City of New Bedford
Municipal Vulnerability Preparedness Program

Community Resilience Building Workshop Summary of Findings Report

JUNE 2018

Prepared for the City of New Bedford
By Kim Lundgren Associates, Inc. and CDM Smith

With a grant from the Massachusetts Executive Office of Energy & Environmental Affairs

KLA KIM LUNDGREN ASSOCIATES, INC.
Customized Solutions for the Community You Want

CDM Smith

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Overview

This Summary of Findings report presents the results from a multi-pronged effort by the City of New Bedford to build resilience towards climate change. Undertaken as part of the Massachusetts Municipal Vulnerability Preparedness (MVP) process, the City of New Bedford engaged dozens of local and regional stakeholders in a process to understand current and future strengths, opportunities, and challenges as it relates to creating a more resilient community. This report summarizes those efforts and the next steps, as identified by stakeholders in New Bedford's process.

As the seventh largest city in Massachusetts and the largest fishing port in the United States in terms of volume and value of catch, New Bedford is a robust and resilient city. The city is home to a vibrant immigrant community, but is also plagued by a 23.5% poverty rate. With a long history as a fishing port and the iconic backdrop to Herman Melville's Moby Dick, New Bedford's identity is closely tied to the water. From fishing and scalloping, to relaxing on beaches, to coastal storms that regularly disrupt life, water is vital to New Bedford's economy, safety, and cultural identity.

Changes in climate have been notable in New Bedford, both on land and in the water. On land, the community has experienced just over a 1.5°F increase in temperature since the mid 1900's; the ocean has experienced nearly a 2°F increase in temperature. One of the more notable changes has been a shift in the precipitation regime. In particular, significantly more rain is falling during extreme storm events (roughly 55% more is falling in the most extreme events), and less winter precipitation is falling as snow and more as ice and freezing rain (minus the 2017-2018 winter). In addition, more than 10 inches of sea level rise over the last century, combined with what appears to be a more intense tropical storm season, are all causing serious localized flooding events. Combined, these events have led the City to begin planning for, and implementing actions that will enhance local resilience to existing and projected changes in climate.

Starting in January 2018 and continuing through May 2018, New Bedford partnered with Kim Lundgren Associates, Inc. (KLA) and CDM Smith to design a process that would allow the City to become an MVP Community and a national model for inclusive resilience building. Importantly, work described in this report is one of the first steps in New Bedford's efforts to create a more resilient community. The journey is just starting and the MVP process is a critical first step to setting New Bedford on this important path. To continue moving forward, this report outlines the City's next steps and desired action items, all of which are essential steps in the City's quest to ensure all residents can bounce back, as well as forward in the face of a disturbance.

To complete the work outlined in this report, the City of New Bedford:

- Created a core team composed of key internal stakeholders;
- Established goals for the MVP process, in partnership with the core team;
- Conducted research on historic and projected changes and impacts from climate change;
- Worked with the core team to determine an initial set of high-priority hazards;
- Collaboratively designed two MVP workshops using the Community Resilience Building process and invited participants;
- Hosted two MVP workshops where: a) the highest priority hazards were identified; b) the impacts, strengths, and vulnerabilities to infrastructure, socio-economic systems, and environmental systems were identified; and c) a number of adaptation actions were identified, and a final set of high priority action items were collectively defined and agreed upon by workshop participants; and
- Prepared for and hosted a listening session to discuss the results from the workshop and solicit feedback from the community.

The cornerstone of this work was the MVP workshops hosted by the City. As identified above, the central objectives of these workshops were to:

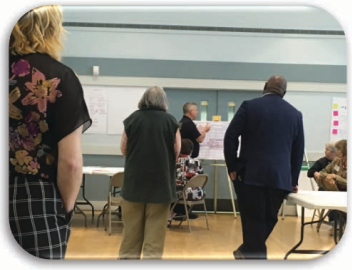
- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for the Community; and
- Identify immediate opportunities to collaboratively advance actions to increase resilience.

The remainder of this report provides greater detail about the MVP process New Bedford undertook and the actions identified as high priority to enhance local and regional resilience. The City would also like to thank the Massachusetts Executive Office of Energy and Environmental Affairs for their financial and technical support for this effort.

MVP Planning Process

Goal: Leverage the historical strength and ties within the community to become one of the most inclusive and resilient communities in America.

In January 2018, New Bedford's Director of Resilience and Environmental Stewardship worked with KLA and CDM to identify individuals to serve as Resilience Core Team members, familiarize themselves with the MVP process, and began establishing goals for both the MVP process and the city's overarching resilience activities.



Between February and May, the Director of Resilience and Environmental Stewardship, along with the Core Team were busy preparing for the workshops. At their April meeting, the Core Team focused on reviewing a climate summary report created by the consultant team, preparing all materials and logistics for the MVP workshops, and determining a preliminary list of hazards for considerations at the workshops.

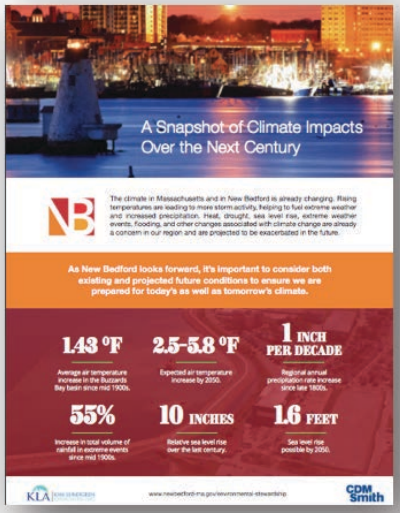
In addition, the Core Team, working together with the Director of Resilience and Environmental Stewardship, identified individuals to participate in two MVP workshops. The Core Team was careful to ensure that invitees represented the diversity of the community, including social justice organizations, educational institutions, housing authorities, economic development entities, conservation organizations, regulators, policy makers, emergency personnel, religious organizations, immigrant communities, and many others. In total, 55 individuals were invited to participate in the MVP workshops.

The Mayor sent invitations to identified stakeholders for the MVP workshops in April 2018. The decision was made to hold two, 4-hour workshops; one on May 15th and the other on May 17th.

Community Resilience Building Framework

DURING WORKSHOP

1	Prepare for the Workshop	1. Establish a core team with goals. 2. Engage stakeholders. 3. Prepare materials for workshop. 4. Decide on participant arrangements
2	Characterize Hazards	1. Identify past, current, and future impacts. 2. Determine the highest-priority hazards.
3	Indentify Community Vulnerabilities and Strengths	1. Identify infrastructural vulnerabilities and strengths. 2. Identify societal vulnerabilities and strengths. 3. Identify environmental vulnerabilities and srengths.
4	Identify and Prioritize Community Actions	1. Identify and prioritize infrastructural actions. 2. Identify and prioritize societal actions. 3. Identify and prioritize environmental actions.
5	Determine the Overall Priority Actions	1. Identify highest-priority actions. 2. Further define urgency and timing.
6	Put It All Together	1. Generate final workshop products.
7	Move Forward	1. Continue community outreach and engagement. 2. Secure additional data and information. 3. Inform existing planning and project activities.



In May, the City hosted their two MVP workshops. Over 45 individuals attended each of the workshops. At the event, the participants were split into six groups. Each group followed the MVP recommended process, which included: confirming hazards; identifying community vulnerabilities and strengths; identifying and prioritizing community actions; and determining overall priority actions to move forward with implementing. At the end of the second workshop, each group identified their top action in each feature area (infrastructure, socio-economic, and environmental) and presented them to the full group. After those 18 actions were grouped (based on similarities), each participant was provided 3 dot stickers that they could use to vote for their top three.

The highest priority actions from that exercise were:

- Increase communication capabilities and educational opportunities for everyone related to resilience (14 votes)
- Ensure we are taking all steps to protect aquifer protection zone through forest management around reservoir and addressing invasive species (13 votes)
- Evacuation and sheltering plan – including siren, evacuation routes, signage; and education around plans (including a road race) (7 votes)

Going forward, the City plans to host a number of community discussions to get additional feedback about the recommended actions, to integrate findings and results into other City planning and decision-making processes, and to begin implementing (or securing the resources to implement) prioritized actions.

