

# NEW ECOLOGY

## Resilience Needs of Coastal Multifamily Affordable Housing

### PROJECT BACKGROUND

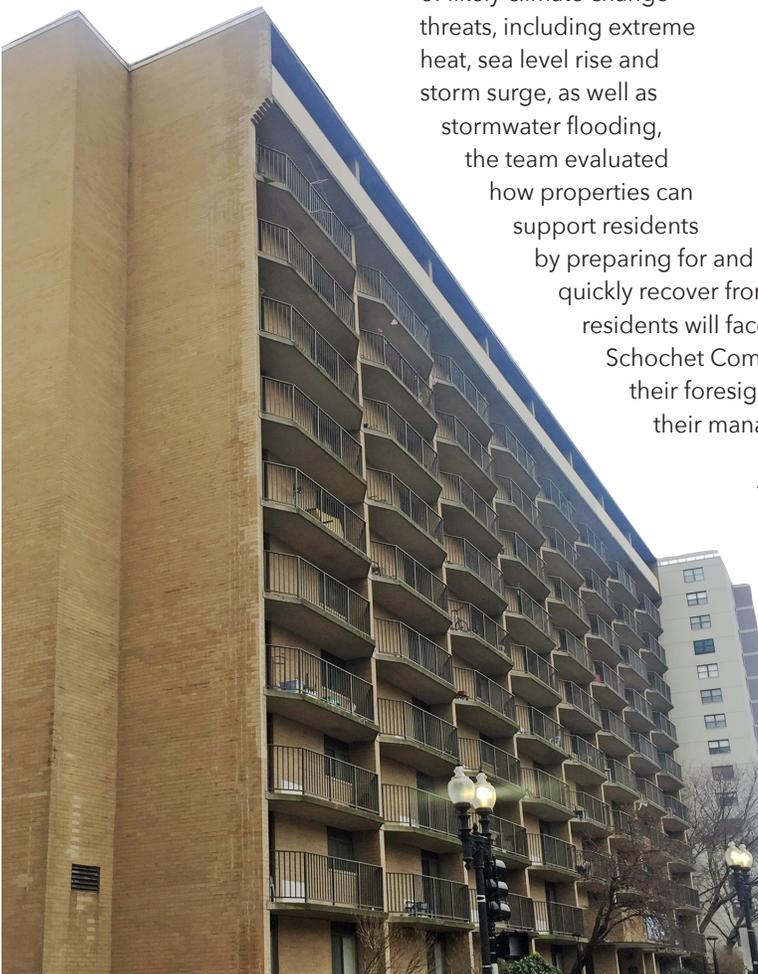
Over the past year, New Ecology Inc., with the support of LISC Boston (Local Initiatives Support Corporation), has evaluated hundreds of units of affordable housing in coastal Massachusetts. Looking through the lens of likely climate change threats, including extreme heat, sea level rise and storm surge, as well as stormwater flooding, the team evaluated how properties can support residents

by preparing for and minimizing impacts. By preparing properties to withstand or quickly recover from extreme events, property managers can rest assured that residents will face minimal disruption. New Ecology would like to thank the Schochet Companies, HallKeen Management, and Maloney Properties for their foresight and willingness to take action to prepare properties under their management for extreme events.



At each development, the New Ecology and property management teams began the analysis by looking at resilience opportunities in order of priority to help teams implement resiliency upgrades over time. When paired with identifiable milestones such as mechanical system replacement, unit turnover, or periodic refinancing, incorporating resilience can be made more manageable for everyone involved.

*Left: Amy Lowell Apartments, Boston, MA; Above: Waterview Apartments, South Boston, MA.*



## Risks to Multifamily Properties and Reasons to Take Action

The main risks that may pose threats to residents of multifamily buildings in Eastern Massachusetts can be prepared for and managed. These risks include:

- **Coastal flooding**, especially storm surge during major events;
- **Extreme heat** during summer months and;
- **Stormwater flooding** from heavy rain events or nearby bodies of water overtopping their banks.

