses and nonprofit organizations in their efforts to provide protection to citizens and property.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/MEMA	Continue to Utilize

Table 3-2 Existing Protection Matrix Mashpee Wampanoag Tribe

Administrative and Technical				
Emergency Response Partners				
	Massachusetts State Police MEMA and the Massachusetts State Police issued an update of the Cape Cod Emergency Traffic Plan in August 2014, developed to facilitate the egress of the high volume of traffic from Cape Cod in the event of a hurricane or other potential high hazards, particularly during peak tourist season.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/MA State Police	Continue to Utilize
	Indian Health Services Health-related disaster assistance.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/IHS	Continue to Utilize
	Federal Emergency Management Agency Post-disaster individual and Tribal Financial assistance.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/FEMA	Continue to Utilize
	U.S. Coast Guard Hazardous waste spills in marine waters	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/US Coast Guard	Continue to Utilize
	Eversource Power outage restoration	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/Eversource	Continue to Utilize
	United South and Eastern Tribes, Inc. Tribal Emergency Management Mutual Aid Compact	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/TEMAC	Continue to Utilize
Coordination with Neighboring Municipalities				
	Coordination to identify applicable efficiencies (resource-sharing and Mutual Aid agreements).	Regional context	Effectiveness: Very Good Enforcement: Tribal Emergency Management Director	Maintain
	FEMA 2013 Hazard Mitigation Guidance, HMA Guidance, FEMA requirements regarding HMGP, PDM and FMA grants. http://www.fema.gov/media-library/assets/documents/33634?id=7851	Tribal Lands/Tribal Members living in the service area		Continue to Utilize

Table 3-2 Existing Protection Matrix Mashpee Wampanoag Tribe

Financial				
Federal/State Funding Opportunities				
	HUD CDBG Disaster Recovery Assistance: http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsi	Low-income areas.		Continue to utilize
Federal/State Funding Opportunities				
	USDA, Natural Resources Conservation Service (NRCS) Conservation Technical Assistance: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/technical/cta_ Financial Assistance: http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/ Conservation Innovation Grant Programs:	Tribal Lands		Continue to utilize
	MA State Hazard Mitigation Officer (SHMO) and State Mitigation Planners	Statewide		Continue to utilize
	2019 Massachusetts State Hazard Mitigation and Climate Adaptation Plan	Statewide		Continue to utilize
	FEMA Preparedness Case Study FEMA conducts grant effectiveness case studies to demonstrate how states and urban areas across the country use a mix of homeland security non-disaster grant programs to improve preparedness.	Tribal Lands/Tribal Members living in the service area	Effectiveness: Very Good Enforcement: Tribe/FEMA	Continue to Utilize

Section 4 Mitigation Strategy

4.1 Introduction

Removing and precluding development from hazardous areas is the best method of mitigation. However, this cannot be the sole focus of hazard mitigation for Tribal lands and Tribal members living in the service area. The Tribe's character and functionality require a level of intimacy with the areas of greatest risk – flood-related, winter-related and wind-related hazard events.

4.2 Mitigation Activities

In completing the risk and vulnerability analyses, the THMC considered projects and actions that would reduce the Tribe's vulnerability to the identified hazards. The Risk Assessment Matrix (Table 2-1) is the basis for the mitigation actions presented in Section 4.3.

4.3 Mitigation Action Plan

The THMC considered the goals of this plan and prioritized the matrix and the associated actions based on historical damage, safety of the population, property protection and consistency with Tribal goals and objectives. Issues and objectives were aligned to Tribal health risks, evacuation and mass care considerations, disruption of essential services and potential economic losses to the Tribe.

The THMC determined that the identified objectives could be met by considering actions aligned to the following Mitigation Categories:

- Public Education and Awareness
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services
- Planning and Prevention

The THMC has worked to set goals and objectives that are bounded by a time frame and are compatible and consistent with state hazard mitigation goals. Upon submittal of this plan to MEMA, the State Hazard Mitigation Committee (SHMC) is expected to review and approve these goals and objectives to ensure consistency with the statewide goals and objectives. The time frames used for this strategy are as follows:

- Short Term = 0 to 6 Months
- Medium Term = 6 to 18 Months
- Long Term = 18 Months to 5 Years

The following actions use the Risk Assessment Matrix (Table 2-1) to identify areas at risk, offer mitigation strategies and consider benefits. Each action offers a discussion of the project and if applicable, includes the options considered. Multiple actions associated with a vulnerable area reflect Tribal priorities and are simply prioritized high, medium or low. If known, the actions include cost estimates and assign responsible parties to lead the efforts to complete the action. The cost ranges used for this strategy are as follows:

- Staff Time – Tribal personnel time
- Minimal – less than $5,000
- Moderate – more than $5,000, but less than $25,000
- Significant – over $25,000

Other relevant departments/agencies that can offer support to the project are also listed. Finally, possible finance options are offered. Once the 2020 plan receives FEMA's 'Approved Pending Adoption', the mitigation strategy will be put into motion.

Evaluation/Selection of Mitigation Actions

After reviewing the Tribe's identified risks and vulnerabilities to natural hazards, the input/feedback from the Tribal workshops and recommendations from the Tribe, and the local Capability Assessment, the THMC selected mitigation actions to incorporate into the 2019 plan.

Prioritization of Actions

Due to budgetary constraints and other limitations, it is often impossible to implement all mitigation actions. The THMC needed to select the most cost-effective actions for implementation first to use resources efficiently and develop a realistic approach toward mitigation risks. The Disaster Mitigation Act 2000 (DMA) supports this principle of cost-effectiveness by requiring action plans to follow a prioritization process that emphasizes benefits over costs. DMA 2000 states:

> *"The mitigation strategy section shall include an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs."*

Part 1: Review Benefits and Costs

As part of the planning process, the THMC utilized Review Tools 1, 2, and 3 associated with each action identified.

Part 2 Prioritize Actions – Qualitative Method, Relative Score

The THMC utilized Method B: Prioritization using the Social, Technical, Administrative, Political, Legal, Economic, and Environmental (STAPLEE) criterion Relative Scores, suggested in FEMA's Hazard Mitigation Planning How-to-Guide Series (Table 4-1).

Table 4-1 STAPLEE Review and Selection Criteria

Category	Criteria
Social	Is the proposed action socially acceptable to the community?
	Are there equity issues involved that would mean that one segment of the community is treated unfairly?
	Will the action cause social disruption?
Technical	Will the proposed action work?
	Will it create more problems than it solves?
	Does it solve a problem or only a symptom?
	Is it the most useful action in light of other community goals?
Administrative	Can the community implement the action?
	Is there someone to coordinate and lead the effort?
	Is there sufficient funding, staff, and technical support available?
	Are there ongoing administrative requirements that need to be met?
Political	Is the action politically acceptable?
	Is there public support both to implement and to maintain the project?
Legal	Is the community authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity?
	Are there legal side effects? Could the activity be construed as a taking?
	Is the proposed action allowed by a comprehensive plan, or must a comprehensive plan be amended to allow the proposed action?
	Will the community be liable for action or lack of action?

	Will the activity be challenged?
Environmental	How will the action affect the environment?
	Will the action need environmental regulatory approvals?
	Will it meet local and state regulatory requirements?
	Are endangered or threatened species likely to be affected?
Economic	What are the costs and benefits of this action?
	Do the benefits exceed the costs?
	Are initial, maintenance, and administrative costs taken into account?
	Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)?
	How will this action affect the fiscal capability of the community?
	What burden will this action place on the tax base of the local economy?
	What are the budget and revenue effects of this activity?
	Does the action contribute to other community goals, such as capital improvements or economic development?
	What benefits will the action provide?

Part 3 Documentation of the Process

Each of the mitigation actions were scored against each of the STAPLEE criteria outlined above with a numerical score. These numbers were then totaled and developed into an overall priority score (Table 4-2). The ranking of the Priority Score is a guideline for when the Tribe should begin acting on the identified strategies, or actions.

The STAPLEE Method includes a cost-benefit review as part of the Mitigation Actions prioritization process. A more detailed cost-benefit analysis will be done, at the time of application, for those proposed Mitigation Actions that the Tribe applies for funding under the Pre-Disaster Grant Program and Hazard Mitigation Grant Program.

Table 4-2 STAPLEE Analysis

2019 Action Number	Title	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Economic	Environmental	Total	Prioritization
PUBLIC EDUCATION AND AWARENESS											
2019 - 1	Informational Natural Hazards Pamphlet	Cost	2	1	1	2	2	2	0	10	
		Benefit	2	2	2	2	2	2	0	12	**22**
2019 - 2	Hazard Mitigation Education Program	Cost	2	2	2	2	2	2	0	12	
		Benefit	2	2	2	2	2	2	0	12	**24**
STRUCTURAL PROJECTS											
2019 - 3	Hurricane Shutters Old Indian Meeting House	Cost	2	-1	2	2	2	2	0	9	
		Benefit	2	2	2	2	2	2	0	12	**21**
2019 - 4	Stormwater Feasibility Study Community/Government Center	Cost	2	2	2	2	2	2	1	13	
		Benefit	2	2	2	2	2	2	2	14	**27**
2019 - 5	Santuit River Embankment Strengthening	Cost	2	2	2	2	0	2	0	10	
		Benefit	2	2	2	2	2	2	2	14	**24**
2019 - 6	Stormwater Feasibility Study at the Parsonage	Cost	2	-1	2	2	2	2	0	9	
		Benefit	2	2	2	2	2	2	0	12	**21**
2019 - 7	Tribal Headstones Mitigation	Cost	2	-1	2	2	2	2	0	9	
		Benefit	2	2	2	2	2	2	0	12	**21**
PLANNING AND PREVENTION											
2019 - 8	Public Dam Engineering Assessment	Cost	2	2	2	2	-1	2	-1	8	
		Benefit	2	2	2	2	2	2	2	14	**22**
2019 - 9	Update Emergency Operations Plan	Cost	2	2	1	2	2	2	0	11	
		Benefit	2	2	2	2	2	2	0	12	**23**
2019 - 10	O & M Plans for Town-Owned Dams	Cost	2	2	1	2	-1	2	-1	7	
		Benefit	2	2	2	2	2	2	2	14	**21**

2019 Action Number	Title	Cost/ Benefit	Social	Technical	Administrative	Political	Legal	Environmental	Economic	Total	Prioritization
PLANNING AND PREVENTION											
2019 - 11	O & M Plans for State-Owned Dams	Cost	2	2	1	2	-1	2	-1	7	
		Benefit	2	2	2	2	2	2	2	14	**21**
2019 - 12	Develop Education Programs	Cost	2	2	2	2	2	2	0	12	
		Benefit	2	2	2	2	2	2	0	12	**24**
NATURAL RESOURCE PROTECTION											
2019 - 13	Herring Run Stream Enhancement	Cost	2	2	2	2	-1	2	-1	8	
		Benefit	2	2	2	2	2	2	2	14	**22**
EMERGENCY SERVICES											
2019 - 14	Generators for Critical Facilities	Cost	2	2	2	2	2	2	0	12	
		Benefit	2	2	2	2	2	2	0	12	**24**
2019 - 15	Emergency Communications Capability	Cost	2	2	2	2	2	2	0	12	
		Benefit	2	2	2	2	2	2	0	12	**24**

PUBLIC EDUCATION AND AWARENESS

Action #1

Distribute Informational Natural Hazards Pamphlet

Develop a pamphlet to be distributed to all Tribal members that describes the natural hazards that threaten Tribal lands and Tribal members living in the service area, as well as steps they can take for each hazard to mitigate damages to their property. Include evacuation routes and shelter locations along with items that can and cannot be taken to the shelters.

- Action Type: Planning, Pre-Disaster
- Priority Score: 22
- Lead: Emergency Management Director/Coordinator
- Supporting: Emergency Preparedness Outreach Coordinator/Emergency Response Task Force
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities

- Vulnerable Area: Tribal Housing/Tribal lands/Tribal members living in the service area, Individual Tribal member's health

Action #2
Work with Town of Mashpee and Barnstable County to develop a multi-faceted hazard mitigation education program to raise public awareness and support for mitigation; conduct on-going risk assessment and vulnerability analysis, floodplain management, land use and community planning; and through participation in other state and federal programs intended to reduce risk; and to reduce duplication of effort of countywide work.

- Action Type: Outreach, Pre-Disaster
- Priority Score: 24
- Lead: Town of Mashpee/Barnstable County
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Tribal Lands and Tribal Members Living in the Service Area

STRUCTURAL PROJECTS

Action #3
Install hurricane windows/shutters on the Old Indian Meeting House
The Old Indian Meeting House is the oldest Native American church in the country and is threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. The windows themselves are historic, as are the building and its contents. The shutters serve as a potential preventative measure.

- Action Type: Planning, Pre-Disaster
- Priority Score: 21
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Significant
- Benefit: Protection of property, protection of life/infrastructure
- Vulnerable Area: Old Indian Meeting House

Action #4

Conduct feasibility study of stormwater drainage solutions around the Tribal Community and Government Center

The Tribal Community and Government Center is bordered by the Tribal Meeting Area and Pow-Wow Field. The field is used for annual meetings, youth education, a Yurt School, and various cultural events. The field has inadequate drainage and floods during heavy rain events. It is also bordered by environmentally sensitive wetlands owned by the Tribe.

Also, the topography slopes down from the front of the facility to the rear, forming a basin behind the Center. The backup/emergency generator for the Center is located within this basin. The Center could flood during heavy rain events.

- Action Type: Planning, Pre-Disaster
- Priority Score: 27
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, protection of life/infrastructure, public safety
- Vulnerable Area: Tribal Community and Government Center

Action #5

Conduct feasibility study of river embankment strengthening around Maushop Farm.

Tribal farmland is located in the vicinity of the Willow Bend Golf Course which is bisected by the Santuit River. The property, a former horse farm, was gifted to the Tribe 15 years ago and is on the National Historic Register. During heavy rain events, river flooding threatens the farmland, a DPW barn and the emergency management storage shed.

- Action Type: Planning, Pre-Disaster
- Priority Score: 24
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, reduced natural resource/economic impacts
- Vulnerable Area: Maushop Farm/Tribal garden

Action #6

Conduct feasibility study of stormwater drainage solutions at the Tribal Parsonage.

The Tribal Parsonage is a historic structure from the 1700s and served as a place for Native Americans from area Tribes to rest while traveling and is located across from Route 130 and the Tribal Museum. The Parsonage is threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms, and is in need of rehabilitation and historic preservation.

- Action Type: Planning, Pre-Disaster
- Priority Score: 21
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, protection of life/infrastructure, public safety
- Vulnerable Area: Tribal Parsonage

Action #7

Consider potential mitigation towards Tribal Headstones.

Ancestral Tribal burial grounds are adjacent to the Old Indian Meeting House and are still in use today. Similar to the Old Indian Meeting House structure, Tribal headstones are also threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. Headstones are in need of rehabilitation and historic preservation.

- Action Type: Planning, Pre-Disaster
- Priority Score: 21
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Medium Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Reduced impacts to cultural resources/traditions
- Vulnerable Area: Cemeteries/Burial Grounds

PLANNING AND PREVENTION

Action #8

Assist the Town of Mashpee in preparing an engineering assessment of the various dam/flume structures controlled by the Town, including those at Santuit Pond, Mill Pond (Mashpee River), Quashnet River, in order to develop a long-term plan for the improvements and/or replacement of these structures as

necessary.

- Action Type: Planning, Pre-Disaster
- Priority Score: 22
- Lead: Mashpee Conservation Commission
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #9
Update the Tribe's Emergency Operations Plan – Basic Plan (2015 – 2020)

A number of hazard-, function-, and department-specific annexes/SOPs still need to be developed, including:

- Pandemic Influenza
- Wildfire
- Building, Transportation and Equipment SOPs
- Continuity of Operations Plan
- Risk Communications Plan
- Indian Health Services Emergency Plan
- Continuity of Government Plan

- Action Type: Planning, Pre-Disaster
- Priority Score: 23
- Lead: Emergency Management Director/Coordinator
- Supporting: Emergency Preparedness Outreach Coordinator/Emergency Response Task Force
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Emergency Response

Action #10
Work with the Town of Mashpee to Develop Operations and Maintenance Plans for Town-owned dams, including:

- John's Pond Dam
- Mashpee Pond Dam
- Mashpee River Dam

There are four dams in Mashpee that are associated with the herring run on Quashnet River and classified as Regulated Dams by the Massachusetts Office of Dam Safety. Tribal members exercise aboriginal rights each spring in harvesting the herring run. The John's Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River.

An Operations and Maintenance (O & M) Manual is a detailed written description of systematic procedures for ensuring that a dam is operated and maintained in proper fashion. Adequate operation and maintenance is critical for ensuring the ongoing safe functioning of the dam, as well as continued productive use of the structure and its associated reservoir.

- Action Type: Mitigation, Pre-Disaster
- Priority Score: 21
- Lead: Town of Mashpee
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: N/A
- Cost Estimate: Staff/Personnel Time
- Benefit: Property protection, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #11
Work with the Department of Conservation and Recreation (DCR) to Develop Operations and Maintenance Plans for State-owned dams, including:

- Quashnet River Dam

There are four dams in Mashpee that are associated with the herring run on Quashnet River and classified as Regulated Dams by the Massachusetts Office of Dam Safety. Tribal members exercise aboriginal rights each spring in harvesting the herring run. The John's Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River.

An Operations and Maintenance (O & M) Manual is a detailed written description of systematic procedures for ensuring that a dam is operated and maintained in proper fashion. Adequate operation and maintenance is critical for ensuring the ongoing safe functioning of the dam, as well as continued productive use of the structure and its associated reservoir.

- Action Type: Mitigation, Pre-Disaster
- Priority Score: 21
- Lead: MA Department of Conservation and Recreation.

- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: DCR funds
- Cost Estimate: Staff/Personnel Time
- Benefit: Property protection, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #12
Work with Town of Mashpee and Barnstable County to develop education programs to inform Town residents/Tribal members living in the service area about techniques to minimize storm damage to private and public property

- Action Type: Planning, Pre-Disaster
- Priority Score: 24
- Lead: Town of Mashpee/Barnstable County
- Supporting: Emergency Management Director
- Time Frame: Short term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Staff/Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Tribal Members Living in the Service Area

NATURAL RESOURCE PROTECTION

Action #13
Conduct stream enhancement of Tribal Herring Run.
The Herring Run is located adjacent to the Tribal Museum on Route 130. The herring run structure is old and in need of repair/upgrade. During heavy rain events the herring run overtops.

- Action Type: Natural Resource Protection, Pre-Disaster
- Priority Score: 22
- Lead: Town of Mashpee
- Supporting: DPW/Facilities Director
- Time Frame: Medium term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, reduced natural resource/economic impacts
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

EMERGENCY SERVICES

Action #14

Acquire generators for critical infrastructure facilities.

Presently, the generator at the Community and Government Center only powers a portion of the Center and not the entire building. The Center serves as the Tribe's shelter/warming station and needs to be fully functional. A secondary shelter is proposed as part of the residential housing development, however there is no generator budgeted for that facility.

- Action Type: Emergency Services, Pre-Disaster
- Priority Score: 24
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Medium term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Continuity of services (sheltering/warming station)
- Vulnerable Area: Tribal Critical Facilities

Action #15

Strengthen emergency communications capability (internal and external linkages).

Presently, the Tribe has established a Motorola base station as a means of communication during hazard events. The Tribe will upgrade to an FCC Band with the FEMA communications team, update and integrate the Risk Communications Plan with the EOP and transfer the satellite tower to the Community and Government Center.

- Action Type: Emergency Services, Pre-Disaster
- Priority Score: 24
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Medium term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Continuity of emergency services/operations
- Vulnerable Area: Tribal Communications

Section 5 Plan Implementation and Maintenance

5.1 Implementation, Evaluation, and Revision of Plan

Implementation

The THMC realized that assigning a time frame to each recommended mitigation action is important so that activities can be coordinated with other important Tribal functions, such as committee meetings and budget hearings. Assigned time frames also provide input to a project plan used for tracking the progress of all activities. Once the 2020 plan update receives FEMA's 'Approved Pending Adoption', the mitigation strategy will be put into motion and the Tribal Council will adopt the Plan (within one year of FEMA's approval). It is recognized that progress on plan implementation may vary dependent upon available funding and capacity of staff to complete assigned tasks.

Evaluation

The Emergency Management Director/Coordinator will bring the THMC together annually to review the status of the mitigation actions. Within two months of this meeting, a status report will be given to the Tribal Council. Progress will be reviewed annually at advertised Tribal Council hearings. It is advantageous the annual review be conducted prior to the Tribe's annual budget process so any Tribally funded projects can be considered in the budget process.

Revision

As per 44 CFR S 201.6(d)(3), the plan will be reviewed and revised to reflect progress in local mitigation efforts and changes in priorities and resubmitted for approval within 5 years in order to continue to be eligible for mitigation project grant funding. In order to ensure that the plan remains current, the THMC will meet annually. The plan will also be evaluated and updated after a disaster, or as funding opportunities arise for the actions and projects identified in the plan. Any updates will be reviewed and submitted to MEMA upon local approval to ensure that the state hazard mitigation strategy remains current.

The Mashpee Wampanoag Tribe Multi-Hazard Mitigation Plan will be incorporated into the Tribe's Emergency Management Plan when updated and for consistency.

5.2 Continued Tribal Involvement

The Tribe will continue Tribal involvement in the plan maintenance process by:

- The approved/adopted plan will be posted on the Tribe's web site;
- The annual meeting of the THMC to review the implementation of the plan will be posted/advertised as a Tribal general assembly meeting, and

- The THMC will include the Tribe in the preparation of the five-year update using the same Tribal participation process as in the development of this plan.

References

Federal/National Resources

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State Resources

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Local/Regional Resources

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Appendix A – Maps

Location Map (2-1)

Flood Hazard Areas (2-2)

Earthquakes (2-3)

Hurricanes/Tornadoes (2-4)

Average Annual Snowfall (2-5)

Hurricane Inundation Levels (2-6)

Sea Level Rise – Various Scenarios (2-7)

SANDWICH

BOURNE

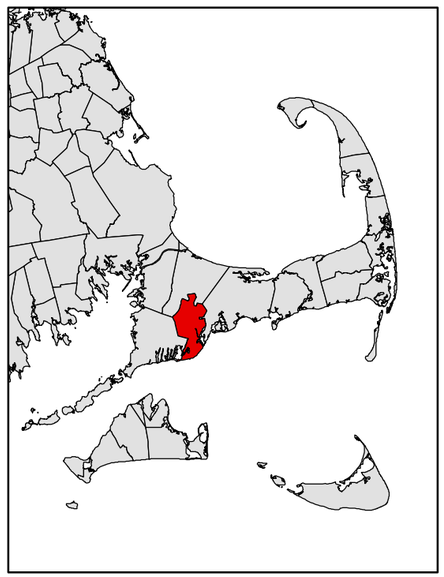
BARNSTABLE

FALMOUTH

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N



Map 2-1
Location Map

September 23, 2019 CSP
Source: MassGIS

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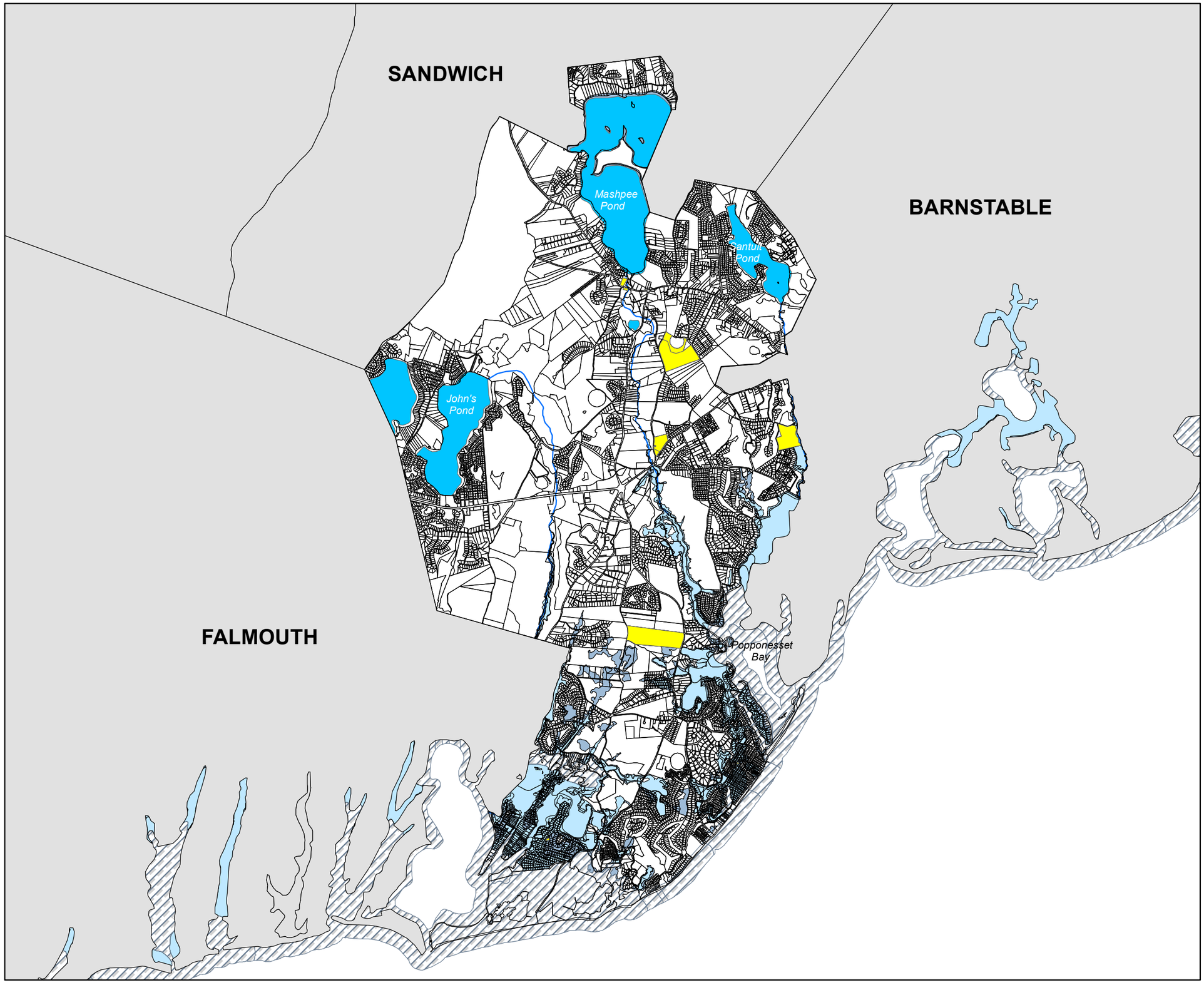

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

FEMA Flood Zones

- A Zone
- X Zone
- V Zone
- Water
- Tribal Properties

Map 2-2
Flood Hazard Areas

September 23, 2019 CSP
Source: MassGIS

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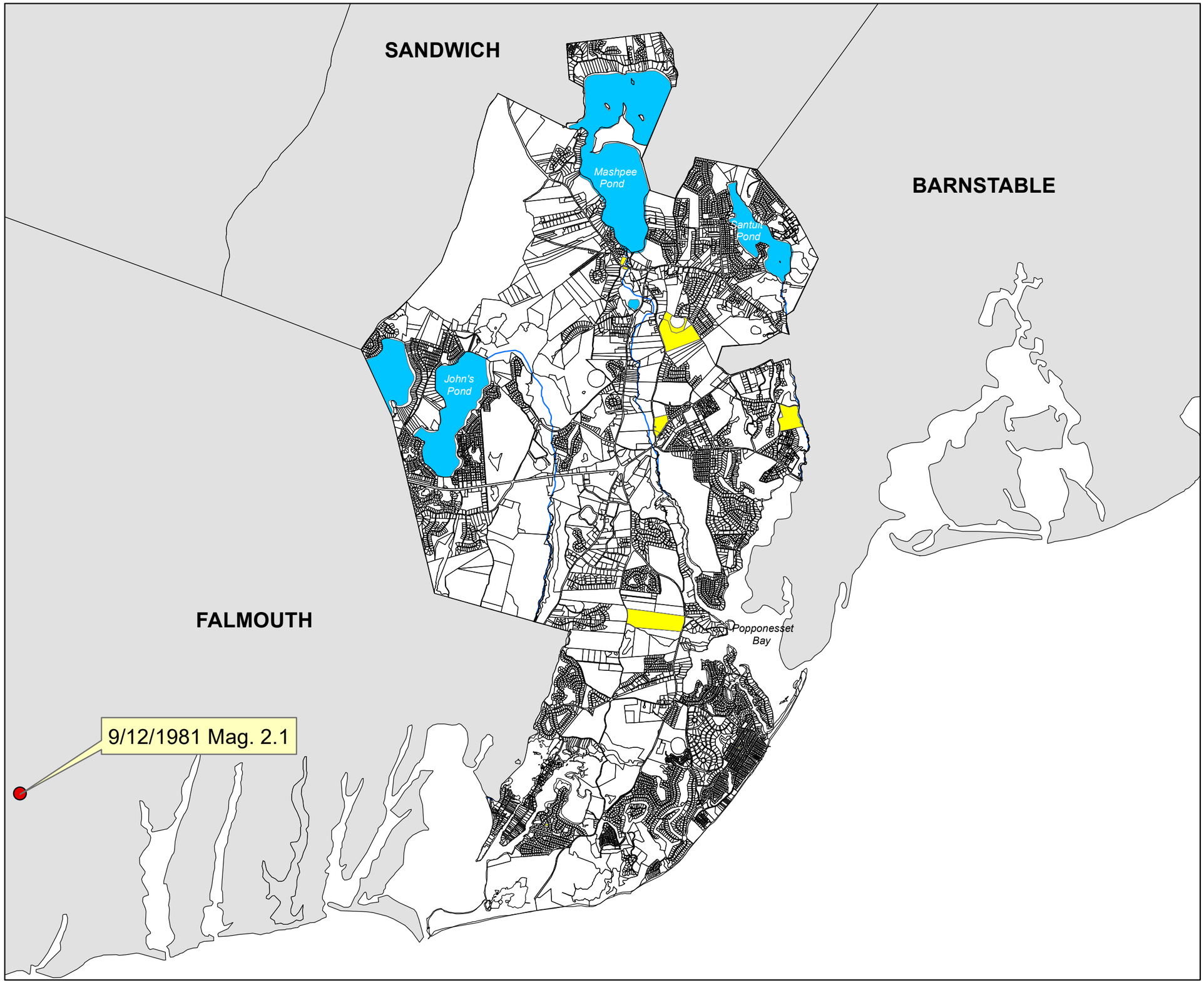

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

- Earthquake Point
- Water
- Tribal Properties

Map 2-3
Earthquakes

September 23, 2019 CSP
Source: MassGIS

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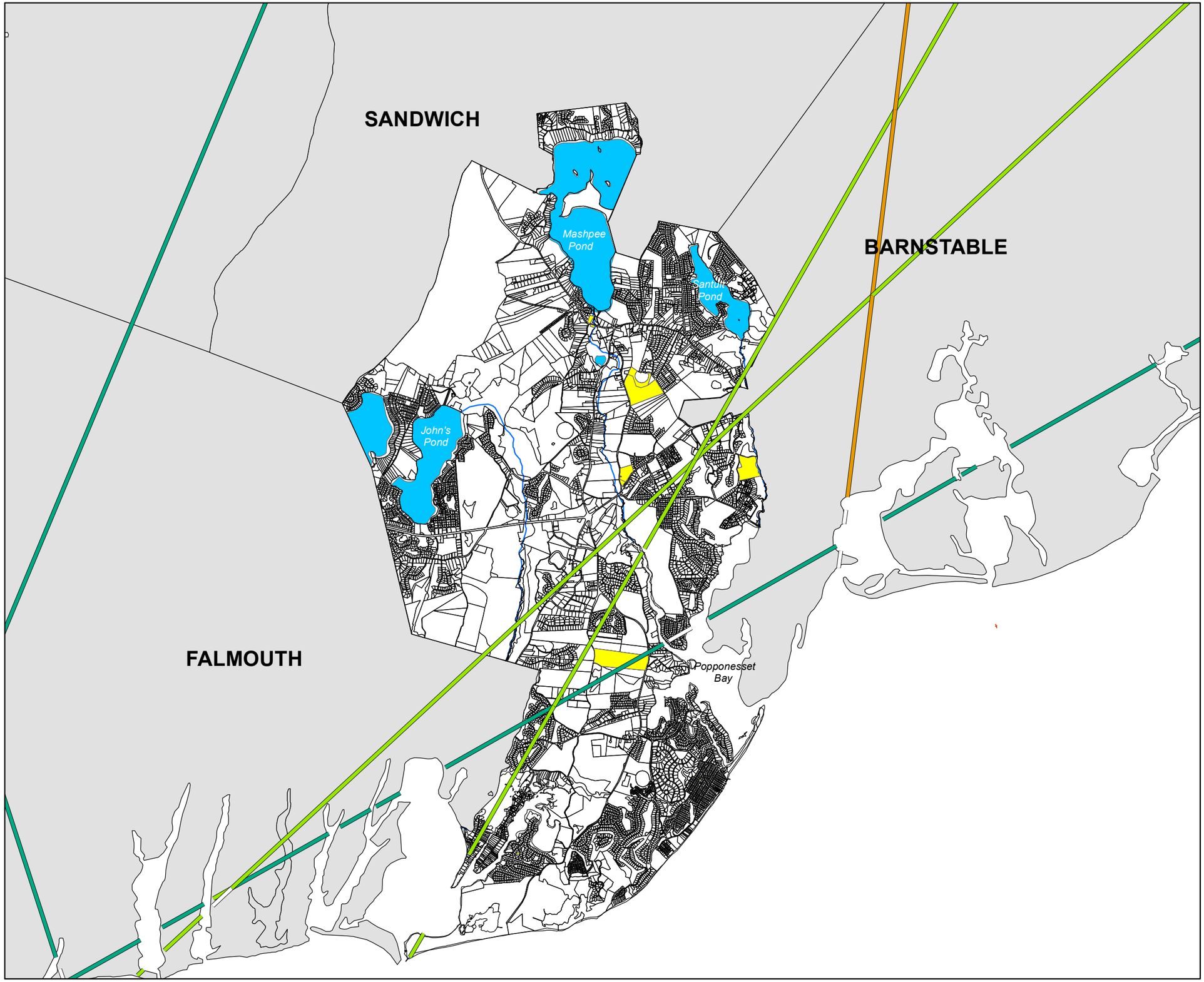

