

THE  
UNIVERSITY  
OF RHODE ISLAND



# Building a Resilient Future for Providence: Business and Civic Leaders Forum

January 15-16, 2019



# Purpose



Ignite interest

Expand knowledge

Explore ways to move forward

# Tuesday, January 15, 2019 Presentations

## **Resilience: Providing a Context for Providence**

Barnaby Evans, WaterFire Providence

## **Experience from 100 Resilient Cities**

Bryna Lipper, 100 Resilient Cities

## **Boston's Leadership for Resilience**

John Cleveland, Boston Green Ribbon Commission



The Great September Gale of 1815 (Cat 3; Storm surge +15.8')

**Providence's Future in the face of sea level rise  
presents challenges and opportunities  
By Barnaby Evans**



The Great September Gale of 1815 (Cat 3; Storm surge +15.8')

**Sea level rise is a huge challenge worldwide, but Providence is one of the few cities where it can be successfully managed, if we act soon.**



**We all know that Providence's downtown is threatened**

Westminster Street, Providence, 1954

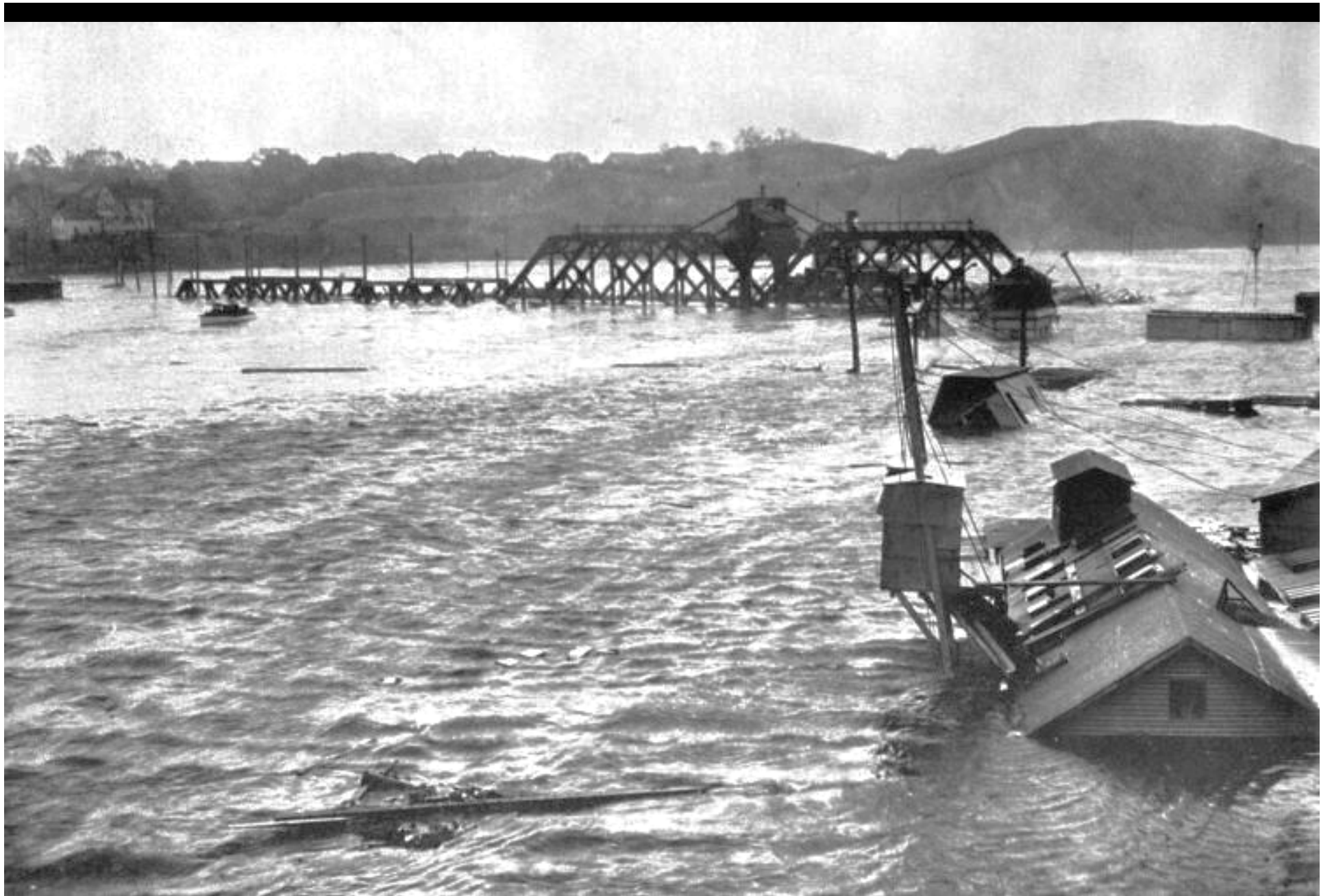


Point Street Bridge, Providence, 1938



Boat Yards at Port of Providence, Providence, 1938





Gano Street, Providence, 1938



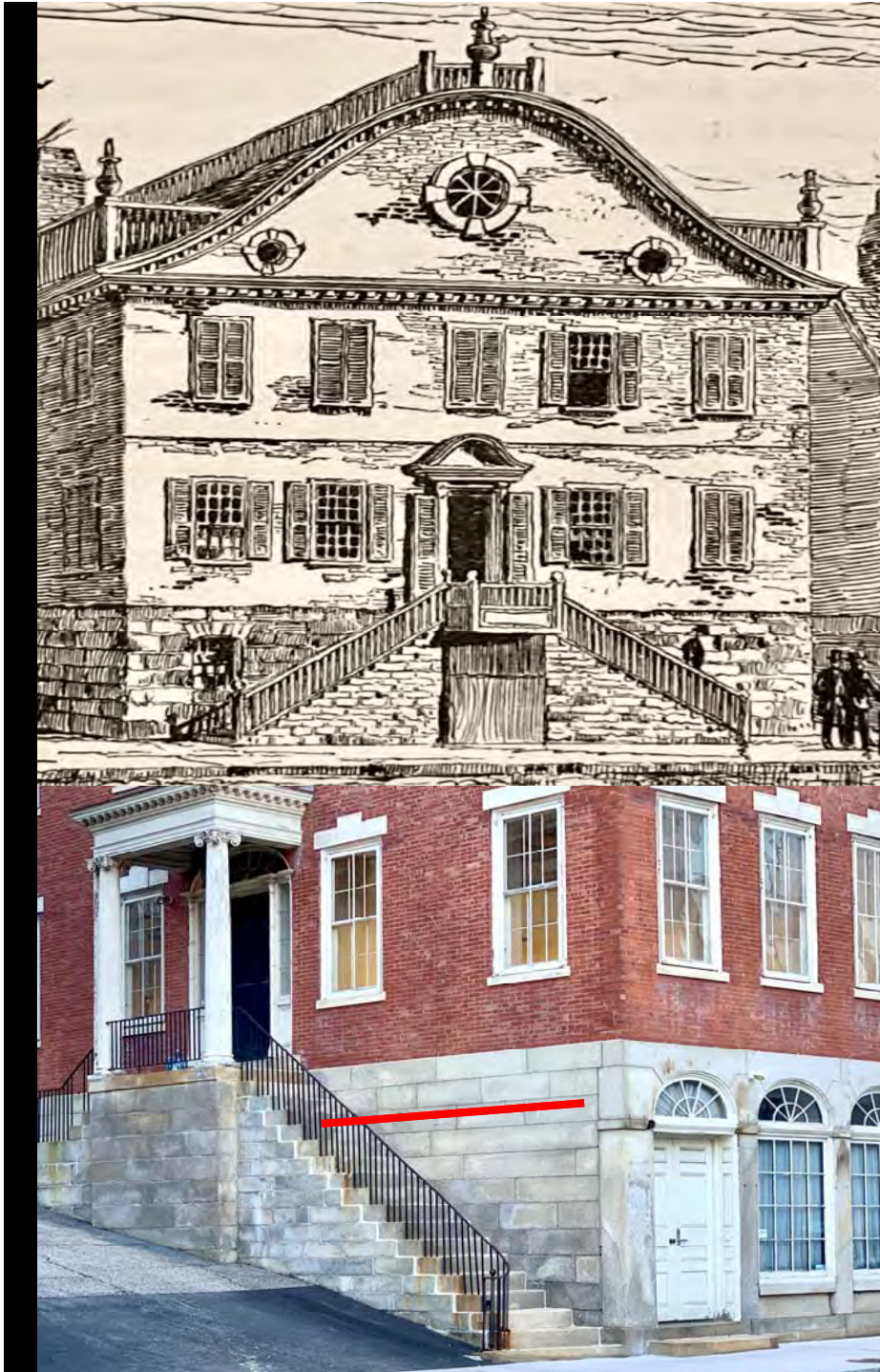
Buildings were far more resistant to water damage then





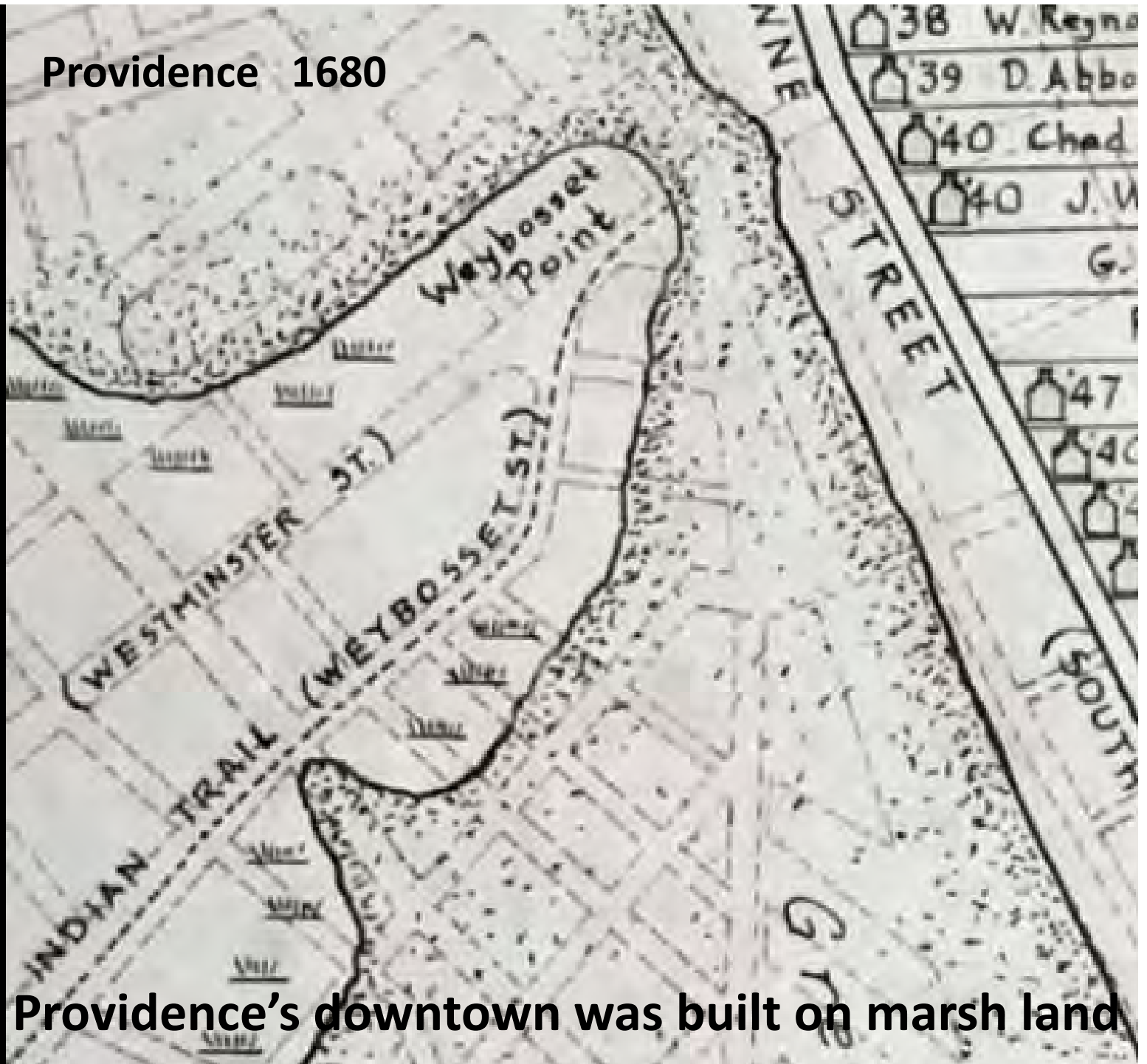
1635 Great Gale	Cat 3.5	+18.9' (MLLW)
1638 Great Gale	Cat 3	+19.9' (MLLW)
Great Gale of 1764		
Great September Gale 1815	Cat 3	+15.97' (MLLW)
September Gale of 1869	Cat 3	
Great NE Hurricane 1938	Cat 3.5	+18.98' (MLLW)
Great Atlantic Hurricane 1944		
Hurricane Carol 1954	Cat 3	+17.93' (MLLW)
Hurricane Sandy 2012	Cat 3	+13.9' in NY
Sea Level Rise PVD 2100		+9.6' + surge
Sea level rise PVD 2200		+30' + surge

