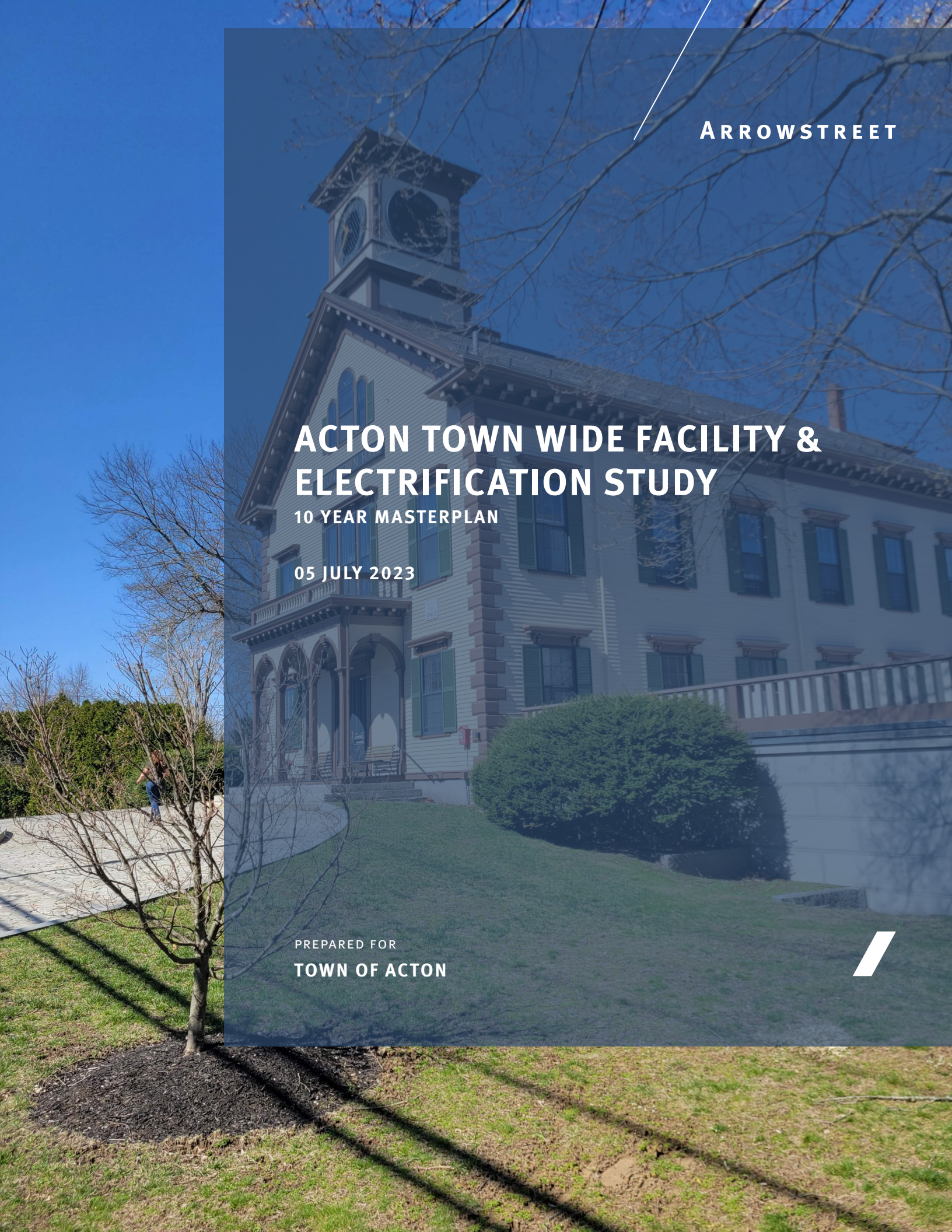


ARROWSTREET

ACTON TOWN WIDE FACILITY & ELECTRIFICATION STUDY

10 YEAR MASTERPLAN

05 JULY 2023

PREPARED FOR

TOWN OF ACTON

ARROWSTREET

Acton Town Wide Facility & Electrification Study

10 Year Masterplan
05 July 2023

I. OVERVIEW

A. Executive Summary

The Acton Town Wide Facility and Electrification Study is intended to capture the current condition of the Town's municipal building inventory, to develop recommendations for capital repairs and maintenance for the next 10 years, and provide recommendations for how to electrify the existing building stock.

Introduction

This study was managed by the Operations Division for the Town of Acton, Massachusetts. The process for this study involved meeting with Andrea Ristine and Andrea Becerra to review recent capital projects that the Town has undertaken, conduct site tours, and review of provided documentation. Preliminary recommendations were reviewed with the Town for feedback prior to pricing.

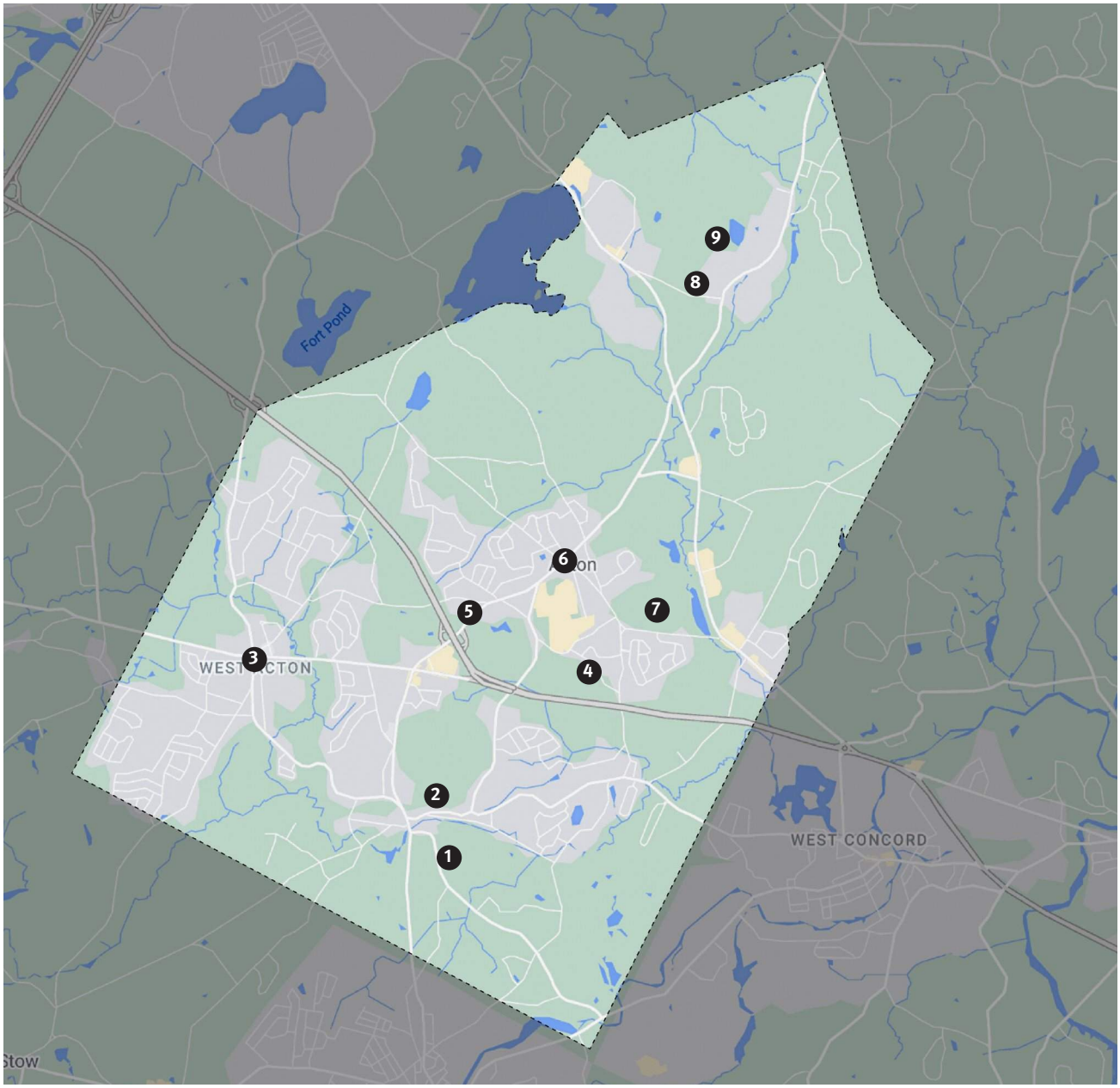
TOWN OF ACTON, OPERATIONS DIVISION

Andrea Ristine, Municipal Properties Superintendent
Andrea Becerra, Sustainability Director

CONSULTANT TEAM

Arrowstreet: architecture & planning
GGD Consulting Engineers, Inc: MEP/FP Engineering
Engineers Design Group: structural engineering
Thornton Tomasetti: energy and solar capacity
Code Red: code consulting
Ellana: cost estimating

BELOW Map of all building clusters within the Town of Acton



The intent of this report is to understand the current condition of the Town of Acton's municipal building stock and to develop recommendations for the next 10 years in terms of capital repairs but also electrification. This is in alignment with the Town of Acton's Climate Emergency Declaration to reach net-zero carbon emissions as quickly as possible, with a target date of 2030. This report consists of condition summaries as well as capital and electrification recommendations. A package of Excel files accompanies this report as a database a tracking mechanism for these recommendations.

The Town of Acton has nineteen (19) buildings in its primary portfolio. The buildings were organized and clustered based on location in town. The map on the previous page indicates each cluster's location.

