QUINCY HAZARD MITIGATION PLAN SUMMARY

Draft: February 2019

Hazard Mitigation Plan Executive Summary

Hazard Mitigation planning is a proactive effort to identify actions that can be taken to reduce the dangers to life and property from natural hazard events. The Federal Disaster Mitigation Act of 2000 requires all municipalities that wish to be eligible to receive Federal Emergency Management Agency (FEMA) funding for hazard mitigation grants to adopt a local multi-hazard mitigation plan and update this plan in five-year intervals. In the communities of the Boston region of Massachusetts, hazard mitigation planning tends to focus most on flooding, the most likely natural hazard to impact these communities.

The 5-year update for Quincy Hazard Mitigation Plan was prepared with funding from FEMA under the Pre-Disaster Mitigation Grant (PDM) Program. The planning process included updating the plan to reflect the new Massachusetts State Hazard Mitigation Plan and incorporating a variety of natural hazard risk and vulnerability assessments into the plan including future impacts due to climate change. The City of Quincy recognized climate change as a factor that will affect weather patterns, flooding extent, habitat and species distribution, and ultimately impact the ability to recover from disaster and increase risk to the economy of Quincy. The 5-year update was completed during a year that experienced record setting flood events and extensive damages to coastal properties. These unfortunate events highlighted the importance developing a Hazard Mitigation Plan (HMP), including providing opportunities for community engagement, a platform for better understanding changing climate impacts on the Cities resources and providing a systematic plan for funding hazard mitigation projects for Quincy City officials. The following summary provides a snapshot of the Quincy HMP process to identify natural hazards, evaluate potential losses, and goals and actions to reduce or eliminate the long-term risk to people, buildings, economy and the natural environment .

QUINCY'S RESILIENCY VISION

A resiliency vision for Quincy includes empowering the residents, business community and City Leaders to make near, mid and long-term changes that will reduce future climate change impacts, protect its vital community assets, and adapt to changes already occurring. The mitigation actions included in the 2019 Hazard Mitigation Plan complement and support this resiliency vision.

Contents

The HMP Planning Process

The City of Quincy used a planning process framework, described in Section 1 of the HMP, based on FEMA's hazard mitigation planning guidance focusing on local needs and priorities, but maintaining a regional perspective on natural hazard events. To support the planning process for the 2019 HMP Quincy accomplished the following:

- Developed HMP Planning Team
- Identified hazards and mapped of concerns
- Profiled and prioritized these hazards
- Identified critical community assets and evaluated risk and potential losses associated with these hazards
- Developed mitigation strategies that address the hazards impacting Quincy
- Developed an implementation, maintenance and update procedure to be executed upon approval of the plan.

While flooding continues to be the number one priority for Quincy, the risk and vulnerability analysis completed for the 2019 HMP shifted priorities to include addressing a wider range of natural hazards (see Natural Hazards on Page 3). Climate change was considered in relation to inland and coastal flooding and mitigation projects were recommended based on potential inundation related to storm surge, sea level rise and extreme precipitation.

The City has provided opportunities for the public to be involved by holding public workshops, conducting surveys and other outreach events. The MVP plan described below will further engage and educate residents and business to better understand the Cities vulnerabilities to natural hazard risk and the necessity to plan projects that will enable Quincy to adapt and recover from these event.