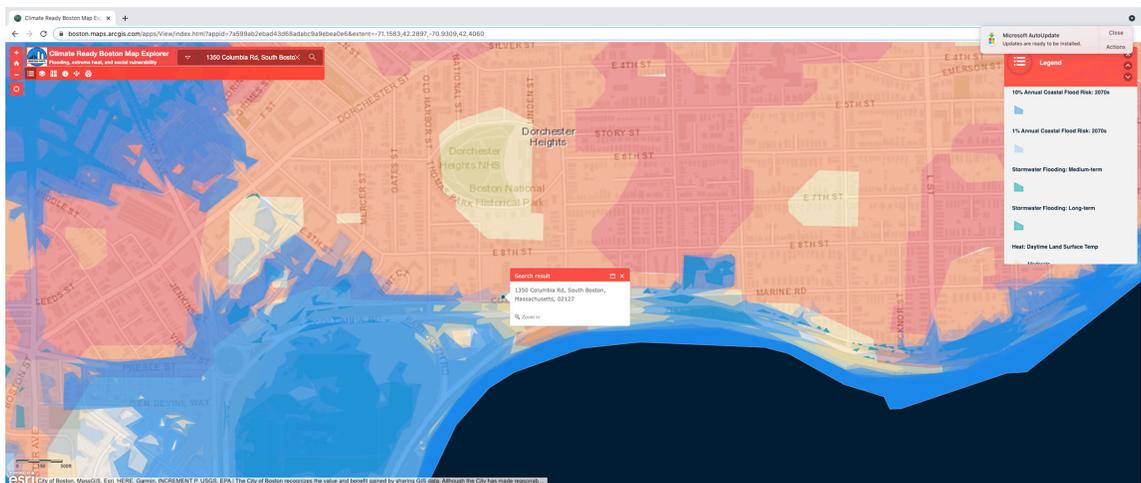
The key functions of resilient buildings are twofold - protecting residents during an emergency, and quickly resuming normal operations for all residents after an event. The team has found that small incremental adaptations, such as adapting an existing common space into a resilience hub to provide for residents' needs during power outages and extreme storm events can provide a significant benefit when an emergency hits. The capability to provide conditioned space, refrigerated medicine storage, potable water, warm meals, and cellular device charging can allow short-term respite for residents remaining in place when an emergency does not rise to a level requiring evacuation. From a resident's perspective, staying properly hydrated and cool, having access to routine medical supplies, and being able to stay in touch with loved ones, can make a world of difference.

Empowering property managers is also an important step. As part of the resilience assessment process, property managers can learn to see key features that could be incorporated into future projects in order to further protect the lives and livelihoods of residents. Features like renewable energy sources with battery energy storage may allow for uninterrupted power supply as well as lower routine utility costs. Elevating electrical equipment and including resilient flooring in first floor spaces in place of carpeting can improve recovery time after water inundation, reducing materials replacement costs and enable residents to move back into their living spaces quickly.

## Methodology: Assessing Challenges and Opportunities

New Ecology uses a focused methodology to understand the history of each property and to assess current and future risks. Key steps include:

*Climate Ready Boston Map Explorer Web Tool. This tool can help to identify heat and flooding risks.*



- **Assess Risks and Property History** - Conduct a site visit to observe and assess risks, meet with property managers who know the history of the property and how it performed during previous extreme weather events.
- **Ask Focused Questions** - Use a resilience assessment tool to ask 30 high value resilience-related questions.

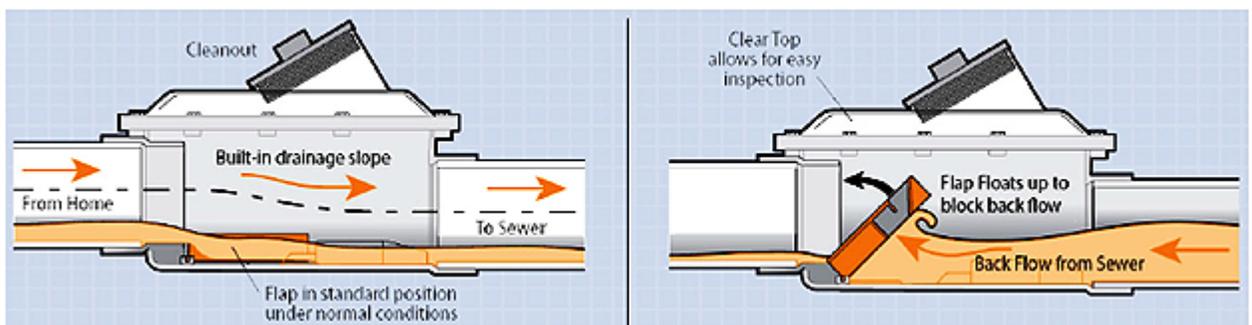
- **Prioritize Actions** - Recommend resilience strategies in order of priority, often placing emergency preparedness, flood mitigation and a resilience hub towards the top of the priorities list.
- **Assess Hazards Over Time** - Conduct a flood hazard review using relevant tools including [FEMA Flood Insurance Risk Models \(FIRM\)](#) and other flood tools as available, including Boston Harbor Flood Risk Model (BH-FRM) or [Cambridge FloodViewer](#).
- **Identify Opportunity for Backup and Renewables** - Analyze preliminary solar PV and backup battery opportunities at each property.
- **Cut Costs** - Analyze utility use data to assess water/energy savings opportunities to lower operating costs at each property, which could create savings to help fund resilience improvements. Properties that have completed efficiency upgrades often demonstrate year over year energy cost reductions.
- **Recommend Resilience Measures** - Produce a written report of recommended mitigation measures, with a follow up call to property managers to review strategies in detail.