Cluster 1
1.1 - Recreation Center

Cluster 2
2.1 - South Fire Station

Cluster 3
3.1 - West Fire Station
3.2 - Windsor Building
3.3 - West Acton Citizens Library

Cluster 4
4.1 - DPW Building
4.2 - Transfer Station
4.3 - Salt Shed

Cluster 5
5.1 - Public Safety Facility

Cluster 6
6.1 - Town Hall
6.2 - Memorial Library
6.3 - Red House
6.4 - Center Fire Station

Cluster 7
7.1 - Kennedy Service Building

Cluster 8
8.1 - North Fire Station

Cluster 9
9.1 - NARA Park Sports Pavilion
9.2 - NARA Park Bathhouse

Map of all building locations within Cluster 3

Map of all building locations within Cluster 4

Map of all building locations within Cluster 6

Map of all building locations within Cluster 9

9.3 - NARA Park Picnic Pavilion
9.4 - NARA Park Amphitheater

The buildings include the following programmatic categories:

FIRE STATIONS

6.4 - Center Fire Station #1
2.1 - South Fire Station #2
3.1 - West Fire Station #3
8.1 - North Fire Station #4

LIBRARIES

6.2 - Memorial Library
3.3 - West Acton Citizen's Library

MUNICIPAL OFFICES

6.1 - Town Hall
6.3 - Red House
5.1 - Public Safety Facility

SERVICE BUILDINGS

4.1 - DPW Building
4.3 - Salt Shed
4.2 - Transfer Station
7.1 - Kennedy Service Building

RECREATION DEPARTMENT

1.1 - Recreation Center
9.1 - NARA Park Sports Pavilion
9.2 - NARA Park Bathhouse
9.3 - NARA Park Picnic Pavilion
9.4 - NARA Park Amphitheater

VACANT

3.2 - Windsor Building

ELECTRIFICATION SUMMARY

Of the nineteen (19) buildings, seven (7) are already electrified/fossil fuel free:

- North Fire Station
- Transfer Station
- Salt Shed
- NARA Park Sports Pavilion
- NARA Park Bathhouse
- NARA Park Picnic Pavilion
- NARA Park Amphitheater

In addition, the DPW building is in the process of planning for the construction of a replacement building. This building is planned to also be electric only/fossil fuel free and operational by 2030.

This leaves eleven (11) buildings to be electrified in the next seven (7) years by 2030. Of these eleven (11) buildings, only two (2) are not in a Historic District, the Public Safety Facility and the Kennedy Service Building. The below timeline lays out roofing and/or window replacement projects in blue, electrification projects in green, and combined electrification and envelope upgrade projects in purple for these 11 buildings. Alignment to years is approximate and represents a potential ordering and prioritization of projects to address the electrification goals and major capital envelope needs.

Refer to recommendations in Section II and energy and emissions assessment in Section III for additional information.

The buildings needing electrification include the following:

SMALL WOOD FRAMED STRUCTURES

1.1 - Recreation Center
3.3 - West Acton Citizen's Library
3.2 - Windsor Building
6.3 - Red House
7.1 - Kennedy Service Building

UNINSULATED CMU BLOCK FIRE STATIONS

2.1 - South Fire Station
3.1 - West Fire Station
6.4 - Center Fire Station

LARGE CAVITY WALLS STRUCTURES

6.1 - Town Hall
5.1 - Public Safety Facility
6.2 - Memorial Library

TIMELINE FOR UPGRADES TO BUILDINGS THAT NEED ELECTRIFICATION

RECOMMENDATIONS COST SUMMARY

Below is the summary results for pricing by priority. Detailed back up for each building can be found in Section II.

#	BUILDING NAME	PRIORITY 1	PRIORITY 2	PRIORITY 3	PRIORITY 4	PRIORITY 5	ADDITIONAL ELECTRIFICATION	TOTAL
1.1	Recreation Center	$951,150	$64,500	$1,515,000	$300,000	$126,000	$5,250	$2,961,900
2.1	South Fire	$997,500	$420,000	$517,500	$213,750	$102,000	$2,121,000	$4,371,750
3.1	West Fire	$855,000	$390,000	$213,000	$532,500	$34,500	$1,317,000	$3,342,000
3.2	Windsor Building	$2,346,000	$43,500	$18,000	$207,000	$36,000	$-	$2,650,500
3.3	West Acton Citizens' Library	$-	$215,250	$748,350	$814,500	$25,200	$439,500	$2,242,800
4.2	Transfer Station	$426,000	$82,500	$-	$135,000	$-	$-	$643,500
4.3	Salt Shed	$-	$108,000	$72,000	$615,000	$-	$-	$795,000
5.1	Public Safety Facility	$23,100	$3,902,250	$180,000	$1,868,700	$2,400,000	$187,500	$8,561,550
6.1	Town Hall	$1,185,000	$2,130,000	$9,133,500	$3,640,500	$862,500	$223,500	$17,175,000
6.2	Memorial Library	$1,195,000	$135,000	$2,280,000	$395,000	$-	$8,850,000	$12,855,000
6.3	Red House	$70,500	$1,091,000	$240,000	$473,500	$97,500	$634,500	$2,607,000
6.4	Center Fire	$49,500	$363,000	$199,750	$381,750	$16,500	$997,500	$2,008,000
7.1	Kennedy Service Building	$-	$46,500	$90,000	$158,250	$67,500	$487,500	$849,750
9.1	NARA Park Sports Pavilion	$-	$-	$-	$300,000	$-	$-	$300,000
9.2	NARA Park Bathhouse	$498,000	$-	$69,450	$235,000	$-	$-	$802,450
9.3	NARA Park Picnic Pavilion	$-	$6,600	$-	$73,500	$292,500	$-	$372,600
9.4	NARA Park Amphitheatre	$208,500	$7,500	$36,000	$36,000	$-	$-	$288,000
Total		$8,805,250	$9,005,600	$15,312,550	$10,379,950	$4,060,200	$15,263,250	$62,826,800

B. Methodology

The work proceeded in two phases, a discovery phase and a recommendation phase. The team visited each of the nineteen municipal buildings with the purpose to evaluate existing conditions of the building inventory.

Process

The team visited each of the nineteen buildings with the intent to:

- Determine the existing conditions of the facility inventory, with emphasis on the building envelope and MEP system conditions
- Identify needed capital repairs that will be necessary in the next 10 years
- Prioritize building electrification based on system condition and capital repairs needed

The following outline explains the process of collecting and understanding the current facility status.

DISCOVERY PHASE

During the discovery phase, the team referenced many preceding studies, reports, and drawings that were provided to the consultant team by the Town of Acton. These documents provided a basis to understand work that had been completed in recent years, and the current efficiency and energy usage by the buildings.

The following relevant documents were reviewed as part of this study:

- Acton Town Wide Facility Study Report by Lerner Ladds Bartels Architects dated June 23, 2015
- Property Cards
- Acton Electrification Roadmap by Salas O'Brien dated June 27, 2022
- ADA Title II Transition Plan by EMG dated October 31, 2018 and associated individual building reports
- Partial or Full Drawing sets for the following buildings:
  - » Recreation Center drawings dated October 1992
  - » South & West Fire HVAC upgrades drawings and specifications dated June 2019
  - » Proposed Design Development Interior Renovations for Windsor Building dated August 2013 - work not completed
  - » West Acton Citizen's Library floor plan by Roger Taylor Panek Architects, undated
  - » Solid Waste Transfer Station drawings dated February 1983
  - » Salt Shed drawings dated March 2012
  - » New Public Safety Facility drawings dated June 23, 2003
  - » Additions and Renovations to Town Hall drawings dated April 1987
  - » Acton Town Hall Renovations as built drawings dated April 2014
  - » Public Library blueprints, undated from ~1889
  - » Addition and Renovations to the Acton Public Library dated March 1997
  - » Proposed plans for a revolving door at Memorial Library dated January 2014 - work not completed
  - » Acton Memorial Library Roof and HVAC replacement drawings and specifications dated March 21, 2018
  - » Red House Handicapped Entrance drawings dated June 20, 2013
  - » Generator Upgrades for Fire Station #1 & #2 dated August 29, 2013
  - » Center Fire Station HVAC upgrade drawings dated August 2017
  - » Kennedy Service Building Interior Renovation drawings and specifications dated December 2017
  - » North Acton Fire Station drawings and specifications dated June 17, 2020
  - » Miracle Field Sports Pavilion drawings and specifications dated January 30, 2020
  - » Bathhouse and Amphitheater drawings dated October 6, 1998
- PSF EMS Modifications and Retro-Commissioning report by AECOM dated October 12, 2011

- AECOM Energy Saving Upgrades proposal for PSF dated April 2, 2013
- Acton Public Safety Facility Weatherization report dated October 5, 2022
- RISE Engineering proposal for LED lighting and control upgrades at Public Safety Facility dated February 5, 2019
- Energy Analysis Report - Acton Town Hall by RDK Engineers dated April 18, 2011
- Additional documentation related to Fire Alarm upgrades at Acton Town Hall that occurred in 2015
- Air quality report for Town Hall by HUB Testing Laboratory, Inc dated February 3, 2023
- RISE Engineering proposal for LED lighting and control upgrades at Town Hall dated February 6, 2018
- AML Energy Reduction Study by Sterling Engineering dated May 4, 2010
- RISE Engineering Air Sealing and Insulation Recommendations for Memorial Library dated March 23, 2021
- RISE Engineering Air Sealing and Insulation Recommendations for Red House dated March 23, 2021
- Energy Monster Mass Save Insulation proposal for Red House dated November 23, 2020
- RISE Engineering proposal for LED lighting and control upgrades at Center Fire Station dated February 6, 2018
- Jasonics Security proposals for Fire Alarm Installation scope at Central, South, and West Fire Stations, dated 09/24/2021
- RISE Engineering O&M manual for LED lighting and control upgrades at Recreation Center, undated

The team began by collecting, organizing, and digesting the available documentation and previous recommendations made in the 2015 Acton Town Wide Facility Study report. Recommendations that have been addressed since 2015 were removed. Recommendations that have not been addressed and are still relevant remained on the list. Additional recommendations for accessibility barriers identified in the most recent round of Title II assessments were also added to the list of recommendations.

FACILITY VISITS

Arrowstreet visited each of the buildings to observe and evaluate the facility conditions. Primary focus was given to the building envelope; joints, sealants, and caulking; MEP building systems; interior finishes; appearance; and to check against previous reports for accessibility and code considerations.

