



**Fort Point Associates, Inc.**

*Urban Planning Environmental Consulting Project Permitting*

**A TETRA TECH COMPANY**

## Coastal Development Best Practices: Boston Real Estate

Urban Land Institute Coastal Forum

October 8, 2018

Jamie M. Fay, AICP

President, Fort Point Associates, Inc.

[jfay@fpa-inc.com](mailto:jfay@fpa-inc.com)

# What we do



## Water

- Coastal and Marine Resources Management
- Drinking Water
- Groundwater
- Wastewater Treatment
- Water and Agriculture
- Water Resources
- Wet Weather Infrastructure/CSOs

## Environment

- Air Quality
- Environmental Compliance
- Environmental Management
- Remediation
- Waste Management

## Infrastructure

- Airports and Aviation
- Buildings
- Communications
- Dams, Reservoirs, and Levees
- Ports, Harbors, and Waterfront
- Transportation

## Resource Management

- Industrial
- Mining and Minerals
- Oil and Gas

## Energy

- CCR Waste Management
- Conventional Generation
- Renewable Energy
- Energy Efficiency
- Offshore Energy
- Nuclear
- Utilities and Market Analytics
- Transmission and Distribution

## International Development

- Agriculture and Economic Growth
- Architecture and Engineering
- Democracy and Governance
- International Energy Services
- Environmental and Natural Resources
- Land Tenure and Property Rights
- Rule of Law
- Water Resources and Infrastructure
- Security and Stabilization



# Boston, March 2, 2018

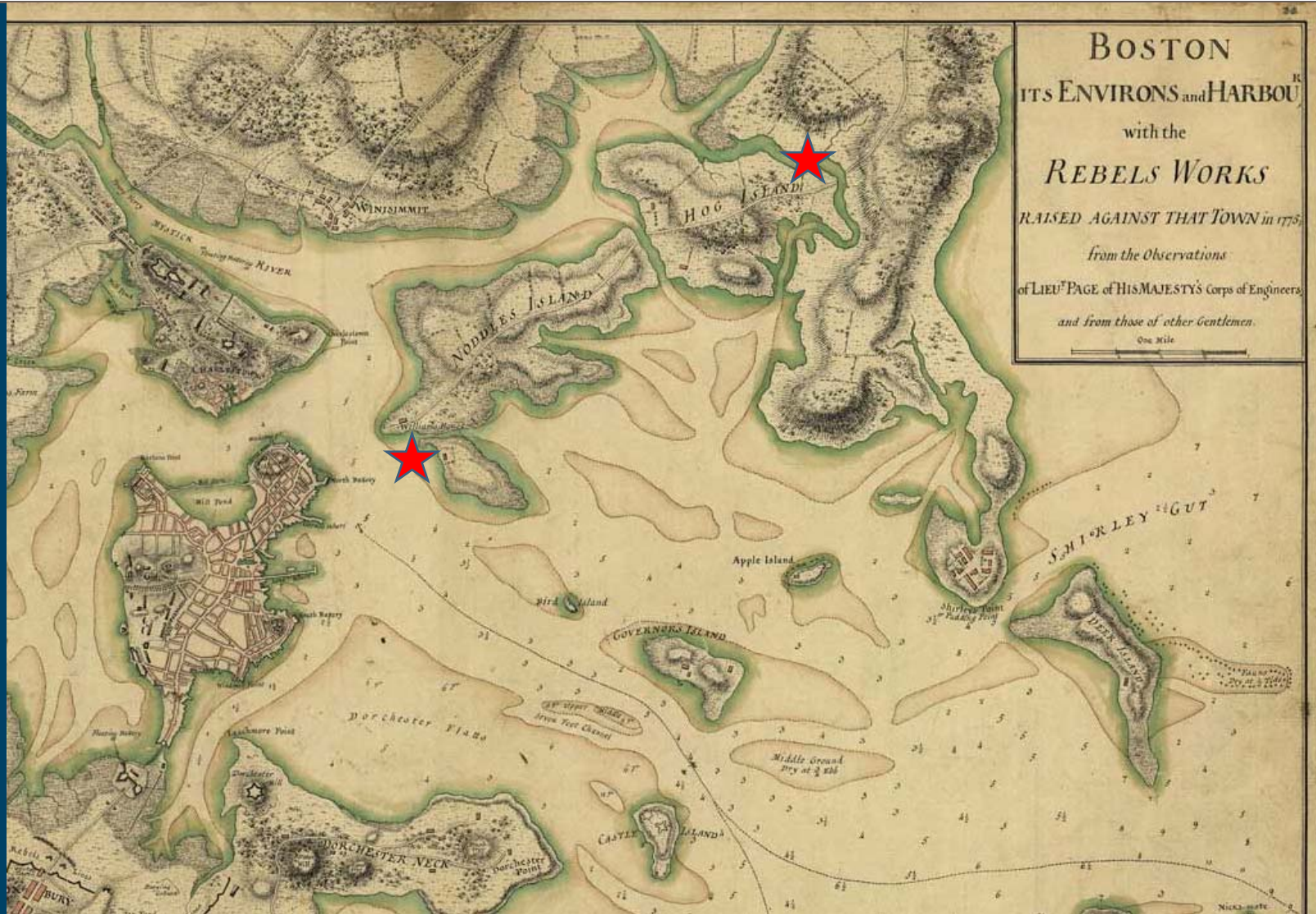


March 2, 2018



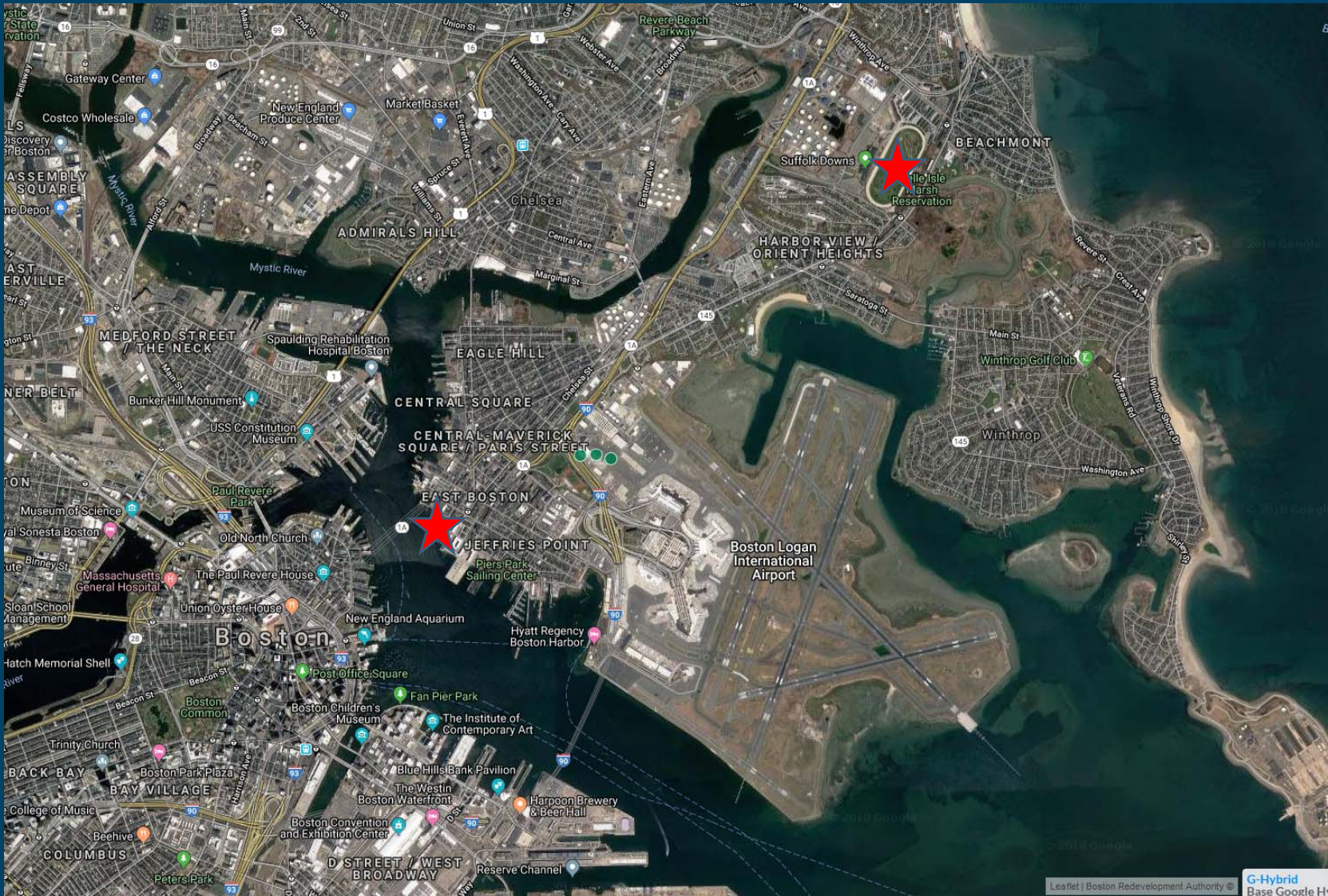


# Boston, 1775





# Boston, 2018





# Boston, 2070



# Climate Ready Boston

## COASTAL RESILIENCE SOLUTIONS FOR EAST BOSTON AND CHARLESTOWN

### EXECUTIVE SUMMARY

October 2017



Mayor Martin J. Walsh



GREENOVATE  
CITY OF BOSTON



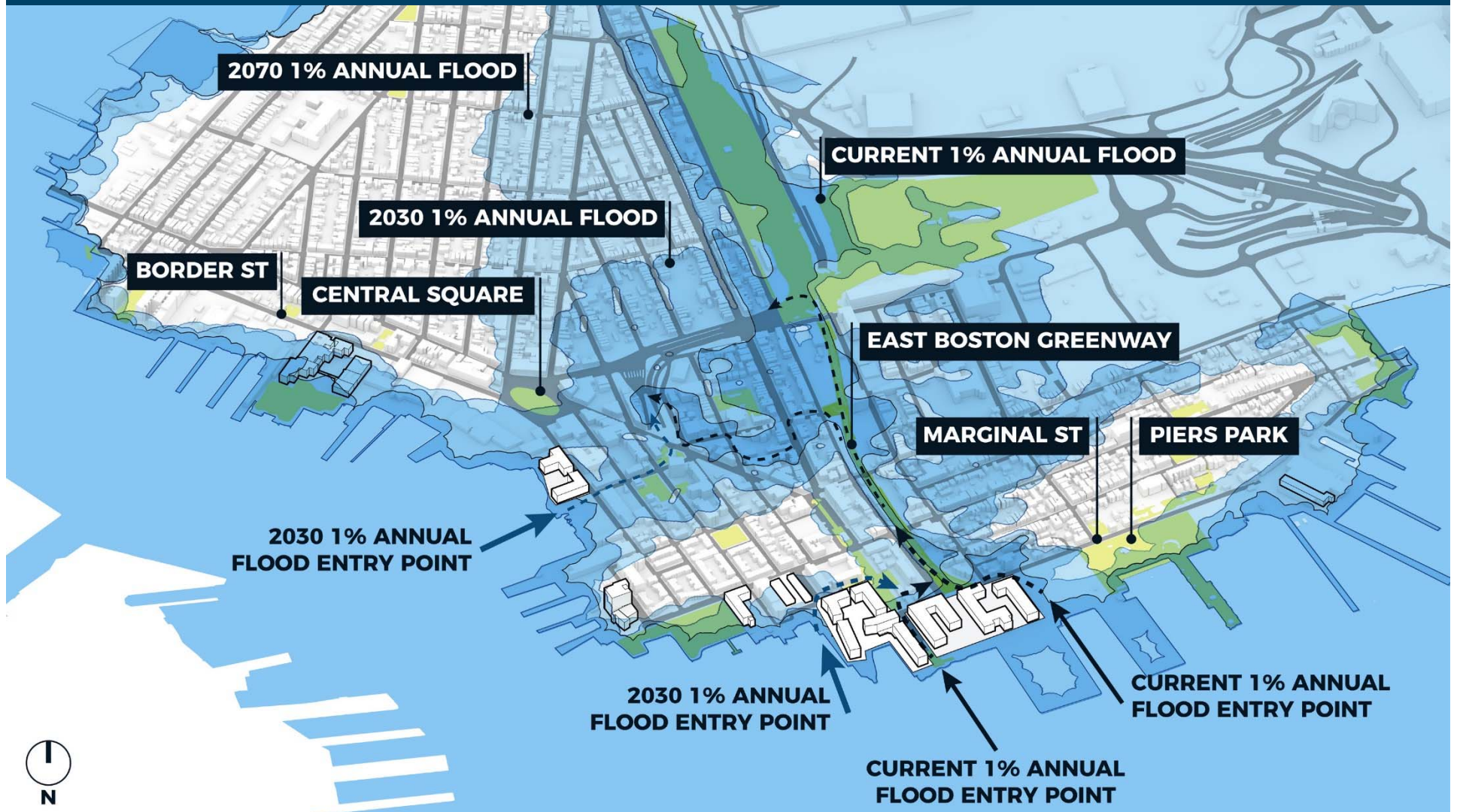
MASSACHUSETTS OFFICE OF  
COASTAL ZONE MANAGEMENT



BOSTON  
Green Ribbon  
COMMISSION



# Climate Ready Boston





# Climate Ready Boston





# Planning Strategies for Climate Resilient Development

ULI Coastal Forum







SITE

Aerial Image

Lendlease



# Our Vision

To Create the Best Places!



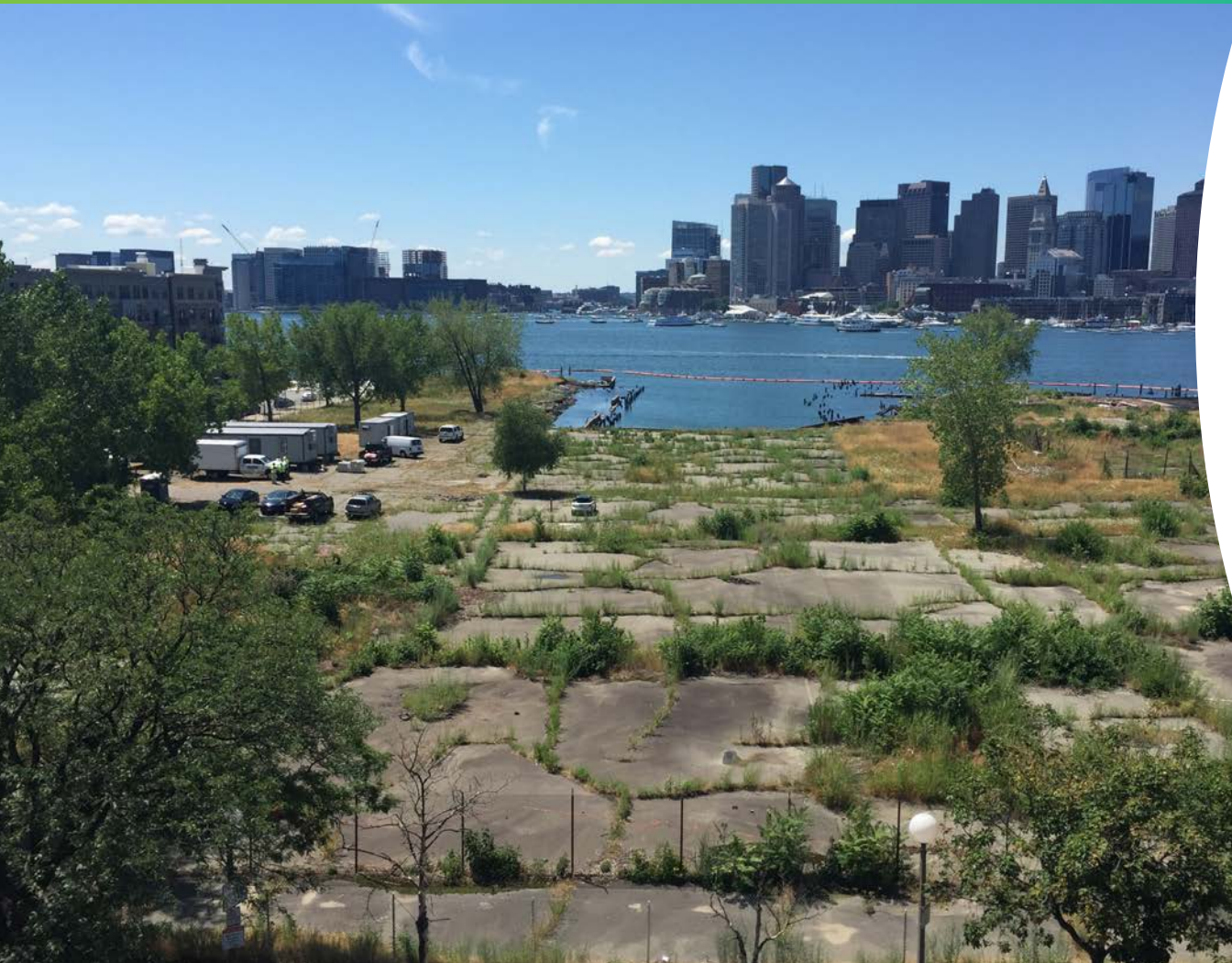
## Clippership Wharf Overview

- 12 acre site, 7 acres of land area
- TOD: Adjacent to Maverick T & Lewis Street Water Terminal
- Parking Ratio: 0.57
- 478 Residential Units in 2 Phases:
  - Phase I: 284 Apartments  
80 Condominiums
  - Phase II: 114 Condos
- Targeted LEED Platinum (LEED for Homes Mid-rise)
- Delivery Early 2019





With FEMA representing a rear view mirror approach, what steps would we take to look forward? We want to be a 100-year project, not a 25-year project.



