

# Downtown Waterfront Municipal Harbor Planning Advisory Committee

June 15, 2016



CITY OF BOSTON  
Martin J. Walsh  
*Mayor*



Boston  
Redevelopment  
Authority  
Brian Golden, Director

Consultants:  
Utile, Inc.  
Durand & Anastas  
Noble & Wickersham

# Agenda

- **Preparing for Climate Change**
  - District Vulnerability
  - Climate Ready Boston
  - Climate Change and the DTW MHP
    - MHP limitations on enforceable climate change provisions
    - Subcommittee recommendations
    - Climate change provisions of the MHP
  - Existing Climate Change Policies
  - Climate Change Preparedness Plan

# Preparing for Climate Change

## District Vulnerability



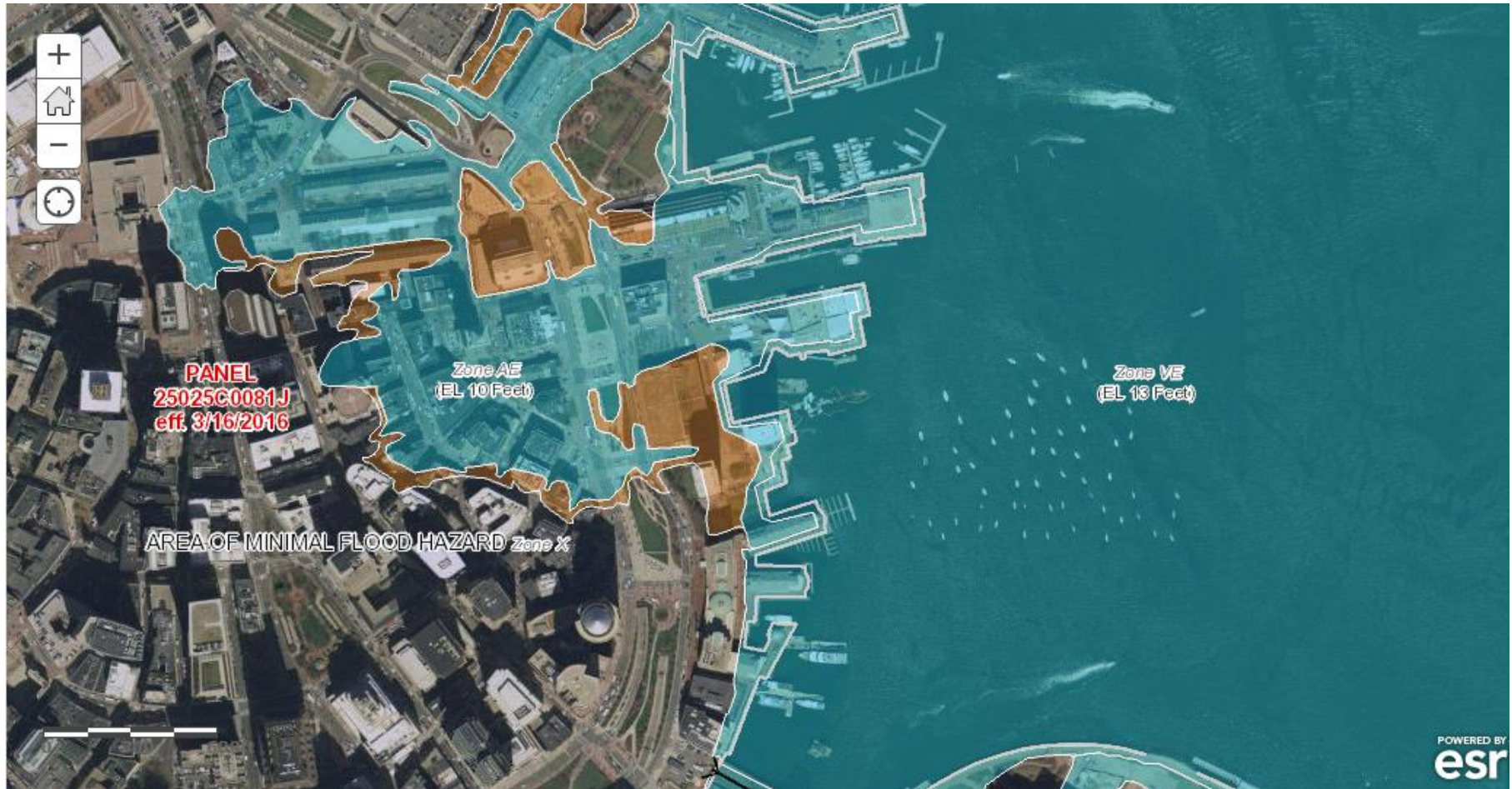
# District Vulnerability

- The Downtown Waterfront is particularly vulnerable to inundation from coastal storms and future sea level rise due to its orientation to open water at the base of the Harbor and the area's elevation.



# District Vulnerability

FEMA's most recent Flood Insurance Rate Maps (March, 2016) delineate much of the planning area within a Special Flood Hazard Area, subject to the 100-year storm event.



# District Vulnerability

- Coastal Zone Management's has developed a reference document, *Sea Level Rise: Understanding and Applying Trends and Future Scenarios for analysis and Planning* (2013)
- New projects within the DTW MHP shall utilize the intermediate to highest scenarios to determine Base Floor Elevations (BFEs), which anticipate
  - 1.19 to 1.81 feet by 2050 and
  - 4.20 to 6.83 feet by 2100.



# Preparing for Climate Change

Climate Ready Boston, Mia Goldwasser





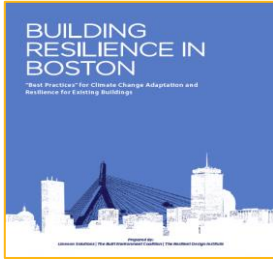
*CLIMATE*  
**READY**  
*BOSTON*



## CLIMATE READY BOSTON GOAL

Generate solutions for resilient buildings, neighborhoods, and infrastructure to help Boston and its metro region prosper in the face of long-term climate change impacts, including sea level rise, coastal and stormwater flooding, and extreme temperatures.