SOLAR CAPACITY ANALYSIS

Each building's structural capacity to accommodate rooftop solar was analyzed at a high level based on the building's construction type and age to estimate if any reserve capacity exists. It is assumed that PV panels are supported with ballast with an allowance of 15 psf. Mechanically attached systems could also be considered, but additional wind and snow loads would apply and need to be analyzed.

The buildings were categorized into three general groups:

Not Recommended

These structures are highly unlikely to have any reserve capacity to support rooftop solar.

Not Recommended w/o Additional Analysis and/or Upgrades

These structures are potential candidates for rooftop PV but require additional analysis in order to confirm. An analysis of the roof trusses and connections should be performed to determine the reserve capacity for downward loads and the uplift loads on the structure. Based on this analysis, truss members or connections may need to be reinforced to support the loads from the PV panels.

Likely Possible

These structures may have reserve capacity to accommodate rooftop solar. Further analysis of the structure would be required to determine and

quantify the reserve capacity. If it is determined that roof framing members do not have adequate capacity, it may be feasible to support PV panels on a dunnage steel platform supported on existing structural columns.

ENERGY & EMISSIONS ASSESSMENT

Refer to “A. Energy and Emission Reductions” on page 138 for a more detailed methodology. Anticipated reduction in energy use was determined through benchmarking based on recommendations, no energy modeling was performed. The associated emissions for the existing and reduced energy use of each building was then determined based on fuel source.

FACILITY REPORT

Each facility has a summary and recommendation report in Section II that outlines the existing condition and presents capital and electrification recommendations. These are cataloged in the following format for each of the buildings:

Cover Page

A. Building Name & Cover Photo

B. Facility Information

- Building Address
- Department
- Year Built
- Gross Square Feet
- Historic District Indication
- On-site Combustion Indication
- Capacity for Solar Indication

C. Location Map

D. Energy and Emissions Summary Table

- Existing, Proposed, and Change in Energy Use
- Existing, Proposed, and Change in Utility Cost
- Existing, Proposed, and Change in Emissions[1]

1 Proposed emissions will continue into the future until the time that the electrical grid is 100% renewable, which is expected to be in 2050. Refer to “Carbon Emissions” on page 143 for more information on emission factor sources.

Conditions Summary Pages (Sample on previous page)

E. Building Identification Label

F. Condition narratives covering the following topics:

- Structure
- Exterior Walls
- Exterior Openings
- Roof and Rainwater Management
- Stairs and Vertical Circulation
- Interiors and Finishes
- Joints and Caulking
- Plumbing
- Fossil Fuel Appliances[2]
- Heating
- Cooling
- Ventilation
- HVAC Controls[3]
- Fire Protection
- Electrical
- HVAC
- Accessibility
- Code Considerations
- Appearance
- Historic District Considerations

Recommendations Pages

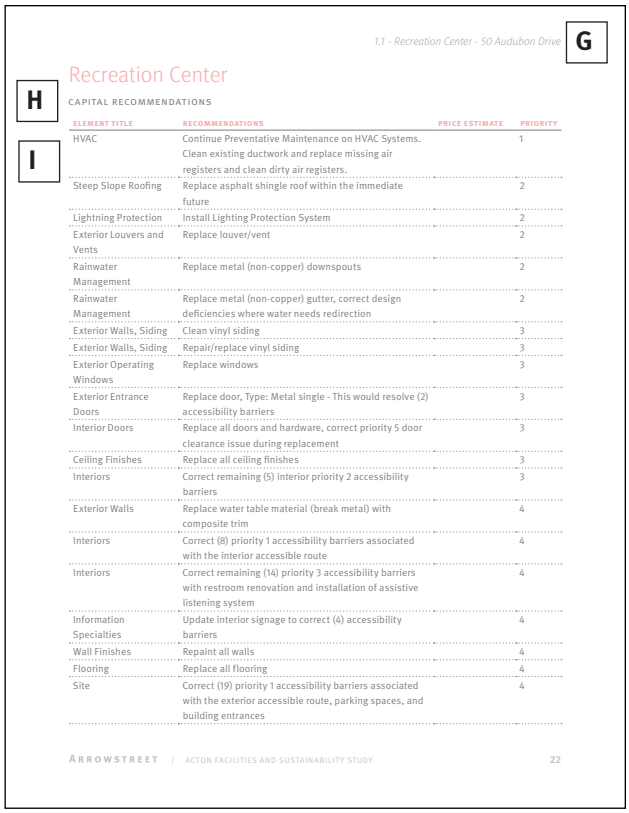
G. Building Identification Label

H. Recommendations Type: Capital or Electrification

Note that recommendations related to electrification that are Critical or Necessary (Priorities 1 through 3) are listed under the Capital Recommendations. Electrification items that are in Priorities 4 are listed in the Electrification Recommendations.

I. List of Recommendations with the following information:

- Element Title: Corresponds to Uniformat Elements
- Recommendations: Description of recommendation



- Price Estimate: Estimated construction cost of this recommendation in today's dollars
- Priority: Recommendations are sorted with highest priority first. See below for detailed description of the priorities.

The following priorities have been used to classify the recommendations.

- Priority 1 - Currently Critical (1-2 yrs)
  - » Conditions require immediate action to correct a safety hazard, stop accelerated deterioration, return a facility to operation, or correct an environmental hazard
- Priority 2 - Potentially Critical (3-4 yrs)
  - » Conditions will become critical within a few years if not addressed. Conditions include intermittent operations, rapid deterioration, potential life safety hazards, and environmental non-compliance

2 As applicable

3 As applicable

- Priority 3 - Necessary, not yet critical (5-6 yrs)
  - » Conditions require attention to preclude predictable deterioration or potential downtime and damage if the condition continues to be deferred.
- Priority 4 - Recommended (7-10 yrs)
  - » Conditions are a sensible improvement to existing conditions and would improve the overall usability and/or reduce maintenance costs.
- Priority 5 - Grandfathered
  - » Conditions do not meet existing codes or standards but are 'grandfathered' in their current condition. No action is required at this time, but should substantial work be undertaken in contiguous area, certain existing condition may require correction.

Timeline Recommendations

This section presents recommendations for how to approach the electrification and capital recommendations as a holistic package for each building with the intention that every building is electrified by 2030.

ABBREVIATIONS

The following abbreviations are used throughout the report

AHU	Air Handling Unit
DX	Direct Expansion
EA	Each
EUI	Energy Use Intensity
GHG	Green House Gases
GSF	Gross Square Feet
kBTU	kilo-British Thermal Units
KG	Kilograms
KWH	Kilowatt Hours
LF	Linear Feet
MMBTU	Metric Million British Thermal Units
MTCO2e	Metric tons of Carbon Dioxide equivalent
PSF	Pounds per Square Foot
PV	Photo voltaic
RTU	Rooftop Unit
SF	Square Feet
YR	Year

1,000 kBTU = 1 MMBTU
1 KWH = 3.412 kBTU
1,000 kg CO2e = 1 MTCO2e

C. Assumptions & Limitations

This report is the compilation and cumulation of provided documentation, visual observations, and feedback from the Town of Acton. The future use of this document and associated Excel files is subject to the assumptions and limitations contained herein. This report and provided recommendations are the composite of the available data, conclusions gathered from visual observation and reported conditions by town staff. Destructive investigation or testing was not conducted as part of this study. Therefore, concealed conditions are not included in this study and should be investigated at each building as needed. Potential hazardous materials were observed in some buildings. It is not possible to quantify hazardous materials from the methodology employed. It is recommended to employ a hazardous materials testing study to quantify the scope and risk associated with such potential materials prior to undertaking a major renovation or removal of materials.

CONDITION ASSUMPTIONS

This study did not address or look at the programmatic or space utilization needs of the buildings. No destructive testing was performed. Condition summaries are based on previous information, visual observations, and reported concerns by town staff.

RECOMMENDATION ASSUMPTIONS

Timing recommendations are constrained by two factors. The first being that the team recognizes that it takes time to procure a design team, prepare bid documents, bid, and construct a capital renovation or repair project. Therefore, the earliest estimated completion time for an electrification project is 2025. Many non-electrified buildings have envelope and HVAC systems that need are critical and necessary to be replaced within the next five years. It is recommended that these items be replaced as fossil fuel free systems. These improvements are listed in the capital recommendations section for this reason. The remaining buildings have systems that can be improved after the Town's goal for electrification by 2030 are listed in the electrification recommendations as these are not critical or necessary at this time.

The following expected life spans were used to determine replacement schedule for existing equipment.

- Furnace with DX cooling: 15 yrs
- Boilers: 30 yrs
- Rooftop AHUs: 25 yrs
- Ductless mini splits: 15 yrs
- Roofing: 30 yrs
- Wood/Fiberglass/Vinyl windows: 30 yrs
- Aluminum windows: 25 yrs

BUILDING SPECIFIC ASSUMPTIONS

Public Safety Facility

This building was not evaluated for solar capacity because this building was evaluated as part of the 2022 Salas O'Brian Electrification Roadmap and was found to not be viable for solar. Solar is being planned for the rear parking lot at this site. This planned solar is included in the potential solar generation values.

Town Hall

This building was not evaluated for solar capacity because this building was evaluated as part of the 2022 Salas O'Brian Electrification Roadmap. In this evaluation, the only feasible location for rooftop solar was on the slate roof on one of the most prominent corners of the building. Due to the Historic District and nature of the building, as well as the desire to not place solar panels on the slate roof, the team has excluded this potential area from our solar capacity study.

DPW Building

The DPW building is being replaced therefore, it is not included in the Conditions and Recommendations sections. Its roof is also already covered in solar, therefore it was excluded from the solar capacity analysis. However, the predicted energy use of this building is incorporated to maintain a full picture of the

town's expected energy load. In addition, the solar generation that is on the existing roof is assumed to continue into the future as part of the building replacement.