## RESILIENCE RECOMMENDATIONS

New Ecology has found that by working through the methods outlined above, properties can be made better prepared, more comfortable, able to recover more quickly. Some typical adaptation strategies can be seen below.

### Site Specific Resilience Recommendations to Respond to Risks:

- **Storm Surge/Sea Level Rise** - For coastal properties at risk of flooding, perimeter defense can offer some protection, allowing residents to return more quickly after an event. Perimeter defense can take the form of permanent earthen barriers, deployable barriers, or a combination of both. The installation of backwater valves can also help defend from sewage inundation during a flood. Backwater valves are one-way valves which prevent sewage from flowing back into a building when the sewer system is unable to drain.



*Low lying floor drains can be protected by backwater valves to prevent sewage backflow. (Image source: City of Windsor, Ontario, Canada)*

- **Elevate Mechanical and Electrical Equipment** - Low lying mechanical systems including boilers, water heaters, and, at some locations, electrical infrastructure, may be at risk of inundation. Systems can be elevated by 1-2 feet when replaced at the end of their service life. This process is currently underway at one of the properties that New Ecology reviewed.



- **Connect Sump Pumps to Backup Power** - Intermittent stormwater flooding as well as persistent groundwater intrusion can pose a risk to equipment and switch gear. Connecting sump pumps to backup power in order to prevent inundation of electrical and mechanical equipment during a power outage can protect equipment until it can be permanently elevated.

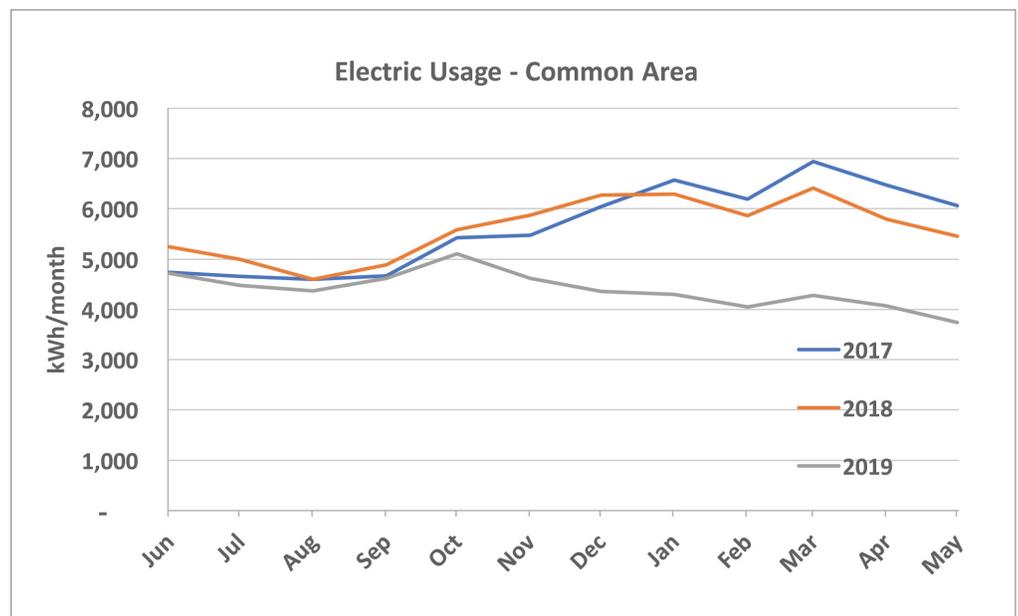
## Generally Applicable Resilience Recommendations in MA

The following steps can generally be applied to help minimize disruption to residents' lives during and after extreme evacuation:

- **Emergency Preparedness Plan** - Emergency preparedness plans can be used to respond to a variety of challenges like flood, fire, extended power outages, or other disturbances that may interrupt the normal operation of building systems or resident services. Properties can benefit from a yearly review of their emergency preparedness plan to practice preparation and communication.
- **Resilience Hub** - Many properties have a common room or a gathering space that can be prepared to serve residents during extreme conditions for water and food distribution, and to include backup power for space conditioning and device charging to provide respite during an extreme event.
- **Exterior Window Shading** - Shading can help control indoor temperatures, both during power outages and normal operations. Shading can be oriented to block the summer sun (high in the sky) and still allow for sunlight to enter during cooler seasons. Shading, if it can be added cost effectively, can also be a useful addition to an existing building. On new construction, window reveals and wall depth can also help control temperatures on Southern exposures.
- **Flood Preparation** - Steps ranging from removing carpet on lower levels to installing backwater valves to prevent the reverse flow of sewerage at drains can help return a property to service after flooding, allowing residents to move back in more quickly.

Resilience recommendations might include (top to bottom): elevate mechanical systems, including furnaces and water heaters, when they are replaced; and connect sump pumps to backup power to protect electrical infrastructure in the basement.

Right: Retrofits resulting from energy audits can lead to substantial reductions in electricity consumption as seen here in 2019 usage figures.





- **Renewable Energy Systems** - Many properties could host **solar photovoltaics and possibly a backup battery** to support building resilience and reduce electricity costs. An appropriately sized backup battery can support a resilience hub during an outage. Incentives for renewables like the [SMART solar incentives](#) and Connected Solutions for backup batteries may help offset system costs. System costs and maintenance needs, as well as condition of the existing roof should be evaluated as part of this process.
- **Utility Use Analysis** can help identify opportunities to lower costs. Properties that have updated systems after a detailed energy audit show cost savings, as seen in the chart on the previous page.
- Each property has its own challenges, and **site specific recommendations** are included to respond to those more specific needs.

## RESILIENCY UPGRADES

Identifying resilience opportunities and planning for improvements are keys to increasing resilience and can be done over time. Flood resilience improvements can be made incrementally, and identifying key points of opportunity can prompt conversations to happen earlier, lowering barriers to change. Some adaptations can take place **at unit turnover**, for example removing carpet from a first level unit or common area. Others, like elevating a heating system, may fit best **at the end of a system lifetime**. Planning ahead simplifies resilience upgrades. Larger upgrades, like adding exterior window shading or solar photovoltaics may be better planned **around roofing or siding/cladding updates**. These larger upgrades could support a resilience hub especially if paired with battery energy storage.

*A few more resilience recommendations include (above) a preliminary solar photovoltaic system layout; and (below) preparing an existing common area into a resilience hub.*



### How to Finance Resiliency Upgrades

Adapting a property to increase resilience can have long term operational benefits, but the funding, planning and implementation can be a challenge.

#### HIGH OPPORTUNITY FOR RESILIENCY UPGRADES:

- **Purchase** - When a property is put up for sale, there is a key opportunity during the due diligence process to assess the resilience needs, develop a scope of work for the upgrades, and incorporate the cost of that work into the bridge loan. With a due diligence process of 90 days to one year, the assessment can be planned, scheduled and executed.
- **Redevelopment** - When a property is scheduled for redevelopment, resilience can and should be part of the redevelopment plan. From elevating mechanical systems above flood elevation, to incorporating a resilience hub, a redevelopment/refinance presents the ideal opportunity to prepare for future extreme conditions. Additional incremental costs can be included in the overall financing for the project.

## ACKNOWLEDGEMENTS

LISC, MassHousing, The Funders' Network for Smart Growth and Livable Communities, Schochet, RPM, Peabody Properties, Maloney Properties



For further information, please see the following resources:

[\*\*Strategies for Multifamily Resilience, Enterprise Green Communities\*\*](#)

[\*\*Climate Hazard and Resilience Masterplan for Statewide Housing Resource\*\*](#)

## LIMITED OPPORTUNITY FOR RESILIENCY UPGRADES:

- **Building Rehabilitation** - During a moderate rehab of an existing building, there is some opportunity to update systems and take action to address needs. Updating site drainage, adding or backing up sump pump systems, replacing and raising mechanical systems may all be possible during a moderate rehab.
- **Property in Operation** - Between refinancing - While it is possible to upgrade properties incrementally during normal operations, it can often be difficult to finance updates and to devote staff time to planning and executing upgrade projects. This may be the ideal time to assess a property for resilience opportunities in preparation for a refinancing or rehab.

Planning ahead to include resilience measures can benefit residents and property management teams. A key first step is to understand resilience needs and opportunities, and put the planning in place to make those incremental improvements over time.



*Charlame Park Homes townhome style apartments in the Roxbury neighborhood of Boston, MA.*