# Clippership Wharf Practical Constraints

## Challenging Infrastructure

- 1,700 linear feet of harbor front
- Dilapidated wharf structures and piles
- Dirty dirt

## Chapter 91

- Height
- Setbacks
- FPA challenges require offsets and creativity

## FEMA Requirements

## The East Boston Economy

- Previous project unbuildable
- Stick on podium construction
- Condo and rental realities





# Clippership Wharf Opportunities

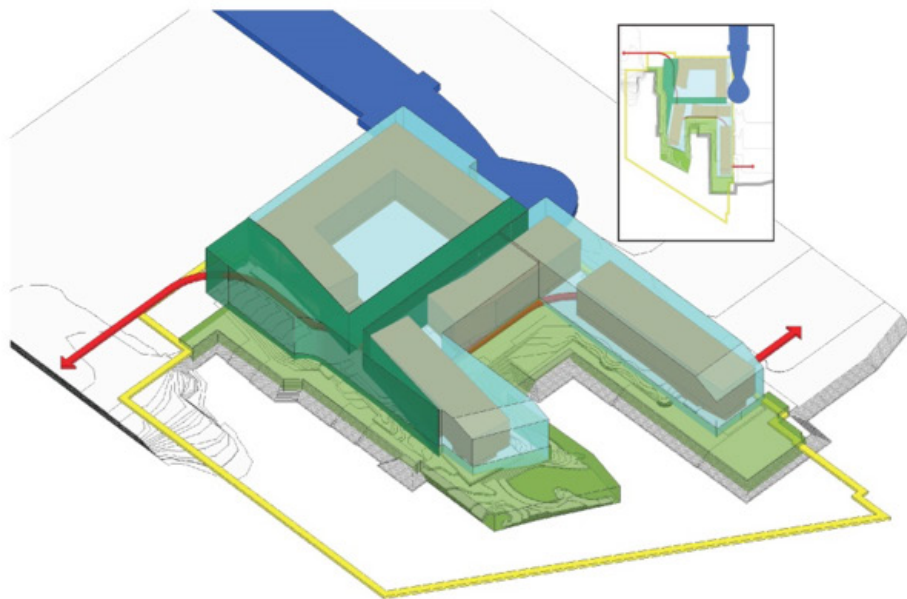
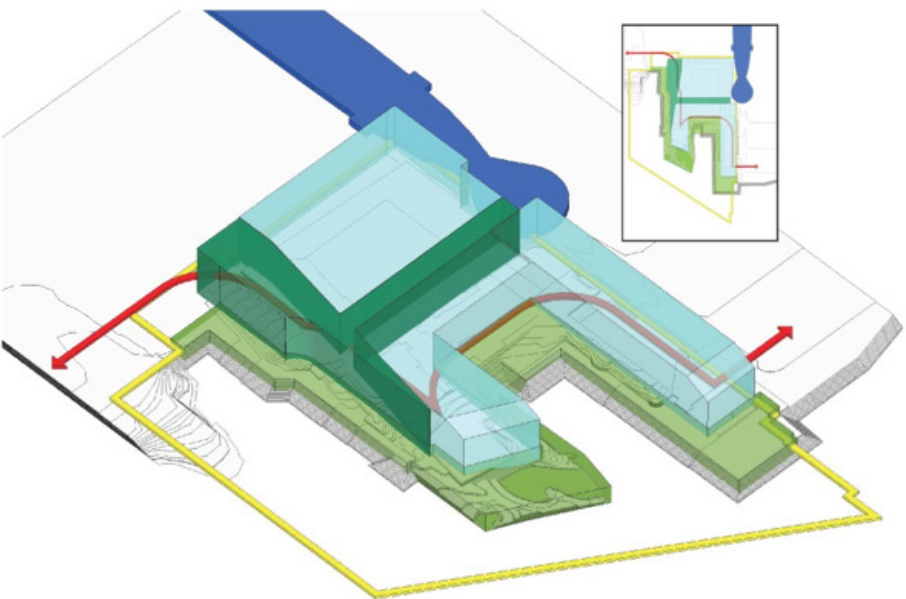
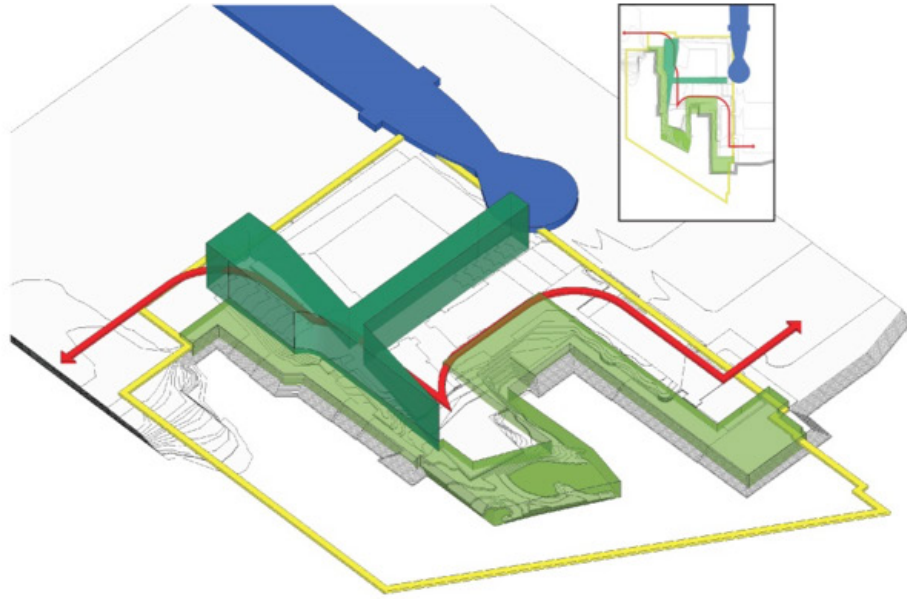
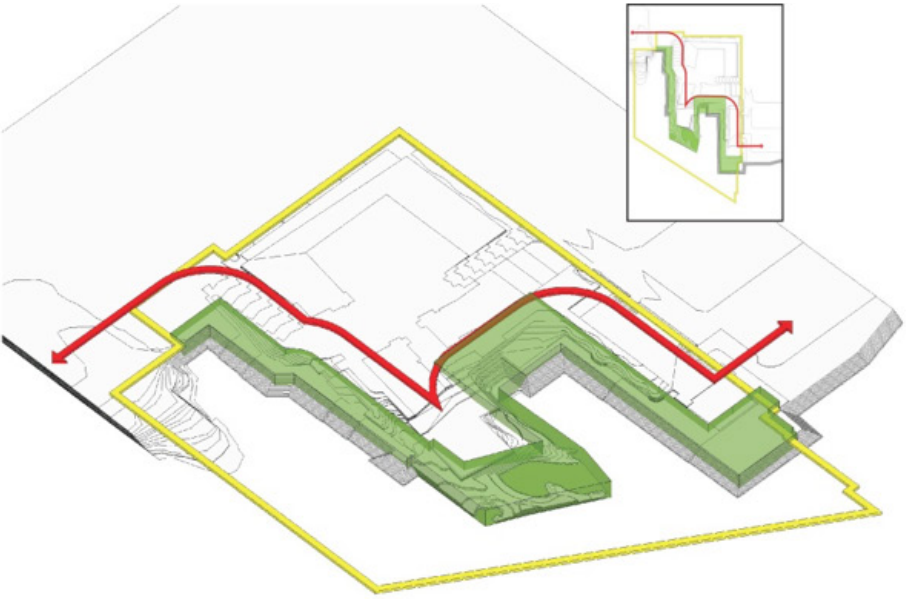
- Use the attributes of the site to create a resilient and sustainable place
- Create a waterfront experience unlike any in Boston
- Knit together one of the best stretches of waterfront in Boston
- A unique transportation story – T, bikes, zipcars, water transportation, and lower parking ratios
- Combine recreation and education around a living shoreline
- Amenities are on the ground, not in the air – blending of public and private

Access to the water should not be a privilege, but a requirement. How could we create a waterfront experience around real access, not just viewing behind bollards and chains?

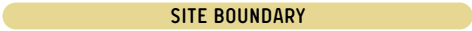









# Clippership Wharf Site Constraints



KEY

	SITE BOUNDARY
	CHAPTER 91 SETBACKS
	FACILITIES OF PUBLIC ACCOMMODATION (100' SETBACK)
	MBTA EASEMENT
	VIEW CORRIDOR PER MHP
	MAX BUILD PER CHAPTER 91





KEY

FACILITIES OF PUBLIC ACCOMMODATION (CHAPTER 91)

- RESIDENTIAL
- RESIDENTIAL AMENITY
- CIRCULATION/EGRESS
- SERVICE/GARAGE

# Plaza Level Plan

## Proposed





An “anti-urban” solution was the consensus at BCDC. Reconciling the development solution, building heights, and site circulation with a resilient and feasible solution was a delicate balance.



## Permitting a Resilient Solution

- Use the unique attributes of the site to create a resilient place (size, configuration, and setbacks)
- Raise the ground floor but provide experiences at grade
- Manage transitions from the street level to the podium and from the podium to the Harborwalk
- Calculate building height in a way that doesn't penalize a resilient solution
- Account for flooding and sea level rise in appropriate and seamless ways
- Trade-offs/larger urban moves unlocked the box





# Final Site Plan





# PUBLIC REALM

## The Living Shoreline

- Defined by existing sea walls
- Excavated to provide salt marsh terraces
- Sills created with salvaged granite
- Natural filter for site runoff

## The Harborwalk

- Cornerstone of public realm
- Diverse experiences and gathering spots
- Special and unique moments

## Partnerships

- Harbor Arts
- Atlantic Works Gallery
- Zumix
- Charles River Canoe and Kayak

The public realm is as important an amenity as traditional amenity spaces. Integrating the “community” with the community is the goal.







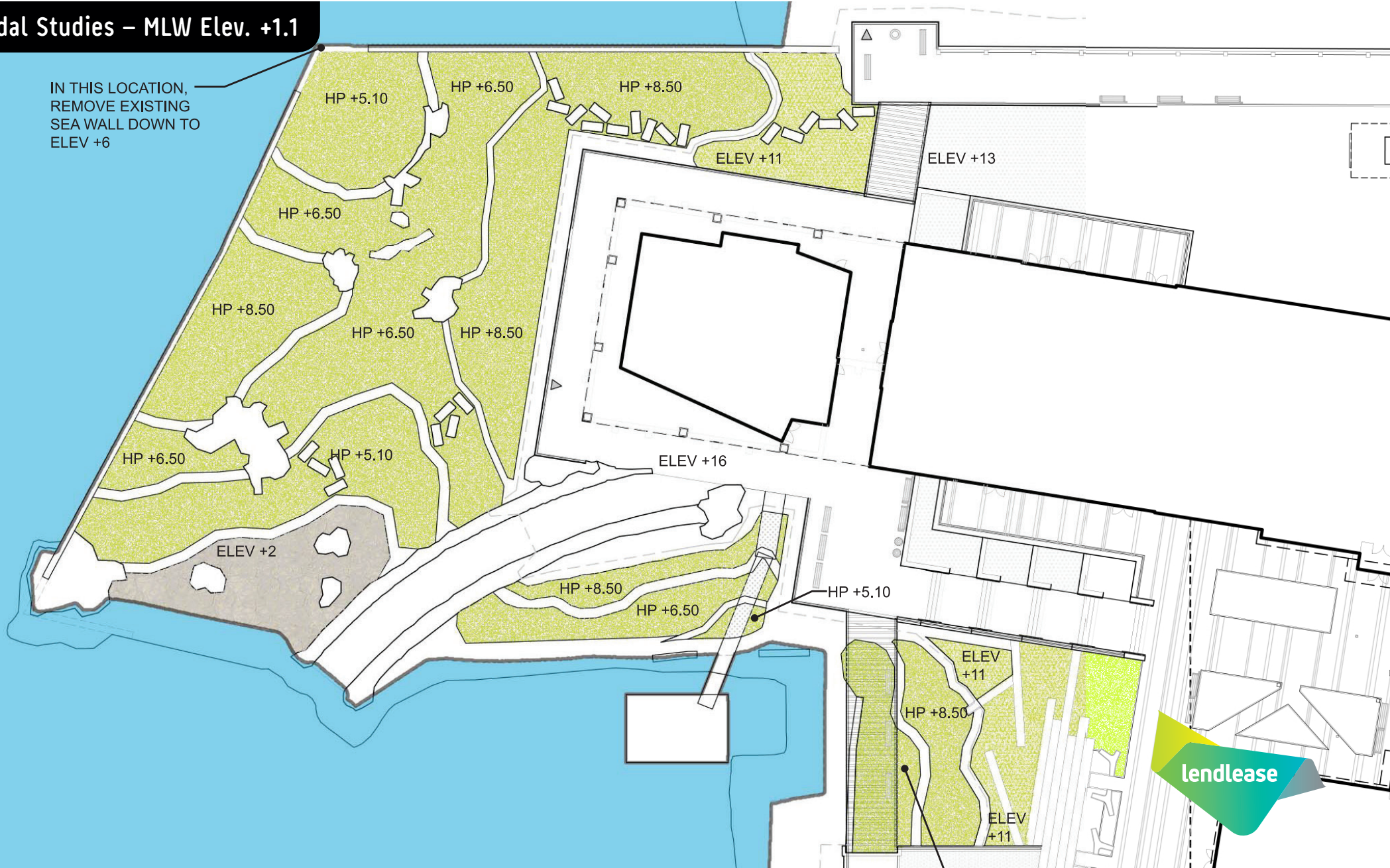
**Living  
Shoreline  
Precedent  
Images**





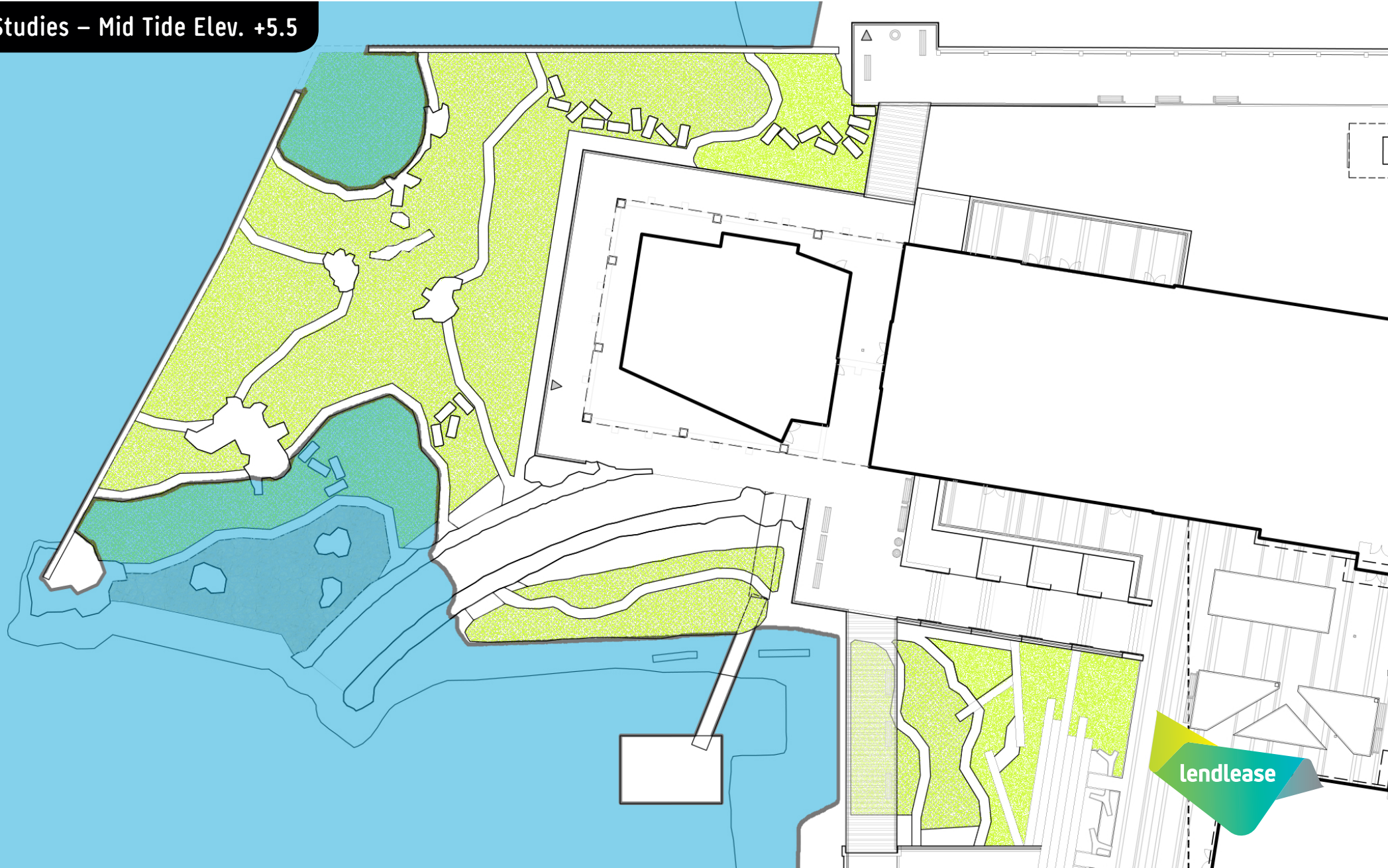
# Living Shoreline Tidal Studies – MLW Elev. +1.1