North Fire Station

The North Fire Station #4 was recently constructed and opened in 2022. As the building is new construction, there are no capital recommendations to make in the next 10 years. In addition, the building is already electrified/fossil fuel free in alignment with the Town of Acton's Climate Emergency Declaration. Therefore, no recommendations have been made for this building.

This building was not evaluated for solar capacity because this building currently has the rooftop solar panels.

Electric Only

The following six buildings that are already electric/ fossil fuel free only have capital recommendations.

- Transfer Station
- Salt Shed
- NARA Park Sports Pavilion
- NARA Park Bathhouse
- NARA Park Picnic Pavilion
- NARA Park Amphitheater

PRICING ASSUMPTIONS

Pricing is conceptual in nature and does not capture detailed design issues. Some volatility inherent in forecasting construction pricing is to be expected, particularly as the scope of the recommendation gets refined from conceptual level to detailed design.

Recommendations are priced in todays dollars, projects undertaken in future years should be appropriately escalated. Pricing is for anticipated construction cost and does not include design and engineering costs, testing, or other soft costs. Pricing also does not include procurement of potential solar generation or any potential structural upgrades or reinforcement required to support rooftop PV.

PV GENERATION ASSUMPTIONS

The rooftop area of each building was modeled based on the existing drawings provided, taking into account slope and orientation. Rooftop solar energy generation potential was analyzed using the National Renewable Energy Laboratory's (NREL) PVWatts Calculator. Input assumptions used were:

- Only roof surfaces that are tilted and oriented in an optimal manner to generate a minimum of 17 kWh/sf (58 kBTU/sf) were considered[1]
- Only roof surfaces greater than 100 sf were considered to be suitable for PV installation
- Roof surface available for PV coverage: 70%
- Active PV cell area of PV coverage: 90%
- PV module type: Standard
- Cell material: Crystalline silicon
- Module nominal efficiency: 19%
- Module cover: glass with anti-reflective coating
- Temperature coefficient of power: -0.37%/°C
- Array type: Roof mounted
- Inverter loss factor: 0.96
- Shading loss: 0%
- Snow loss: 0%
- Total system losses: 11.42%
- DC to AC factor: 0.85

CODE ASSUMPTIONS

A detailed code evaluation of all potential code issues at the existing buildings was not performed. Issues raised by previous reports, including accessibility, have been carried forward if the condition continues to apply. In addition, recommendations were evaluated at a high level to identify potential major triggers that fall into the following categories: fire alarm or sprinkler upgrades, structural upgrades, energy code requirements, egress and life safety requirements, and fire rating requirements. Most of the buildings are anticipated to fall into a Level 2 alteration with no work area due to only modification of the HVAC and envelope

Please refer to "Potential PV Generation Areas" on page 149

systems but no anticipated floor area or programmatic changes. The Windsor Building is an exception to this, and is anticipated to be a Level 3 alteration.

Sprinklers

Retroactive installation of an automatic Sec. sprinkler system is governed by both (1) MGL Ch. 148 Sec. 26G and (2) the requirements of Chapter 8 of the Massachusetts Existing Building Code (MEBC).

Massachusetts General Law Ch. 148 Sec. 26G requires every building or structure, including major alterations thereto, which totals more than 7,500 gross square feet to be protected throughout with an automatic sprinkler system. Note that the 7,500 sf threshold includes "the sum total of the combined floor areas for all levels, basements, sub-basements, and additions, in aggregate, measured from the outside walls, irrespective of the existence of interior fire resistive walls, floors and ceilings".

An advisory document published by the Sprinkler Appeals Board in 2009 expands upon the application of this MGL to existing buildings. An existing building is required to be protected with sprinklers where all the following four (4) conditions are satisfied:

1. Building gross square footage is more than 7,500 sf.
2. Sufficient water and water pressure exist to serve the system. This should be verified by the project's sprinkler design engineer of record, however, it is recommended that it be assumed adequate coverage is provided unless proven otherwise.
3. The nature of work to the building is considered as "major", including any one or more of the following.
    - » The demolition or reconstruction of existing ceilings or installation of suspended ceilings.
    - » The removal and/or installation of sub flooring, not merely the installation or replacement of carpeting or finished flooring.
    - » The demolition and/or reconstruction or repositioning or walls or stairways or doors.
    - » The removal or relocation of a significant portion of the building's HVAC, plumbing, or electrical systems involving the penetration of walls, floors, or ceilings.
4. The scope of work is proportional to the cost/benefit of sprinkler installation. To evaluate whether this is satisfied, the advisory document lists either of the following as thresholds for requiring sprinkler protection.
    - » Work affects 33% or more of the total gross square footage.
    - » The total cost of the work (excluding cost to install a sprinkler system) is equal to or greater than 33% of the assessed value of the building, as of the date of permit application.

It is the conclusion of the advisory document that if any of the buildings within the scope of this project meets the conditions of items 1 through 4, then it is reasonable to conclude that the alterations and modifications are considered as major, thus requiring sprinkler protection. However, ultimately it is the determination of the local fire code official to determine whether the renovation is considered as "major" or not.

Based on the above trigger requirements of lacking a current automatic fire protection, building size, assumed water pressure, and recommendations in excess of 33% of the asses value of the building, the only potential structure that would be affected by this law is the Salt Shed.

In addition to the above, the MEBC Chapter 8 also governs automatic sprinkler requirements for work classified as a Level 2 alteration. A Level 2 alteration is defined as:

A work area that is 50% or less of the total building area consisting of the reconfiguration of space, the addition or elimination of any doors or windows, the reconfiguration or extension of any system, or the installation of any additional equipment.

MEBC Section 804.2.2 would require automatic sprinkler protection to be provided throughout the work area where all of the following condition exist:

1. The work area contains exits and corridors that serve an occupant load greater than 30.
2. The work are is required to be provided with automatic sprinkler protection in accordance with 780 CMR Chapter 9 as applicable to new construction.
3. The work area exceeds 50% of the floor area. Work area is defined as:

   That portion or portions of a building consisting of reconfigured spaces as indicated on the construction documents.

In general, it is not anticipated that the recommendations in this report will trigger these conditions, as it is not anticipated for there to be work area associated with reconfiguring spaces. The Windsor Building and Fire Stations with their toilet room reconfigurations, may be the exceptions.

Structural Upgrades

Detailed structural analysis and any potential upgrades are triggered when alterations either reduce the structural capacity of a load carrying element, increase the stress of structural elements more than 5%, or result in a prohibited structural irregularity as defined in Chapter 8 of the MEBC. It is not anticipated that any of the recommendations would trigger reducing the structural capacity or introducing prohibited structural irregularities.

Reroofing projects are anticipated to be able to accommodate the additional insulation required without exceeding 5% of the existing stress on the structural members. If this 5% of additional stress is exceeded, detailed analysis of the structural members will be required. This may be an ideal time to evaluate the roof for additional PV loads and determine if there is an optimal balance between potential additional loads and potential reinforcement required.

In addition, if the CMU bearing walls at the Fire Stations are unreinforced, Chapter A1 Seismic Strengthening Provisions for Unreinforced Masonry Bearing Wall Buildings may apply.

Energy Code Requirements

Envelope upgrades such as reroofing, window replacement, exterior wall alteration, and overcaldding projects are required to meet the newest energy code. Mechanical system alterations will be required to comply with the energy code as well. Detailed analysis for energy code compliance was not performed, but it is assumed that the recommendations can be designed in compliance. Repair, reconstruction, or renewal of any part of an existing building for the purpose of its maintenance or to correct damage, has exceptions in the energy code. Historic structures that can demonstrate that compliance with a provision would threaten, degrade or destroy the historic form, fabric, or function of the building are not required to comply with that energy code provision.

Egress Requirements

In general, it is not anticipated that occupancy will change, that floor areas will significantly alter, or programmatic factors that would affect egress would be affected by the recommendations. Buildings with non-compliant stairs or other egress components have been flagged in the specific building sections. In addition, if conditions are cited as “hazardous” by the building official, this would be another potential trigger for additional scope.

Fire Rating Requirements

Level 2 and 3 alterations as defined by the MEBC, trigger requirements for fire rating the vertical opening connecting two or more floors. There are a number of exceptions to reduce or eliminate this rating, however, these should be evaluated on a project by project basis. In addition, if conditions are cited as “hazardous” by the building official, this would be another potential trigger for additional scope.

Accessibility Scoping

Accessibility requirements can be triggered by two codes, the Massachusetts Architectural Access Board Regulations (521 CMR) and the 2010 ADA standards. The requirements of 521 CMR are limited to buildings

or portions thereof that are open to the public. Employee-only spaces are exempt from these requirements.

521 CMR Section 3.3 contains the following scoping requirements for projects in existing buildings. The costs referred to in the scoping requirements below are cumulative for all projects to the building within a rolling 36-month period:

1. If the work is less than $100,000, then only the work being performed is required to comply with 521 CMR.
2. If the work costs more than $100,000 but is less than 30% of the full and fair cash value of the building then in addition to the work being performed, the following accessible features are also required to be provided in the building:
    - » Accessible entrance
    - » Accessible toilet room
    - » Accessible drinking fountain (if provided)
    - » Accessible public telephone (if provided)
3. If the work, plus the cost of all work within the past 36-months, costs more than 30% of the full and fair cash value of the building, then all public portions of the building are subject to the requirements of 521 CMR. Full and fair cash value is defined as the assessed value of the property not including the land (521 CMR 5.38).

The 2010 ADA Standards require altered portions of an existing building to be readily accessible to and usable by individuals with disabilities to the maximum extent feasible (ADA 35.151(b)). Further, alterations to primary function areas should be made such that the level of accessibility, including the path of travel to the space, is made accessible to the maximum extent feasible. When determining if the upgrade is feasible, the ADA requirements state that the upgrade to the path of travel is disproportionate to the project when the cost to perform the work exceeds 20% of the cost of the alteration to the primary function area.

Spaces and elements within employee work areas are required to be designed and constructed so that individuals with disabilities can approach, enter, and exit the employee work area (ADA 203.9). Elements within employee work areas are not required to be fully accessible, however consideration should be given to designing employee work areas as accessible at the outset of the project in order to accommodate the potential needs of future employees.