Top Hazards and Vulnerable Areas

Through the MVP workshops, as well as pre-workshop preparation, the City identified four main hazards that have historically impacted the community and are projected to have notable impacts going forward. Those four hazards are:

Intense storms

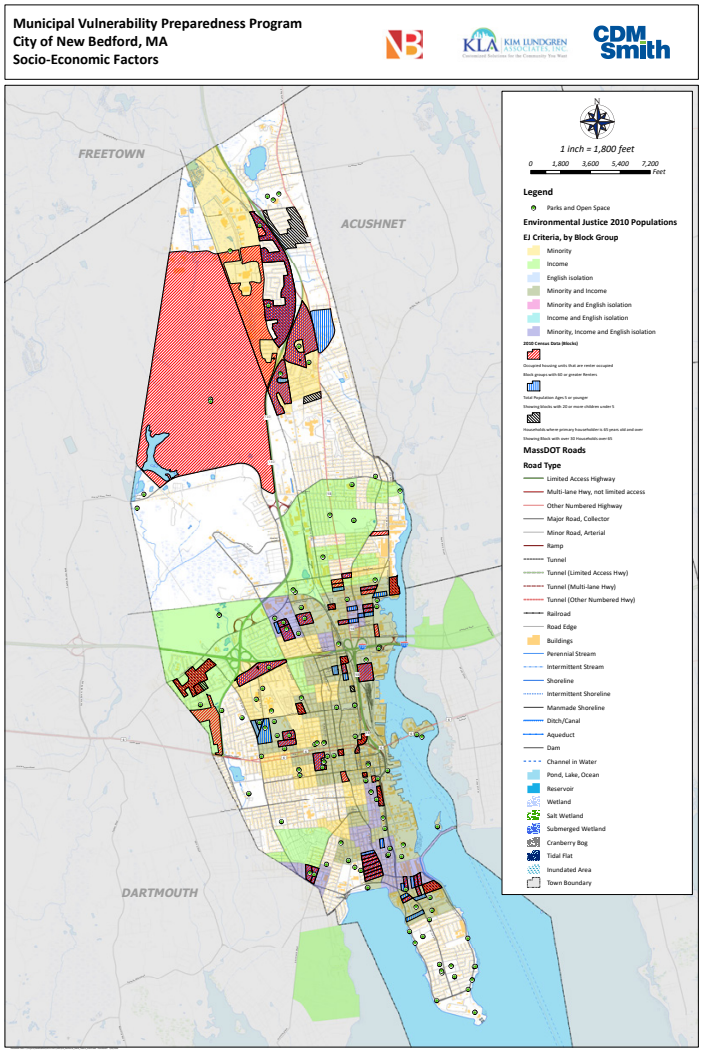
Heat waves and changes in air quality

Flooding

Sea Level Rise

Appendix Seven provides a summary of the historic as well as projected changes in weather and climate experienced in New Bedford. This information was foundational to the MVP process as it helped to ground all stakeholders in what has historically changed in the region and what types of changes and associated impacts to expect going forward.

Once hazards were agreed upon, workshop participants worked in small groups to articulate what they saw as the community's strengths and vulnerabilities in three core areas: environmental features, socio-economic features, and infrastructural features. Each group worked through all three of these groupings, focusing on one at a time. In total, there were six breakout groups meaning that we had six groups individually identifying what they saw as the important features (across all three categories) in New Bedford.



Below are all features that were identified by at least 50% of groups:

Infrastructural Features:

- Water and wastewater systems (citywide and beyond)
- Critical facilities (citywide)
- The port (at the port)
- Transportation system (citywide but not equal access throughout city)
- Housing – in particular public housing (along the water)
- Harbor walk and River walk (along the water)
- Communication networks and systems (citywide and beyond)

Socio-Economic Feature

- Vulnerable populations and their pets (citywide – but noted on socio-economic map)
- Community organizations (citywide)
- Education system (schools; see maps in appendices)
- Medical/ emergency services / health care (citywide; St. Luke's, nursing homes)
- Self-reliant populations (citywide)
- Fishing / marine industry (coast)
- Small businesses (citywide)

Environmental Features

- Fish (and fishing industry) (waterways)
- Food supply (mostly outside of the city)
- Great Ponds (water supply) (North of the city)
- Street trees (canopy) (citywide)
- Parks (canopy) (in parks, see maps in appendices)
- Coastal ecosystems (coast)
- Insects and vector borne diseases (citywide)
- Industrial contaminants (industrial sites mostly on the waterfront)

Appendix Six includes photos of all the completed matrices.

Nearly all these features were flagged as being both strengths and vulnerabilities. As such, workshop participants unpacked what were the specific strengths within each of these features as well as what their vulnerabilities were. This additional step within the MVP process allowed stakeholders to more quickly identify actions that enhanced strengths and mitigated vulnerabilities.

Current Concerns and Challenges Presented by Hazards

More details on each of the four identified hazards is provided below.

Intense storms:
Over the last several decades, the number and intensity of storms has been on the rise. This includes hurricanes, nor'easters, ice storms, and rainstorms. And research shows that these types of storms are only likely to become more frequent, intense, and possibly of longer duration in the future. With these intense storms comes flooding, property damage, downed trees and the potential of power outages, not to mention significant economic disruption. Under future climate projections, we expect the number and intensity of these storms to continue increasing. More specifically, we expect more winter ice storms as winter precipitation shifts from snow to ice as well as more hurricane related damage as recent research suggests that hurricane tracks are shifting northward. Because of the very immediate and significant impact intense storms have on New Bedford, all stakeholders unanimously agreed that this should be a core hazard considered as part of the MVP process.

While nearly every area of the City is affected by intense storms, MVP workshop participants and the core team were particularly concerned with impacts to traditionally vulnerable populations, the fishing industry, the capacity of emergency management to respond, the adequacy of evacuation routes and the transportation systems, and the impact to critical infrastructure (e.g., communication systems, health care facilities, EMS). Particular attention was paid to the needs of youth, those with low socio-economic security, the elderly, and those for whom English is not their primary language. Notably, workshop participants acknowledged that many communities traditionally framed as "vulnerable" often have extremely high resilience – often out of necessity. As such, participants encouraged the City to work with these existing stakeholders to understand the activities they undertake to prepare for, recover from, and advance post disturbance.

Heat waves:
Since the mid-1900's, New Bedford has experienced more than a 1.5^{o}F increase in annual average temperatures. The greatest increase has occurred in winter but all seasons have seen an increase in average temperature. With these increases in temperature, primarily in the summer, comes an increase in the likelihood of heat waves. The figure to the right helps demonstrate this point by showing how summer may "feel" in Massachusetts under different climate futures.

While the crosswinds in New Bedford normally help to mitigate extreme heat, projected changes in climate may mitigate these winds while also increasing summer temperatures. In fact, projections show that by mid-century, New Bedford may experience an additional 21 days over 90°F and by end of the century, that number could jump to 55 more days over 90°F. Given that many in New Bedford do not have air conditioning, more warm days could quickly become a public health crisis. Therefore, it was not surprising that all MVP stakeholders unanimously voted to have heat waves be one of the four primary hazards considered as part of this process.

In terms of targeted areas of concern, MVP stakeholders identified the following groups as being particularly vulnerable to extreme heat: the elderly, youth, outdoor workers, students in outdoor sports, those with compromised immune systems, the obese, those without home cooling systems, and those residing in or close to poverty who may not have the resources to pay for additional cooling needs.

Flooding:
Over the last several decades, New Bedford (and the entire northeast) has seen a remarkable increase in the amount of precipitation falling during extreme rainfall events. In fact, 55% more rain is falling during extreme events today compared to the mid 1900s. This massive increase in rainfall is causing significant localized flooding, which disrupts transportation systems, damages infrastructure and property, leads to public health concerns (e.g., standing water, flooding in basements, mold dissemination), leads to more combined sewer overflows (CSOs) – which impairs water quality, and causes economic disruptions. In light of these concerns, MVP workshop participants unanimously agreed that flooding was a serious hazard that warranted consideration.

