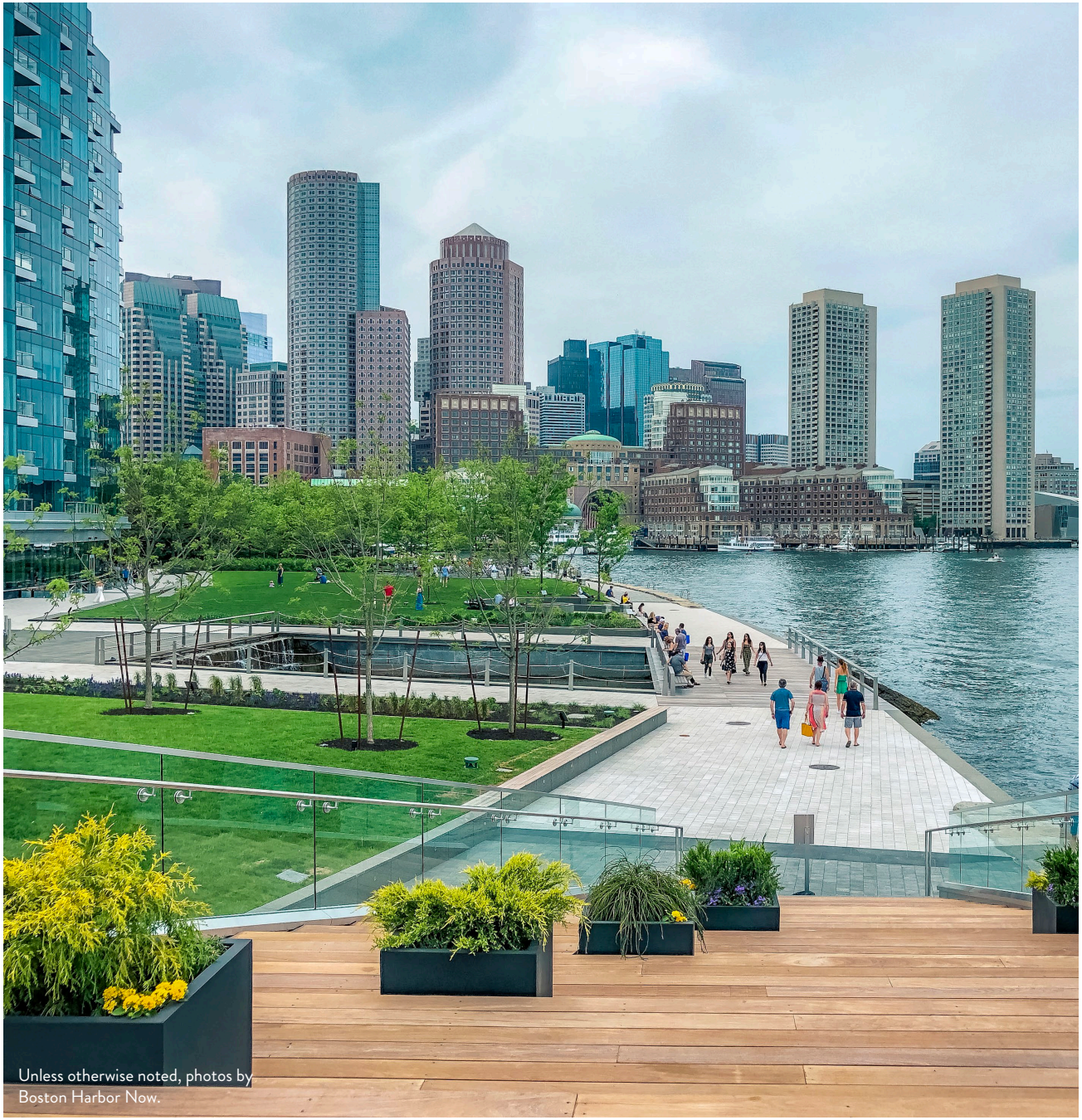
VISUALIZING HARBORWALK 2.0

DESIGNING A MORE RESILIENT AND EQUITABLE WATERFRONT FOR GREATER BOSTON

BOSTON HARBOR NOW



Unless otherwise noted, photos by Boston Harbor Now.

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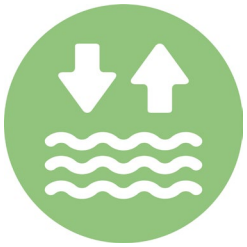
GOALS OF HARBORWALK 2.0

Boston Harbor Now recognizes that nearly four decades of planning has created an extensive network of waterfront paths and parks on public and private property. In order to address the need for higher standards in the face of the climate crisis and decades of structural inequality, Boston Harbor Now is pushing for a bolder waterfront vision encapsulated by Harborwalk 2.0.

These principles are described in and guide the development of Boston Harbor Now's comment letters. This guide illustrates some of the ways the principles might be realized across a range of coastal conditions. Though written for Boston, these principles can be applied to other urban waterfronts in Massachusetts and beyond.



RESILIENCE

The waterfront should be prepared for the impacts of climate change, including coastal and stormwater flooding and heat.

EQUITY

The waterfront should center equity and inclusion in the development of its design, construction practices, tenants, and programming.

ACCESS

The waterfront should be accessible and welcoming, reflected in its activation, connectivity to other waterfront paths and to the city's neighborhoods, and signage.

RESILIENCE

The waterfront should be prepared for the impacts of climate change, including coastal and stormwater flooding and heat.

The waterfront should include a variety of climate adaptation strategies to protect and serve Boston at a district scale.

The waterfront should adapt to address flooding as a result of sea level rise, storm surge, and extreme precipitation.

The waterfront should adapt to predicted rising temperatures, incorporating areas for respite as the number of very hot days continues to increase and to mitigate heat island effects.

The waterfront should incorporate nature-based approaches and strategies to address the impacts of climate change.

Nature-Based Approaches
-Vegetated Berms
-Living Seawall
-Living Shorelines

Flood Mitigation
-Sea Level Rise
-Storm Surge
-Stormwater Management

Heat Mitigation
-Shade
-Misters
-Cooling Areas

EQUITY

The waterfront should center equity and inclusion in the development of its design, construction practices, tenants, and programming.

The waterfront should be designed with strategies that make the waterfront feel safe and inclusive to people with different backgrounds and abilities.

The waterfront should eliminate features that make visitors feel unwelcome or excluded.

The waterfront should offer entertainment and food at a range of price points.

The waterfront should have multilingual signage and ADA accommodations that help users navigate the waterfront.

Women and Minority Owned Businesses

Language Access

Affordable Entertainment

Affordable Food

Accessibility

ACCESS

The waterfront should be accessible and welcoming, reflected in its activation, connectivity to other waterfront paths and to the city's neighborhoods, and signage.