Where discrepancies exist between the ADA and 521 CMR, the regulation that provides the greater level of accessibility must be followed. Though 521 CMR does not regulate employee only areas, Title II makes it clear that employee-only areas are required to comply with the 2010 ADA Standards.

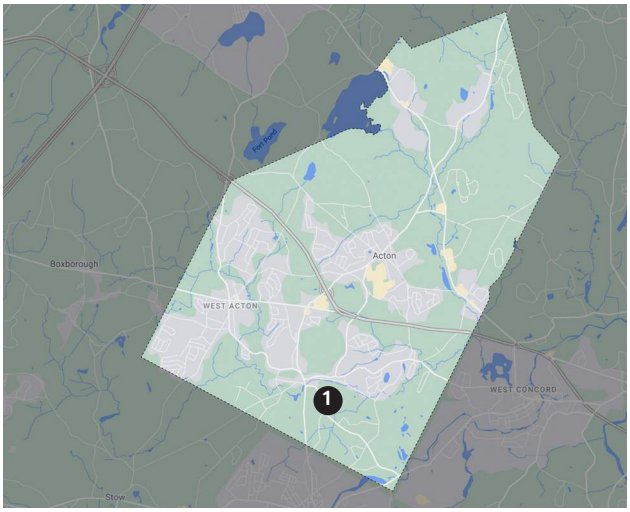
Work surfaces for use by other than employees, conference rooms, break rooms, dining surfaces are required to be provided with tables, chairs, stations, etc. that are accessible. At least 5% of all elements, but not less than one, are required to be accessible in accordance with ADA Section 902 (ADA 226.1).

II. CONDITION SUMMARIES & RECOMMENDATIONS

Recreation Center

Facilities Information

Address	50 Audubon Drive
Department	Recreation Center
Year(s) Built	1993
Gross Square Feet	6,704 SF
Historic District	No
On site Combustion	Yes
Capacity for Solar	Not Rec, w/o analysis



Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	21,596	60,338	38,742	179%
Natural Gas (Therm/yr)	2,938	-	(2,938)	-100%
TOTAL Energy Use (kBTU/yr)	367,486	205,872	(161,614)	-44%
Electric Utility Cost ($/yr)	$3,440	$9,612	$6,172	179%
Natural Gas Utility Cost ($/yr)	$2,644	$-	$(2,644)	-100%
TOTAL Utility Cost ($/yr)	$6,084	$9,612	$3,528	58%
TOTAL Emissions (MTCO2e/yr)	21	13	-8	-38%

STRUCTURE	Concrete foundation, lally columns, wood frame floor and roof. No structural issues evident.
EXTERIOR WALLS	Vinyl siding, some areas of damage evident. Mold growth from water running down exterior walls evident in multiple areas. Existing insulation is 5 1/2" R-19 fiberglass insulation. Metal base trim damaged in some areas.
EXTERIOR OPENINGS	Single-pane wood windows with screen units. Exterior motorized doors installed in 2013. Attic vent louvers at gable ends, need paint and maintenance.
ROOFING AND RAINWATER MANAGEMENT	Roof is original to building, asphalt shingle. Metal gutters and downspouts, some areas of damage, some areas not functioning as designed. No lightning protection system, building has been reported to have been hit multiple times. Minimal insulation reported at attic level.
STAIRS AND VERTICAL CIRCULATION	The building is one floor that is publicly accessible with a basement. Access to the basement is available only from a bulkhead outside of the building.
INTERIORS AND FINISHES	Kitchen rehab occurred 2015. Floors are a mix of vinyl plank, carpet, and tile in restrooms. Ceiling are a mix of ACT and GWB, ACT tiles are sagging. Walls are primarily painted GWB and have been redone as of Summer 2015. Plastic laminate counters throughout are delaminating and sealant is missing.
SEALANTS AND CAULKING	Minimal sealant & caulking visible. Seal at IGUs appears moldy or deteriorated. Substantial air leakage felt at exterior side doors despite weatherstripping. Some doors were observed to have to be pulled shut to latch.
PLUMBING	Water Service: 1" Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and in good working condition. Water Heating Systems: This system comprises of multiple electric water heaters throughout the facility. All tank water heaters are in good working order but are nearing end of life. Plumbing Fixtures: Fixtures in bathrooms are vitreous china with manual flush valves for toilets and urinals, counter mounted sinks not in bathrooms are stainless steel with manual faucets. All fixtures appear to be original to the building and in good working order. Large commercial gas stove in kitchen from 2015. Piping System: Domestic water supply piping that was observed in the building was copper. Piping serving bathroom is reported to freeze in winter if attic space is not passively heated by moving a ceiling tile. Waste and vent piping that was observed was PVC. All piping appears to be original to the building and is in good condition.

FOSSIL FUEL APPLIANCES	There is a large commercial-style gas oven, installed in 2015. It is reported that this oven is infrequently used and planned for decommissioning.
HEATING	Heating for the majority of the facility is provided by (3) natural gas fired furnace air handling units. One furnace is located in the basement, and two furnaces were reported to be in the attic area, though access was unavailable. The furnaces were manufactured by Trane and were installed in 2012. The furnaces are standard (approx. 80%) efficiency models (Trane XR80 Model).
COOLING	Cooling for the building is provided by direct expansion (DX) cooling coils that are attached to the furnace air handling units. The associated condensing units for the coils are located outside on grade. The condensing units were manufactured by Trane (Model XB13, 410A refrigerant) in 2011 and installed in 2012. Piping to these units appears to be in fair condition.
VENTILATION	The building is ventilated by a combination of natural ventilation provided through operable windows and distributed to building areas by the furnace duct distribution system when it is operating. Some registers are missing grilles, and this appears to be due to aging and sagging of ceiling tiles. Some return registers appear to be dirty and in need of cleaning. The kitchen cooking range has a kitchen exhaust hood with fire suppression system that appears to be in good condition. Ductwork System: The ductwork distribution system includes insulated sheet metal ductwork. Ductwork appears to be original to the building and in fair condition.
FIRE PROTECTION	There is a fire suppression system in the kitchen hood. The building is not protected with an automatic sprinkler system.
ELECTRICAL	Electrical Service: - underground from utility pole - Direct metered - 400Amp- 1phase- 3wire- 120/240volt Electrical Distribution: - Circuit breaker type panelboards. - General Power - 15A and 20A duplex receptacles - Wiring - conduit/ wiring and metal-clad cabling. Standby Generator: - 100kw- 1phase - 120/240volt (Kohler). - Natural gas type - Installed in 2012 Interior Lighting: - 2020 update replaced interior lighting with LED fixtures - Emergency Lighting - dual head battery units - Exit Signs - stamped housing LED type. Exterior Lighting: Reapired as needed, not part of LED upgrade - Parking lot - Pole Mounted (10'+/-) Full-cut off LED Architectural Area type. - Building mounted twin head incandescent flood lights with LED bulbs.

ELECTRICAL	Lighting Controls: Upgraded as part of LED retrofit - Interior: Occupancy and vacancy sensors with dimming wall switches - Exterior: Time clock and Photocell. Fire Alarm: - Zoned hardwired type system. - Master box. - Smoke detectors, manual pull stations. - Audio/Visual devices. Access Control system- S2 net box with Altronix central power supplies
HVAC	The mechanical system for the building was generally replaced in 2012, and is not reported to have substantial issues. Potential maintenance barriers exist to accessing furnaces located in attic.
ACCESSIBILITY	Signage is lacking on the accessible route from the parking to the building. Some doors require a step up but appear to be on the accessible route. Title 2 assessment from 2019 noted 27 Priority 1 & 11 Priority 2 accessibility barriers, primarily related to the parking lot, an accessible route to the building, and entrances. It is anticipated that the scope of recommendations would at least trigger upgrades to the entrance, toilet rooms, drinking fountains, and public telephone as applicable.
CODE CONSIDERATIONS	It is not anticipated that the scope of work would trigger major code requirements, other than correcting accessibility deficiencies and energy code requirements for window replacement. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. Sprinkler protection may be triggered under the Exisitng Building Code Chapter 8 if the work area exceeds 50% of the floor area. This threshold is not anticipated to be triggered at this time. The fire alarm system may need to be upgraded under a Level 2 alteration, and has been priced as a grandfathered code condition.
APPEARANCE	Appearance of the building currently suffers from water management problems as well as evidence of groundskeeping equipment damaging the break metal base water table. Cleaning of the siding, repair of damaged sections, replacement of the break metal with a more durable material such as composite trim, and replacement of the roof, gable vents, and gutter system would significantly improve the exterior appearance.
HISTORIC DISTRICT CONSIDERATIONS	This building is not in a Historic District. No restrictions apply.