# CONTEXT



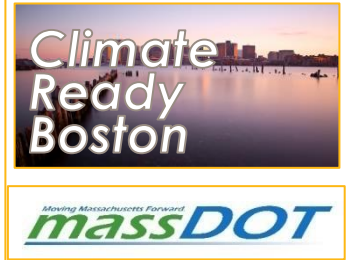
'13



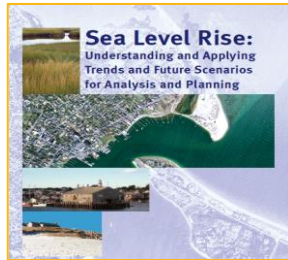
'14



'15



'16



# CLIMATE READY BOSTON

## PROJECT COMPONENTS

Winter 2015-6



- Review of existing literature
- Scientific consensus on projections and future scenarios

Spring 2016

**Integrated Vulnerability Assessment**

- Asset inventory
- Social Vulnerability
- Hazard overlay
- Risk assessment

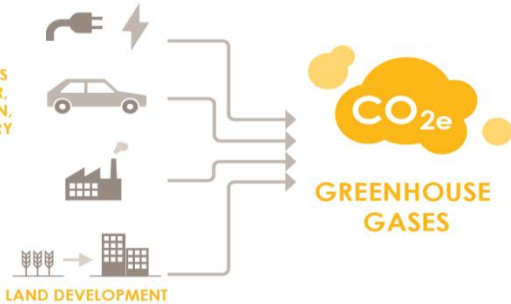
Summer 2016



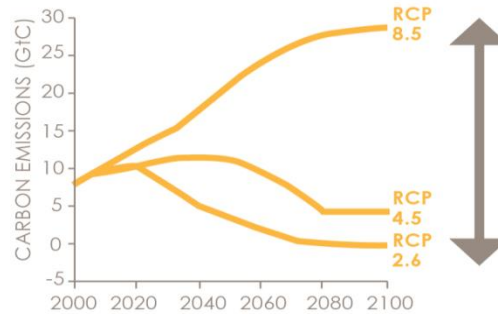
- Critical Resilience focus areas
- Policy
- Physical Projects
- Programs

# FUTURE CONDITIONS DEPEND ON OUR ACTIONS TODAY

FUEL SOURCES FOR POWER, TRANSPORTATION, & INDUSTRY



TODAY'S CHOICES



EMISSION SCENARIOS

The more greenhouse gases in the atmosphere...

MORE HOT DAYS



INCREASED EXTREME PRECIPITATION



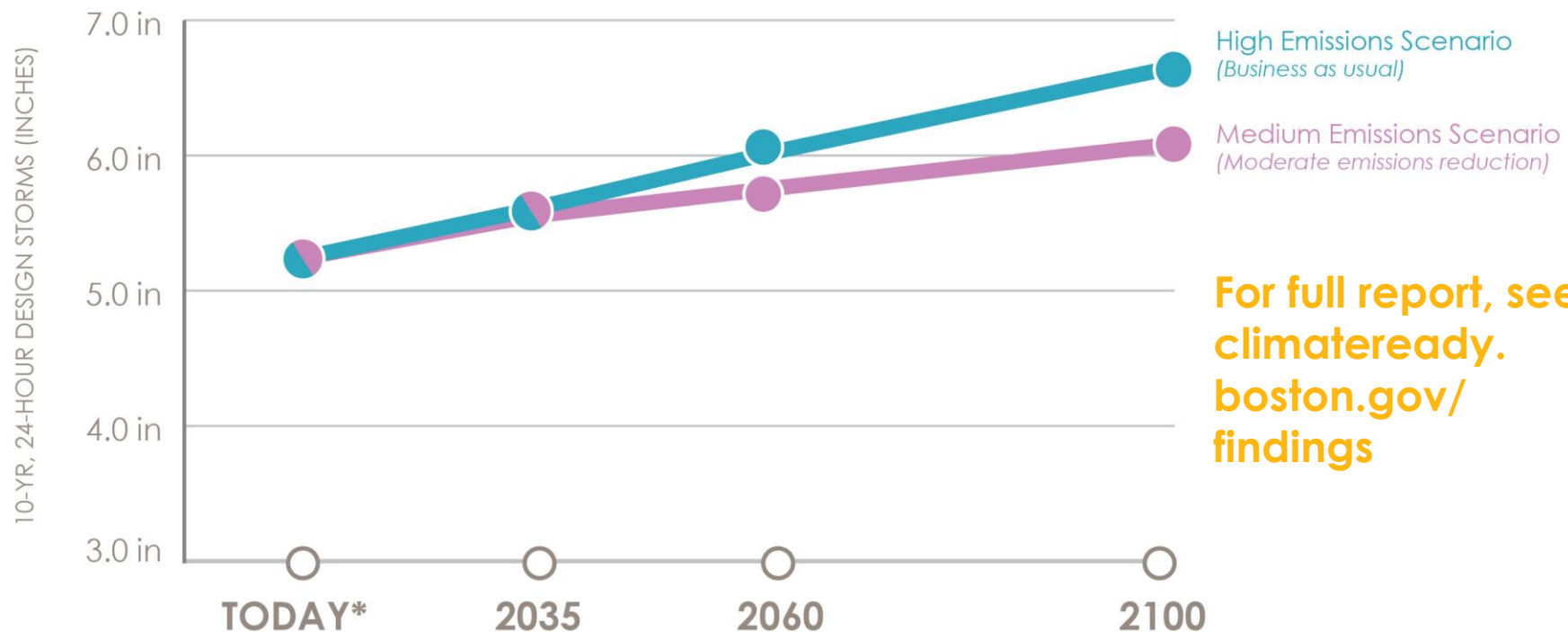
GREATER AMOUNTS OF SEA LEVEL RISE



FUTURE IMPACTS

For full report, see [climateready.boston.gov/findings](https://climateready.boston.gov/findings)

