B ADAPTED BUILDINGS

WHAT IS AT RISK?

By 2070, the percentage of properties in the Alewife area that could experience flooding from the 100-year precipitation event doubles compared to sea level rise and storm surge.

FLOODING CHALLENGES

Percent of Properties Flooded for the 100-Year Storm in Alewife Area

ALEWIFE AREA FLOODING		
STORM EVENT	% FLOODED LAND AREA	% FLOODED PROPERTIES
100-YEAR 24-HOUR PRECIPITATION EVENT	11%	18%
100-YEAR 24-HOUR PRECIPITATION EVENT	13%	21%
100-YEAR 24-HOUR PRECIPITATION EVENT	19%	28%
100-YEAR SLR/SS EVENT	34%	14%

[SOURCE: CCPR, 2017]

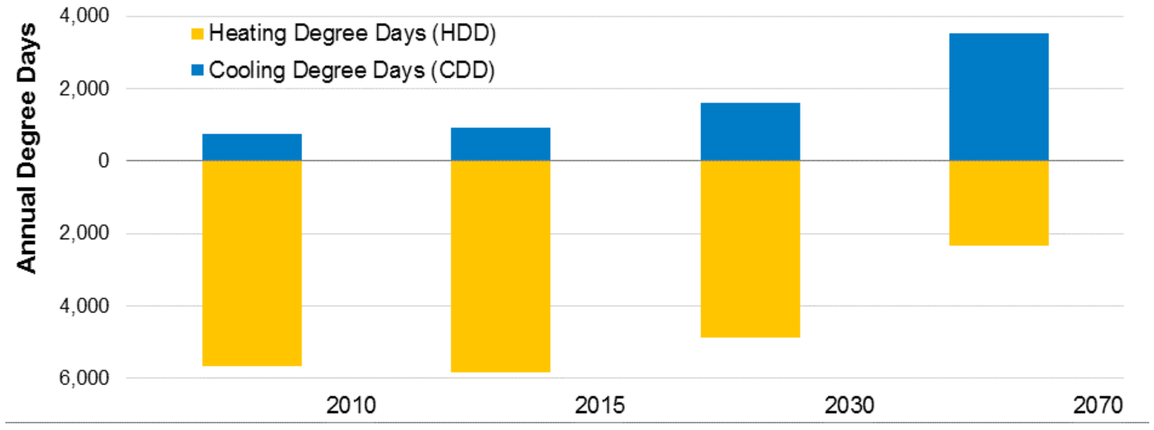
Buildings in the Alewife area need to be protected against projected climate change impacts and/or designed for a speedy return to normal operation.

Open spaces in the Alewife area are more affected by sea level rise and storm surge flooding, whereas more properties are affected from piped infrastructure flooding due to precipitation.

By 2070, Cambridge may experience nearly three months over 90 °F, as a result there will be more days required for cooling buildings than for heating.

COOLING CHALLENGES

Projected Annual Heating and Cooling Degree Days

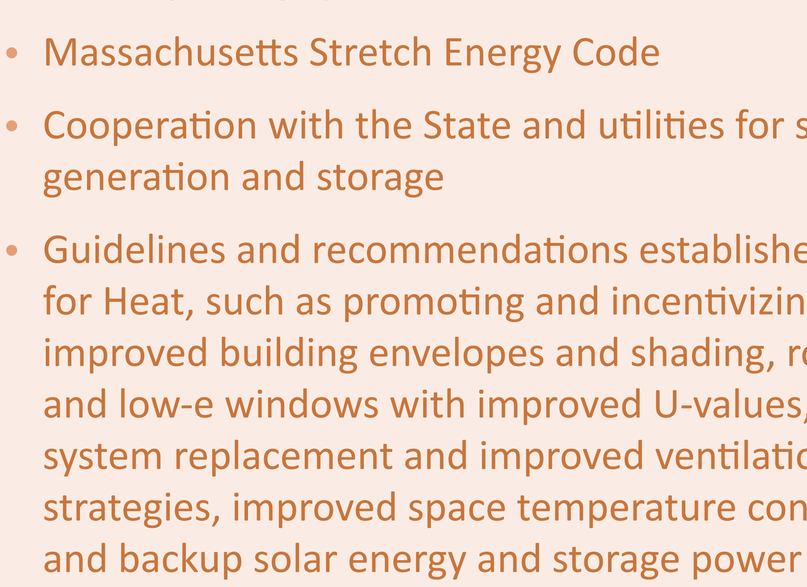


[SOURCE: CCPR, 2017]

WHAT ACTIONS ARE ALREADY BEING TAKEN?