The waterfront should include linear and lateral connections between the city and the water, including walking, biking, and connections to public transit.

The waterfront should have amenities that are clear and abundant, communicated with both wayfinding and interpretive signage.

The waterfront should include numerous activation strategies that invite people to explore and spend time along the harbor.

The waterfront should be visible from inland areas and the design should communicate that it is available and open to visitors.

DYNAMIC FLOOD VULNERABILITY

Boston has 49 miles of shoreline with more than 40 miles of existing Harborwalk. Waterfront access is a public amenity, but low lying coastal areas are at risk of flooding. Severe storms, extreme precipitation, and rising sea levels each threaten to inundate these areas and pose different risks.

Harborwalk 2.0 addresses flood vulnerability along the waterfront. Sea level rise raises the regularly occurring cyclical high tides over time. Storm surge pushes water into the harbor and adds wave action along the shore. Increased precipitation adds rain and snow to storm water systems that drain to the harbor but can't always drain at high tide.

SPECTRUM OF FLOOD VULNERABILITY

TIME FRAME	PROJECTED SEA LEVEL RISE (IN)	10% ANNUAL EXCEEDANCE PROBABILITY WATER SURFACE ELEVATION (FT, NAVD88)	1% ANNUAL EXCEEDANCE PROBABILITY WATER SURFACE ELEVATION (FT, NAVD88)
2030	14.4" SLR	9.3'	10.7'
2050	28.8" SLR	10.7'	12.3'
2070	50.4" SLR	12.5'	14.0'

Source:
MA Coast Flood Risk Model

* Boston City Base (BCB) - BCB is a city-wide datum that can be converted to NAVD88 by adding 6.46 feet.

2030 - FLOOD DEPTH FOR 1% ANNUAL COASTAL FLOOD EXCEEDENCE PROBABILITY

LEGEND

- BUILDING FOOTPRINTS
- ROADWAY NETWORK
- EXISTING HARBORWALK
- >10.0 FT
- 10.0 FT
- 9.0 FT
- 8.0 FT
- 7.0 FT
- 6.0 FT
- 5.0 FT
- 4.0 FT
- 3.0 FT
- 2.0 FT
- 1.0 FT
- 0.5 FT

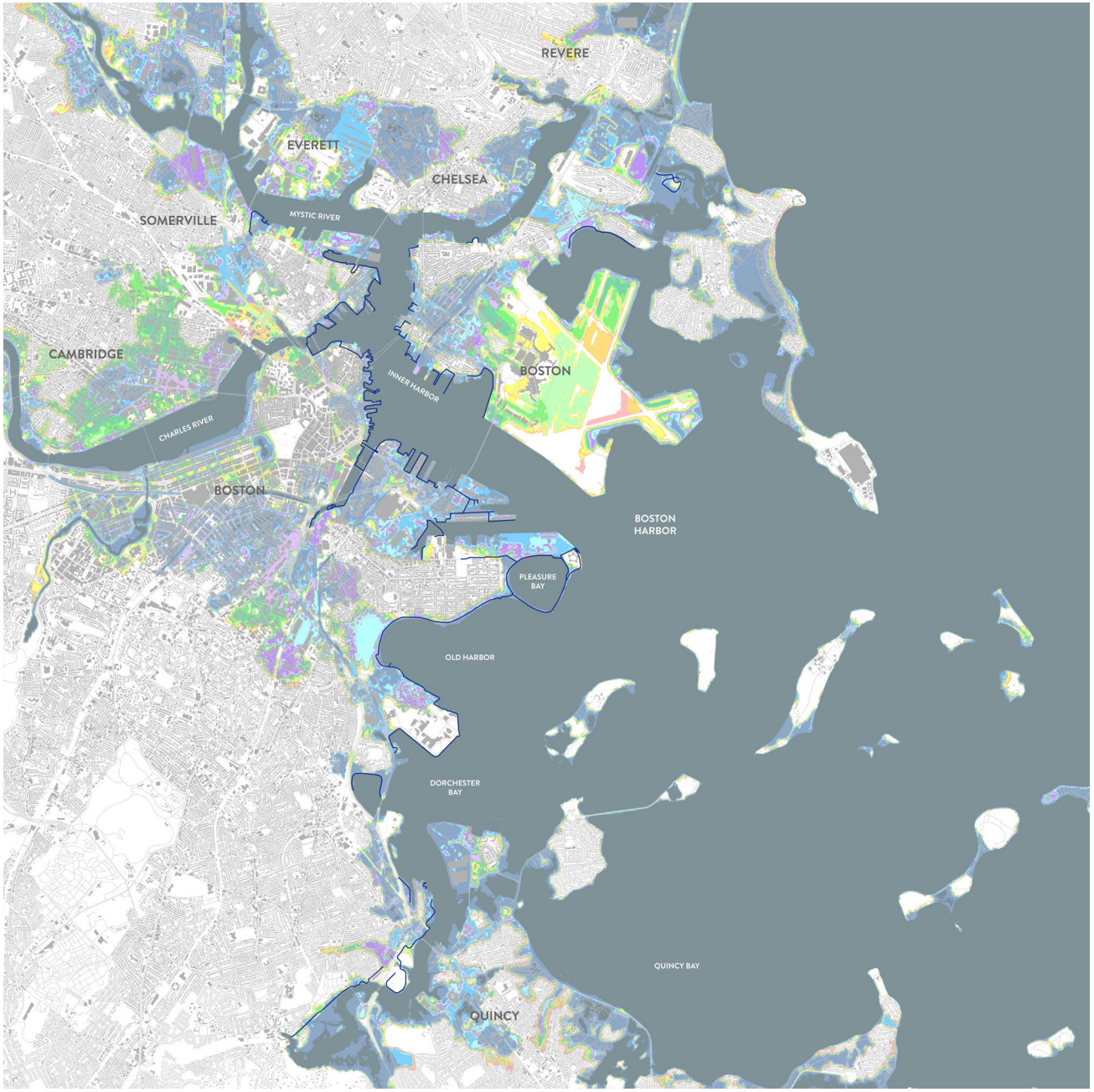
Source:
MA Coast Flood Risk Model, May 30, 2023

2050 - FLOOD DEPTH FOR 1% ANNUAL COASTAL FLOOD EXCEEDENCE PROBABILITY

LEGEND

- BUILDING FOOTPRINTS
- ROADWAY NETWORK
- EXISTING HARBORWALK
- >10.0 FT
- 10.0 FT
- 9.0 FT
- 8.0 FT
- 7.0 FT
- 6.0 FT
- 5.0 FT
- 4.0 FT
- 3.0 FT
- 2.0 FT
- 1.0 FT
- 0.5 FT

Source:
MA Coast Flood Risk Model, May 30, 2023



2070 - FLOOD DEPTH FOR 1% ANNUAL COASTAL FLOOD EXCEEDENCE PROBABILITY

LEGEND

- BUILDING FOOTPRINTS
- ROADWAY NETWORK
- EXISTING HARBORWALK
- >10.0 FT
- 10.0 FT
- 9.0 FT
- 8.0 FT
- 7.0 FT
- 6.0 FT
- 5.0 FT
- 4.0 FT
- 3.0 FT
- 2.0 FT
- 1.0 FT
- 0.5 FT

Source:
MA Coast Flood Risk Model, May 30, 2023

HEAT VULNERABILITY

As a result of a changing climate, the number of days when Boston's temperatures reach extreme heat levels are projected to increase, amplifying the already existing threats of heat island effect, putting the health of vulnerable populations at risk.

