Sea Level Rise / Storm Surge Protection

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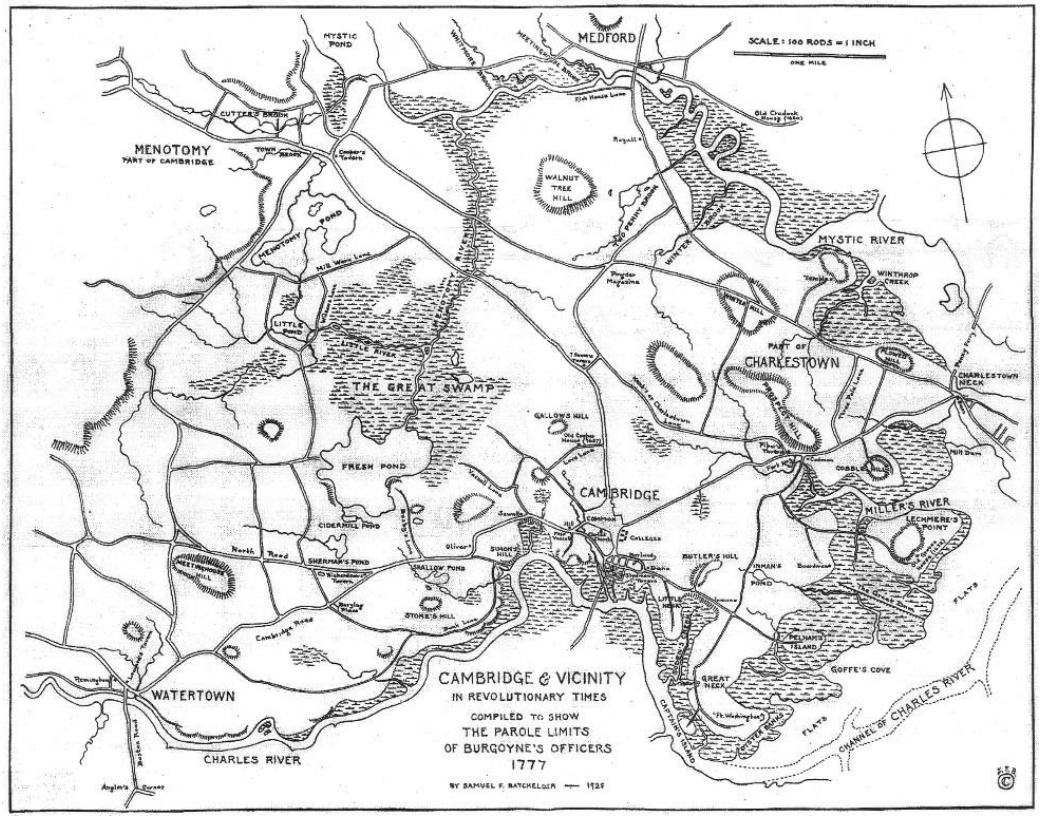
Kleinfelder

Presentation as Part of Workshop “Responding to Local Climate Risk through Collaborative Action”
Organized by Cambridge Compact for Sustainable Future and Kendall Square Association
June 1, 2017

Cambridge History



Cambridge – "The Great Swamp" [1777]

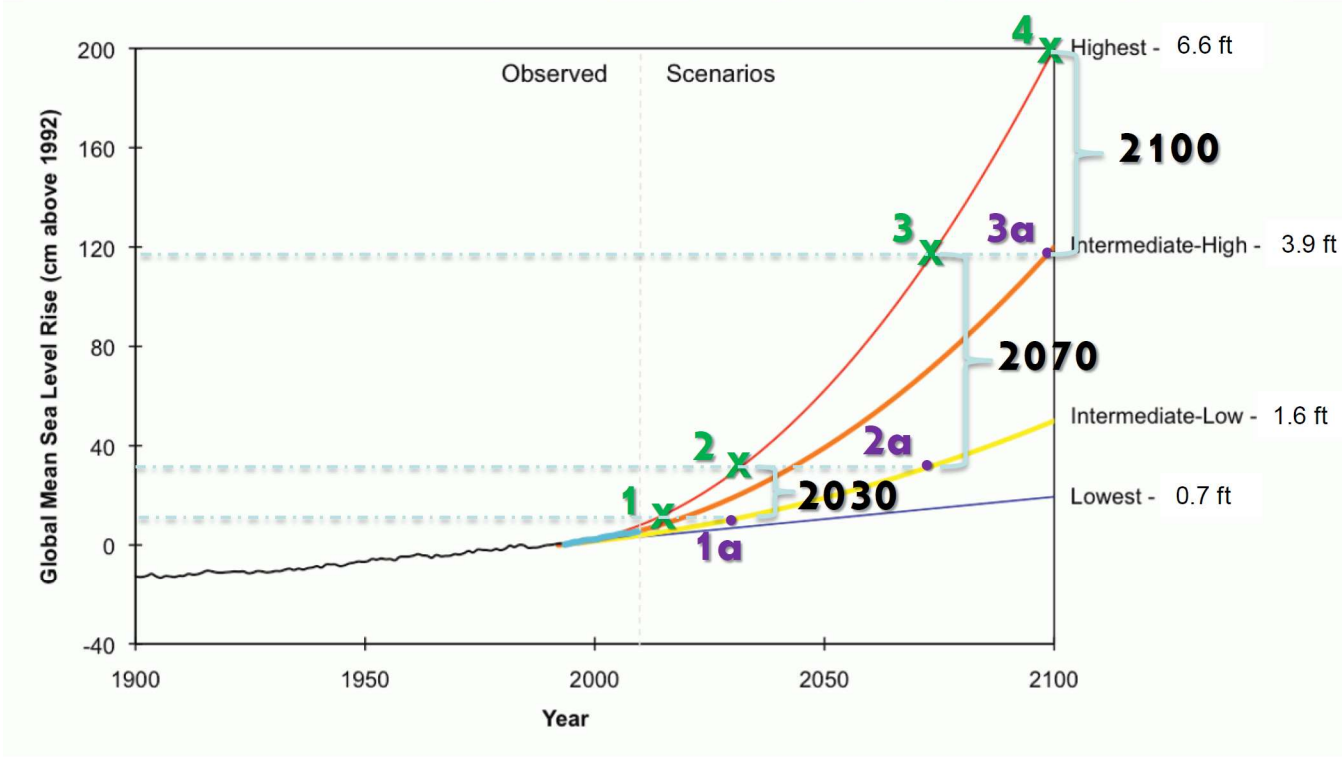
Cambridge – Alewife [1947]

Alewife Brook channelized [1909]