- The City requires buildings of at least 25,000 square feet of gross floor area to meet the requirements of the most current LEED building rating system
- Massachusetts Stretch Energy Code
- Cooperation with the State and utilities for solar energy generation and storage
- Guidelines and recommendations established for homeowners for Heat, such as promoting and incentivizing weatherization, improved building envelopes and shading, rooftop reflectivity and low-e windows with improved U-values, encouraging HVAC system replacement and improved ventilation systems and strategies, improved space temperature control and setpoints, and backup solar energy and storage power systems
- Substantial renovations required to comply with new regulations
- The City requires sewage backflow preventers
- Flooding brochure to inform residents
- Alewife Overlay District Zoning to preserve and enhance the capacity to store floodwater, recharge groundwater and manage the collection and disposal of stormwater
- Guidelines and recommendations established for homeowners for flooding strategies to protect homes
- Green Roof Area exempt from max allowed building area (Zoning Ordinance Article 22, Subsection 22.30)

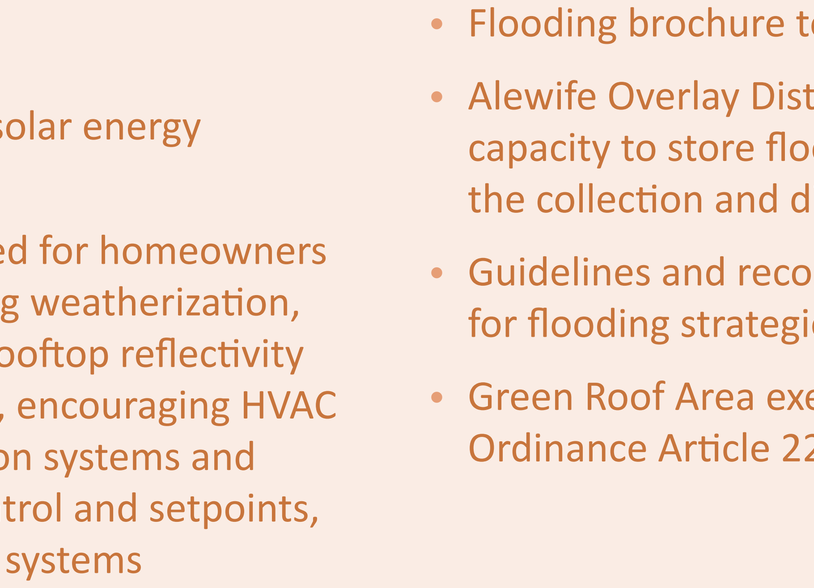
WHAT ARE OTHER CITIES DOING?



[SOURCE: CITY OF HAMBURG, GERMANY]

HAFENCITY, HAMBURG - GERMANY

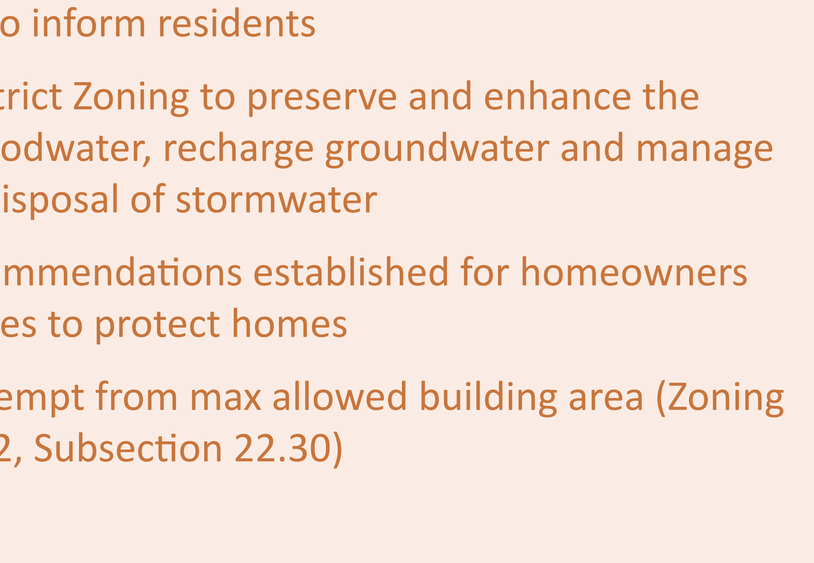
Series of mixed-use buildings fully elevated from the street level for flood protection and improved neighborhood resilience.



[SOURCE: NEW YORK TIMES, CURBED NY]

AMERICAN COPPER BUILDINGS - NEW YORK CITY, NEW YORK

The mechanical systems are on the 2nd floor, and there are five natural gas emergency generators on the 48th floor.