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

Hurricane Tracks
Categories
- Tropical Storm
- Hurricane 1
- Hurricane 2

Water
Tribal Properties

Map 2-4
Hurricanes

September 23, 2019 CSP
Source: MassGIS

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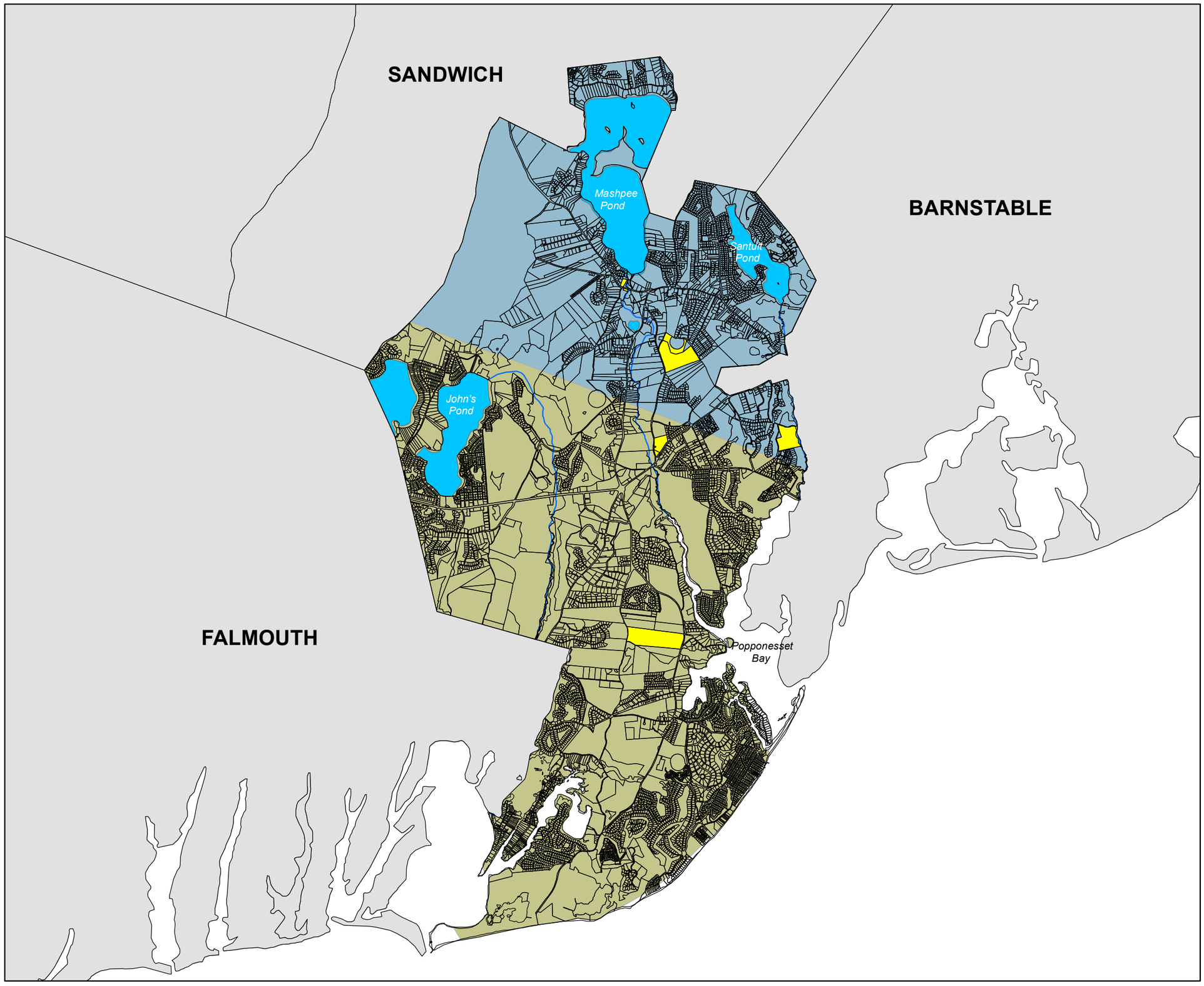

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

Average Annual Snowfall

- 12.1 - 24.0 Inches
- 24.1 - 36.0 Inches
- Water
- Tribal Property

Map 2-5
Average Annual Snowfall

September 23, 2019 CSP
Source: MassGIS

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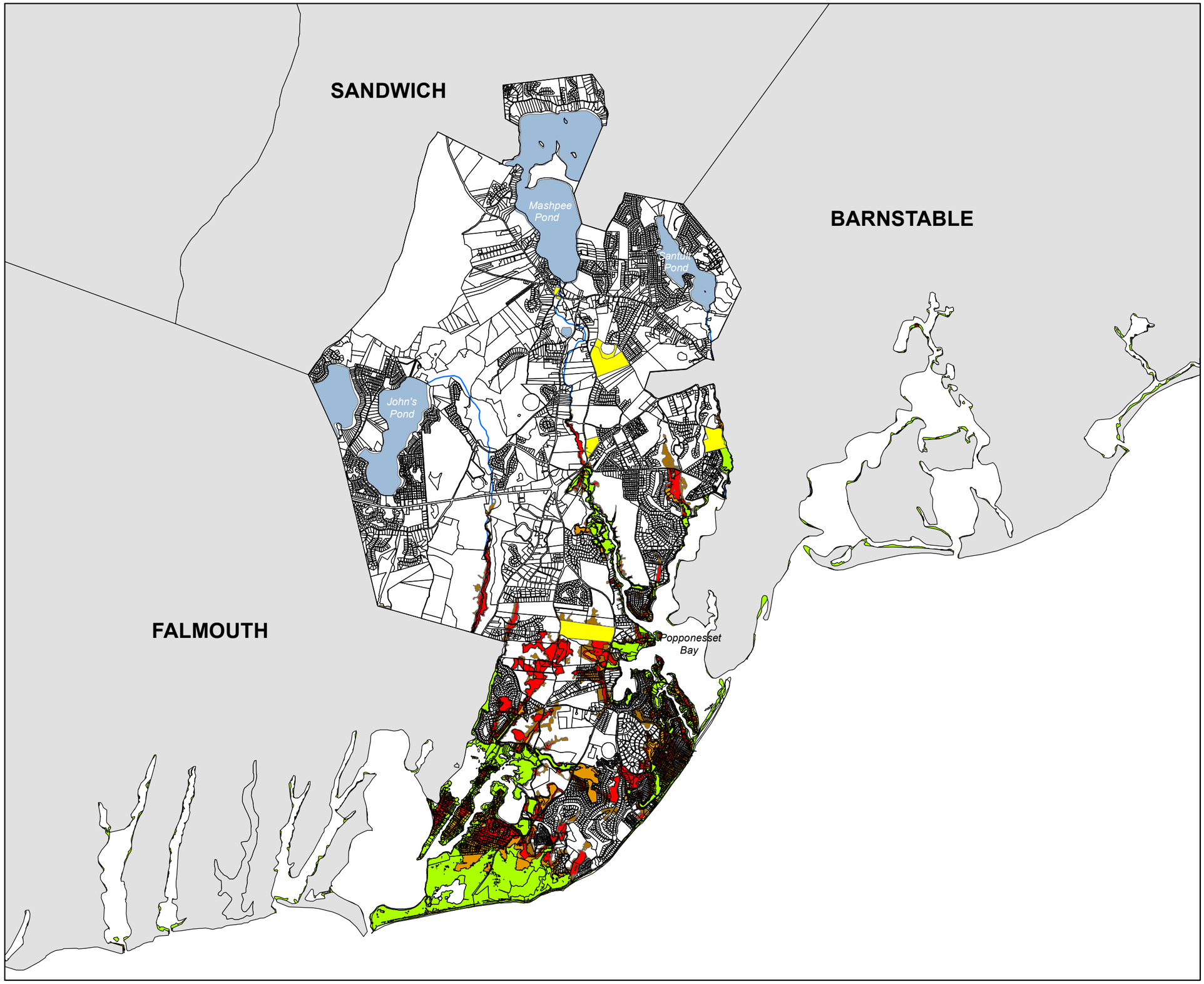

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

Hurricane Categories
- Category 1
- Category 2
- Category 3
- Category 4

Water

Tribal Properties

Map 2-6
Hurricane Inundation Areas

September 23, 2019 CSP
Source: MassGIS/NOAA

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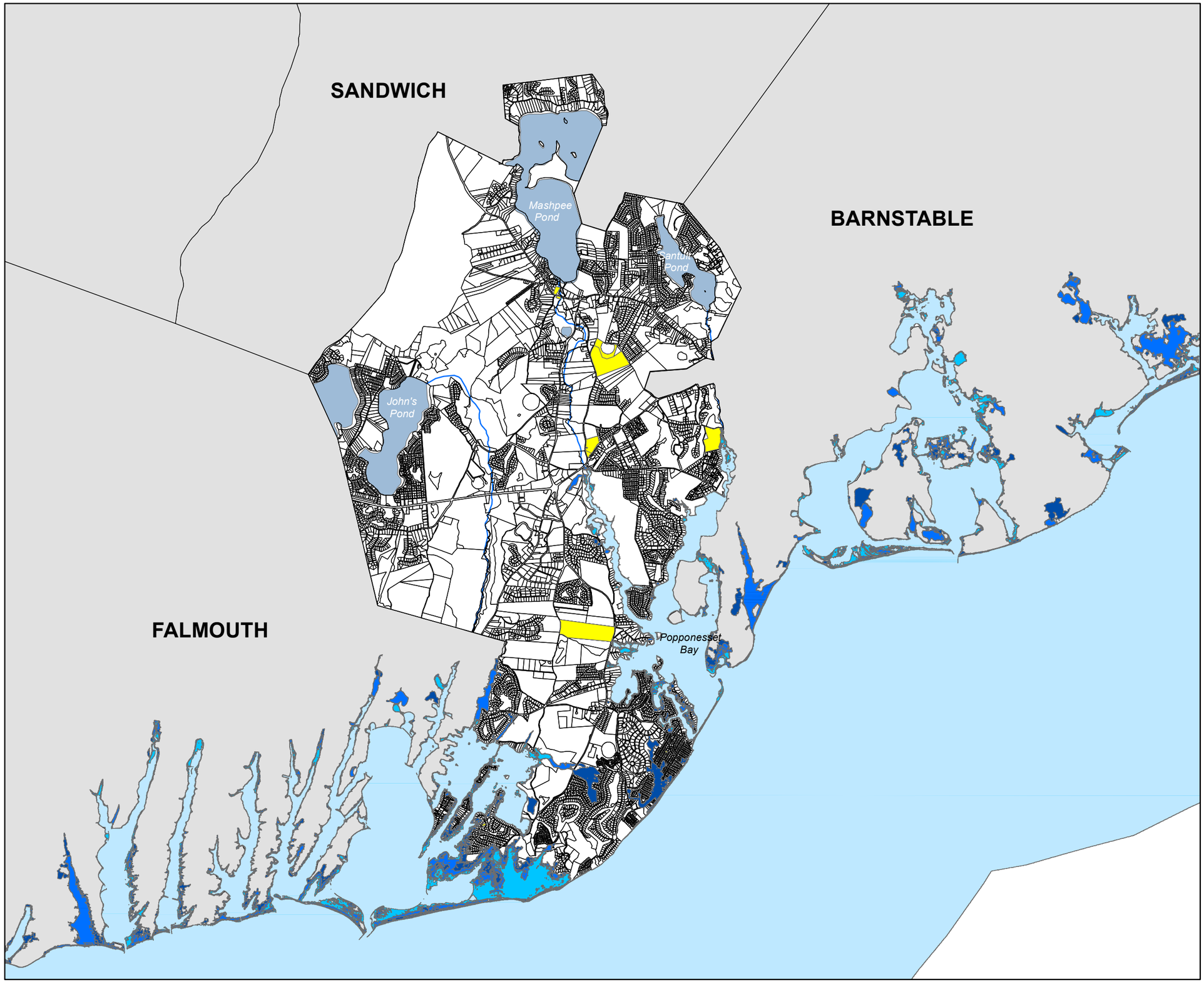

Mashpee Wampanoag Tribe

0 0.5 1 2
Miles

N

Legend

Sea Level Rise Scenarios

- + One Foot
- + Three Feet
- + Five Feet
- + Seven Feet

Water

Tribal Properties

Map 2-7
Sea level Rise
Various Scenarios

September 23, 2019 CSP
Source: MassGIS/NOAA Office of Coastal management

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Appendix B – Tribal/Public Information and Outreach

Project Webpage

Tribal Hazard Mitigation Committee Meeting #1: April 26, 2019

Tribal Workshop #1: June 9, 2019

Tribal Hazard Mitigation Committee Meeting #2: June 14, 2019

Tribal Hazard Mitigation Committee Meeting #3: September 6, 2019

Tribal Hazard Mitigation Committee Meeting #4: October 11, 2019

Tribal Workshop #2: October 13, 2019

On-Line Survey (8/19/19 – 9/27/19)

Project Webpage

Mashpee Wampanoag Tribe Hazard Mitigation Plan

FEMA defines hazard mitigation as:

A series of actions and policies designed to reduce and/or eliminate the impacts of naturally occurring disasters on people and property.

About the Mashpee Wampanoag Tribe Hazard Mitigation Plan Project

On April 24, 2019, the Tribal Council approved the Office of Emergency Management's plan to hire the Horsley Witten Group, Inc. to assist with the development of the Mashpee Wampanoag Tribe Hazard Mitigation Plan utilizing FY 2015 Pre-Disaster Mitigation Grant Program funding secured by the Director, Emergency Management.

Why is this important? Hazard mitigation planning enables Indian tribal governments to identify risks and vulnerabilities associated with natural disasters, and develop long-term strategies for protecting people and property from future hazard events. Further information is available on FEMA's Hazard Mitigation Planning page: http://www.fema.gov/hazard-mitigation-planning.

A hazard mitigation plan should be considered a living document that must grow and adapt, keeping pace with a community's growth and change. The Disaster Mitigation Act of 2000 (DMA) places high priority on the continuation of the planning process after the initial submittal, requiring communities to seek and receive re-approval from FEMA in order to remain eligible for financial assistance.

The approach for this plan development is premised on four primary methods, all geared towards meeting the requirements of the DMA 2000 Public Law 106-390, October 10, 2000:

- Planning Process—Outreach and Stakeholder Coordination
- Risk Assessment—Identifying Hazards and Estimating Losses
- Mitigation Strategy— Identifying Mitigation Actions and Implementation Strategies
- Plan Maintenance—Implementation, Evaluation and Revision/Update

Contacts

Nelson Andrews Jr.
Director, Emergency Management
Mashpee Wampanoag Tribe
483 Great Neck Road
Mashpee, MA 02649
Nelson.AndrewsJr@mwtribe-nsn.gov
Office: (508) 477-0208 Ext. 103

Carl Simons
Project Manager
Horsley Witten group, Inc.
90 Route 6A, Unit #1
Sandwich, MA 02563
csimons@horsleywitten.com
Office: (508) 833-6600

Stay tuned for more information on how to get involved!

Tribal Hazard Mitigation Committee Meeting #1: April 26, 2019

Horsley Witten Group

Memorandum of Meeting

To: Mashpee Wampanoag Tribe Hazard Mitigation Plan

From: Craig Pereira

Date: May 3, 2019

Re: Mashpee Wampanoag Tribe Hazard Mitigation Plan Project Kickoff Meeting

In attendance:

Nelson Andrews – Tribal Emergency Management Director
Will Keefer – HW Senior Planner
Carl Simons – HW Project Manager
Jane Estey – HW Corporate Counsel
Craig Pereira – HW Senior Planner

1. Introductions
    a. Patrick Kozak (South Dakota) will be a subconsultant to HW to ground truth the plan development.
2. Scope of Work Overview…task by task
    a. Craig Pereira provided an overview of the Scope of Work
    b. Tribal Hazard Mitigation Committee (THMC)…discussion on membership of the THMC. Nelson Andrews discussed the proposed composition of the THMC, drawing from the existing Tribal Emergency Response Task Force, including:
        i. Natural Resources Director
        ii. Hosing Director
        iii. Public Health Director
        iv. Facilities Director
        v. Police Chief
        vi. Historic Preservation Director
        vii. Public Information Officer
        viii. Tribal Elder (Chief)
        ix. Rachel Fleck (Region 2 MEMA representative)

        Nelson Andrews will confirm participation from the Tribe and provide email/contact information to HW. Nelson will invite Rachel Fleck for her participation on the THMC.

    c. Craig Pereira proposed a project webpage to be hosted on the Tribe's website. This will provide background on the project early on and throughout the planning process, as well as provide a repository for meeting/workshop materials throughout the project in support of continuous Tribal engagement. Craig will provide content to Nelson for development of a project webpage. Nelson Andrews also suggested utilizing the smart board in the Tribe's Government Building to facilitate outreach and

participation at the Tribal Workshops. We can also utilize the tribe's monthly newsletter for continued engagement.

d. Nelson Andrews reviewed the Tribe's facilities/land holdings, which include:
    i. Government Building
    ii. Oyster Farm (Herring Run waterway/Parsonage)
    iii. Proposed Housing (currently under construction, WWTF is complete)
    iv. Taunton Casino (site is currently fenced-in, no structures)

Nelson has data/drone fly-overs that he will provide to HW to develop the mapping.