Corrected to MLLW (MHW +4.03')

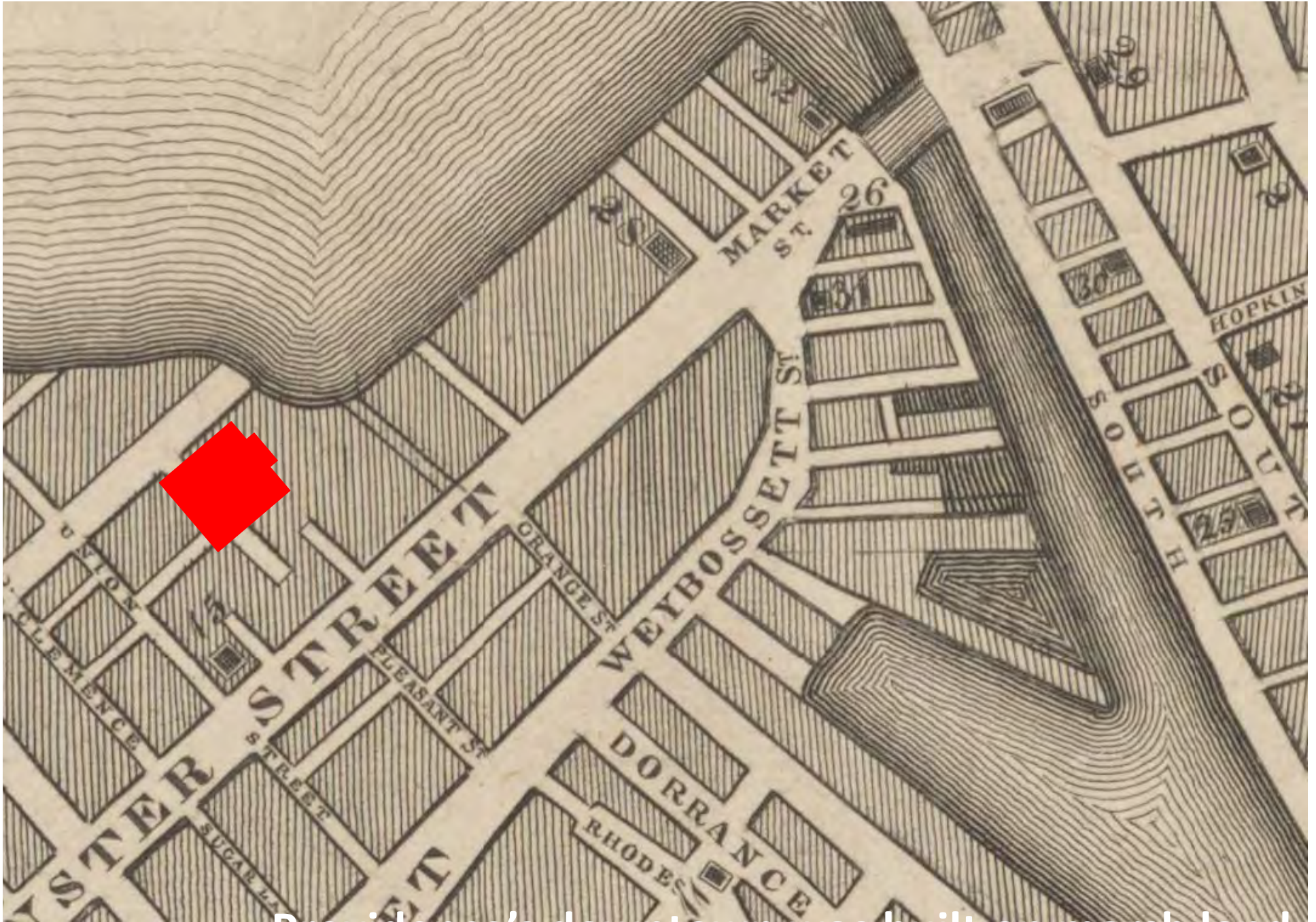


Joseph Brown built 50 S. Main Street in 1774, clearly expecting it to experience flooding up to the “second” floor. The ground floor was a basement warehouse that was built to be flooded. The first floor above is built at 23.4’ NAVD88, 10” below the height of the 1961 Fox Point Hurricane Barrier. Isaac Brown built the house next door (left) in 1828 (13 years after the 1815 hurricane) and its first floor is at an elevation of 27.8’, 3.5’ above the Barrier.