Alewife used to be tidal marshland

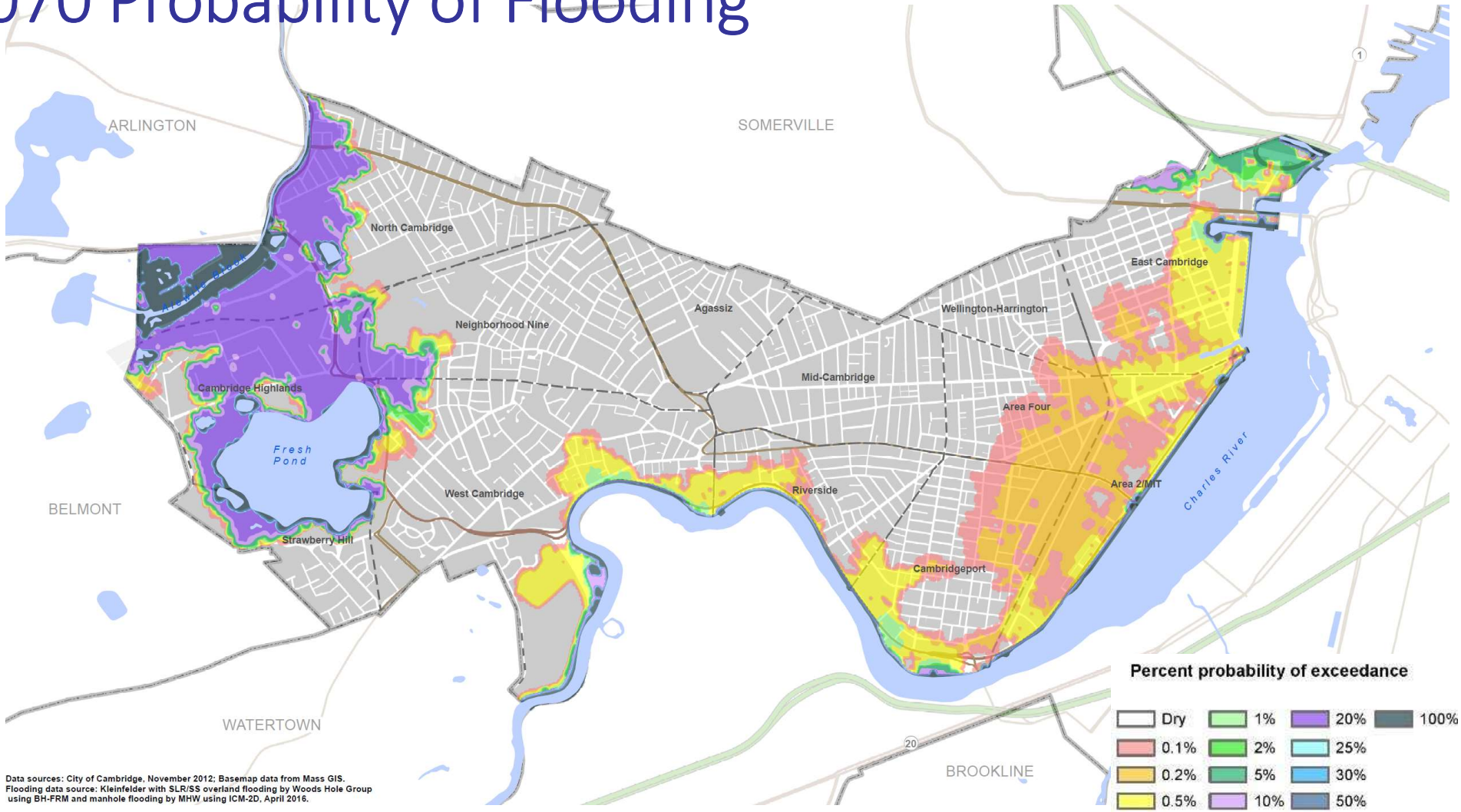
Sea Level Rise Projections

Scenarios	2020	2030	2040	2050	2060	2070	2080	2090	2100
"Highest" Global SLR (from 2013-2020) (feet)	0.21	0.61	1.10	1.70	2.40	3.21	4.11	5.12	6.23
Land subsidence (feet) @ 0.003 ft/yr	0.02	0.06	0.09	0.12	0.15	0.19	0.22	0.25	0.29
"Highest" Relative SLR (from 2013-2020) - (feet)	**0.24**	**0.66**	**1.19**	**1.82**	**2.56**	**3.39**	**4.33**	**5.37**	**6.52**



NOAA (2012). Global Sea Level Rise Scenarios for the United States National Climate Assessment

2070 Probability of Flooding



Flooding Impacts at the Dams

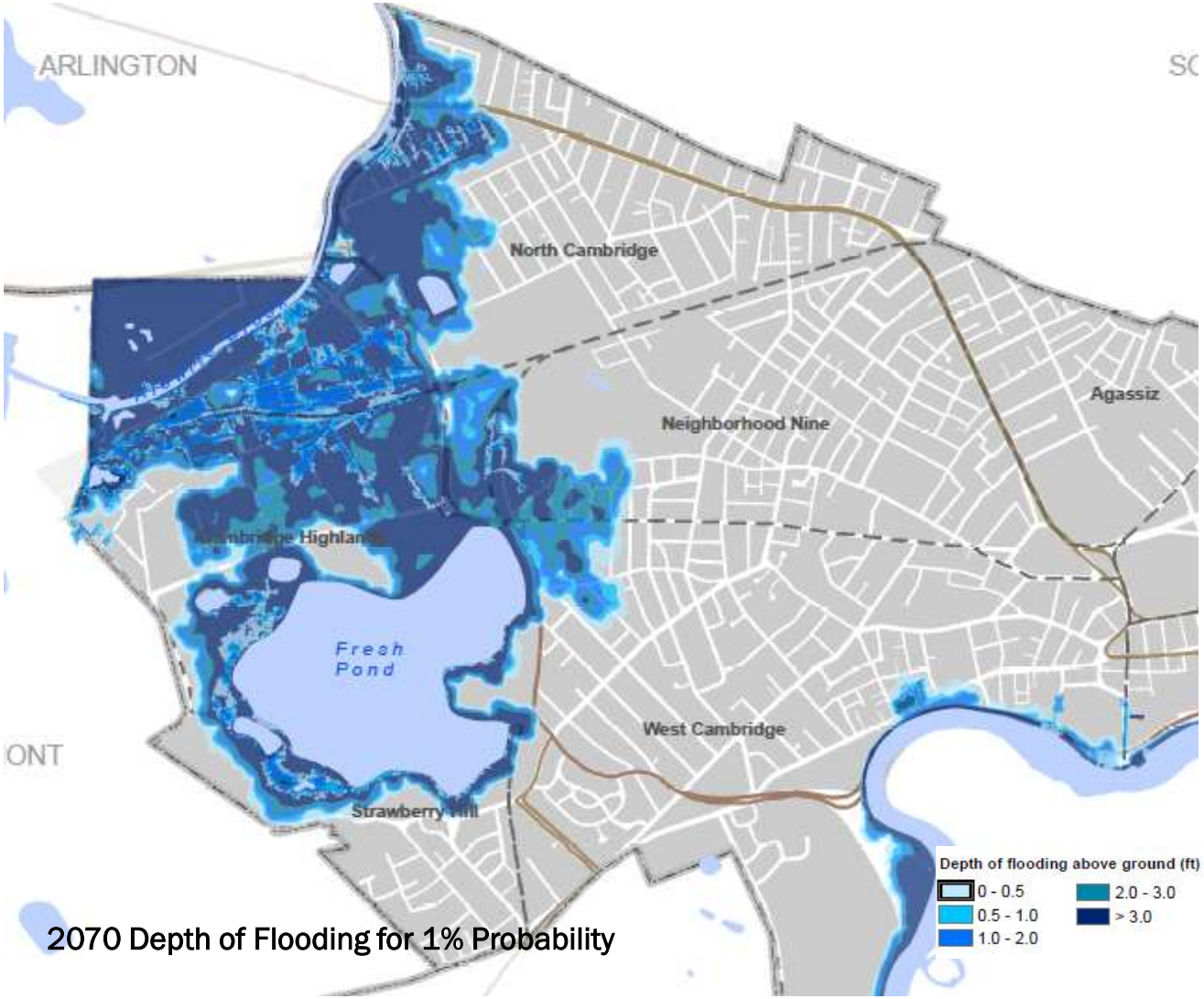
Amelia Earhart Dam

At 1% (100-yr):