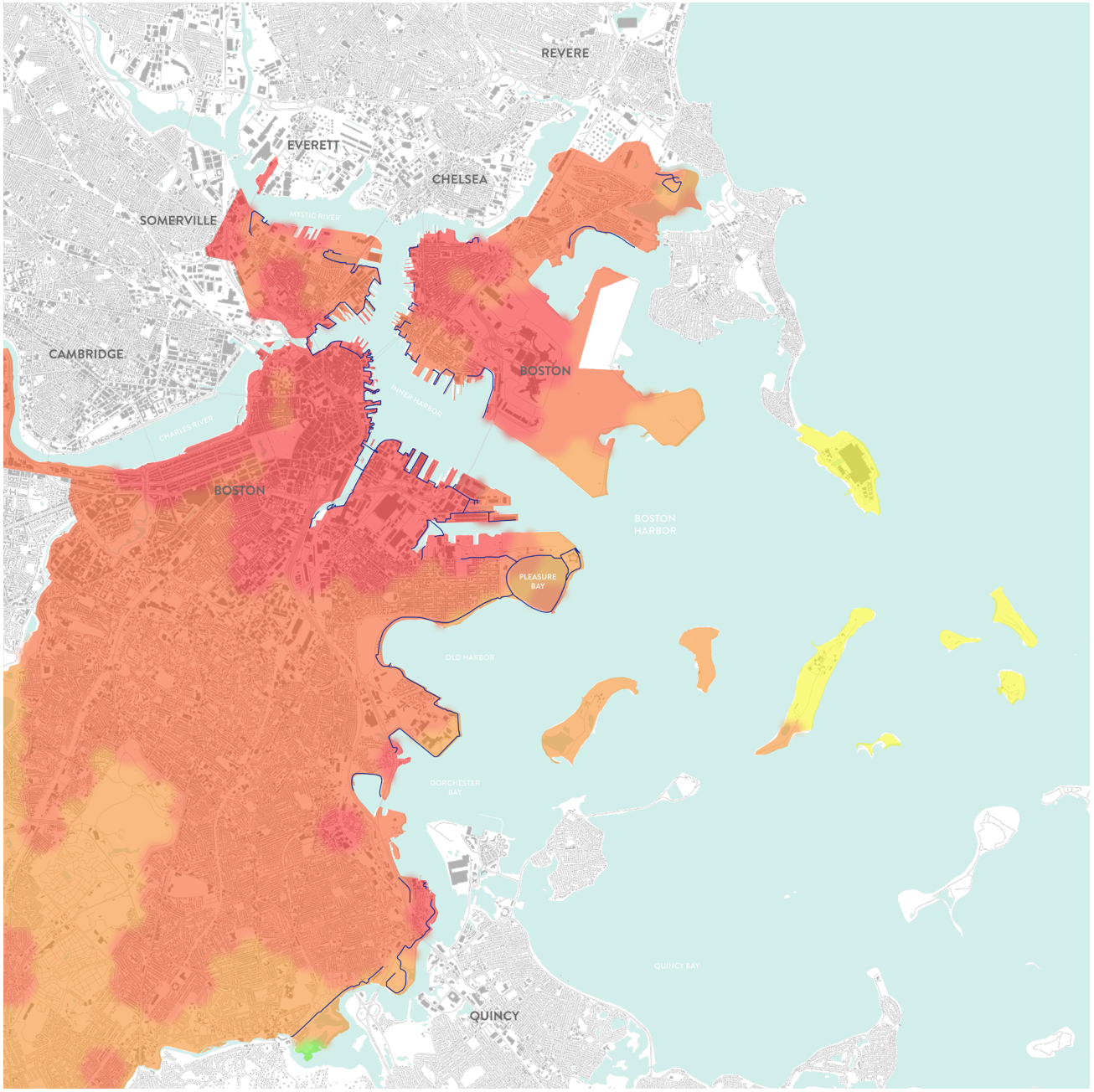
The waterfront can be naturally cooling with breezes off the water as well as beaches, pools, and splash pads for people to cool down in, but much of the coastline is also paved and lacks shade.

Harborwalk 2.0 addresses heat vulnerability along the waterfront, by recommending new surface materials and permeability, canopy cover, and shade structures.

SPECTRUM OF HEAT VULNERABILITY

TIME FRAME	AVERAGE SUMMER TEMPERATURES	DAYS BELOW 32 DEGREES F	DAYS ABOVE 90 DEGREES F
2030	69 - 73° F	86 TO ~ 120	17 TO ~ 26
2050	70 - 76° F	68 TO ~ 120	25 TO ~ 42
2070	69 - 84° F	34 TO ~ 120	33 TO ~ 62

Source:
Climate Ready Boston, Climate Projection Consensus



2022-
MEDIAN DAILY TEMPERATURE

Source:
Climate Ready Boston

HARBORWALK 2.0 TOOLKIT

How can the Harborwalk 2.0 Toolkit be implemented in three different scenarios?