Providence 1680



Providence's downtown was built on marsh land



**Providence's downtown was built on marsh land**



1912-16

Creation of the Port of Providence



The old and new downtowns are just above current sea level

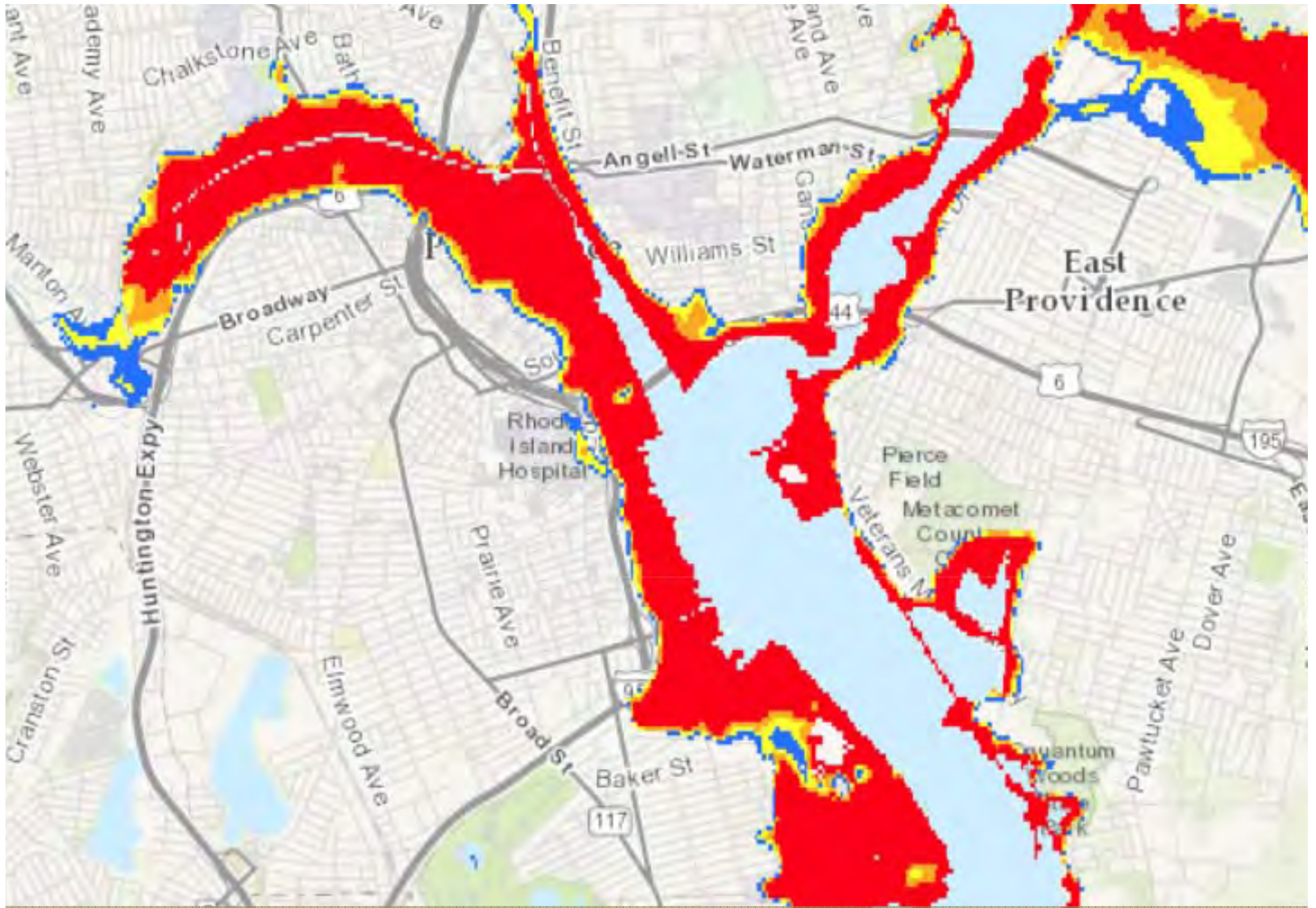




1976 – 2002 Capital Center and moving the rivers



1989-2019 Moving I-195, 2 parks & pedestrian bridge

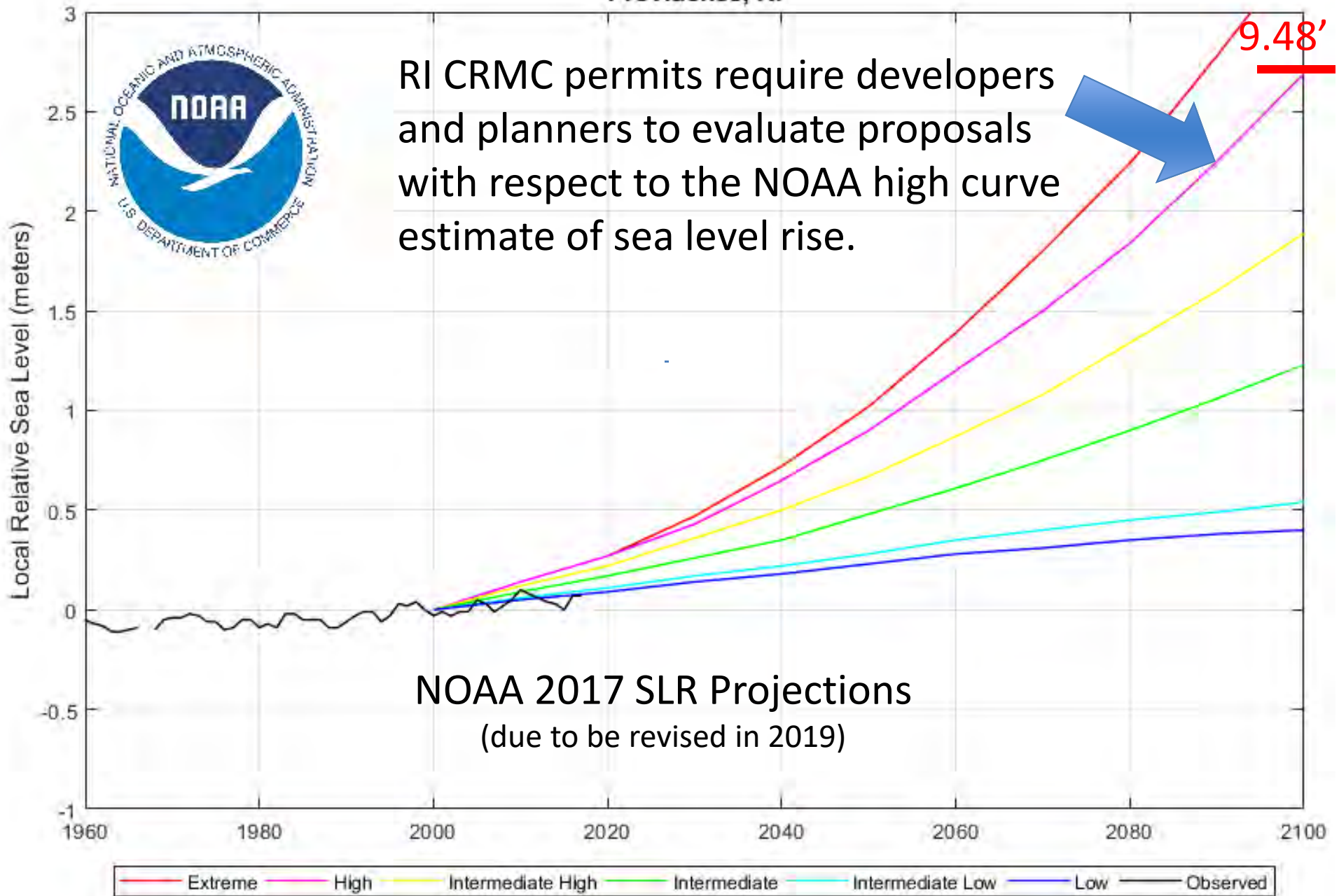


Areas subject to flooding from storms and sea level rise



**The industrial and port areas on Providence's Allens Ave and Fields Point are highly vulnerable**

# Providence, RI



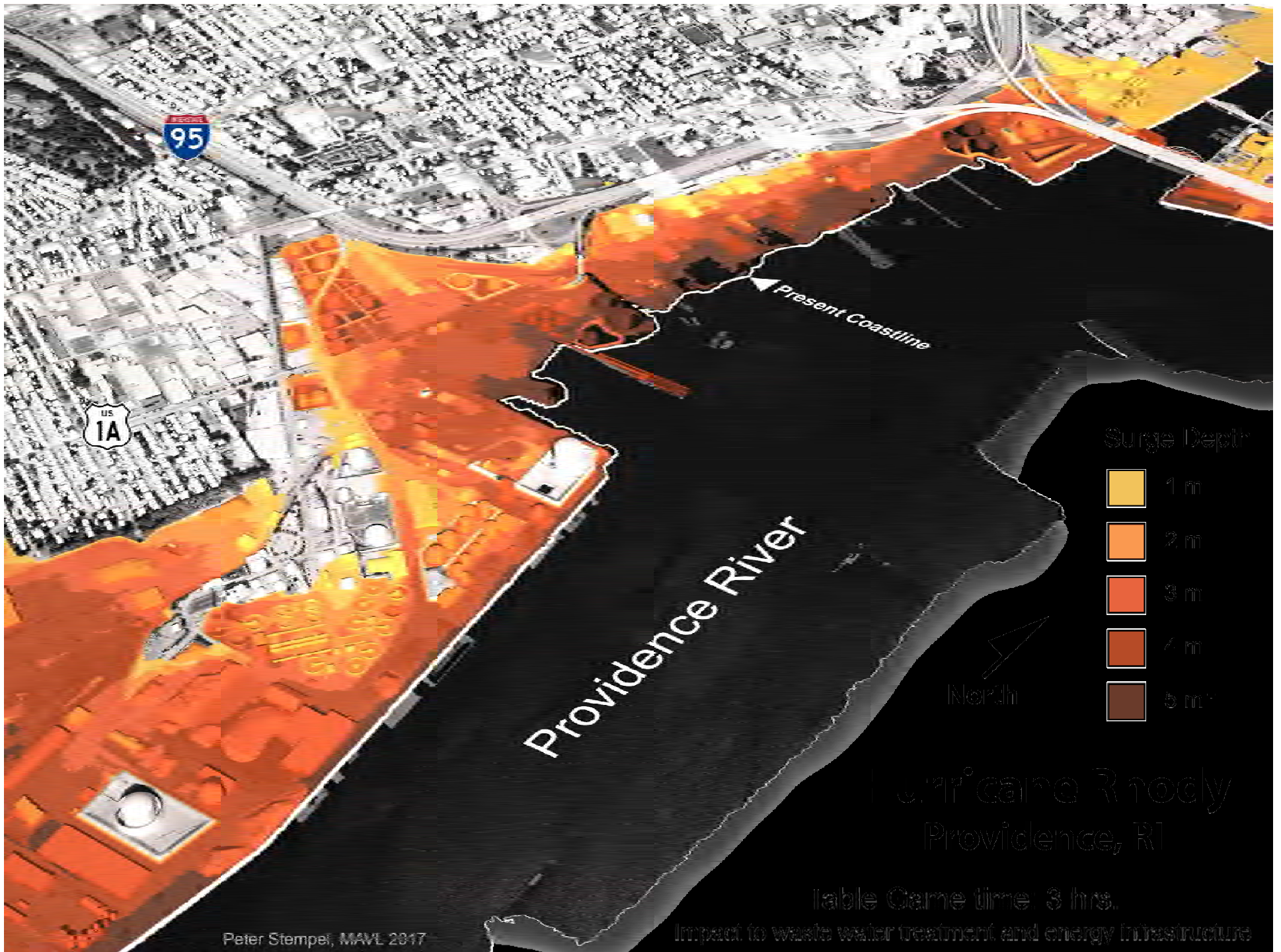
RI CRMC permits require developers and planners to evaluate proposals with respect to the NOAA high curve estimate of sea level rise.



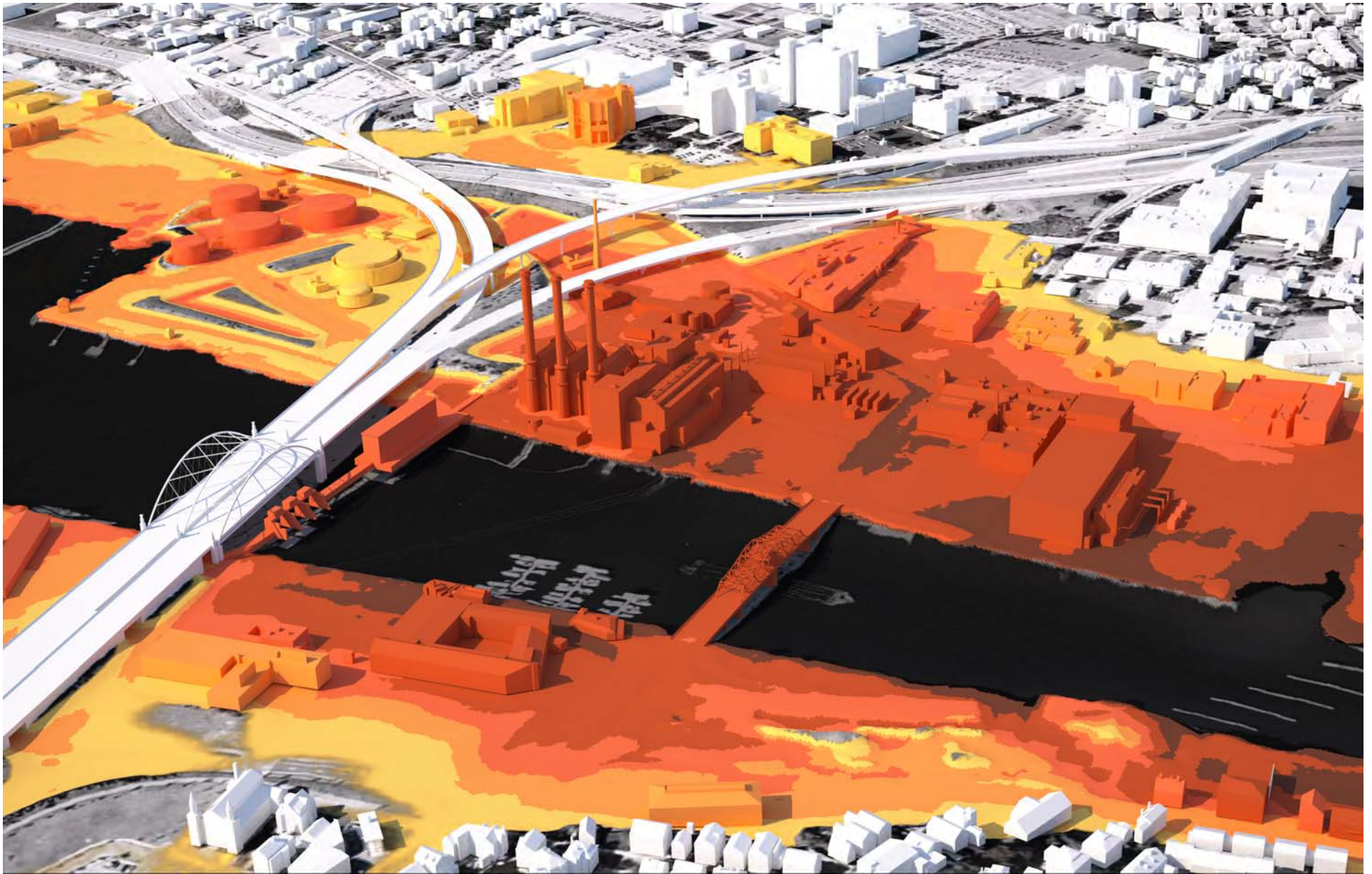
StormTools Map of 100 year storm with 2' of sea level rise



StormTools Map of 12' of sea level rise with no storm







# Hurricane Rhody

## Providence, RI

View to Manchester Street Station and Rhode Island Hospital.  
 Table Game: 52.75 hrs.