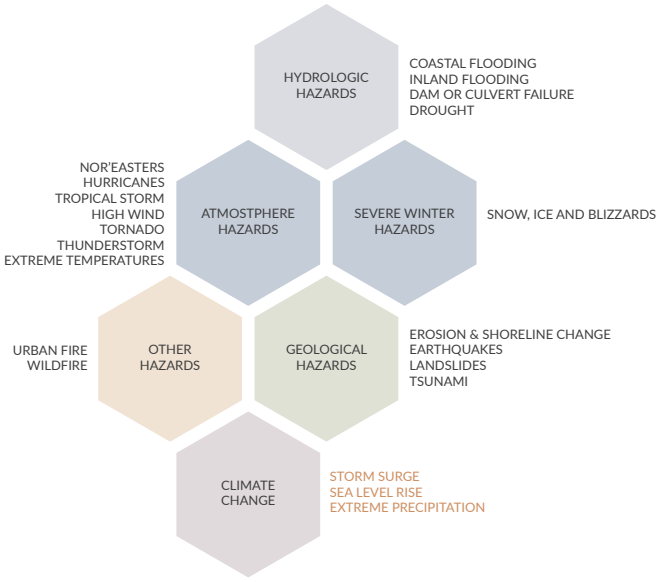
The MVP planning process will engage and educate the resident and businesses in Quincy so they can better understand the Cities vulnerabilities to climate change and necessity for implementing specific mitigation projects.

Muncipal Vulnerability Preparedness Planning

The City of Quincy obtained a state grant in the fall of 2018 to complete a Municipal Vulnerability Preparedness Plan (MVP) . The planning process will utilize information complied in the HMP and then further engage and educate the resident and businesses in Quincy so they can better understand the Cities vulnerabilities to climate change and necessity for implementing specific mitigation projects and adaptation strategies.

Two outreach workshops will be organized to engage specific Community Sectors (i.e. individuals representing businesses, residents impacted by coastal flooding, public health and emergency response professionals) in discussion of priority projects. The workshops will provide the City with critical feedback on how these different groups perceive the degree of risk from natural hazards, how willing they are to accept the changes needed to adapt and reduce damages from natural hazard and how much residual risk can be tolerated if adaptation is not an option.

Once the MVP plan is completed, Quincy will become a designated Municipal Vulnerability Preparedness Community and receive preferential treatment in applying for both state and federal grant programs.



Natural Hazard Risks

The City of Quincy elected to include all 16 hazards from the 2018 State Plan as the basis for evaluating natural hazard risk for the Quincy Hazard Mitigation Plan (HMP) 5-year update. Climate change impacts are integrated into the natural hazard elements where appropriate, consistent with regional climate change information used in the 2018 State Hazard Mitigation Plan.

The highest ranked natural hazards for Quincy include Coastal and Inland Flooding, Nor'easters, Coastal Erosion and Severe Winter Weather. Within the past year Quincy has witnessed 21 coastal flooding events including record breaking high tide and storm surge.

Climate change projections for Quincy were included using multiple sources including data developed by the Northeast Climate Science Center (NCSC) at the University of Massachusetts Amherst for the State HMP Plan.

The City is already feeling the impacts of climate change, particularly related to coastal flooding due to storm surge and sea level rise and extreme temperatures. Quincy already has some of the highest repetitive loss claims in the Commonwealth due to flood damage from coastal storms and extreme precipitation. With more than 27 miles of coastline, and three isolated dense residential peninsulas, Quincy is particularly vulnerable to sea level rise and storm surge. Inland the City is vulnerable as storm water conveyed by numerous waterways frequently overtop during large precipitation events flooding adjacent neighborhoods and businesses. With climate change, inland flooding will worsen as riparian waterway drainage is blocked by advancing storm surge and sea level rise. Extreme heat impacts many of Quincy's most vulnerable populations including elderly, financially disadvantaged and physically challenged populations. Temperatures in Quincy can rise into the 90's during the summer, and heat island effects can add an additional 5-10 degrees in highly urbanized areas.

Quincy has keenly felt the effects of extreme weather in 2018, including weeks of below zero temperatures and record breaking high tides in January, temperatures 30 degrees above normal in February and three back to back Nor'easters in March resulting in some of the worst flooding that Quincy has seen. The timing of the 5-year HMP update and MVP workshops will take advantage of Quincy's recent experience with extreme weather events and the heightened awareness of how vulnerable the community is.

HAZARD RISK ASSESSMENT

A key component of the mitigation plan is the identification of risks posed by hazard and the corresponding impacts to the community. The process of identifying hazards of concern, profiling hazard events, and conducting a vulnerability assessment is known as a risk assessment. The risk assessment is a 4-step process:

Step 1: Identify Risks

Identify natural hazards that could impact Quincy in the future or have impacted Quincy in the past.