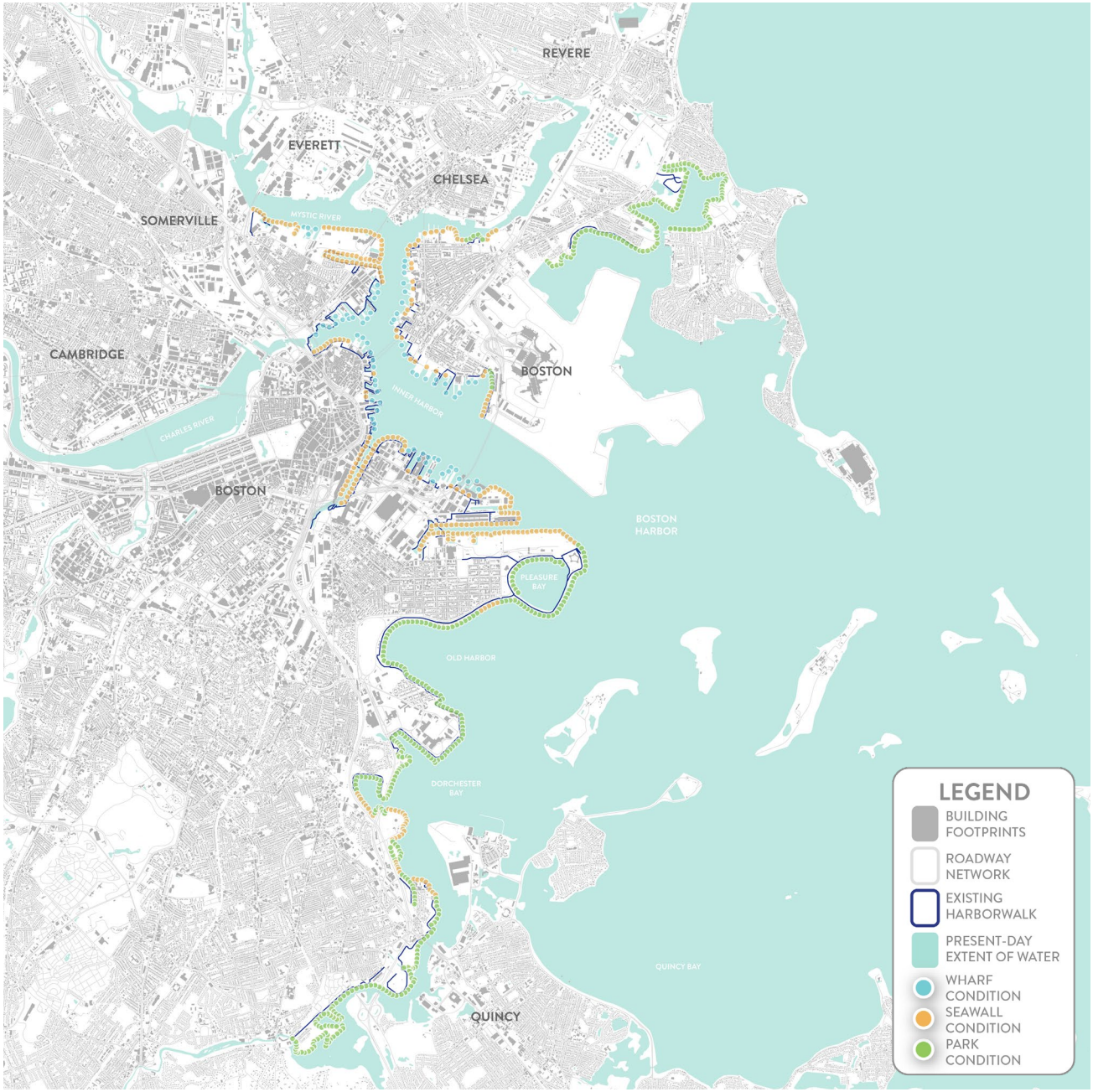
The following visualizes improvements that can be implemented as part of Harborwalk 2.0 at three commonly found conditions.

Scenario 1 :
Wharf Condition

Scenario 2 :
Seawall Condition

Scenario 3 :
Park Condition

Note that the subsequent cross sections and collages have been created for illustrative purposes. Some elements of the collages have been taken from existing places in Boston, but they are designed to inspire and should not be considered directives for any particular site.

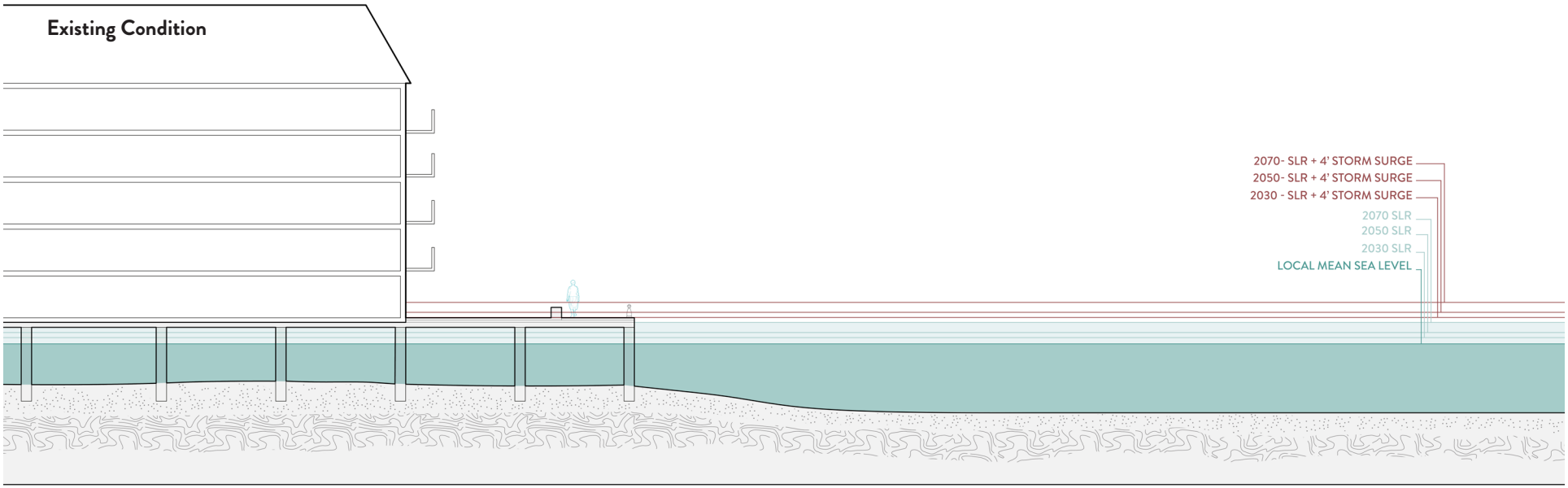


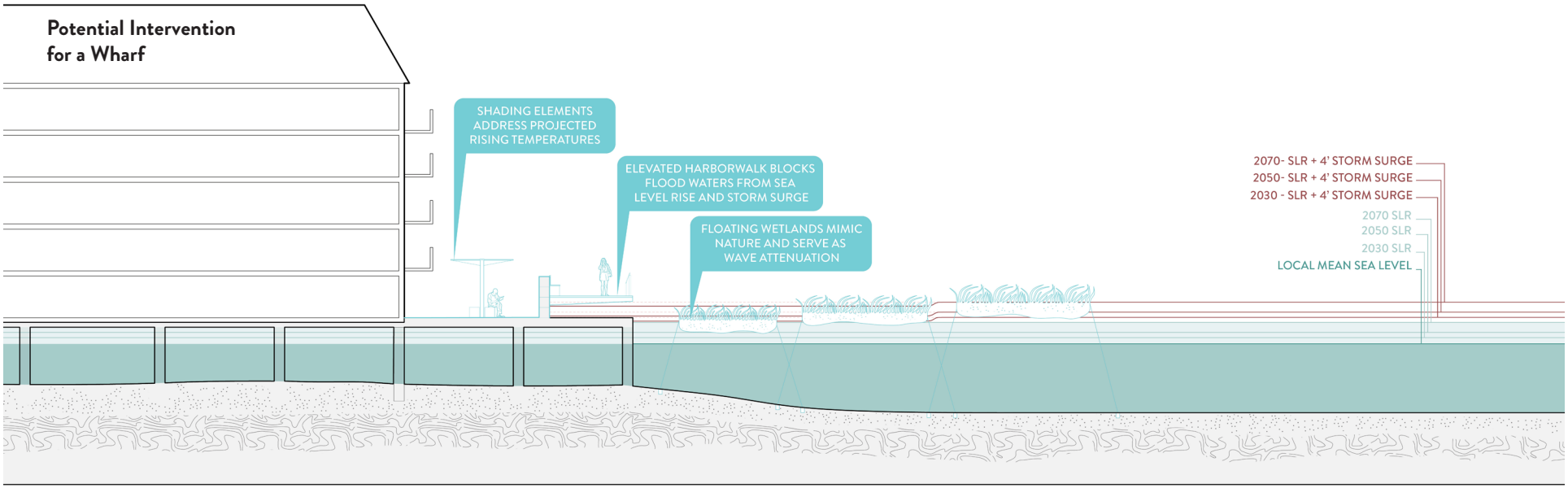
SCENARIO 1
WHARF

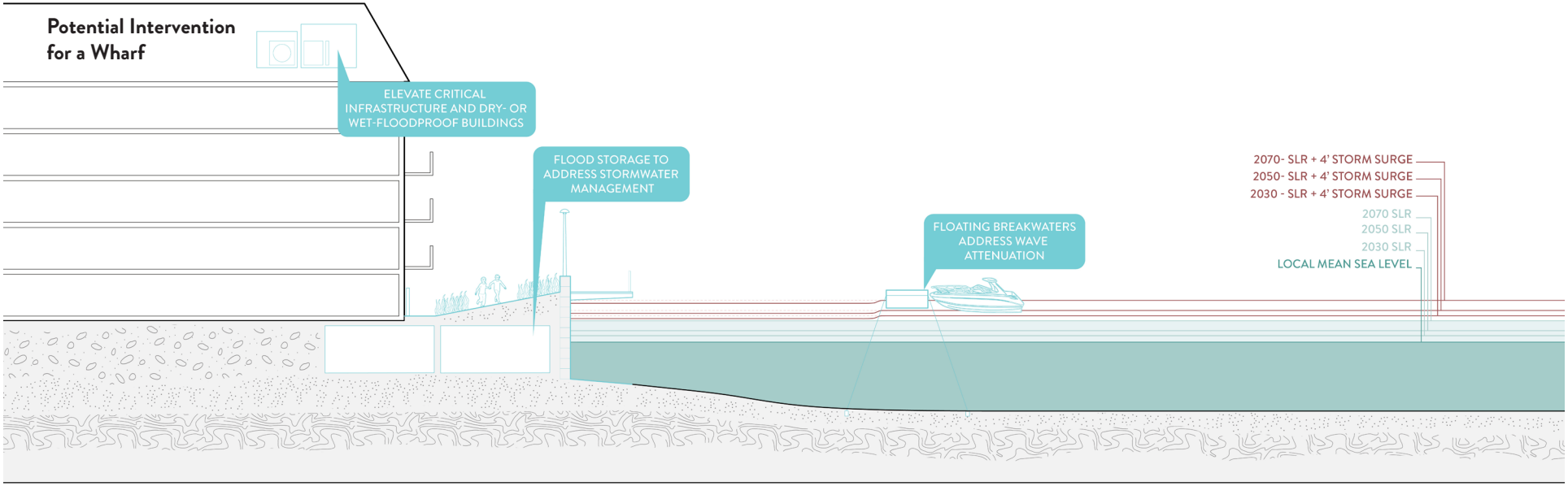
Boston's shoreline first began to change as the early maritime industry built wharves for docking ships and unloading goods and passengers. Even outside of designated port areas, Boston's waterfront still has many wharves projecting into the harbor. Some of them haver been surrounded by sea walls, while others still have water flowing under them as they balance on wood, steel, or concrete pilings. Examples of this condition are visible along Constitution Wharf, Battery Wharf, Constellation Wharf, and Fish Pier among others.

Resilient interventions for wharves include floating wetlands, offshore wave attenuation, and elevated harborwalk boardwalks or paths. The grade change may be significant and designs should try not to "wall off" the harbor. Activation of the water sheet may include docks for water transportation or recreational boating, water sculptures, and other floating community uses like a floating performance space. On ground floors and in facilities of public accommodation, there should be food and entertainment options, civic uses like museums, and interpretive signage.

Depending on the location a wharf may be subject to different wind and wave conditions that impact the storm surge elevations. For illustrative purposes, storm surge is shown as 4 feet, the highest current and anticipated level in Boston Harbor.




Potential Intervention
for a Wharf
SHADING ELEMENTS ADDRESS PROJECTED RISING TEMPERATURES
ELEVATED HARBORWALK BLOCKS FLOOD WATERS FROM SEA LEVEL RISE AND STORM SURGE
FLOATING WETLANDS MIMIC NATURE AND SERVE AS WAVE ATTENUATION
2070- SLR + 4' STORM SURGE
2050- SLR + 4' STORM SURGE
2030 - SLR + 4' STORM SURGE
2070 SLR
2050 SLR
2030 SLR
LOCAL MEAN SEA LEVEL


Potential Intervention
for a Wharf
ELEVATE CRITICAL INFRASTRUCTURE AND DRY- OR WET-FLOODPROOF BUILDINGS
FLOOD STORAGE TO ADDRESS STORMWATER MANAGEMENT
FLOATING BREAKWATERS ADDRESS WAVE ATTENUATION
2070- SLR + 4' STORM SURGE
2050- SLR + 4' STORM SURGE
2030 - SLR + 4' STORM SURGE
2070 SLR
2050 SLR
2030 SLR
LOCAL MEAN SEA LEVEL

Ideas for a Wharf

CONNECTIVITY
Incorporate access to public transit and water transportation.

RESILIENCE
Incorporate nature-based approaches to flood and heat risks along the waterfront.

LIGHTING
Integrate lighting to improve visibility along the Harborwalk.

PUBLIC USE
Ground floor building uses incorporate public access.

FOOD
Offer food of different types and at a range of prices.

ACTIVATION
Activities along the Harborwalk for a range of ages, abilities, and cultures.

SEATING
Accessible and varied seating options along the Harborwalk.

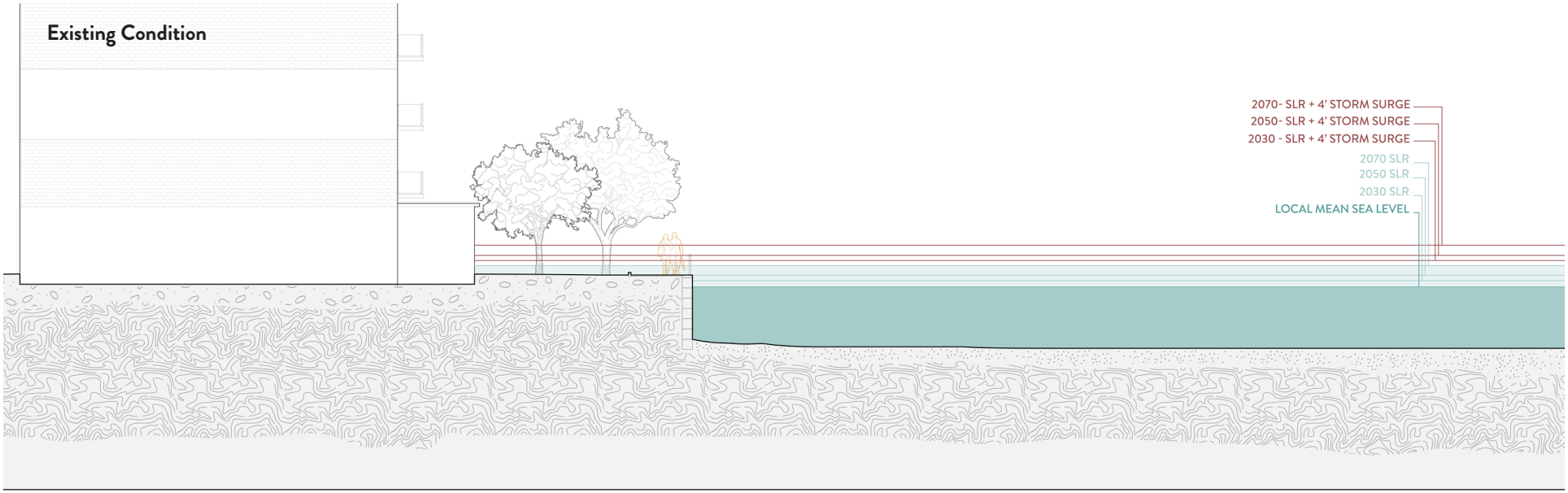
ACCESS
Improved accessibility for a range of users - pedestrians, wheelchair, strollers, etc.

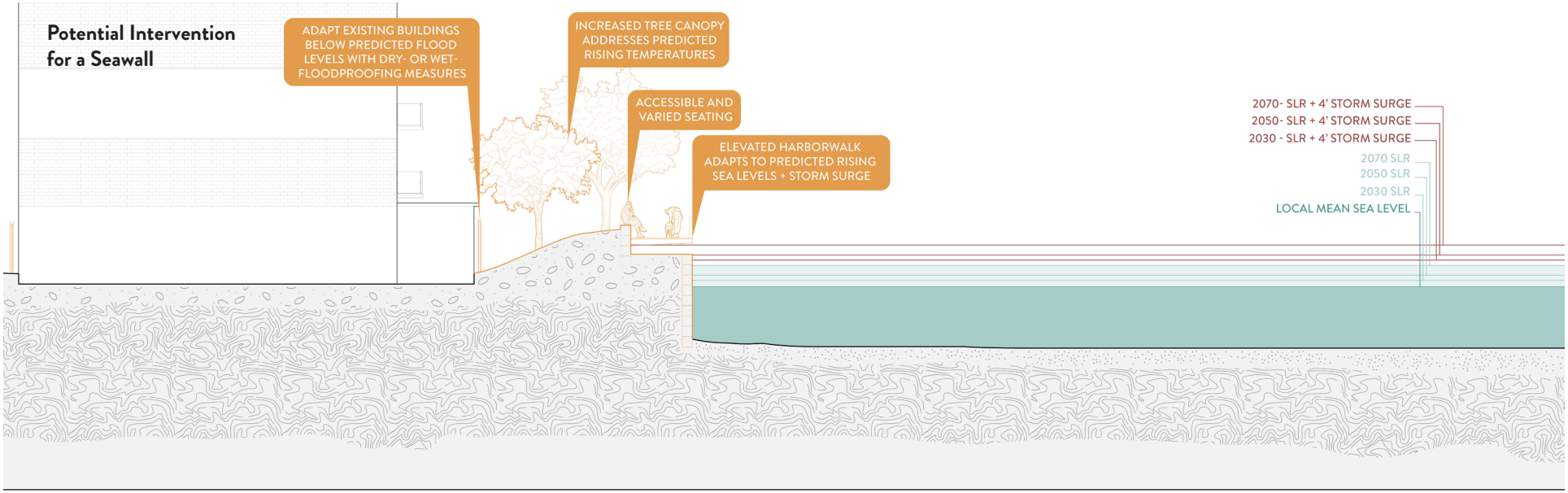
SCENARIO 2
SEAWALL

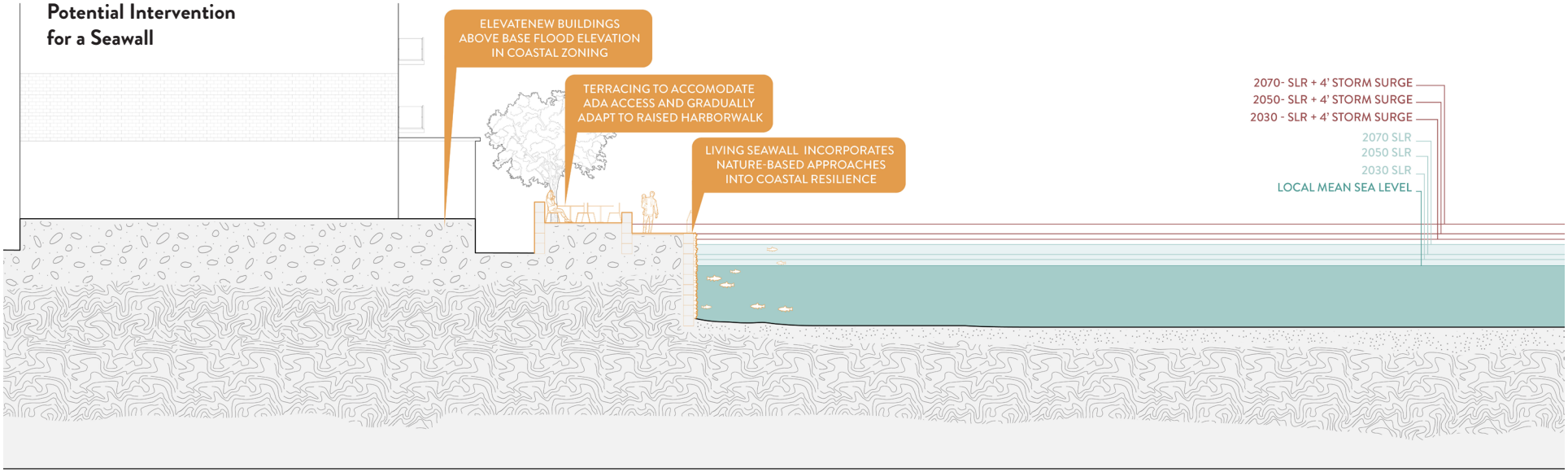
As Boston's waterfront was filled in, seawalls became increasingly prevalent, vertical structures made of stone or concrete provide a fixed edge to the coastline. Most waterfront properties with seawalls offer space between the water's edge and the building, allowing for improvements in the public realm to make the waterfront more welcoming and more resilient. Examples of this condition are visible along the Fort Point Channel, Christopher Columbus Park, Chelsea Creek, and Fan Pier, among others.

Resilience interventions for areas with seawalls may include higher walls or a terraced approach. The wall can be treated with surfaces that invite aquatic ecosystems to thrive. Activation of the Harborwalk might look like expanded seating options, additional signage, shade and indoor facilities that support visitation to the waterfront. Nearby buildings should provide affordable entertainment and food options, like a coffee shop, as well as public restrooms.

Depending on the location a seawall may be subject to different wind and wave conditions that impact the storm surge elevations. For illustrative purposes, storm surge is shown as 4 feet, the highest current and anticipated level in Boston Harbor.




Potential Intervention for a Seawall
ADAPT EXISTING BUILDINGS BELOW PREDICTED FLOOD LEVELS WITH DRY- OR WET-FLOODPROOFING MEASURES
INCREASED TREE CANOPY ADDRESSES PREDICTED RISING TEMPERATURES
ACCESSIBLE AND VARIED SEATING
ELEVATED HARBORWALK ADAPTS TO PREDICTED RISING SEA LEVELS + STORM SURGE
2070- SLR + 4' STORM SURGE
2050- SLR + 4' STORM SURGE
2030 - SLR + 4' STORM SURGE
2070 SLR
2050 SLR
2030 SLR
LOCAL MEAN SEA LEVEL


Potential Intervention for a Seawall
ELEVATENEW BUILDINGS ABOVE BASE FLOOD ELEVATION IN COASTAL ZONING
TERRACING TO ACCOMODATE ADA ACCESS AND GRADUALLY ADAPT TO RAISED HARBORWALK
LIVING SEAWALL INCORPORATES NATURE-BASED APPROACHES INTO COASTAL RESILIENCE
2070- SLR + 4' STORM SURGE
2050- SLR + 4' STORM SURGE
2030 - SLR + 4' STORM SURGE
2070 SLR
2050 SLR
2030 SLR
LOCAL MEAN SEA LEVEL

Ideas for a Seawall

FOOD
Offer outdoor seating to activate the waterfront. Don't require a purchase to use tables.

SIGNAGE
Clear and continuous signage along the Harborwalk helps with wayfinding and explains public rights.

VEGETATION
Incorporate native, salt-tolerant, and flood-tolerant plantings along the Harborwalk to foster biodiversity, and plant trees for shade.

RESILIENCE
Terraced levels provide flood protection for inland areas.

SEATING
Expanded availbility and types of seating along the Harborwalk. Embed seating in resilience infrastructure.

ACTIVATION
Activities along the Harborwalk for a range of ages, abilities, and cultures.

ACCESS
Improved accessibility for a range of users—pedestrians, wheelchair, strollers, etc.

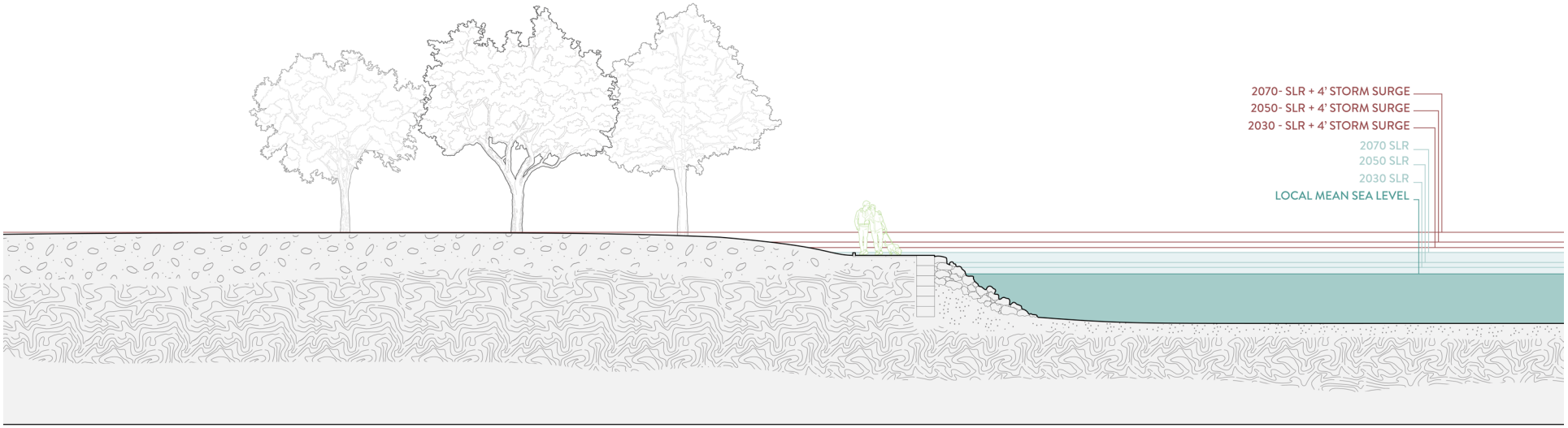
SCENARIO 3
PARK

The Boston waterfront in parts of East Boston and much of Dorchester is owned by the Massachusetts Department of Conservation and Recreation (DRC) and is in a more natural condition with a combination of beaches and marshes as well as sloped rocky shorelines. With more room to develop adaptation strategies, implement nature-based approaches, and offer inclusive waterfront access, parks offer the greatest opportunity to create a multi benefit waterfront with "Harborwalk 2.0." Some of these strategies are also applicable to the Boston Harbor Islands. Examples of this condition are visible along Castle Island, Carson Beach, Constitution Beach, and Pope John Paul II Park.

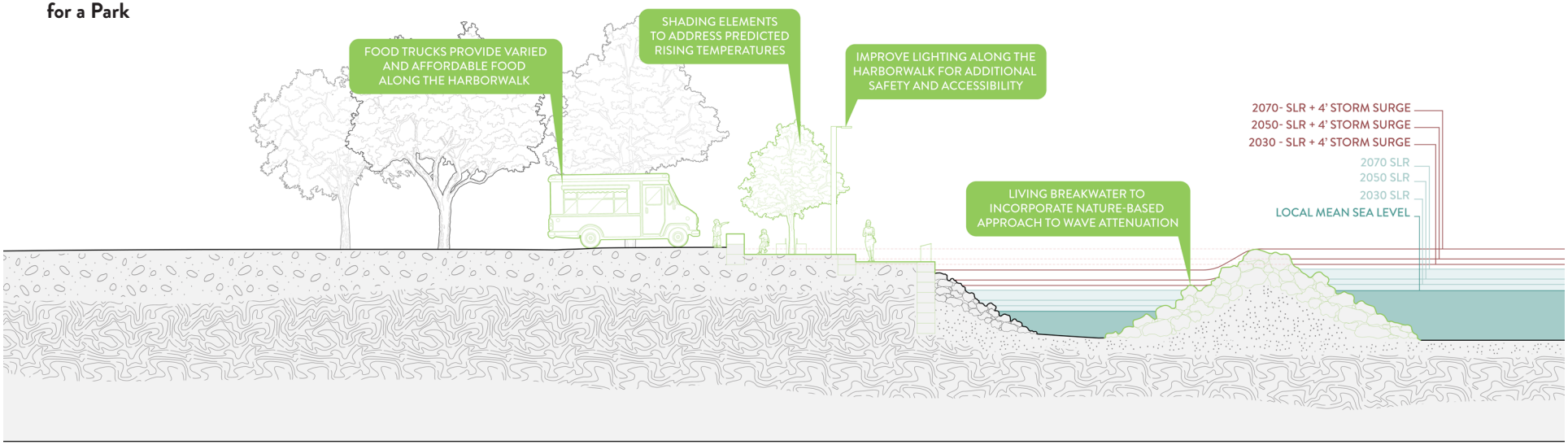
Resilience interventions in parks (both DRC parks and other publicly owned waterfronts) may include nature-based approaches, like vegetated berms or integrated living breakwaters. If elevation for flood protection is placed further inland, an alternative higher elevated Harborwalk path should be provided. Parks along the waterfront should include shading elements, like trees as well as gazebos and other structures that support community gatherings. Parks should also feature recreational and social infrastructure that supports the desire of diverse communities with a range of athletic uses, grills and picnic tables, and space to relax and enjoy the views of the water. Waterfront path lighting is especially important in winter months in areas without buildings.

Depending on the location a park may be subject to different wind and wave conditions that impact the storm surge elevations. For illustrative purposes, storm surge is shown as 4 feet, the highest current and anticipated level in Boston Harbor.

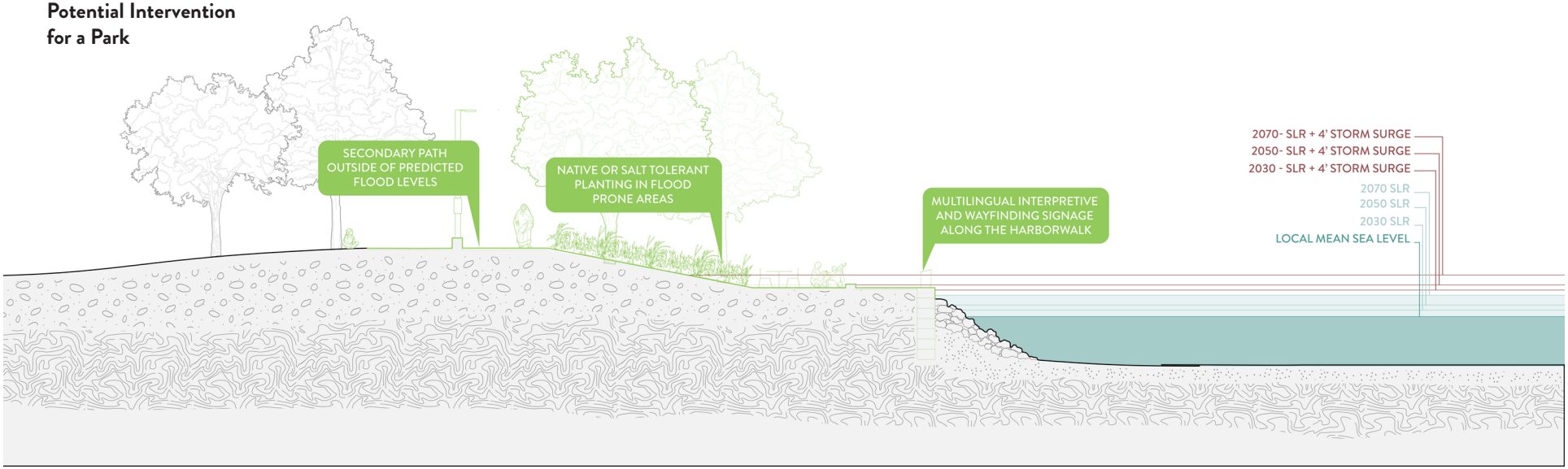
Existing Condition



Potential Intervention for a Park



Potential Intervention for a Park



Ideas for a Park

LIGHTING
Integrated lighting to improve visibility along the Harborwalk.

FOOD
Offer food in parks with food trucks or make outdoor cooking easier to permit.

SEATING
Expanded availbility and types of seating along the Harborwalk.

ACCESS
Improved accessibility for all users—pedestrians, wheelchair, strollers, etc.

SIGNAGE
Interpretive signange along the Harborwalk, in multiple languages.

ACTIVATION
Access to boat launches and boat rentals along the shoreline.

RESILIENCE
Incorporate nature-based approaches to flood risks along the waterfront.

REFERENCES

Reports

Climate Ready Boston Report, 2016

Climate Resilient Design Standards & Guidelines, 2018

Heat Resilience Solutions For Boston, 2022

Wharf District Council Climate Resilience Plan, 2023

GIS Data

Climate Ready Boston Map Explorer

MassGIS Data

Massachusetts Coast Flood Risk Model (MC-FRM)