Peter Stempel, Marine Affairs Visualization Lab, 2017

# Hurricane Rhody

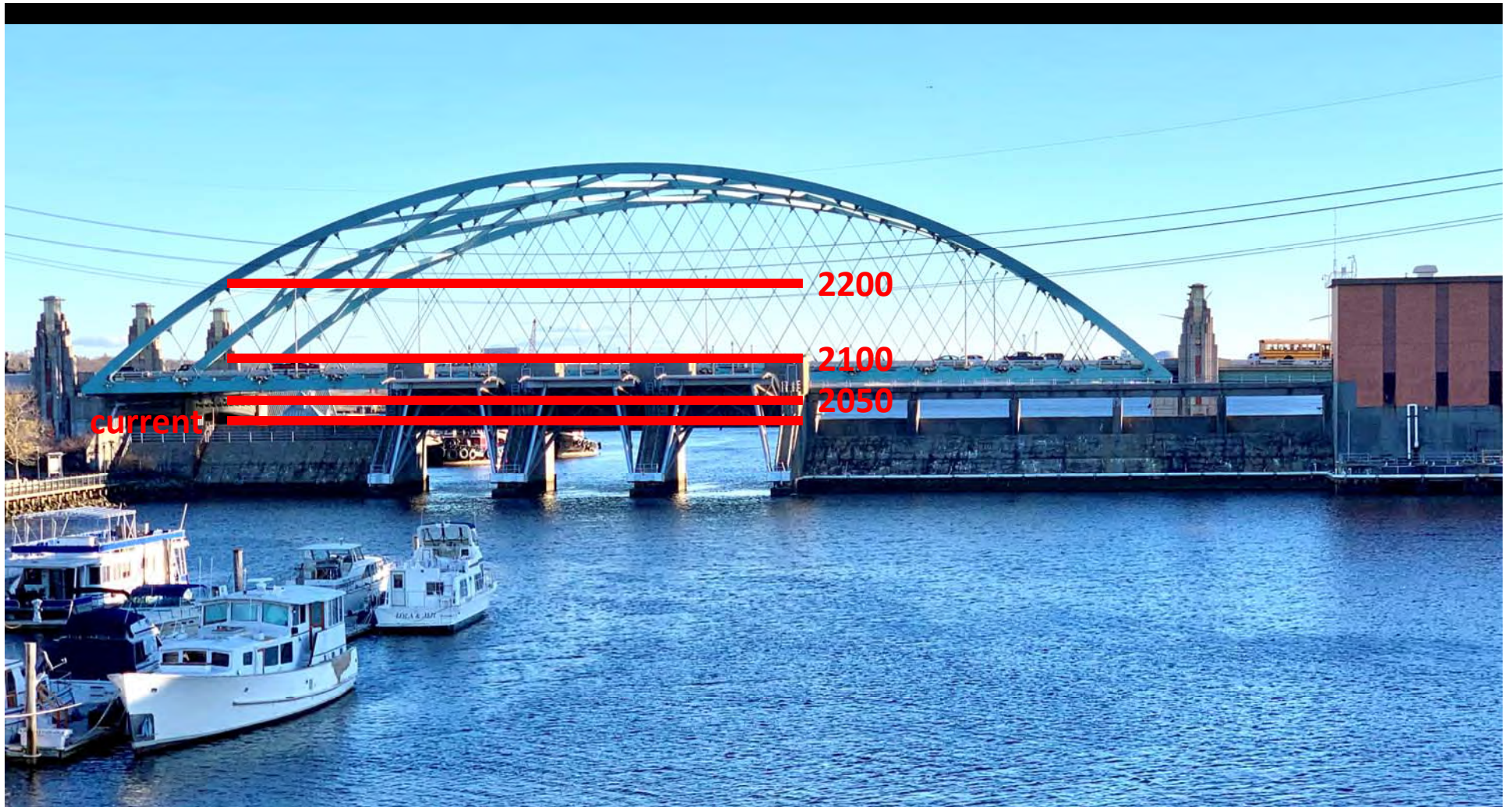
## Providence, RI

View from Smith Hill / Capital

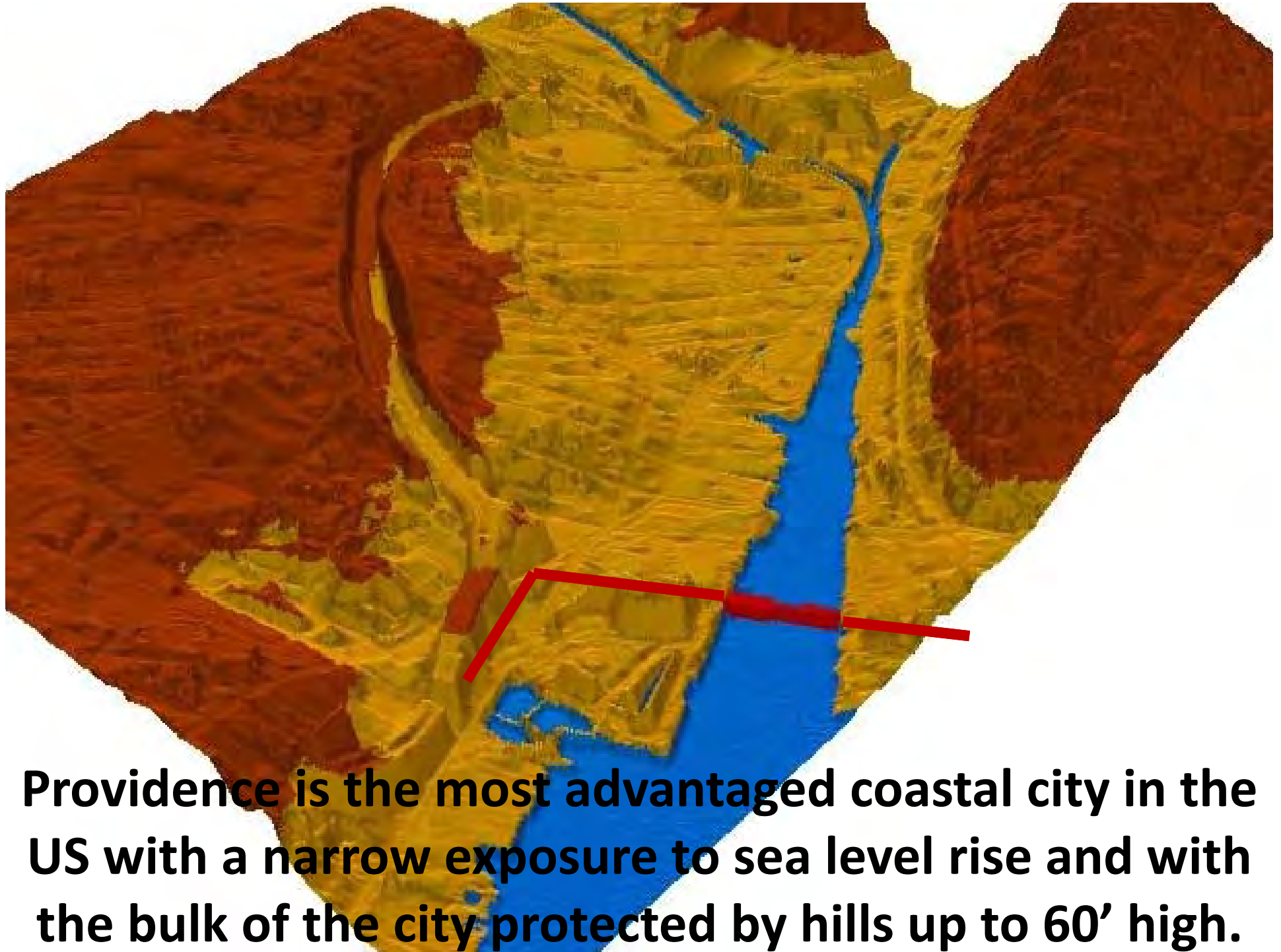
### Inundation Depth



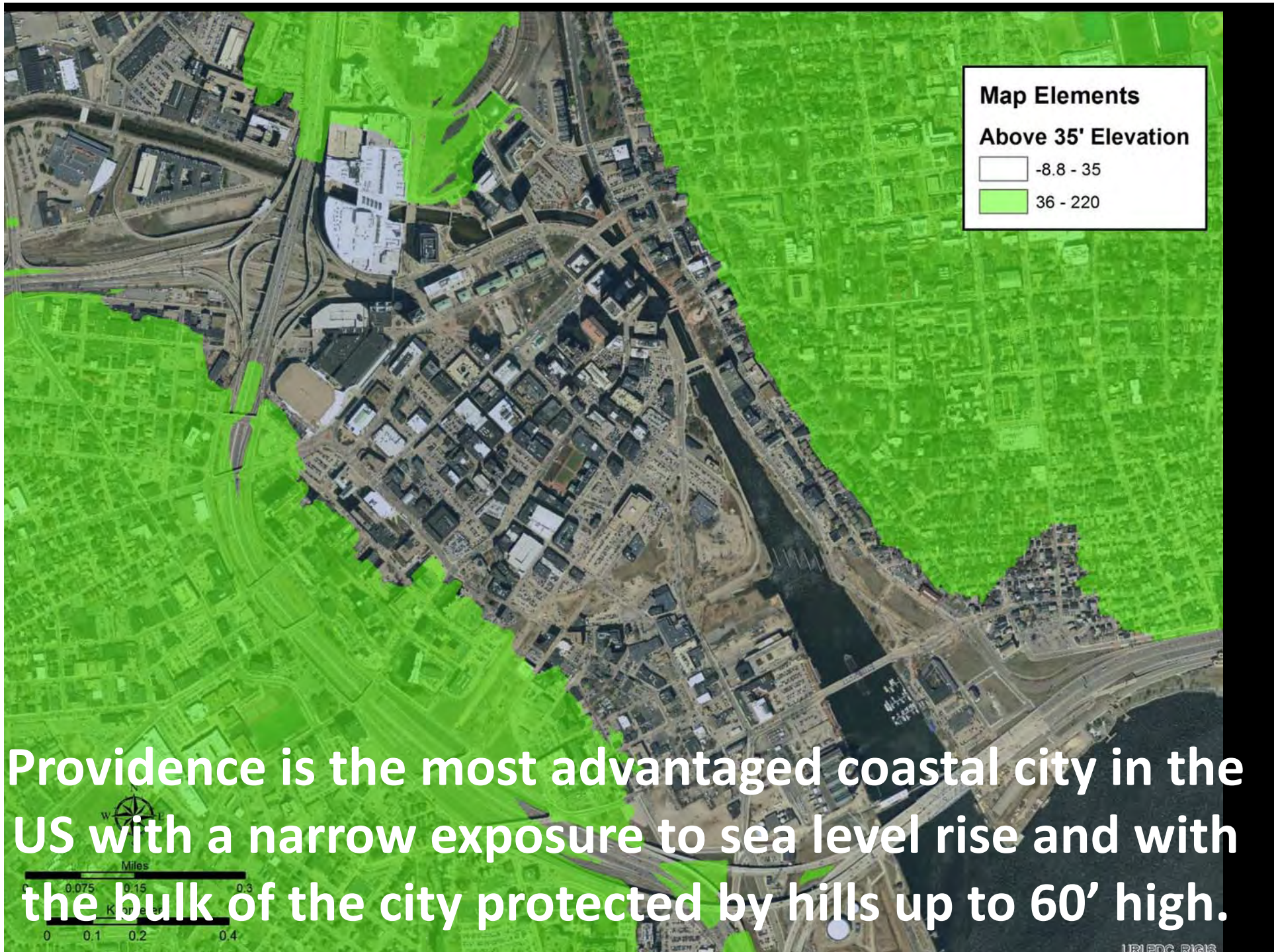
Table Game: 52.75 hrs.



**Predicted heights needed for the Hurricane Barrier  
for a “500 yr” storm to 2200**



**Providence is the most advantaged coastal city in the US with a narrow exposure to sea level rise and with the bulk of the city protected by hills up to 60' high.**



Providence is the most advantaged coastal city in the US with a narrow exposure to sea level rise and with the bulk of the city protected by hills up to 60' high.



**New land will be needed for an expanded barrier for both sea level rise and Hurricane protection.**



Photo: Pam Rubinoff



[barnaby@waterfire.org](mailto:barnaby@waterfire.org)

An aerial night view of a city, likely Providence, Rhode Island, featuring a large body of water (Providence River) and mountains in the background. The city lights are visible, and the overall scene is dimly lit with a blue tint.

# THE GLOBAL URGENCY FOR RESILIENT CITIES

Bryna Lipper for  
Providence Resilience Forum  
January 2010



# Why Urban Resilience?



3.7 billion people, or just over 50% of the world's population lives in cities. **That number will rise to 70% by the year 2050.** Globally, one in five people lives in a city with more than 1 million inhabitants.

Cities are responsible for **80% of global GDP** – making our increasingly global economy an inherently urban economy.

Cities are increasingly becoming **centers of political power**, with mayors and other city leaders becoming prominent drivers of social, political, and economic change.



## CITIES NEED \$57T IN INFRASTRUCTURE INVESTMENT THROUGH 2030

### IMPLICATION:

Cities have a once-in-a-lifetime opportunity to **invest for multiple outcomes** infrastructure projects

*More than 60% of metropolitan regions that will exist in 2050 don't exist today and 75% of urban infrastructure that will exist in 2050 has not yet been built.*



Sao Paulo Brazil

## INEQUITY AND SOCIAL COHESION WILL DEFINE THE URBAN AGENDA

### **IMPLICATION:**

Urban planning and political priorities must focus on ways to fully include vulnerable, fragile, poor, marginalized and at-risk populations

*More than 2.2 billion people at or near poverty*



## TOO MUCH OR TOO LITTLE WATER WILL SHIFT URBAN ECONOMICS

### IMPLICATION:

Cities must radically rethink **behavior and investment** related to sea level rise, increased storms and **flooding** as well as **drought** combined with increasing demand from growing urban populations for **clean water supply**

*Over 90% of urban areas are coastal – and cities are amongst the first to experience the consequences of the climate crisis, from sea level rise and chronic flooding to the increasingly prevalent and powerful coastal storms.*

# URBAN CHALLENGES ARE GLOBAL CHALLENGES

## IMPLICATION:

Cities will need to exercise and rely on **coalition building** and **informal power**

*More than **60%** of the world's 21.3 million refugees and **80%** of 40.8 million IDPs live in urban environments.*





## MOST CITIES ARE VULNERABLE TO AT LEAST ONE TYPE OF NATURAL DISASTER

### IMPLICATION:

Metropolitan areas are ground-zero for human and economic loss when a major shock occurs – **which has national and global impacts**

***82% of cities globally are located in areas that face a high risk of mortality from a natural disaster. Nearly 90% of cities are highly vulnerable to economic losses.***



# MEGACITIES OF THE GLOBAL SOUTH ARE REHAPING OUR WORLD

## **IMPLICATION:**

Backward planning modes and models are highly inadequate for the future

*Nearly 80% of the world's megacities are located in the Global South. And 10 more are projected to reach megacity status by 2030 – all in the Global South – meaning now is a critical time to influence resilience thinking.*

# Urban Resilience

is the capacity of individuals, communities, institutions, businesses, and systems within a city to **survive**, **adapt**, and **grow** no matter what kinds of **chronic stresses** and **acute shocks** they experience.



## CHRONIC STRESSES

weaken the fabric of a city on a day-to-day or cyclical basis. Examples of these stresses include high unemployment; environmental degradation, an overtaxed or inefficient public transportation system; endemic violence; and chronic food and water shortages.



## ACUTE SHOCKS

are the sudden, sharp events that threaten a city, including earthquakes, floods, disease outbreaks, and terrorist attacks. Shocks compound and amplify existing stresses, increasing their impact on the most vulnerable people



A cityscape at dusk or dawn. In the foreground, a river flows under a stone bridge. The banks are lined with trees and streetlights. In the background, several tall buildings are visible, including a prominent one with a purple light on top. The sky is a mix of blue and orange.

SO WHAT IS YOUR VISION FOR A  
RESILIENT PROVIDENCE?

WHAT IS DIFFERENT IN 10-20 YEARS?

An aerial night view of a city, likely Vancouver, with a large body of water in the foreground and mountains in the background. The city lights are visible, and the overall scene is dimly lit with a blue tint. The text is centered over the image.