3. Nelson Andrews conveyed that the Tribe's natural resources and historic sites/structures (Meeting House, Cemetery, and Museum) will be the emphasis for preservation/resilience for the Tribe.
4. Nelson Andrews stated that the Tribe does have an Emergency Operations Plan that he will provide to HW for review.
5. Craig Pereira stated that HW does have the 2017 Town of Mashpee Hazard Mitigation Plan which will also be reviewed, and applicable data incorporated into the plan.
6. Craig Pereira reviewed the original project schedule and proposed updated milestone/meeting/workshop dates. Nelson Andrews commented that the best opportunity for a Tribal workshop would be at the monthly general Body/Assembly meetings held the second Sunday of the month. Nelson will coordinate with the Tribe to see if HW can conduct the first workshop on June 9, 2019 from 2 – 4 PM.
7. Meeting Schedule. It was determined best to confirm the Tribal Hazard Mitigation Committee meeting schedule and Tribal Workshop schedule early on. With that, below are the target dates for both, with HW's availability, for Nelson to schedule and confirm:

Meeting #1 – THMC: week of May 20, 2019
- HW availability: May 23rd, May 24th

Tribal Workshop: June 9, 2019 (2 – 4PM)
- HW is available for this date//time

Meeting #2 – THMC: week of June 17, 2019
- HW availability: June 16th, June 17th

Meeting #3 – THMC: week of July 22, 2019
- HW availability: July 22nd, 23rd, 24th, 25th – afternoon, 26th – afternoon

Meeting #4 – THMC: week of August 12, 2019
- HW availability: August 12th, 16th

Tribal Workshop/Council Meeting: October 13, 2019
- HW is available for this date

Tribal Workshop #1: June 9, 2019

Mashpee Wampanoag Tribe

Tribal Workshop – Hazard Mitigation Plan

Community/Government Center
483 Great Neck Road
Mashpee, MA

Agenda

1. Overview
2. Why Hazard Mitigation Planning?
    a. Mitigation Process
    b. Mitigation Goals
    c. Mitigation Measures
3. Questions/Comments

Mashpee Wampanoag Tribe Hazard Mitigation Plan Tribal Workshop

Craig Pereira, CFM
Project Manager – Horsley Witten Group

June 9, 2019
Community/Government Center

1

Why Hazard Mitigation Planning

Disaster Mitigation Act of 2000, Interim Final Rule, 44 CFR Parts 201 and 206 states, "All communities must have an approved Multiple Hazards Mitigation Plan in order to qualify for future federal disaster mitigation grants".

Reduction or elimination of long-term risk to life, property, and the environment.

2

Mashpee Wampanoag Tribal Hazard Mitigation Committee

- Nelson Andrews Jr., Emergency Management Director
- Allyssa Hathaway, Emergency Preparedness Specialist
- Rita Lopez, Acting tribal Administrator
- Chuckie Green, Natural Resources Director
- Shellie Tobey, Housing Director
- Unique Lopes Forde, Public Health Director
- Rita Gonsalves, Indian Health Services Director
- Jason Steiding, Public Works Director
- Willard Pocknett, Facilities Director
- Kevin Frye, Police Chief
- Curtis Frye, Police Captain
- David Weeden, Historic Preservation Director
- Trish Keliinui, Public Information Officer
- Tribal Elder
- Rachel Fleck, MEMA Region 2

3

Mitigation Process

- **Assess Risks**
- Establish Goals
- Identify Projects/Actions
- Update/Maintain Plan

4

Assess Risks… Risk and Vulnerability Assessment

Natural Hazard:

"Any event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, and agricultural loss, damage to the environment, interruption of business, or other types of harm and/or loss".

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Hazards Affecting Mashpee, MA

- Coastal Erosion/Shoreline Change
- Dam Failure
- Earthquake
- Fire (Urban/Wildland)
- Flood
- Hurricane and Tropical Storms
- Landslide
- Nor'easters
- Severe Weather (high winds, thunderstorms, extreme temperatures, tornadoes and drought)
- Severe Winter Weather (snow, blizzards and ice storms)
- Tsunami

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Hazards Classification and Probability

- Flood-Related Hazards
  - Riverine: Inland/Urban Flooding, Heavy Rain: Highly Likely
  - Coastal Erosion/Shoreline Change: Highly Likely
  - Dam Failure: Possible
- Winter-Related
  - Blizzards/Snow: Highly Likely
  - Ice Storms: Highly Likely
  - Extreme Cold: Possible
- Wind-Related
  - Hurricanes/Nor'easters: Highly Likely
  - High/Strong Winds: Highly Likely
  - Tornadoes: Possible
  - Lightning/Thunder Storms: Highly Likely
  - Hail: Highly Likely

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Hazards Classification and Probability

- Geologic-Related Hazards
  - Earthquake: Unlikely
  - Landslide: Possible
- Drought-Related
  - Drought: Highly Likely
  - Extreme Heat: Possible
- Fire-Related
  - Urban Fire: Highly Likely
  - Wildfire: Highly Likely

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Assess Risks…
Risk and Vulnerability Assessment - Assets

- **Economic Assets**
  - Businesses/employers
  - Tourist destinations
- **Social Assets**
  - Vulnerable populations
  - Cultural locations

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Assess Risks…
Risk and Vulnerability Assessment - Assets

- **Natural Resources**
  - Lifeline and utility systems
  - Wetlands
  - Conservation and recreation lands
- **Essential Buildings and Critical Facilities**
  - Tribal Government buildings
  - Hazardous facilities
  - Roadways
  - GIS Mapping…

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Mitigation Process

- Assess Risks
- **Establish Goals**
- Identify Projects/Actions
- Update/Maintain Plan

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Establish Goals…Mitigation Goals

- Protect the Tribal health, safety and welfare.
- Reduce Tribal property damages caused by hazard impact.
- Minimize social distress and economic losses/business disruption.
- Provide an ongoing forum for the education and awareness of natural hazard mitigation issues, programs, policies, projects and resources.
- More emphasis on Tribal historic and cultural assets/resources…

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Establish Goals…Mitigation Measures

- Planning and Prevention
- Property Protection
- Natural Resource Protection
- Structural Projects
- Emergency Services, and
- Public Education and Awareness

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Mitigation Process

- Assess Risks
- Establish Goals
- **Identify Projects/Actions**
- Update/Maintain Plan

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Identify Projects/Actions… Identification of Mitigation Actions

Mitigation actions to be developed based on review of the Tribe's identified risks and vulnerabilities to natural hazards.

Each action incorporates a brief description of the intended action, who the responsible parties are, a proposed time frame for completion and potential funding sources.

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Identify Projects/Actions… Prioritization of Actions…STAPLEE

- **Social**…is the action socially acceptable?
- **Technical**…is the action technically feasible and provide appropriate level of protection?
- **Administrative**…does the Tribe have the capability to complete the action?
- **Political**…will the Tribe support or oppose the project?
- **Legal**…does the Tribe have the legal authority to complete the action?
- **Economic**…is the action cost-effective?
- **Environmental**…will the action affect the natural environment?

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Identify Projects/Actions… Implementation

- Tribe's Capability
- Plan Adoption/Incorporation into Existing Plans

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Mitigation Process

- Assess Risks
- Establish Goals
- Identify Projects/Actions
- **Update/Maintain Plan**

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Project Schedule

Draft Update available for comment – **September 2019**

Draft Update to FEMA – **October 2019**

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Contact Us...

Questions and/or comments about the Hazard Mitigation Plan, please contact:

Nelson Andrews Jr. – Director, Emergency Management
Mashpee Wampanoag Tribe

483 Great Neck Road
Mashpee, MA 02649
Nelson.AndrewsJr@mwtribe-nsn.gov
Phone: (508) 477-0208

Craig Pereira—Project Manager
Horsley Witten Group

55 Dorrance Street, Suite 200
Providence, RI 02903
cpereira@horsleywitten.com
Phone: (401) 272-1717

Thank You!

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Tribal Hazard Mitigation Committee Meeting #2: June 14, 2019

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Tribal Hazard Mitigation Committee Meeting #2

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road
Mashpee, MA 02649
June 14, 2019 2:00 PM – 3:00 PM

Agenda

1. Introductions

2. Project Coordination

    a. Tribal Hazard Mitigation Committee Confirmation
    b. Plan Layout
    c. Data Collection
    d. Project Schedule
        i. THMC Meetings
        ii. Tribal Workshop
        iii. Tribal Interviews
    e. Tribal Outreach
        i. Project Webpage

3. Questions

Horsley Witten Group

Memorandum of Meeting

To: Mashpee Wampanoag Tribal Hazard Mitigation Committee

From: Craig Pereira

Date: June 14, 2019

Re: Mashpee Wampanoag Tribal Hazard Mitigation Committee Meeting No. 2

In attendance:

Nelson Andrews – Tribal Emergency Management Director
Rita Lopez – Acting Tribal Administrator
Michelle Tobey – Housing Director
Trish Keliinui – Public Information Officer
Rachel Fleck – MEMA Region 2 (via phone)
Carl Simons – Horsley Witten Group (HW) Project Manager
Craig Pereira – HW Senior Planner (via phone)

1. Introductions
    a. Everyone introduced themselves and described the role they'll fill on the Tribal Hazard Mitigation Committee (THMC).
2. Project Coordination
    a. THMC Confirmation…discussion on membership of the THMC. Nelson Andrews discussed the proposed composition of the THMC, drawing from the existing Tribal Emergency Response Task Force, including:
        i. Chuckie Green - Natural Resources Director
        ii. Shelley Tobey - Housing Director
        iii. Unique A. Lopes Forde - Public Health Director
        iv. Willard Pocknett - Facilities Director
        v. Kevin Frye - Police Chief
        vi. David Weeden - Historic Preservation Director
        vii. Trish Keliinui - Public Information Officer
        viii. _____ - Tribal Elder
        ix. Rachel Fleck - Region 2 MEMA representative

    Several members requested clarification on the time commitment necessary to participate. HW affirmed that participation will include several THMC meetings, a brief interview with HW staff, and review of draft and final plan.

    Nelson Andrews will confirm participation from the remaining members not present at the meeting.

    b. Plan Layout…Craig Pereira reviewed the proposed plan layout (separate attachment), briefly describing what each section will include, and the process to develop the plan.

c. Data Collection…Craig Pereira confirmed receiving the following from Nelson Andrews:
   i. Tribal Emergency Operations Plan (2015 – 2020)
   ii. EOP Appendices/Annexes

   Craig Pereira requested any additional documents that would be helpful to develop the draft plan, preferably something that can provide historical context of the Tribe. Nelson Andrews mentioned the Tribe receiving federal funds from a 2015 winter storm and will provide HW with the details for this.

d. Project Schedule…Craig Pereira emphasized the project has an accelerated schedule due to limitations on the close of the grant funding the project.
   i. THMC Meetings…Craig Pereira requested that due to the accelerated schedule, all future THMC meetings be scheduled in advance to keep the project moving forward.

      THMC Meeting #2: week of July 15, 2019

      THMC Meeting #3: week of week of August 12, 2019

      THMC Meeting #4: week of September 16, 2019

   ii. Tribal Workshop…Craig Pereira requested to schedule the second Tribal Workshop in advance.

      Tribal Workshop #2: Sunday, September 8, 2019 (at Tribal General Assembly meeting)

   iii. Tribal Interviews…Craig Pereira requested a date to be set aside for Tribal interviews by HW staff.

      Interviews: Proposed for the same day of THMC Meeting #2.

   HW will work with Nelson Andrews to confirm these meeting dates/times/locations.

   iv. Tribal Outreach…Nelson Andrews stated there will be a project webpage added to the Tribe's website. This will serve as a repository for project information and a way for members to get involved. The Tribal Public Workshop notice was published in the Tribe's June newsletter – the Mittark.

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Sign in Sheet

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road

June 14, 2019 2:00 PM - 3:00 PM

Name	Email Address	Phone
Rita Lopez	rita.lopez@mwtribe-nsn.gov	508-477-0208x173
MICHELLE TOBEY	MICHELLE.TOBEY@MWTRIBE-NSN.GOV	508-477-0208 x 107
Nelson Andrews Jr	Nelson.Andrews.Jr@MWtribe-NSN.gov	508-477-0208(103)
TRISH KELLINGI	Trish.Kellingi@MWTribe-NSN.GOV	508 477-0208(167)
Carl Simons	CSimons@horsleywitten.com	508-540-1226
by Phone	E	
Craig Pereira	cpereira@horsleywitten.com	508-540-1226
Rachel Fleck	Rachel.Fleck@MassMail.State.MA.US	508-427-0405

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Mashpee Wampanoag Tribal Hazard Mitigation Plan

Section 1: Introduction

Overview

- Hazard mitigation planning in general

What Hazard Mitigation Can do for the Mashpee Wampanoag Tribe

- Benefits of hazard mitigation planning

Mashpee Wampanoag Tribe Goals

- Protect the public health, safety and welfare.
- Reduce both public and private property damages caused by hazard impact.
- Minimize social distress and economic losses/business disruption.
- Provide an ongoing forum for the education and awareness of natural hazard mitigation issues, programs, policies, projects and resources.

Planning Process

- Overview of approach/process of the project
    - Tribal Hazard Mitigation Committee Meetings
    - Tribal Workshops
    - Tribal Interviews
    - Survey

Environmental Setting

- Geographic location
- History
- Tribal Structure

History of Disaster Declarations

- Federal Emergency and Major Disaster Declarations for the County

Recent Disaster Declarations

- Recent (2010 – forward) Federal Emergency and Major Disaster Declarations for the County

Section 2: Risk Assessment

Introduction

- Which hazards merit special attention
- What actions might be taken to reduce the impact(s) of those hazards
- What resources are likely to be needed

Hazard Identification

- Required to evaluate all hazards identified in the State Plan…anticipated list:
    - Riverine/Flash Flooding

  - Heavy Rain/Inland and Urban Flooding
  - Climate Change/Sea Level Rise
  - Dam Failure
  - Blizzards/Heavy Snow/Winter Weather/Nor'easters
  - Ice Storms
  - Extreme Cold
  - Hurricanes
  - Tornadoes/High Winds
  - Lightning/Thunderstorms
  - Hail
  - Earthquakes
  - Drought
  - Extreme Heat
  - Urban Fire/Wildfires
  - Invasive Species
- Likely not to be addressed:
  - Avalanche
  - Expansive Soils
  - Land Subsidence
  - Landslides
  - Volcanoes
  - Tsunamis

Hazard Profiles

- Review of NOAA's National Climatic Data Center (http://www.ncdc.noaa.gov/) 'Storm Events' database and develop tables based on hazard type, date, level/description and damages to develop a Hazard Index.
  - Flood Related
  - Winter Related
  - Wind Related
  - Geologic Related
  - Drought Related
  - Urban Fire/Wildfire Related

- Evaluate the location/history/probability of future occurrence of hazards

  Criteria for Frequency Categorization:

  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).

Criteria for Severity Categorization (based on past hazard events):
Minor: Limited and scattered property damage; no damage to public infrastructure; contained geographic area; essential services not interrupted; no injuries or fatalities.

Serious: Scattered major property damage; some minor infrastructure damage; wider geographic area; essential services are briefly interrupted; some injuries/fatalities.

Extensive: Consistent major property damage; major damage to public infrastructure; essential services are interrupted for several hours to several days; many injuries and fatalities.

Catastrophic: Property and public infrastructure destroyed; essential services stopped; thousands of injuries and fatalities.

- Mapping will also be developed
    - Critical Facilities
    - FEMA Flood Zones
    - Snowfall, Hurricane paths, storm surge, etc.

Vulnerability

- Evaluates vulnerability of built environment, social and environment.

Development Trends
- Changes over time, future development plans (residential/commercial)

Economic Vulnerability
- Does the Tribe participate in National Flood Insurance Program?
- Impacts of FEMA flood zones (Economic by land use type, land/building values)

Social Vulnerability
- Impacts to built/natural environment and that relationship to the social structure of the Tribe
- Infrastructure/Emergency life lines
- Evacuation/Populations at risk

Environmental Vulnerability

FEMA Disaster Grant Assistance

- Has the Tribe received any financial assistance from MEMA/FEMA?

Section 3: Capability Assessment

Introduction

- Documents local, state and federal department, agency and program capabilities in terms of pre and post-disaster activities

Planning/Regulatory Capabilities

- Planning documents
- Regulations/Bylaws
- Building Code

Administrative Capabilities

- Tribal Emergency Management Plan
    - Emergency Operations Center/Shelter
- Municipal Website
- Coordination with Neighboring Communities
- Tribal Structure/Staff

Financial Capabilities

- Federal/State Grant Opportunities

National Flood Insurance Program

- NFIP/Compliance with NFIP

Existing Protection Matrix

- Summary of all above

Section 4: Mitigation Strategy

Introduction

Mitigation Activities

- Requires an action for every vulnerability identified in the plan

Mitigation Action Plan

- Categories
    - Public Education and Awareness
    - Property Protection
    - Natural Resource Protection
    - Structural Projects
    - Emergency Services
    - Planning and Prevention

- Time Frame

- Short Term = 0 to 6 Months
- Medium Term = 6 to 18 Months
- Long Term = 18 Months to 5 Years

- Cost Estimate
  - Staff Time – municipal personnel time
  - Minimal – less than $5,000
  - Moderate – more than $5,000, but less than $25,000
  - Significant – over $25,000

- Prioritization of Actions (abbreviated Benefit/Cost Analysis
  STAPLEE Criteria

  - **S**ocial: Is the action compatible with present and future local community needs and values?
  - **T**echnical: Is the action feasible with available local resources (or as supplement by outside resources as necessary)?
  - **A**dministrative: Does the community have the administrative capacity to implement the action?
  - **P**olitical: Is there strong public support to implement and maintain the action?
  - **L**egal: Does the community have the legal authority to implement the action?
  - **E**conomic: Is the action cost-effective?
  - **E**nvironmental: Does the action impact environmental resources, and is the impact positive, negative, or neutral?