IN THIS LOCATION,  
REMOVE EXISTING  
SEA WALL DOWN TO  
ELEV +6



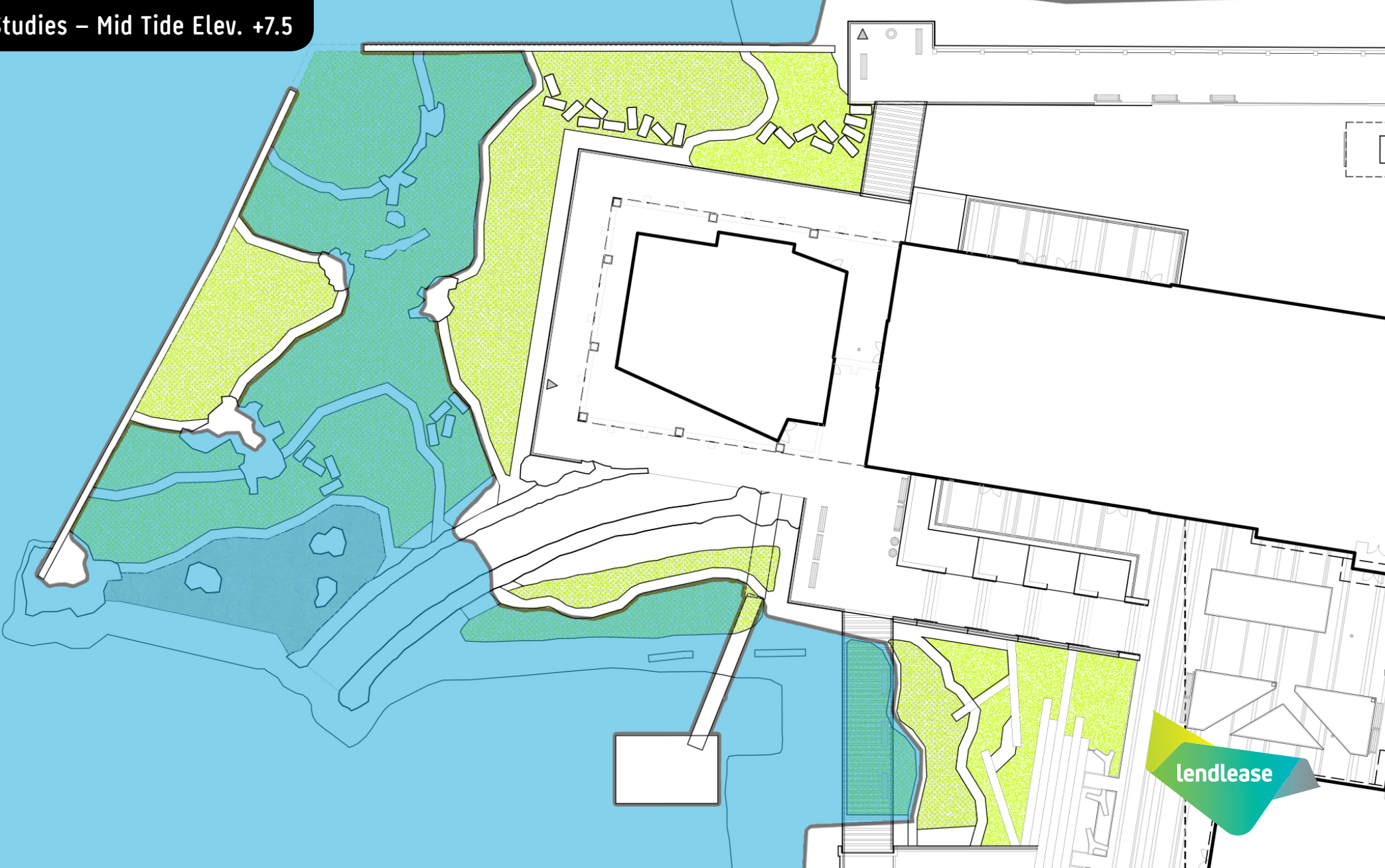


Living Shoreline Tidal Studies – Mid Tide Elev. +5.5



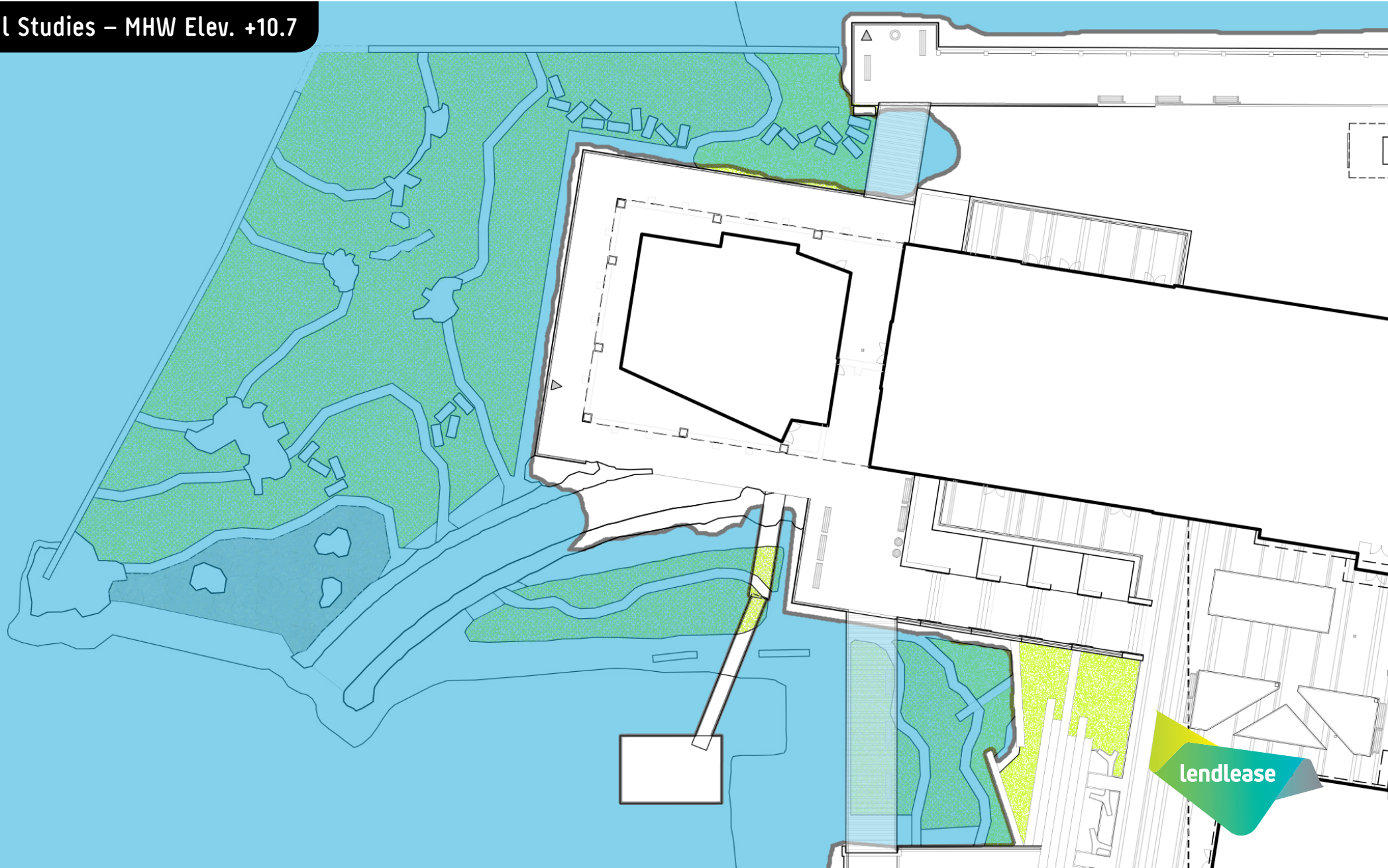


Living Shoreline Tidal Studies – Mid Tide Elev. +7.5





Living Shoreline Tidal Studies – MHW Elev. +10.7





Low Tide



High Tide



Low Tide



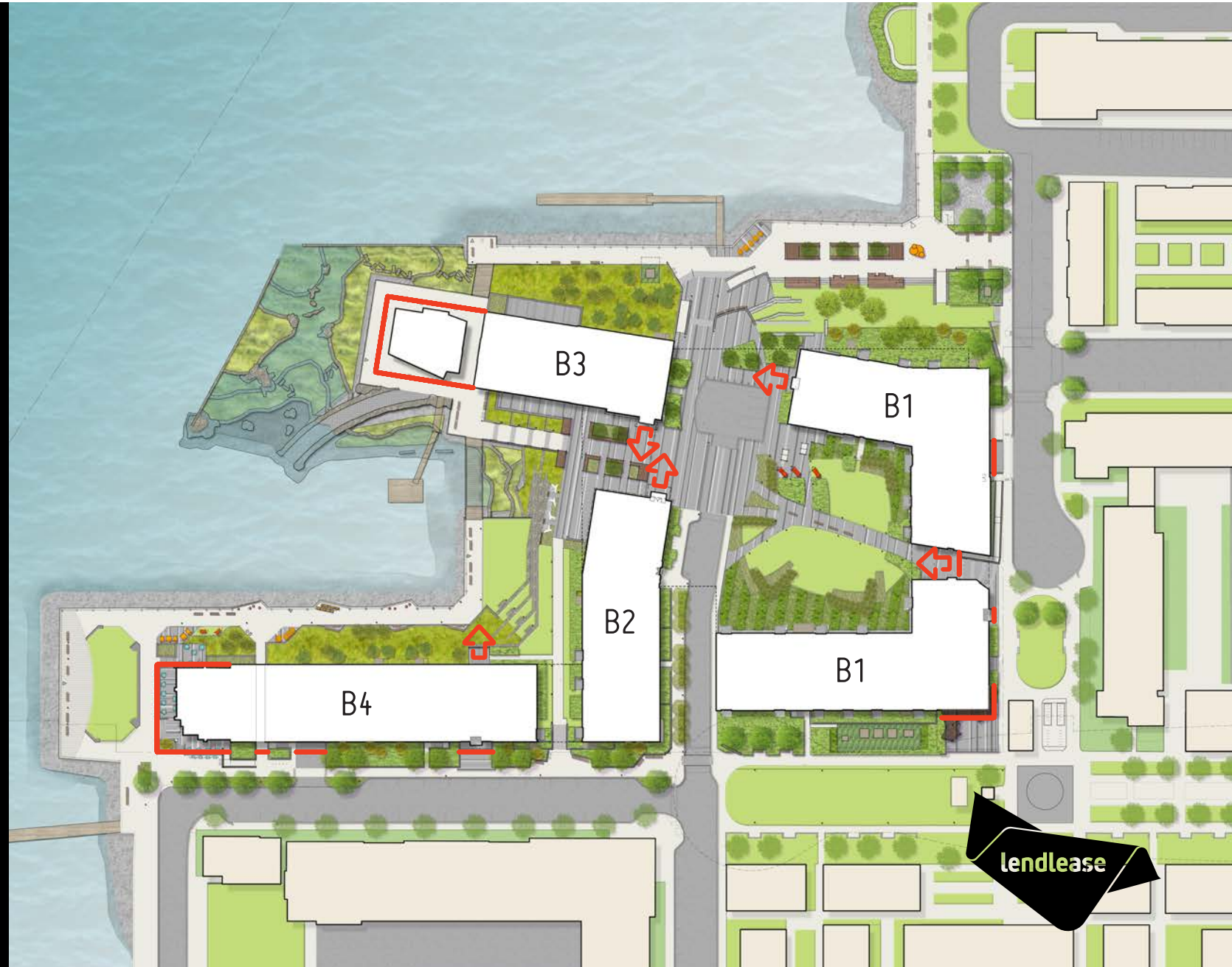
High Tide





# Clippership Wharf Resiliency Measures

- Raising the ground floor level
- Flood barriers where uses hit the ground
- Wave dissipation features
- Native plantings
- Redundant systems
- Renewable energy sources
- Egress paths above flood plain





## Summary

- Resilient solutions are expensive
- Targeted financing sources are not available for resilient infrastructure
- Policy and codes should account for resilient solutions
- Real challenge is not for sites like Clippership but for lot-line developments and existing buildings
- District-wide solutions are more powerful than one-offs
- Need to design for tomorrow's climate events, not today's





# District wide resiliency solutions

Consultant Team

Kleinfelder  
Stoss Landscape Urbanism  
ONE Architecture  
Woods Hole Group

lendlease





**lendlease**







# Suffolk Downs Redevelopment

Coastal Forum, October 2018



# Proximity To Off-Site Assets





# A Landlocked And Disconnected Site

 PUBLICLY INACCESSIBLE

Land In Boston: 109 acres  
Land In Revere: 52 acres



Shopping Center



Access from Winthrop Ave

REVERE BEACH PKWY.