Recreation Center

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Exterior Operating Windows	Replace windows	$795,000	1
Exterior Louvers and Vents	Replace louver/vent	$9,000	1
Steep Slope Roofing	Replace asphalt shingle roof	$90,000	1
Rainwater Management	Replace metal (non-copper) downspouts	$7,500	1
Rainwater Management	Replace metal (non-copper) gutter, correct design deficiencies where water needs redirection	$22,500	1
	Replace delaminating PLAM counters with new countertops	$7,650	1
HVAC	Continue Preventative Maintenance on HVAC Systems. Clean existing ductwork and replace missing air registers and clean dirty air registers.	$7,500	1
Lightning Protection	Install Lighting Protection System	$12,000	1
Priority 1 Total	8	$951,150	
Domestic Water Distribution	Insulate hot water piping	$30,000	2
Domestic Water Equipment	Replace existing tank electric water heaters with new. Existing appear to be near end of useful life.	$34,500	2
Priority 2 Total	2	$64,500	
Exterior Walls	Replace water table material (break metal) with composite trim	$24,000	3
Exterior Walls, Siding	Clean vinyl siding	$18,000	3
Exterior Walls, Siding	Repair/replace vinyl siding	$6,000	3
Exterior Entrance Doors	Replace door, Type: Metal single - This would resolve (2) accessibility barriers	$30,000	3
Interiors	Correct remaining (5) interior priority 2 accessibility barriers	$30,000	3
Interior Doors	Replace all doors and hardware, correct priority 5 door clearance issue during replacement	$93,000	3
Ceiling Finishes	Replace all ceiling finishes	$105,000	3
Plumbing Fixtures	Replace existing plumbing fixtures with new low flow fixtures. Provide accessible fixtures.	$54,000	3
Sanitary Sewerage Piping	Replace PVC sanitary waste piping with cast iron piping in accordance with current plumbing code.	$30,000	3

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
HVAC	Replace existing gas fired furnace and split DX expansion cooling HVAC system with a new high efficiency air source variable refrigerant flow (VRF) heat pump HVAC system, including indoor units, outdoor units and associated insulated piping and ductwork. Provide new energy recovery ventilation and insulated ductwork to provide mechanical ventilation to the building. Provide new ductwork, piping and ATC/BMS control systems. New controls should be integrated into Town Wide energy management system (EMS)	$750,000	3
Facility Power Generation	Emergency power system will require upgrade to an exterior rated 100KW 120/208V, 3Phase generator with sound attenuated enclosure. Fuel source can remain natural gas as the generator does not power life safety lighting.	$262,500	3
Electrical Service and Distribution	Electrical service and distribution should be upgraded to a 400 amp 120/208V 3phase service.	$112,500	3
Priority 3 Total	12	$1,515,000	
Interiors	Correct (8) priority 1 accessibility barriers associated with the interior accessible route	$39,000	4
Interiors	Correct remaining (14) priority 3 accessibility barriers with restroom renovation and installation of assistive listening system	$52,500	4
Information Specialties	Update interior signage to correct (4) accessibility barriers	$13,500	4
Wall Finishes	Repaint all walls	$36,000	4
Flooring	Replace all flooring	$91,500	4
Site	Correct (19) priority 1 accessibility barriers associated with the exterior accessible route, parking spaces, and building entrances	$67,500	4
Priority 4 Total	6	$300,000	
Stairs	Insufficient stair landing due to door swing or other regulatory issue	$30,000	5
Lighting	Replace exterior lighting with upgraded LED fixtures	$12,000	5
Detection and Alarm	Replace fire alarm system with new addressable type	$84,000	5
Priority 5 Total	3	$126,000	
Total	31	$2,956,650	

Recreation Center

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Foodservice Equipment	Replace gas stove with induction unit	$5,250	4
Grand Total	1	$5,250	

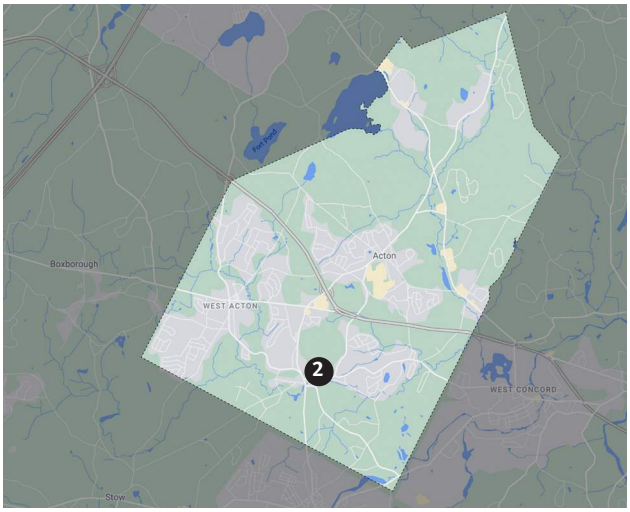
TIMELINE RECOMMENDATIONS

The architectural condition of the building is likely going to drive the need to further invest in the building prior to the anticipated end of life of the mechanical system. The roof and windows are 30 years old and are in need of replacement. The interiors of the building are in fair condition and could use a refresh. The mechanical systems should have approximately 4-9 years of life left, however, barriers to accessing the furnace units in the attic space may discourage regular maintenance and shorten their lifespan. In addition, their end of life is within the 2030 goal for electrification.

The recommended system for electrification is a VRF system. While it is possible to install this system without opening ceiling, it would be recommended to install at the same time as the interior refresh and ceiling replacement so that a majority of the refrigerant and condensate lines could be hidden above the new ceiling.

If the work is desired to be phased, more pressing exterior work (roof, windows) could precede the interior and mechanical renovation phases.

South Fire



Facilities Information

Address	54 School Street
Department	Fire Department
Year(s) Built	1961
Gross Square Feet	5,848 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	36,134	73,082	36,948	102%
Natural Gas (Therm/yr)	3,614	-	(3,614)	-100%
TOTAL Energy Use (kBTU/yr)	484,689	249,356	(235,333)	-49%
Electric Utility Cost ($/yr)	$5,756	$11,642	$5,886	102%
Natural Gas Utility Cost ($/yr)	$2,692	$-	$(2,692)	-100%
TOTAL Utility Cost ($/yr)	$8,448	$11,642	$3,194	38%
TOTAL Emissions (MTCO2e/yr)	28	16	-12	-43%

STRUCTURE	Slab-on-grade, major cracking in truck bay. Load bearing CMU walls, second floor & low roof concrete plank deck and beams. Wood roof deck on second floor.
EXTERIOR WALLS	Brick veneer in generally good condition, some vinyl siding on upper level. Level of insulation in existing walls is unknown, assumed to be none.
EXTERIOR OPENINGS	Single paned aluminum windows original to building and at end of life. Metal exterior doors have been recently replaced and are in good condition. Overhead doors appear to be in relatively good condition.
ROOFING AND RAINWATER MANAGEMENT	EPDM roof on both upper and lower roofs, replaced 1997 and nearing end of life. Mechanically fastened rigid insulation on GWB, fully adhered EPDM membrane. Appeared to only be one roof drain on lower roof, reoccurring ponding away from this drain evident.
STAIRS AND VERTICAL CIRCULATION	Wood stair and handrails. Does not appear to be properly enclosed as an egress stair. Metal fire escape from second floor is rusting. No elevator.
INTERIORS AND FINISHES	Mainly painted CMU walls, painted ceiling deck and ACT spline ceilings. Bare concrete slab and asbestos flooring on the ground floor. Upper level floor has a composite wood look product. Restroom has tile.
SEALANTS AND CAULKING	Masonry joints appear to be in good condition. Sealants around windows are at end of useful life.
PLUMBING	Water Service: 1 ½" Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to public sewer. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: This system comprises of a 50 Gallon Storage, Natural Gas Fired, 40,000 BTU Water Heater. This heater appears to be in good working condition. Plumbing Fixtures: All plumbing fixtures appear to be original to the building and nearing the end of their useful life. Shower in restroom is particularly in need of replacement. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears to be original to the building and nearing the end of its useful life.
FOSSIL FUEL APPLIANCES	Gas stove circa 2018 in kitchen on second floor.

HEATING

A high efficiency gas boiler and hot water pumps were installed in 2019. The boiler was manufactured by Lochinvar (Model KBN 500 with 470 MBH output). This boiler provides heating hot water to unit heaters that supply the Apparatus Bay and supplemental hot water fin tube radiation heating in the office and living areas of the building. The fin tube radiation appears original to the building and in fair to poor condition. An air source VRF heat pump system provides heating to the second floor multipurpose room, bunk rooms and day room.
Piping System: Heating Hot Water piping is a combination of Steel and Copper. The majority of hot water piping appears to be original to the building and in fair condition. New boiler loop main header piping was installed in 2019. The majority of hot water piping appears to be original to the building nearing the end of its useful life. The VRF system piping is in good condition.

COOLING

The second floor multipurpose, bunk and day room areas are cooled by a VRF system that was manufactured by Trane (4 ton, R-410a refrigerant) that was installed in 2019. The VRF system consists of five (5) ductless indoor units that are connected to one (1) roof mounted outdoor unit. The VRF system is in good condition.

VENTILATION

Ventilation for the office and living areas of the building is achieved via windows though natural ventilation. The First floor Janitor's closet and toilet room are exhausted by exhaust fans that were installed in 2019. The Apparatus Bay has a Vehicle Exhaust System which appears to be in good condition.

A DDC ATC/BMS system was installed in 2019 to control the boiler plant and VRF system.

FIRE PROTECTION

There are no Fire Protection sprinkler systems in the building. There was a fire in the building in 2016, resulting in the installation of a fire detection system.

ELECTRICAL

Electrical Service:
120/240Volt- 1Phase - 3Wire - 200Amp
Electrical Distribution:
- Direct metered
- Circuit Breaker type Panelboards
- Power distribution - 15A and 20A duplex receptacles.
- Wiring - combination of conduit (EMT)/wiring and Metal-clad cabling.

Emergency Generator:
- Manufacturer - Kohler
- Fuel Source - Diesel
- Size - 50Kw -120/240volt
- Single 200Amp Automatic Transfer Switch
- Annunciator located on second floor common room.

ELECTRICAL	Interior Lighting: LED retrofit in 2018 - Truck Bay Area - 1x8 enclosed and gasketed wraparound LED luminaires with LED lamps - Common areas - 1x4 wraparoundLED luminaires with LED lamps - Emergency - LED upgrade does not appear to include emergency functions, no emergency dual head battery units observed - Exit Signs - Thermoplastic LED - White with Red letters. Exterior Lighting: - Parking Area - Pole mounted HID flood lights - Building mounted HID wall packs Lighting Controls: Upgraded as part of 2018 retofit - Occupancy and vacancy sensors with dimming wall switches - Exterior lighting is controlled via time clock. Fire Detection: - Addressable single station smoke detectors in common areas. - Wired Alarm Master Box. Security System: - none is present
HVAC	Generally, the primary components of the mechanical system have all been relatively recently replaced and are in good working condition. However, these systems are currently fossil fuel based and will be evaluated for electrification.
ACCESSIBILITY	Designated parking and accessible route are not apparent. No elevator or lift to second floor, but also not publicly accessible. The most recent Title 2 assessment noted 12 priority 1 issues and 1 priority 2 issues associated with accessible routes. In addition, there are 4 priority 3 issues associated with the restroom that should be corrected when the plumbing fixtures are replaced. These accessibility issues would need to be resolved as part of future projects as the recommendations are anticipated to exceed 30% of the cash value of the building.
CODE CONSIDERATIONS	Reroofing, overcladding, electrification, and window replacements will need to comply with the most recent energy code. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. Sprinkler protection may be triggered under the Existing Building Code Chapter 8 if the work area exceeds 50% of the floor area. This threshold is not anticipated to be triggered at this time. However, scope of work renovating the restrooms may create work areas that impact the bunk areas/R occupancy that may trigger the installation of sprinklers. The installation of an automatic sprinkler system throughout the building would impact the need to rate/enclose the egress stair.