- Action Description
  - Action Type:
  - Priority Score:
  - Lead:
  - Supporting:
  - Time Frame:
  - Financing Options:
  - Cost Estimate:
  - Benefit:
  - Vulnerable Area:

Section 5: Plan Implementation/Maintenance

Implementation/Evaluation/Revision

- Implementation
  - Following Tribal adoption

- Evaluation
  - Annually

- Revision
    - Every 5 years/after a major event

Continued Tribal Involvement

- Posted on Tribe's website
- Annual meeting of Tribal Hazard Mitigation Committee

Tribal Hazard Mitigation Committee Meeting #3: September 6, 2019

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Tribal Hazard Mitigation Committee Meeting #3

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road
Mashpee, MA 02649
September 6, 2019 1:00 PM – 2:00 PM

Agenda

1. Project Website

2. Section 1 Introduction
   a. Mission Statement
   b. Goals
   c. Survey

3. Section 2 Risk Assessment
   a. Hazard Profiles
   b. NFIP Participation
   c. Climate Change Component (MA MVP Data)
   d. Vulnerability
   e. FEMA Disaster Grant Assistance
   f. Mapping

4. Section 3 Capability Assessment
   a. Relationship with the Town?
   b. FEMA Preparedness Case Study

5. Section 4 Mitigation Strategy

Horsley Witten Group

Memorandum of Meeting

To: Mashpee Wampanoag Tribal Hazard Mitigation Committee

From: Craig Pereira

Date: September 11, 2019

Re: Mashpee Wampanoag Tribal Hazard Mitigation Committee Meeting No. 3

In attendance:

Nelson Andrews – Tribal Emergency Management Director
Trish Keliinui – Public Information Officer
Kevin Frye – Police Chief
Dale Oakley – Natural Resources Department
David Weeden – Historic Preservation Director
Craig Pereira – HW Senior Planner

1. Project Website:
    a. The June 6, 2019 Tribal HMP Workshop powerpoint and static 'About the Tribal Hazard Mitigation Plan' pdf are now posted on Emergency Management Department's page (with Community Survey link).
    b. Community Survey link is available and will be open through at least the end of September.
        - **THMC members** should continue to push this out to professional and personal networks (https://www.surveymonkey.com/r/MashpeeWampanoagTribeSurvey).
        - **Trish** will push it out via the Tribe's Facebook page, Tribal distribution lists, place it on the Tribal website main page, and post the link in the computer room where elders often meet and have access to computers.

2. Section 1 - Introduction
    a. Most data needed has been collected.
    b. Outstanding items for discussion/consideration include:
        - Mission Statement…needs to be developed. For consideration: *The purpose of the Mashpee Wampanoag Tribe Hazard Mitigation Plan is to preserve the quality of life, property values, historic and cultural resources and traditions by identifying all potential natural hazards impacting the Tribe and mitigating their effects to reduce loss of life, as well as, losses of economic, natural, historic and cultural resources.*
            - **THMC members** should review and provide feedback on the mission statement.
        - Goals… Craig suggested these four overarching goals, with the mitigation actions providing more details:
            1. Protect the Tribal health, safety and welfare.
            2. Reduce Tribal property damages caused by hazard impacts.
            3. Minimize social distress and economic losses/disruption.

4. Provide an ongoing forum for the education and awareness of natural hazard mitigation issues, programs, policies, projects and resources.
    - **THMC members** should review and provide feedback on the mission statement.

3. Section 2 – Risk Assessment
    a. Hazard Profiles…HW has completed research of NOAA's database to begin to populate this section.
    b. NFIP Participation…no Tribal members currently live on reservation property, so no NFIP policies.
    c. Climate Change data (from Commonwealth's MVP program) to be incorporated here.
    d. Vulnerability…
        - Development Proposals/Trends
            - A few new housing units is near completion. **Ms. Tobey** to provide additional details including number of units or GFA, impacts, and status (built/not built/under construction), and locations on a plan (Map/Lot).
            - A listing of completed development projects over the last 15 – 20 years completed (with the same details as referenced above) is also requested (**Nelson**).
        - Vulnerable Assets…**David** has access to MACRIS with access to archeological sites, particularly burial sites in flood zones, shell heaps/middens along the coast vulnerable to coastal erosion.
    e. FEMA Disaster Grant Assistance…**Nelson** to provide a list of any grant assistance the Tribe has received (2015 Snowstorm), to include:
        - Date
        - Declaration number
        - Description of what the funds were used for
        - Total funds provided
    f. Mapping…**Craig** needs to develop mapping required for the plan.
        - **David** will see what GIS data he has and coordinate with Craig. If not, David to provide municipal contact information for Craig to reach out.
        - Otherwise…**Rachel Fleck** (MEMA representative) may have access to Town of Mashpee GIS data.

4. Section 3 – Capability Assessment
    a. Craig asked if there are any additional Tribal documents to pull from regarding the Tribe's capabilities to address natural hazards/impacts?
        - THIRA…**Nelson** to provide copy
        - Housing Production Plan…**Ms. Tobey** to provide copy
        - FEMA Preparedness Case Study…**Nelson** to provide summary
    b. HW (**Patty Linehan**)needs to finish Tribal interviews via telephone…
        - Ms. Tobey (Housing Director)
        - Jim Peters (Commission on Indian Affairs/Chair of Wampanoag Confederation)

5. Section 4 – Mitigation Strategy
    a. Craig asked all **THMC members** to start thinking about mitigation actions for consideration at the next meeting.

6. Enhanced Tribal Mitigation Plan…Craig will develop the draft HMP with achieving an 'Enhanced Tribal Mitigation Plan' as a target.
7. Next Steps
    a. THMC meeting #4 scheduled for Friday, October 4, 2019 1:00 PM
    b. Tribal Workshop #2 scheduled for Sunday, October 13, 2019 2:00 PM

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Sign in Sheet

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road

September 6, 2019 1:00 PM - 2:00 PM

Name	Email Address	Phone
CRAIG PERRINA	HORSLEY WITTEN GROUP	
TRISH Heliinui	TRISH.Heliinui@mwtribe-nsn.gov	
Kevin M. Frye SR	Kevin.Frye@mwtribe.nsn.gov	7
Nelson Andrews dr	Nelson.Andrewsdr@mwtribe-nsn.gov	
Dale Oakley	Dale.oakleyjr@mwtribe-nsn.gov	
David Weeden	David.Weeden@mwtribe-nsn.gov	(508)477-0208 x102

Tribal Hazard Mitigation Committee Meeting #4: October 11, 2019

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Tribal Hazard Mitigation Committee Meeting #4

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road
Mashpee, MA 02649
October 11, 2019 1:00 PM – 2:00 PM

Agenda

1. Section 4 Mitigation Strategy
    a. Mitigation actions for consideration
    b. Benefit Cost Analysis

2. Outstanding data needs

3. Tribal Workshop logistics

Horsley Witten Group

Memorandum of Meeting

To: Mashpee Wampanoag Tribal Hazard Mitigation Committee

From: Craig Pereira

Date: October 11, 2019

Re: Mashpee Wampanoag Tribal Hazard Mitigation Committee Meeting No. 4

In attendance:

Nelson Andrews – Tribal Emergency Management Director
Trish Keliinui – Public Information Officer
Adam Jonas – Mashpee Wampanoag Tribe
Aneba Costa – Mashpee Wampanoag Tribe
Ryan Santos – Mashpee Wampanoag Tribe
Carl Simons – HW Group
Craig Pereira – HW Senior Planner

1. Section 4 Mitigation Strategy
    a. Craig reviewed the STAPLEE Analysis to be conducted (attached)
    b. Craig reviewed the Mitigation Actions for consideration (attached). Items in grey highlight are from HW recommendations, green highlight from the Tribe's EOP or THMC, and blue highlight from the Town of Mashpee's 2017 draft Hazard Mitigation Plan.
    c. The THMC conducted the BCA on the mitigation actions (ranking attached as separate document).

2. Tribal Workshop Logistics
    a. Scheduled for Sunday, October 13, 2019 2 pm.
    b. Craig will present:
        i. Hazard Index
        ii. Vulnerability Assessment
        iii. Mitigation Actions (ranking)

3. Enhanced Tribal Mitigation Plan…Craig will develop the draft HMP with achieving an 'Enhanced Tribal Mitigation Plan' as a target.

4. Next Steps…

    a. Following the Tribal Workshop, Craig will pull together the draft hazard mitigation plan as a PDF.
        i. Trish will post the draft plan for public comment on the Tribe's Emergency Management web page and reach out through social media that the draft plan is available for public comment through October 29, 2019. Trish will forward correspondences to Craig for inclusion in the plan's appendices.

ii. Nelson will reach out to Tribal Department Directors that the draft plan is available for public comment through October 29, 2019. Nelson will forward correspondences to Craig for inclusion in the plan's appendices.
iii. Nelson will present the draft plan at Tribal Council and seek approval to forward the draft plan to FEMA.
iv. Once the draft plan is posted on the Tribe's website, Craig will reach out to adjacent communities that the draft plan is available for public comment through October 29, 2019.

Part 2: Prioritize Actions – Quantitative Method
Method C – Simple Score

Criterion:	Cost	Benefit
Social: Is the action compatible with present and future local community needs and values? - Is the proposed action socially acceptable to the community? - Are there equity issues involved that would mean that one segment of a community is treated unfairly? - Will the action cause social disruption?		
Technical: Is the action feasible with available local resources (or as supplement by outside resources as necessary)? - Will the proposed action work? - Will it create more problems than it solves? - Does it solve a problem or a symptom? - Is it the most useful action in light of other community goals?		
Administrative: Does the community have the administrative capacity to implement the action? - Can the community implement the action? - Is there someone to coordinate and lead the effort? - Is there sufficient funding, staff, and technical support available? - Are there ongoing administrative requirements that need to be met?		
Political: Is there strong public support to implement and maintain the action? - Is the action politically acceptable? - Is there public support both to implement and to maintain the project?		
Legal: Does the community have the legal authority to implement the action? - Are there legal side effects (taking)? - Is the action allowed via Comprehensive Plan, or does it need to be amended? - Will the community be liable for the action? - Will the activity be challenged?		
Economic: Is the action cost-effective? - What are the costs and benefit of the action? - Do the benefits exceed the costs? - Are initial, maintenance, and administrative costs taken into account? - Has funding been secured for the proposed action? - What burden will this action place on the tax base of local economy? - Does the action contribute to other community goals?		
Environmental: Does the action impact environmental resources, and is the impact positive, negative, or neutral? - Will the action need environmental regulatory approvals? - Will it meet local and state regulatory requirements?		
Sub-total		
Priority/Total Score		

Ranking Descriptions:
Very Beneficial: 2
Favorable: 1
Not Applicable: 0
Not Favorable: -1

Proposed Timeframe

- Short Term = 0 to <6 Months
- Medium Term = >6 to 18 Months
- Long Term = >18 months but < 5 years

Proposed Cost Range

- Staff/Personnel Time – Municipal staff/Tribal personnel time
- Minimal – less than $5,000
- Moderate – more than $5,000, but less than $25,000
- Significant – over $25,000

Key:
HW
Mashpee Draft Hazard Mitigation Plan
MWT Emergency Operations Plan

PUBLIC EDUCATION AND AWARENESS

Action #.....
Distribute Informational Natural Hazards Pamphlet
Develop a pamphlet to be distributed to all Tribal members that describes the natural hazards that threaten Tribal lands and Tribal members living in the service area, as well as steps they can take for each hazard to mitigate damages to their property. Include evacuation routes and shelter locations along with items that can and cannot be taken to the shelters.

- Action Type: Planning, Pre-Disaster
- Priority Score:
- Lead: Emergency Management Director/Coordinator
- Supporting: Emergency Preparedness Outreach Coordinator/Emergency Response Task Force
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Tribal Housing/Tribal lands/Tribal members living in the service area, Individual Tribal member's health

Action #.....
Work with Town of Mashpee and Barnstable County to develop a multi-faceted hazard mitigation education program to raise public awareness and support for mitigation; conduct on-going risk assessment and vulnerability analysis, floodplain management, land use and community planning; and through participation in other state and federal programs intended to reduce risk; and to reduce duplication of effort of countywide work.

- Action Type: Outreach, Pre-Disaster
- Priority Score: ……
- Lead: Town of Mashpee/Barnstable County
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities

- Vulnerable Area: Tribal Lands and Tribal Members Living in the Service Area

STRUCTURAL PROJECTS

Action #.....
Install hurricane windows/shutters on the Old Indian Meeting House
The Old Indian Meeting House is the oldest Native American church in the country and is threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. The windows themselves are historic, as are the building and its contents. The shutters serve as a potential preventative measure.

- Action Type: Planning, Pre-Disaster
- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Significant
- Benefit: Protection of property, protection of life/infrastructure
- Vulnerable Area: Old Indian Meeting House

Action #.....
Conduct feasibility study of stormwater drainage solutions around the Tribal Community and Government Center
The Tribal Community and Government Center is bordered by the Tribal Meeting Area and Pow-Wow Field. The field is used for annual meetings, youth education, a Yurt School, and various cultural events. The field has inadequate drainage and floods during heavy rain events. It is also bordered by environmentally sensitive wetlands owned by the Tribe.

Also, the topography slopes down from the front of the facility to the rear, forming a basin behind the Center. The backup/emergency generator for the Center is located within this basin. The Center could flood during heavy rain events.

- Action Type: Planning, Pre-Disaster
- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, protection of life/infrastructure, public safety
- Vulnerable Area: Tribal Community and Government Center

Action #.....

Conduct feasibility study of river embankment strengthening around Maushop Farm.

Tribal farmland is located in the vicinity of the Willow bend Golf Course which is bisected by the Santuit River. The property, a former horse farm, was gifted to the Tribe 15 years ago and is on the National Historic Register. During heavy rain events, river flooding threatens the farmland, a DPW barn and the emergency management storage shed.

- Action Type: Planning, Pre-Disaster
- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, reduced natural resource/economic impacts
- Vulnerable Area: Maushop Farm/Tribal garden

Action #.....

Conduct feasibility study of stormwater drainage solutions at the Tribal Parsonage.

The Tribal Parsonage is a historic structure from the 1700s and served as a place for Native Americans from area Tribes to rest while traveling and is located across from Route 130 and the Tribal Museum. The Parsonage is in need of rehabilitation and historic preservation. During heavy rain events the herring run overtops and impacts this general area.

- Action Type: Planning, Pre-Disaster
- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Long Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, protection of life/infrastructure, public safety
- Vulnerable Area: Tribal Parsonage

Action #.....

Consider potential mitigation towards Tribal Headstones.

Ancestral Tribal burial grounds are adjacent to the Old Indian Meeting House and are still in use today. Similar to the Old Indian Meeting House structure, Tribal headstones are also threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. Headstones are in need of rehabilitation and historic preservation.

- Action Type: Planning, Pre-Disaster

- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Medium Term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Reduced impacts to cultural resources/traditions
- Vulnerable Area: Cemeteries/Burial Grounds

PLANNING AND PREVENTION

Action #.....
Assist the Town of Mashpee in preparing an engineering assessment of the various dam/flume structures controlled by the Town, including those at Santuit Pond, Mill Pond (Mashpee River), Quashnet River, in order to develop a long-term plan for the improvements and/or replacement of these structures as necessary.

- Action Type: Planning, Pre-Disaster
- Priority Score:
- Lead: Mashpee Conservation Commission
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #.....
Update the Tribe's Emergency Operations Plan – Basic Plan (2015 – 2020)

A number of hazard-, function-, and department-specific annexes/SOPs still need to be developed, including:

- Pandemic Influenza
- Wildfire
- Building, Transportation and Equipment SOPs
- Continuity of Operations Plan
- Risk Communications Plan
- Indian Health Services Emergency Plan
- Continuity of Government Plan

- Action Type: Planning, Pre-Disaster
- Priority Score:
- Lead: Emergency Management Director/Coordinator

- Supporting: Emergency Preparedness Outreach Coordinator/Emergency Response Task Force
- Time Frame: Short Term
- Financing Options: N/A
- Cost Estimate: Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Emergency Response

Action #.....
Work with the Town of Mashpee to Develop Operations and Maintenance Plans for Town-owned dams, including:

- John's Pond Dam
- Mashpee Pond Dam
- Mashpee River Dam

There are four dams in Mashpee that are associated with the herring run on Quashnet River and classified as Regulated Dams by the Massachusetts Office of Dam Safety. Tribal members exercise aboriginal rights each spring in harvesting the herring run. The John's Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River.

An Operations and Maintenance (O & M) Manual is a detailed written description of systematic procedures for ensuring that a dam is operated and maintained in proper fashion. Adequate operation and maintenance is critical for ensuring the ongoing safe functioning of the dam, as well as continued productive use of the structure and its associated reservoir.

- Action Type: Mitigation, Pre-Disaster
- Priority Score: **.....**
- Lead: Town of Mashpee
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: N/A
- Cost Estimate: Staff/Personnel Time
- Benefit: Property protection, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #.....
Work with the Department of Conservation and Recreation (DCR) to Develop Operations and Maintenance Plans for State-owned dams, including:

- Quashnet River Dam

There are four dams in Mashpee that are associated with the herring run on Quashnet River and classified as Regulated Dams by the Massachusetts Office of Dam Safety. Tribal members exercise aboriginal rights each spring in harvesting the herring run. The John's Pond Dam controls the flow to the Child's River, the Mashpee Pond Dam controls the flow to the Quashnet River, the Santuit Pond Dam controls the flow to the Santuit River.

An Operations and Maintenance (O & M) Manual is a detailed written description of systematic procedures for ensuring that a dam is operated and maintained in proper fashion. Adequate operation and maintenance is critical for ensuring the ongoing safe functioning of the dam, as well as continued productive use of the structure and its associated reservoir.

- Action Type: Mitigation, Pre-Disaster
- Priority Score: **……**
- Lead: MA Department of Conservation and Recreation.
- Supporting: Emergency Management Director/Coordinator
- Time Frame: Medium Term
- Financing Options: DCR funds
- Cost Estimate: Staff/Personnel Time
- Benefit: Property protection, protection of life/infrastructure
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

Action #……
Work with Town of Mashpee and Barnstable County to develop education programs to inform Town residents/Tribal members living in the service area about techniques to minimize storm damage to private and public property

- Action Type: Planning, Pre-Disaster
- Priority Score: ……
- Lead: Town of Mashpee/Barnstable County
- Supporting: Emergency Management Director
- Time Frame: Short term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Staff/Personnel Time
- Benefit: Protection of property, protection of life/infrastructure, increased awareness of vulnerabilities
- Vulnerable Area: Tribal Members Living in the Service Area

NATURAL RESOURCE PROTECTION

Action #……
Conduct stream enhancement of Tribal Herring Run.