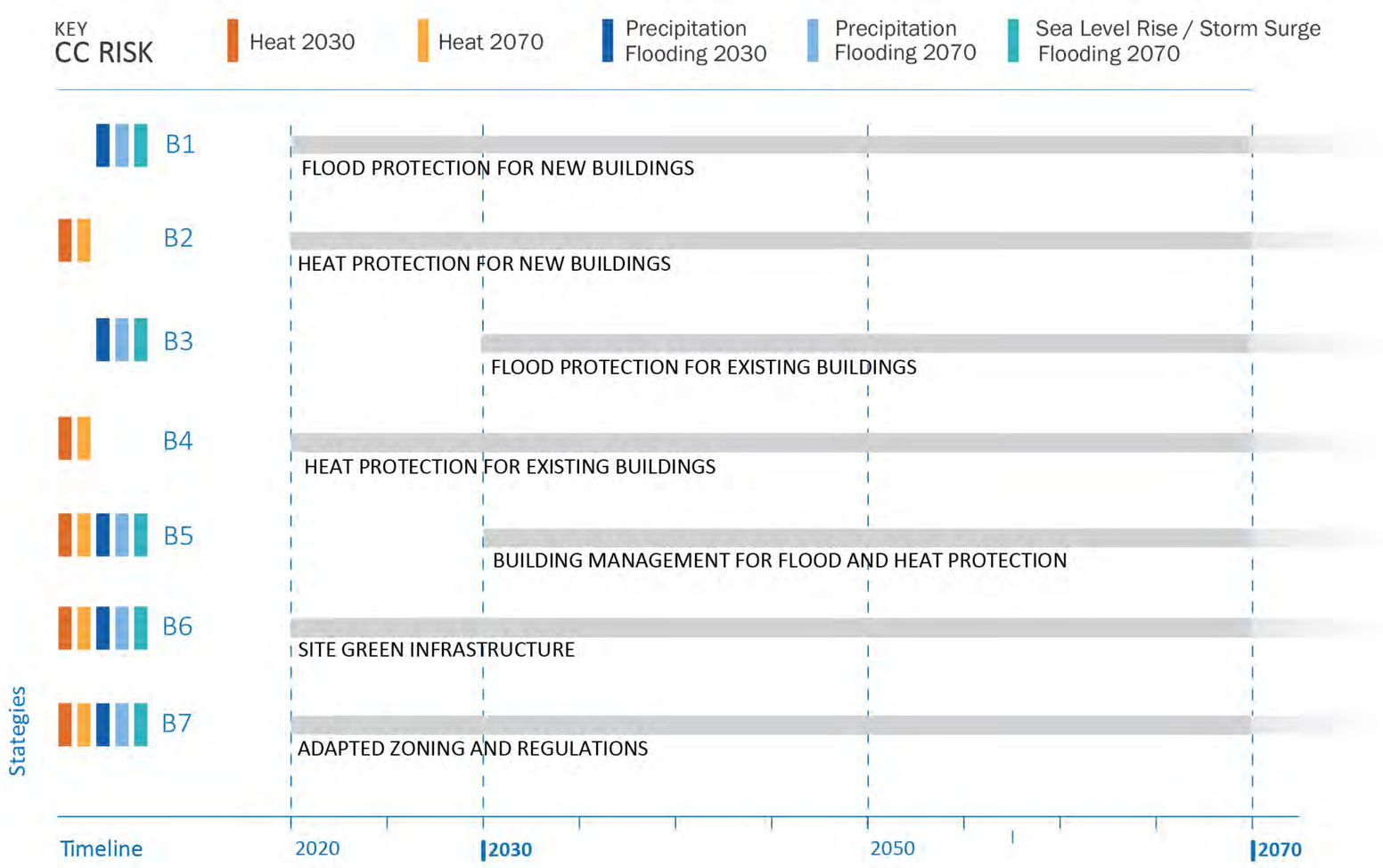
[SOURCE: NYC COOLROOFS]

NEW YORK CITY COOL ROOFS PROGRAM - NEW YORK CITY, NEW YORK

New York City's CoolRoofs™ Program was launched in 2009. Through the program, building owners have applied approximately 6 million square feet of white, reflective coating on more than 600 building roofs.

B ADAPTED BUILDINGS

TIMELINE



The overall benefit of the strategies for **Adapted Buildings** is to develop a **resilient neighborhood**, **protected from climate change impacts** and designed to **return to normal quickly**.

Strategies for flood and heat resiliency have been developed separately for new and existing buildings as different approaches and means are needed for each.

ADD YOUR STICKERS TO THE TABLE BELOW

Which strategy is most important for your household (or work) in terms of resiliency?

Which strategy is most important for the Alewife Neighborhood in terms of resiliency?

STRATEGY	TITLE	DESCRIPTION	YOUR VOTE
B1	**FLOOD PROTECTION FOR NEW BUILDINGS**	Establish regulations and design guidelines for new buildings and re-development to be resilient to future flood risks identified for the neighborhood.	
B2	**HEAT PROTECTION FOR NEW BUILDINGS**	Establish regulations and design guidelines for new buildings and re-development to be resilient to future heat risks identified for the neighborhood.	
B3	**FLOOD PROTECTION FOR EXISTING BUILDINGS**	Establish a program to support retrofitting of existing buildings and re-development to be resilient to future flood risks.	
B4	**HEAT PROTECTION FOR EXISTING BUILDINGS**	Establish a program to support retrofitting of existing buildings and re-development to be resilient to future heat risks.	
B5	**BUILDING MANAGEMENT FOR FLOOD AND HEAT PROTECTION**	Develop a program to enable building residents and occupants to effectively manage and operate resilient buildings.	
B6	**SITE GREEN INFRASTRUCTURE**	Implement green infrastructure (GI) at the parcel level to improve water management and reduce heat-island effect.	
B7	**ADAPTED ZONING, POLICIES AND REGULATIONS**	Revise zoning to factor in Climate Change risks, such as flooding and extreme heat and adjust building requirements to take into account new constraints such as revised flood elevation.	