APPEARANCE	The exterior appearance of the building is generally well kept and in good order. Interior finishes show wear, particularly level 1 flooring and level 2 ceilings.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the South Acton Historic District. It is also listed on the National Historic Register District. This may make over cladding more difficult.

South Fire

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Stairs	All or portion of stair shaft not in a rated assembly; (8) accessibility barriers associated with the stairs identified. Remove stair, modify enclosure and rebuild; provide a lift	$375,000	1
Exterior Operating Windows	Replace all windows with triple paned aluminum windows	$360,000	1
Domestic Water Distribution	Renovate restroom including: replace all plumbing fixtures, including showers; replace domestic water & sanitary sewer piping; correct (12) accessibility barriers; replace toilet partitions	$262,500	1
Priority 1 Total	3	$997,500	
Standard Slabs-on-Grade	Repair cracked slab, remove existing drains and replace with trench drain	$37,500	2
Fire Escapes	Replace fire escape	$90,000	2
Low-Slope Roofing	Replace fully adhered roofing membrane within the immediate future, install minimum of R-30 insulation	$285,000	2
HVAC	Continue preventative maintenance of existing HVAC systems.	$7,500	2
Priority 2 Total	4	$420,000	
Exterior Oversize Doors	Replace oversized door assembly	$270,000	3
Interior Doors	Replace all doors and hardware, providing appropriate clearances and hardware will resolve (19) identified accessibility barriers	$112,500	3
Acoustical Suspended Ceilings	Replace the acoustical suspended ceiling system	$52,500	3
Wall Finishes	Refinish all walls	$37,500	3
Flooring	Replace all flooring except those areas on Level 2 that have been recently replaced. Note: Abatement of existing asbestos flooring not included in price estimate.	$45,000	3
Priority 3 Total	5	$517,500	
Interiors	Correct (5) accessibility barriers associated with miscellaneous interior conditions	$19,500	4
Interiors	Correct (3) accessibility barriers associated with the kitchen	$9,000	4

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Information Specialties	Correct (4) accessibility barriers associated with building signage	$2,250	4
General Purpose Electrical Power	Install additional branch wiring for new devices where needed to support added electrical equipment	$39,000	4
General Purpose Electrical Power	Install additional new receptacles where needed to support added electrical equipment	$39,000	4
Lighting	Install/replace exterior lighting	$22,500	4
Lighting Fixtures	Replace exit signage	$7,500	4
Site	Correct (6) accessibility barriers associated with parking, exterior accessible route and building entrances	$75,000	4
Priority 4 Total	8	$213,750	
Fire Escapes	Install accessible means of egress	$90,000	5
Lighting	Replace emergency lighting system	$12,000	5
Priority 5 Total	2	$102,000	
Grand Total	22	$2,250,750	

South Fire

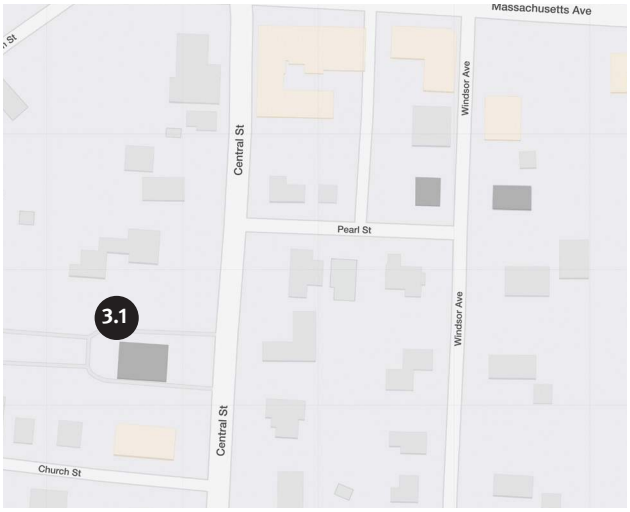
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Exterior Walls	Insulate and overclad building: 4" of continuous rigid mineral wool insulation, 1" air gap, new brick veneer	$600,000	4
Domestic Water Equipment	Replace existing gas fired domestic water heater with electric water heater.	$12,000	4
HVAC	Remove existing hot water boiler, pumps, older terminal heating equipment and associated hot water piping and controls. Provide new air source to hot water heating heat pump unit to provide hot water heating to new hot water terminal heating equipment (unit heaters and supplemental fin tube radiation heating) that can operate at a lower HW temperature of 130 deg F. Provide new hot water piping, pumps, accessories, terminal heating equipment and associated insulated hot water piping. Provide a new energy recovery ventilation unit and associated insulated ductwork distribution system to provide mechanical ventilation to the office and living areas of the building. Provide new apparatus bay unit heaters to provide additional heating requirements in addition to the existing unit heaters which can be reused. Provide new ATC/BMS controls for all new HVAC equipment and systems. The existing second floor VRF system can remain and be reused to continue to provide heating and cooling to the second floor areas.	$975,000	4
Facility Power Generation	Emergency power system will require upgrade to an exterior rated 100KW 120/208V, 3Phase generator with sound attenuated enclosure. (2) transfer switches shall be provided and a 2 hour rated room for life safety distribution shall be installed emergency lighting can be run from the new generator.	$337,500	4
Electrical Service and Distribution	Electrical service and distribution should be upgraded to a 400 amp 120/208V 3phase service.	$187,500	4
Foodservice Equipment	Install electric induction stove in place of the existing gas stove; correct (2) accessibility barriers associated with oven	$9,000	4
Grand Total	6	$2,121,000	

TIMELINE RECOMMENDATIONS

Architectural conditions are likely going to drive the need to further invest in the building prior to the anticipated end of life of the mechanical system. The roof is 26 years old and windows are original to the building - 62 years old. Both are in need of replacement within the immediate future. The interiors of the building are in generally good condition, although asbestos has not been abated and the restroom is in need of a gut renovation. Accommodating new gendered code compliant restrooms with new showers may be challenging in the given footprint. The mechanical systems should have approximately 20+ years of life on the lower level system and 11 years of life on the upper level system left. This would put them being replaced after the 2030 goal for complete electrification. Electrification will require significant exterior vertical wall upgrades. Therefore, it is recommended that electrification may want to be considered as a new build scenario and reviewed with immediate capital projects to determine most cost effective solution.

West Fire



Facilities Information

Address	256 Central Street
Department	Fire Department
Year(s) Built	1958
Gross Square Feet	5,162 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	38,878	64,430	25,552	66%
Natural Gas (Therm/yr)	2,677	-	(2,677)	-100%
TOTAL Energy Use (kBTU/yr)	400,352	219,834	(180,518)	-45%
Electric Utility Cost ($/yr)	$6,193	$10,264	$4,071	66%
Natural Gas Utility Cost ($/yr)	$2,462		$(2,462)	-100%
TOTAL Utility Cost ($/yr)	$8,655	$10,264	$1,609	19%
TOTAL Emissions (MTCO2e/yr)	24	14	-10	-42%

STRUCTURE	Slab-on-grade, major cracking in truck bay, original drains being replaced with trench drain. Load bearing CMU walls, second floor & low roof concrete planks deck, beams. Wood roof deck on second floor. Wooden storage mezzanine constructed in storage room.
EXTERIOR WALLS	Brick veneer in generally good condition, some vinyl siding on upper level. Algae growing on wall under fire escape stair. Unknown level of insulation in exterior walls, assumed to be none.
EXTERIOR OPENINGS	Single paned aluminum windows original to building and at end of life. Metal exterior doors are in adequate condition, with some rust deterioration evident. Overhead doors exhibit condensation issues.
ROOFING AND RAINWATER MANAGEMENT	EPDM roof replaced 1997 on both upper and lower roofs and nearing end of life. Mechanically fastened rigid insulation on GWB, fully adhered EPDM membrane. Roof drains on roof.
STAIRS AND VERTICAL CIRCULATION	Wood stair and handrails. Does not appear to be properly enclosed as an egress stair. Metal fire escape from second floor is in acceptable condition but exhibiting beginnings of rust deterioration. No elevator.
INTERIORS AND FINISHES	Mainly painted CMU walls, some areas with wood paneling. Painted ceiling deck and ACT spline ceilings, VCT floors.
SEALANTS AND CAULKING	Masonry joints appear to be in good condition. Sealants around windows are at end of useful life.
PLUMBING	Water Service: 2” Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: This system comprises of a 50 Gallon Storage, Natural Gas Fired, 40,000 BTU Water Heater. This heater was installed in 2009 and is near the end of useful life. Plumbing Fixtures: All plumbing fixtures appear to be original to the building and nearing the end of their useful life. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. Storm drainage piping reported to be clay tile. All piping appears to be original to the building and nearing the end of its useful life.
FOSSIL FUEL APPLIANCES	Gas stove in the kitchen on the second floor. Stove is not vented.