As mentioned above, flooding is a pervasive issue that impacts nearly every aspect of life in New Bedford. The targeted areas of concern identified by MVP workshop participants included those individuals and pieces of infrastructure residing within the 100 year and 500 year floodplain as well as those within a category 2 or lower hurricane storm surge zone (see maps in Appendix One-Three).

Sea Level Rise:
Over the last century, New Bedford has experienced more than 10 inches of relative sea level rise. This rise has led to more localized flooding during high tides as well as greater flooding due to storm surges. Looking forward, projections show that by mid-century, sea levels are very likely to be 0.9 to 1.6 feet higher (and possibly up to 2.7 feet higher). By end of the century, sea levels are likely to be 2 to 4.1 feet higher (and possibly 9.8 feet higher). And with recent research showing that ice sheets are melting faster than projected, it may be prudent to prepare for the higher range of sea level rise projections. Given the importance of water to New Bedford and the very real and immediate threats faced by sea level rise, MVP stakeholders unanimously supported the inclusion of sea level rise as a hazard for consideration.

While all in New Bedford are impacted, directly or indirectly, by sea level rise, those most impacted include: coastal residents, those on the south peninsula, businesses along the coast, the fishing industry, and environmental and recreational facilities along the coast.

Current Strengths and Assets

The MVP Workshop participants felt very strongly that New Bedford's rich history and thriving harbor are a great source of strength. It is what shapes their economy- from the fishing industry to tourism. The harbor will also soon be the home to several wind turbines, demonstrating how a historical city can be on the cutting edge of resilience and sustainability**.**

Its people were also mentioned frequently as a strength. New Bedford has a very large self-reliant population that has learned to weather economic and climate related storms. They have large groups that are connected culturally that create a strong foundation for resilience.

Other strengths that came up in the working groups included:

- Harbor
- Hurricane Barrier
- Upgrades to the WWTP
- Water Supply/Great Ponds
- Parks/Beaches
- Tree Canopy/Street Trees
- Schools/Education

Top Recommendations to Improve Resilience

The last two steps in the MVP workshop were to brainstorm possible adaptation actions to help each of the core features either address existing or projected vulnerabilities or enhance the things that make it a strength in the community. This was then followed by a group prioritization of actions; thereby allowing the City to identify which actions to begin immediately working towards.

Through this process, MVP stakeholders identified over 60 possible actions. Of these possible actions, 18 were flagged as being of particularly high priority (Appendix Five). The following are the top three actions that were collectively identified as the top priorities for New Bedford:

- Increase communication capabilities – expand and educate re-reverse 911; multilingual program; ensure communication program for everyone (14 votes)
- Ensure we are taking all steps to protect aquifer protection zone through forest management around reservoir and addressing invasive species (13 votes)
- Evacuation and sheltering plan – including neighborhood resilience hubs, sirens, evacuation routes, signage; and education around plans (including a road race) (7 votes)

Top Infrastructure Actions From Each Group

- Continued upkeep and improvements to water, sewer, and storm systems
- CSO Mitigation/Green Infrastructure
- Bury power lines and replace aging infrastructure
- Develop a long-term adaptation strategy for the Port
- Develop/enhance the evacuation and sheltering plan (including neighborhood resilience hubs, sirens, evacuation routes, and education)
- Put air conditioning in schools (for health benefits and to use the schools as cooling centers)

Top Socio/Economic Actions From Each Group

- Updates to the City's Master Plan that focus on the neighborhood level
- Identify a backup medical facility as part of the St. Luke's resiliency
- Increase availability of affordable housing (not in the flood zone)
- Host a roundtable discussion style workshop with key stakeholders in the fishing industry
- Education on financial literacy and English immersion
- Localize power and increase redundancy to minimize power loss

Top Environmental Actions From Each Group

- Implement green infrastructure projects
- Communication and outreach plan for vulnerable populations
- More green infrastructure projects
- Ensure taking all steps necessary to protect the aquifer production zone through forest management around the reservoir and addressing invasive species
- Water conservation programs with maintenance and upgrades around Great Ponds
- Increase communication capabilities and expand existing educational programs to ensure they are multi-lingual and appropriate for all

Conclusion and Next Steps

New Bedford is committed to leveraging our strengths and ties within the community to become one of the most inclusive and resilient communities in America. The MVP process represents but one step in that quest. We know that we have much to do and that, in order to meet our goal, we will need the engagement of all residents, businesses, and institutions within the City. To that end, we are committed to continuing to build a coalition of resilience ambassadors, to engaging a diversity of stakeholders in our process, and to continually evaluating our progress and making adjustments, as needed, to ensure we are making progress towards our goal. Most immediately, the City is focused on the development of the Climate Adaptation and Resilience Action Plan and continuing to drive an inclusive public engagement process. We are also committed to seeking funding to begin implementing the actions identified in the previous section and to reaching out to community stakeholders to continue developing and refining this plan of action. We also plan to integrate what we've learned as part of the MVP process into our existing and future planning process; thereby ensuring that climate becomes mainstreamed into the way we plan and make decisions as a city.

The road ahead is a long one. As someone at the MVP workshop said, ***"we are running a marathon, not a sprint."*** Stamina, determination, persistence, and focus will be critical. Luckily, some of the smartest and most passionate people live and work in New Bedford so the future looks bright.

Acknowledgements

The City of New Bedford would like to thank all the following core team members that made this project a success:

Michele Paul	Director of Resilience and Env.	City of NB
Christina Connelly	COO	City of NB
Jamie Ponte	DPI Commissioner	City of NB
Mark Champagne/Nick Perreira	Facilities Superintendent	City of NB
Brian Nobrega	Director, Emergency Management	City of NB
Derek Santos	ED	NBEDC
Jake Gonsalves	Port Engineer	NB Port Authority

In addition, we'd like to thank the Massachusetts Executive Office of Energy & Environmental Affairs for the financial support to execute this project.

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Community Resilience Building Workshop Project Team