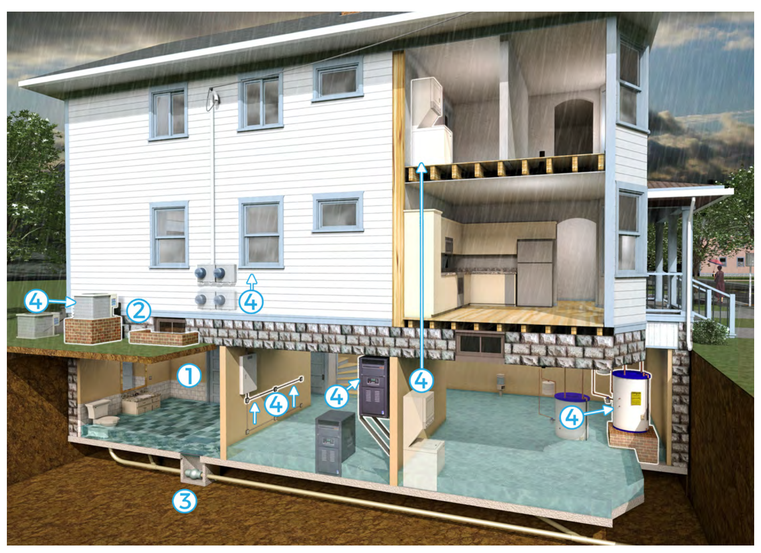
B CLIMATE CHANGE PREPAREDNESS & RESILIENCE (CCPR) PLAN
ADAPTED BUILDINGS

WHAT CAN BE DONE TO PREPARE FOR CLIMATE CHANGE?

EXISTING BUILDINGS

- **Retrofit/Protect to the 2070 10-year flood elevation** from precipitation or sea level rise/storm surge, whichever is higher (B3)
- **Recover/Manage to the 2070 100-year flood elevation** from precipitation or sea level rise/storm surge, whichever is higher (B3)
- **Elevate or protect vulnerable utilities** such as fuel storage, furnaces, and electrical panels above 2070 10-year flood elevation (B3)
- Use **flood resilient construction materials** below the 2070 10-year flood elevation (B3)
- **Maximize opportunities for natural ventilation and upgrading building mechanical systems** for improved passive survivability (B4)
- **Install backup solar energy and storage power systems** and **separate circuits** for critical building loads including AC in “selected cool zone” (B4)
- **Retrofit rooftops with a minimum Solar Reflectance Index (SRI) of 82** (for rooftop slopes less than 10 degrees) and **39** (for rooftops over 10 degrees), **non-roof surfaces** with a minimum solar reflectance of **0.33** or **install white or green roofs** (structural capacity dependent) and green infrastructure in place of grey infrastructure (B4)
- **Replace windows with low-e glass windows** with a U-value maximum of U-0.03 (B4)

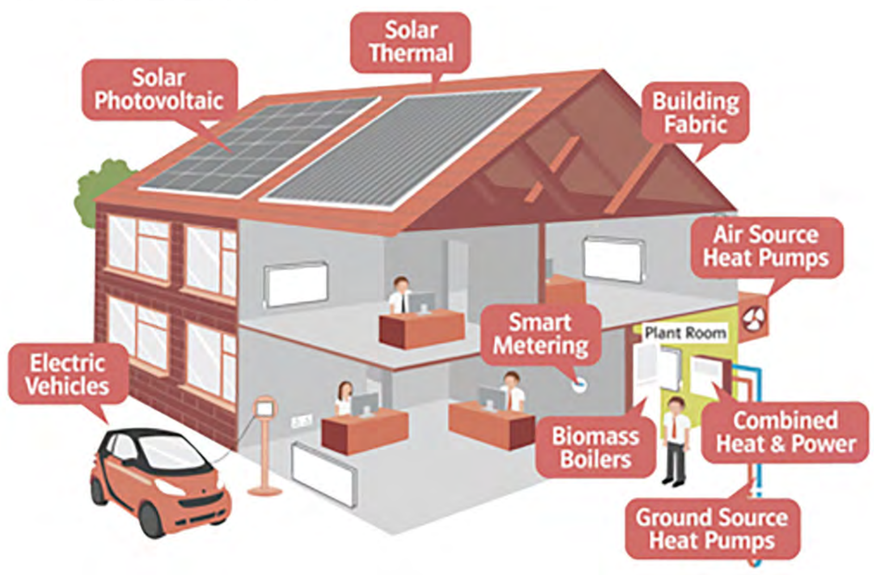
FLOOD PROTECTION



1) Use flood resistant materials
2) Build exterior floodwalls
3) Install backwater valves
4) Elevate/Relocate utilities