- Flanked in 2045-2050
- Overtopped in 2055-2060

At 0.2% (500-yr):

- Flanked in 2030-2035
- Overtopped in 2040



2070 Depth of Flooding for 1% Probability

Flooding Impacts at the Dams

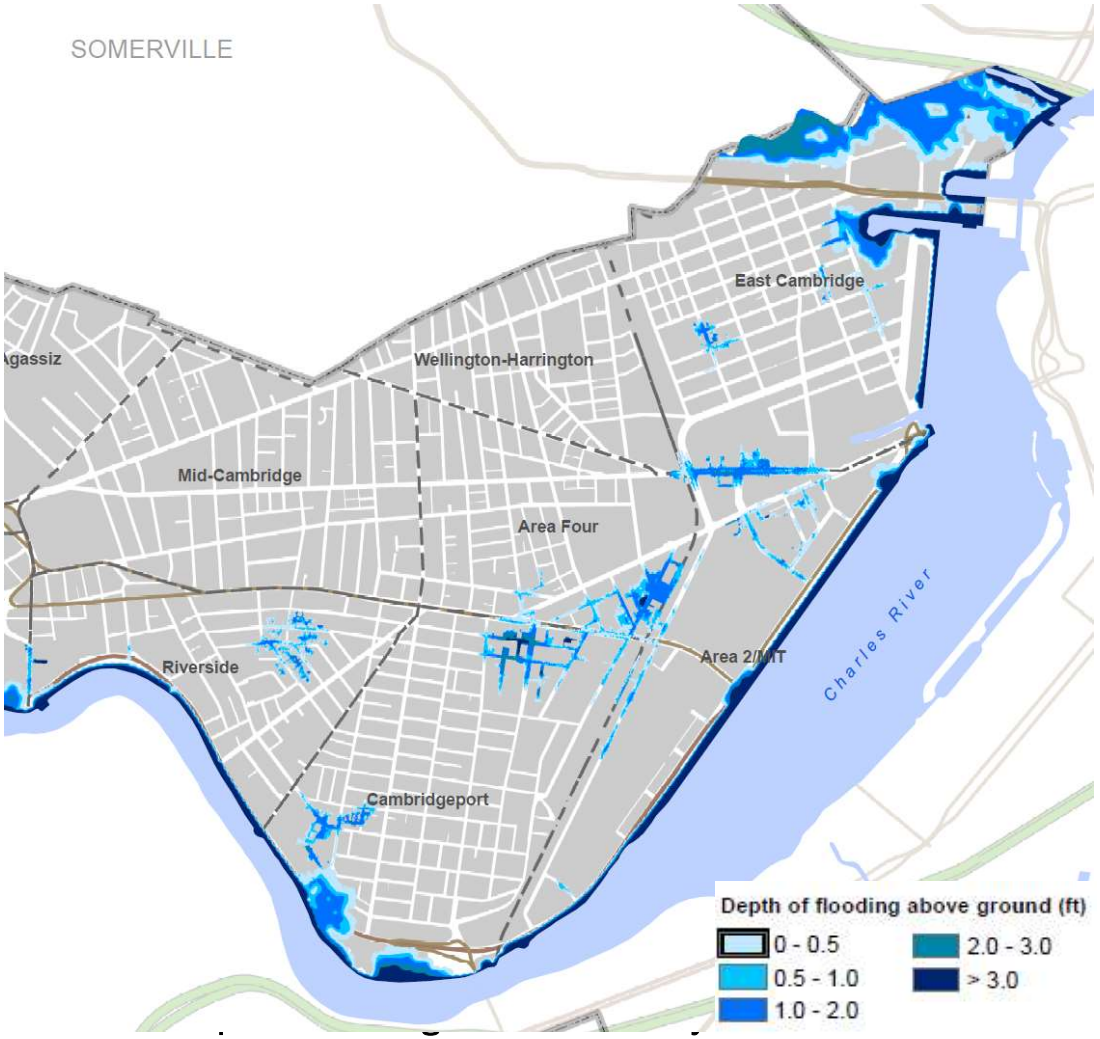
Charles River Dam

At 1% (100-yr):

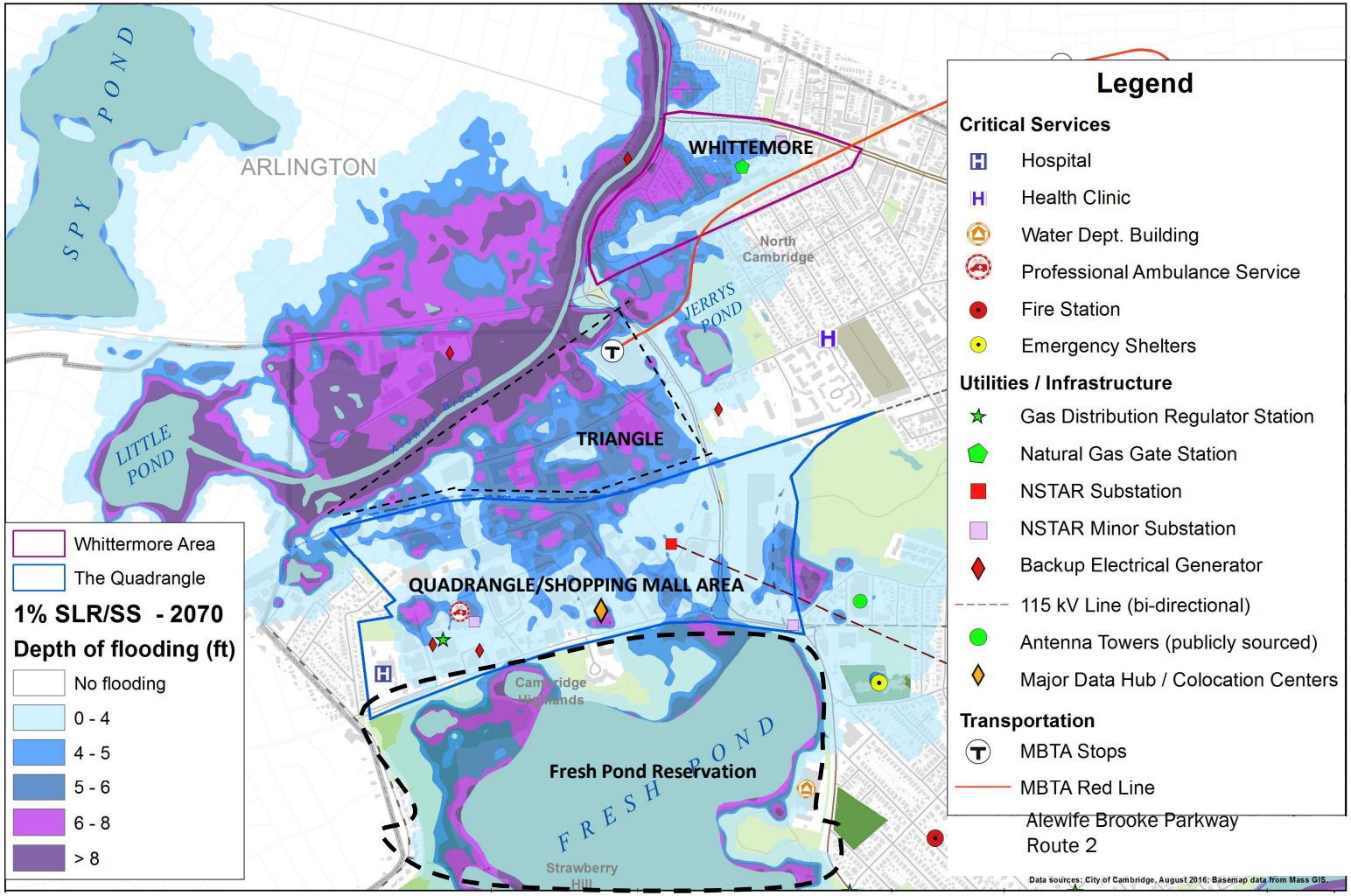
- Flanked in 2055-2060
- Overtopped in 2065