Winthrop ave

Access from Shopping Center



Tomasello Drive

Beachmont

Revere Boston

Washburn ave  
Bennington Street

MBTA TRACKS

Access From Route 1A



OIL TANKS

Parking Lots

Waldemar ave  
ORIENT HEIGHTS



Suffolk Downs



# Updated Master Plan



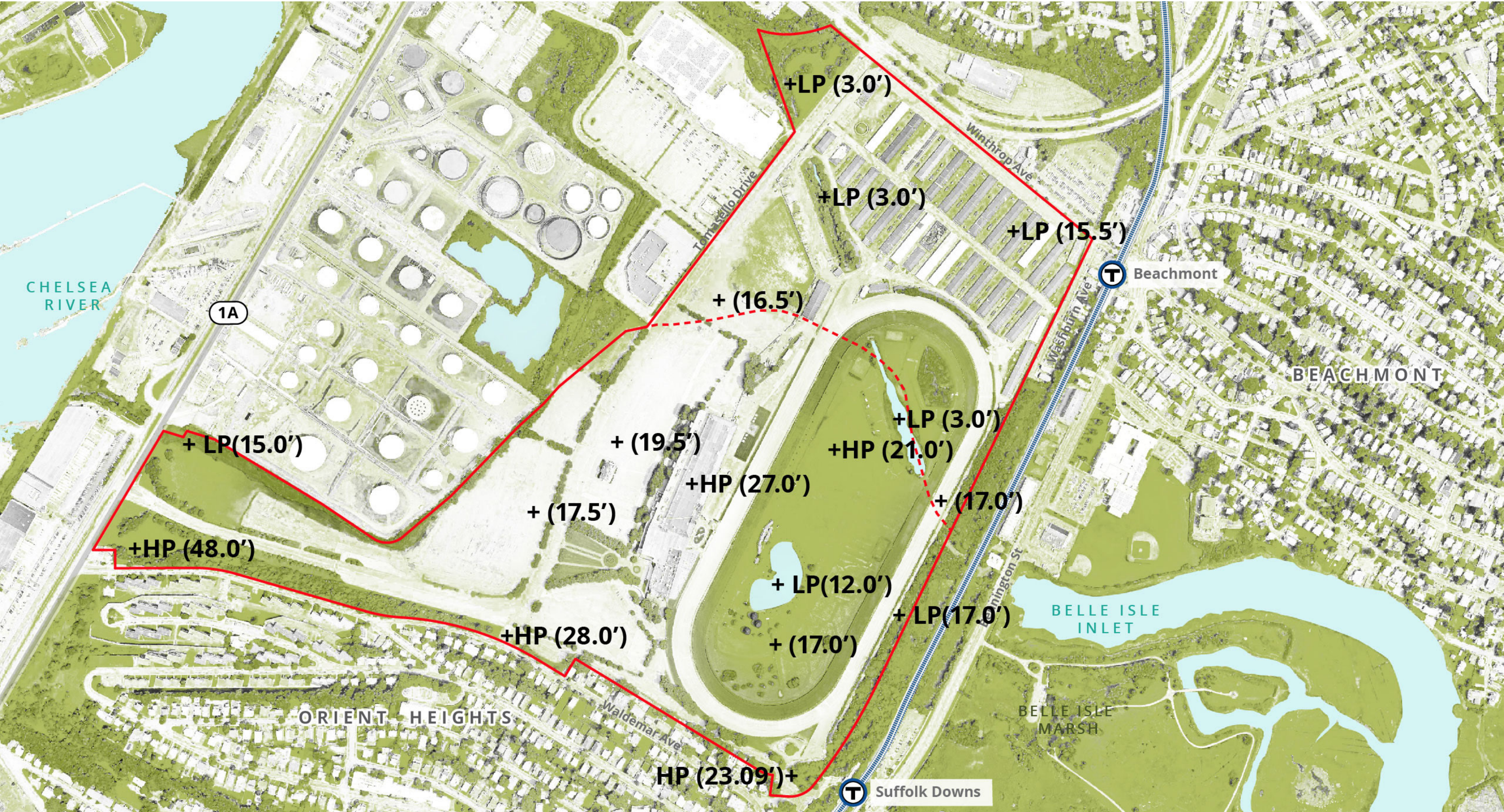


# Land Use Plan



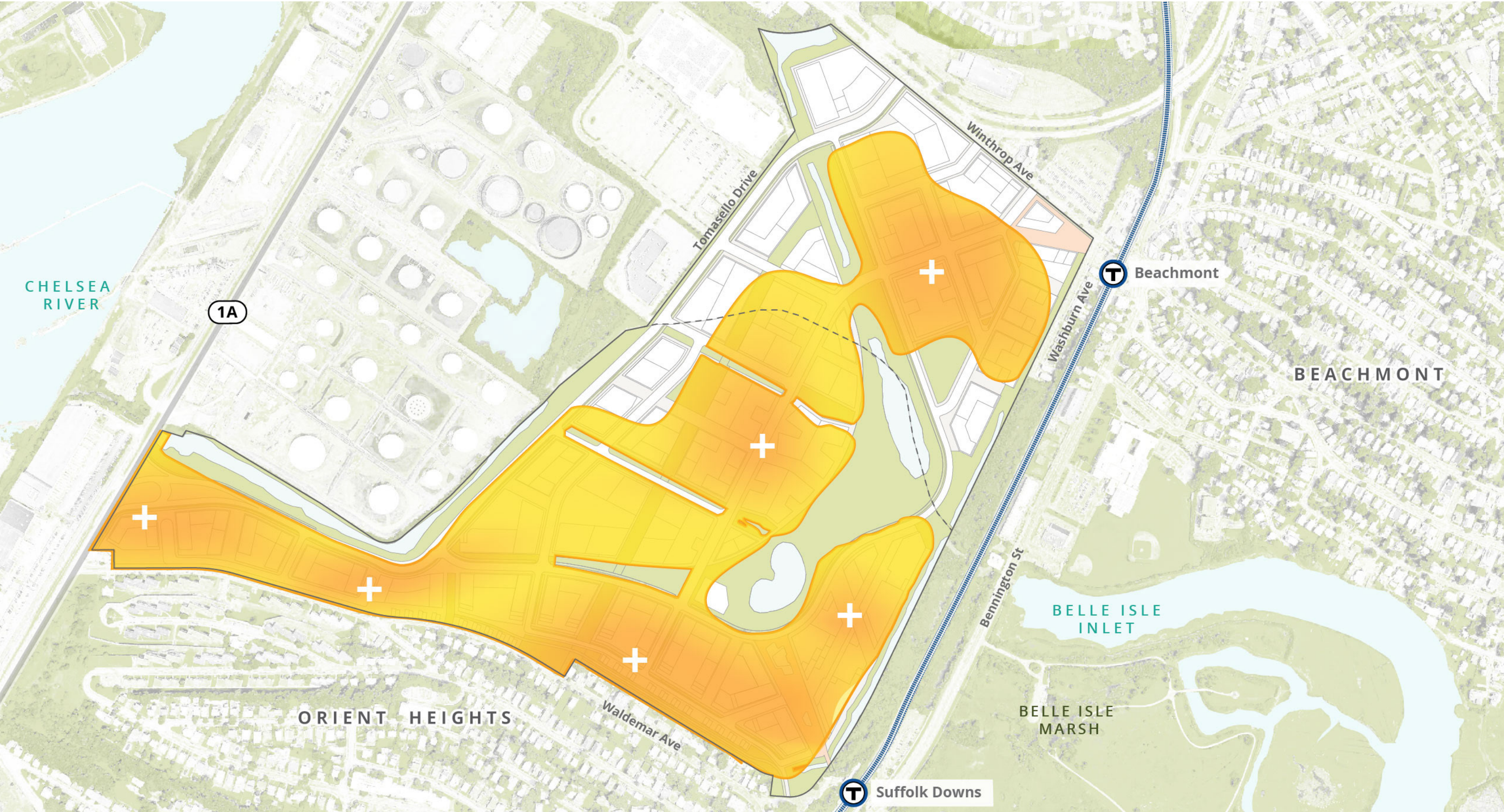


# Existing Conditions





# Grading Plan





# Grading Plan





# Everyday Condition





# Estimated 2 Year Storm Event





# Estimated 10 Year Storm Event





# Estimated 100 Year Storm Event





# Outdoor Theater/ Stormwater Basin





# Outdoor Theater/ Stormwater Basin



2-YR STORM ELEVATION: 11.8'  
10-YR STORM ELEVATION: 15.5'  
100-YR STORM ELEVATION: 16.9'  
VOLUME AT 100-YR STORM: 201,000 CF  
TOTAL VOL: 298,000 CF





# Coastal Flooding Points of Entry to Site





# Aerial Rendering







MIAMI BEACH  
RISING  
ABOVE





# Today's Topics

- Our climate adaptation journey: the early stages of stormwater program – 2013
- Enter 100 RC and regional partnerships – 2016
- The evolution of our program: ULI and 100 RC – 2018
- Implementation – happening now!



*South Beach, Miami Beach Florida*



# The evolution of our work

## Scale & Align





# Miami Beach Before

Risk is Evident





# Miami Beach

## What are we doing?

- Commission Committee on **Sustainability and Resiliency**.
- **Mayor's Blue Ribbon Panel** on Flooding and Sea Level Rise from 2013-2017.
- Multi-year **stormwater program that uses sea level rise projections**.
- Systematically updating the **land use and development code** to incorporate climate adaptation and resilience, including increased freeboard, base flood elevation, roadway, ground, and seawall heights.
- Established a pool of contractors with the capacity to develop a **business case analysis of the resilience program**.

***“The City of Miami Beach is committed to adapting to sea level rise, investing in aging infrastructure, and using the best available science to do so.”***



# Miami Beach Approach

- Water, sewer, and drainage systems need to be **redesigned, rebuilt, and maintained**, with acknowledgement of accelerating sea level rise and the potential for higher storm surges and heavy rainfall events.
- **Rising sea levels are one component of living with water.** We need a good understanding of groundwater levels as well. Groundwater table levels have to be properly managed to provide sufficient protection from saltwater intrusion and manage flood risks from groundwater rise.

*Miami Beach began an aggressive stormwater program in 2013, beginning with the Sunset Harbor neighborhood.*

MIAMIBEACH  
RISING  
ABOVE







**BEFORE**



NOVEMBER 2017



**BEFORE**

2017



**AFTER**



# Miami Beach

## What are we doing?



- Constructing green living shorelines.
- Extensive sand dunes that minimize risk from storm surge and provide habitat.
- Design guidelines for historic preservation in the face of sea level rise and climate change.
- Unique and creative ways to help the community learn more, including an **Adaptation Calculator and dynamic Resilience Open Houses**.
- Dynamic surface/groundwater modeling.
- Hosted an **Urban Land Institute Technical Assistance Panel** to provide recommendations to the stormwater resilience program.



# URBAN LAND INSTITUTE (ULI)

*ULI OBSERVATIONS: “Acted with courage to fix sunny day and stormwater flooding”*

*“Applied good practice for initial pump rollout – engineering and prioritization, initiated street elevations, designed for mid-level climate risk, raised funds through fees, crafted thoughtful communications... collaborated... implemented multiple levers including policy changes, examining cost/benefits...”*

*April 2018*





# Introducing the ULI Panel...



***ULI Advisory Services Panel***

## ***VISION***

- *Integrate stormwater management into the larger resilience strategy*
- *Enhance trust, trust the public, increase transparency*
- *Elevate aesthetics and function to perpetuate city's cultural relevance*
- *Actively use green and open spaces for sponge function*
- *Increase long term financial and comprehensive protection*
- *Go big on the resilience brand – distinguish yourself from your coastal competitors*



# ULI Recommendations

## STORMWATER & CLIMATE ADAPTATION PRINCIPLES

- *Maintained urgency,*
- *incrementalism & evaluation,*
- *transparency,*
- *ecological health,*
- *financial pragmatism,*
- *co-benefits,*
- *social equity,*
- *cultural identity,*
- *living with water,*
- *long-term and regional perspective*





# ULI Recommendation 1

## Infrastructure:

- Blue/green infrastructure
- Water quality enhancements
- Enhanced, integrated and multi-risk modeling
- Living with water pilot projects
- Level of service
- Income generating solar power
- Blue corridor



## **ACTIONS TO DATE**

- READY Team (convened April 2018)
- 100 RC Resilience Accelerator for West Avenue (August 2018)
- RFQ for a Comprehensive & Integrated Stormwater Master Plan and Design Criteria Professional (underway)
- Integrated Water Modeling Market Research (underway)
- Dr. Charles Rowney Water Quality Analysis (complete)
- Street Tree Management Plan (underway)
- Amending Land Use Regulation (Policy discussion)

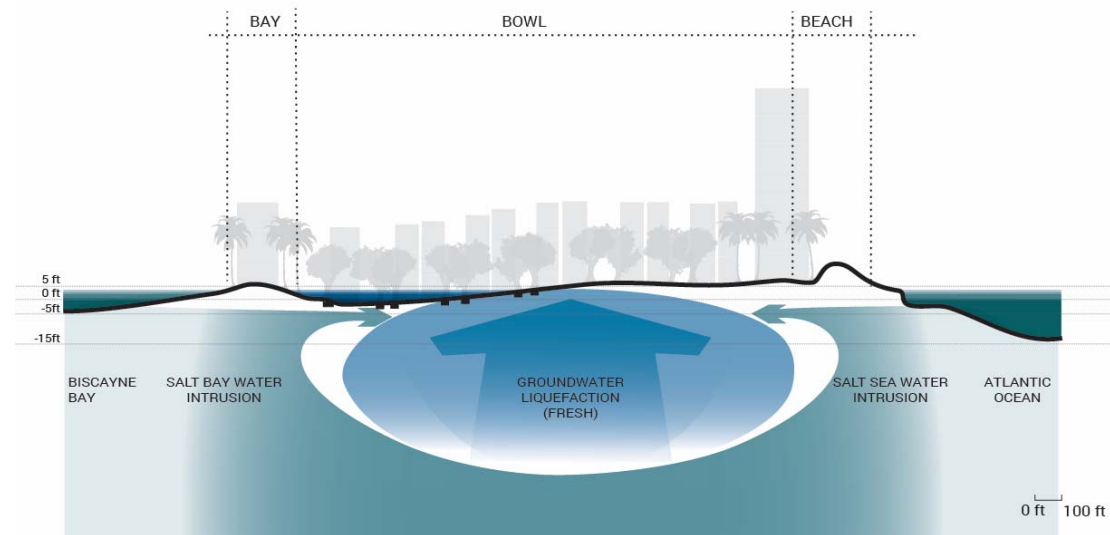


# ULI Recommendation 2

## Design Typologies: →

- Golf course as underused greenspaces
- Enhance road permeability
- Solar and renewable opportunities

**ACTION: Under staff review**





# ULI Recommendation 3

## Creative placemaking:

- Partner with local arts and culture stakeholders
- Incorporate public art into stormwater strategy
- Involve artists in design



**ArtCenter**  
SOUTH FLORIDA



## **ACTION**

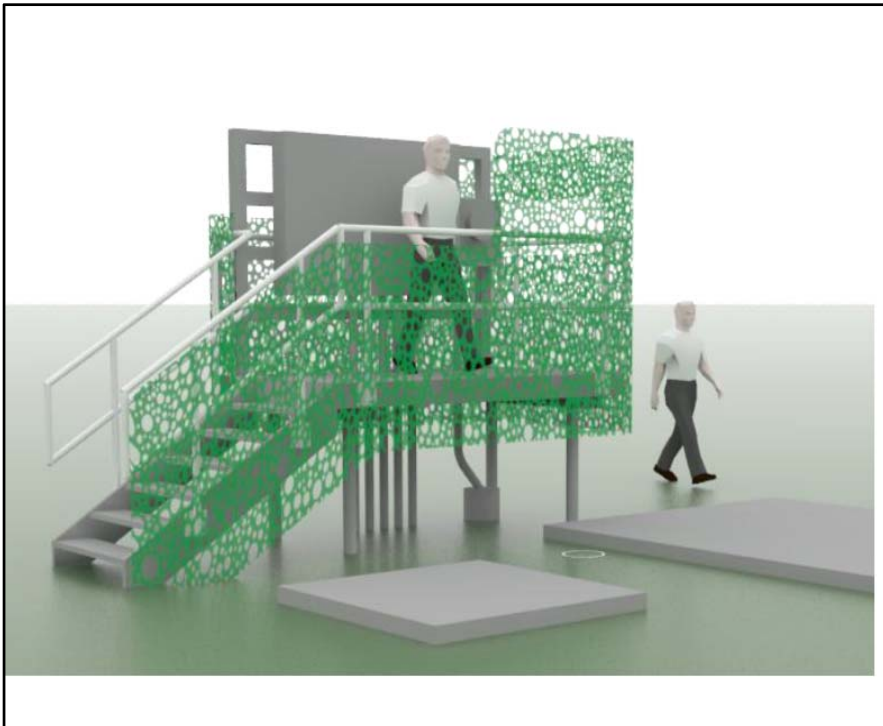
- Resilience Artist in Residency (underway)
- West Lots Planning (underway)
- 41<sup>st</sup> Street Master Plan (underway)
- Design Review Board-approved pump-station screening (underway)
- Further develop Miami Beach Rising Above Resiliency App (funding needed in FY 19/20)



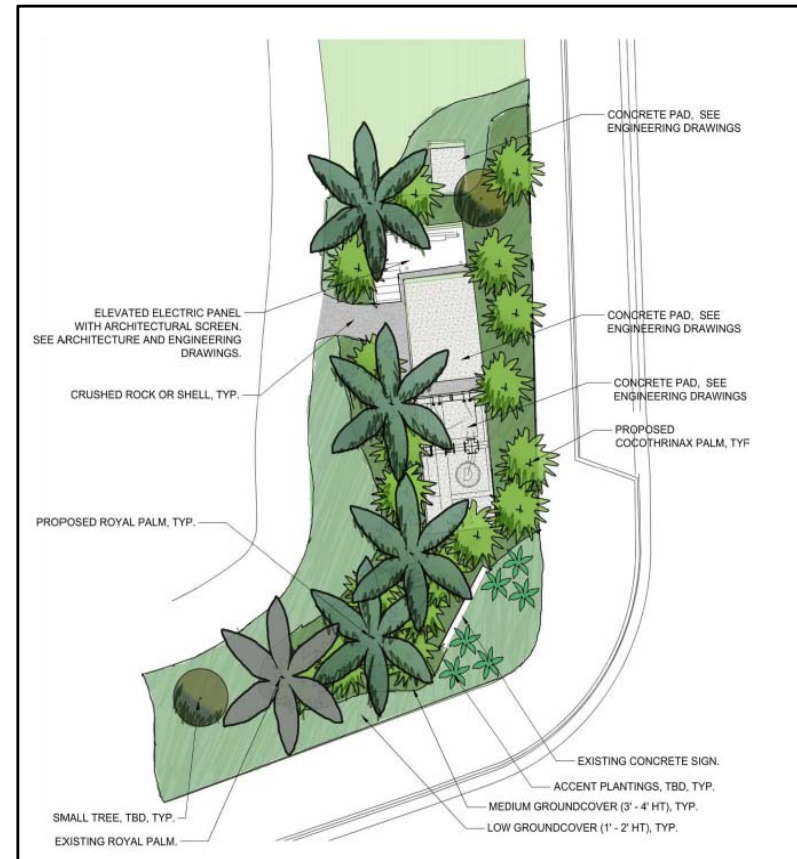
# Design Review

## Board-approved pump-station screening (approved)

### ARCHITECTURAL SCREENING MATERIAL



### LANDSCAPED SCREENING





# ULI Recommendation 4

## Governance:



- Identify, redirect or reorganize staff for:
  - Rising Above Delivery Office
  - Agency for Public Investment & Development in Resilience
  - Risk Transfer Department
- Create a scientific advisory panel
- Create a Community Adaptation Fund
- Align for historic preservation & climate strategies

## **ACTION**

- Negotiating contract with the consultant to develop Design Guidelines for Historic Preservation in the face of Climate Change (underway)
- Other recommendations under staff review

*“New adaptation and mitigation tools are needed to support communities as they respond to the new normal.”*  
– *The National Trust for Historic Preservation*



# ULI Recommendation 5

## Financing:

- Assessment districts (BID, HOA)
- Incremental finance districts – community reinvestment areas
- Risk management function should be driven a total cost of risk approach (TCOR)
- Engage private financial stakeholders
- Adjust stormwater fees based on runoff
- Community adaptation fund for low interest adaptation loans
- Insurance as a form of risk transfer
- Integrate finance into communications strategy



## **ACTION**

- Business case analysis first task order (underway)
- Exploring parametric insurance for resort taxes (underway)
- City's Financial Advisor is engaged with rating agencies, reports on sea level rise risk, and the progress and continuous improvement of our stormwater program (June 2018)
- Exploring Special Assessment Districts for sea walls (underway)



# ULI Recommendation 6

## Regulations:



- Embed water management goals in the development regulations
- Leverage and reform regulatory boards
- Establish specific measurable water management goals at district level
- Adjust stormwater fees
- Create island-wide sea barrier through some form of an assessment rather than leaving this up to individual owners
- Continue to support elevation for new construction

## **ACTION**

- Build upon recent changes to land use boards requiring a sea level rise and resilience review of pending developments (July 2017)
- Requires further policy/legislative change