[Source: KLEINFELDER FOR THE CITY OF CAMBRIDGE]

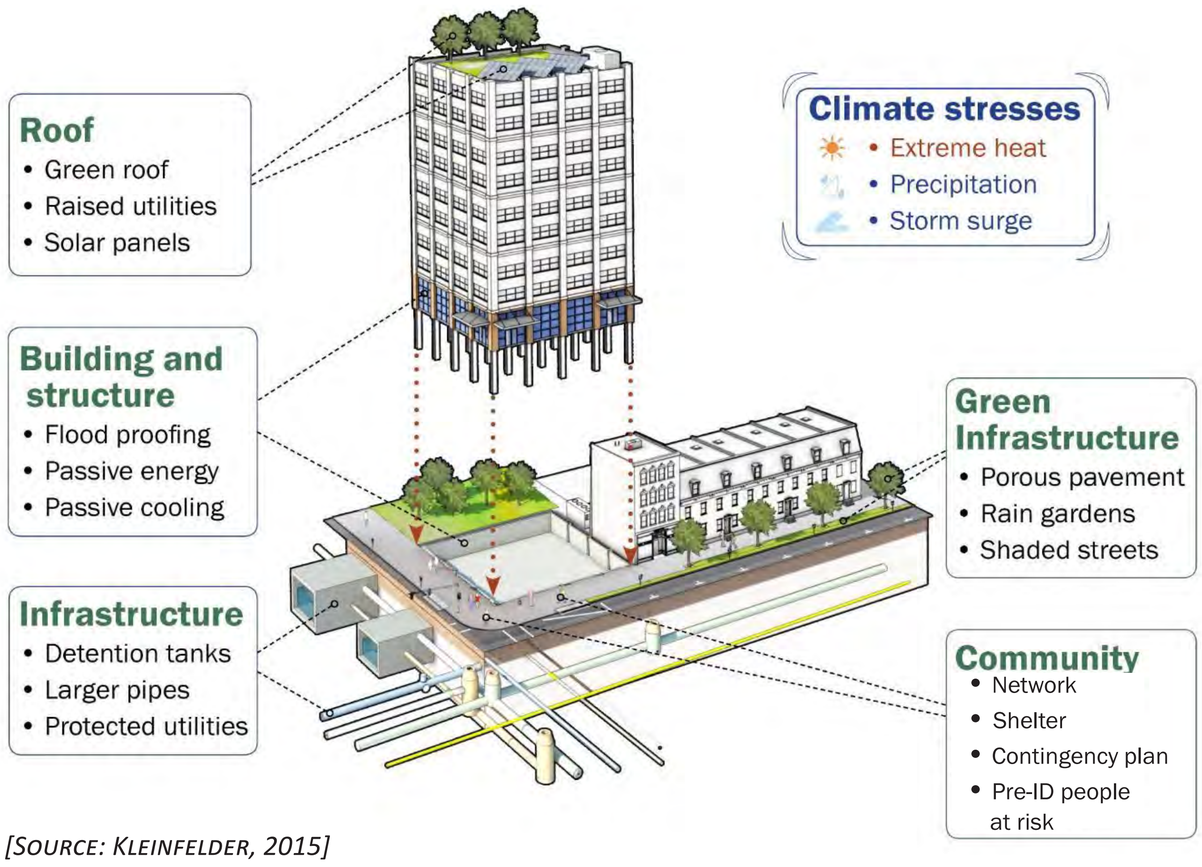
HEAT RESILIENCY



[Source: E.ON Energy]

NEW BUILDINGS

- **Build/Protect to the 2070 10-year flood elevation** from precipitation or sea level rise/storm surge, whichever is higher (B1)
- **Recover/Manage from the 2070 100-year flood elevation** from precipitation or sea level rise/storm surge, whichever is higher (B1)
- Establish requirements for all **vulnerable utilities** to be located above the determined flood elevation based on building use type (B1)
- Design buildings with **passive strategies** including building orientation, high-performance insulation and windows, shading and natural ventilation, and white or green roofs (B2)
- Require all new buildings to design with a **high-performance building envelope** and limit air leakage (B2)
- Require buildings to have **mixed-mode ventilation systems**, which include passive cooling, and install ceiling fans where applicable. Encourage reflective rooftops (white roofs, e.g.) with a minimum solar reflectance index of 82 (B2)



[Source: Kleinfelder, 2015]