At 0.2% (500-yr):

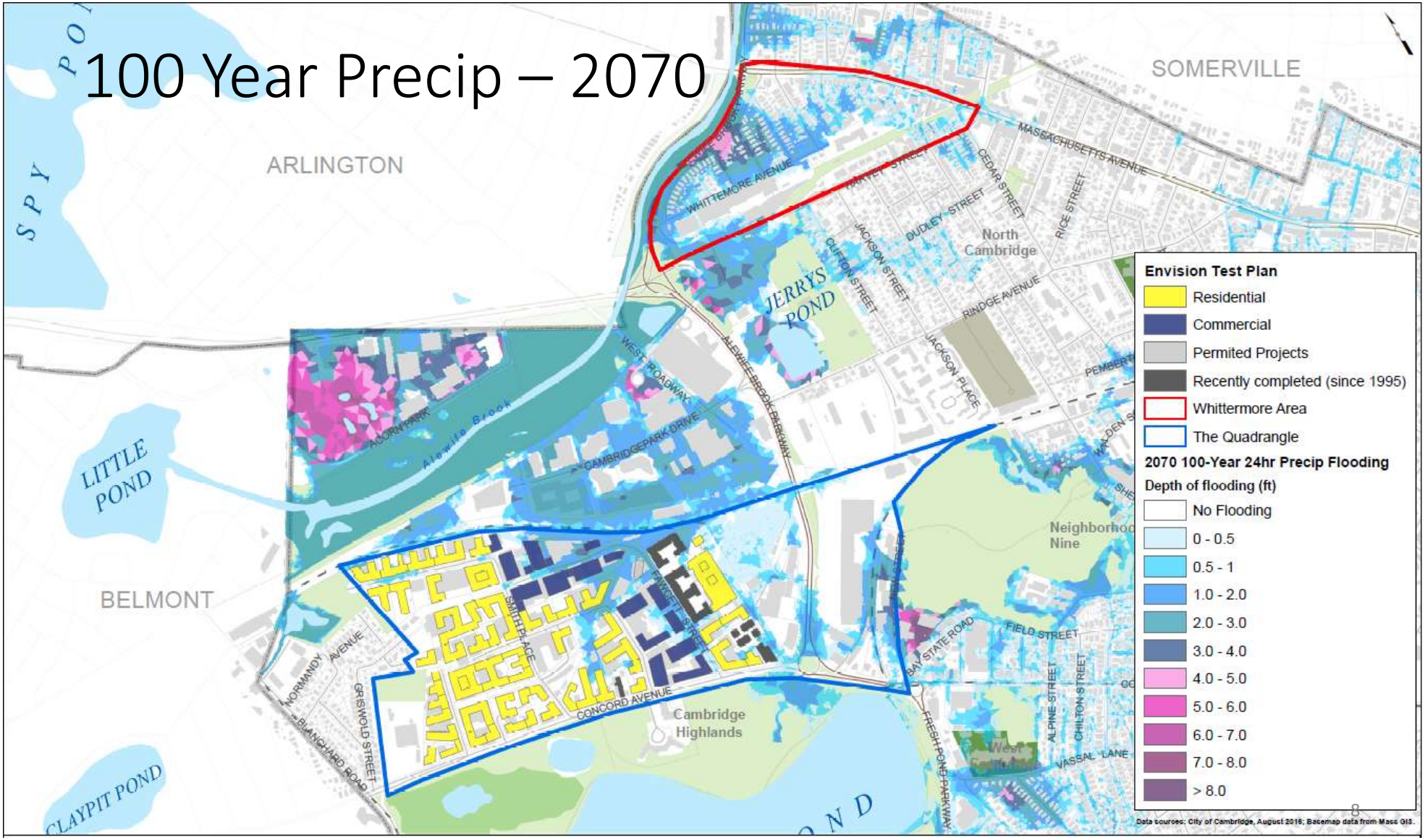
- Flanked in 2045
- Overtopped in 2050



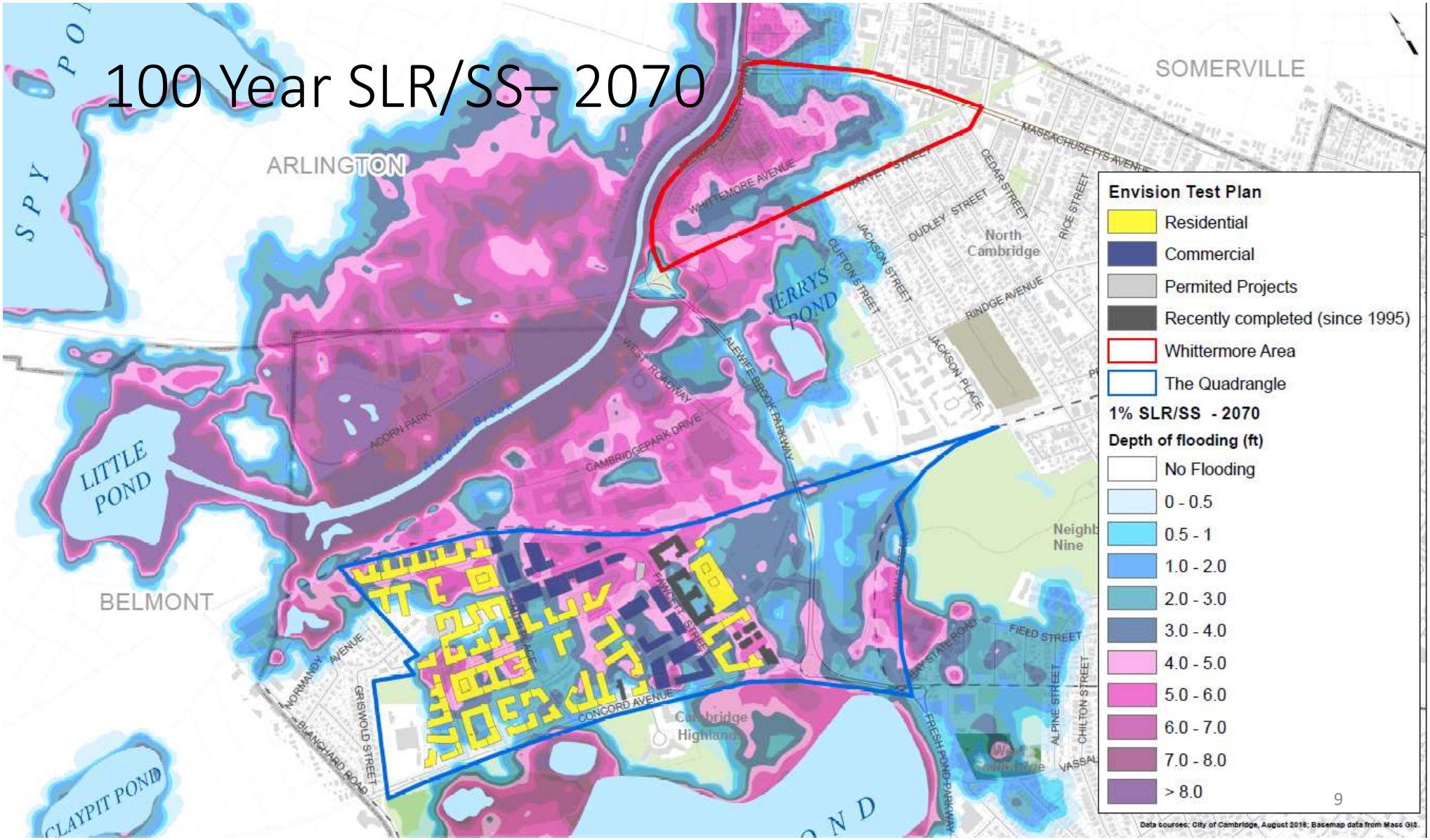
Impacts on Critical Infrastructure and Services - Interdependencies



100 Year Precip – 2070

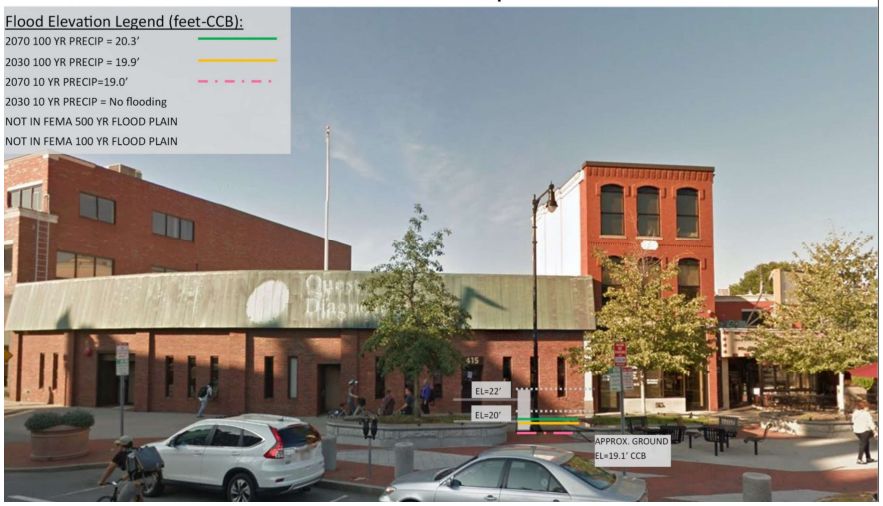


100 Year SLR/SS– 2070



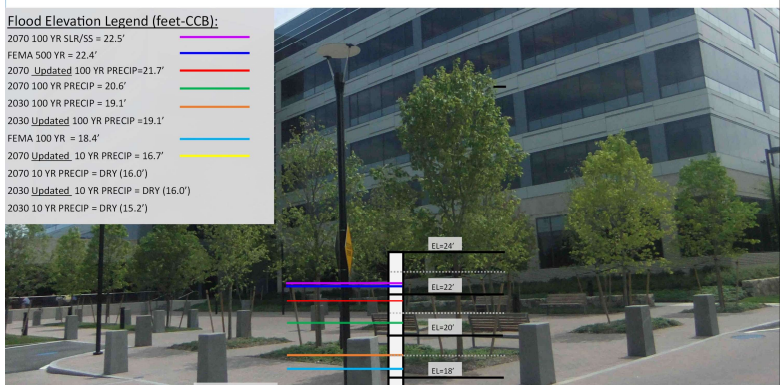
The Challenge

Mass+Main Development



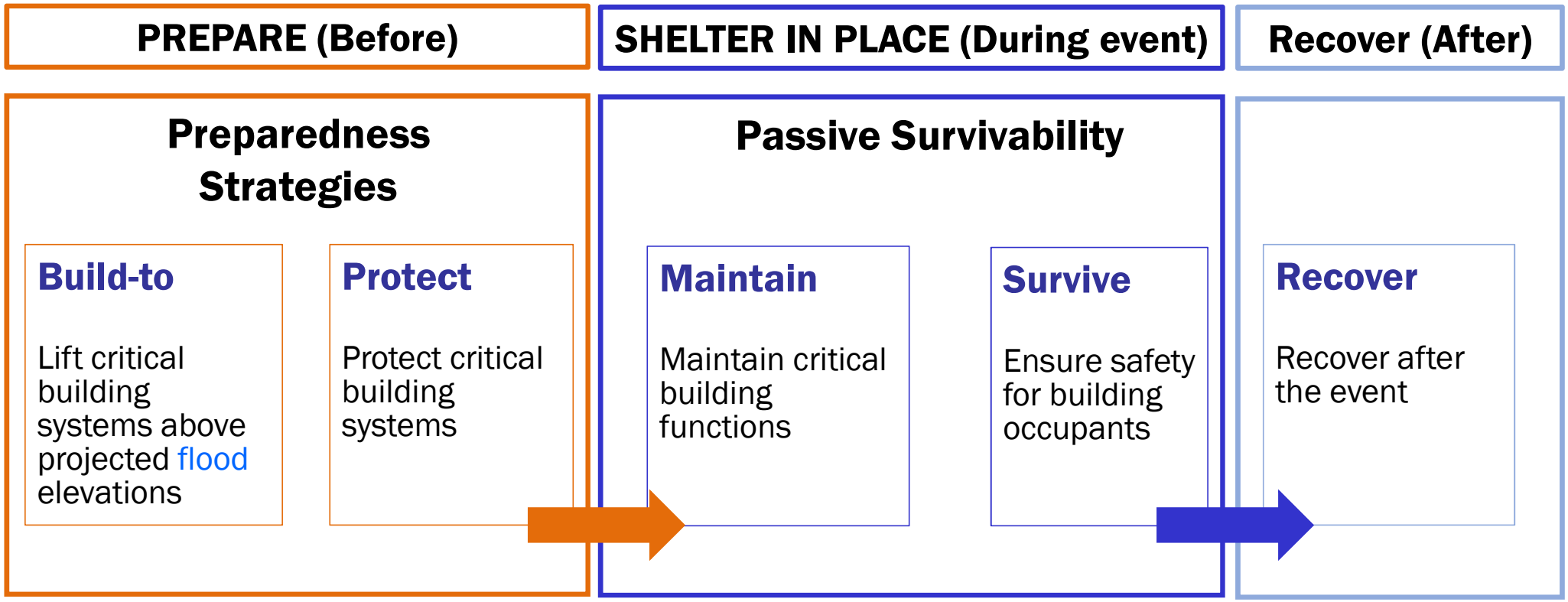
Massachusetts Ave. and Alewife Brook Parkway

C. ACORN PARK DRIVE FLOOD ELEVATIONS

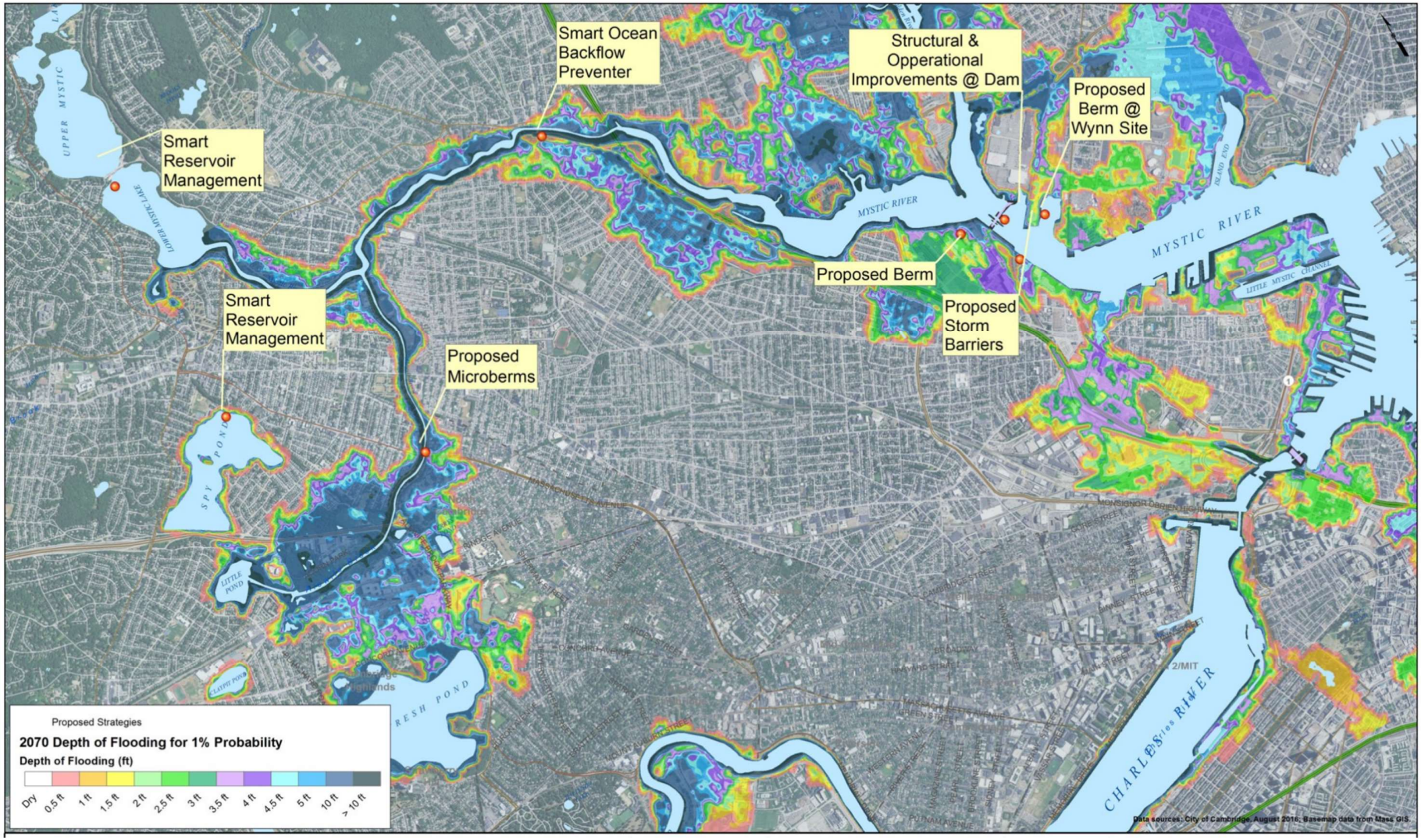


Types of Resiliency Strategies

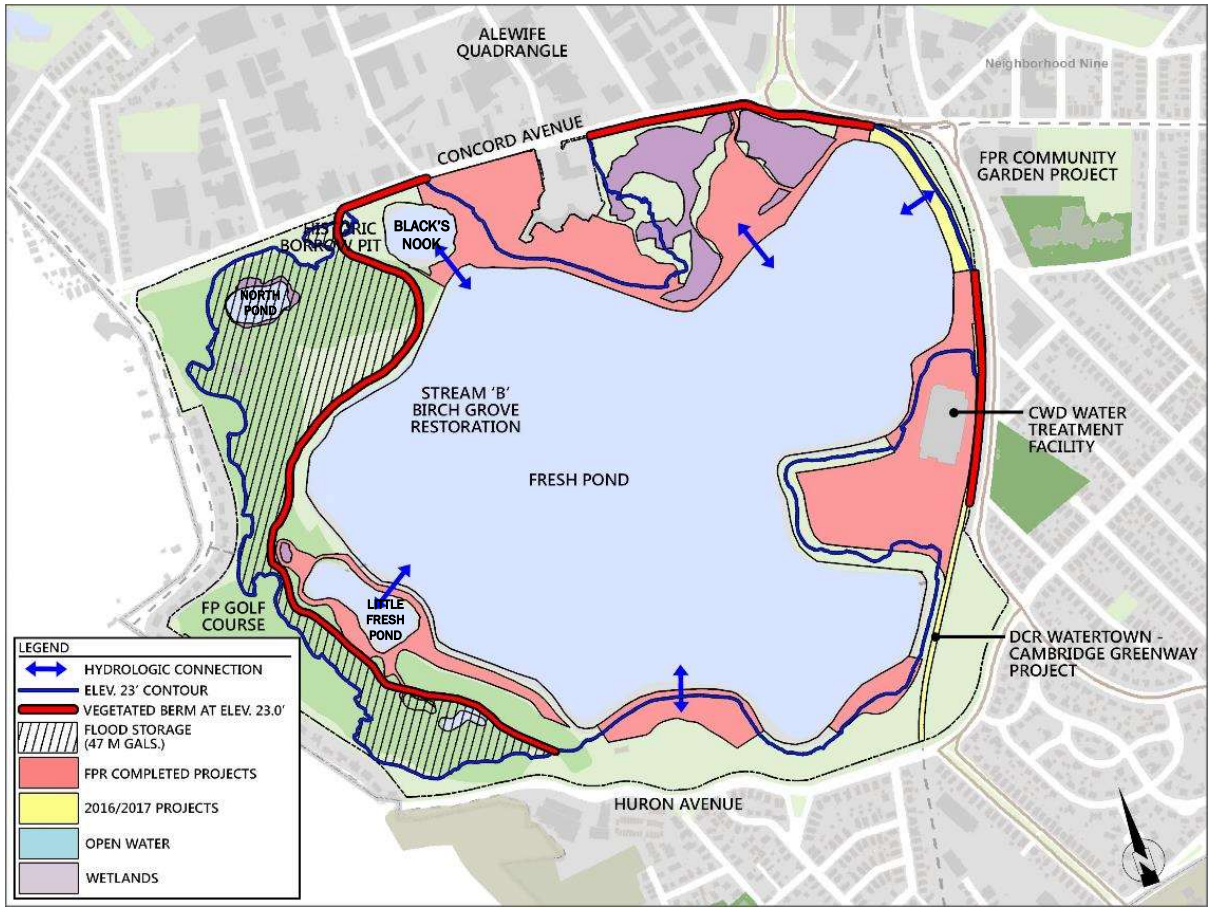
Resilience is the capacity to recover quickly from difficulties; toughness.
Preparedness is the quality or state of being prepared.



Regional Scale Interventions



Neighborhood Scale Interventions

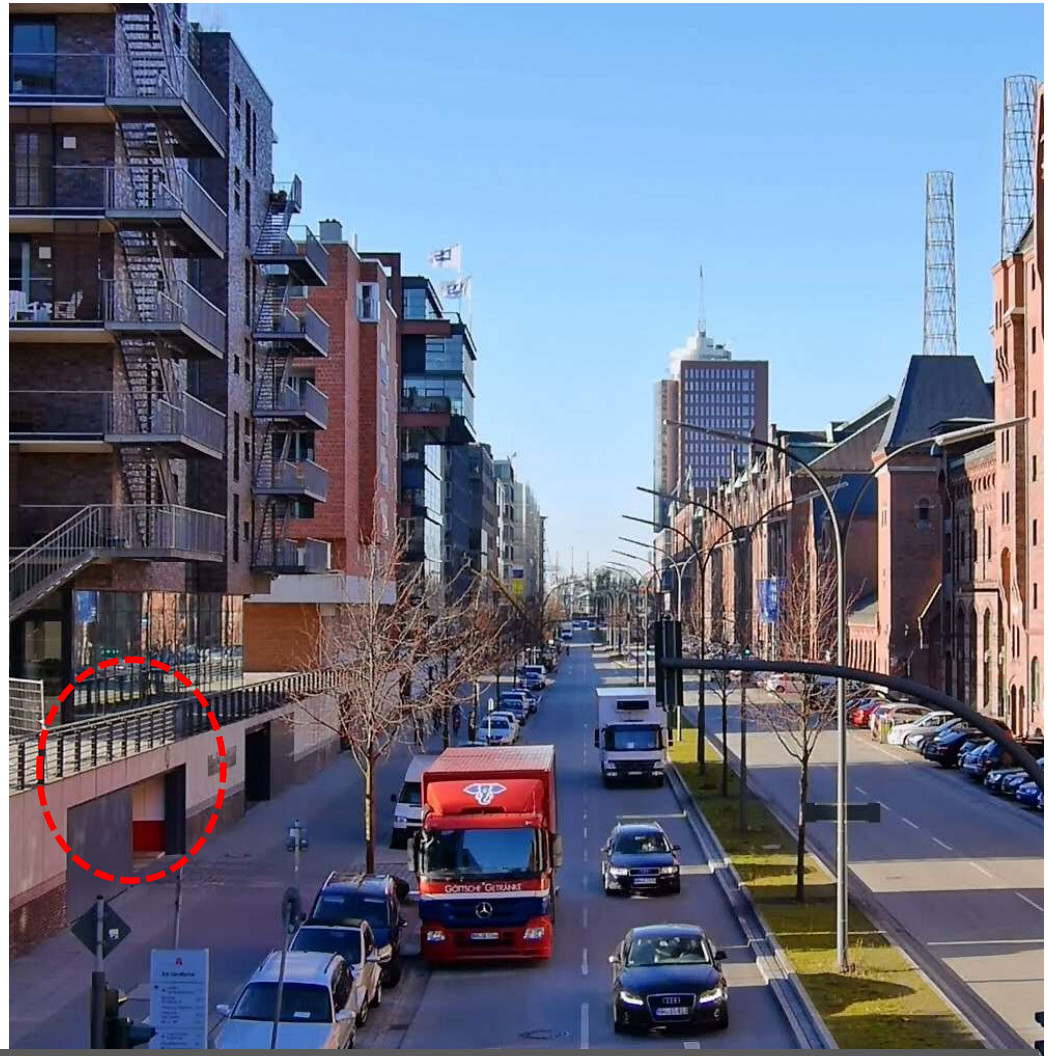


**Note: Minimum available storage is based on capacity lost due to 100-yr 2070 precip flooding, and maximum storage is based on capacity lost due to 10-yr 2030 precip flooding at these locations.*

Protect Fresh Pond from 1% 2070 Storm Surge Flood Event

Sketch of the Proposed Berm (TOB 23.15') at Fresh Pond Golf Course

Protect

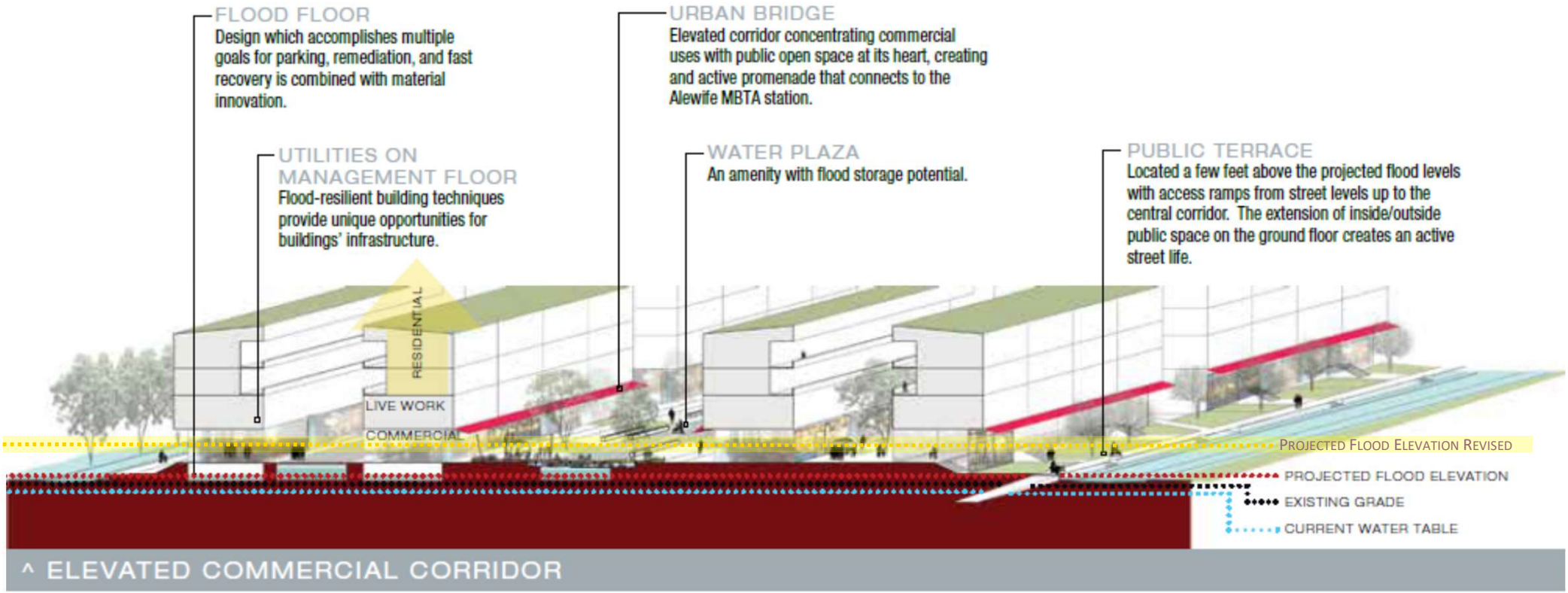


FULLY ELEVATED MIXED-USE BUILDING HAFEN CITY HAMBURG

Build to

FULLY ELEVATED WITH ELEVATED STREETS: RESIDENTIAL LOUISVILLE, KY

Build-to/Protect

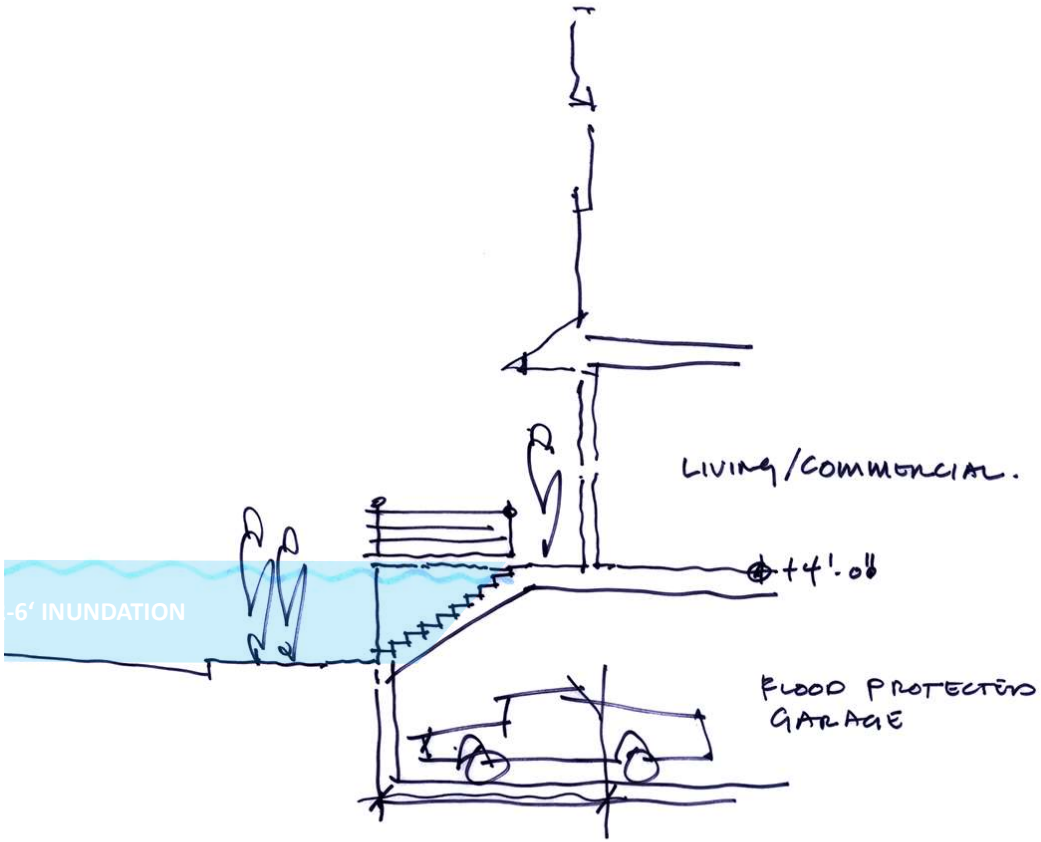


^ ELEVATED COMMERCIAL CORRIDOR

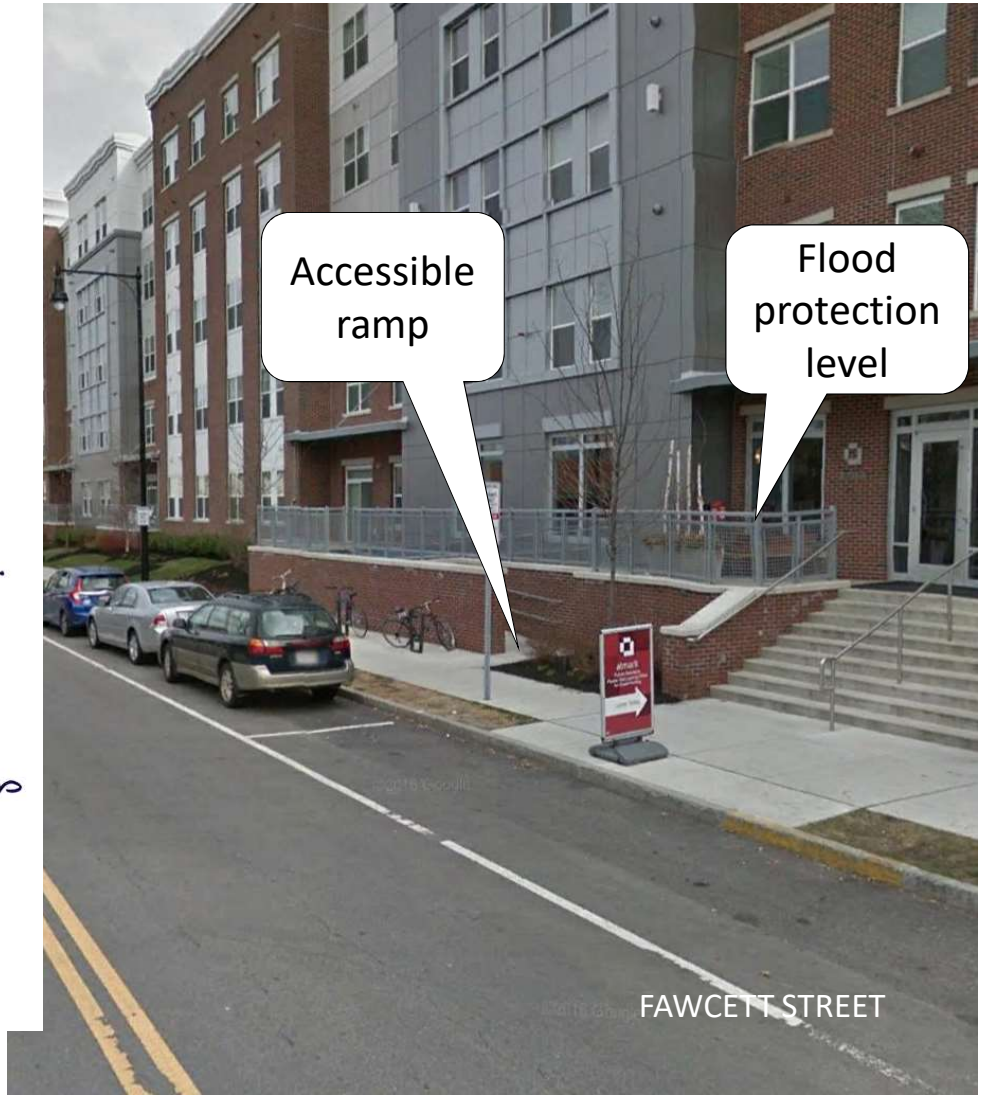
ABOVE The Elevated Commercial Corridor section depicts an infrastructure strategy that constructs an activated pedestrian route that increases in elevation to ultimately bridge across the MBTA commuter rail lines.
Image credit: Ager Group The Boston Studio

http://boston.uli.org/wp-content/uploads/sites/12/2012/04/ULI_LivingWithWater-Final1.pdf

Build-to/Protect

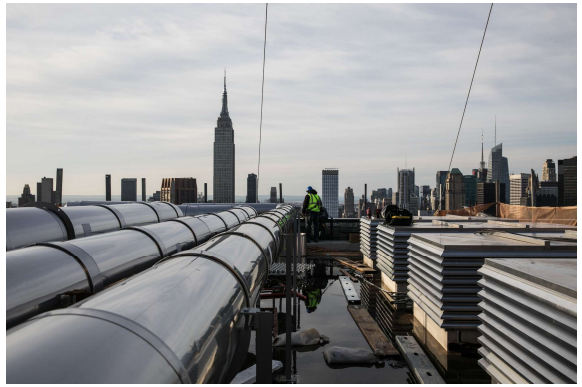


* REQUIRES ANCHORING TO PREVENT FLOTATION



Build-to/Protect
Case Study: American Copper Buildings

- Two residential buildings with a total of 760 apartments
- Located along East River in NYC
- Lobby walls use stone to prevent flood damage
- Stormwater detention pit under basement floor
- Mechanical systems on 2nd floor
- Five natural gas emergency generators on 48th floor



Source: New York Times, Curbed NY

B1. Retrofit existing building/ parcel for enhanced flooding protection

Dry Floodproofing

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Dry Floodproofing

Conceptual Framework