Step 2: Profile Hazards

Hazard profiles were developed for each of the 16 natural hazards that could impact Quincy in the future or have impacted it in the past. Each hazard profile includes a definition and description of the hazard, previous occurrence and extent based on historic data, local areas of impact, and probability for future occurrence.

For each natural hazard, the major vulnerability issues for four key sectors are summarized. The key sectors or categories of community assets include:

- Special populations and places (vulnerable populations and cultural assets)
- Built environment (municipal buildings and critical infrastructure)
- Economic centers
- Natural environment

Step 3 : Community Assets

FEMA defines a community asset as anything that is important to the character and function of a community. Community assets can be split up into four different categories: People, Economy, Built Environment, and Natural Environment.

The People category includes populations that are more vulnerable to disaster (e.g., elderly, children, visiting populations), densely populated areas, and societal assets such as cultural and historical resources.

Economy is included because economic drivers are a major part of disaster recovery. Community assets in the Economy category can include major employers, commercial centers and locations providing food, medical supplies and building materials.

The Built Environment is the largest category and includes existing structures, infrastructure (transportation and utilities) and critical facilities important for disaster response and evacuation (e.g., police, fire stations and medical facilities).

The Natural Environment category is meant to capture any natural resources important to the community's character, economy (tourism, recreation, and the protection of clean air and water), and ecosystem services (e.g., wetlands providing flood storage, coastal areas providing erosion control as a first line of defense from coastal storms).

Identifying Important Community Assets

Quincy is classified as a regional urban center due to its high population density, large proportion of multifamily housing, and its moderate and high-density neighborhoods that surround a historically significant downtown. Natural resources, along with much industrial economic activity, contributed to the development of distinct residential patterns throughout the City that endure today in Quincy's unique neighborhoods.

Seven geographic planning areas were delineated for the Hazard Mitigation Plan approximately defining these neighborhoods. The areas were primarily based on watershed boundaries and then further refined to include coastal flooding patterns. Community assets within each planning area were identified including features from each category defined in the inset to the right. A total of 326 community assets were identified as being important to the character and function of the City of Quincy for the 2019 HMP.

The geographic areas serve as planning boundaries allowing areas to be compared and contrasted, laying the foundation for the vulnerability analysis and development of mitigation strategies.

The geographic areas with total number of defined community assets are listed below. :

- Squantum Point/ Marina Bay (31 community assets)
- Neponset River/ North Quincy (59 community assets)
- Merrymount/ Blacks Creek (23 community assets)
- Houghs Neck/ Germantown (100 community assets)
- South Quincy/ Fore River (69 community assets)
- Furnace Brook North (26 community assets)
- Furnace Brook South (17 community assets)

Separate inserts were prepared for each geographic area to further describe the community assets and results of the vulnerability analysis.

Vulnerability Assessment

An exposure assessment was used to estimate losses due to inland and coastal flooding. An exposure assessment is a geospatial evaluation where geographic areas and hazards are mapped together to show the physical relationship to one another. The geospatial relationship can also be used to quantify the number and value of parcels and structures within the hazard area to estimate losses. For flooding, a GIS-based exposure analysis was used to identify potential losses of developed properties that fall within Quincy's 100-year flood zones and areas that may become impacted in the next 25-30 years due to sea level rise, as defined in the HMP in Section 3.2.1. (continued on page 6)

Inland Flooding

Inland or Riverine Flooding occurs where the rate of precipitation from a severe storm like a Nor'easter or tropical storm causes a large amount of rain in a short period of time, overwhelming the capacity of Quincy's natural or constructed storm drainage systems causing overflows, flooding streets and properties. Poor drainage after flood events is usually associated with poorly infiltrating soils and undersized stormwater conveyance, including channelized streambeds and culverts that do not have adequate capacity to handle runoff from larger storm events. Areas where both coastal and inland flooding occur may be especially hard hit when storm surge, high tides and stream discharge coincide in the same storm, and high tides backwater the inland drainage system. Tide gates have been installed in over 80 locations to address this issue and prevent the backflow from rising tides and storm surge to upland areas via the storm drainage system.