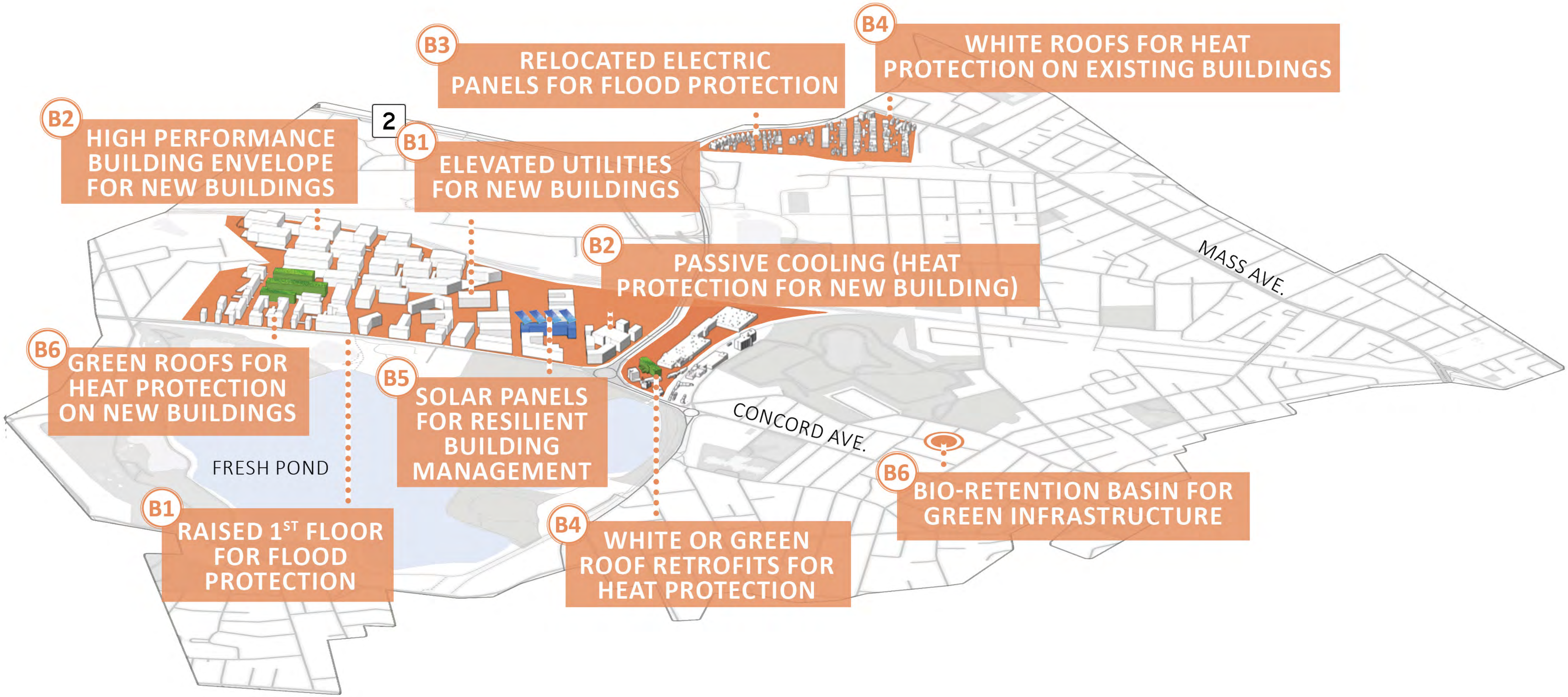
[Source: CCPR, 2017]