HEATING

A high efficiency gas boiler and hot water pumps were installed in 2019. The boiler was manufactured by Lochinvar (Model KBM 501 with 470 MBH output). This boiler provides heating hot water to unit heaters that supply the Apparatus Bay and hot water fin tube radiation heating in the office and living areas of the building. The fin tube radiation appears original to the building and in fair to poor condition. An air source VRF heat pump system also provides heating to the second floor Fire Chief room, bunk/office rooms and day room to provide heating . Piping System: Heating Hot Water piping is a combination of Steel and Copper. The majority of hot water piping appears to be original to the building and in fair condition. New boiler loop main header piping was installed in 2019. The majority of hot water piping appears to be original to the building nearing the end of its useful life. The VRF system piping is in good condition.

COOLING

The second floor Fire Chief office, bunk/office and day room areas are cooled by a VRF system that was manufactured by Trane (4 ton, R-410a refrigerant) installed in 2019. The VRF system consists of five (5) ductless indoor units that are connected to one (1) roof mounted outdoor unit. The VRF system is in good condition.

VENTILATION

Ventilation for the office and living areas of the building is achieved via windows though natural ventilation. The Janitor's Closet and First floor restroom are exhausted by exhaust fans that were installed in 2019. The Apparatus Bay has a Vehicle Exhaust System which appears to be in good condition.

CONTROLS

A DDC ATC/BMS system was installed in 2019 to control the boiler plant and VRF system.

FIRE PROTECTION

There are no Fire Protection Systems in the building.

ELECTRICAL

Electrical Service:
120/240Volt- 1Phase - 3Wire - 200Amp
Electrical Distribution:
- Direct metered
- Circuit Breaker type Panelboards
- Power distribution - 15A and 20A duplex receptacles.
- Wiring - combination of conduit (EMT)/wiring and Metal-clad cabling.

Emergency Generator:
- Manufacturer - Kohler
- Fuel Source - Diesel
- Size - 60Kw -120/240volt
- Single 200Amp Automatic Transfer Switch
- Annunciator located on second floor common room.

ELECTRICAL	Interior Lighting: LED retrofit in 2018 - Truck Bay Area - 1x8 enclosed and gasketed wraparound luminaires with LED lamps - Common areas - 1x4 wraparound luminaires with LED lamps - Emergency - LED upgrade does not appear to include emergency functions, no emergency dual head battery units observed - Exit Signs - Thermoplastic LED - White with Red letters. Exterior Lighting: - Parking Area - Pole mounted HID flood lights - Building mounted HID wall packs Lighting Controls: Upgraded as part of 2018 retrofit - Occupancy and vacancy sensors with dimming wall switches - Exterior lighting is controlled via time clock. Fire Detection: - Addressable single station smoke detectors in common areas. - Wired Alarm Master Box. Security System: - none is present
HVAC	Generally, the primary components of the mechanical system have all been relatively recently replaced and are in good working condition. However, some of the heating systems are currently fossil fuel based and will be evaluated for electrification.
ACCESSIBILITY	Designated parking and accessible route are not apparent. No elevator or lift to second floor, but also not publicly accessible. The most recent Title 2 assessment noted 11 priority 1 issues and 5 priority 2 issues associated with accessible routes. In addition, there is 1 priority 3 issue associated with the restroom that should be corrected when the restroom is renovated. These accessibility issues would need to be resolved as part of future projects as the recommendations are anticipated to exceed 30% of the cash value of the building.
CODE CONSIDERATIONS	Reroofing, overcladding, and window replacements will need to comply with the most recent energy code. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. Sprinkler protection may be triggered under the Existing Building Code Chapter 8 if the work area exceeds 50% of the floor area. This threshold is not anticipated to be triggered at this time. However, scope of work renovating the restrooms may create work areas that impact the bunk areas/R occupancy that may trigger the installation of sprinklers. The installation of an automatic sprinkler system throughout the building would impact the need to rate/enclose the egress stair.

APPEARANCE	The exterior appearance of the building is generally well kept and in good order. Cleaning of algae under fire escape needed to maintain appearance. Interior finishes show wear, particularly level 1 flooring and level 2 ceilings.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the West Acton Historic District. It is also listed on the National Historic Register District. This may make over cladding more difficult.

West Fire

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Stairs	All or portion of stair shaft not in a rated assembly; (9) accessibility barriers associated with the stairs identified. Remove stair, modify enclosure and rebuild; provide a lift	$300,000	1
Exterior Operating Windows	Replace all windows with triple paned aluminum windows	$345,000	1
Domestic Water Distribution	Renovate restroom including: replace all plumbing fixtures, including showers; replace domestic water & sanitary sewer piping; replace toilet partitions; correct (15) accessibility barriers	$195,000	1
Domestic Water Equipment	Replace existing gas fire domestic water heater with electric water heater	$4,500	1
HVAC	Install vent hood for gas stove	$10,500	1
Priority 1 Total	5	$855,000	
Standard Slabs-on-Grade	Repair cracked slab during install of trench drain	$7,500	2
Fire Escapes	Replace fire escape	$22,500	2
Exterior Oversize Doors	Install/replace oversized door assembly	$270,000	2
Low-Slope Roofing	Replace fully adhered roofing membrane within the immediate future, install minimum of R-30 insulation	$37,500	2
Sanitary Drainage	Provide new apparatus bay floor drains connecting to new exterior industrial waste holding tank	$45,000	2
HVAC	Continue preventative maintenance of existing HVAC systems	$7,500	2
Priority 2 Total	6	$390,000	
Exterior Entrance Doors	Install/replace door, Type: Metal single	$37,500	3
Interior Doors	Replace all doors and hardware, providing appropriate clearances and hardware will resolve (8) identified accessibility barriers	$36,000	3
Acoustical Suspended Ceilings	Install/replace acoustical suspended ceiling system	$54,000	3
Wall Finishes	Refinish all walls	$40,500	3
Flooring	Replace all flooring	$45,000	3
Priority 3 Total	5	$213,000	

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Interiors	Correct (9) accessibility barriers associated with miscellaneous interior conditions	$18,000	4
Interiors	Create new gear room	$337,500	4
General Purpose Electrical Power	Install additional branch wiring for new devices where needed to support added electrical equipment	$45,000	4
General Purpose Electrical Power	Install additional new receptacles where needed to support added electrical equipment	$37,500	4
Lighting	Install/replace exterior lighting	$21,000	4
Lighting Fixtures	Install/replace exit signage	$6,000	4
Site	Correct (8) accessibility barriers associated with parking, exterior accessible route and building entrances	$67,500	4
Priority 4 Total	7	$532,500	
Fire Escapes	Install accessible means of egress	$22,500	5
Lighting	Replace emergency lighting system	$12,000	5
Priority 5 Total	2	$34,500	
Grand Total	25	$2,025,000	

West Fire

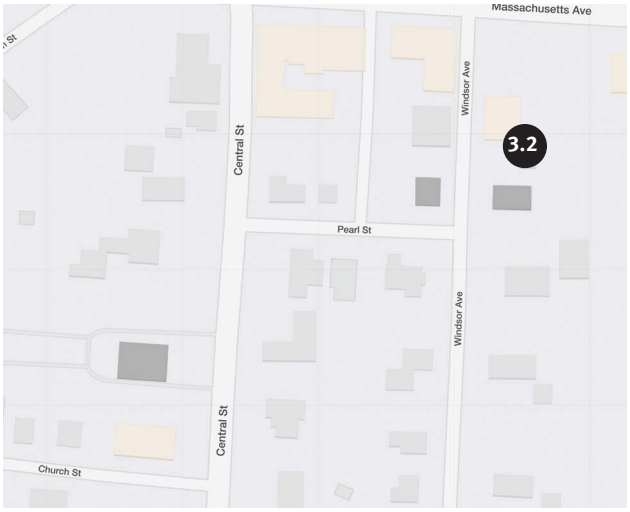
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Exterior Wall Veneer	Insulate and overclad building: 4" of continuous rigid mineral wool insulation, 1" air gap, new brick veneer	$36,000	4
HVAC	Remove existing hot water boiler, pumps, older terminal heating equipment and associated hot water piping and controls. Provide new air source to hot water heating heat pump unit to provide hot water heating to new hot water terminal heating equipment (unit heaters and supplemental fin tube radiation heating) that can operate at a lower HW temperature of 130 deg F. Provide new hot water piping, pumps, accessories, terminal heating equipment and associated insulated hot water piping. Provide a new energy recovery ventilation unit and associated insulated ductwork distribution system to provide mechanical ventilation to the office and living areas of the building. Provide new apparatus bay unit heaters to provide additional heating requirements in addition to the existing unit heaters which can be reused. Provide new ATC/BMS controls for all new HVAC equipment and systems. The existing second floor VRF system can remain and be reused to continue to provide heating and cooling to the second floor areas.	$862,500	4
Facility Power Generation	The emergency power system will require an upgrade to an exterior rated 100KW 120/208V, 3Phase generator with sound attenuated enclosure. (2) transfer switches shall be provided and a 2 hour rated room for life safety distribution shall be installed emergency lighting can be run from the new generator.	$262,500	4
Electrical Service and Distribution	Electrical service and distribution should be upgraded to a 400 amp 120/208V 3phase service.	$150,000	4
Foodservice Equipment	Install electric induction oven in place of the existing gas stove; correct (2) accessibility barriers associated with oven	$6,000	4
Grand Total	5	$1,317,000	

TIMELINE RECOMMENDATIONS

Architectural conditions and programmatic upgrades are likely going to drive the need to further invest in the building prior to the anticipated end of life of the mechanical system. The roof is 26 years old and windows are original to the building - 62 years old. Both are in need of replacement within the immediate future. The interiors of the building are in generally good condition, although asbestos has not been abated and the restroom is in need of a gut renovation. Accommodating new gendered code compliant restrooms with new showers may be challenging in the given footprint. The mechanical systems should have approximately 20+ years of life on the lower level system and 11 years of life on the upper level system left. This would put them being replaced after the 2030 goal for complete electrification. Electrification will require significant exterior vertical wall upgrades. Therefore, it is recommended that electrification may want to be considered as a new build scenario and reviewed with immediate capital projects to determine most cost effective solution.

Windsor Building



Facilities Information

Address	18 Windsor Avenue
Department	Vacant
Year(s) