RESILIENCE HUB BUSINESS PLAN

Cambridge Community Center

OVERVIEW

Resilience Hubs are community-serving facilities augmented to support residents, coordinate communication, distribute resources, and reduce carbon pollution while enhancing quality of life. Hubs can meet a myriad of physical and social goals by utilizing a trusted physical space such as a community center, recreation facility, or multi-family housing building as well as the surrounding infrastructure such as a vacant lot, community park, or local business. They provide an opportunity to effectively work at the nexus of community resilience, emergency management, climate change mitigation, and social equity while also providing opportunities for communities to become more self-determining, socially connected, and successful before, during, and after disruptions. At a minimum, a resilience hub needs to:

- provide wanted day to day community services;
- be equipped to support the community in the event of an emergency, including providing shelter and electricity; and
- be able to run on its own for at least 72 hours without power from the grid.

In addition to providing shelter and electricity, a resilience hub should have the capacity to:

- communicate with residents during and after an emergency;
- maintain a supply of and provide access to freshwater and resources such as food, ice, refrigeration, charging stations, basic medical supplies, and other emergency supplies;
- educate residents about emergency preparedness in their homes; and
- have a plan and system in place to care for vulnerable individuals.

RIVERSIDE DEMOGRAPHICS

- Population: 12,361
- Households: 3,698
- White: 67.5%, Black: 15%, Asian: 9.4%
- Hispanic/Latino: 3.8%
- Foreign born: 20.8%
- Married Households: 30.6%
- Under 18: 16.2%
- Over 65: 12.6%
- One of the densest neighborhoods in Cambridge
- Languages spoken: Indo-European (13.9%), Asian (12%) and Spanish (8.2%)

Through a grant from the Massachusetts Municipal Vulnerability Preparedness Program, the City of Cambridge hired Kim Lundgren Associates, Inc. to assess the current and potential capacity of the Cambridge Community Center to operate as a Resilience Hub in the Riverside area of Cambridge. The consultants, which also included the firms Woodard and Curran and Climate Resilience Consulting, conducted an in-person meeting with the Executive Director, a physical site assessment and online research to understand the organization's mission, site amenities, and the services provided to its members.

These steps resulted in a recognition that the Cambridge Community Center (CCC) is already serving many essential social resilience functions of a Resilience Hub. However, there are several programmatic changes and physical upgrades that could be implemented to make the organization even stronger, especially when faced with climate impacts. This business plan summarizes the short- and long-term programmatic and structural changes CCC could embrace that will support and enhance the mission of this long-standing and important organization in the Riverside area and beyond.

The Objective

The Cambridge Community Center (CCC) is located at 5 Callendar Street in Cambridge which is the Riverside area of the City. The mission of CCC is to promote community cooperation and unity and empower youth, individuals and families by offering social, cultural, educational and recreational activities. CCC is used by hundreds of individuals throughout the year to rent space for events or enroll in various programs and due to its history, provides a tremendous sense of community and family.

Using their mission as the foundation for the assessment, the purpose of this project was to determine what programs, features and assets of the Cambridge Community Center (CCC) could be upgraded and/or supplemented to serve as a Resilience Hub. The ultimate objective was to enhance the current mission of CCC and to make recommendations on how to become a Resilience Hub that supports their mission and make them more resilient as they conduct their work. In order to make a determination, the consultant team took the following 3 steps:

1. Conducted a Meet and Greet with Executive Director, Darrin Korte in May 2019. At this Meet and Greet the consultant team reviewed which elements of the Resilience Hub checklist (see Appendix) that CCC currently addressed. The team focused on the *Structure and Services* and *Administration* tabs of the checklist.
2. Performed a Physical Resilience Audit (see Appendix) to assess the structural features available on site in May 2019. This included investigating past, current and future flood and heat risks, and looked at the energy system, emergency backup systems, and condition of the building.
3. Researched background of the organization, site, and neighborhood. Who lives here? Who does the organization serve? What are their stressors? This was primarily conducted online but was supplemented by the Meet and Greet with Mr. Korte.

Based on the consultants' research and assessments, the following observations were made:

- Observation 1: While emergency plans are in place, the organization has not experienced an emergency in a while and cannot operate fully on its own for 72 hours without grid-supplied power.
- Observation 2: The structure is vulnerable to climate impacts, including localized flooding in the basement where mechanical equipment is located. In case of a power outage, there is no backup generator.
- Observation 3: The neighborhood is suffering from a lack of affordable housing and unemployment. This is also a stressor which can lead to mental health issues.

The Opportunity

The timing is right for the Cambridge Community Center (CCC) to consider establishing itself as a Resilience Hub, especially given the current capital improvements planning process; increasing focus on, and local experience with, the impacts of climate change; and the availability of guidance and funding to prepare our communities to address our vulnerabilities. There are many funding sources, incentives, companies and organizations that can assist CCC in this endeavor. Recognizing the needs of CCC to increase its resilience, the following goals were identified:

- Goal #1: Prepare the organization to experience emergencies and operate on its own for 72 hours.
- Goal #2: Increase the resilience of the site to withstand climate change impacts.
- Goal #3: Increase personal and financial resilience of the CCC members.

The Solution

The recommendations that were created to address the goals take into consideration how to sustain the organization and how to advance the organization's mission. The Cambridge Community Center has embraced many of the Resilience Hub components, including a strong commitment to social cohesion and the health of its members. The final recommendations embrace CCC's current efforts, with an eye towards how to strengthen the organization and improve their ability to continue to provide top notch services to their members. The three recommendations include:

- Recommendation #1: Create and implement an emergency preparedness plan
- Recommendation #2: Continue to implement short-term site improvements to improve the structural resilience of the building
- Recommendation #3: Enhance the programmatic capabilities of CCC to accomplish its mission to serve its members, including finance management guidance and mental health programs for residents.

The plan, and implementation steps necessary to achieve the plan, are outlined in detail below.

RESILIENCE HUB PLAN OF ACTION

In the Spring of 2019, the Cambridge Community Center began working on a Capital Improvements Plan. This presents an exciting opportunity to incorporate new or enhanced capital projects into the planning process and ensure they continue to create a resilient organization to serve their members. In addition to the implementation steps below, a full report from the Physical Resilience Audit is included in the Appendix.

Cambridge Community Center Programs

1. School-Aged Programs
2. Teen Programs
3. Community Programs

Actions and Implementation Steps

In order to accomplish the goals of this Plan, three categories of actions have been developed:

1) Ensure the Organization and Site is Prepared for an Emergency;

2) Create A Resilient Structure;

3) Adopt Programs to Create More Resilient Community Members.

The following table includes a list of these actions, their implementation steps, a description of each step, which of CCC's Programs are supported, the timeframe for implementation, the partners needed (including a CCC Champion to take the lead), and any resources and best practices that can be consulted to help the organization complete the steps. Please note: compliance with the Americans with Disabilities Act was highlighted as a priority by the organization. All capital improvements and actions included below should consider and incorporate ADA accessibility.

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Action 1: Conduct an Emergency Preparedness (EP) Exercise					
Review existing Emergency Preparedness Plan	CCC has an existing Emergency Preparedness Plan (EPP) in place. Review this first to see what is included, how to create an exercise that addresses the plan components and determine whether they are complete/adequate.	All	6-8 months	• Facility Manager (C) • Executive Director • Cambridge Emergency Management	http://safe-wise.com/downloads/EmergencyPlanningGuidelinesforNonprofits_001.pdf

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Conduct Emergency Preparedness Drill	Emergency drills and practice exercises are important for preparing for emergency situations. An organization should follow these six steps to successfully conduct emergency drills and exercises: 1. Develop emergency plans 2. Train employees 3. Conduct tabletop exercises 4. Conduct drills 5. Conduct functional exercises 6. Conduct full-scale exercises	All	3-6 months	• Building Manager (C) • Facilities Manager • Executive Director • Cambridge Emergency Management • CCC Staff	https://www.emcins.com/Docs/OFILib/AA083001483_20140723.PDF?lc=true
Debrief the Results, Conduct After-Action Reporting and Improvement Plan	After the drills, it is important to assess how effective the exercises were. An After-Action Report and Improvement Plan (AAR/IP) is used to provide feedback to participating entities on their performance during the exercises. The AAR/IP summarizes exercise events and analyzes performance of the tasks identified as important during the planning process. It also evaluates achievement of the selected exercise objectives and demonstration of the overall capabilities being validated. The IP portion of the AAR/IP includes corrective actions for improvement, along with timelines for their implementation and assignment to responsible parties. Plans should be reviewed annually, at a minimum, and revised as necessary.	All	2-3 months	• Building Manager (C) • Facilities Manager • Executive Director	https://sfdem.org/phase-4-after-action-report-and-improvement-planning-0

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Action 2: Create a Resilient Structure					
Conduct an Energy Audit	A comprehensive energy audit can identify opportunities for increasing energy efficiency throughout a building, highlight relationships between various building systems, and provide cost and savings estimates for conducting the improvements. There are a variety of national energy audit standards that can guide decisions about what type of audit meets the project needs. Capital improvements can include easy projects with a short cost-recovery period, such as many lighting replacement projects or air-sealing a drafty building, as well as larger projects such as equipment replacements or window replacements.	All	6-8 months	• Building Manager (C) • Facilities Manager	https://www.pnnl.gov/main/publications/external/technical_reports/pnnl-20956.pdf[1]
Install an Uninterruptable Power Supply (UPS)	Power quality is important for electronic devices and sudden voltage changes can do significant damage, whether to a sensitive computer or a simple elevator motor. Uninterruptible Power Supplies (batteries) for mission-critical equipment and servers are important. These systems do not replace a generator, which provides continuous power. UPS systems are intended to run your critical systems for enough time to properly shut them down or switch to a generator. Sizing these to provide sufficient power for all of your critical devices is crucial and should be part of your conversation with your system tech.	All	6-8 months	• Building Manager (C) • Facilities Manager	https://www.goalzero.com/shop/power-stations/goal-zero-yeti-1250-portable-power-station/
Install a Supplemental Sump Pump	The current sump pump system does not have a backup. It is recommended to add a battery system to supply interim mitigation. Small packaged systems can pump a few thousand gallons of water per hour for over 4 hours.	All	6-12 months	• Building Manager (C) • Facilities Manager	https://challenge.abettercity.org/toolkits/climate-resilience-toolkits/flooding-and-sea-level-rise/pumps

[1] *Resilience Hub Guide,* Urban Sustainability Directors Network, May 2019.

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Install a Solar Photovoltaic System	Solar arrays (mounted on the roof, ground or overhead in canopies) can play a very important role for a Resilience Hub. During normal mode, they provide significant economic and sustainability benefits that can reduce utility costs and impact on the grid. During outage and recovery modes, they can provide additional power generation.	All	2-3 years	• Building Manager (C) • Facilities Manager	https://amherstsurvival.org/solar-donor/ http://northeast-solar.com/blog/solar-and-social-justice-peace-development-fund-receives-free-solar-power
Elevate or Weather-Proof Critical Infrastructure	The best technology systems will be rendered useless if exposed to the environment during a weather event. Some considerations to mitigate that risk are liquid-tight conduit to protect cabling systems, and weather-proof enclosures for equipment like wireless access points that are installed throughout the building.	All	2-3 years	• Building Manager (C) • Facilities Manager	
Perform Floodproofing on the Building	Solutions include: **Wet floodproofing:** engineered flood vents, water-resistant building materials, and elevating equipment. **Dry Floodproofing**: Solutions include flood gates, backflow preventers on drains, sealing openings in walls and foundations, sump pumps and waterproof enclosures. **Site Perimeter Floodproofing:** Sandbags, water-inflated tube systems and flood panels.	All	2-3 years	• Building Manager (C) • Facilities Manager	https://challenge.abettercity.org/toolkits/climate-resilience-toolkits/flooding-and-sea-level-rise/floodproofing https://www.dhs.gov/publication/st-national-resilience-standards-flood-proofing-products-project-fact-sheet
Install Backup Storage	Batteries (the predominant form of storage a Resilience Hub will consider) produce electricity using an electrochemical reaction. The size and complexity of the system will dictate its footprint. However, in a Resilience Hub, the size of the battery system will generally range from a few suitcase sized boxes to the size of several refrigerators or even a small shipping container.	All	2-3 years	• Building Manager (C) • Facilities Manager	https://www.techsoup.org/support/articles-and-how-tos/your-organizations-backup-strategy

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Incorporate Air- or Ground-Source Heat Pumps into Design Evaluation	Two main types of heat pumps are used in residential and commercial applications: air-source heat pumps (most common) and ground-source (or geothermal) heat pumps. A heat pump works like an air conditioner in the cooling cycle; in the heating cycle, it simply works in reverse (i.e. cooling the outside, and venting heat to the inside). Ground-source heat pumps transfer heat through earth or water, whereas air-source heat pumps do so via air.	All	3-4 years	• Building Manager (C) • Facilities Manager	https://aceee.org/topics/heat-pumps
Install Backup Generation	Backup or standby generation is usually provided in the form of a gasoline, diesel, propane or natural gas-fired unit that automatically starts in an outage. These systems are typically housed outdoors in rectangular boxes. Backup generation incorporates automatic transfer switches to ensure that they do not feed electricity back onto the utility's distribution lines during a power outage. Diesel, propane and gasoline systems require an external fuel tank while natural gas systems are fueled by the local gas utility's distribution lines. Though a relatively low-cost solution for backup power, most conventional solutions do not offer the incentives and benefits that hybrid solutions[2] do during normal operations.	All	3-5 years	• Building Manager (C) • Facilities Manager	https://www.consumerreports.org/cro/generators/buying-guide/index.htm

[2] One possible resilience solution is a Hybrid Resilience System (HyRS), which typically incorporates solar photovoltaic generation (PV) with an energy storage system (batteries) and firm generation (diesel or natural gas). The HyRS approach creates generation diversity, offers value during normal operating conditions, and can be more economically sized to meet full operational requirements. Source: *Resilience Hubs: Shifting Power to Communities and Increasing Community Capacity,* Urban Sustainability Directors Network, January 2019.

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Action 3: Adopt Programs to Create more Resilient Members					
Create and Expand Financial Management and Skill Building Programs	Addressing financial solvency is a key component of social resilience. One of the stressors identified for CCC was the lack of affordable housing, unemployment and lacking the skills to apply for the new jobs from the expansion of the academic institutions. Programs on budgeting, using money wisely, and resume writing could help address these issues. In addition, offering workshops that address the necessary skills from the new academic institution jobs including computer literacy. This could be an opportunity to partner with companies existing organizations that offer these resources as well.	Community Programs	1-2 Years	• Director of Engagement and Programs (C) • Academic Institutions • MassHire • Cambridge Center for Adult Education • Capital One	https://ccae.org/classes/business-technology https://www.mass.gov/locations/masshire-metro-north-career-center-cambridge
Incorporate Mental Health Resilience into all CCC Programs	CCC is already committed to addressing the mental health of its members and has obtained seed funding to embed mental health services into their programs. As the organization does this, a key focus could be on building mental health resilience. This is the ability of an individual to handle stress and adversity, or to "bounce back". One of the primary methods of enhancing resilience is through skill-building. While it varies based on the individual, some common skill building ideas include: • Active listening workshops • Learning a new hobby • Attending art classes • Mastering a new competency This step involves investigating all programs simultaneously to understand how these skill building ideas (and other activities) can work together to build mental health resilience.	All	1-2 Years	• Director of Engagement and Programs (C)	https://www.psychologytoday.com/us/blog/talking-about-men/201802/three-simple-ways-enhance-mental-health-resilience

Actions and Implementation Steps	Description	Programs Supported	Timeframe to Implement	Partners (C = CCC Champion)	Resources and Best Practices
Expand Healthy Eating Education and Programs	While health is embedded in the CCC programs, there are opportunities to continue promoting the benefits of healthy eating. The first is to expand the Farmer's Market and diversify the residents that participate. Identify metrics for success – what does success participation look like? What are the barriers to attending? What incentives can be applied to diversify participation. Somerville conducted a similar study which can be found in the Resources and Best Practices column. In addition to participation in the Farmers Market, the organization can educate members about the benefits of organic foods. Mental and physical well-being go hand and hand to building personal resilience, so CCC should consider connecting the mental health resilience programming with organic foods workshops. For example, as part of a cooking skills workshop, cook with regular and organic produce and conduct taste tests with the workshop participants. Weave in the physical benefits to them and the earth of choosing organic.	Community Programs	1-2 Years	• Director of Engagement and Programs (C) • Cambridge Winter Farmers Market Manager	https://fairfoodnetwork.org/ https://as.tufts.edu/uep/sites/all/themes/asbase/assets/documents/fieldProjectReports/2014/Team6GroundworkSomerville.pdf
Prepare the Center to Serve Residents Before, During and After Emergencies	In addition to providing shelter and electricity, each Resilience Hub should maintain a supply of and provide access to freshwater and resources such as food, ice, refrigeration, charging stations, basic medical supplies, and other supplies needed in the event of an emergency. Determining the amount of food, water, and supplies to have at each site will depend on neighborhood size and the number of people likely to utilize the site. Many of these details can be coordinated in conjunction with building upgrades and will involve outreach and engagement with community members.	All	12 months	• Executive Director (C) • Facility Manager • Director of Business & Finance Operations • Food Pantry Manager	https://www.enterprisecommunity.org/ https://seatpleasantmd.gov/smart-city/ https://www.linortek.com/otg15w-emergency-solar-power-generator/

Costs

The following outlines the recommended actions and their steps, the potential costs or methods of implementation (where we could not find a specific cost), and the potential sources to fund the steps. Please note: the Massachusetts Non-Profit Network has access to grant funding opportunities that could fund many of these initiatives: http://massnonprofitnet.org/. In addition, the Nonprofit Finance Fund (NFF) helps mission-driven organizations adapt, thrive, and drive positive change through financing, consulting and partnering. This could also be a source of financing for many of these capital costs: https://nff.org/.

Steps	Potential Cost or Method of Implementing	Funding Source(s) and Resources
Building Upgrades		
Elevate or Weather-Proof Critical Infrastructure	Consider consolidating critical infrastructure such as heating equipment and electrical panels above flooding levels.	Incorporate into the Capital Improvements Plan https://nff.org/
Conduct Floodproofing	Varies with solution and facility.	Incorporate into the Capital Improvements Plan https://nff.org/
Install Backup Generation	A 25kW generator that would carry the site load would be approximately $50-100,000 depending on the degree of work on existing conditions and site work required.	Incorporate into the Capital Improvements Plan http://massnonprofitnet.org/blog/non-profit-411-energy-efficiency-resources-organization/ https://nff.org/
Equipment		
Install an Uninterruptable Power Supply (UPS)	$1,200	Energy Star Product and Rebate Finder: https://www.energystar.gov/products/data_center_equipment/uninterruptible_power_supplies
Install a Supplemental Sump Pump	$3,500	Incorporate into the Capital Improvements Plan
Steps	**Potential Cost or Method of Implementing**	**Funding Source(s) and Resources**

Install Solar Photovoltaic System	$2.50 to $3.50 per watt[3]	CCC could consider a Power Purchase Agreement (PPA), an agreement where the center would provide roof space and buy electricity. As part of the PPA, CCC could require energy storage for system deployment. The current Massachusetts solar programs include additional incentives for energy storage coupled with solar. The State's Commercial PACE (Property Assessed Clean Energy) Program could also be an option. This involves the City opting into the program, which then allows property owners to agree to a betterment assessment on their property, which repays the financing. This would allow CCC to adopt more comprehensive energy upgrades and pay for them over a longer period, up to 20 years. https://www.massdevelopment.com/what-we-offer/key-initiatives/pace https://www.masscec.com/government-non-profit/solar https://challenge.abettercity.org/toolkits/emissions-reduction-toolkits/renewable-energ/on-site
Install Backup Storage	$7,000 - $50,000+[4]	A growing number of incentives and rebates create opportunities to reduce (or potentially eliminate) cost to the Resilience Hub, while still providing benefit.
Incorporate Air- or Ground- Source Heat Pumps	~$76,000 (for a 5,000 square foot building)[5] for a ground source heat pump	Incorporate into the Capital Improvements Plan Rebates for a ground source heat pump available up to $9,000 through MassCEC: https://www.masscec.com/clean-heating-and-cooling/learn-about-ground-source-heat-pumps
Programs		
Conduct Emergency Preparedness Drill and Follow up	Staff Time	https://nff.org/ for partnering
Conduct an Energy Audit	$1,000 and $15,000 depending on the level of the audit: • Level 1: Walk Through Analysis • Level 2: Energy Survey and Engineering Analysis • Level 3: Detailed Analysis of Capital-Intensive Modifications	http://massnonprofitnet.org/blog/non-profit-411-energy-efficiency-resources-organization/ https://emsenv.com/2016/04/28/commercial-energy-audit-cost/

[3] USDN Resilience Hub Guide

[4] USDN Resilience Hub Guide

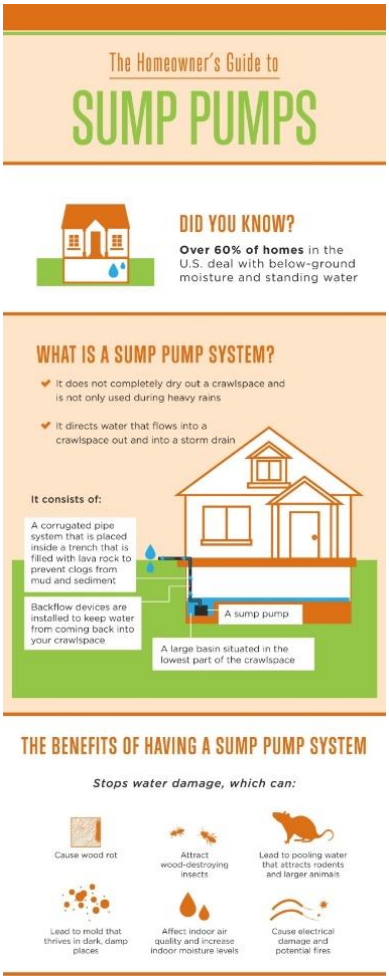
*[5] Data is from the MassCEC ground-source rebate program, including pricing, equipment, installer and location information. This can be helpful in understanding what is being installed in Cambridge. The data can be downloaded **here** and filtered for Cambridge.*

Steps	Potential Cost or Method of Implementing	Funding Source(s) and Resources
Prepare the Center to Serve Residents Before, During and After Emergencies	• Charging Stations: 100W to 1250W ranging from $200-$1,000 • Assess available space to hold extra food, water, and supplies to accommodate the estimated number of members that will need to be served	• Partner with likeminded organizations or companies to sponsor components of the planning and implementation • Individual funders through a "Preparedness Campaign"
Financial Management and Skill Building Programs	• Cost to hire staff • Program materials and printing costs	• Fee for service income from members that can afford programs could fund those that can't afford them • Partner with likeminded organizations or companies to sponsor the events (i.e., Capital One, MIT, Harvard, MassHire).
Mental Health Resilience	• Cost to hire a Mental Health Resilience Coordinator • Program materials and printing costs	• Insurance claims • Fee for service income from members that can afford programs could fund those that can't afford them • Partner with local health care businesses and University students getting their PhD could help to cross reference all programs, continue building partnerships and reduce the costs associated with implementing mental health resilience activities.
Healthy Eating Education and Programs	• Cost to hire staff • Program materials, food for cooking classes, and printing costs	One of the Academic Institutions in Cambridge (similar to the funding of the Somerville study) https://mapublichealth.org/priorities/access-to-healthy-affordable-food/ma-food-trust-program/

NEXT STEPS

The goal of this exercise was to create a Business Plan that enhances the mission of the Cambridge Community Center while helping them increase their resilience. The following steps should be taken to begin implementing the recommendations in this Business Plan:

- **Incorporate the implementation steps into the Capital Improvements Plan (CIP).** As the CCC continues with its CIP process we would recommend prioritizing the steps listed above in the order they are presented, as they are associated with timelines and could be helpful to have in place before others are implemented. For example, elevating critical equipment is an important first step, as floodproofing could be costly and time intensive. Having the equipment elevated will at least help alleviate damage from flooding if that happens before the building is floodproofed.
- **Get the CCC Board on board.** Because there are so many facets to building resilience, it is important that the CCC's Board of Directors are invested. According to the Council of Non-Profits: "Board members are the fiduciaries who steer the organization towards a sustainable future by adopting sound, ethical, and legal governance and financial management policies, as well as by making sure the nonprofit has adequate resources to advance its mission."[6] At any time, the consultant team can come and speak with the Board of Directors about the importance of building resilience by implementing the steps in this plan.
- **Be creative with funding**. Building resilience requires teamwork and community building. Here are some creative ways to fund resilience by forging new partnerships to support and fund your work:
    - Continue partnering with foundations, especially those that are funding emergency preparedness and resilience-building efforts.
    - Contact the companies that manufacture the products recommended above. These companies encourage the use of their products to create resilient structures. Funding CCC's upgrades or acquisitions presents a great opportunity for them to promote their product being used to create a more resilient non-profit and be part of the solution.
    - Habitat for Humanity could be a good source of donations of people and materials to support building upgrades. Alternatively, they could be a partner on a grant application to fund building improvements that incorporate floodproofing, installing a sump pump, and elevating or weatherproofing critical infrastructure.
- **Marketing:** A mantra of another Cambridge-based nonprofit is: "People want to fund impact." In addition to grants, incentives and creative funding sources, some of these structural and programmatic improvements will require private donations. It's not sexy to fund a sump pump, but when you link it to the space and program that will be protected if that sump pump is installed, it will make that important connection to the impact the improvement will have. It is also important to connect the implementation step(s) to the programs that are impacted and how the project will make the organization stronger. In your capital campaign, you could include a fun infographic of how the equipment works and how it will protect CCC programs, creating an appealing way to encourage funders to give. *See sample graphic*. Two great resources for creating graphics for any type of project are Piktochart and Canva.



[6] https://www.councilofnonprofits.org/tools-resources/board-roles-and-responsibilities

APPENDICES

Cambridge Community Center Resiliency Audit, 2019. Woodard and Curran

Cambridge Community Center Resilience Hub Checklist, 2019. Kim Lundgren Associates

CAMBRIDGE COMMUNITY CENTER

Resiliency Audit
June 2019

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woodardcurran.com
COMMITMENT & INTEGRITY DRIVE RESULTS

KLA
City of Cambridge, MA
232424.00

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EXECUTIVE SUMMARY

As part of the City of Cambridge Resilience Hub project, two Community Based Organizations were chosen for the purpose of enhancing overall resilience and their ability to serve as an emergency response center and offer support programs in the community during an emergency event – the Margaret Fuller House and the Cambridge Community Center.

A physical resilience audit of the Cambridge Community Center was conducted on May 17, 2019 and focused on the building's ability to withstand and respond to being impacted by flooding and temperature changes. Focus was given to the building's flood resilience, cooling and heating capacity, energy systems (solar plus storage) and communication systems.

The Cambridge Community Center (the Center) is located at 5 Callendar Street in Cambridge which is the Riverside area of the City. The mission of The Center is to promote community cooperation and unity and empower youth, individuals and families by offering social, cultural, educational and recreational activities. The Center is used by hundreds of individuals throughout the year to rent space for events or enroll in various programs and due to its history, provides a tremendous sense of community and family.

DRAFT

1. GENERAL SITE INFORMATION

The Cambridge Community Center is located on an approximately 19,499 square foot lot in the Residence C-4 Zoning District. The site consists of multiple connected structures (see **Figure 1**). One structure, the "main" building, is a wood frame structure built in the 1880s. The Cambridge Community Center has a brick gymnasium attached to this main structure. Modifications and changes have occurred to the original building with the most recent being a brick/block structure that was added in the 1980s.

Figure 1: Assessors Record of Cambridge Community Center

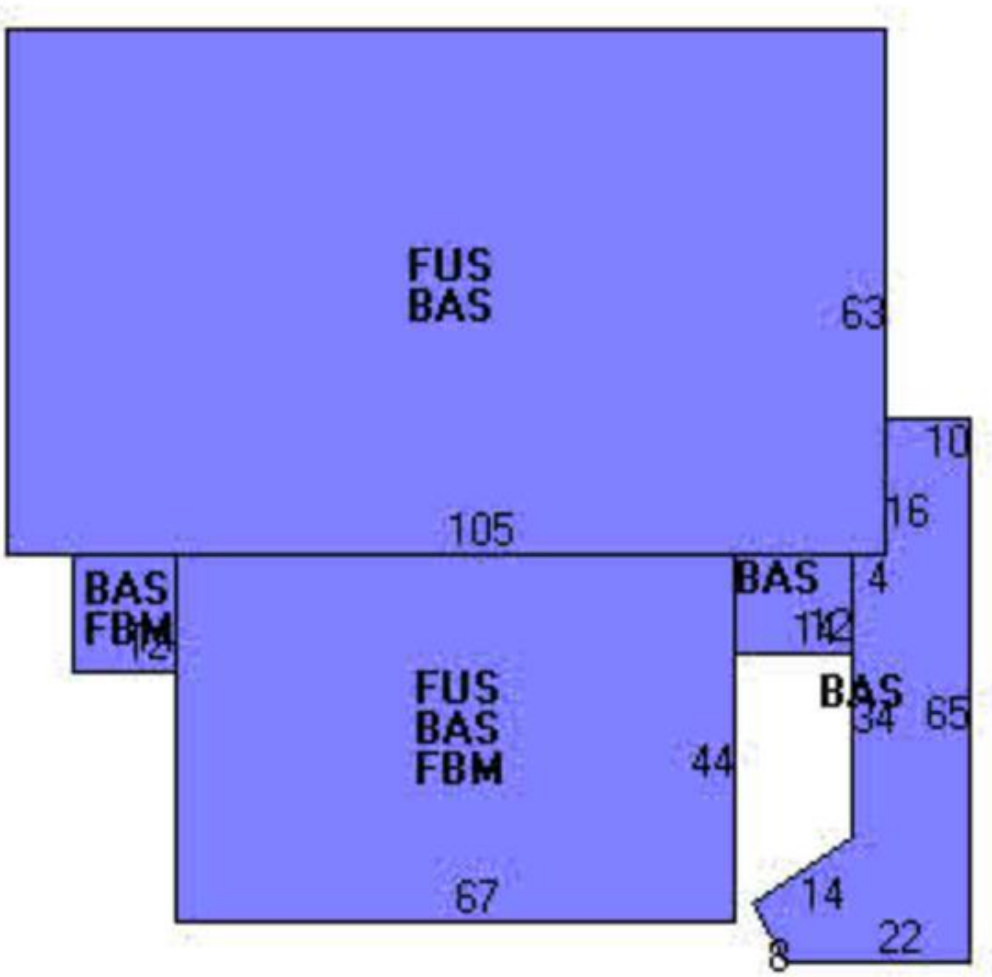

Photo: Cambridge Community Center Main Structure

Photo: Cambridge Community Center Block Addition (c 1980)

The site has been continuously in operation since 1929. Work on the structures has been completed piecemeal with some renovations being started over time, but no major renovations have been conducted. Site conditions are mixed with some modern upgrades intermixed with original features. Most of the site mechanicals are located in the basement of the main building and some are in the newer block building and the spaced used each day are heated with two hot Lochinvar water boilers that appear to be 200-400,000 btu/hr boilers.

A checklist (Resilience Hub Checklist) was developed to gather key information about the building that focuses on its overall resiliency, including:

- Ability to manage and withstand a flooding event,
- Details on heating and cooling systems,
- Asset information about what each floor is used for and where utilities and other systems are located,
- Energy Systems, and
- Communication Systems

Utilizing the resilience hub site check list, the general building information in **Table 1** was collected:

Table 1: Cambridge Community Center Building Resilience Hub Checklist

General Conditions	Notes
How is weather information received?	Internet or phone
Fire alarm system status, condition	Fire alarm appears to be a mix of hard wire and battery alarms. Fire extinguishers are distributed throughout the building. Given the age of the building and nature of the construction, The Community Center works with the City of Cambridge to manage fire risk.
What are the current communication systems of the building? Phone, Internet Service, etc. Any dispatch connections?	Site has internet and phone connection
What is the construction type and foundation type of the building?	Wood frame building for main building, brick for gymnasium and block for 1980 addition. Brick, Stone and block foundations.
Routers	None
Computer Work Stations	16 stand alone computers
Primary Electric Power Systems	Main Feed at front entrance. Panels in basement additional subpanel in the kitchen.
Secondary Electric Power Systems	None
Generator	None
Heating System	Hot water
Air Conditioning System	Window Units in Administrative Areas
Security System Controls	Front Entrances
Telephone/Communications	Main House Basement
Fuel, Gas	Main Building Basement
Potable Water	Main Building Basement
Wastewater	Main Building basement
Are there trees/vegetation around the building?	Yes (tree on street) with one potential falling risk.

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General Conditions	Notes
Landscape design around the site and surrounding area?	Limited risk from site vegetation
Any pruning needed for exterior vegetation? Other noticeable hazards?	No
Any cracks or openings in foundation?	Brick and block foundations are in reasonable condition
Status of roof insulation?	No known upgrades
Insulation value of exterior walls	No known upgrades
Location of mechanical equipment	Main Building Basement
Opportunity for awnings?	NA
Emergency lighting?	Battery Systems In Main Building
Is there a history of power outages in the area?	Limited history of power outages
Are there issues with cell service in the area?	No known issues

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2. FLOOD RISK DETAILS

The Cambridge Community Center is located in an area of Cambridge that is relatively flat but does experience some flooding during more frequent, smaller storms. In this Riverside area, low lying areas are susceptible to certain types of flooding when stormwater backs up in the drainage pipes. There is a vulnerable population in this neighborhood at risk as well as a key electric substation. **Table 2** highlights details about potential flood risk to The Center.

Table 2: Cambridge Community Center Building Flood Risk Details

Flood Risk	Notes
Is the building and/or any of the site located in a floodplain?	No - According to the Current Effective FEMA map for Cambridge, MA (dated June 4, 2010), the site is not located in a floodplain.
Is the site in a hurricane surge inundation zone?	Yes – According to the Massachusetts Sea Level Rise and Coastal Flooding Viewer, the site would start to be impacted when a Hurricane reaches Category 2 status (see **Figure 2**).
Will the site be impacted by Sea Level Rise?	Yes - According to the Massachusetts Sea Level Rise and Coastal Flooding Viewer, the site would start to be impacted when sea levels reach between 4-6 feet over the average highest daily tide (see **Figure 3**).
Is the site near a body of water even if its in or not in an official floodplain?	The Center is within half a mile of the Charles River.
First Floor Elevation of Building	The main building is approximately 3-4 feet above grade.
What is the Base Flood Elevation?	The Flood Zone associated with the Charles River in this area of Cambridge is a AE zone with a BFE of 4 feet.
What is the minimum level of flooding protection required by Cambridge regulations?	Cambridge does have a Flood Plain Overlay District that follows the boundary of the June 4, 2010 FEMA Floodplain maps. The City follows the Massachusetts State Building Code (780 CMR).
What is the history of urban flooding in this area? Discuss local surface drainage problems due to inadequate drainage.	The site has had limited flooding based on site personnel's experience. The site does have a sump pump that appears to be in working condition. See further discussion on this topic in the section following this table and **Figure 4**.
Does surrounding topography contribute to site flooding?	The site topography appears to be flat with limited surface area draining to the site. A storm drain is located on the south west corner of the property line.
Has water from other sources entered the building (water main breaks, high groundwater)?	Unknown

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Flood Risk	Notes
Is there a history of water intrusion through floor slabs?	Unknown. The site has a sump pump indicating that basement flooding may have been an issue in the past.
Are there underground utility systems or areas that can contribute to basement flooding?	At least one hot water heater is located in the basement. This would drain to the sump pump in a failure.
Are there stormwater sewer manholes upslope of windows or openings that allow local drainage to enter basement or lower floors?	No
Is there at least one access road passable during flood events?	The site is located near two streets. It is unknown if Howard Street or Magee Street would be passable during a flood given the relatively close elevations.
Is there a risk of evacuation access being cut off due to roads flooding, if so, where? And has access been cut off in the past?	Access has not been cut off in the past, but flooding may be a risk given the relatively flat topography and risk of both roads flooding.
Are at grade parking lots located in flood prone areas?	The at grade parking is not located in a FEMA Floodplain, but it is located in a Hurricane Surge Inundation area and is projected to be impacted by Sea Level Rise.
Are below grade parking areas susceptible to flooding?	N/A - there are no below grade parking spots
What critical functions are located on lower floor levels or the basement?	Most of the site mechanical equipment and electrical panels are in the basement.
Can critical functions be relocated?	Relocation would be challenging given the lack of space in the main building and the lack of a central panel.
If critical functions can't be relocated is floodproofing feasible?	Flood proofing would be challenging given the nature of the foundations and the entrances at or below grade.
Was the building designed to resist hydrostatic and hydrodynamic flood loads?	Unknown but unlikely
Is the building constructed of any floodproof materials?	No
Are there backflow valves installed at the building?	Yes. The City of Cambridge has a comprehensive back flow preventer program for applicable valves.
Do staircases to basements have flood protection doors?	No
We understand that Cambridge has known urban flooding issues and they are investing $40M in flooding improvements including underground storage tanks… will any of this impact this area?	The area to be impacted by this work is The Port which is to the east of the Riverside neighborhood.

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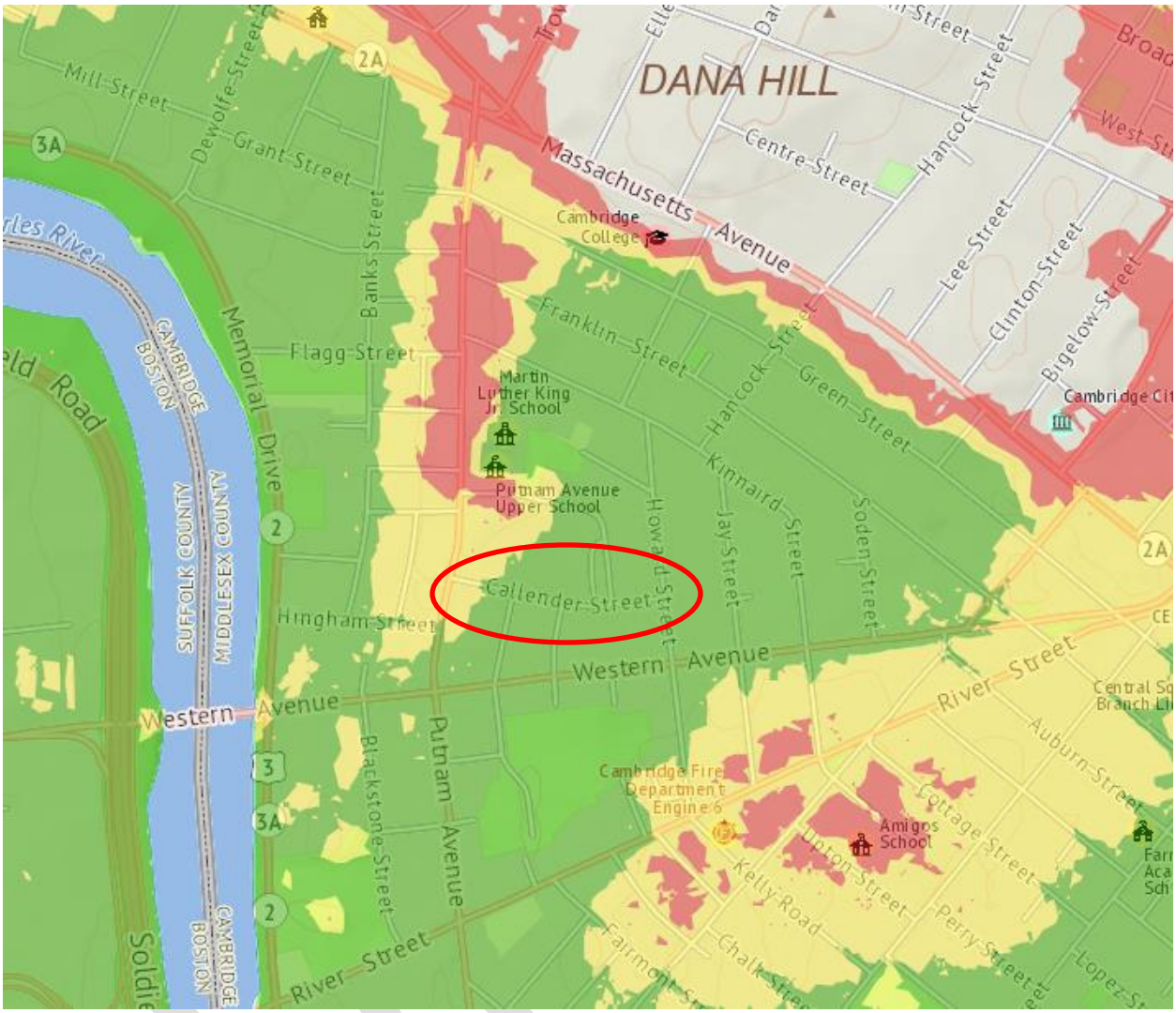
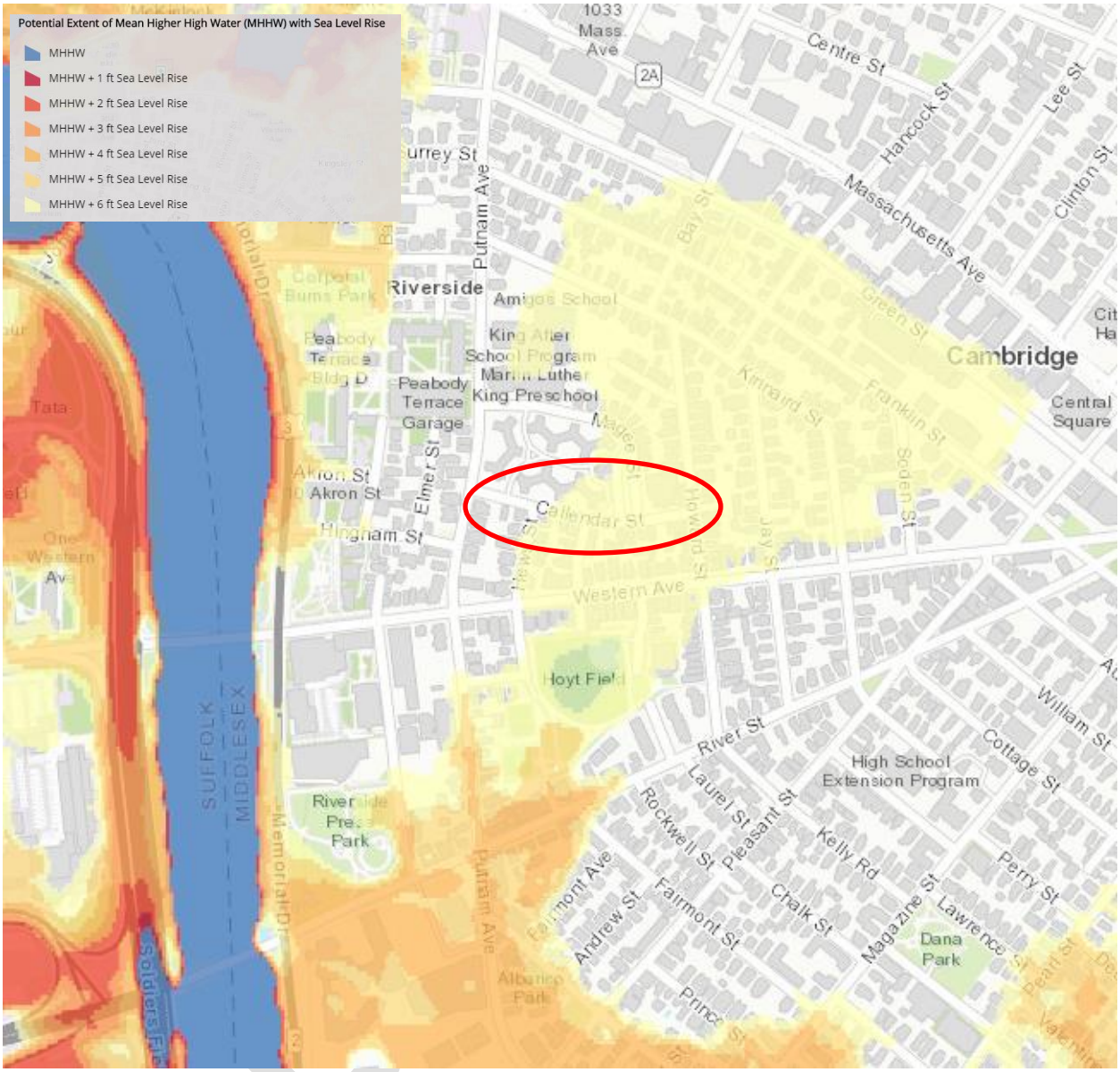
Figure 2: Hurricane Surge Inundation Zones



Source: MassGIS based on NOAA and USACE data

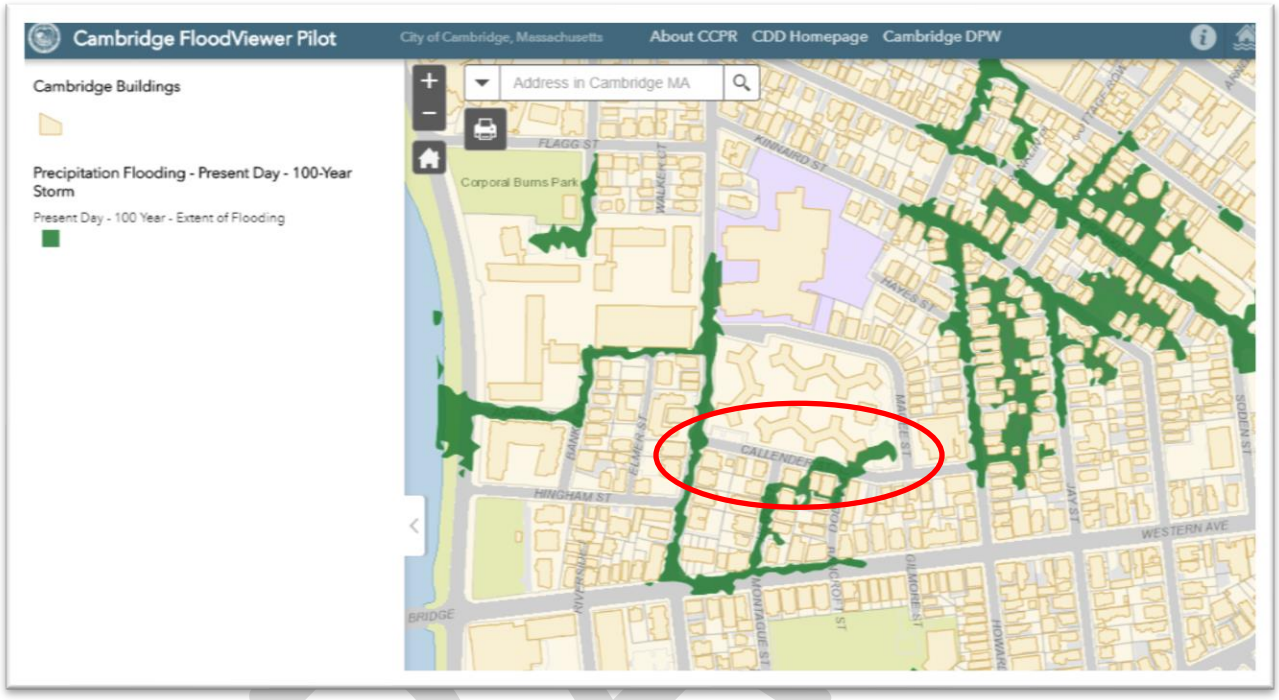
Figure 3: Potential Extent of Sea Level Rise



Source: MassGIS based on NOAA and USACE data

The City of Cambridge FloodViewer Pilot shows flooding in this area during the present day 100 year storm associated with precipitation (see **Figure 4**).

Figure 4: Present Day Precipitation Flooding – 100 Year



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3. ENERGY SYSTEMS

The Cambridge Community Center site is currently served by Eversource Gas and Electric. As an urban customer, site supply of both gas and electricity are relatively reliable. The Center has no back up fuel supply or generator to support gas or power interruption. The site is heated by a hot water heating system from two Lochinvar boilers with total capacities of 500,000 to 800,000 Btu/hr. Limited site cooling is provided by air conditioning window units for the administrative areas and parts of the main Building.

Peak site electric load per the Eversource bills for two accounts (# 1183 341 0019 and # 1196 527 0025) was approximately 12 kW and an estimated 8 kW which is based on the past 13 months of operations (an energy bill with demand charges was not available for account # 1196 527 0025). The peak electric load occurred in February and July 2018 indicating the site likely has some electric heating or space heaters not observed as part of this walk through.

To gather information for future resiliency efforts, the Resilience Hub Site Checklist was completed for Energy Systems (see **Table 3**).

Table 3: Cambridge Community Center Building Energy System Information

Energy Systems	Notes
Energy system in place - description, condition, etc.	Two gas boilers that appear to be in good condition. Window air conditioners in varying conditions.
Status of building insulation?	Unknown
Condition of windows and doors? Are they energy efficient?	Windows are single pane with storm windows. They are of unknown vintage but not energy efficient.
Are the windows operable? Can you open them?	Yes
Ability to have drinking water, toilets, sinks with no power?	Yes, if the City distribution system has power.
Vegetated Roof?	No
High reflective or paving materials used?	No
Any onsite water retention systems?	No
Any ability for islanding or for thermal energy connections?	No
12 months of electric bills that include demand charges	Max kW appears to be approximately 20 kW
Efficiency and demand reduction opportunities on energy load?	An energy program was implemented in the past and lighting measures have been completed.
Verify loads, panels and other information available from as built drawings.	Service appears to be 200-300 amps with three service panel
Can heating system run on back up power, is it duel fuel?	No
How many days of fuel (i.e. oil) is available?	No oil back up
Are there any water booster pumps on site?	No
Heating system in place - description, condition, etc.	Hot water hydronic system– good condition
Cooling system in place - description, condition, etc.	Window units and Central Unit for youth center – Good Condition
Communication/IT systems in place (phone, email, cell, pagers, dispatch, etc.)	Yes

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Energy Systems	Notes
Condition and status of HVAC, ductwork and other mechanical equipment. Above flood levels?	Most of the mechanical equipment is in the basement of the main Building

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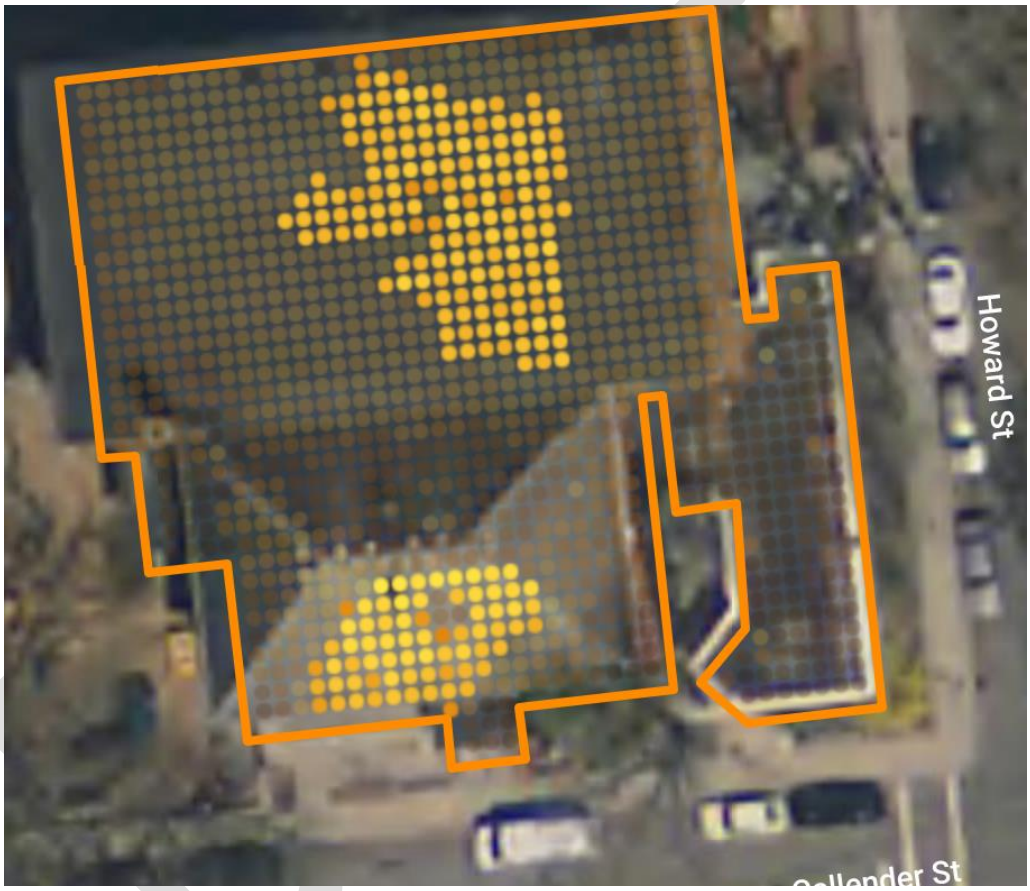
4. ON SITE SOLAR AND STORAGE OPPORTUNITY

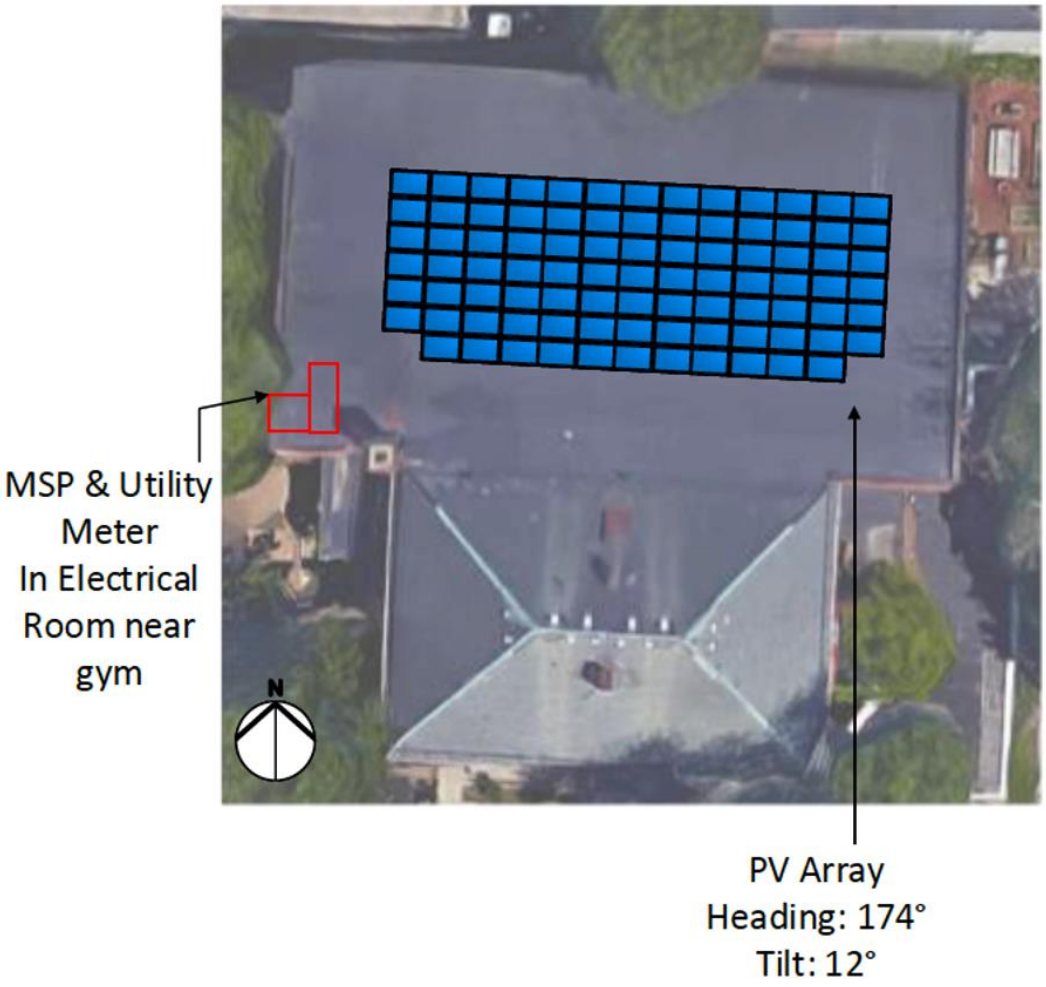
Base on the site review, the area most suitable for solar is the is the roof on top of the gymnasium. This portion of the building offers a flat roof with relatively unobstructed sunlight. Based on this area of 6,000 square feet a solar array of approximately 20-30 kW DC is likely to fit on the site roof which is based on NRELs PV Watts tool, the City of Cambridge's Solar Tool (see **Figure 5**) and a prior assessment done by United Solar Associates in July of 2017 (see **Figure 6)**.

Figure 5: City of Cambridge Solar Mapwell Tool Image



With a solar array of approximately 25 kW DC, an energy storage system of 100 kWh would likely be most appropriate for this site. At this size and based on a peak load from the Eversource bills of approximately 20 kW the solar array could carry the site for approximately 5-7 hours. In the case of emergency, the site may want to isolate critical loads such as refrigeration and the sump pumps.

Figure 6: United Solar Associates Proposed Layout (July 2017 Proposal)



5. CONCLUSIONS

The May 2019 site visit was intended to capture basic information about the Cambridge Community Center and explore overall site conditions. In general, the Cambridge Community Center reflects the building stock that is over 100 years old in the City. This building serves as a important resource to the Community and the physical infrastructure has been supported over time while largely remaining open without significant renovations.

Key areas that could be considered for improved resiliency may broadly be considered in two categories – smaller scope projects and larger scope projects (see **Table 4** and

Table 5).

Table 4: Smaller Scope Projects

	Project Summary	**Implementation**
Solar and Storage	Evaluate the use of a solar combined with a storage system to provide short term (5-7 hour) back up power.	Cambridge Community Center could consider a Power Purchase Agreement (PPA). A PPA is an agreement where the center would agree to provide roof space and buy electricity. As part of the PPA, the center could require energy storage as part of the system deployment. The current Massachusetts solar programs include additional incentives for energy storage coupled with solar.
Supplemental Sump Pump Back Up	The current sump pump system does not have a backup. Add a battery system to supply interim mitigation. Small packaged systems are capable of pumping a few thousand gallons of water per hour for over 4 hours.	There are several packaged commercial sump pump systems that might be cost effective to implement and mitigate risk. A system capable a few thousand gallon per hour would be approximately $3,500 dollars installed.
Lighting with Battery Back Up	Utilize back up lighting with battery packs.	As lighting is evaluated consider battery back up integration. Several commercial systems are more cost effective.
Install a small UPS system	Use a small battery system that could power multiple devices.	A system like the Goal Zero 1250 Portable Power System could be purchased for approximately $1,200 and can charge up to 10 devices and may provide 50 or more total charges.

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Table 5: Larger Scope Projects

	Project Summary	Implementation
Flood Proofing	Develop comprehensive flood mitigation measures including flood proof doors, site configuration and waterproofing	This is an extensive program that could be incorporated into larger renovations.
Back Up Generation	Implement back up generation plan that could be dispatched in larger power interruption.	A 25kW generator that would carry the site load would be approximately $50-100,000 depending on the degree of work on existing conditions and site work required.
Elevate Critical Infrastructure	Currently critical infrastructure (electrical, heating, etc.) is spread out through the basement.	Consider consolidating critical infrastructure such as heating equipment and electrical panels above flooding levels.
Incorporate Air or Ground Source Heat Pumps into design Evaluation	Given the lack of central cooling and the economic case for heat pumps in Massachusetts larger scope renovations should evaluate the use of heat pump systems.	Consider as part of future renovations.

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For a comprehensive assessment of the site a more thorough evaluation needs to be conducted. This summary was completed as a preliminary assessment of site infrastructure and to provide a summary of potential options that would improve site infrastructure and overall resiliency.

5.1 The Port Preparedness Plan – Energy Resilience

The Port Preparedness Plan is a document focused specifically on The Port neighborhood of Cambridge. The project has specifically identified Energy Resilience strategies for existing buildings in The Port area of Cambridge. While the report is specific to this neighborhood, the recommendations are applicable to numerous other buildings in the City such as The Center. The Center should reference and leverage TPPP prior to advancing any projects for the building. Below is a summary of strategies and actions for existing building energy resilience that was developed as part of TPPP – they focus on flood and heat protection (see Error! Reference source not found.).

Table 6: The Port Preparedness Plan Flood & Heat Protection Strategies for Existing Buildings

	Strategy	Action	Implementation	Benefits	Implementation Considerations
B3	**Flood Protection for Existing Buildings**	Elevate critical building systems	Elevate or protect vulnerable utilities such as fuel storage, furnaces, and electrical panels above the 2070 10-year flood elevation.	Minimizes flood damage, lessened need to retrofit later due to increasing flood risks.	Split incentives between owners and renters. Lack of space on upper floors. Structural retrofit may be needed for equipment relocated to building roof.
B	**NEW**	High-efficiency electric heating and cooling	Replace equipment with high-efficiency electric heating and cooling systems that exceed ENERGY STAR requirements.	Requires less floor area within building; more feasible to install at higher elevations. Reduced energy consumption and GHG emissions.	Eligible for rebates and incentives, including financing. Vulnerable to outages if no back-up power provided. In-unit systems may be more feasible for condo owners.
B4	**Heat Protection for Existing Buildings**	Solar PV with energy storage	Install solar power with storage capabilities sufficient to provide two (2) consecutive days at 24 hrs./day of backup power or as required by LEED v4 for backup generation.[37]	Improves passive survivability. For a typical building, renewable energy would offset 8-12% of annual energy consumption and 12-14% of GHG emissions.	Eligible for rebates and incentives, including financing. Potential issues with permitting and approvals. Possible to integrate with microgrid or community energy system.
		High performance building envelope	Require minimum R-20 wall insulation, R-40 roof insulation, maximum of U-0.3 glazed windows, and limit air leakage to less than or equal to 3 ACH at 50 pascals	Improves passive survivability. For a typical residential building, enhancements would result in an estimated 50-60% reduction in annual energy consumption, and a 40-50% reduction in total GHG emissions.	Eligible for rebates and incentives, including financing. Difficult to implement in buildings with multiple tenants, although single-unit upgrades may be possible for condo owners.

Note: Strategies are ordered as presented in the CCPR Handbook and the order of presentation is not indicative of their relative importance.

TPPP also discusses energy resilience at a neighborhood scale – specifically focusing on traditional microgrids and community energy systems. Both of these can facilitate the adoption of renewable energy sources, modernize and relieve stress on local electricity distribution, reduce GHG emissions, and potentially energy costs, and improve business performance by mitigating potential losses resulting from power outages. The Center should consider any projects in the context of the larger neighborhood. A link to the Energy Resilience for the Port report can be found here: https://www.cambridgema.gov/CDD/Projects/Climate/~/media/5D83391A50F84D798FDF230297F183B1.ashx

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