ABOVE: DRY FLOODING

LEFT: RESILIENCY AT THE NEIGHBORHOOD SCALE

ADAPTED BUILDINGS

MAPPING THE POTENTIAL LOCATIONS OF ADAPTED BUILDINGS STRATEGIES



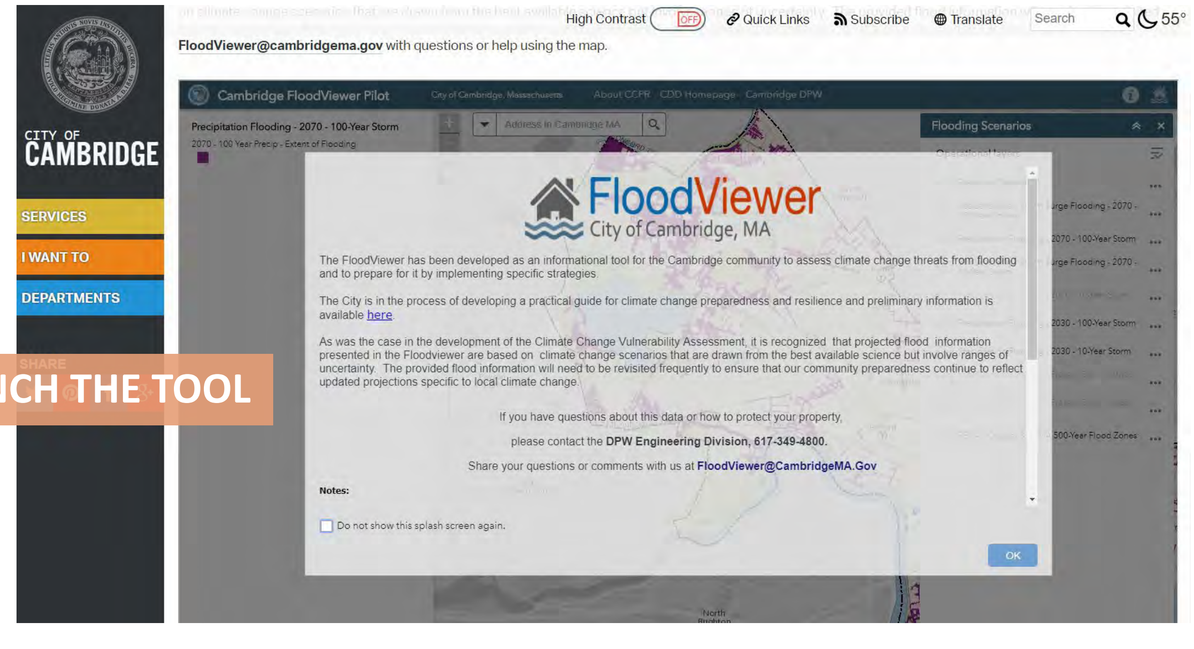
[Source: CCPR, 2017]

ADAPTED BUILDINGS - Understanding Flood Risks

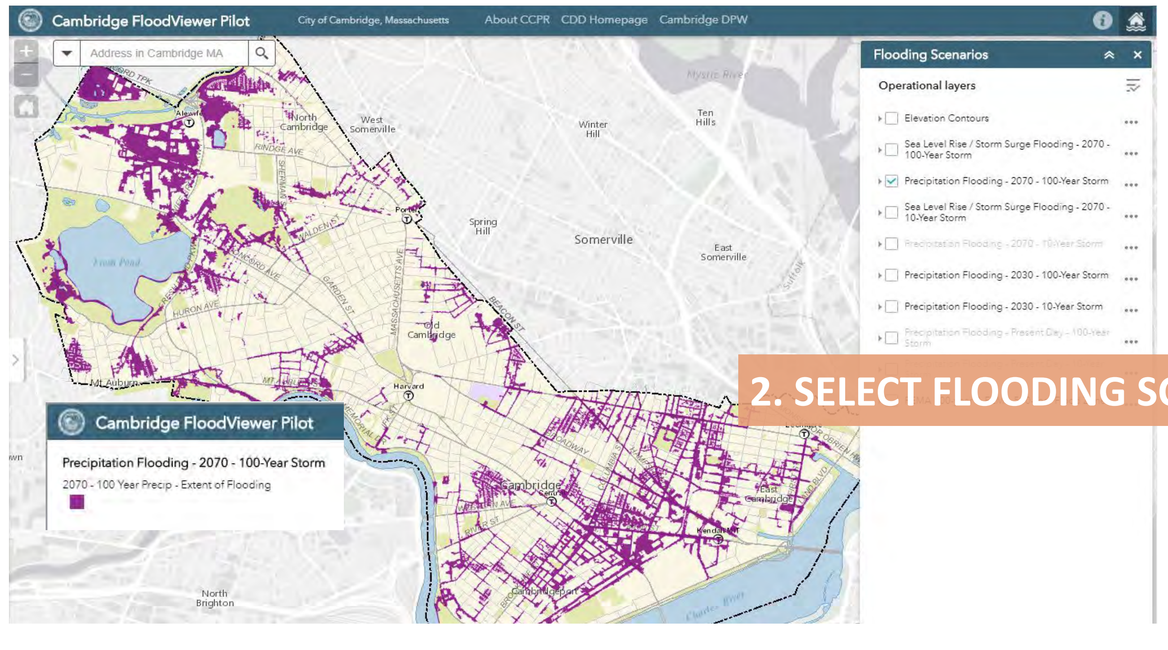
WHAT IS THE *FLOODVIEWER* TOOL?

To help the community understand flood risks to their property, the City has developed an online tool called the ***FLOODVIEWER.*** In just 4 EASY CLICKS, you can assess the climate change threats from flooding and how it affects your property. To learn more, visit: **www.cambridgema.gov/Services/FloodMap**

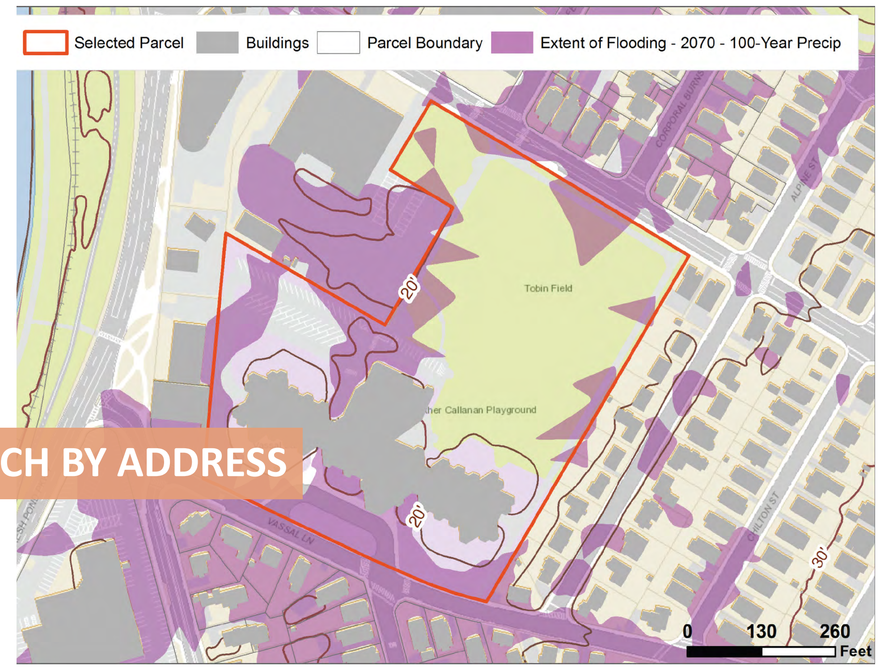
1. LAUNCH THE TOOL



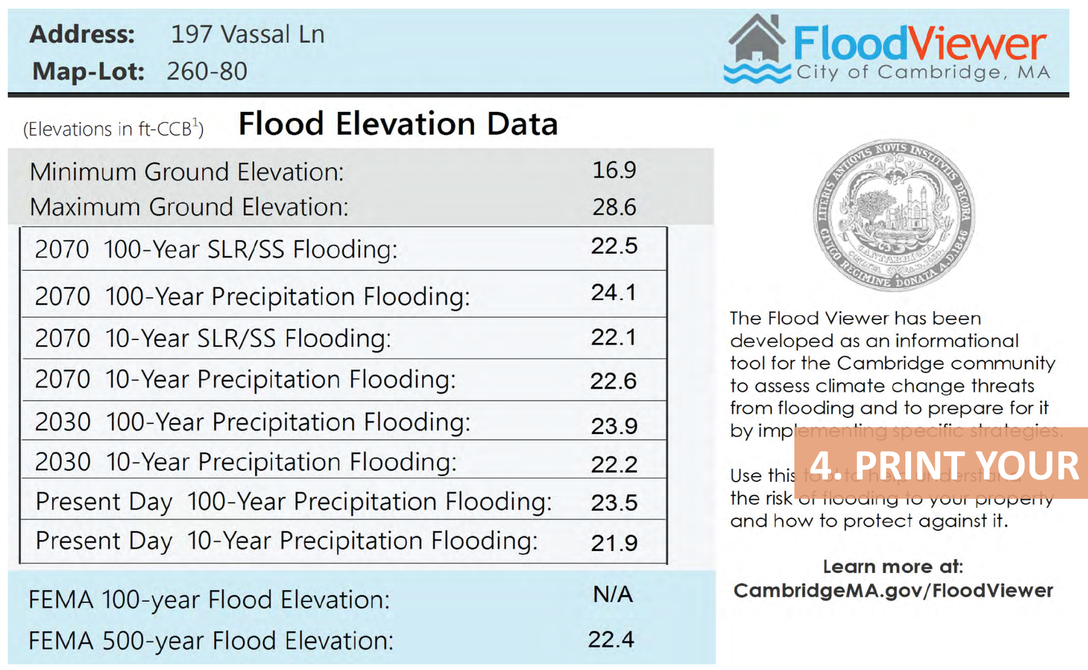
2. SELECT FLOODING SCENARIO



3. SEARCH BY ADDRESS



4. PRINT YOUR SUMMARY



ADDITIONAL NOTES:

- Existing "ground elevation" and "flood elevation" data are reported in feet above the Cambridge City Base (ft-CCB) datum[1], and are based on the 2014 LiDAR data collection performed over Boston and Cambridge by Pictometry.
- Projected flood elevations are based on precipitation flooding from piped infrastructure using the City's hydraulic model, and on sea level rise/storm surge flooding using the Boston Harbor Flood Risk Model (BH-FRM).
- These modeling efforts were part of the City's Climate Change Vulnerability Assessment, last updated in February 2017)
- This is the best available information on existing ground elevations and projected flooding in Cambridge. This information is subject to revisions as more information becomes available about climate change projections.

[1]*Cambridge City Base (CCB) datum is a standard vertical datum used by the City of Cambridge. This datum is 11.65 ft above the national standard vertical datum NAVD88, and 11.95 ft above the mean sea level in the Boston area.*

FLOODVIEWER Questions or Comments?

Send us an email at: FloodViewer@CambridgeMA.gov