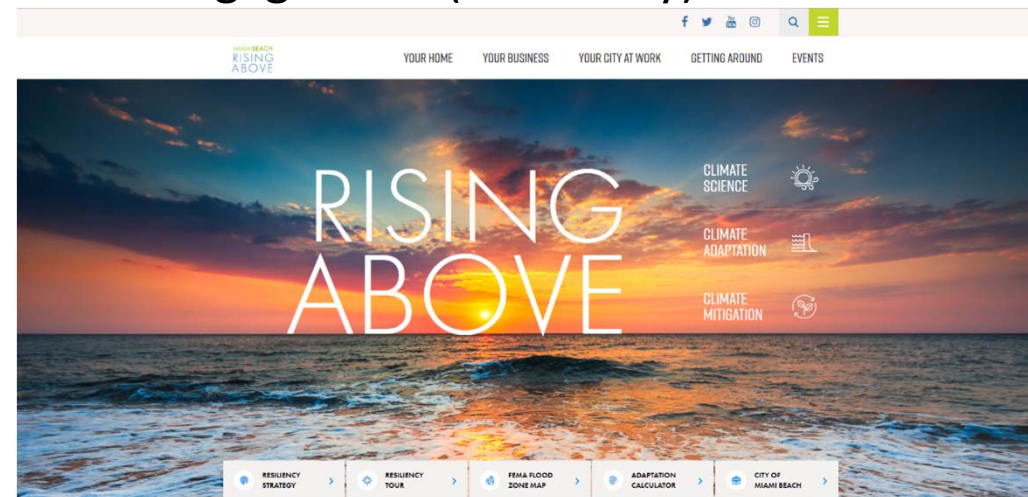
# ULI Recommendation 7

## Integrated Communications Plan:

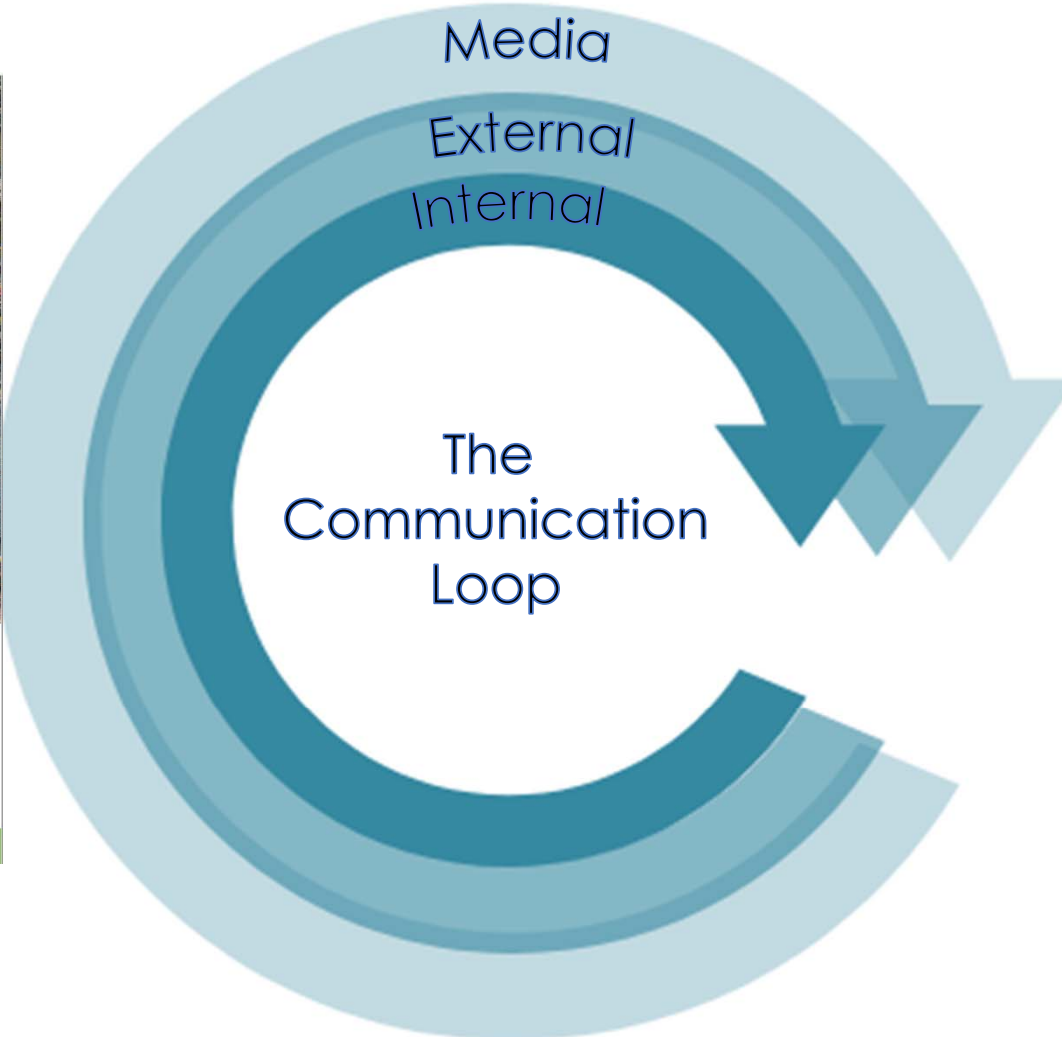
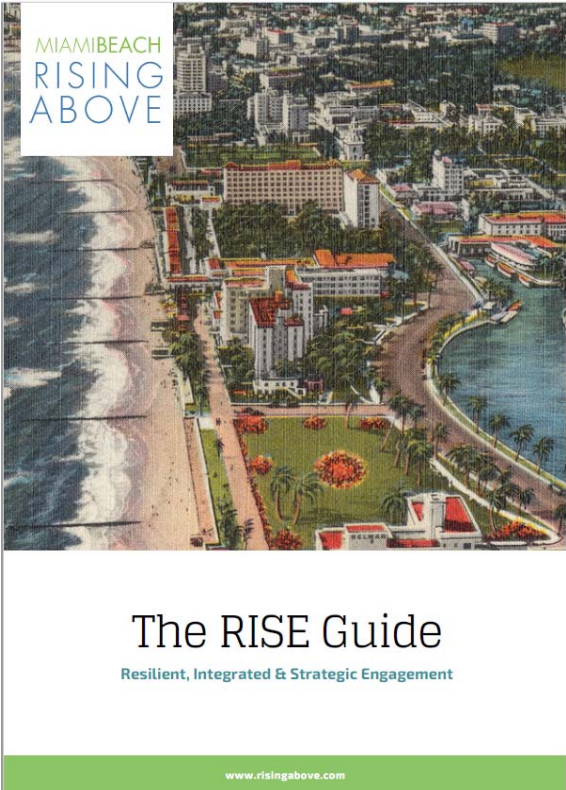
- Promote Rising Above website as the primary resource
- Be bolder in communications strategy
- Build public trust through clarity and transparency
- Create a broad communications plan
- Increase diversity and robustness of communications
- Solicit community input
- Recognize achievements and successes

## ACTION

- Developing tools for internal integration and internal communications (underway)
- Developing integrated external communications plan for stakeholder engagement (underway)







**“Designed to increase message consistency, trusting relationships, and knowledge sharing among our government and members of the community”.**



# IMPLEMENTATION STRATEGY



## Miami Beach Advisory Services Panel Report: Summary of Recommendations

Topic	LEAD	SUPPORT	Recommendation	TYPE (administrative, legislative, research needed)	LEAD (person-owner/champion)	Support (team)	\$\$ FUNDING NEEDS (yes/no)	STATUS (recent action, next action)
Infrastructure	PWD,CIP	E&S, PLANNING, COUNTY(?)	<ol style="list-style-type: none"> <li>1 Improve flexibility and robustness of current stormwater system</li> <li>2 Create an integrated, hydrodynamic computer model to better inform decision making on flooding issues and risk</li> <li>Engage an owner's representative to consult on product selection</li> <li>Purchase integrated modeling software</li> <li>Add "flood risk model manager" position to ensure most productive</li> <li>3 Implement blue and green infrastructure to advance a more holistic living-with-water</li> <li>4 Ensure appropriate modeling, study, and funding availability for green</li> <li>5 Implement living-with-water pilot projects</li> <li>6 Create tools for living-with-water projects at the building level</li> <li>7 Consider a level-of-service concept to guide future decision making</li> <li>8 Address water quality concerns</li> <li>9 Improve communications about engineering and infrastructural solutions</li> </ol>					




## Next Steps

# MIAMI BEACH RISING ABOVE

- October City Commission for report acceptance
- Monthly updates at the Commission's Sustainability and Resilience Committee (SRC) to develop legislative and policy actions items and to consider budget implications
- Bi-weekly review at the City Manager's READY Team
- Develop and use recommendation tracking chart





**Jimmy Morales  
Miami Beach  
City Manager  
Thank you!**

MIAMIBEACH  
RISING  
ABOVE





A foggy waterfront scene in Boston. On the left, a red fishing boat with the number 684132 is docked. In the background, a large white archway and modern buildings are visible. On the right, a paved walkway with a black metal railing runs along the water, with a street and more buildings in the distance. The overall atmosphere is overcast and misty.

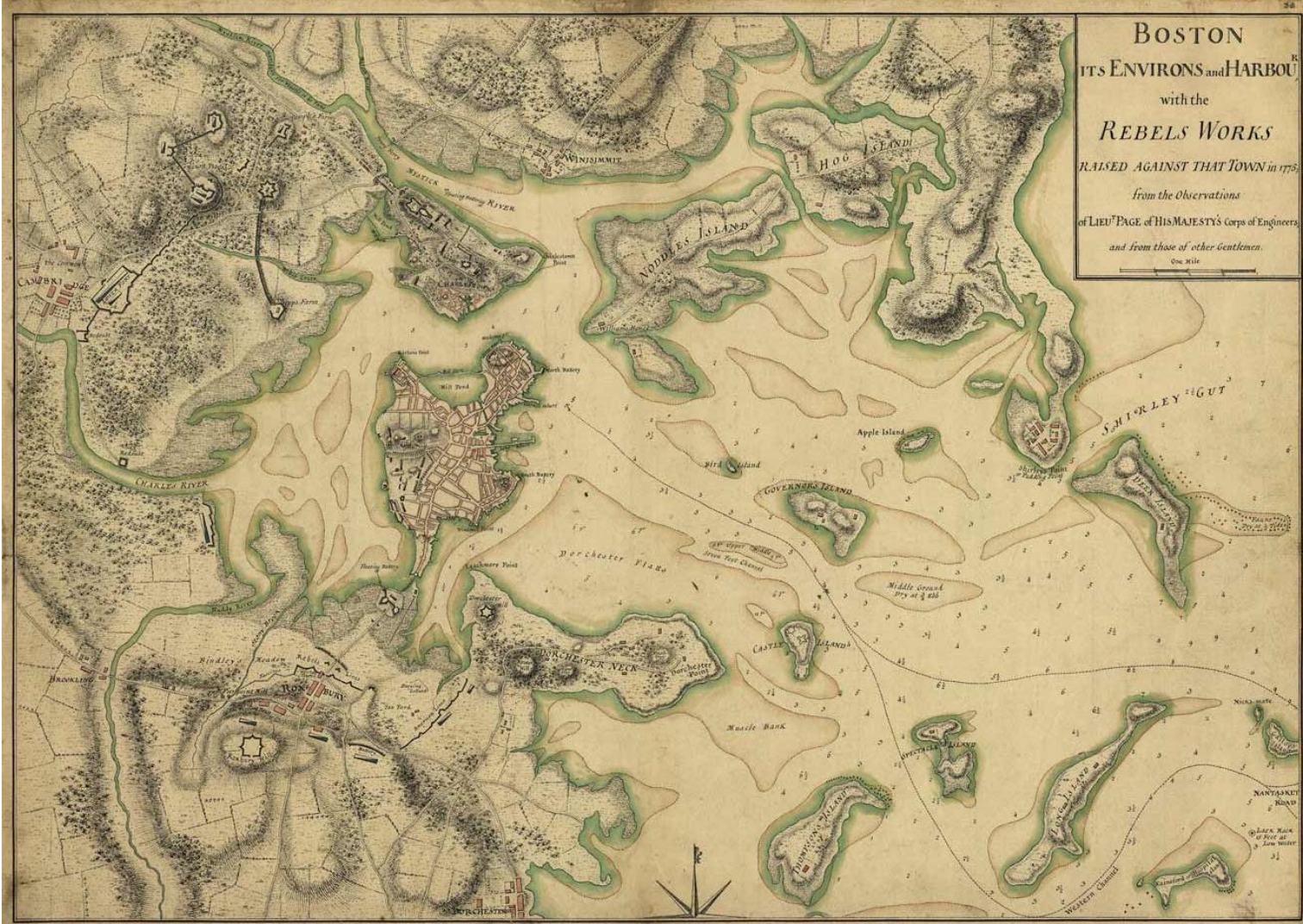
# *ULI Annual Meeting Coastal Forum Setting the Stage*

October 8, 2010  
Boston

Jason Hellendrung, Tetra Tech  
Erik Tinkhauser, Lendlease  
Katie Wholey, Arup  
Matthijs Bouw, One Architecture + Urbanism  
Alice Brown, Boston Harbor Now

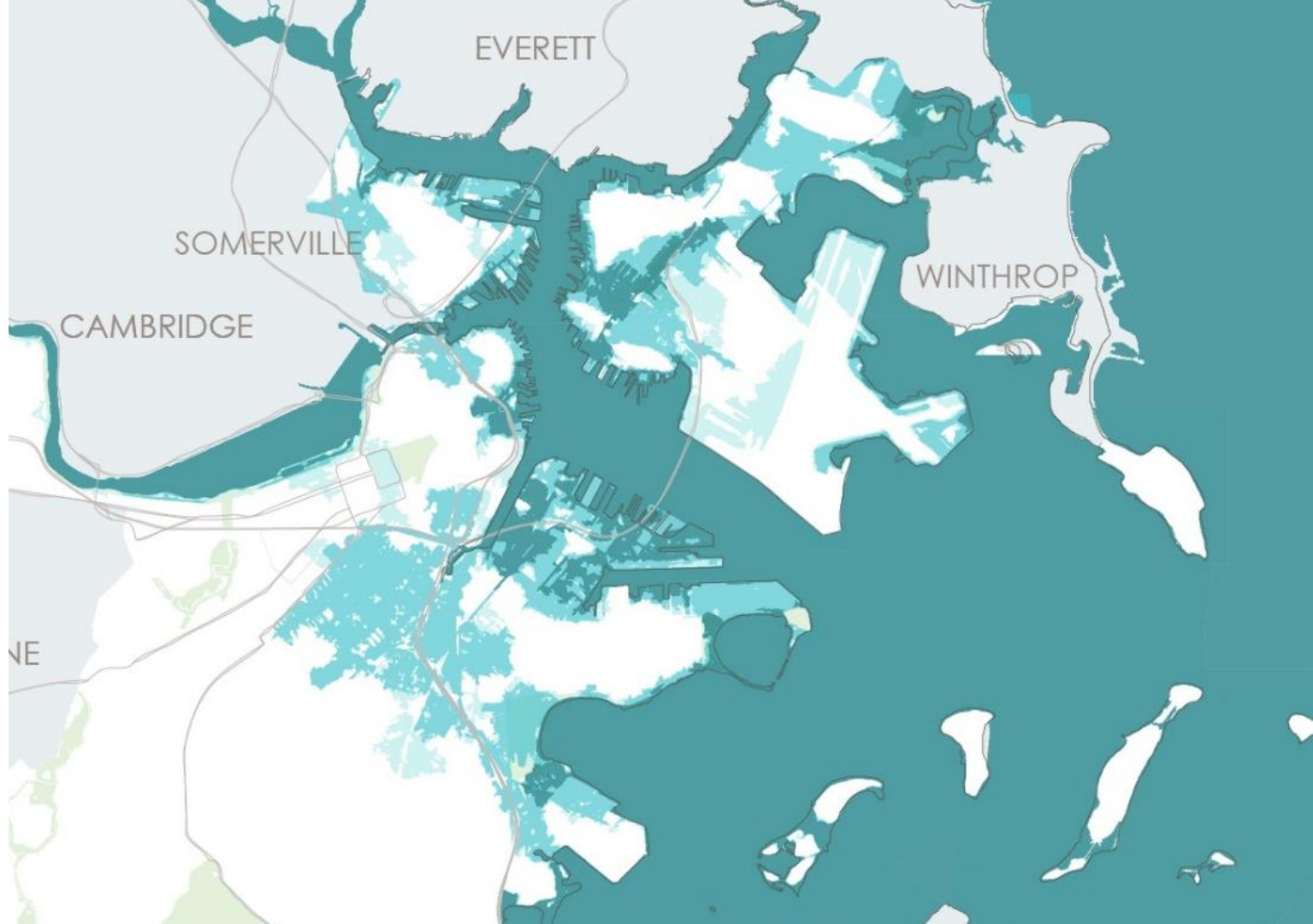


# SETTING THE STAGE





# SETTING THE STAGE



Boston, 2070



# SETTING THE STAGE



King Tide,  
October, 2016



# SETTING THE STAGE

**EPIC NOR'EASTER FLOODS DOWNTOWN STREETS**

**TIDAL RUSH**

**BOSTON Herald**  
BOSTONHERALD.COM  
FRIDAY, JANUARY 5, 2018 • \$2.00

**New calls for harbor sea wall as storm surge wrecks havoc in Hub**



Boston firefighters rescue a motorist from his flooded car on State Street during the height of yesterday's storm.



PHOTO BY MICHAEL LEVY

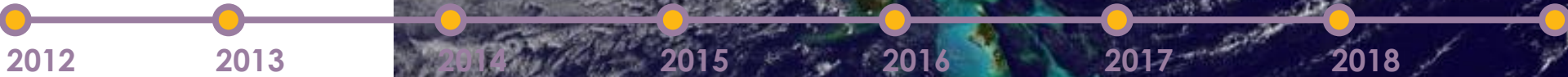


Winter Storms,  
January 4, 2018;  
March 2, 2018



# SETTING THE STAGE

October, 2012 –  
Superstorm Sandy  
hits





# SETTING THE STAGE

February, 2013 - The Boston Harbor Association publishes *Preparing for the Rising Tide*



2012

2013

2014

2015

2016

2017

2018



## SETTING THE STAGE



# CLIMATE READY BOSTON

November, 2016 – Mayor Walsh  
releases ImagineBoston 2030  
Citywide Plan

December, 2016 – Mayor Walsh  
releases Climate Ready Boston  
Vulnerability Assessment and  
Resilience Strategy





# CONTENTS

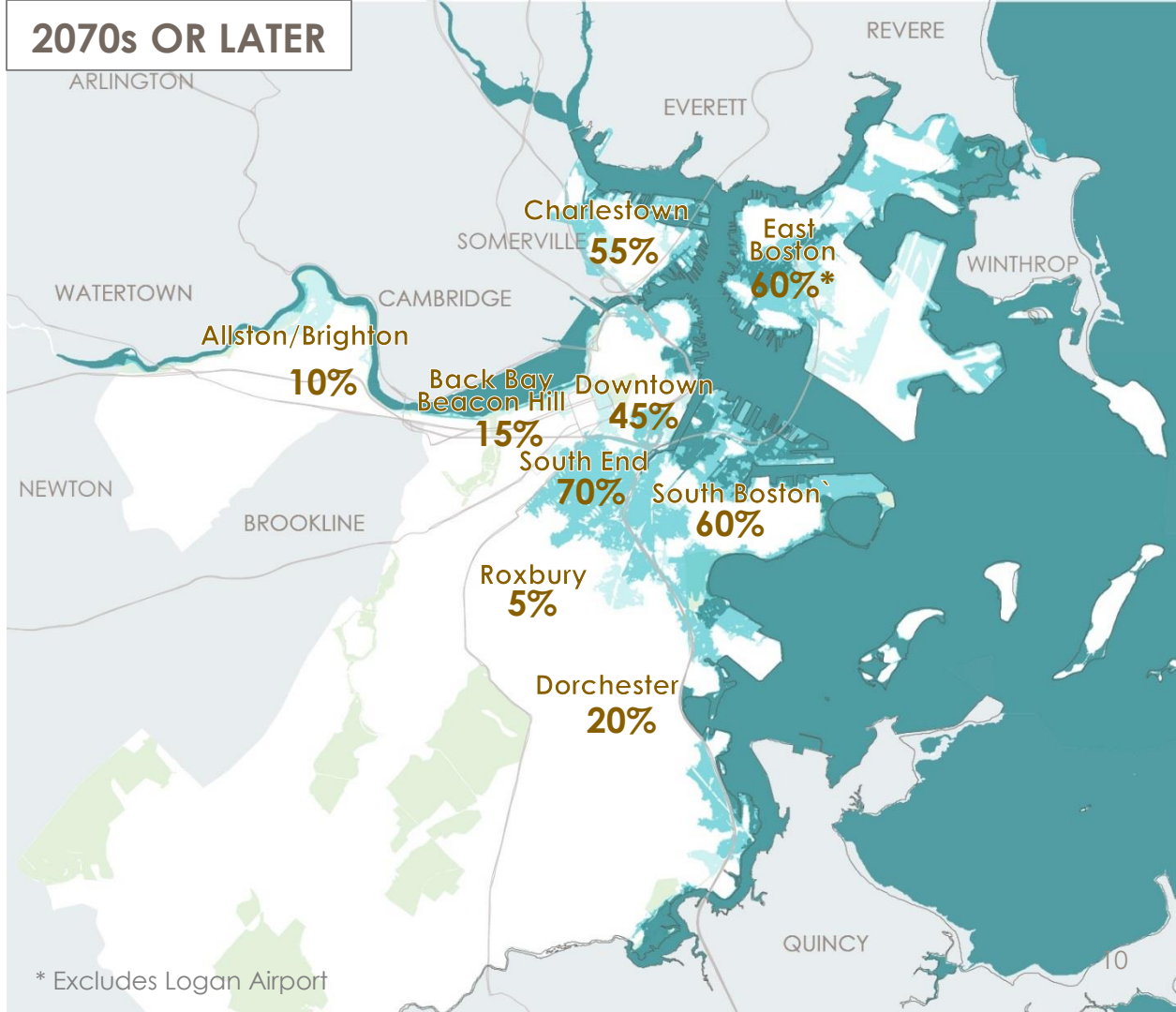
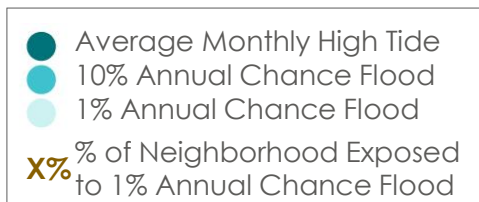
- I. **Climate Projection Consensus**
- II. **Vulnerability Assessment**
- III. **Resilience Initiatives**
- IV. **Geographic Focus Areas**



# FLOOD PROGRESSION

COASTAL & RIVERINE FLOODING

In the late century, exposure will expand to vast areas of the city, including inland neighborhoods like the **South End** and neighborhoods **along the Charles River**.





# FLOOD PROGRESSION

COASTAL & RIVERINE FLOODING

A **1% annual chance** flood  
2030s - 2050s



A **10% annual chance** flood  
2050s - 2100s



Monthly flooding  
2070s or later

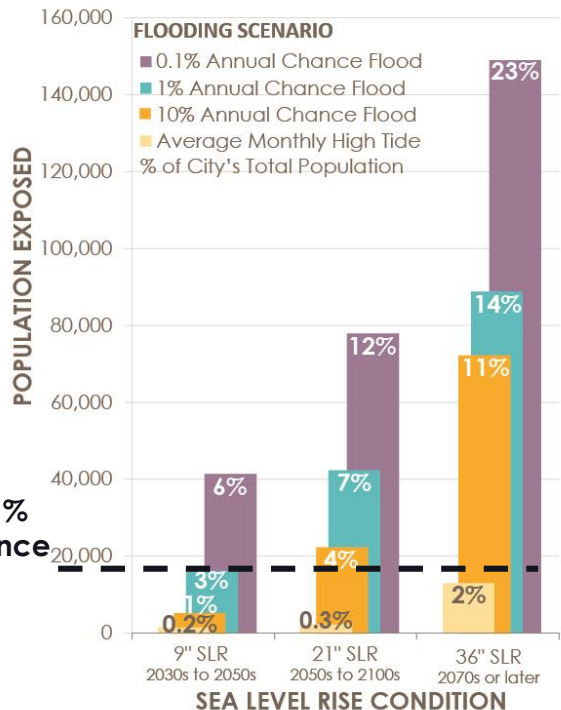




# PEOPLE AND BUILDINGS EXPOSED TO FLOODING

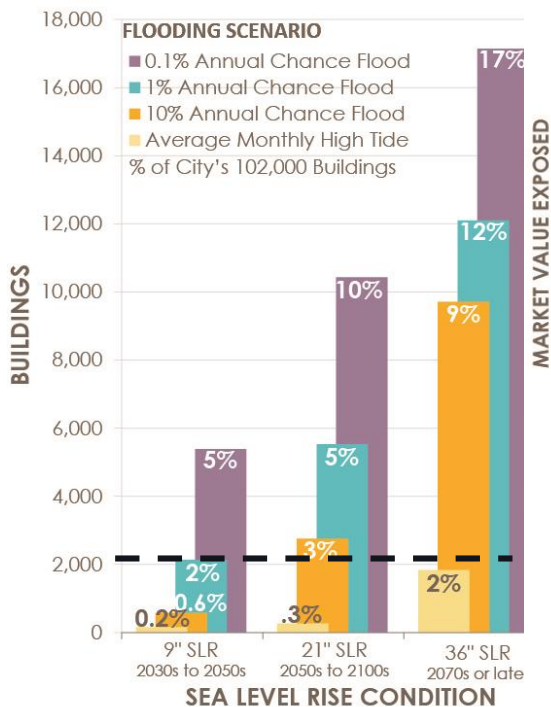
COASTAL & RIVERINE FLOODING

## POPULATION

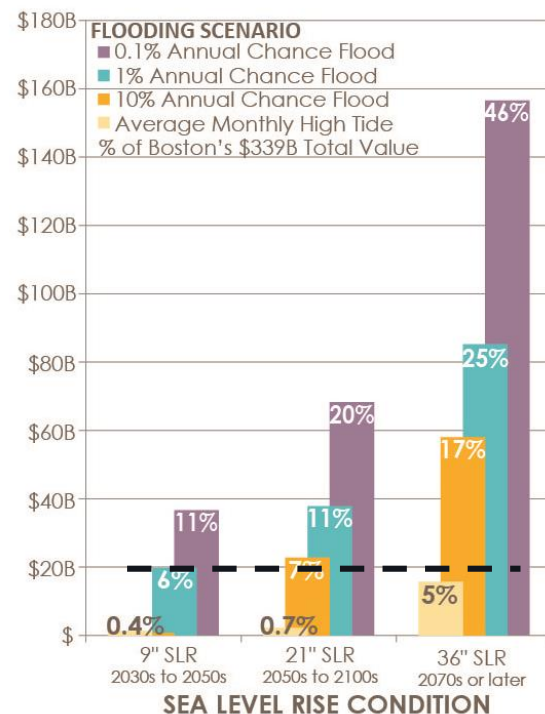


Near-term 1% annual chance exposure

## BUILDINGS



## BUILDING VALUE





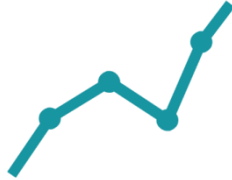
# RESILIENCE INITIATIVES



# RESILIENCE INITIATIVES PRINCIPLES



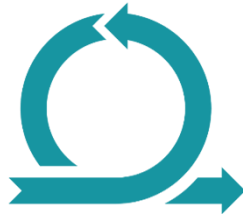
SUPPORT **MULTIPLE BENEFITS** WITH EACH ACTIVITY



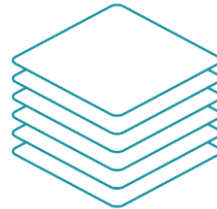
MAKE IMPROVEMENTS AS PART OF **BUILDING CYCLES**, AND **ADDRESS MARKET FAILURES**



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



DEVELOP **ADAPTIVE AND FLEXIBLE STRATEGIES**



**WORK IN LAYERS** FOR INDEPENDENTLY EFFECTIVE SOLUTIONS



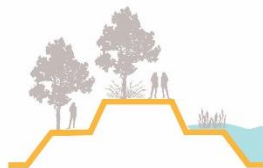
# RESILIENCE INITIATIVES FRAMEWORK



*Updated  
Climate  
Projections*



*Prepared &  
Connected  
Communities*



*Protected  
Shores*



*Resilient  
Infrastructure*



*Adapted  
Buildings*



Layer: Prepared & Connected Communities

**Strategy: Expand education & engagement of Bostonians on climate hazards and action.**



Credit: Matt Conti



Layer: Protected Shores

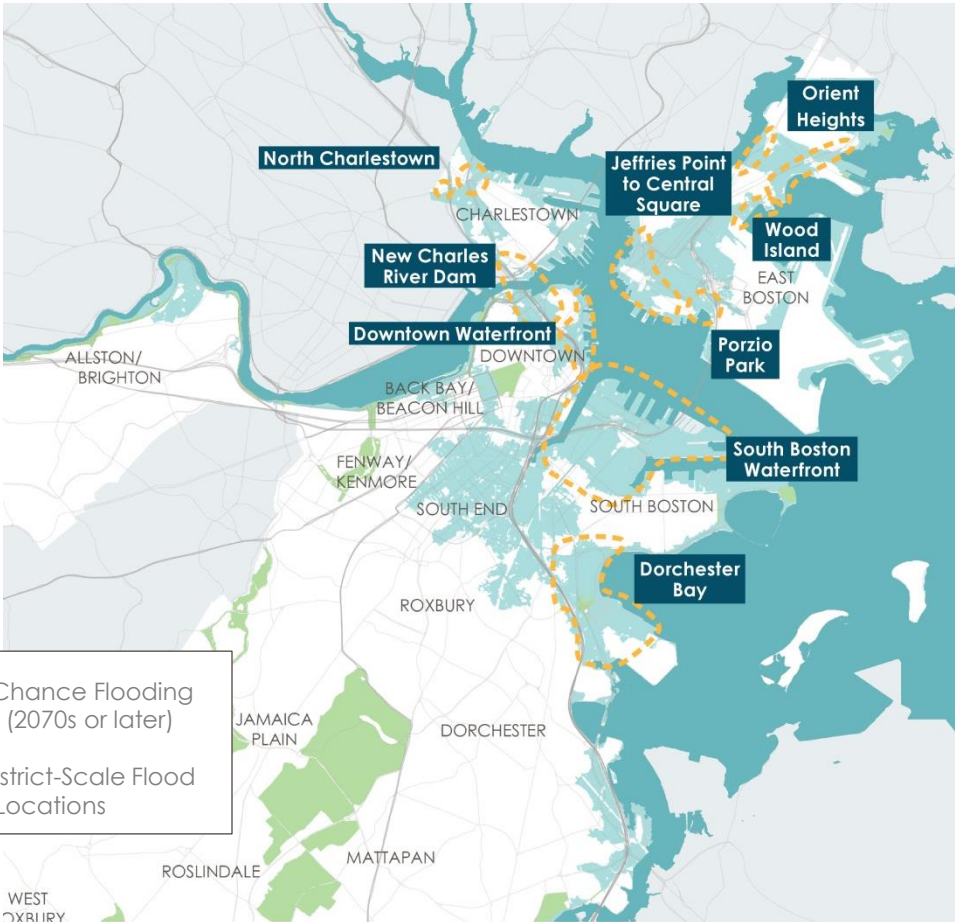
**Strategy: Develop local climate resilience plans to coordinate adaptation efforts.**







Layer: Protected Shores

# Strategy: Create a coastal protection system.



 1% Annual Chance Flooding with 36" SLR (2070s or later)

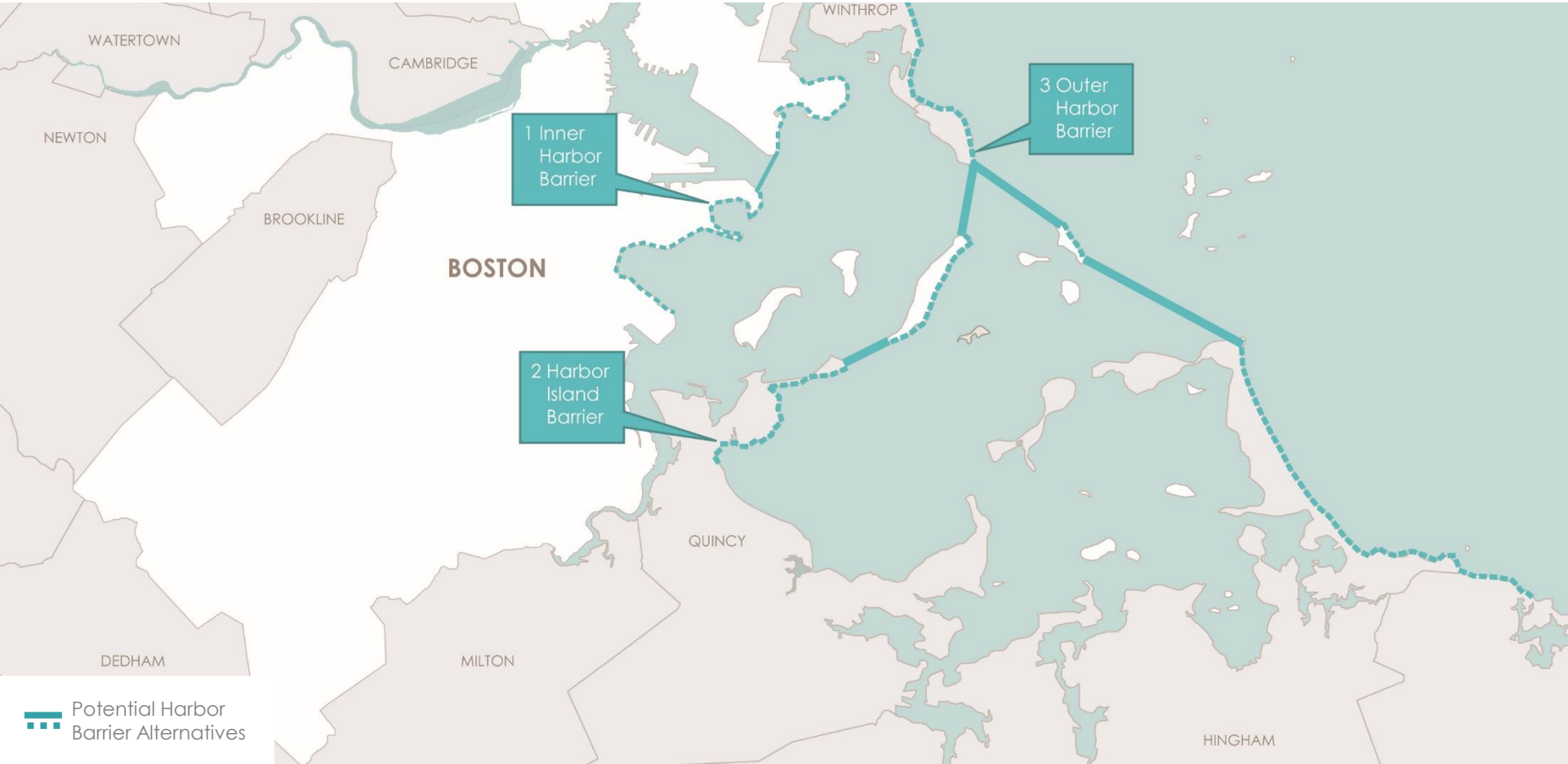
 Potential District-Scale Flood Protection Locations





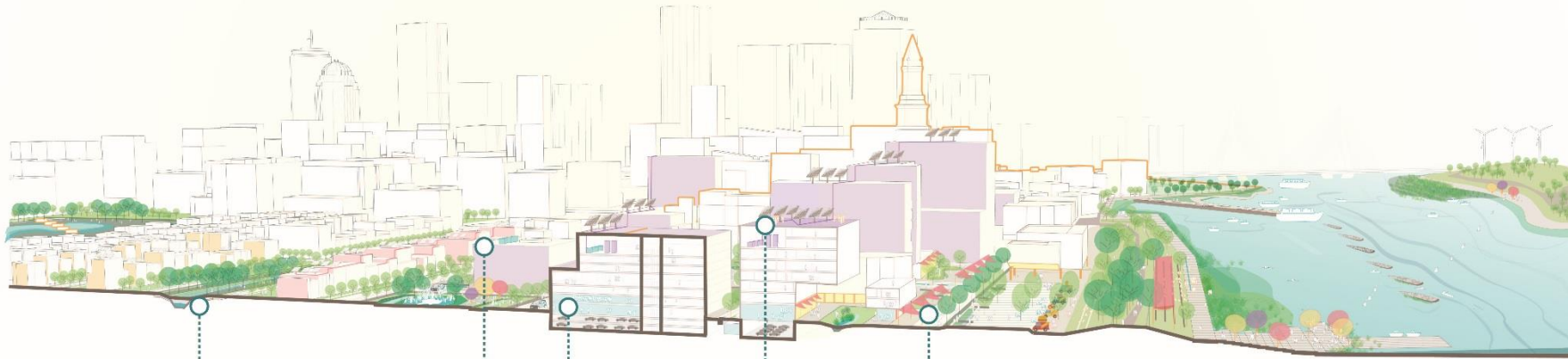
# Layer: Protected Shores

**Strategy: Create a coastal protection system.**





# HOT DAY



Maintain up-to-date projections of future climate conditions to inform adaptation

Expand education on climate hazards and action

Develop district level energy solutions to increase decentralization & redundancy

Leverage climate adaptation as a tool for economic development

Create a coastal protection system to address flood risk

Develop local climate resilience plans to coordinate adaptation efforts

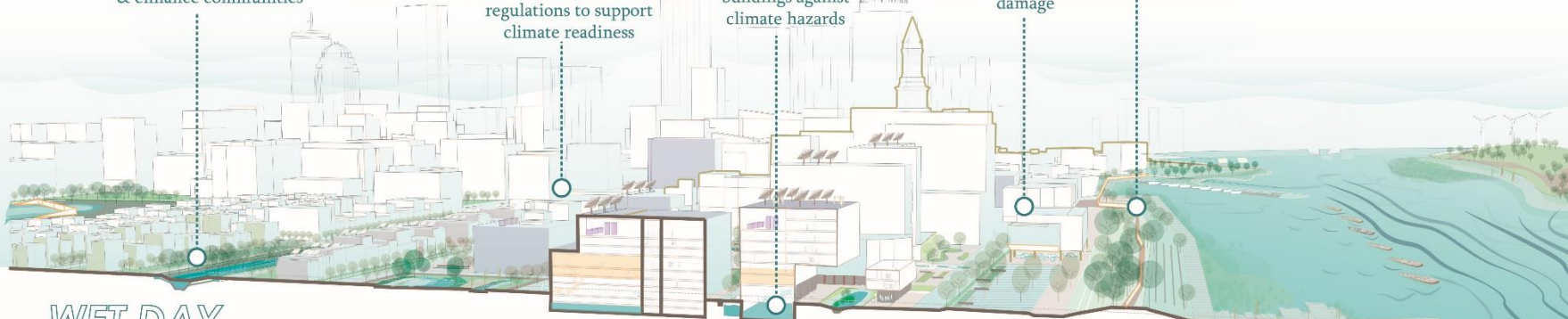
Expand the use of green infrastructure & natural systems to manage stormwater, mitigate heat, & enhance communities

Coordinate investments to adapt infrastructure to future climate conditions

Update zoning & building regulations to support climate readiness

Retrofit existing buildings against climate hazards

Insure buildings against flood damage



# WET DAY



Layer: Resilient Infrastructure

**Strategy: Coordinate investments to adapt infrastructure to future climate conditions.**

### Infrastructure Coordination Committee

- Establish planning & design standards
- Identify cascading vulnerabilities & opportunities for joint adaptation projects
- Develop adaptation plans
- Provide annual progress reports



Credit: Bill Damon



## Layer: Adapted Buildings

**Strategy: Update zoning and building regulations to support climate readiness.**

### Potential Revisions

- Requiring min. ceiling height for ground floors to be measured from the Planning Flood Elevation (PFE).
- Measuring max. building height from PFE (vs. grade) within future floodplains.
- Allowing first floors below PFE to be converted to uses other than human occupancy, wet floodproofed, & removed from total floor area.
- Allowing subgrade basements to be filled in & removed from total floor area.
- Allowing mechanical systems, cables, & other wiring equipment to be either elevated above DLFE & removed from total floor area or moved outdoors.



Spaulding Rehabilitation Hospital



# SETTING THE STAGE





**2070 1% ANNUAL STORM**

**2030 1% ANNUAL STORM**

**CENTRAL SQUARE**

**CURRENT 1% ANNUAL STORM**

**EAST BOSTON GREENWAY**

**PIERS PARK**

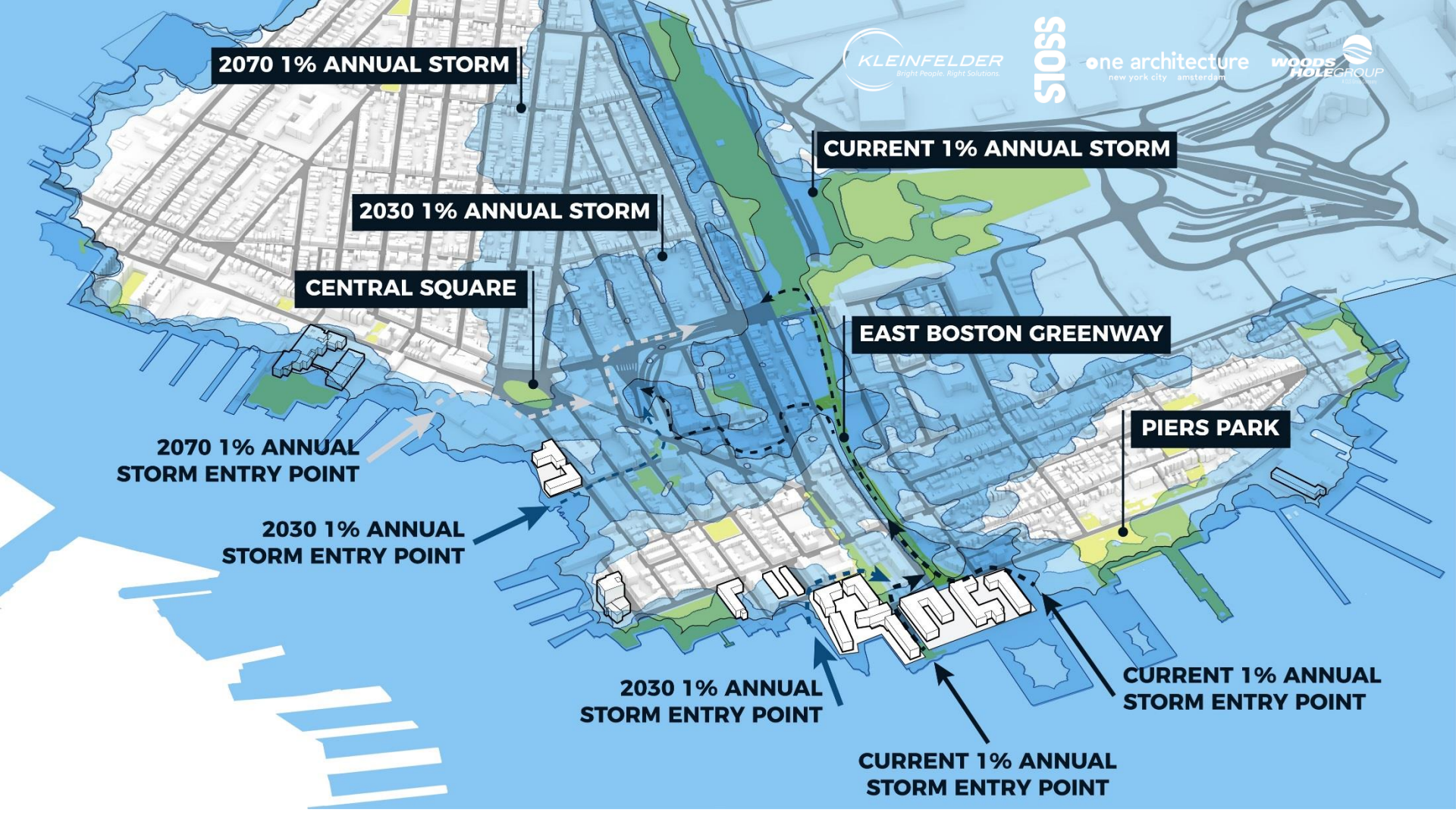
**2070 1% ANNUAL STORM ENTRY POINT**

**2030 1% ANNUAL STORM ENTRY POINT**

**2030 1% ANNUAL STORM ENTRY POINT**

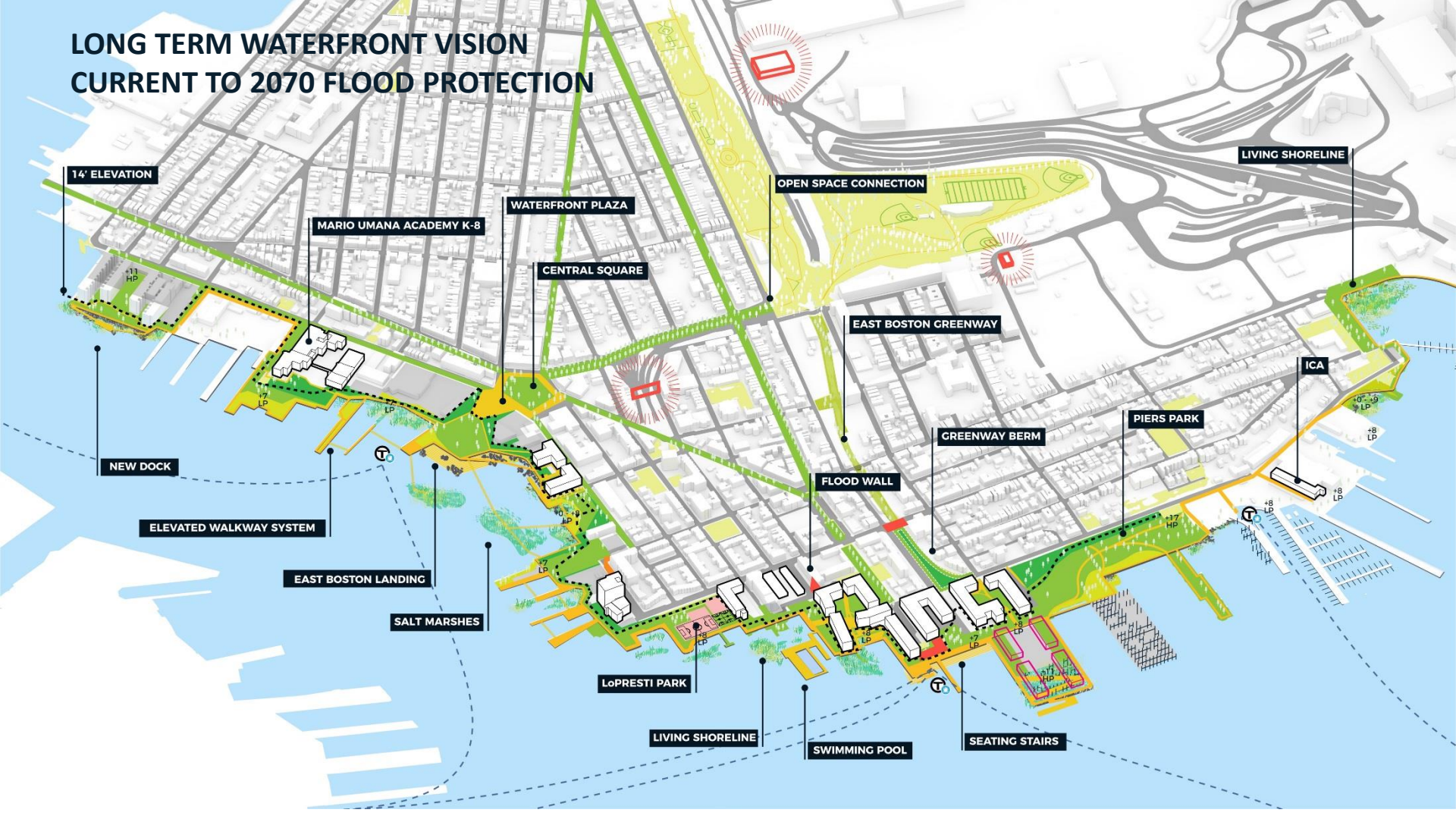
**CURRENT 1% ANNUAL STORM ENTRY POINT**

**CURRENT 1% ANNUAL STORM ENTRY POINT**





# LONG TERM WATERFRONT VISION CURRENT TO 2070 FLOOD PROTECTION



14' ELEVATION

MARIO UMANA ACADEMY K-8

WATERFRONT PLAZA

CENTRAL SQUARE

OPEN SPACE CONNECTION

EAST BOSTON GREENWAY

LIVING SHORELINE

NEW DOCK

ELEVATED WALKWAY SYSTEM

EAST BOSTON LANDING

SALT MARSHES

LoPRESTI PARK

LIVING SHORELINE

SWIMMING POOL

SEATING STAIRS

FLOOD WALL

GREENWAY BERM

PIERS PARK

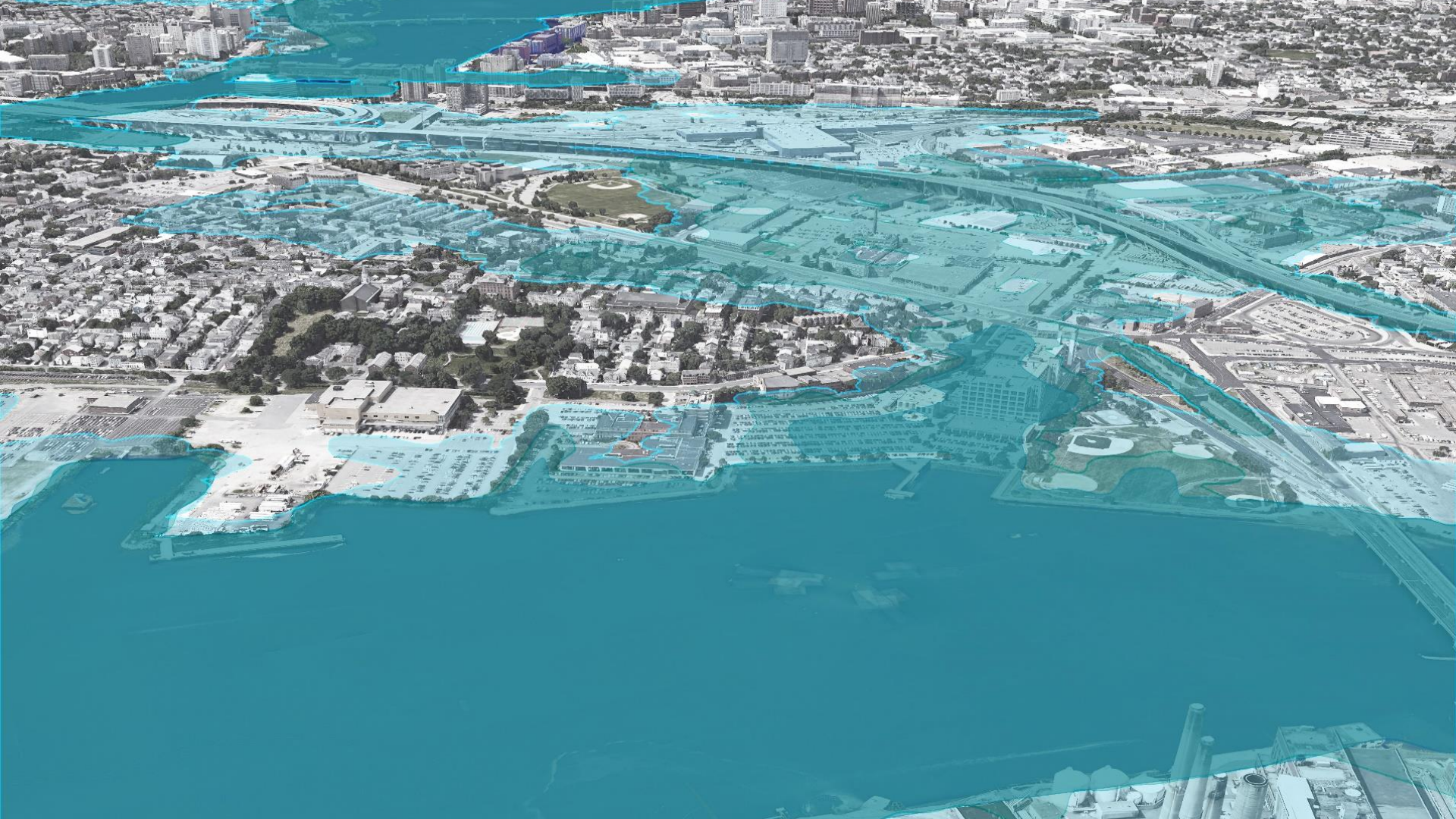
ICA



# Overall Resilience Vision – East Boston













# CHARLESTOWN: FLOOD PATHWAY 2070



CAMBRIDGE BORDER

2070 FLOOD RISK

2030 FLOOD RISK

CURRENT FLOOD RISK

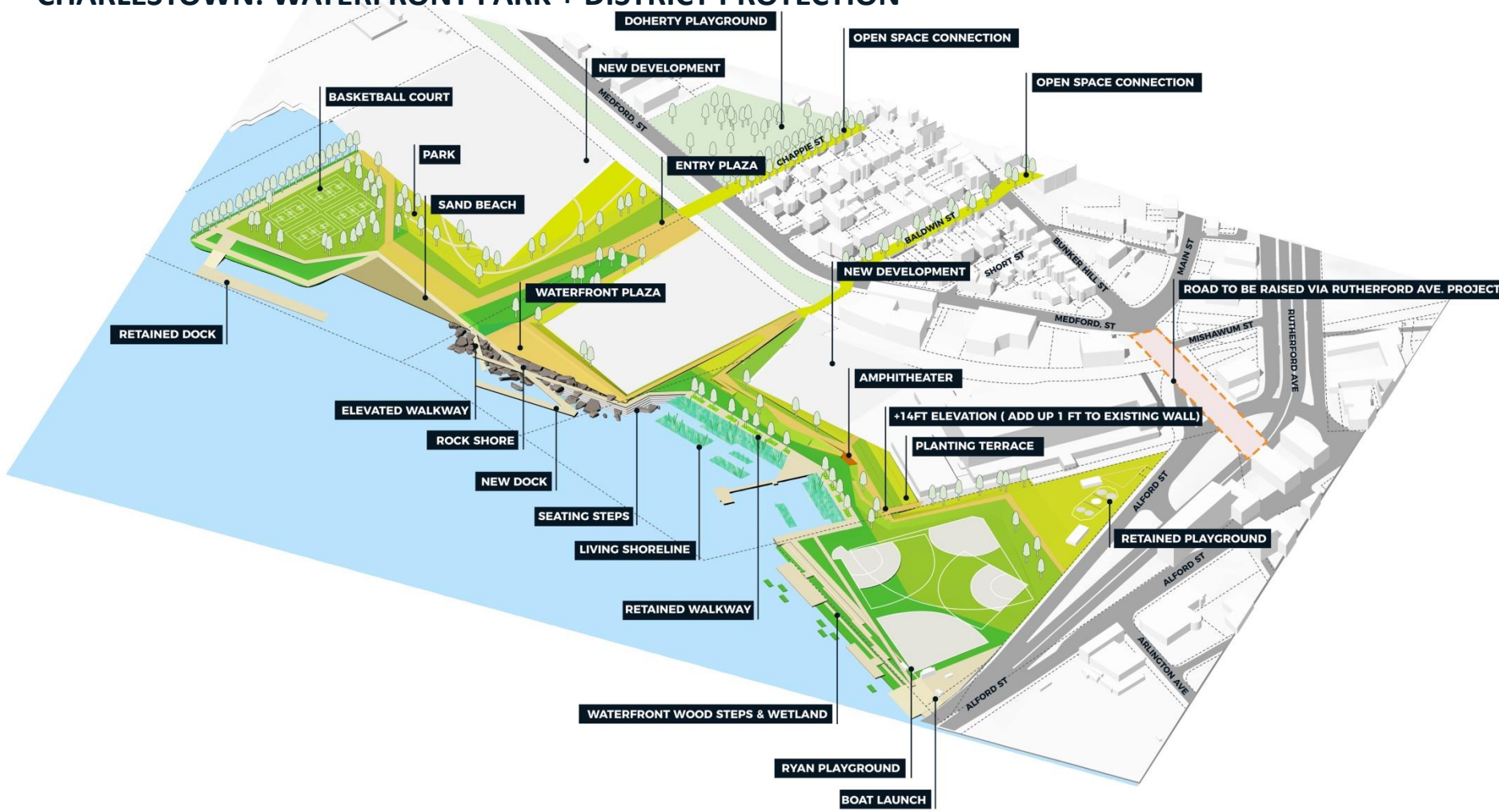
SULLIVAN SQUARE

SCHRAFFT'S BUILDING

RYAN PLAYGROUND



# CHARLESTOWN: WATERFRONT PARK + DISTRICT PROTECTION



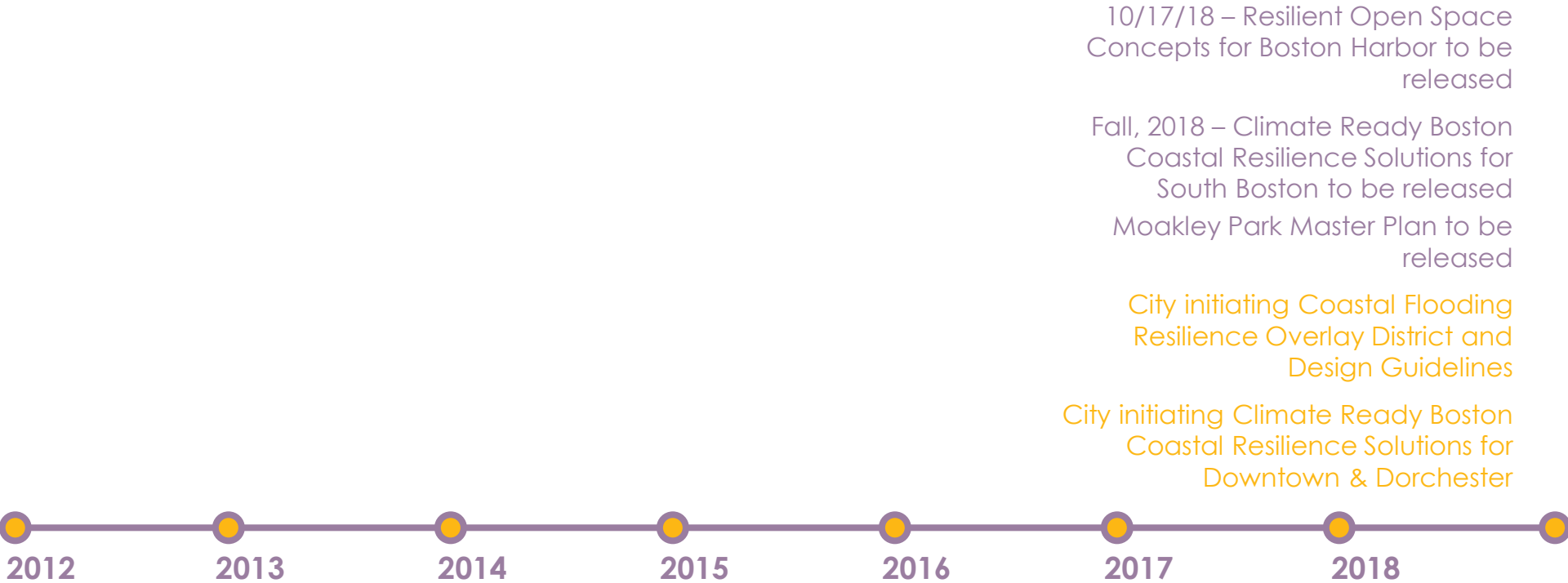


# Overall Resilience Vision – Charlestown





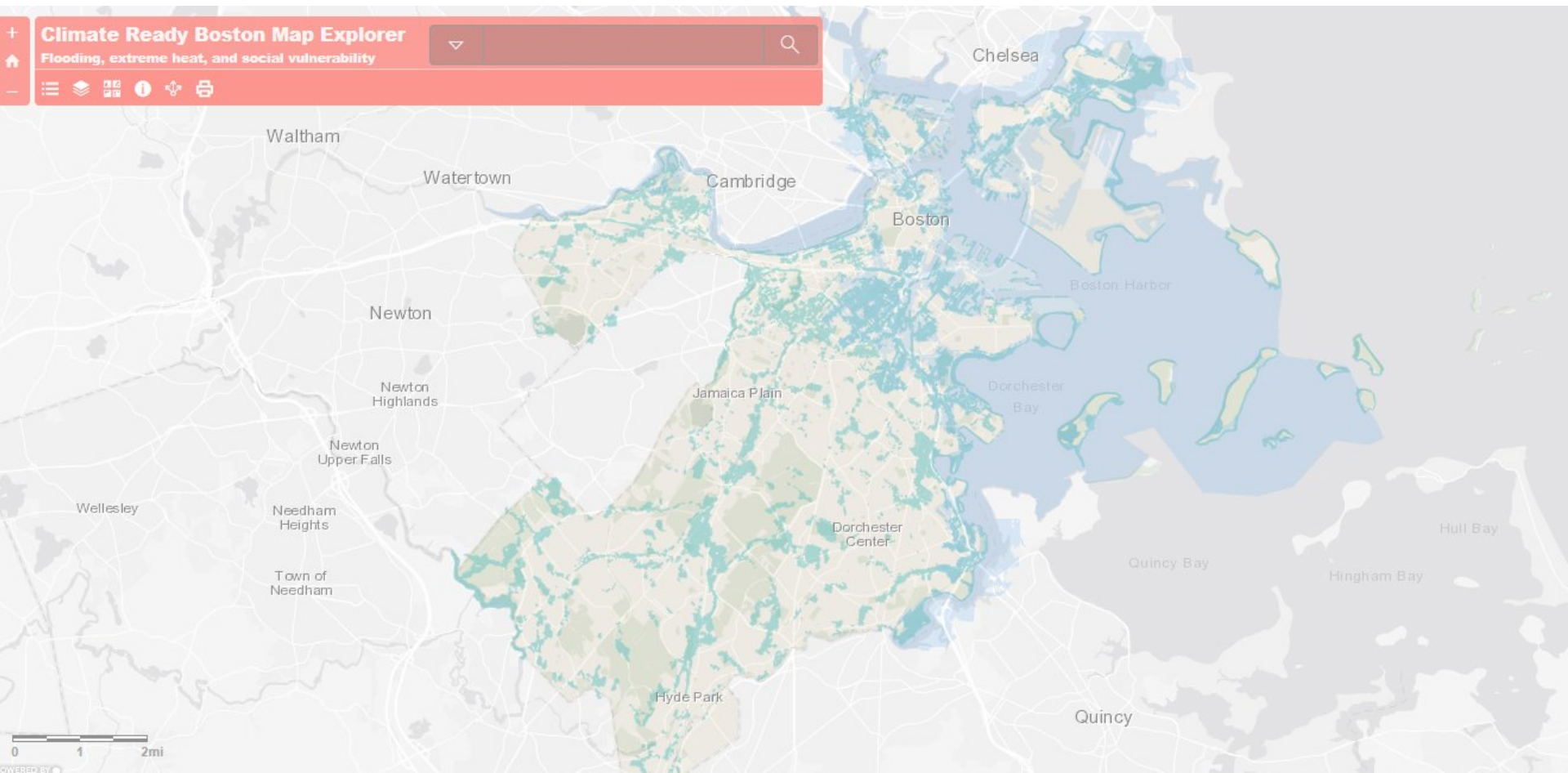
# SETTING THE STAGE





# SETTING THE STAGE

**Climate Ready Boston Map Explorer**  
Flooding, extreme heat, and social vulnerability

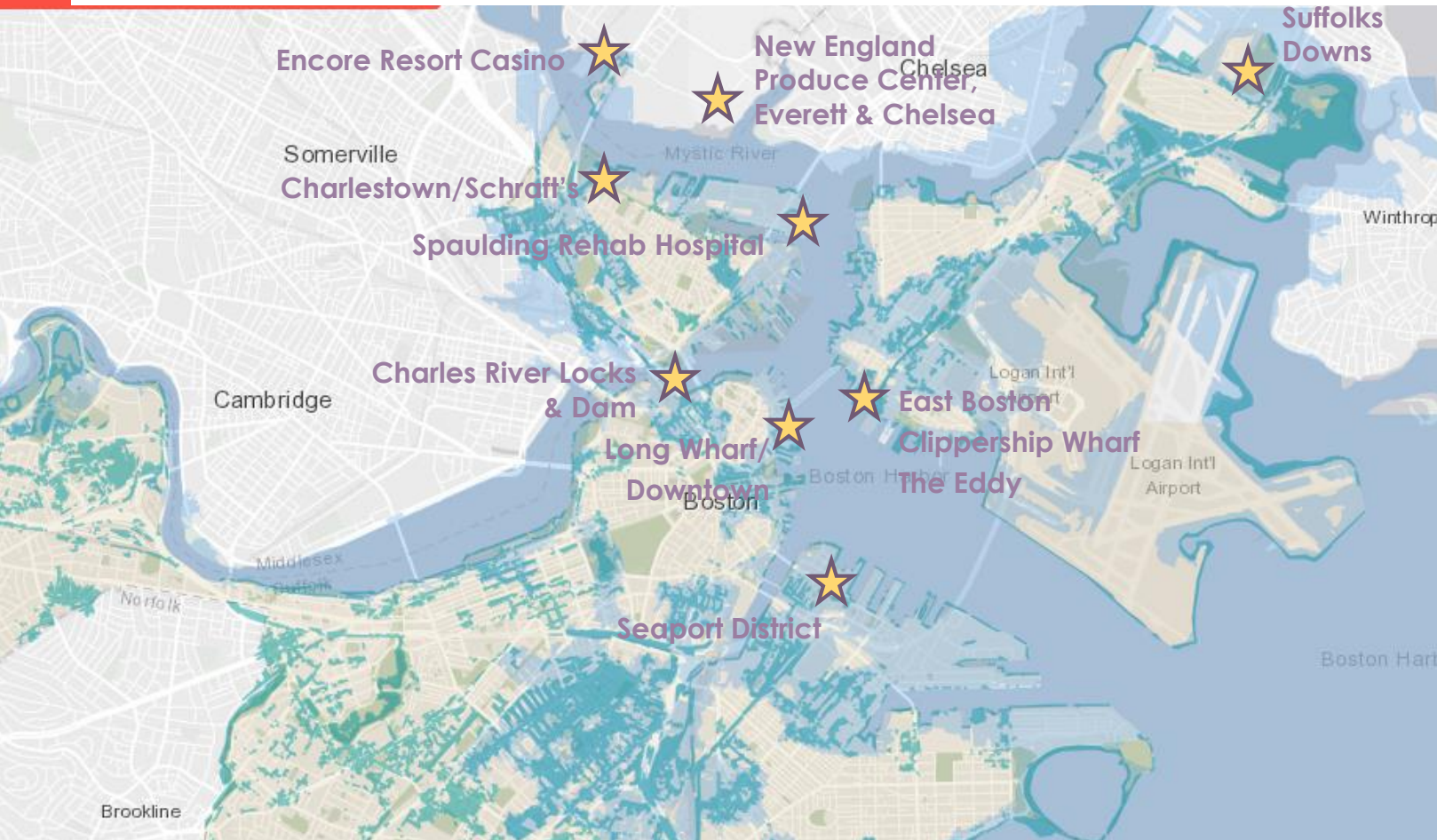




Everett



# BOAT TOUR



Encore Resort Casino



New England Produce Center,  
Everett & Chelsea



Suffolk Downs



Somerville  
Charlestown/Schraff's



Spaulding Rehab Hospital



Charles River Locks  
& Dam



Long Wharf/  
Downtown



East Boston  
Clippership Wharf  
The Eddy



Seaport District



Cambridge

Logan Int'l

Logan Int'l  
Airport

Middlesex  
Cut-off

Boston Harbor

Boston Harbor

Brookline

Norfolk

Cambridge

Mystic River

Chelsea

Winthrop

Everett



# MBTA CLIMATE CHANGE RESILIENCE



Assessing climate change vulnerability and recommending resilience measures along the MBTA's blue line from Aquarium Station to the Maverick Portal, including:

- System-wide vulnerability assessment
- ID hydraulic modeling of the MBTA's subway system under extreme flood scenarios
- Identification and design of customized flood barriers and other flood mitigation measures
- Policy and planning support for improving resiliency within the MBTA's administrative processes
- Climate change risk and resiliency communications for the MBTA and external audiences.



# SPAULDING REHAB HOSPITAL