Coastal Flooding

Currently, coastal storms present a threat to development along the 25 miles of Quincy's coastline due to storm surges that overtop coastal structures and natural shorelines, resulting in coastal flooding. Hurricanes typically do not penetrate the Quincy shore as it is protected by adjacent coastal barrier landmasses including the Town of Hull and the Boston Harbor Islands. Nor'easters pose the biggest threat to Quincy and other east facing communities on Boston Harbor and Massachusetts Bay. Damage from nor'easters is exacerbated when combined with spring tides and when they extend across multiple high tides.

Step 4: Vulnerability Assessment– Potential Losses to Quincy

Quincy completed a vulnerability assessment (VA) to estimate the extent or magnitude of potential damages from natural hazards of varying types and intensities. The VA focuses on flood risk and the identified community assets to estimate the potential losses that Quincy could experience during a flood under existing and future conditions with climate change.

The VA included flood analysis for each geographic area in Quincy, and additional analysis for vulnerable community assets under current and future conditions with climate change.

FEMA data for repetitive and severe repetitive loss claims due to flooding was included in the HMP. Quincy ranks the 5th highest in repetitive loss claim in Massachusetts, involving over 185 locations and 650 claims from 1979-2017.

The HMP also evaluates impacts for areas slated for future development. This assessment identified natural hazard risk from hurricanes, earthquakes, and flooding, and is further described in Section 5.3.2 of the HMP.

Future Flood Risk

Future flood risk was determined by using NOAA Sea Level rise (SLR) data looking at 1, 2 and 4 feet of sea level rise. The 1 and 2-foot SLR values were chosen to align with the level of sea level rise that fall within the likely or 66% probability of occurrence range for the time periods 2030-2070 for Boston Harbor. 4 feet of SLR was included in the analysis to visualize a long term (2100) potentially worst case SLR Scenario.

Flooding within the 1, 2 and 4-foot flood zone includes area of the City in almost all of the planning areas except for Furnace Brook North and South, which only experience inland flooding. Flooding impacts solely due to SLR impact 6% of all developed parcels in Quincy.

The analysis showed that 199 properties may be flooded with 2 feet of SLR in the Merrymount/ Blacks Creek planning area compared to 114 properties for Houghs Neck/ Germantown, and 10 for Squantum Point/ Marina Bay. 4 feet of SLR planning area has the greatest impact on Houghs Neck/ Germantown. The analysis showed 395 properties would be impacted with a 4 foot SLR inn the Houghs Neck/ Germantown area, compared to 199 in Squantum Point/ Marina Bay and 160 in Merrymount/ Black Creek.

NOAA SLR data used for future flood risk does not consider natural processes such as erosion, subsidence, or future construction and is only a screening level tool. Inundation is shown on Map 5.1 as it would appear during Mean Higher High Water as observed over the past 19 years.

Vulnerability Analysis (cont.)

(Continued from page 5)

This exposure assessment was completed using GIS analysis for existing flooding and future flooding due to climate change for the entire City, based on geographical areas, referred to as "planning areas" (see Section 3.2 for more detail), assessor's data, current FEMA FIRMs and data from the 2017 NOAA Sea level Rise Viewer. This assessment is described in Section 5.3.1

A separate detailed assessment was completed to determine whether specific critical facilities and other identified community assets could be exposed to flooding, surge, sea level rise and coastal erosion. The assessment looks at existing flood conditions based on approved FEMA FIRMS with 2017 and 2018 map revisions and future flood conditions due to climate change from sea level rise and storm surge for time periods 2030 and 2070 based on NOAA and modeling data from the Resilient Quincy Report and the Boston Harbor Model. This assessment is described in Section 5.5 of the HMP.

Out of a total of 19,603 developed parcels in Quincy about 20% (4,100) are located in the FEMA 100-year flood plain with a combined building value over 1.75 billion dollars. 13% (2630) of the properties are in coastal floodplain areas and the remaining 7% (1456) are in inland floodplain areas.

Regionally, Merrymount/Blacks Creek neighborhood has the greatest number of potentially impacted coastal properties, and Furnace Brook North has the greatest number of potentially impacted inland properties.

Fifty-five (55) of the 260 community assets were identified within the 100-year flood zone, 33 of which were in the coastal zone and 22 in inland flood zone. Established base flood elevations for each location were determined (ranging from 10-49 feet NAVD88) . All coastal community assets were further evaluated to compare established base flood elevations against modeled SLR and base flood with a 2 foot rise. No determination of elevation of the building first flood relative to flood depths were included.

Mitigation Project Goals & Objectives

1. Public Health and Safety

Recommended Goal: Protect the health and safety of the public.

Objectives:

- Promote cost-effective hazard mitigation actions that protect and promote public health and safety from all hazards with an emphasis on reducing damage to repetitive and severe repetitive loss properties.
- Encourage people to be prepared before, during and after a hazard event.
- Ensure that services related to public health (e.g., sanitation, water, debris removal, hospitals and emergency services) can function during and after a hazard.
- Ensure that evacuation can happen in an organized and efficient manner.
- Minimize secondary impacts from hazards, such as the release of pollutants. (e.g., fuel spills into waterbodies).
- Promote public communications.

2. Protection of Existing Infrastructure

Recommended Goal: Protect existing properties and structures

Objectives:

- Provide resources for residents and businesses to make their buildings and properties more disaster resistant.
- Educate the public on measures they can take to protect their property from natural hazards.
- Maintain existing drainage and seawall infrastructure to protect residential and business areas from flooding.
- Ensure that critical facilities and infrastructure are protected from hazards.
- Upgrade existing structures to mitigate repetitive or severe repetitive loss properties.
- Ensure that future development / redevelopment does not make existing properties more vulnerable to hazards.

3. Protection of Natural Resources

Recommended Goal: Increase resilience by protecting and enhancing natural resources.

Objectives:

- Preserve and restore marsh ecosystems along coast-line and subtidal area (including shellfish habitat).
- Protect natural areas (including open space, wetlands, green spaces) to ensure that they buffer impacts to developed areas during a natural disaster.
- Protect and increase urban tree canopy.
- Manage stormwater with Low Impact Development techniques (provide capital resources to encourage investment in LID upgrades).
- Optimize techniques to provide safe access to the waterfront to avoid erosion.

4. Emergency Response to Hazards

Recommended Goal: Ensure that essential services can function during and after a hazard event.

Objectives:

- Ensure that critical infrastructure is protected from natural hazards.
- Ensure that key service emergency personnel and employees can get into and around the City to provide services.
- Promote effective and consistent interdepartmental communication.
- Maintain the Comprehensive Emergency Management Plan (CEMP)

5. Planning for Future Development

Recommended Goal: Minimize hazard risks for future development.

Objectives:

- Encourage future development in areas that are not prone to natural hazards.
- Engage developers in discussions regarding the Hazard Mitigation Plan and known hazards in Quincy.
- Enforce existing zoning and building regulations, and make updates to address known hazards and risks.
- Ensure that future development meets federal, state, and local standards for preventing and reducing the impacts of natural hazards including impacts due to climate change on natural and historic resources.

6. Regional Cooperation

Recommended Goal: Work regionally to mitigate impacts from natural hazards and to respond and recover from hazard events.

Objectives:

- Continue to participate in regional efforts.
- Cooperate with other agencies, communities, and private entities.
- Understand priorities and capabilities of other entities to allow for resource-sharing, mutual aid, and entering into memoranda of understanding (MOU).

7. Hazard Awareness

Recommended Goal: Maintain Hazard Awareness

Objectives:

- Track and compile hazard related data.
- Understand the potential implications of climate change on the frequency and extent of natural hazard events and incorporate that knowledge into hazard mitigation efforts.
- Maintain publicly available information on natural hazard risks in the City.
- Integrate hazard mitigation into other City initiatives and plans.
- Encourage the business community and local agencies representing vulnerable populations to work with the City to participate in development of the hazard mitigation plan.
- Plan outreach events educating the broader community on hazard risks and community vulnerability, and the benefits of hazard mitigation.

8. Hazard Mitigation Resources

Recommended Goal: Determine priorities for directing resources for hazard mitigation and response.

Objectives:

- Maintain adequate staff resources.
- Prioritize mitigation projects.
- Continue to include mitigation projects in the Capital Improvement Plan.
- Pursue various funding sources.
- Encourage private property owners to implement measures to protect their own properties.

Mitigation Progress

Nearly $17M in drainage improvements were completed in the last 5-years resolving many problematic areas. Mitigation Progress Tide gates have been installed in over 90 locations to address flooding and prevent the backflow from rising tides and storm surge to upland areas via the storm drainage system.

How Will Future Projects be Funded?

Municipal Vunlerability and Preparedness Action Grants

Coastal Zone Management Resiliency Grants

FEMA Hazard Mitigation Grants - Pre-Disaster Mitigation and Hazard Mitigation Grant Program

Executive Office of Energy and Environmental Affairs Dam and Seawall Repair Funds

Quincy Capital Improvement Plan

Top Priority Mitigation Projects

A total of 52 mitigation actions were selected by the planning team to include in the HMP. The projects were ranked using a FEMA standardized benefit cost review called STAPLEE that considers the social, technical, administrative, political, legal, environmental and economic costs and benefits for each action. A total of 28 mitigation projects are at the top of the list addressing a wide range of natural hazards that will result in protecting property, providing public education and awareness, natural resource protection, infrastructure improvements, and emergency services. The complete list is included in the HMP as Table 7.3 -2019 Mitigation Action Plan.

A few of the immediate high priority needs that benefit the whole City include:

- More opportunities for Hazard Mitigation Public Education (such as the MVP workshops)
- Improving Emergency Power Generators
- Updates to Quincy's Emergency Communication System
- Improvements to the Building Inspections Records System
- A City-wide Tide Gate Management Plan
- Additional Tree Removal Equipment

MITIGATION ACTION	GEOGRAPHIC AREA
Public Education	Citywide
Emergency Power Generators	Citywide
Quincy's Emergency Communication System	Citywide
Faxon Park Outreach	South Quincy/Fore River
Building Inspections Records System	Citywide
Tide Gate Management Plan	Citywide
Tree Removal Equipment	Citywide
Stormwater Control Station	Furnace Brook North
Stormwater Pumping Station	Houghs Neck/Germantown
High Capacity Mobile Pumps	Houghs Neck/Germantown
Pump Station Rehabilitation	Merrymount/Blacks Creek
Drainage Hydraulic Model	Squantum Point/Marina Bay
Hurricane Barrier Evaluation	Citywide
Coastal Buffer Maintenance	Houghs Neck/Germantown
Invasive Species Removal Program	Citywide
Drainage Improvements	Houghs Neck/Germantown
Tide Gate Modernization	Houghs Neck/Germantown, Merrymount/Blacks Creek
Salt Marsh Restoration	Merrymount/Blacks Creek
Seawall Construction	Houghs Neck/Germantown
Tide Gate Construction	Houghs Neck/Germantown
Hydraulic Model and Tide Gate Updates	Houghs Neck/Germantown
Drainage Improvements	South Quincy/Fore River
Seismic Impact Evaluation and Gas Utility Study	Citywide
Flood Protection	Houghs Neck/Germantown
Sewer System Rehabilitation	Merrymount/Blacks Creek
Sewer Interceptor Relief	South Quincy/Fore River
Slope Protection and Infrastructure Hardening	Squantum Point/Marina Bay
O'Rourke Field Conversion	Furnace Brook North