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Missy Stults	Facilitator	KLA
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Lauren Miller	Facilitator	CDM Smith
Lauren Klonsky	Facilitator	CDM Smith
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Jamie Ponte	DPI Commissioner	City of NB
Mark Champagne/Nick Perreira	Facilities Superintendent	City of NB
Scott Durkee	Energy Manager	City of NB
Brian Nobrega	Director, Emergency Management	City of NB
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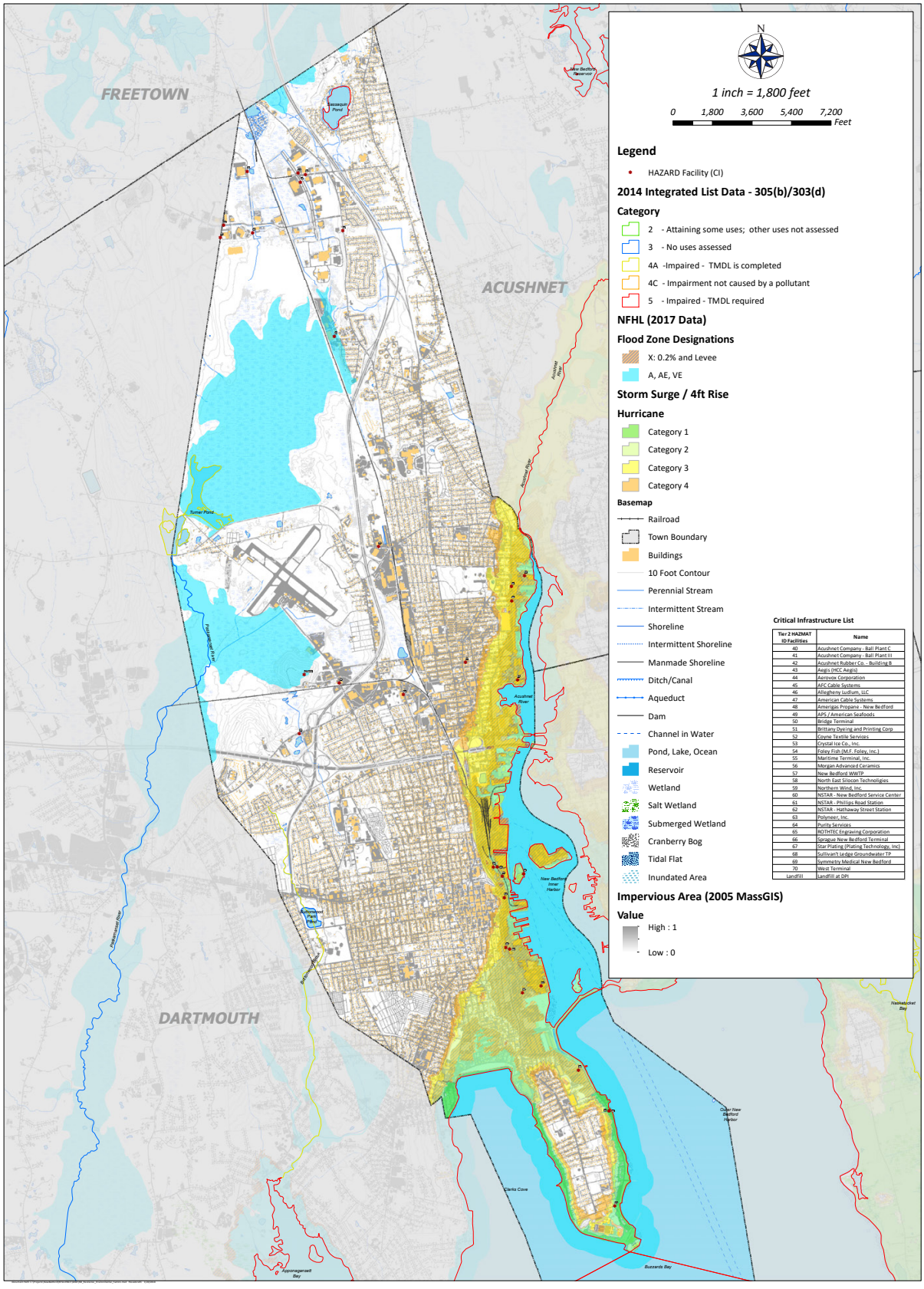
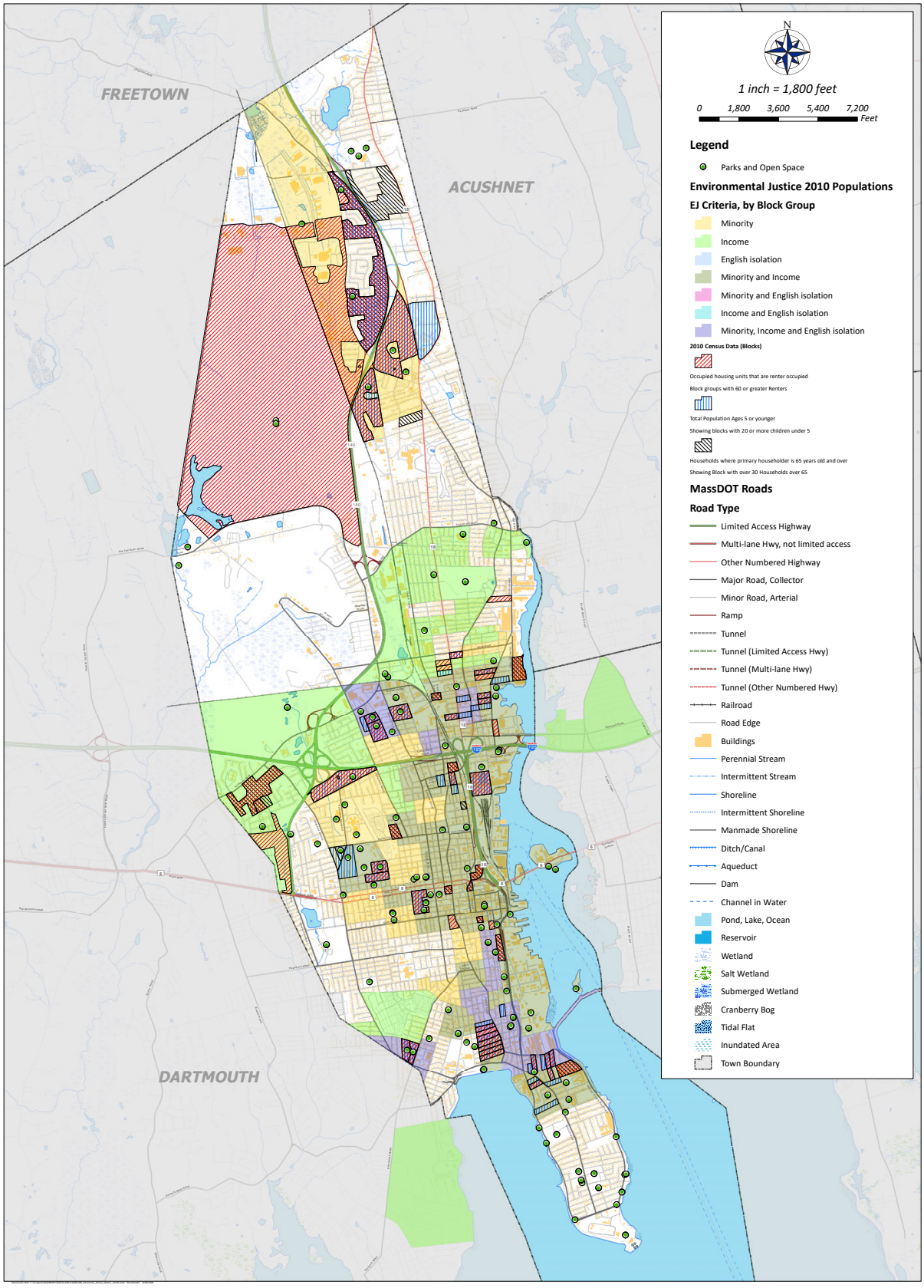
APPENDICES

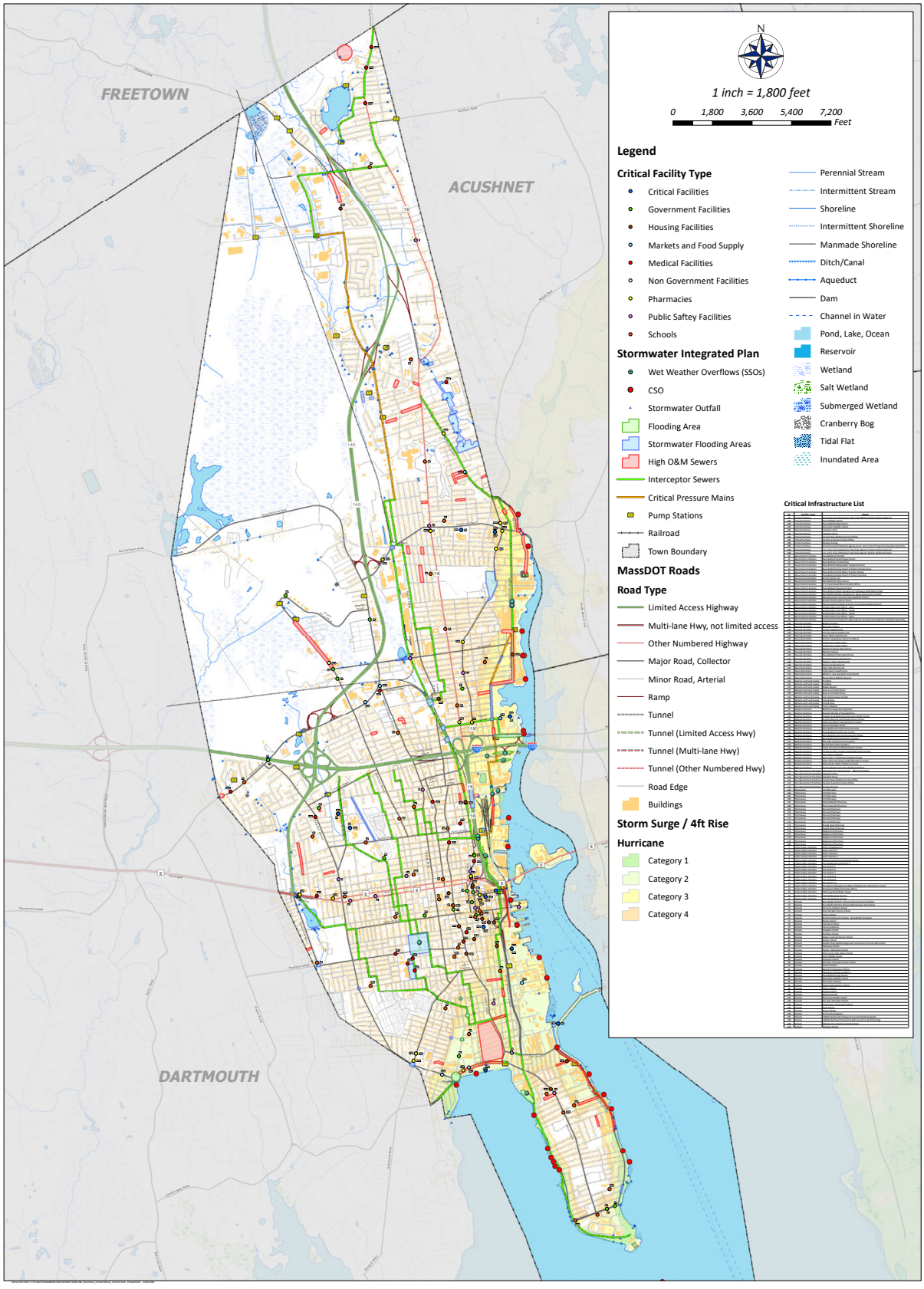
Municipal Vulnerability Preparedness Program
City of New Bedford, MA
Environmental Factors



Municipal Vulnerability Preparedness Program
City of New Bedford, MA
Socio-Economic Factors



Municipal Vulnerability Preparedness Program
City of New Bedford, MA
Infrastructure Factors



Name	Title	Affiliation
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Cynthia Walquist	Director	City of NB
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Mark McGraw	Director	City of NB
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Hugh Dunn	Councilor - Ward 3	City of NB
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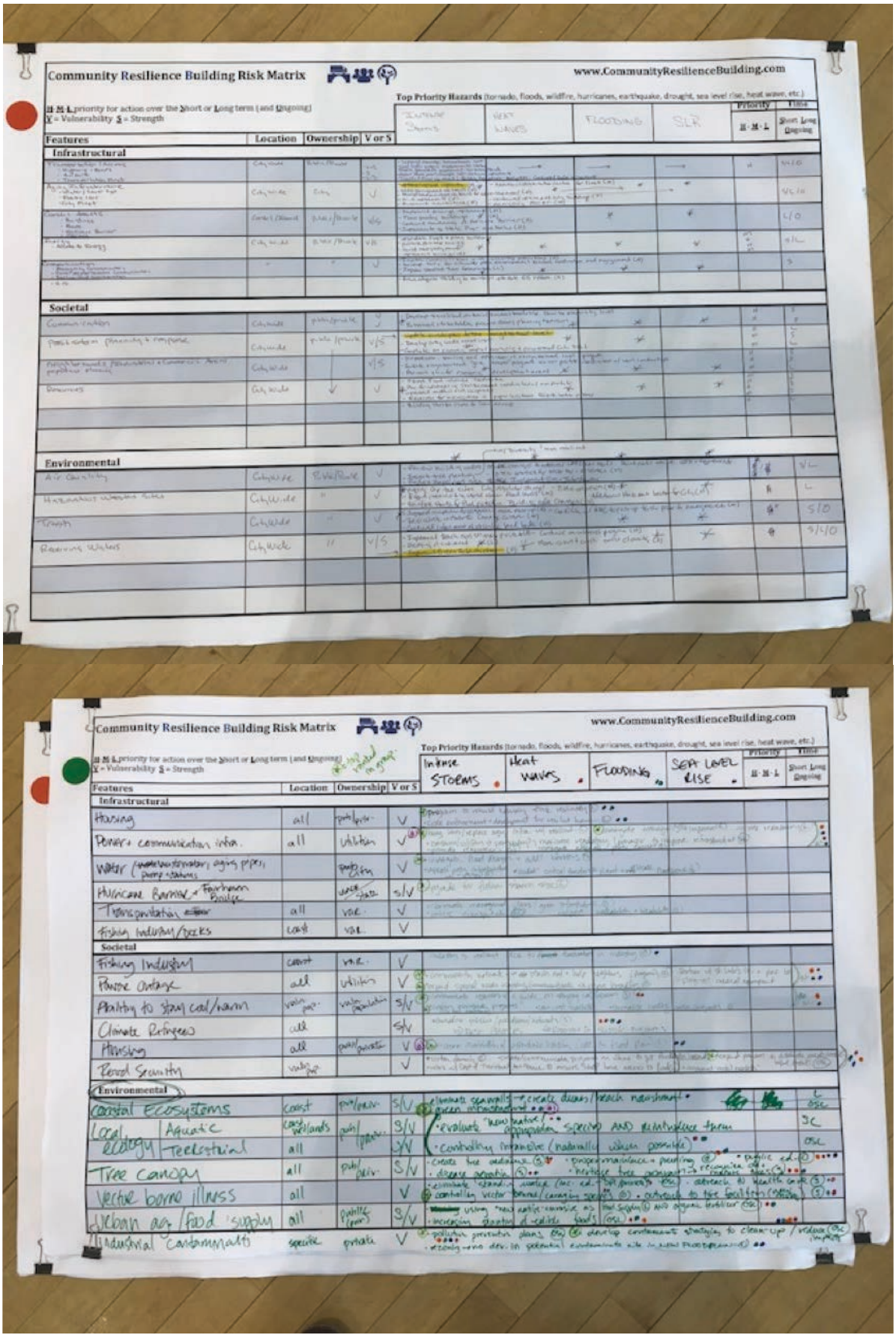
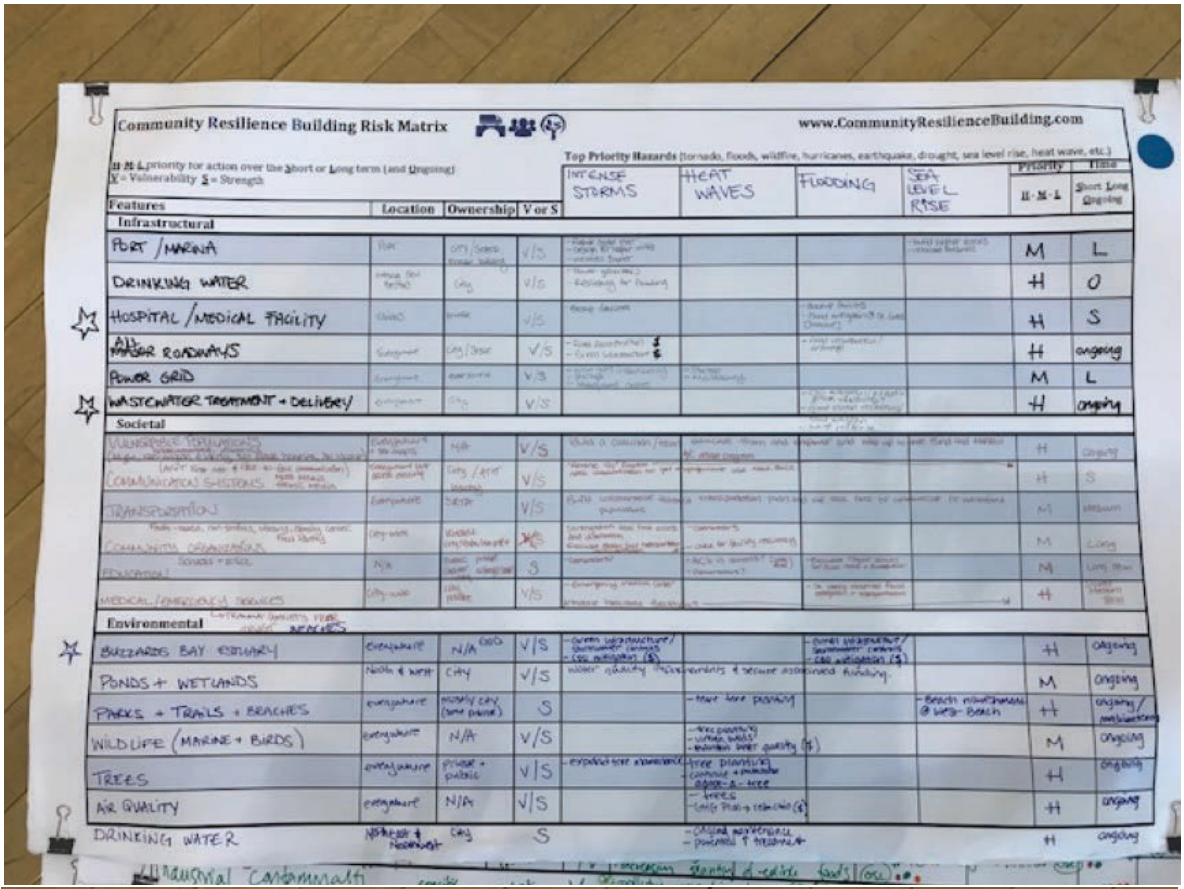
Scott Lima	Councilor - Ward 5	City of NB
Joe Lopes	Councilor - Ward 6	City of NB
Ian Abreau	Councilor-at-Large	City of NB
Naomi Carney	Councilor-at-Large	City of NB
Debora Coelho	Councilor-at-Large	City of NB
Brian Gomes	Councilor-at-Large	City of NB
Linda Morad	Councilor-at-Large	City of NB