The Herring Run is located adjacent to the Tribal Museum on Route 130. The herring run structure is old and in need of repair/upgrade. During heavy rain events the herring run overtops.

- Action Type: Natural Resource Protection, Pre-Disaster
- Priority Score: ……
- Lead: Town of Mashpee
- Supporting: DPW/Facilities Director
- Time Frame: Medium term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Protection of property, reduced natural resource/economic impacts
- Vulnerable Area: Herring Run/Fish Ladders/Dams/Oyster Farm

EMERGENCY SERVICES

Action #……
Acquire generators for critical infrastructure facilities.
Presently, the generator at the Community and Government Center only powers a portion of the Center and not the entire building (e.g. kitchen and gymnasium). The Center serves as the Tribe's shelter/warming station and needs to be fully functional. A secondary shelter is proposed as part of the residential housing development, however there is no generator budgeted for that facility.

- Action Type: Emergency Services, Pre-Disaster
- Priority Score: ……
- Lead: Emergency Management Director/Coordinator
- Supporting: DPW/Facilities Director
- Time Frame: Medium term
- Financing Options: MEMA/FEMA grants
- Cost Estimate: Moderate
- Benefit: Reduced impacts to cultural resources/traditions
- Vulnerable Area: Tribal Critical Facilities

Mashpee Wampanoag Tribe Hazard Mitigation Plan

Sign in Sheet

Mashpee Wampanoag Tribe Community/Government Center
483 Great Neck Road

October 11, 2019 1:00 PM - 2:00 PM

Name	Email Address	Phone
CRAIG PEREIRA	cpereira@horsleywitten.com	
Carl Simons	CSimons@horsleywitten.com	508-833-6600
TRISH Kelliher	TRISH.Kelliher@MWTRIBE-NSN.GOV	
Nelson Andrews Jr	Nelson.Andrews.Jr@MWTRIBE-NSN.GOV	774-327-0567
Adam Jonas	afam30@yahoo.com	
Aneba Costa	aacchildofgod@yahoo.com	774-441-0047
Ryan Santos	wampboy130@aol.com	

Tribal Workshop #2: October 13, 2019

Mashpee Wampanoag Tribe

Tribal Workshop – Hazard Mitigation Plan

Tribal Community/Government Center
483 Great Neck Road
Mashpee, MA

October 13, 2019 Agenda

1. Overview
2. Why Hazard Mitigation Planning?
3. Mission Statement/Goals
4. Hazard Index
5. Hazard Vulnerabilities
6. Mitigation Actions

Mashpee Wampanoag Tribe Hazard Mitigation Plan Tribal Workshop

Craig Pereira, CFM
Project Manager – Horsley Witten Group

October 13, 2019
Community/Government Center

1

Mashpee Wampanoag Tribal Hazard Mitigation Committee

- Nelson Andrews Jr., Emergency Management Director
- Allyssa Hathaway, Emergency Preparedness Specialist
- Rita Lopez, Acting tribal Administrator
- Chuckie Green, Natural Resources Director
- Shellie Tobey, Housing Director
- Unique Lopes Forde, Public Health Director
- Rita Gonsalves, Indian Health Services Director
- Jason Steiding, Public Works Director
- Willard Pocknett, Facilities Director
- Kevin Frye, Police Chief
- Curtis Frye, Police Captain
- David Weeden, Historic Preservation Director
- Trish Keliinui, Public Information Officer
- Tribal Elder
- Rachel Fleck, MEMA Region 2

Horsley Witten Group

2

Why Hazard Mitigation Planning

Disaster Mitigation Act of 2000, Interim Final Rule, 44 CFR Parts 201 and 206 states, "All communities must have an approved Multiple Hazards Mitigation Plan in order to qualify for future federal disaster mitigation grants".

Reduction or elimination of long-term risk to life, property, and the environment.

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3

Mission Statement

The purpose of the Mashpee Wampanoag Tribal Multi-Hazard Mitigation Plan is to preserve and enhance the quality of life, property values, and historic/cultural resources and traditions by identifying all potential natural hazards impacting the Tribe and mitigating their effects to reduce the loss of life, as well as, losses of economic, natural, historical, and cultural resources.

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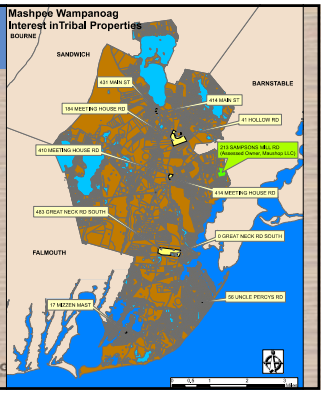
4

Tribal Lands



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5

Mitigation Process

- Assess Risks
- Establish Goals
- Identify Projects/Actions
- Update/Maintain Plan

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Goals

- Protect the Tribal health, safety and welfare.
- Reduce Tribal property damages caused by hazard impact.
- Minimize social distress and economic losses/disruption.
- Provide an ongoing forum for the education and awareness of natural hazard mitigation issues, programs, policies, projects and resources.

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Risk Assessment…Hazards

- Flood-Related
- Winter-Related
- Wind-Related
- Geologic-Related
- Drought-Related
- Urban Fire/Wildfire-Related

Climate Change…

As one of the most pressing issues with both direct and indirect impacts on the range of natural hazards the Tribe is vulnerable to, it has been included as a 'climate change impacts on' section to each natural hazard profiled.

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Hazard Index

Natural Hazard	Frequency (i.e. Very Low, Low, Medium, High)	Location (i.e. small/local, medium/regional, large/multiple communities)	Severity (i.e. minor, serious, extensive, catastrophic)	Hazard Index (i.e. ranked by combining frequency and severity; 10 - high, 1 - low)
Flood-Related Hazards				
- Riverine/Flash Flooding	High	Medium/Regional	Serious	6
- Inland/Urban Flooding/Heavy Rain	High	Medium/Regional	Extensive	7
- Coastal Erosion/Shoreline Change	High	Medium/Regional	Extensive	7
- Dam Failure	Low	Small/Local	Extensive	5
- Sea Level Rise	High	Large/Multiple	Serious	6
- Coastal Flooding	High	Large/Multiple	Serious	6
Winter-Related Hazards				
- Blizzards/Snow/Nor' easter	High	Large/Multiple	Extensive	7
- Ice	Low	Medium/Regional	Minor	3
- Extreme Cold	Low	Large/Multiple	Minor	3
Wind-Related Hazards				
- Hurricanes	High	Large/Multiple	Serious	6
- Tornadoes*/High Winds	High	Medium/Regional	Extensive	7
- Lightning/Thunderstorm	High	Local	Serious	6
- Hail	High	Local	Serious	6
Geologic-Related Hazards				
- Earthquake	Very Low	Medium/Regional	Catastrophic	5
- Landslide	Low	Medium/Regional	Serious	4
- Tsunami	Low	Medium/Regional	Serious	4
Drought				
- Drought	High	Medium/Regional	Minor	5
- Extreme Heat	Low	Medium/Regional	Minor	3
Urban Fire/Wildfire				
- Urban Fire/Wildfire	High	Small/Local	Serious	6

* Tornadoes not a major issue for tribal lands/tribal members in service area

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Risk Assessment…Vulnerability

- Economic
- Social
- Environmental

Hazard	Frequency	Severity
Flood-Related Hazards	High	Extensive
Winter-Related Hazards	High	Extensive
Wind-Related Hazards	High	Extensive/Serious
Geologic-Related Hazards	Low	Catastrophic
Drought	High	Minor
Urban Fire/Wildfire	High	Serious

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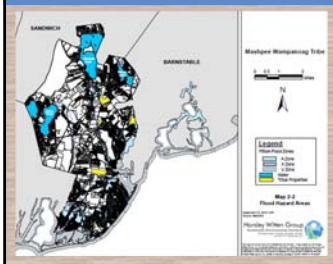
Economic Vulnerability



FEMA Flood Zones

Flood Zone	VE Zone		AE Zone		X Zone	
Land Use	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value
Residential			1	$912,000		
Government Building						
Historic Cemetery			1	$224,900	1	$224,900
Vacant Land			1	$17,300		
Popponesset Bay	1	N/A	1	N/A	1	N/A
Total	1	N/A	4	$1,154,200	2	$224,900

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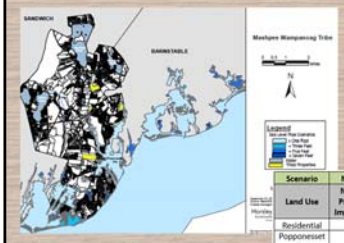
Economic Vulnerability



Sea Level Rise Scenarios

Scenario	MHHW Plus 1 FT.		MHHW Plus 3 FT.		MHHW Plus 5 FT.		MHHW Plus 7 FT.	
Land Use	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value
Residential	1	$912,000	1	$912,000	1	$912,000	1	$912,000
Popponesset Bay	1	N/A	1	N/A	1	N/A	1	N/A
Total	2	$912,000	2	$912,000	2	$912,000	2	$912,000

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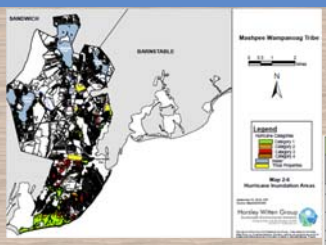
Economic Vulnerability



Hurricane Categories 1 - 4

Hurricane Category	Category 1		Category 2		Category 3		Category 4	
Land Use	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value	No. of Parcels Impacted	Total Value
Residential	1	$912,000	1	$912,000	1	$912,000	1	$912,000
Government Building							1	$13,978,800
Historic Cemetery			1	$224,900	1	$224,900	1	$224,900
Vacant Land			1	$17,300	1	$17,300	1	$17,300
Peppercrest Bay	1	N/A	1	N/A	1	N/A	1	N/A
Total	2	$912,000	4	$1,154,200	4	$1,154,200	4	$15,133,000

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Social Vulnerability

- Tribal Community/Government Center
- Cultural Properties (Old Indian Meeting House, Parsonage, etc.)
- Tribal Housing
- Utilities/Communications
- Evacuation/Sheltering

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Environmental Vulnerability

- Maushop Farm
- Oyster Farm
- Quashnet River/Herring Run

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Capability Assessment

- Planning and Regulatory
- Administrative and Technical
- Financial (grants)

- Towards 'Enhanced' hazard mitigation plan…

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Prioritization of Actions…STAPLEE

- **Social**…is the action socially acceptable?
- **Technical**…is the action technically feasible and provide appropriate level of protection?
- **Administrative**…does the Tribe have the capability to complete the action?
- **Political**…will the Tribe support or oppose the project?
- **Legal**…does the Tribe have the legal authority to complete the action?
- **Economic**…is the action cost-effective?
- **Environmental**…will the action affect the natural environment?

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Mitigation Actions

PUBLIC EDUCATION AND AWARENESS

Action #1

Distribute Informational Natural Hazards Pamphlet

Develop a pamphlet to be distributed to all Tribal members that describes the natural hazards that threaten Tribal lands and Tribal members living in the service area, as well as steps they can take for each hazard to mitigate damages to their property. Include evacuation routes and shelter locations along with items that can and cannot be taken to the shelters.

Action Type: Planning, Pre-Disaster
Priority Score: 22

Horsley Witten Group

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Mitigation Actions

Action #2

Work with Town of Mashpee and Barnstable County to develop a multi-faceted hazard mitigation education program to raise public awareness and support for mitigation; conduct on-going risk assessment and vulnerability analysis, floodplain management, land use and community planning; and through participation in other state and federal programs intended to reduce risk; and to reduce duplication of effort of countywide work.

Action Type: Outreach, Pre-Disaster

Priority Score: 24

Horsley Witten Group

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Mitigation Actions

STRUCTURAL PROJECTS

Action #3

Install hurricane windows/shutters on the Old Indian Meeting House

The Old Indian Meeting House is the oldest Native American church in the country and is threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. The windows themselves are historic, as are the building and its contents. The shutters serve as a potential preventative measure.

Action Type: Planning, Pre-Disaster

Priority Score: 21

Horsley Witten Group

20

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Mitigation Actions

Action #4

Conduct feasibility study of stormwater drainage solutions around the Tribal Community and Government Center

The Tribal Community and Government Center is bordered by the Tribal Meeting Area and Pow-Wow Field. The field is used for annual meetings, youth education, a Yurt School, and various cultural events. The field has inadequate drainage and floods during heavy rain events. It is also bordered by environmentally sensitive wetlands owned by the Tribe.

Also, the topography slopes down from the front of the facility to the rear, forming a basin behind the Center. The backup/emergency generator for the Center is located within this basin. The Center could flood during heavy rain events.

Action Type: Planning, Pre-Disaster

Priority Score: 27

Horsley Witten Group

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Mitigation Actions

Action #5

Conduct feasibility study of river embankment strengthening around Maushop Farm.

Tribal farmland is located in the vicinity of the Willow Bend Golf Course which is bisected by the Santuit River. The property, a former horse farm, was gifted to the Tribe 15 years ago and is on the National Historic Register. During heavy rain events, river flooding threatens the farmland, a DPW barn and the emergency management storage shed.

Action Type: Planning, Pre-Disaster

Priority Score: 24

Horsley Witten Group

22

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Mitigation Actions

Action #6

Conduct feasibility study of stormwater drainage solutions at the Tribal Parsonage.

The Tribal Parsonage is a historic structure from the 1700s and served as a place for Native Americans from area Tribes to rest while traveling and is located across from Route 130 and the Tribal Museum. The Parsonage is threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms, and is in need of rehabilitation and historic preservation.

Action Type: Planning, Pre-Disaster

Priority Score: 21

Horsley Witten Group

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Mitigation Actions

Action #7

Consider potential mitigation towards Tribal Headstones.

Ancestral Tribal burial grounds are adjacent to the Old Indian Meeting House and are still in use today. Similar to the Old Indian Meeting House structure, Tribal headstones are also threatened by surrounding trees and vegetation, nor' easters, hurricanes, tornadoes and winter storms. Headstones are in need of rehabilitation and historic preservation.

Action Type: Planning, Pre-Disaster

Priority Score: 21

Horsley Witten Group

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Mitigation Actions

Action #8

Assist the Town of Mashpee in preparing an engineering assessment of the various dam/flume structures controlled by the Town, including those at Santuit Pond, Mill Pond (Mashpee River), Quashnet River, in order to develop a long-term plan for the improvements and/or replacement of these structures as necessary.

Action Type: Planning, Pre-Disaster

Priority Score: 22

Horsley Witten Group

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Mitigation Actions

Action #9

Update the Tribe's Emergency Operations Plan – Basic Plan (2015 – 2020)

A number of hazard-, function-, and department-specific annexes/SOPs still need to be developed, including: Pandemic Influenza, Wildfire, Building, Transportation and Equipment SOPs, Continuity of Operations Plan, Risk Communications Plan, Indian Health Services Emergency Plan and Continuity of Government Plan.

Action Type: Planning, Pre-Disaster

Priority Score: 23

Horsley Witten Group

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Mitigation Actions

Action #10

Work with the Town of Mashpee to Develop Operations and Maintenance Plans for Town-owned dams, including:

-John's Pond Dam
-Mashpee Pond Dam
-Mashpee River Dam

An Operations and Maintenance (O & M) Manual is a detailed written description of systematic procedures for ensuring that a dam is operated and maintained in proper fashion.

Action Type: Mitigation, Pre-Disaster

Priority Score: 21

Horsley Witten Group

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Mitigation Actions

Action #11

Work with the Department of Conservation and Recreation (DCR) to Develop Operations and Maintenance Plans for State-owned dams, including:

-Quashnet River Dam

Action Type: Mitigation, Pre-Disaster

Priority Score: 21

Horsley Witten Group

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Mitigation Actions

Action #12

Work with Town of Mashpee and Barnstable County to develop education programs to inform Town residents/Tribal members living in the service area about techniques to minimize storm damage to private and public property

Action Type: Planning, Pre-Disaster

Priority Score: 24

Horsley Witten Group

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Mitigation Actions

NATURAL RESOURCE PROTECTION

Action #13

Conduct stream enhancement of Tribal Herring Run.

The Herring Run is located adjacent to the Tribal Museum on Route 130. The herring run structure is old and in need of repair/upgrade. During heavy rain events the herring run overtops.

Action Type: Natural Resource Protection, Pre-Disaster

Priority Score: 22

Horsley Witten Group

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Mitigation Actions

EMERGENCY SERVICES

Action #14

Acquire generators for critical infrastructure facilities.

Presently, the generator at the Community and Government Center only powers a portion of the Center and not the entire building. The Center serves as the Tribe's shelter/warming station and needs to be fully functional. A secondary shelter is proposed as part of the residential housing development, however there is no generator budgeted for that facility.

Action Type: Emergency Services, Pre-Disaster

Priority Score: 24

Horsley Witten Group

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Mitigation Actions

Action #15

Strengthen emergency communications capability (internal and external linkages).

Presently, the Tribe has established a Motorola base station as a means of communication during hazard events. The Tribe will upgrade to an FCC Band with the FEMA communications team, update and integrate the Risk Communications Plan with the EOP and transfer the satellite tower to the Community and Government Center.

Action Type: Emergency Services, Pre-Disaster

Priority Score: 24

Horsley Witten Group

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Contact Us...

Public Comment Period: October 15 – 29, 2019

Nelson Andrews Jr. – Director, Emergency Management
Mashpee Wampanoag Tribe

483 Great Neck Road
Mashpee, MA 02649
Nelson.AndrewsJr@mwtribe-nsn.gov
Phone: (508) 477-0208

Craig Pereira—Project Manager
Horsley Witten Group

55 Dorrance Street, Suite 200
Providence, RI 02903
cpereira@horsleywitten.com
Phone: (401) 272-1717

Thank You!