# RAINFALL FROM STORMS WILL INCREASE

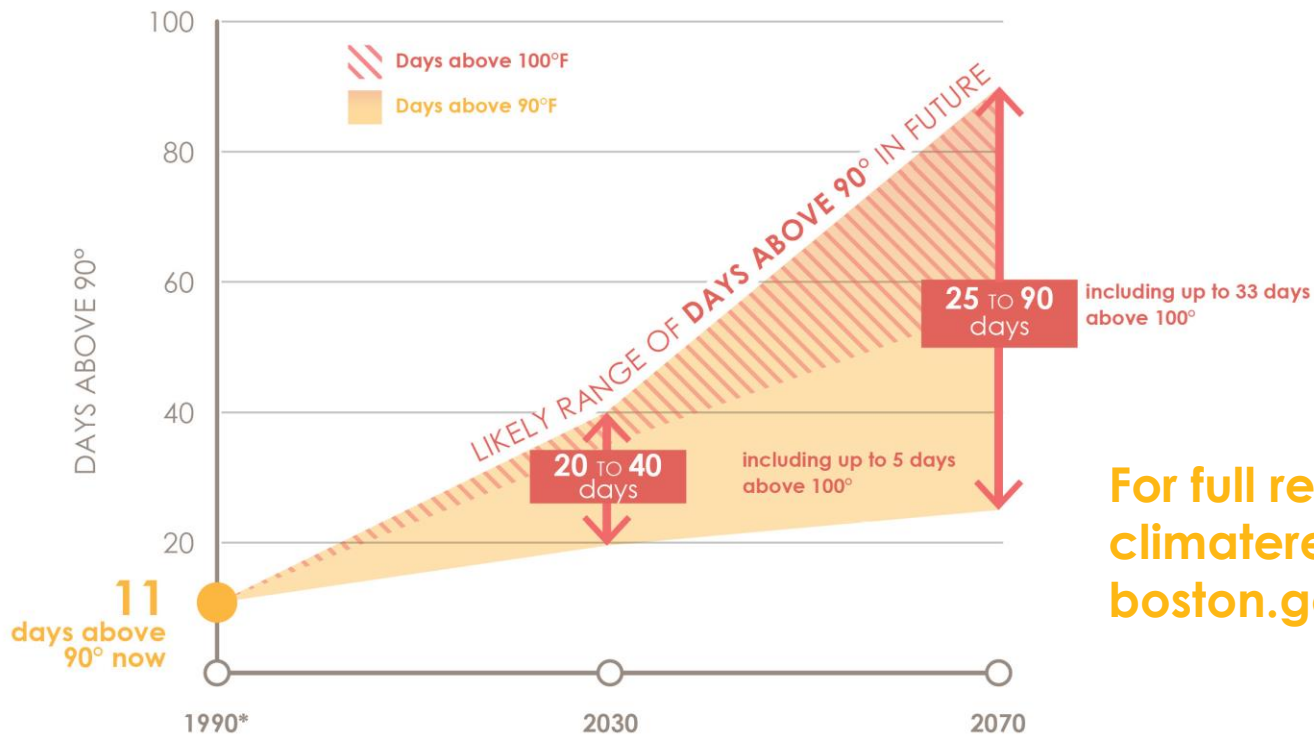


**For full report, see  
climateready.  
boston.gov/  
findings**

\* "Today" baseline represents historical average from 1948-2012  
Confidence intervals are not available for these projections but are likely large,  
so these numbers should be considered as the middle of a large range

Data Source:  
Boston Water & Sewer Commission

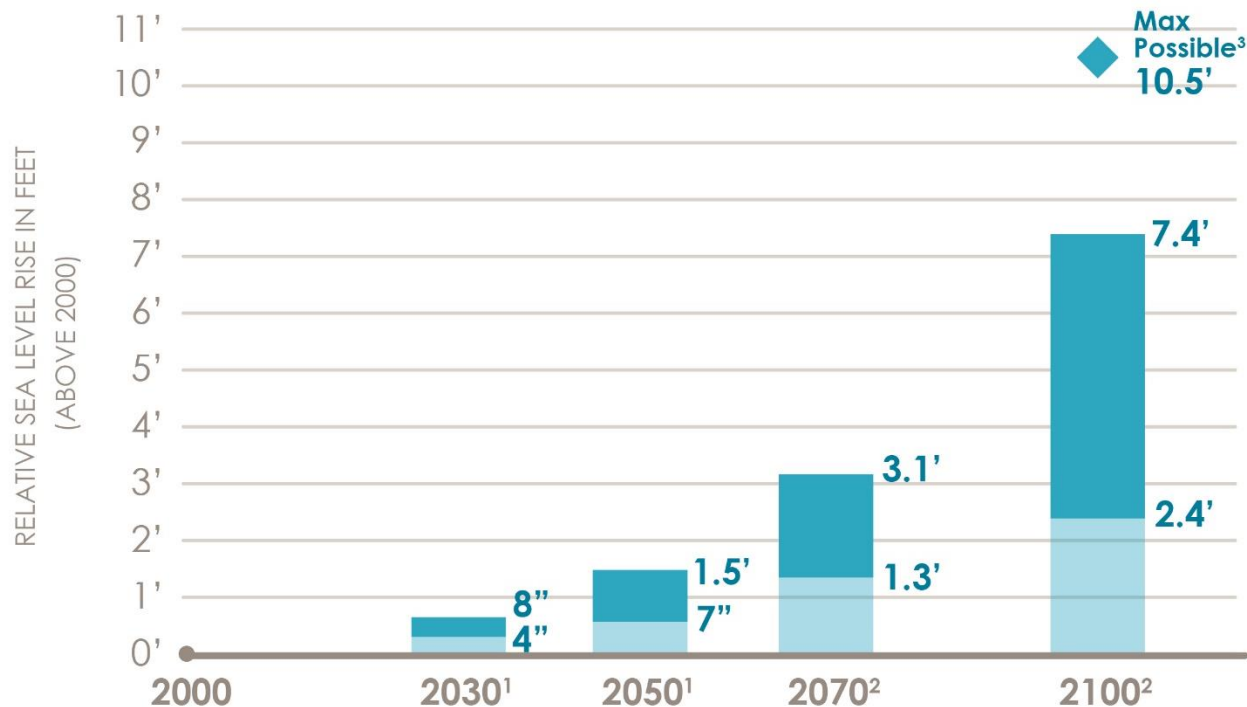
# THE NUMBER OF VERY HOT DAYS WILL INCREASE



For full report, see  
[climateready.  
boston.gov/findings](http://climateready.boston.gov/findings)

\* Baseline represents historical average from 1971-2000  
Upper values from high emissions scenario. Lower values from low emissions scenario.

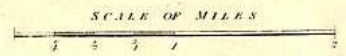
# RELATIVE SEA LEVEL IN BOSTON WILL RISE



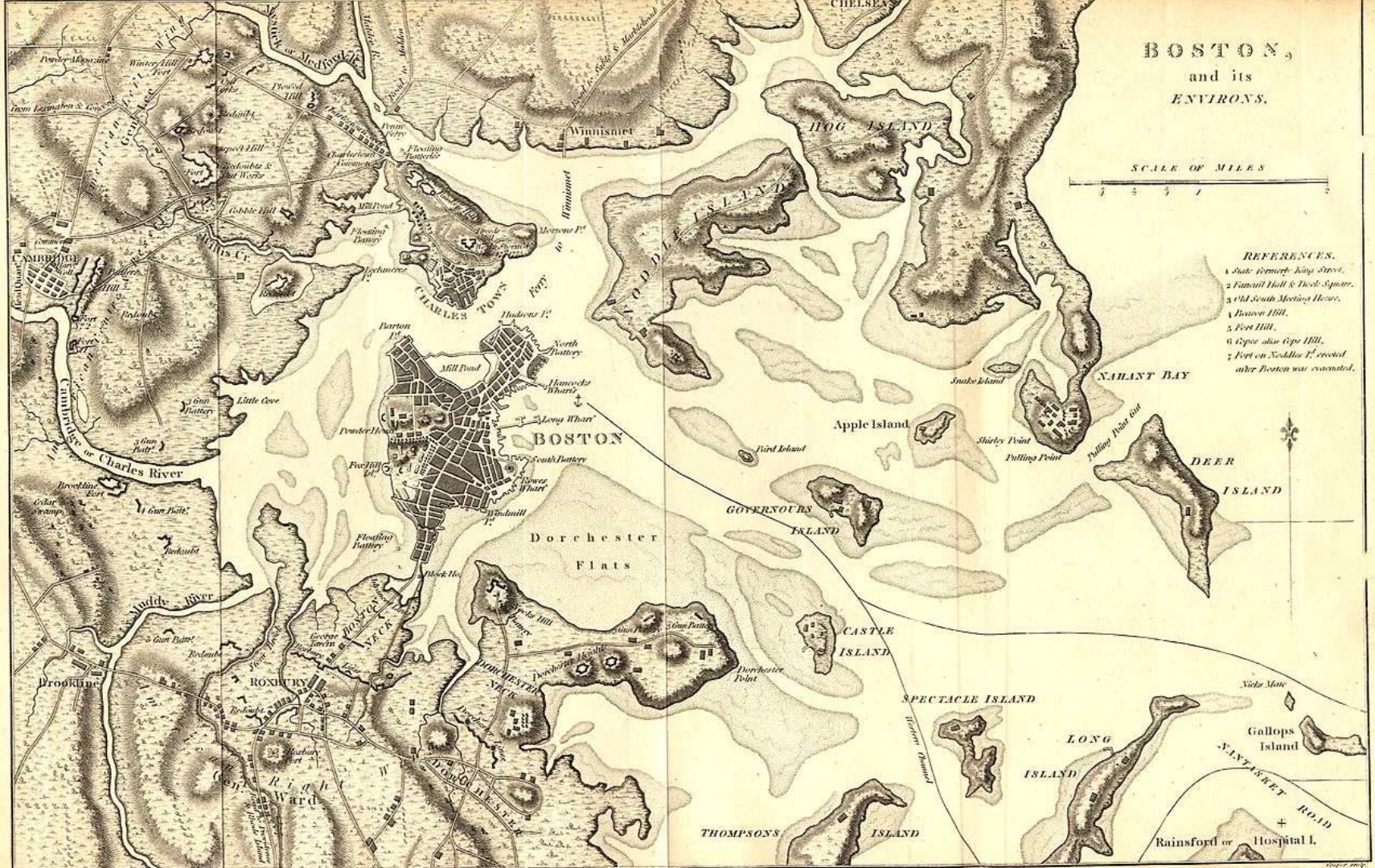
For full report, see [climateready.boston.gov/findings](https://climateready.boston.gov/findings)

1 - Likely under all emission scenarios  
2 - Likely under moderate to high emission scenarios  
3 - Low probability under high emission scenario

# BOSTON, and its environs.



- REFERENCES.
- 1 State formerly King Street.
  - 2 Faneuil Hall & Dock Square.
  - 3 Old South Meeting House.
  - 4 Beacon Hill.
  - 5 Fort Hill.
  - 6 Cape also Cape Hill.
  - 7 Fort on No. 11th St. erected after Boston was evacuated.





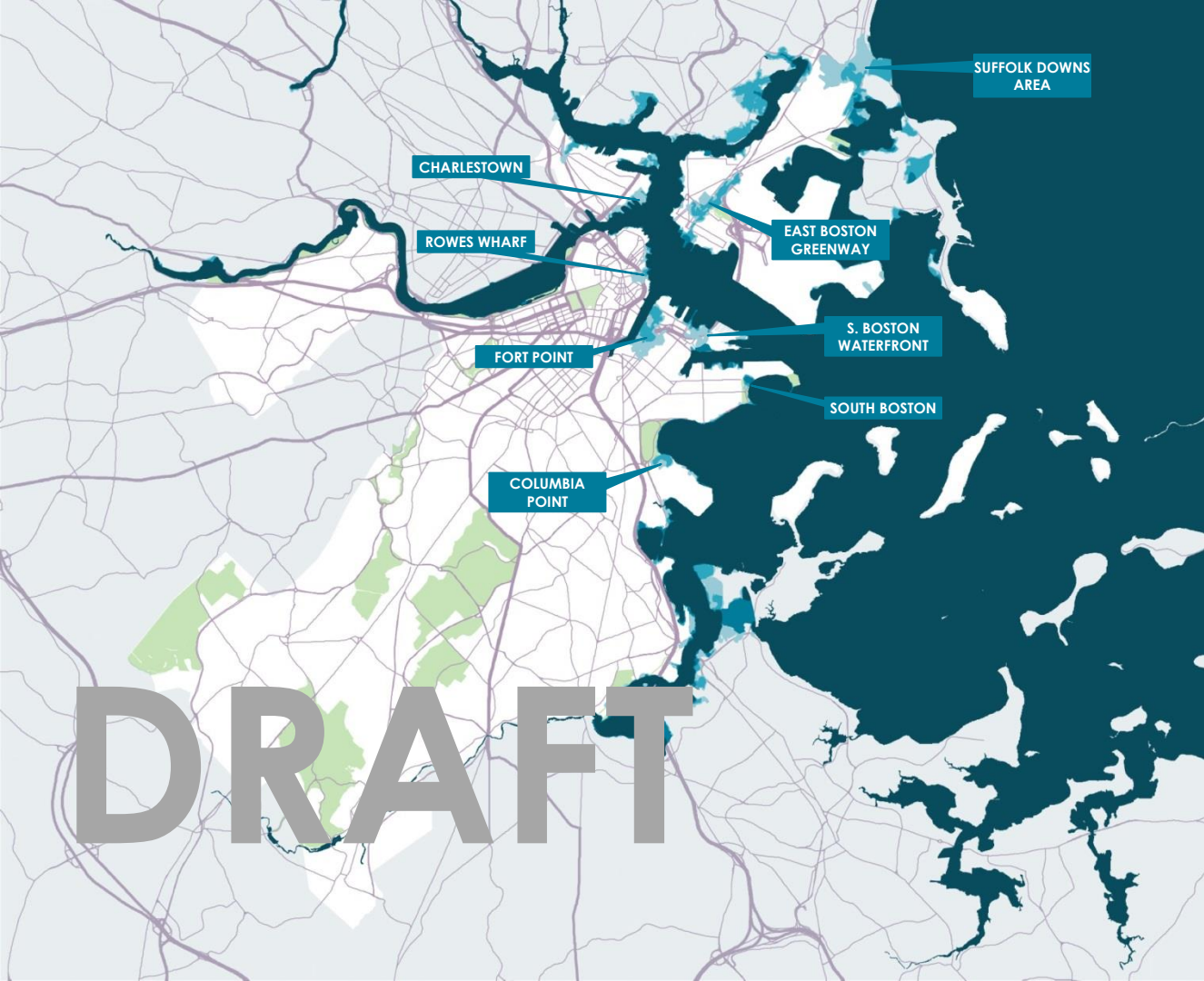
# 2013 FLOODING VULNERABILITY

## FLOODING RISK

- 0.2% Annual Probability
- 1% Annual Probability
- 10% Annual Probability

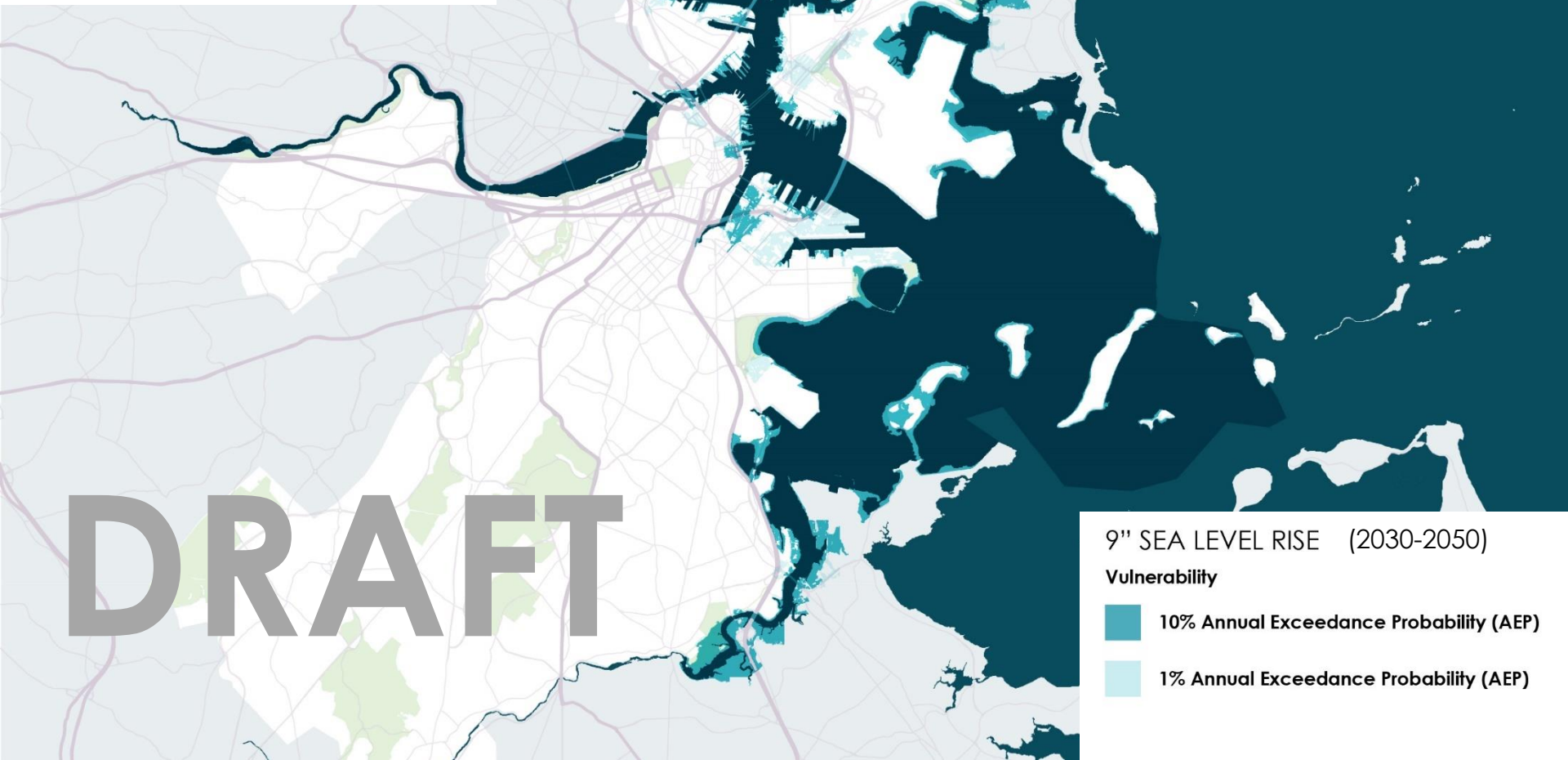
## OTHER

- Major Parks
- Major Roads



DRAFT

# CLIMATE READY BOSTON FLOOD EXTENT MAPS



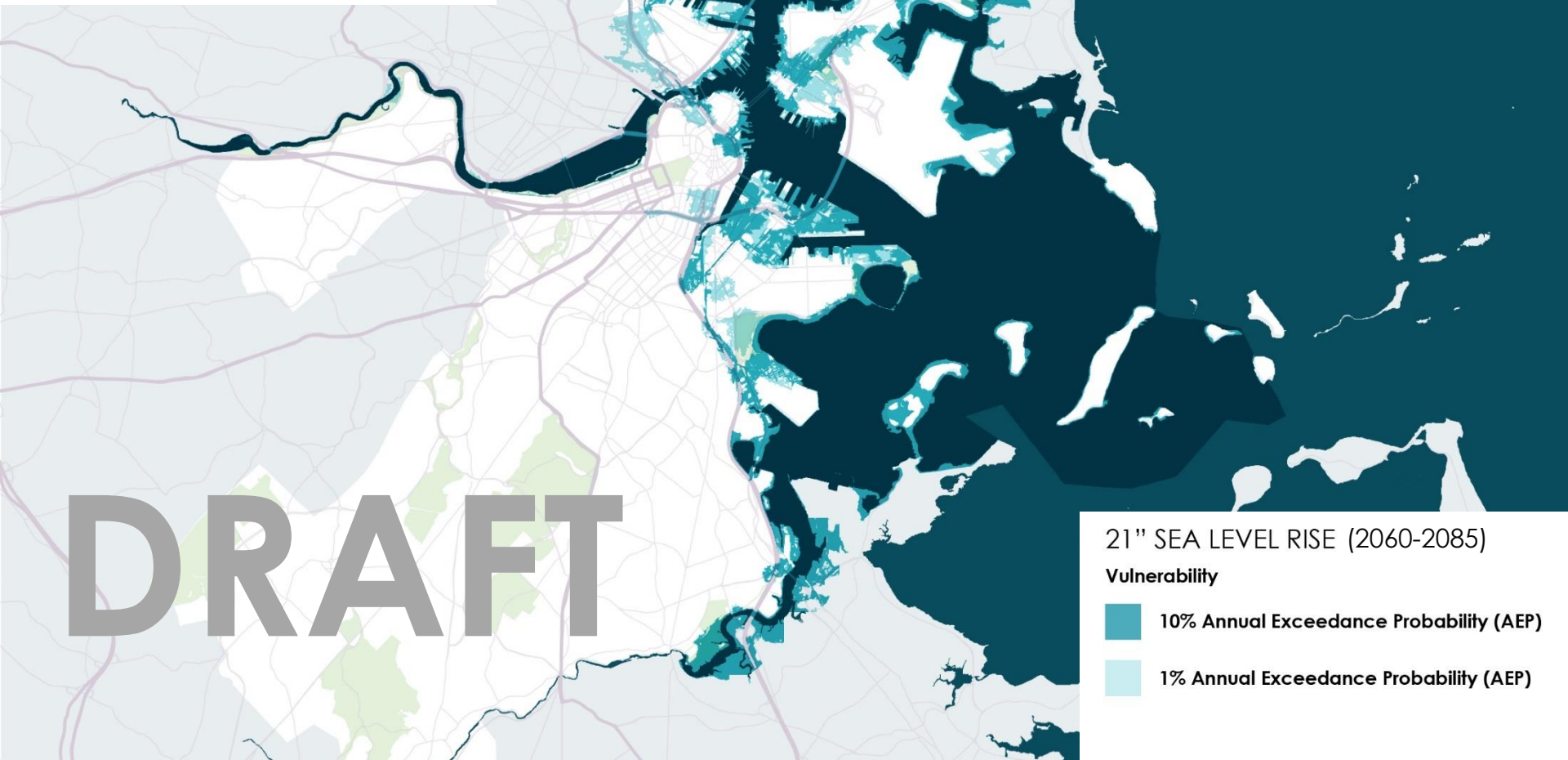
DRAFT

9" SEA LEVEL RISE (2030-2050)

Vulnerability

-  10% Annual Exceedance Probability (AEP)
-  1% Annual Exceedance Probability (AEP)