- Evacuation and sheltering plan – including siren, evacuation routes, signage; and education around plans (including a road race) (7 votes)
- Water conservation plus maintenance and upgrades around Great Ponds (3 votes)
- Develop a long-term adaptation strategy for the port (5 votes)
- Host a roundtable discussion and MVP style workshop with key stakeholders in the fishing industry (0 votes)
- Ensure taking all steps to protect aquifer protection zone through forest management around reservoir and addressing invasive species (13 votes)
- Bury lines / replace aging power infrastructure with resilient infrastructure (5 votes)
- Increase availability of affordable housing (not in the flood zone) (1 vote)
- Green infrastructure (4 votes)
- CSO mitigation / green infrastructure (5 votes)
- Backup medical facility / St. Luke's flood resilience (1 vote)
- Put air conditioning in schools – health benefits and available for cooling centers (2 votes)
- Localize power increase – redundancy to minimize power loss (3 votes)
- Increase communication capabilities – expand educate reverse 911 – multilingual program; large scale communication program for everyone (14 votes)
- Continued upkeep and improvements to water, sewer, and storm systems (0 votes)
- Updates to the City's master plan down to neighborhood level (0 votes)


Community Resilience Building Risk Matrix
www.CommunityResilienceBuilding.com
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)
Features
Location
Ownership
V or S
Priority
Time
Infrastructural
Societal
Environmental
Community Resilience Building Risk Matrix
www.CommunityResilienceBuilding.com
Intense Storms
Heat Waves
Flooding
SLR
Features
Location
Ownership
V or S
Infrastructural
Housing
Power + communication infra.
Water
Hurricane Barrier
Transportation
Fishing Industry/Docks
Societal
Fishing Industry
Power outage
Planning
Food Security
Environmental
Coastal Ecosystems
Local Ecology
Aquatic
Terrestrial
Tree canopy
Vector borne illness
Urban ag/food supply
Industrial contaminants



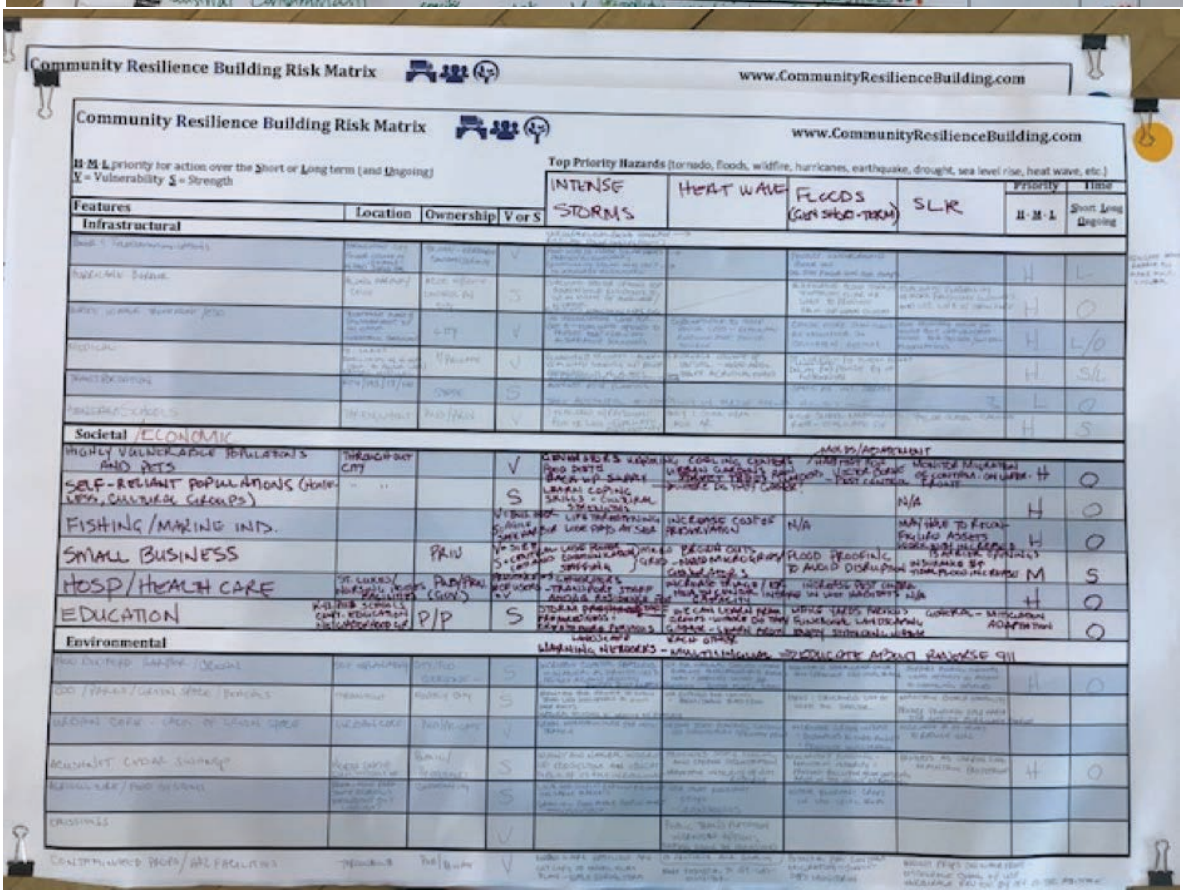
Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

H M L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	INTENSE STORMS	HEAT WAVES	FLOODING	SEA LEVEL RISE	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
PORT / MARINA			V/S					M	L
DRINKING WATER			V/S					H	O
HOSPITAL / MEDICAL FACILITY			V/S					H	S
MAJOR ROADWAYS			V/S					H	ongoing
POWER GRID			V/S					M	L
WASTEWATER TREATMENT + DELIVERY			V/S					H	ongoing
Societal									
			V/S					H	ongoing
			V/S					H	S
TRANSPORTATION			V/S					M	L/long
								M	Long
			S					M	Long Term
			V/S					H	Short Term
Environmental									
BUZZARDS BAY ESTUARY		N/A	V/S					H	ongoing
PONDS + WETLANDS		CITY	V/S					M	ongoing
PARKS + TRAILS + BEACHES			S					H	ongoing / maintenance
WILDLIFE (MARINE + BIRDS)		N/A	V/S					M	ongoing
TREES			V/S					H	ongoing
AIR QUALITY		N/A	V/S					H	ongoing
DRINKING WATER		CITY	S					H	ongoing