Horsley Witten Group

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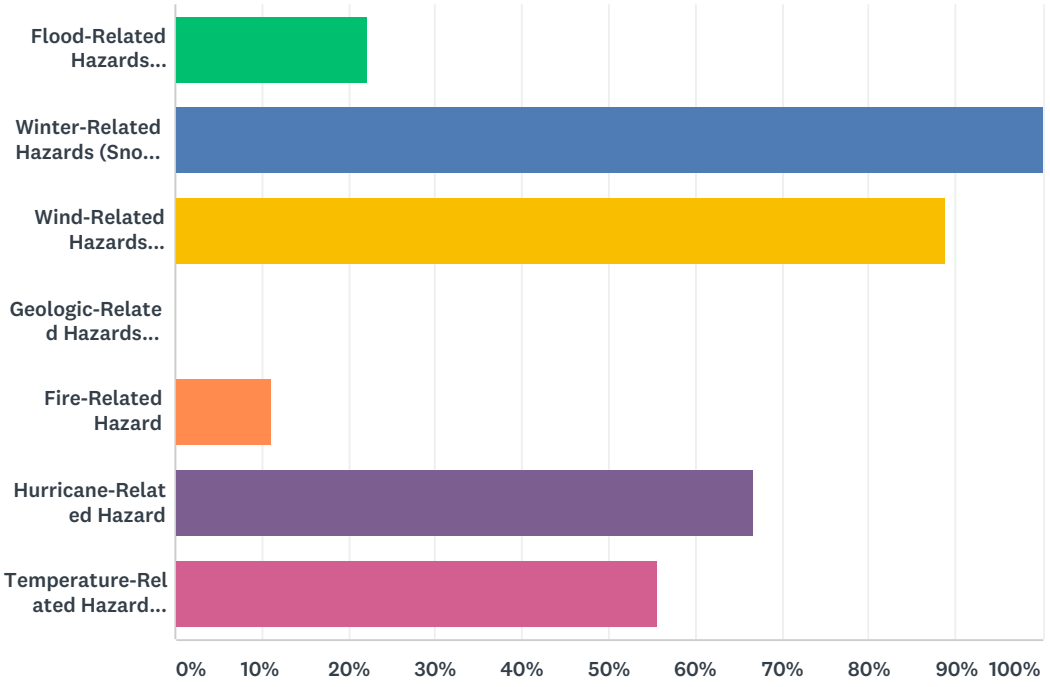
On-Line Survey

Q1 Which of the following hazard events have you or has anyone in your household and/or business experienced in the past 20 years within the Tribal reservation or within the Tribe's county of Barnstable, MA? (Check all that apply)

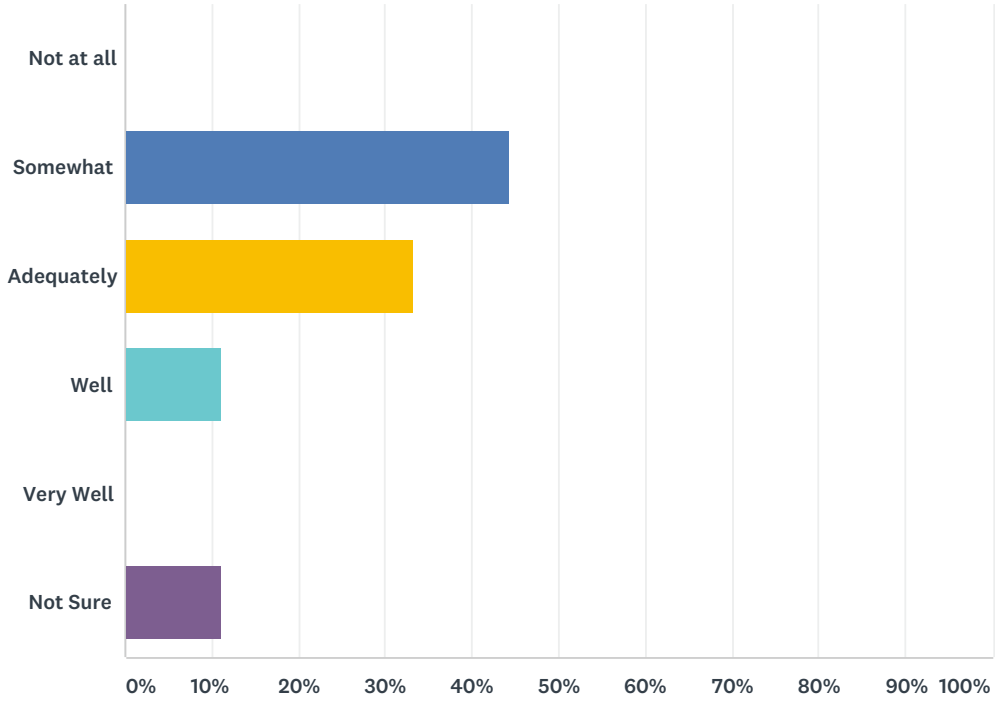
Answered: 9 Skipped: 1



ANSWER CHOICES	RESPONSES	
Flood-Related Hazards (Riverine/Flash Flooding, Inland/Urban Flooding)	22.22%	2
Winter-Related Hazards (Snow, Ice, Extreme Cold)	100.00%	9
Wind-Related Hazards (Tornadoes, High Winds, Lightning/Thunderstorms, Hail)	88.89%	8
Geologic-Related Hazards (Earthquakes)	0.00%	0
Fire-Related Hazard	11.11%	1
Hurricane-Related Hazard	66.67%	6
Temperature-Related Hazard (Extreme Heat, Drought, Extreme Cold)	55.56%	5
Total Respondents: 9		

Q2 In your opinion, how prepared is your household and/or business to deal with a natural hazard event?

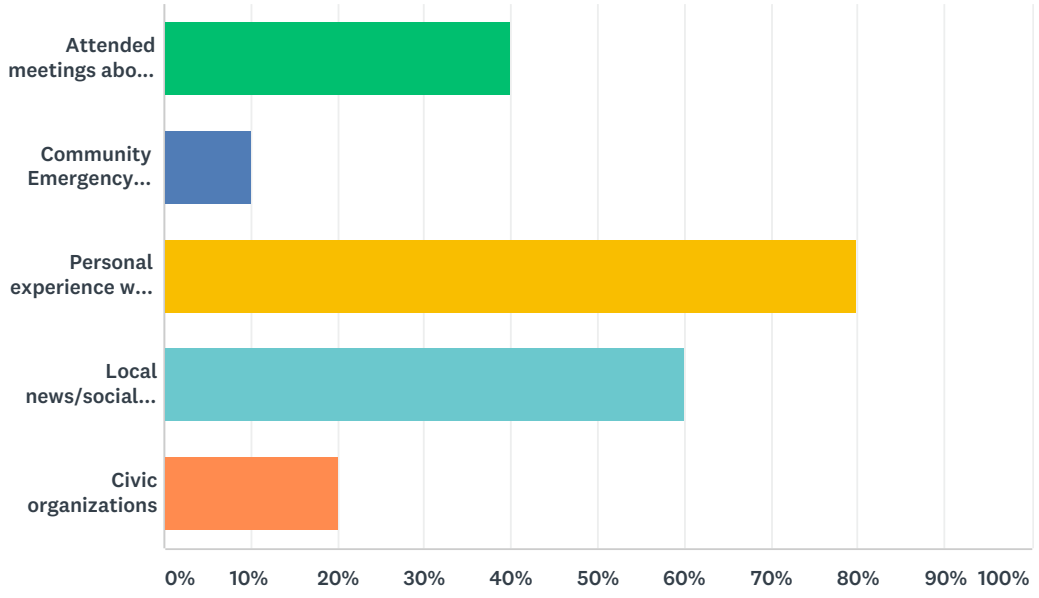
Answered: 9 Skipped: 1



ANSWER CHOICES	RESPONSES	
Not at all	0.00%	0
Somewhat	44.44%	4
Adequately	33.33%	3
Well	11.11%	1
Very Well	0.00%	0
Not Sure	11.11%	1
TOTAL		9

Q3 Which of the following have provided you with useful information to help you prepare for a hazard event? (Check all that apply)

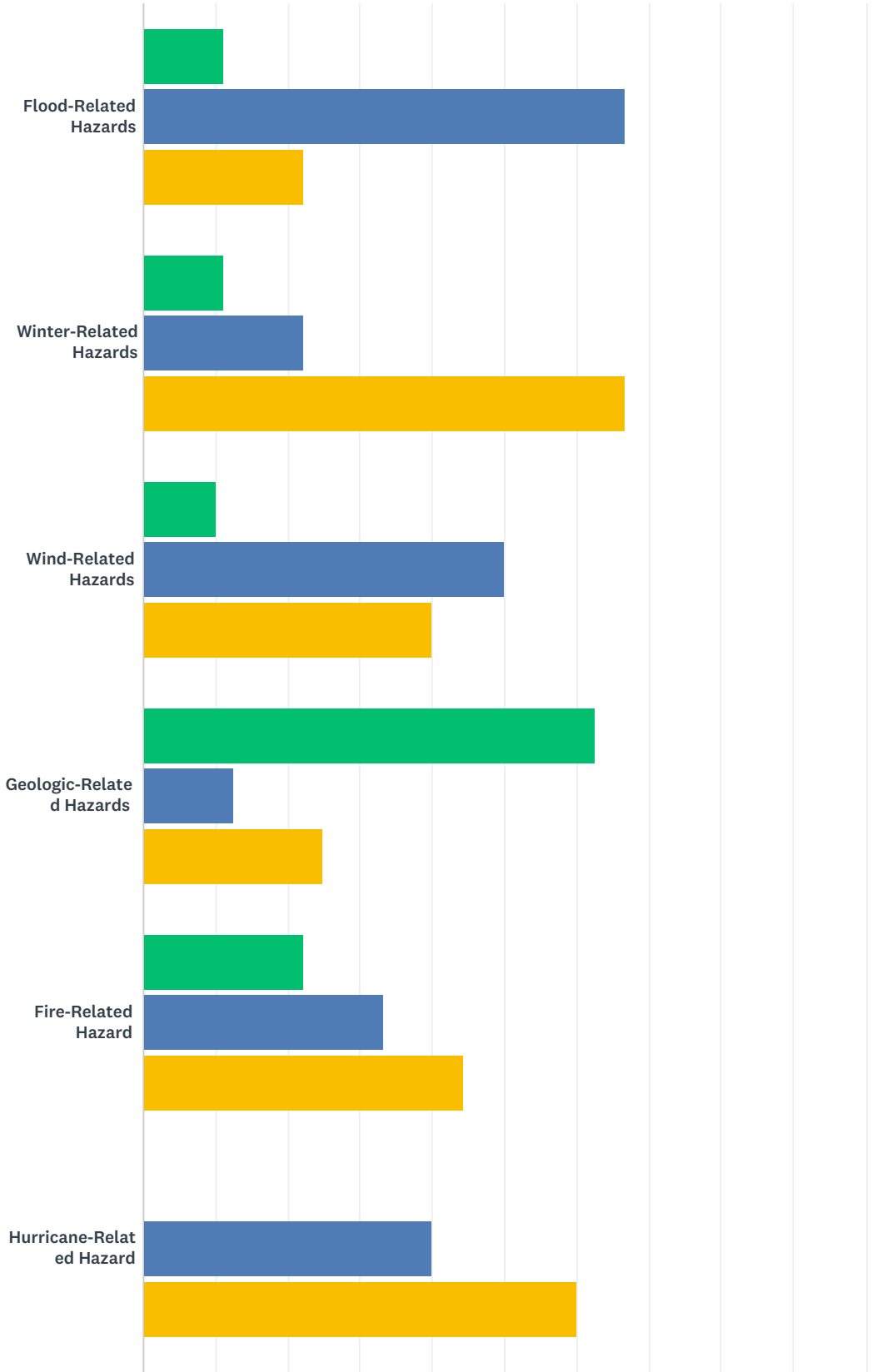
Answered: 10 Skipped: 0

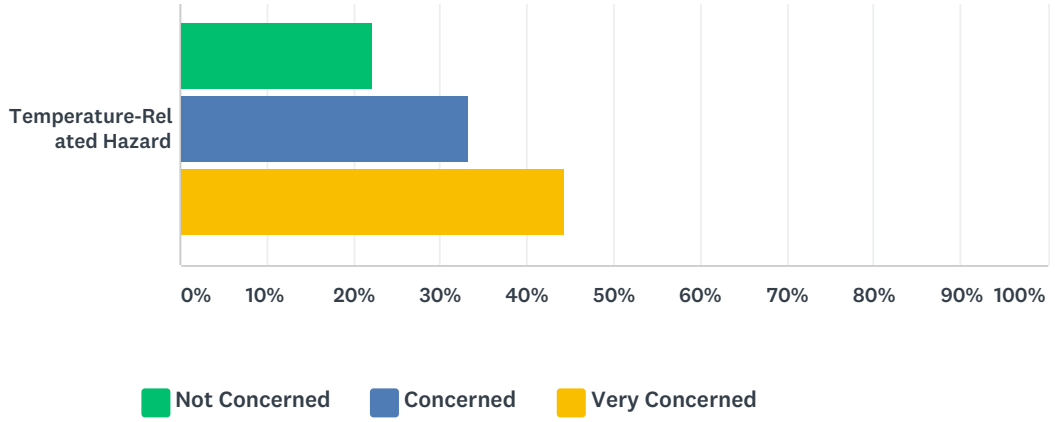


ANSWER CHOICES	RESPONSES	
Attended meetings about disaster preparedness	40.00%	4
Community Emergency Response Training (CERT)	10.00%	1
Personal experience with one or more natural hazards/disasters	80.00%	8
Local news/social media	60.00%	6
Civic organizations	20.00%	2
Total Respondents: 10		

Q4 How concerned are you about the following hazards on the Tribal reservation? (Check one response for each hazard)

Answered: 10 Skipped: 0

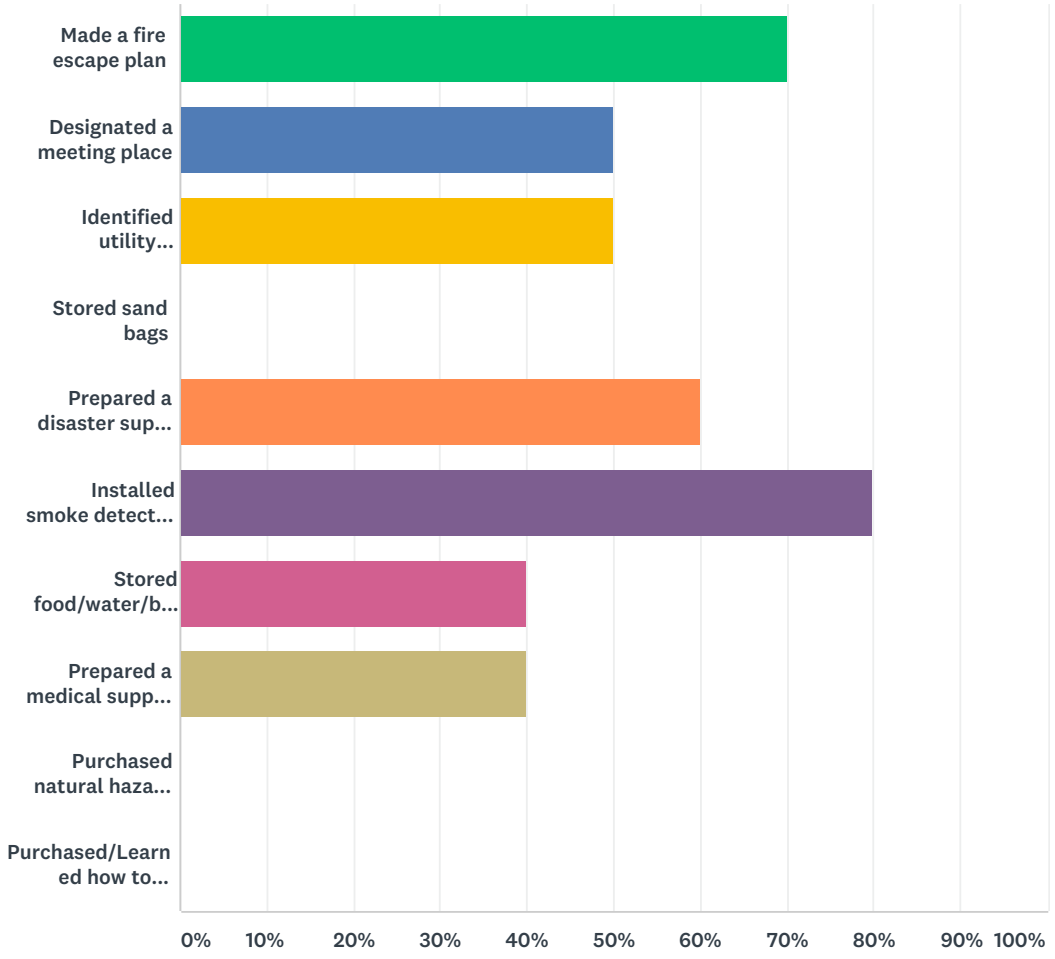




	NOT CONCERNED	CONCERNED	VERY CONCERNED	TOTAL
Flood-Related Hazards	11.11% 1	66.67% 6	22.22% 2	9
Winter-Related Hazards	11.11% 1	22.22% 2	66.67% 6	9
Wind-Related Hazards	10.00% 1	50.00% 5	40.00% 4	10
Geologic-Related Hazards	62.50% 5	12.50% 1	25.00% 2	8
Fire-Related Hazard	22.22% 2	33.33% 3	44.44% 4	9
Hurricane-Related Hazard	0.00% 0	40.00% 4	60.00% 6	10
Temperature-Related Hazard	22.22% 2	33.33% 3	44.44% 4	9