# CLIMATE READY BOSTON FLOOD EXTENT MAPS

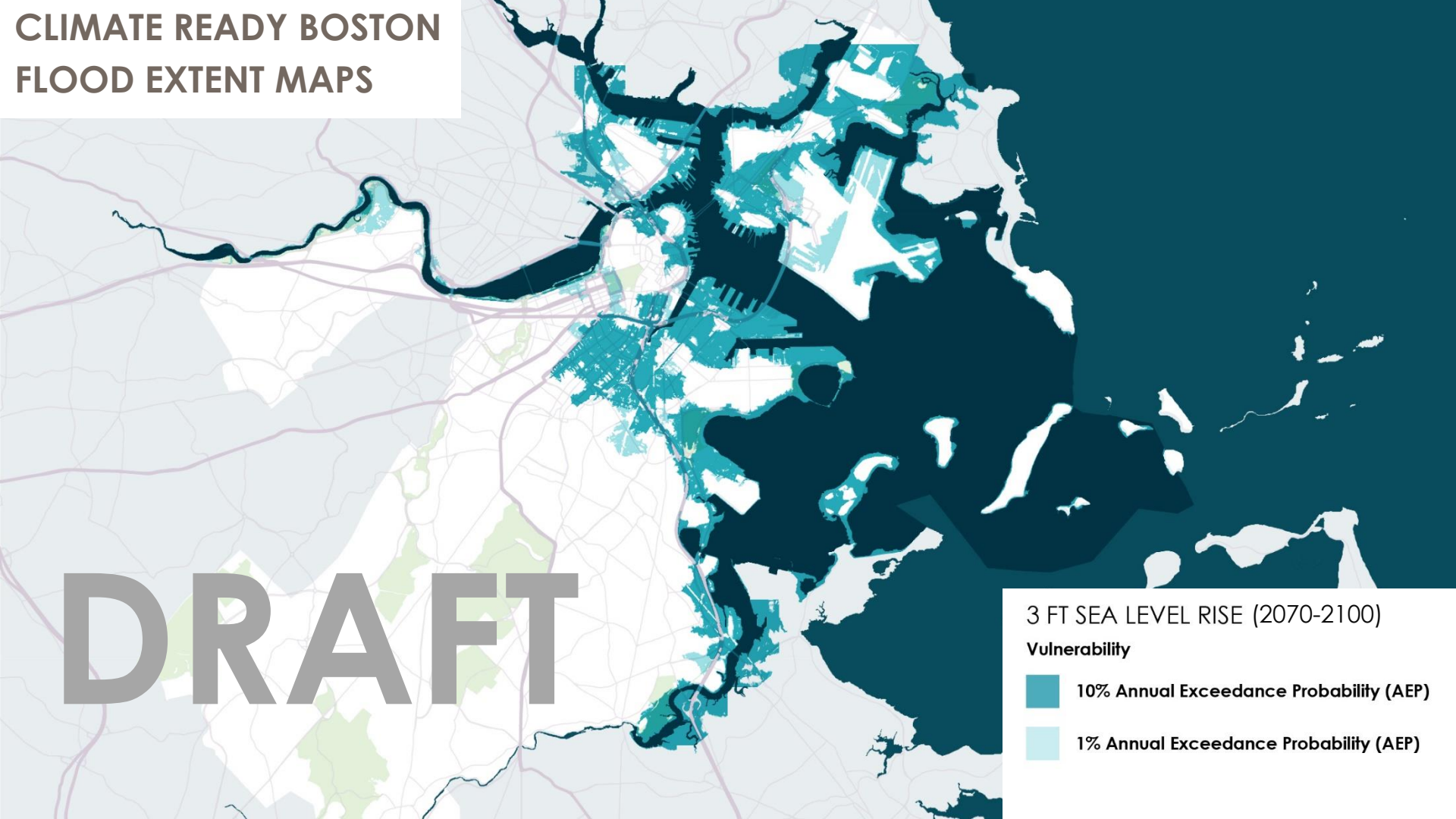


21" SEA LEVEL RISE (2060-2085)

### Vulnerability

-  10% Annual Exceedance Probability (AEP)
-  1% Annual Exceedance Probability (AEP)

# CLIMATE READY BOSTON FLOOD EXTENT MAPS



DRAFT

3 FT SEA LEVEL RISE (2070-2100)

Vulnerability

-  10% Annual Exceedance Probability (AEP)
-  1% Annual Exceedance Probability (AEP)

# Downtown - 100-Year Flood + 9 inches of Sea Level Rise



- 100 YEAR FLOOD INCLUDING 9 INCHES SEA LEVEL RISE
- EVACUATION ROUTES
- VULNERABLE POPULATIONS
- HAZARDOUS MATERIALS AND SITES
- ARTICLE 80 PIPELINE BUILDINGS
- HISTORIC BUILDINGS AND CULTURAL INSTITUTIONS
- BRIDGES
- TUNNELS
- ✈ AIRPORT
- ⚓ LIGHTHOUSE
- H HOSPITAL
- P POLICE FACILITY
- F FIRE STATION
- ⚓ SCHOOL FACILITY
- ⚓ UNIVERSITY
- ⚓ SEAPORT
- 🚊 TRANSIT STATIONS
- HEALTH AND SAFETY
- RECREATION
- WATER AND SEWER
- CRITICAL FACILITIES
- TRANSPORTATION

# DRAFT



# Downtown - 100-Year Flood + 3 Feet of Sea Level Rise



- 100 YEAR FLOOD INCLUDING 3 FEET SEA LEVEL RISE
- EVACUATION ROUTES
- VULNERABLE POPULATIONS
- HAZARDOUS MATERIALS AND SITES
- ARTICLE 80 PIPELINE BUILDINGS
- HISTORIC BUILDINGS AND CULTURAL INSTITUTIONS
- BRIDGES
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# RESILIENCE INITIATIVES PRINCIPLES



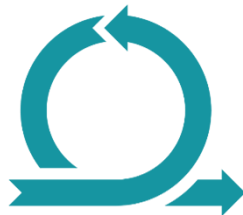
SUPPORT **MULTIPLE BENEFITS** WITH EACH ACTIVITY



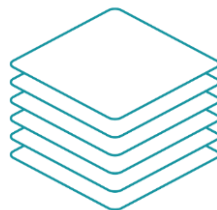
MAKE IMPROVEMENTS AS PART OF **NATURAL BUILDING CYCLES**, AND **ADDRESS MARKET FAILURES**



**INCORPORATE LOCAL INVOLVEMENT** IN DESIGN AND DECISION-MAKING

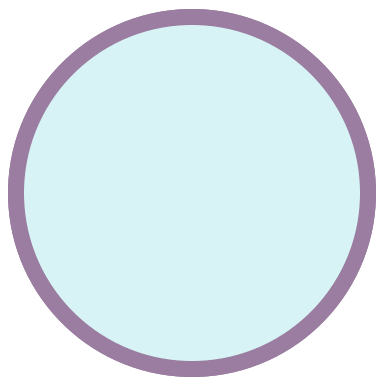


DEVELOP **ADAPTIVE AND FLEXIBLE STRATEGIES**



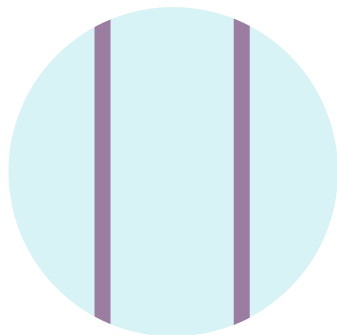
**WORK IN LAYERS** FOR INDEPENDENTLY EFFECTIVE SOLUTIONS