# DESIGNING AND PLANNING PRINCIPLES OF RESILIENT CITIES

# To Build Resilience, Cities Must:

Meet basic needs

Support livelihoods & employment

Ensure public health services

Foster economic prosperity

Ensure social stability, security, and justice

Promote cohesive and engaged communities

Provide reliable communication & mobility

Ensure continuity of critical services

Provide & enhance natural and manmade assets

Promote leadership & effective management

Empower a broad range of stakeholders

Foster long-term & integrated planning

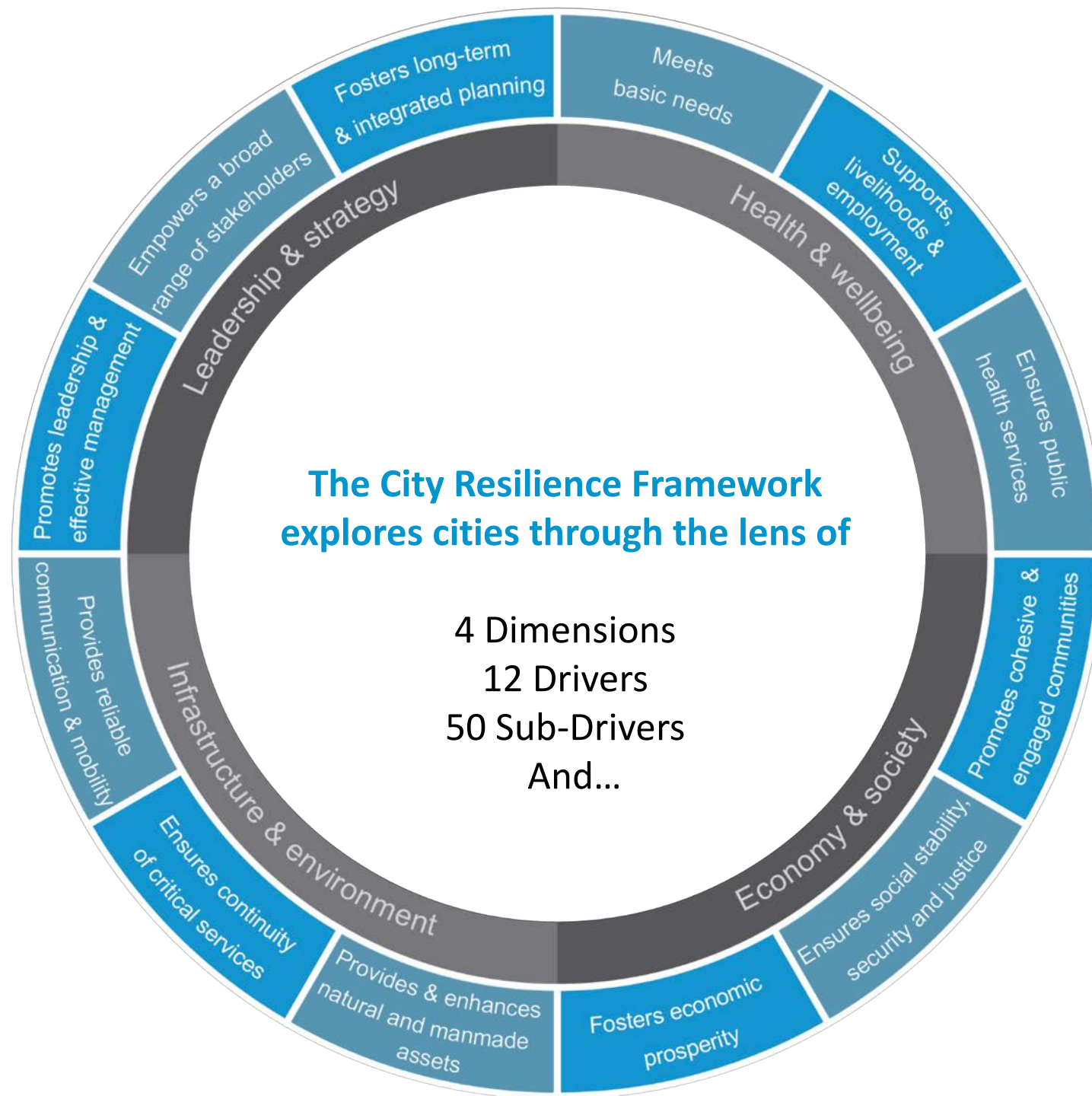
People: Health & Wellness

Economy & Society

Infrastructure & Environment

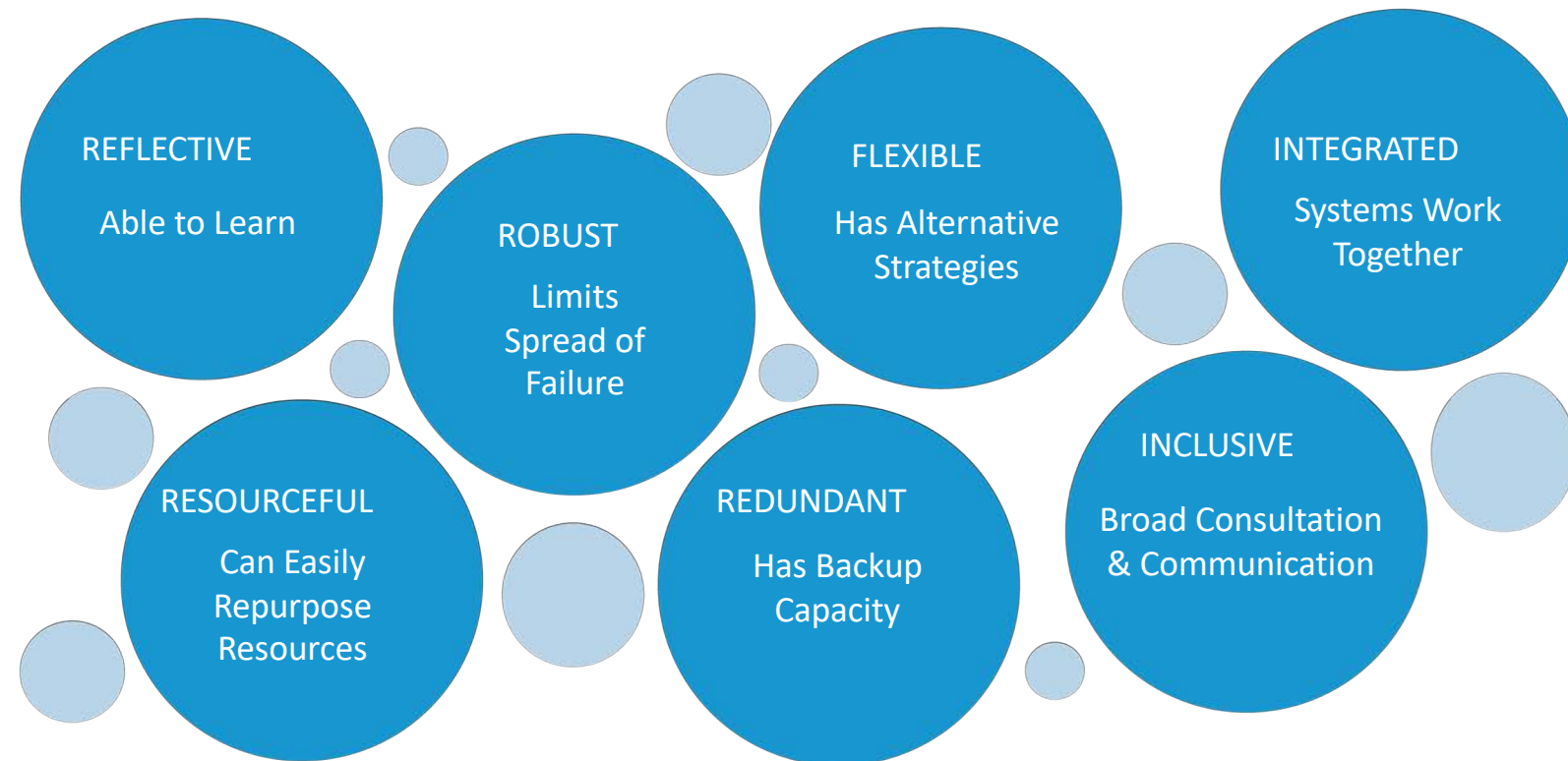
Leadership & Strategy





## 7 Qualities of resilient systems

Resilient systems exhibit certain qualities that enable them to withstand, respond, and adapt more readily to shocks and stresses.



# Gaining the Resilience Dividend



Instead of investing to reduce impacts and/or improving resilience in only in one specific area, cities make **integrated decisions** which result in **cost-savings, cost-avoidance** and creating **multiple benefits** across multiple systems.

*New York's flood investments intended to create new jobs, improve safety and community, ensure buildings are protected and create local ownership*

An aerial night view of a city, likely Vancouver, with a large body of water in the foreground and mountains in the background. The city lights are visible, and the water reflects the lights. The text is overlaid in the center.

SOME CASE STUDIES FROM  
AROUND THE WORLD

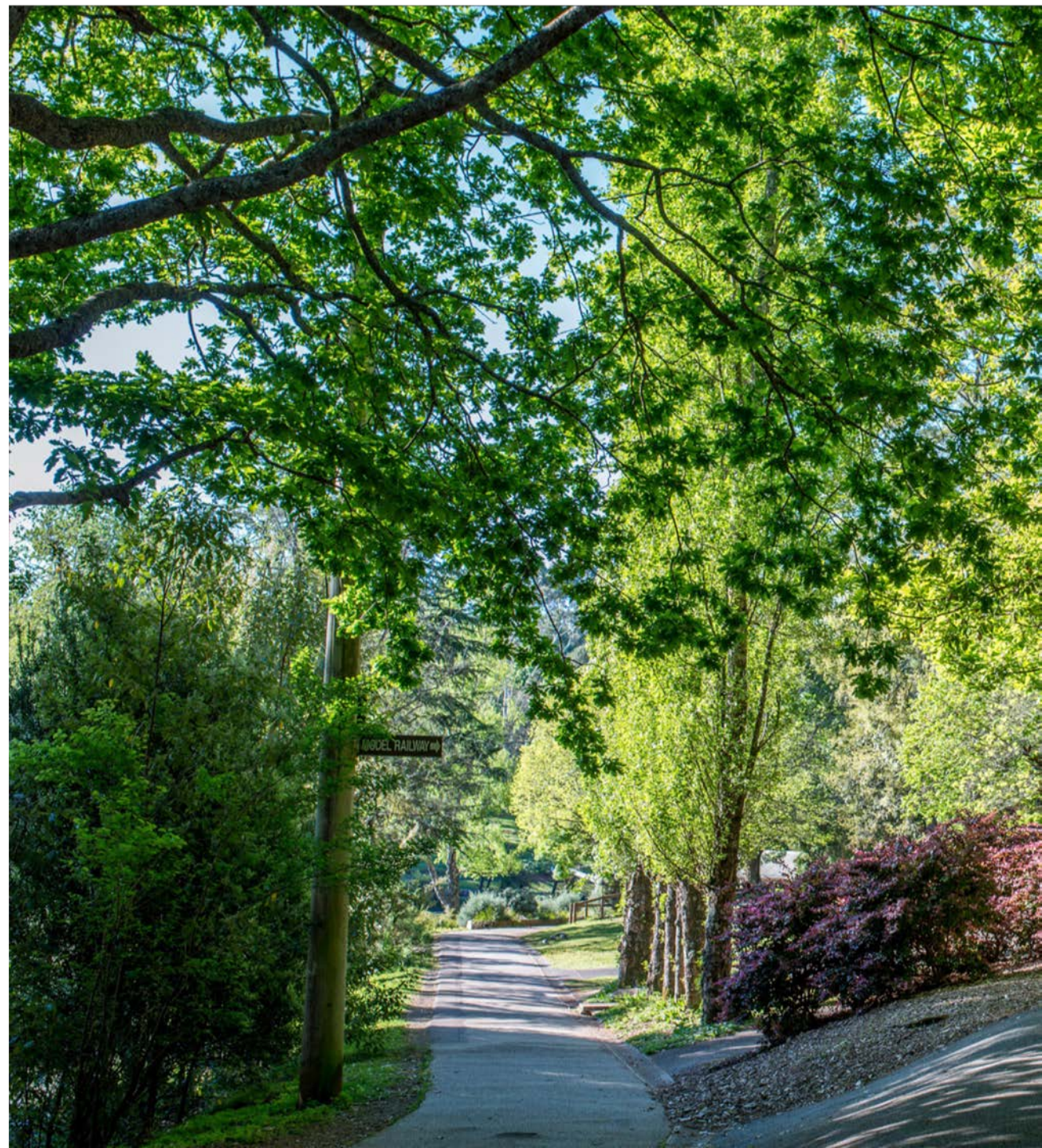
# Case Studies: Cities in Action

## Melbourne

AUSTRALIA

### Valuing Natural Assets

Melbourne is leveraging the value of natural assets through a cohesive, metro-wide urban forestry and biodiversity strategy, that will reduce the city's heat island effect, mitigate flooding, foster social cohesion, and improve public health.





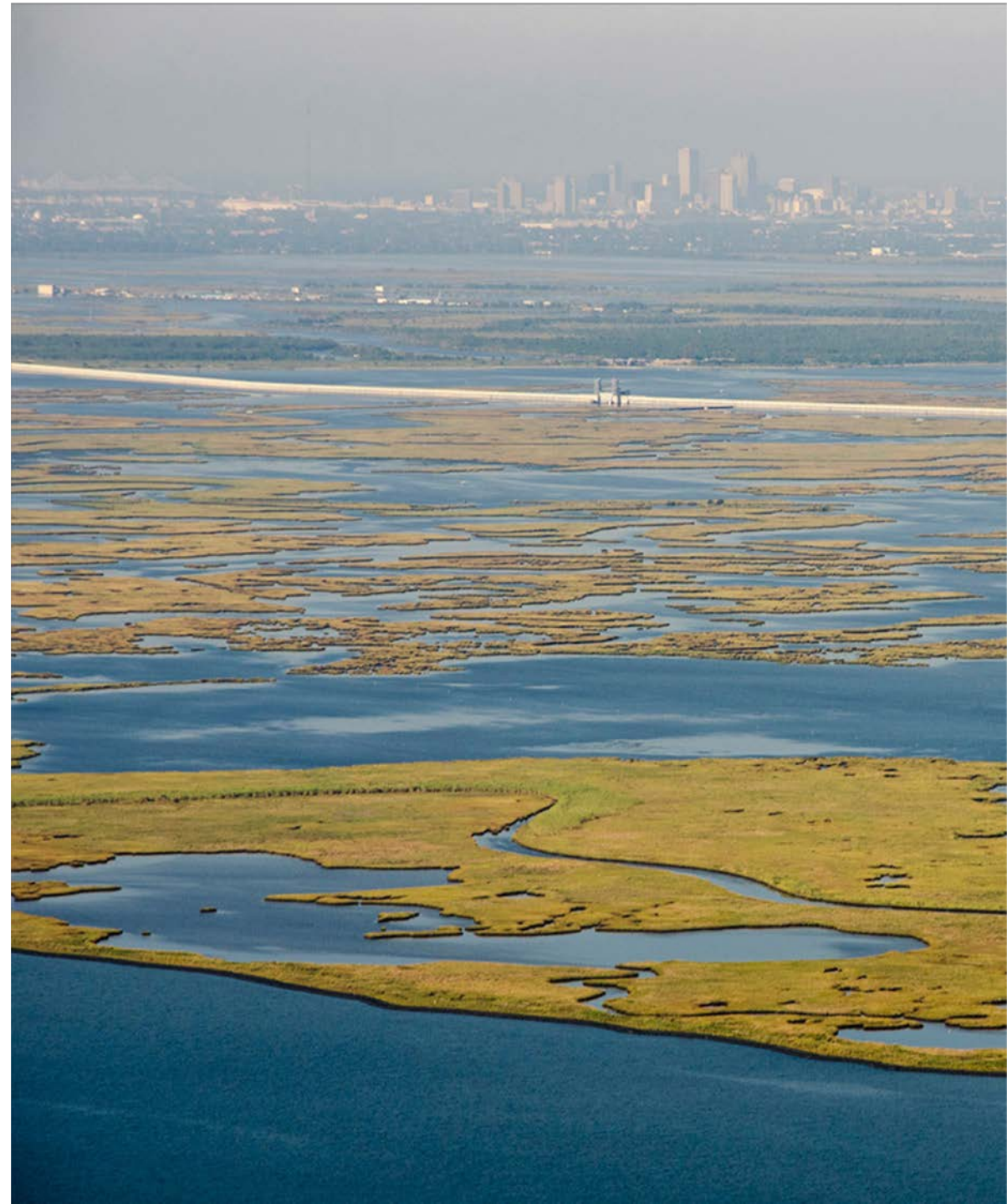
# Case Studies: Cities in Action

## New Orleans

UNITED STATES

### Building Resilient Districts

New Orleans is creating a neighborhood model in its Gentilly District that addresses the interrelated risks of flooding and soil subsidence alongside the needs of a vulnerable community. Rather than just installing new water management infrastructure, the project also fosters economic development, empowerment, and social cohesion.



# Case Studies: Cities in Action

## Medellín

COLOMBIA

### Integrating Informal Communities

Medellín is collaborating with slum residents on housing retrofits to improve their living conditions, better incorporate them into the rest of the city, and mitigate the city's exposure to the risk of landslides and earthquakes.



# Case Studies: Cities in Action

## Boston

USA

Integrating Equity with Environment

Boston is incorporating racial equity goals into its plans for extending its transit system, preparing for climate change impacts for those most vulnerable.



# Case Studies: Cities in Action

## Athens

### Greece

#### Making all Investments Count

Athens is examining how all of its investments and initiative add up to a more resilient city for it's future. Animated by a changing climate, significant risk hazards such as earthquakes, an unsettled European context, declining infrastructure, and changing social conditions, the city is integrating all of its actions to realize multiple outcomes for every investment.



# Case Studies: Cities in Action

## Surat

India

Public Wellbeing and Infrastructure

Surat will address its twin problems of insufficient water quantity and quality through comprehensive and inclusive planning that combines place-based interventions with programmatic elements and community engagement.



An aerial night view of a city, likely Vancouver, with mountains in the background and a large body of water in the foreground. The city lights are visible, and the water reflects the lights. The text "SOME CHALLENGES AND BARRIERS" is overlaid in the center.

# SOME CHALLENGES AND BARRIERS



- Political Transitions, Continuity and “Stickiness”
- Technical and Finance Skills in Local Government
- Silos, Bureaucratic Protectionism and Status-Quo
- Long-Term Capital Planning, Budgeting and Procurement Processes
- Insurance and Risk Responsibility
- Resilience Design, Operations and Maintenance
- Populism and Nationalism
- Hard Infrastructure and Systems Change
- Ownership and Multiple Outcome Responsibility
- Profitability

An aerial night view of a city, likely Vancouver, with mountains in the background and a large body of water in the foreground. The city lights are visible, and the water reflects the lights. The text "SOME INNOVATION AND OPPORTUNITY" is overlaid in the center.

SOME INNOVATION AND OPPORTUNITY





- Resilience Funds and Financing in Multilaterals and Funders, Banks, Low-Rate Loans
- Grantmaker Guidelines
- Community Review and Design Review Boards
- Bonds and Ratings
- Resilience Districts to Pilot and Scale
- Collective Action in National and International Policy Fora
- Leveraging Implementation and Purchasing Power
- Resilience Budgeting Lens
- Products, Solutions and Market Innovation
- International City to City Mentoring

An aerial night view of a city, likely Seattle, with mountains in the background. The city lights are visible, and the water of the harbor is in the foreground. The entire image has a blue tint.

**THANK YOU**

**@brynalipper**  
**blipper@gsd.harvard.edu**



# PLANNING FOR LONG-TERM RESILIENCE

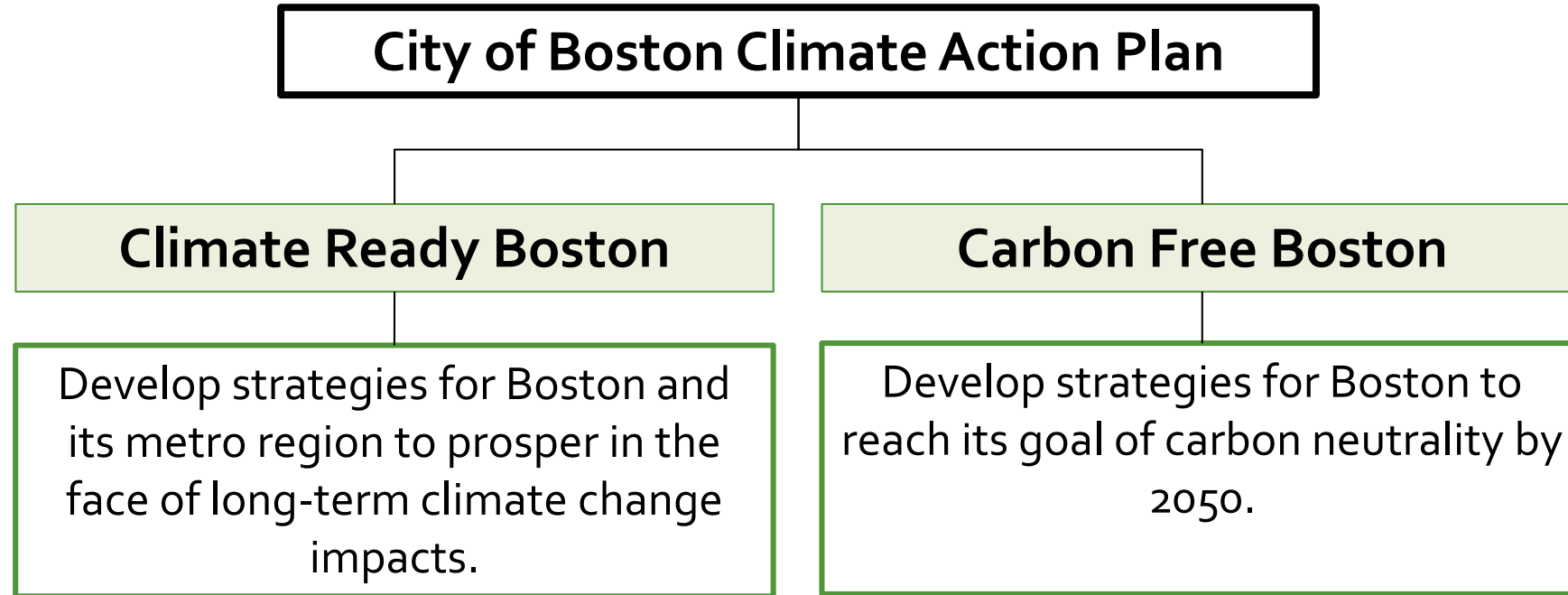
LESSONS FROM THE BOSTON GREEN RIBBON COMMISSION

**John Cleveland, Executive Director  
Boston Green Ribbon Commission**

January 15, 2019

# BOSTON CLIMATE GOALS

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# Green Ribbon Commission Mission and Role

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**Mission:** Convene leaders from Boston's key sectors to support the City's Climate Action Plan

**Advise** Boston on the implementation of its Climate Action Plan (CAP)

**Advocate** within key sectors to align sector strategies with CAP goals

**Highlight** best practices within and across sectors



# GRC Membership

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- Higher Education
- Health Care
- Commercial Real Estate
- Hospitality
- Finance and Insurance
- Construction
- Cultural Institutions
- Utilities
- Clean Energy
- Philanthropy
- State Government
- Faith
- Local NGOs
- International NGOs

# THE IMPORTANCE OF LARGE PROPERTY OWNERS

- **Buildings = 75% of City emissions**
- **Top 50 Property Owners = 28% of Boston SF**
- **“First Movers” show the way for others**

# GRC FUNDING PARTNERS

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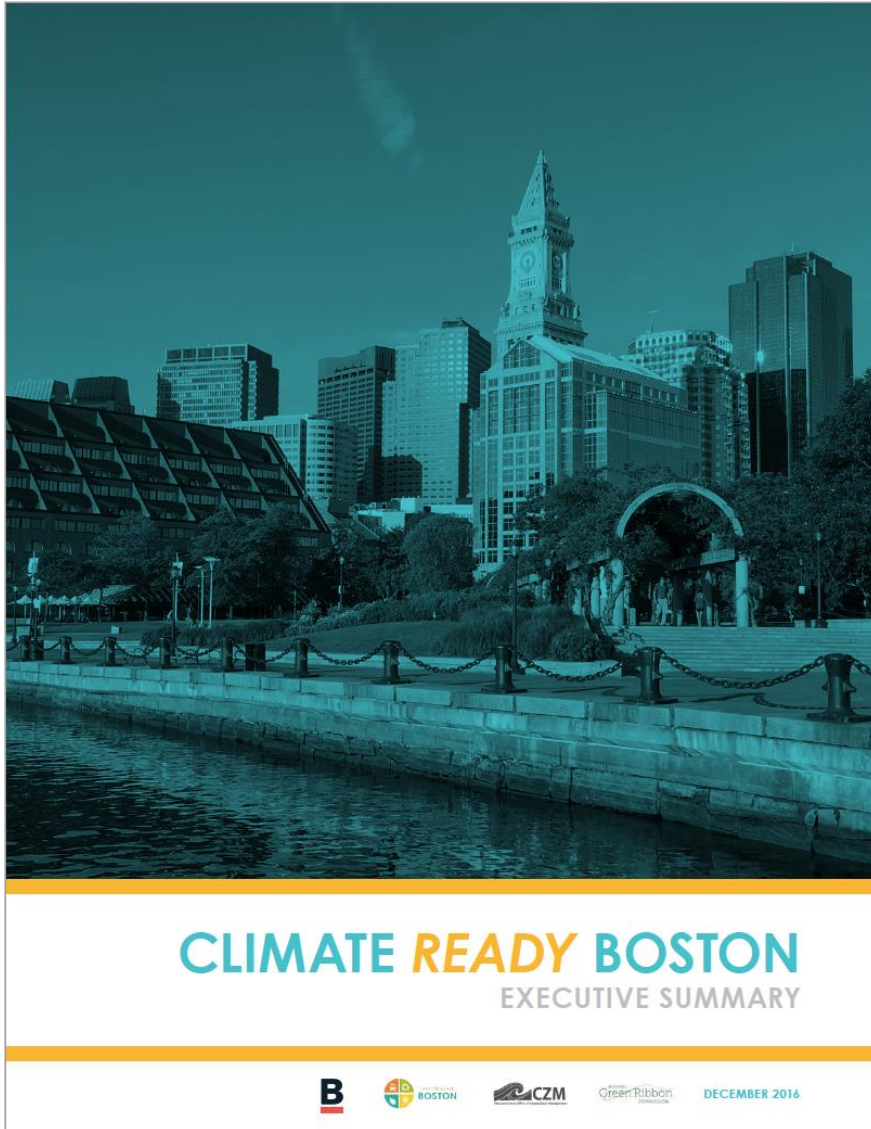
HENRY P. KENDALL FOUNDATION

Sherry and Alan Leventhal  
Family Foundation





# LONG-TERM RESILIENCE STRATEGY

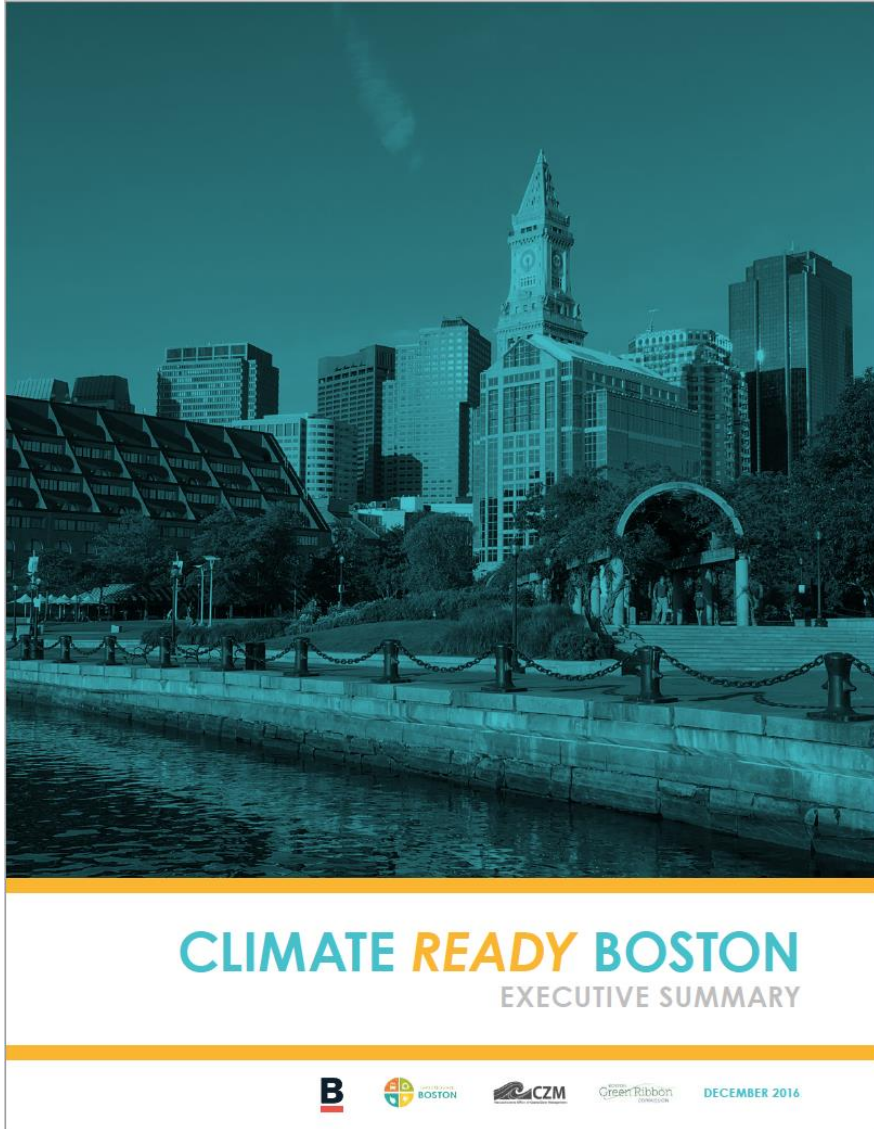


**Bryan Koop**  
**Senior Vice President**  
**Boston Properties**



**Alan Leventhal**  
**Chairman and CEO**  
**Beacon Capital**  
**Partners**

# LONG-TERM RESILIENCE STRATEGY



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# CLIMATE READY BOSTON DELIVERABLES

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## 1. Climate Projections

*Science-based consensus of likely ranges for future climate conditions across multiple risk factors for several time periods*

## 2. Vulnerability Assessment

*Comprehensive evaluation of future risks associated with each of three climate hazards: extreme heat, stormwater flooding and coastal and riverine flooding*

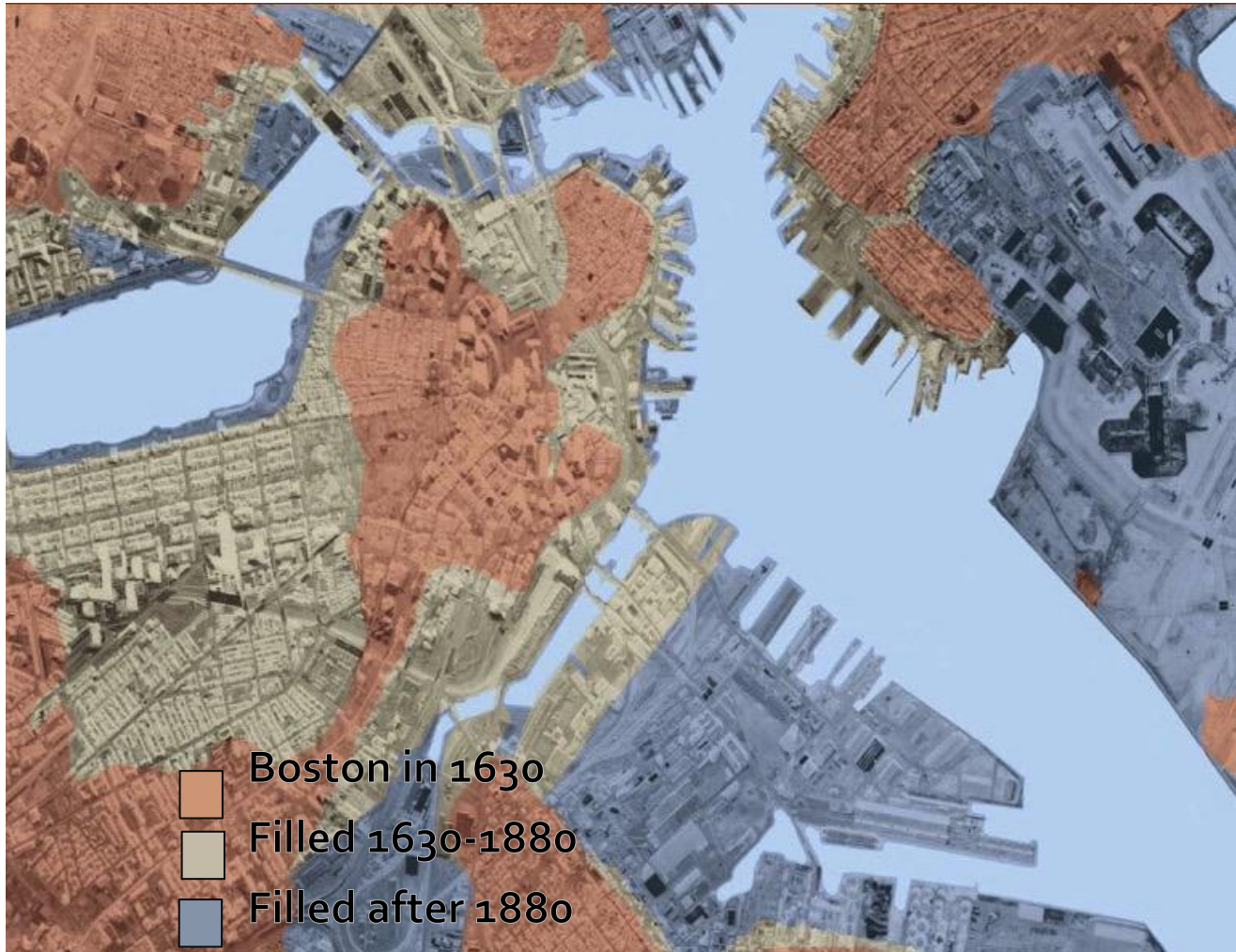
## 3. Resilience Initiatives

*Set of actions to address the key risks identified in the Vulnerability Assessment.*

## 4. Implementation Roadmap

*Recommendations for execution of resilience initiatives, including responsible parties and milestones*

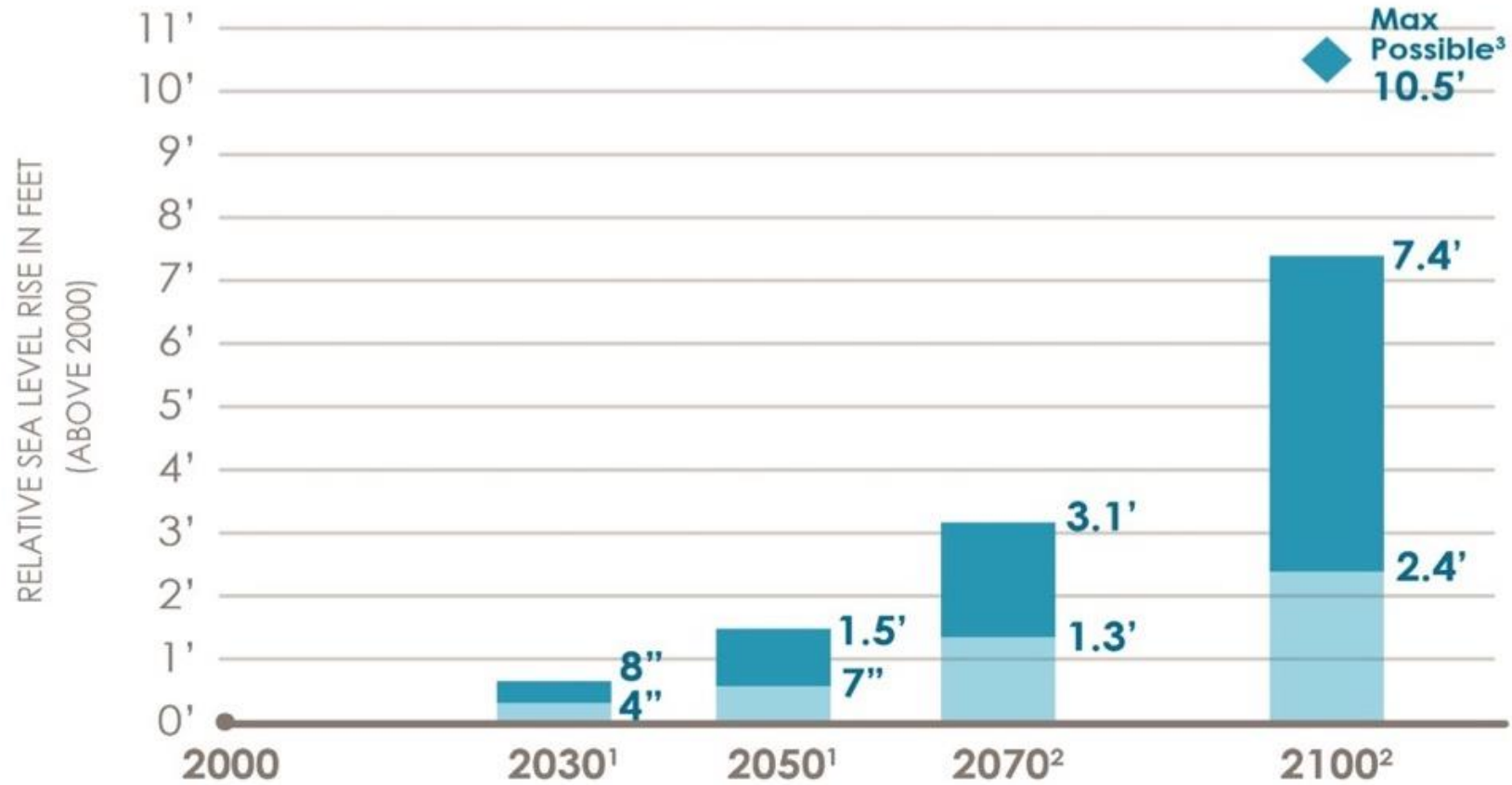
# BOSTON OVER 400 YEARS: A CITY BUILT ON "MADE LAND"



From Krieger, Boston Over Time



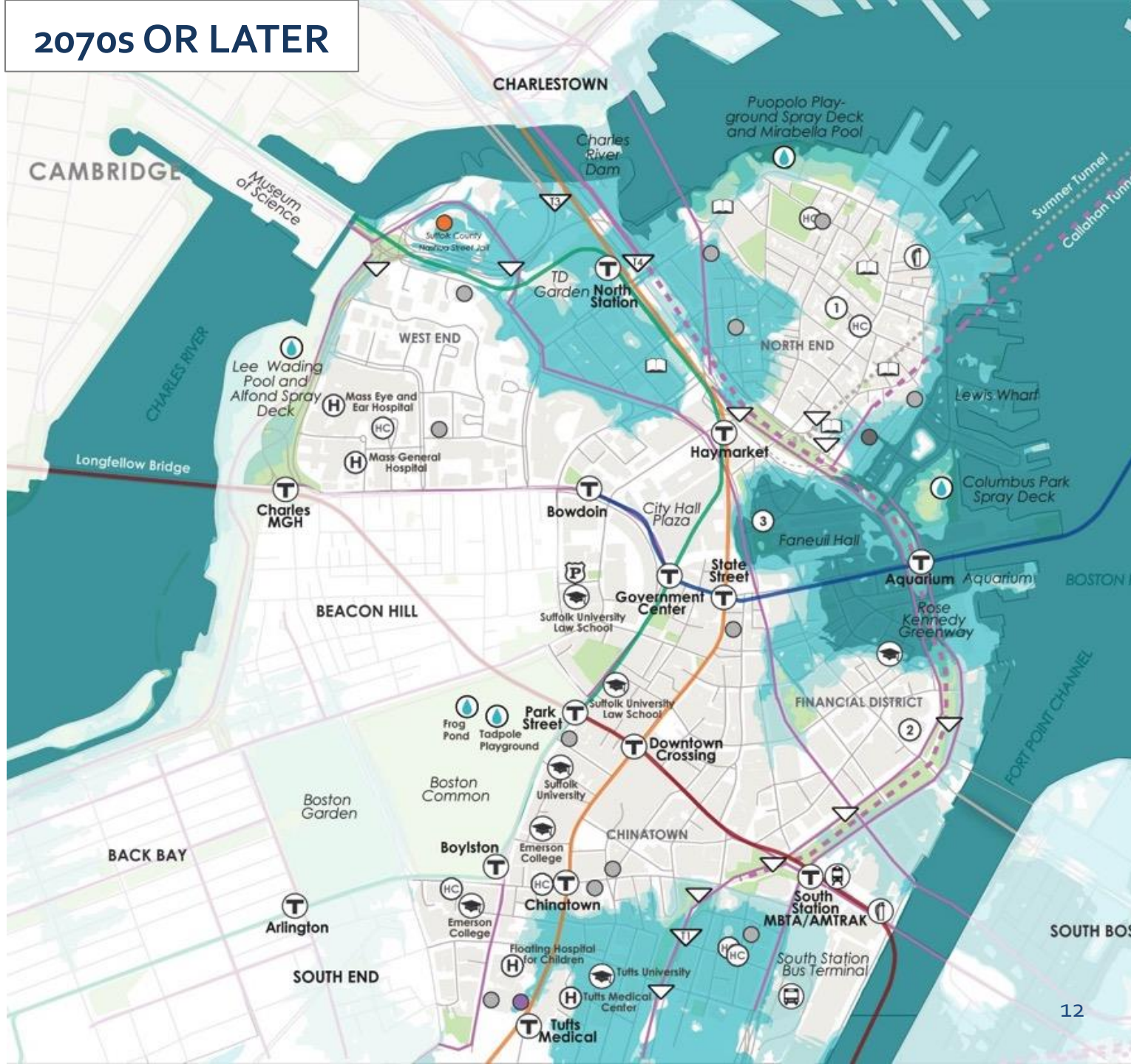
# SEA LEVEL RISE PROJECTIONS



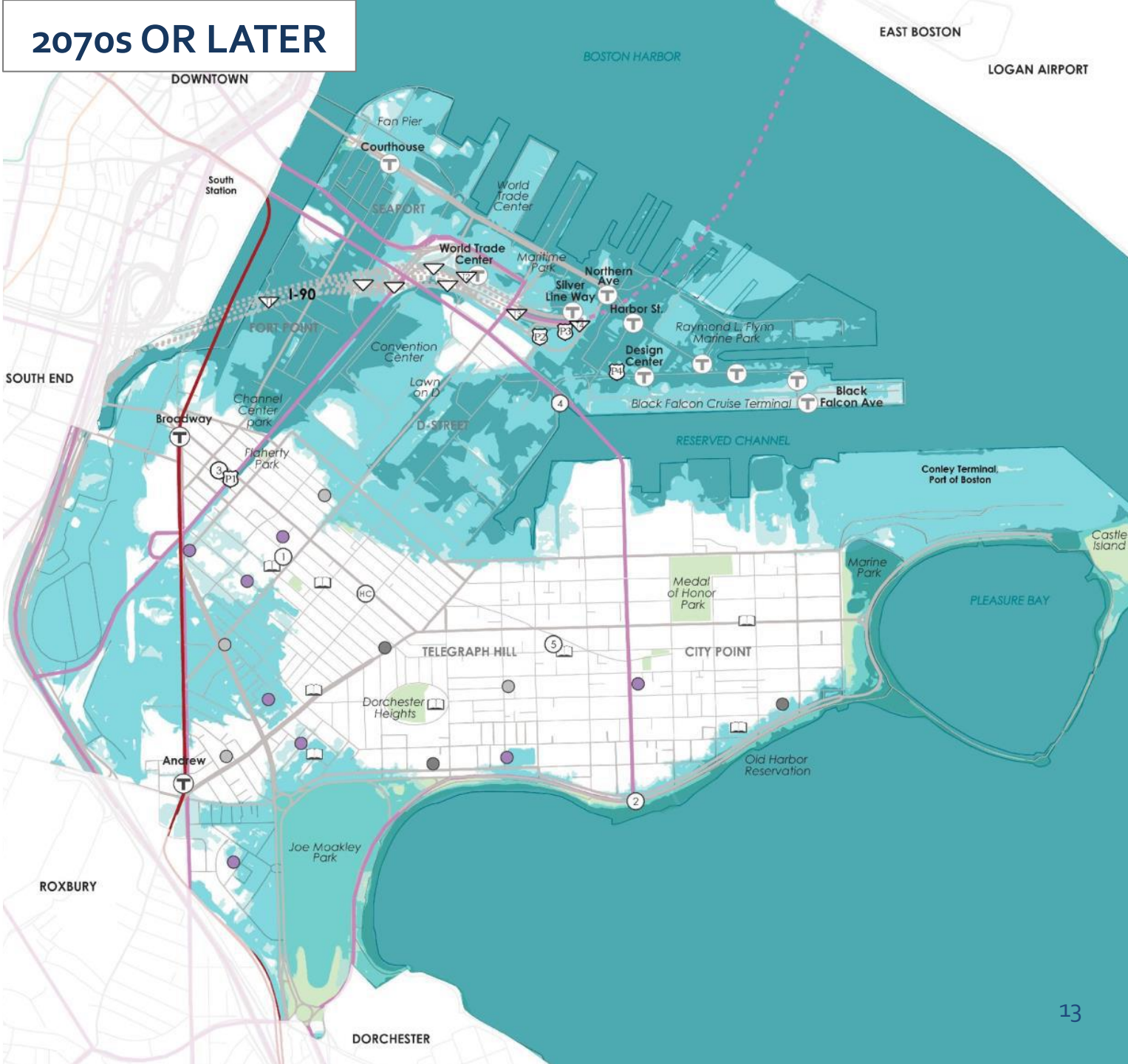
- 1 - Likely under all emission scenarios
- 2 - Likely under moderate to high emission scenarios
- 3 - Low probability under high emission scenario

Data Source: BRAG Report

# DOWNTOWN



# SOUTH BOSTON - SEAPORT



# RISING TO THE CHALLENGE



Climate Projection  
Concensus



Protected Shores



Resilient Infrastructure



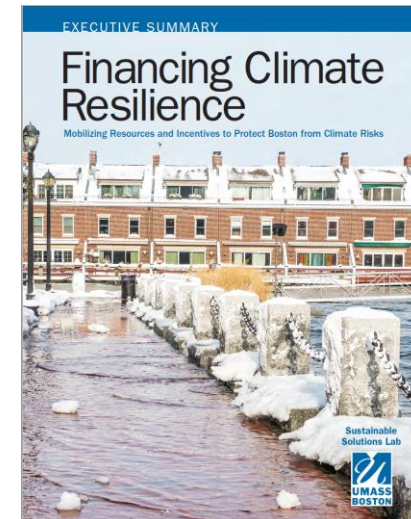
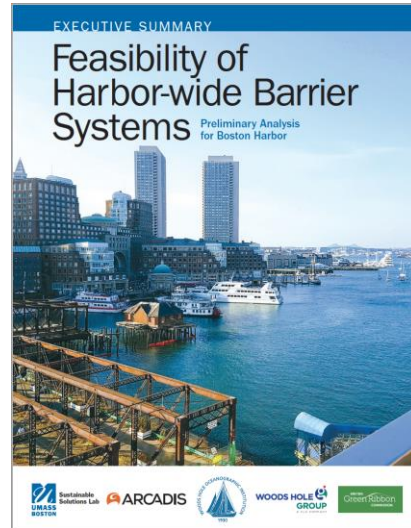
Adapted Buildings



Prepared & Connected  
Communities



# IMPORTANT PHASE 2 PROJECTS



# MAYOR'S RESILIENT HARBOR VISION



# NEXT ROUND OF CHALLENGES

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- **Governance Structures – Who Does the Work?**
- **Financing – How Do We Pay for It? Who Pays What Share?**
- **Regulatory – How Are Plans Legally Codified? How Do We Get It Permitted?**
- **Infrastructure – How Do We Mandate Resilience Standards for Ongoing Infrastructure Investments?**

# LESSONS LEARNED

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- **It Took 6+ Years to Get Here**
- **Business and Civic Leaders Created the Urgency**
- **Leadership at the City Level is Driving Action at the State Level**
- **No US Cities Have Figured It All Out**

# For Additional Information on the GRC

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[www.greenribboncommission.org](http://www.greenribboncommission.org)

John Cleveland, Executive Director

[john@in4c.net](mailto:john@in4c.net)

616-240-9751

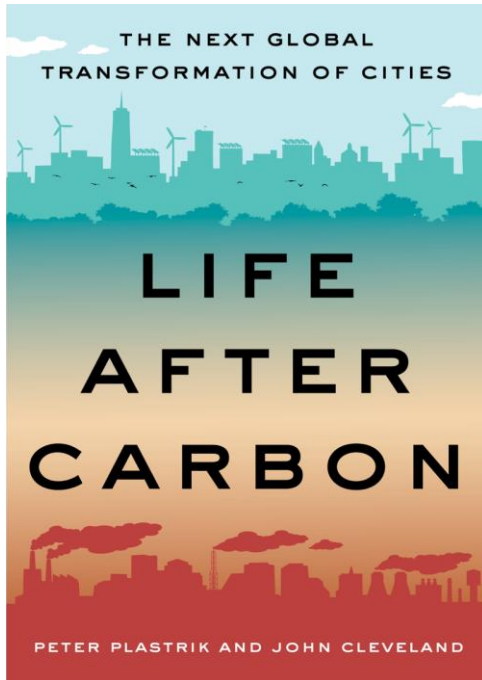
Amy Longsworth, Director

[amy@greenribboncommission.org](mailto:amy@greenribboncommission.org)

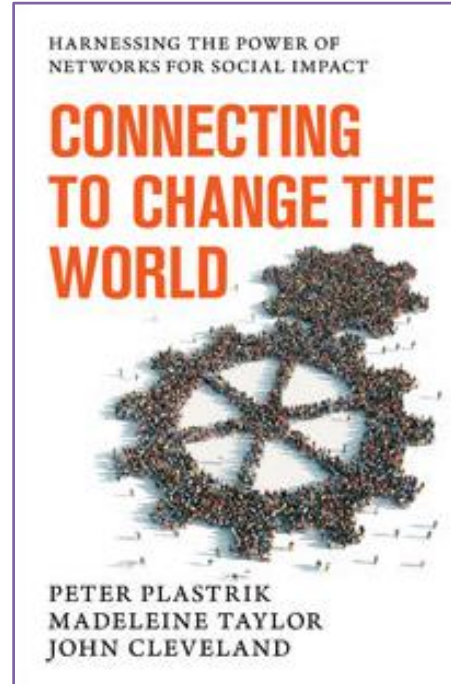
617-854-3937

# SOME ADDITIONAL RESOURCES

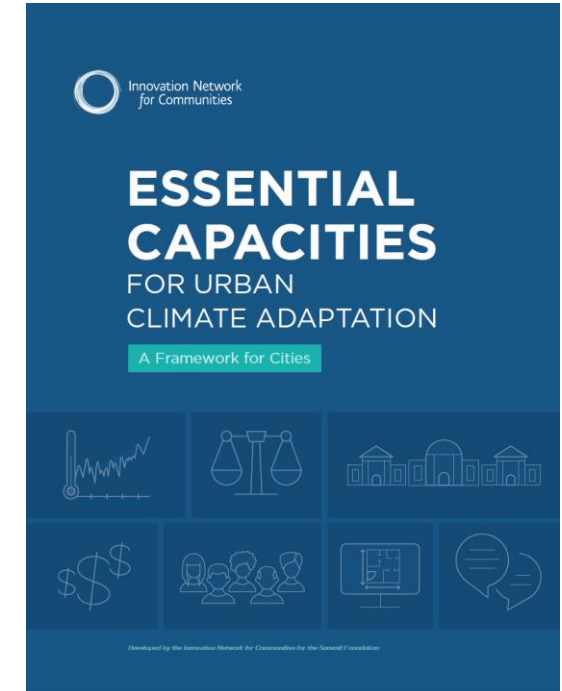
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How city climate leaders are re-writing the rules of urban design  
[www.liferaftercarbon.net](http://www.liferaftercarbon.net)



Network building for social impact  
[Connecting to Change the World: Harnessing the Power of Networks for Social Impact](#)



Report on leading city adaptation practices  
[Essential Capacities for Urban Climate Adaptation](#)