Community Resilience Building Risk Matrix

www.CommunityResilienceBuilding.com

Community Resilience Building Risk Matrix

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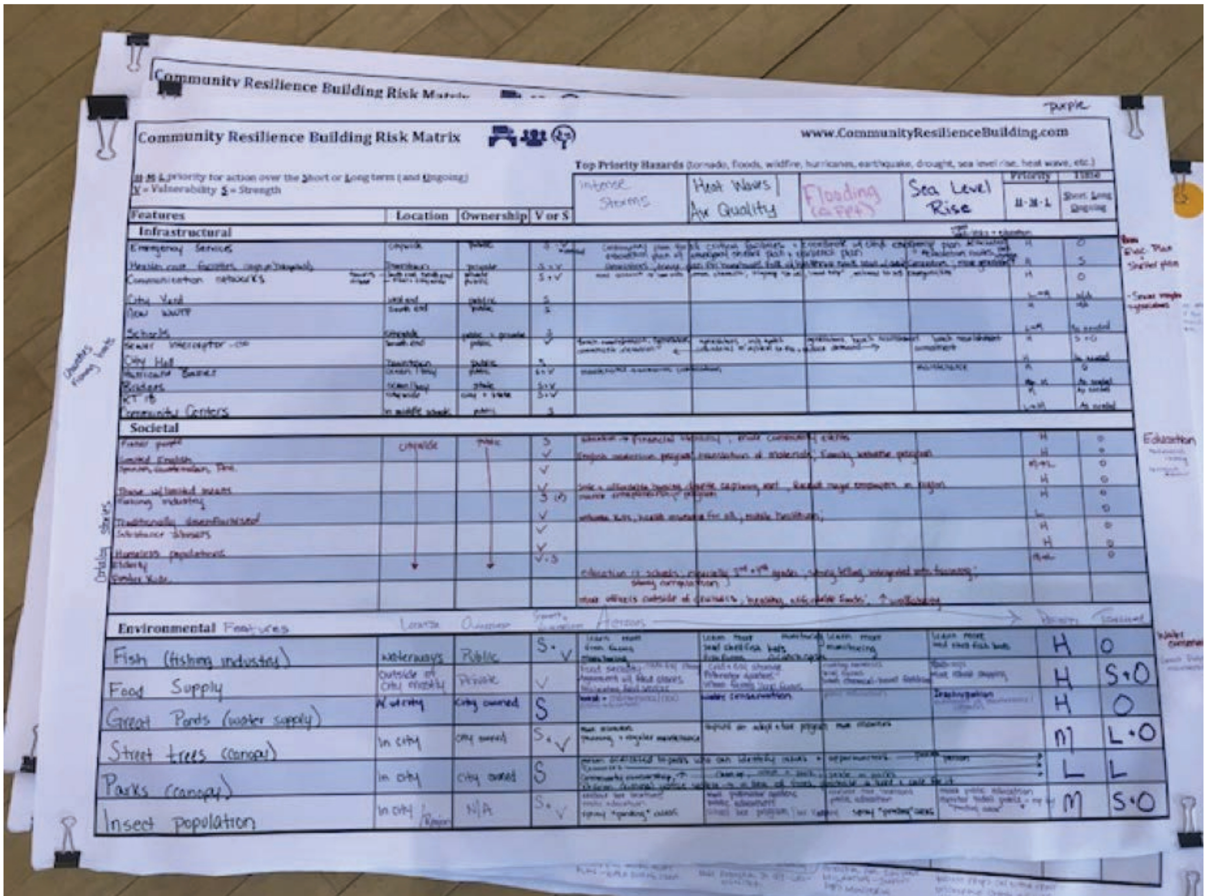
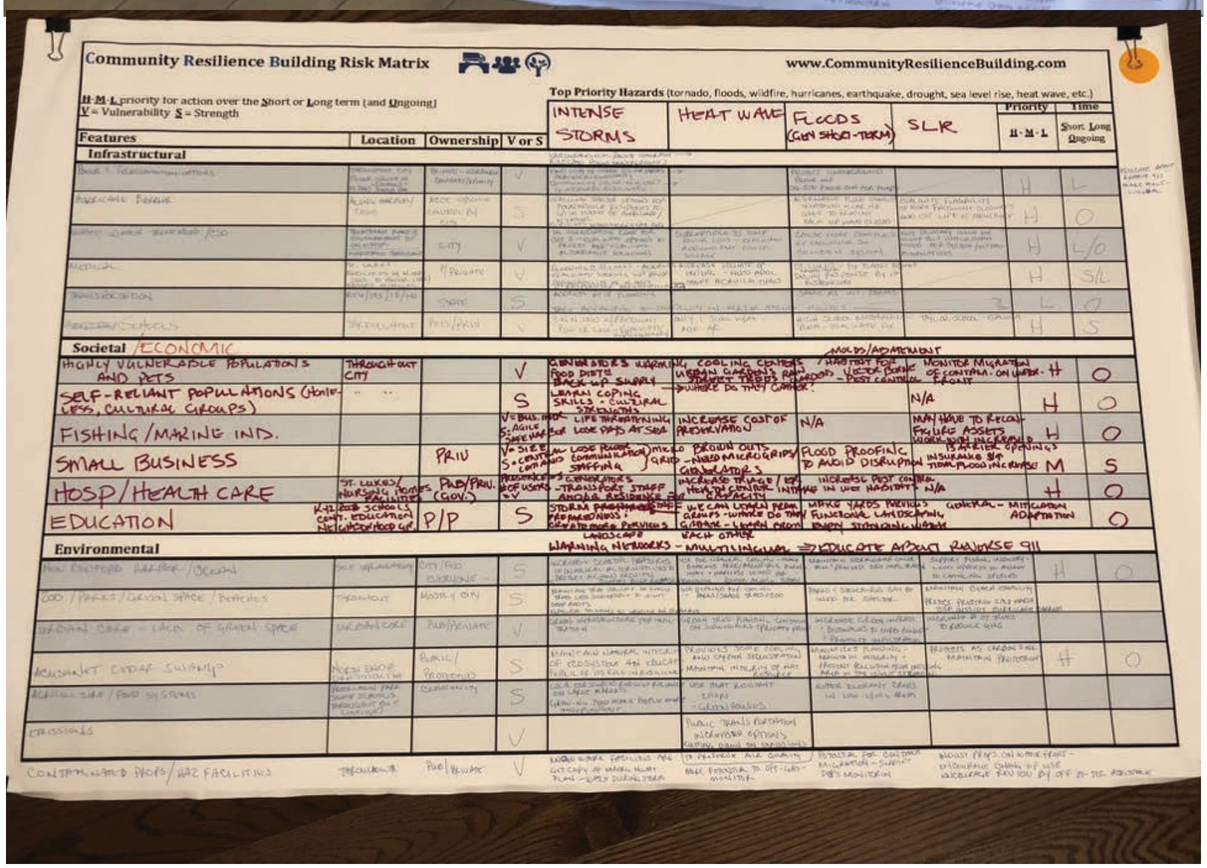
H M L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength

Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)

Features	Location	Ownership	V or S	INTENSE STORMS	HEAT WAVE	FLOODS (SHORT-TERM)	SLR	Priority H-M-L	Time Short Long Ongoing
Infrastructural									
			V					H	L
			S					H	O
			V					H	L/O
			V					H	S/L
			S					H	L
			V					H	S
Societal ECONOMIC									
HIGHLY VULNERABLE POPULATIONS AND PETS	THROUGHOUT CITY		V					H	O
SELF-RELIANT POPULATIONS (HOUSEBOATS, CULTURAL GROUPS)			S					H	O
FISHING / MARINE IND.					INCREASE COSTS PRESERVATION	N/A		H	O
SMALL BUSINESS		PRIV				FLOOD PRONE/INC TO AVOID DISRUPTION		M	S
HOSP/HEALTH CARE	ST LUKE'S HOSPITAL (NEW BEDFORD)	PUB/PRIV						H	O
EDUCATION	SCHOOLS CONT. EDUCATION	P/P	S						O
Environmental									
			S					H	O
			S						
			V						


Community Resilience Building Risk Matrix
www.CommunityResilienceBuilding.com
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)
Intense Storms
Heat Waves Air Quality
Flooding
Sea Level Rise
Features
Location
Ownership
V or S
Infrastructural
Societal
Environmental


Community Resilience Building Risk Matrix
www.CommunityResilienceBuilding.com
H-M-L priority for action over the Short or Long term (and Ongoing)
V = Vulnerability S = Strength
Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)
INTENSE STORMS
HEAT WAVE
FLOODS
SLR
Priority
H-M-L
Time
Short Long Ongoing
Features
Location
Ownership
V or S
Infrastructural
Societal
Environmental

A Snapshot of Climate Impacts Over the Next Century

The climate in Massachusetts and in New Bedford is already changing. Rising temperatures are leading to more storm activity, helping to fuel extreme weather and increased precipitation. Heat, drought, sea level rise, extreme weather events, flooding, and other changes associated with climate change are already a concern in our region and are projected to be exacerbated in the future.

As New Bedford looks forward, it's important to consider both existing and projected future conditions to ensure we are prepared for today's as well as tomorrow's climate.

1.43 °F
Average air temperature increase in the Buzzards Bay basin since mid 1900s.

2.5–5.8 °F
Expected air temperature increase by 2050.

1 INCH PER DECADE
Regional annual precipitation rate increase since late 1800s.

55%
Increase in total volume of rainfall in extreme events since mid 1900s.

10 INCHES
Relative sea level rise over the last century.

1.6 FEET
Sea level rise possible by 2050.

KLA KIM LUNDGREN ASSOCIATES, INC.

www.newbedford-ma.gov/environmental-stewardship

CDM Smith

TODAY. TOMORROW. **OUR FUTURE.**

Hotter Days

Days with temperature at or above 90°F are not currently very common within the Buzzards Bay Watershed. By mid-century (i.e., 2050), models suggest an increase of anywhere from 4 to 21 more days per year over 90°F, and an increase of 8 to 55 more days per year over 90°F by end of century.

On the flip side, the watershed is expected to experience fewer nights below 32°F with decreases of 20 to 44 days projected by mid-century, and declines of 24 to 67 less days below 32°F by end of the century.

Wetter Days

Models project an increase in annual precipitation, ranging from .3 inches to 5.43 more inches by mid-century and .28 inches to 6.8 more inches by end of century.

Flooding and Drought

Over the last five decades the Northeast has experienced a 55% increase in the amount of precipitation falling during extreme precipitation events. Models project that the Buzzards Bay basin will see .8 to 2.7 more days with 1" or more of precipitation falling by mid-century and 1 to 4 more days with 1" of precipitation falling by end of the century.

Even though more annual precipitation is projected overall, more is anticipated to fall in shorter, extreme events. Thus, there will be longer periods of time that experience no rainfall, increasing the potential for drought.

Rising Seas

By mid-century, sea levels are likely to be 0.9 to 1.6 feet higher (and possibly up to 2.7 feet higher) than current levels. By end of the century, sea levels around Buzzards Bay are likely to be 2.0 to 4.1 feet higher (and possibly 9.8 feet higher). Sea levels of this magnitude with completely overwhelm coastal infrastructure, transportation systems, and natural assets bordering the coastline. Moreover, higher sea levels mean that storm surge and flooding events are likely to be significantly more intense in the future.

KLA KIM LUNDGREN ASSOCIATES, INC.

www.newbedford-ma.gov/environmental-stewardship

CDM Smith

Hazard: Heat Waves
(Increased Temperatures)

Hotter Days

Days with temperature at or above 90°F are not currently very common within the Buzzards Bay Watershed. By mid-century (i.e., 2050), models suggest an increase of anywhere from 4 to 21 more days per year over 90°F, and an increase of 8 to 55 more days per year over 90°F by end of century.

On the flip side, the watershed is expected to experience fewer nights below 32°F with decreases of 20 to 44 days projected by mid-century, and declines of 24 to 67 less days below 32°F by end of the century.

What we have already seen

1.43°F annual temperature increase since mid 1900s

What we are expected to see

Temperatures are going to continue to rise
- 2.5°F to 5.8°F by 2050
- 3.2°F to 10.3°F by 2100

	Observed Baseline 1971-2000	Mid-Century Projected Change	End of Century Projected Change
Avg. Days Over 90°F:	4	+12	+31

1. What concerns you most about this hazard?

2. What could be done to help community members be better prepared for this hazard?

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Hazard: Sea Level Rise

Rising Seas

By mid-century, sea levels are likely to be 0.9 to 1.6 feet higher (and possibly up to 2.7 feet higher) than current levels. By end of the century, sea levels around Buzzards Bay are likely to be 2.0 to 4.1 feet higher (and possibly 9.8 feet higher). Sea levels of this magnitude with completely overwhelm coastal infrastructure, transportation systems, and natural assets bordering the coastline. Moreover, higher sea levels mean that storm surge and flooding events are likely to be significantly more intense in the future.

What we have already seen

10 INCHES

Relative sea level rise over the last century.

What we are expected to see

1.6 FEET

Sea level rise possible by 2050.

1. What concerns you most about this hazard?

2. What could be done to help community members be better prepared for this hazard?

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Hazard: Intense Storms

What we have already seen

55%

Increase in total volume of rainfall in extreme events since mid 1900s.

Since 1950's, more than a dozen hurricanes affected the region

What we are expected to see

Climate change is changing everyt about hurricanes, including the trajectories – New England need prepare for a wet future.

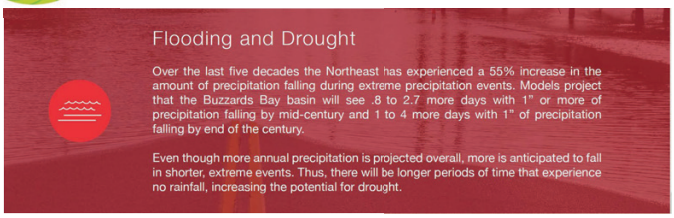
	Observed Baseline 1971-2000	Mid-Century Projected Change	End o Project
Avg. Days with over 1" of precipitation:	8	+2	+3

1. What concerns you most about this hazard?

2. What could be done to help community members be better prepared for this hazard?

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Hazard: Flooding



What we have already seen

55%

Increase in total volume of rainfall in extreme events since mid 1900s.

1 INCH PER DECADE

Regional annual precipitation rate increase since late 1800s.

What we are expected to see

By 2100, 100 year floods may occur as often as every three years

Winter is expected to see the highest increase in days with precipitation over 1". When the ground is frozen, the water cannot infiltrate the soil, which can create flooding conditions.

1. What concerns you most about this hazard?

2. What could be done to help community members be better prepared for this hazard?

3. What actions have you already taken or would you be willing to take to better protect yourself from this hazard?

Climate Change

The City of New Bedford is launching a planning process to identify how our community contributes to and how we could be impacted by a changing climate. Our contributions come in the form of greenhouse gas emissions and the impacts to our community from increased temperatures, more intense storms, and rising seas could alter our way of life. We must take action now to minimize our contributions and prepare for what may come.

Our contributions to a changing climate

How a changing climate could impact us

Ocean temperatures have risen nearly 2°F since 1970s.

1. What concerns you most about climate change?

2. What would you like to see the City do about reducing the community's overall contribution to climate change?

3. What actions have you already taken to minimize your contribution to climate change?

4. What do you think the City should do to better prepare for climate impacts?