## RESILIENCE INITIATIVES LAYERS



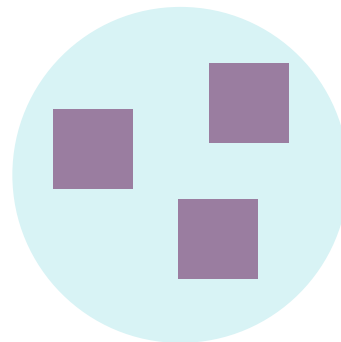
### Protected Shores

*Interventions to prevent harbor flooding; protect against storm surge; minimize upland wave zones; and raise coastal edge elevations*



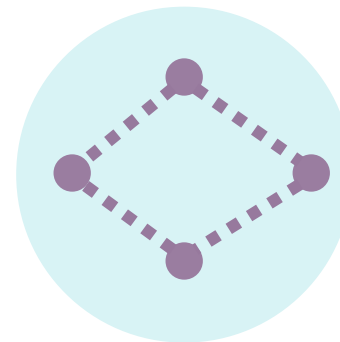
### Resilient Infrastructure

*Modification of existing infrastructure or creation of new infrastructure to allow effective functioning under future climate conditions.*



### Adapted Buildings

*Efforts to retrofit existing buildings to be more resilient or to build resilient new buildings*



### Prepared & Connected Communities

*Planning efforts and operational protocols that increase communities', facilities', and institutions' ability to thrive under future climate conditions.*



# [CLIMATEREADY.BOSTON.GOV](https://www.climate-ready.boston.gov)

LAUNCHED ON EARTH DAY, APRIL 22

CITY of **BOSTON**

AN OFFICIAL WEBSITE OF THE BOSTON CITY GOVERNMENT

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**READY**  
BOSTON





# CLIMATE READY BOSTON

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City of Boston Environment Department  
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# Preparing for Climate Change

Climate Change and the DTW MHP



# Climate Change and the DTW MHP

- Climate resiliency is not a focus of the Waterways regulations, so there are few provisions that can be substituted or amplified with a direct effect on climate resiliency
- An MHP cannot supercede applicable building codes with enforceable provisions.
- The DTW MHP subcommittee on climate resiliency



# Climate Change and the DTW MHP

The DTW MHP addresses three elements of climate resiliency

- One **amplification** specifies that areas improved for public open space shall also be incrementally elevated, to improve resiliency
- Another **amplification** promotes, where possible, design standards and construction methods that improve the resiliency of interior FPA space within the DTW MHP.
- A **substitute provision** allows additional building height for existing structures as long as steps are taken to flood-proof mechanicals and provide additional public benefits.



# Preparing for Climate Change

## Existing Climate Change Policies



# Existing Climate Change Requirements

- **City of Boston Climate Action Plan**
- **City of Boston Zoning Code**
  - All new buildings over 50,000 square feet are subject to the City's Green Building Zoning Code Article 37 and are expected to pursue LEED Silver rating
  - Climate Change Preparedness and Resiliency Guidelines and associated Checklist for projects subject to the Article 80 development review component of the city's zoning code.



# Preparing for Climate Change

Climate Change Preparedness Plan





# Climate Change Preparedness Plan

## For existing conditions

Property owners should address the feasibility of implementing the following:

- Temporary watertight window and door barriers.
- Sealed electrical, communications and fuel line wall penetrations.
- Septic line backflow prevention valves.
- Sump and discharge pumps.
- Alternative electrical lines for pumps to an external or emergency generator.
- Back-up utility connections for temporary generators.
- Use of dry and wet flood proofing coatings and materials on the ground floor and at sub-grade elevations.
- Measures for passive survivability in times of power and utility failure.
- Viability of fire suppression systems in flood conditions.
- Flood emergency plan to ensure worker and tenant safety and limit damage to building systems and infrastructure.
- Protection of building records and inventory.

# Climate Change Preparedness Plan

## For future conditions - #1 Best Practices

Property owners and project proponents shall evaluate and provide information on the following:

- Design of ground floor as a sacrificial level that can be hardened in the future to prevent inundation, and elevate primary entrances to the building's second floor.
- Design of floor to floor heights on the ground level to accommodate future raised floor level on the ground floor.
- Determine Design Flood Elevation (DFE) for the property and related elevations for the following:
  - Building mechanicals: heating, HVAC, elevator systems
  - Ventilation exhaust and intakes
  - Utilities, telecommunication systems, electrical and plumbing
  - Back-up power systems and emergency generators
  - Fuel storage systems and hazardous materials
  - Points of egress and underground garage portals
- Dry & or wet flood proofing per FEMA construction standards up to DFE.

# Climate Change Preparedness Plan

## For future conditions – #2 Best Practices

Property owners and project proponents shall evaluate and provide information on the following:

- Structural reinforcement measures up to the DFE to ensure building is designed to support hydrostatic and flood loading.
- Measures to limit inundation of underground parking garages such as drainage pumps and floodgates.
- Deployable flood management measures such as sandbags and flood barriers, adjustable parapet wall.
- Storage of hazardous materials outside or above flood hazard areas.
- Installation of watertight utility conduits & elevation of utility connections and exterior auxiliary hookups for portable generators above DFE.
- Cogeneration and backup power systems.
- Cogeneration and backup power systems.
- Sewerage backflow preventers.
- Building materials and measure to withstand direct and indirect impacts of high winds and limit damage from flood or wind induced debris.

# Climate Change Preparedness Plan

## For future conditions – #3 Best Practices

Property owners and project proponents shall evaluate and provide information on the following:

- Use of high albedo pavers and roofing surfaces to manage heat gain.
- Operable windows to allow for air circulation in times of power outage.
- Use of saltwater tolerant landscape vegetation that also provides shade and mitigates the effects of wind.
- Implementation of Low Impact Design storm water measures and rainwater recycling
- Design elements for public outdoor areas including shade structures and measures to limit damage from inundation and wave action.
- Measures for passive survivability in times of power and utility failure.
- Viability of fire suppression systems in flood conditions.
- Flood emergency plan to ensure worker and tenant safety and limit damage to building systems and infrastructure.
- Protection of building records and inventory.

Downtown Waterfront

# Next Meeting

# Wednesday, June 22, 6-8 pm