Q5 Which of the following steps has your household and/or business taken to prepare for a hazard event? (Check all that apply)

Answered: 10 Skipped: 0

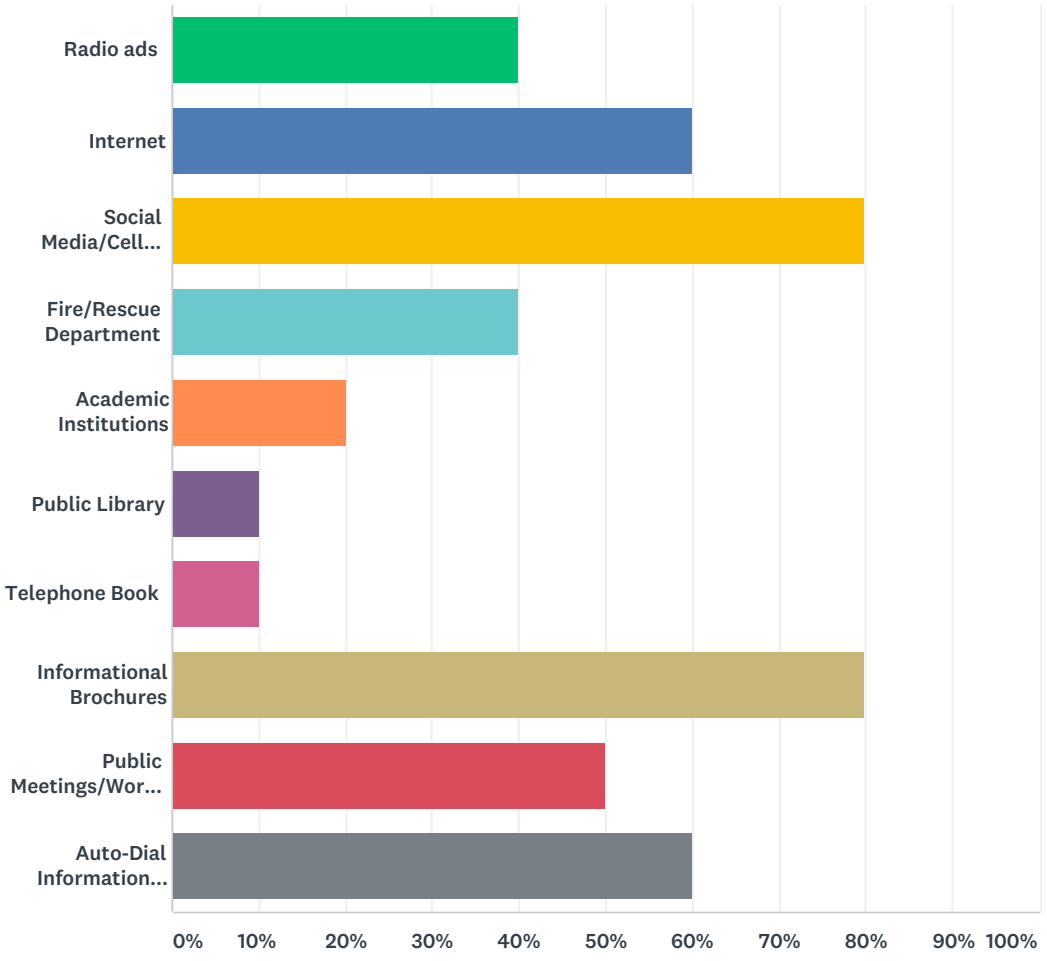


ANSWER CHOICES	RESPONSES	
Made a fire escape plan	70.00%	7
Designated a meeting place	50.00%	5
Identified utility shut-offs	50.00%	5
Stored sand bags	0.00%	0
Prepared a disaster supply kit	60.00%	6
Installed smoke detectors on each level of the house	80.00%	8
Stored food/water/batteries	40.00%	4
Prepared a medical supply kit	40.00%	4
Purchased natural hazard insurance	0.00%	0
Purchased/Learned how to program a NOAA Weather Radio	0.00%	0

Total Respondents: 10	

Q6 In your opinion, which of the following methods do you think are most effective for providing hazard and disaster information? (Check all that apply)

Answered: 10 Skipped: 0

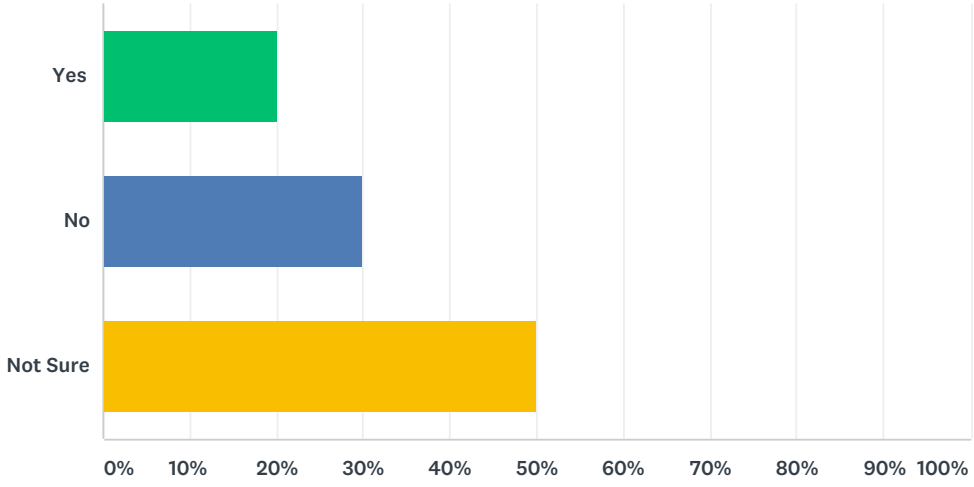


ANSWER CHOICES	RESPONSES	
Radio ads	40.00%	4
Internet	60.00%	6
Social Media/Cell phone apps.	80.00%	8
Fire/Rescue Department	40.00%	4
Academic Institutions	20.00%	2
Public Library	10.00%	1
Telephone Book	10.00%	1
Informational Brochures	80.00%	8
Public Meetings/Workshops	50.00%	5
Auto-Dial Information (Code Ready or similar)	60.00%	6

Total Respondents: 10	

Q7 Is your property located in or near a FEMA designated floodplain?

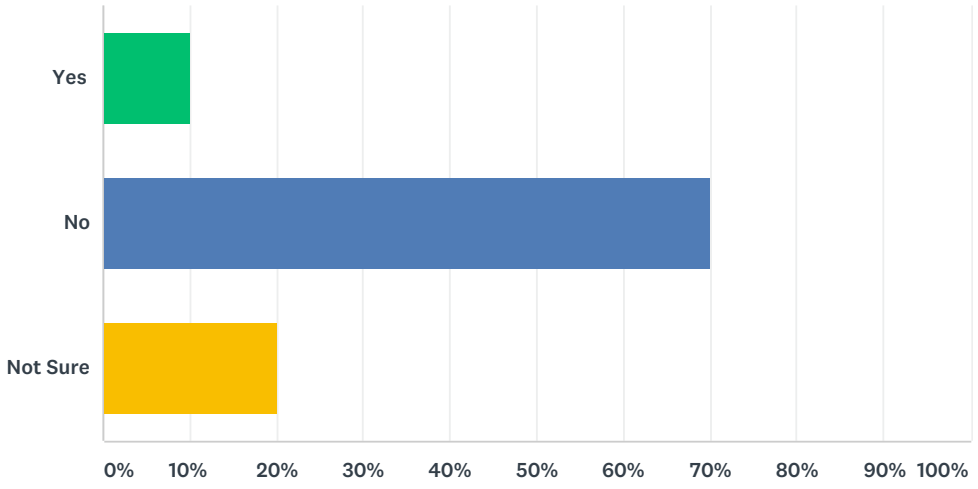
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	20.00%	2
No	30.00%	3
Not Sure	50.00%	5
TOTAL		10

Q8 Do you have flood insurance?

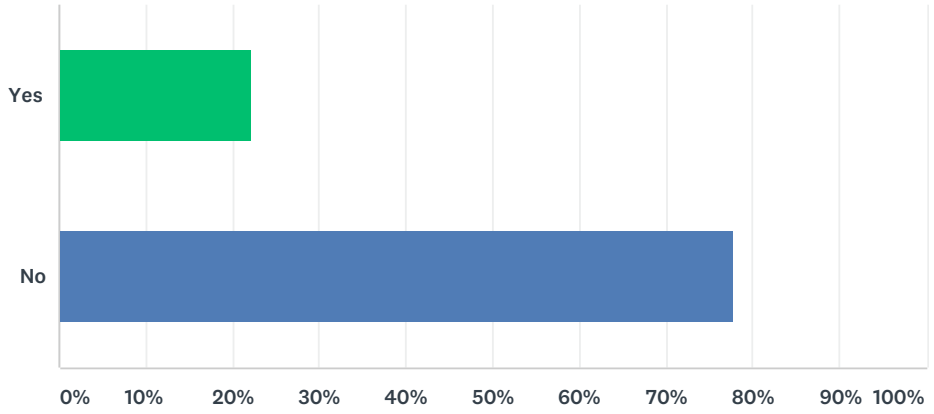
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	10.00%	1
No	70.00%	7
Not Sure	20.00%	2
TOTAL		10

Q9 Do you have any special access or functional needs within your household and/or business that would require early warning or specialized response during disasters?

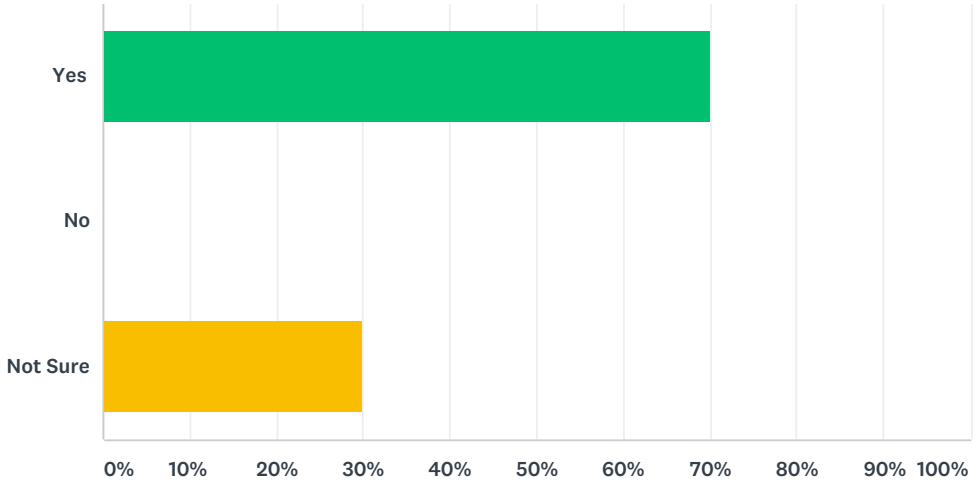
Answered: 9 Skipped: 1



ANSWER CHOICES	RESPONSES	
Yes	22.22%	2
No	77.78%	7
TOTAL		9

Q10 Are you interested in making your home, business or neighborhood more resistant to hazards?

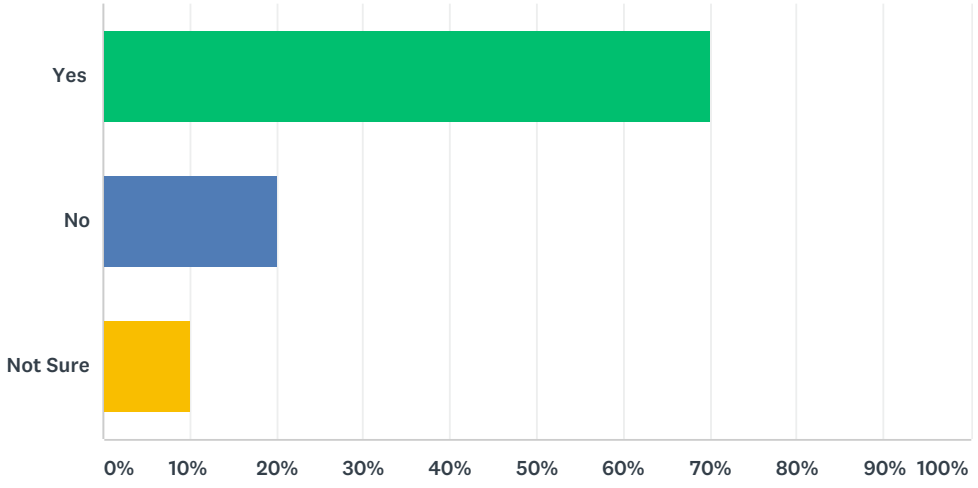
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	70.00%	7
No	0.00%	0
Not Sure	30.00%	3
TOTAL		10

Q11 Would you be willing to spend your own money on your current home and/or business to help protect it from impacts of potential future natural disasters within the community? Examples could include: Elevating a flood-prone home; Elevating utilities in flood-prone basements; Strengthening your roof, siding, doors, or windows to withstand high winds; Removing trees/low branches.

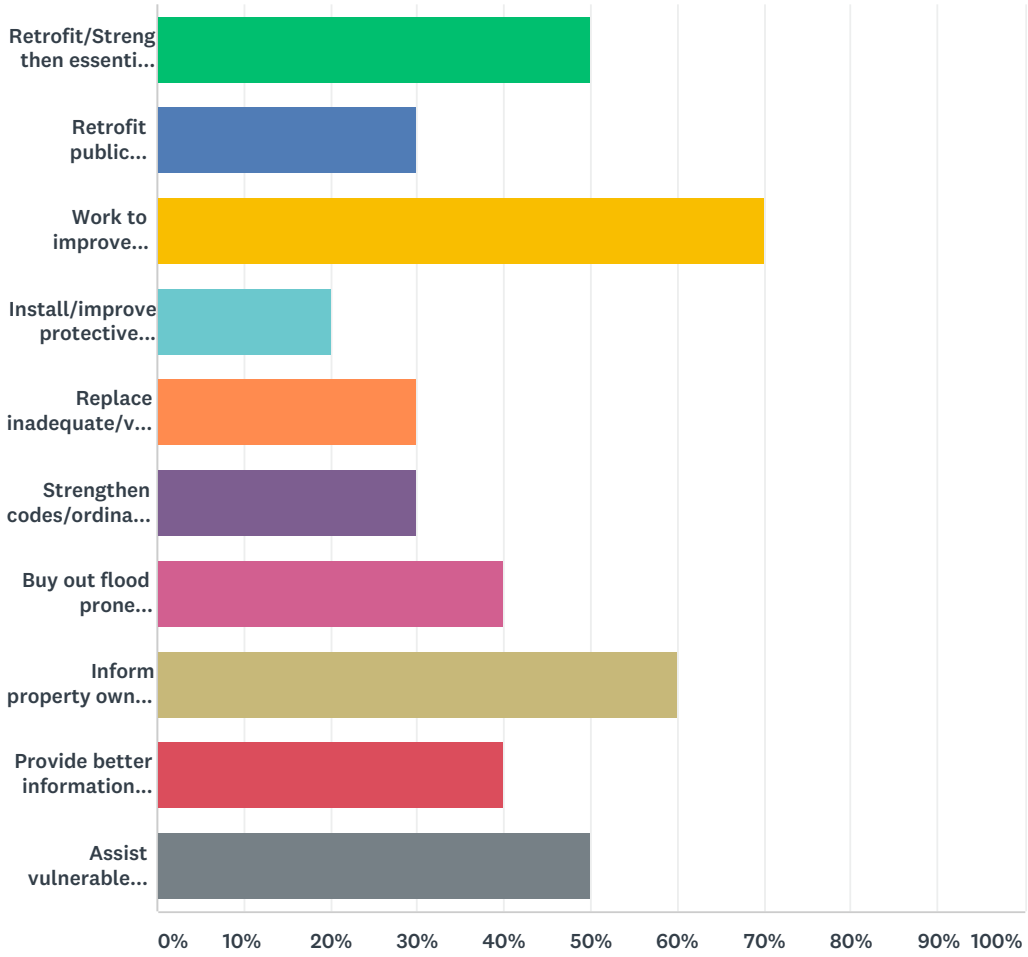
Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Yes	70.00%	7
No	20.00%	2
Not Sure	10.00%	1
TOTAL		10

Q12 In your opinion, what types of projects do you believe local, county, state or federal government agencies could be doing to reduce the damage and disruption of natural disasters on the Tribal reservation? (Select your top three choices)

Answered: 10 Skipped: 0



ANSWER CHOICES	RESPONSES	
Retrofit/Strengthen essential public facilities such as police, fire/emergency, schools	50.00%	5
Retrofit public infrastructure, such as elevating roadways and improving drainage systems	30.00%	3
Work to improve utilities resiliency (electric, communications, water/wastewater facilities)	70.00%	7
Install/improve protective structures (floodwalls)	20.00%	2
Replace inadequate/vulnerable bridges	30.00%	3
Strengthen codes/ordinances to require higher hazard risk management standards and/or provide greater control over development in high hazard areas	30.00%	3
Buy out flood prone properties and maintain as open space	40.00%	4
Inform property owners of ways they can reduce the damage caused by natural events	60.00%	6

Provide better information about hazard risks and high hazard areas	40.00%	4
Assist vulnerable property owners with securing funding to make their properties more resilient	50.00%	5
Total Respondents: 10		

Q13 Additional comments?

Answered: 0 Skipped: 10

#	RESPONSES	DATE
	There are no responses.	

Appendix C – Correspondences

Availability of Draft Plan – Tribal Posting

Availability of Draft Plan – Adjacent Communities

Availability of Draft Plan – Tribal Departments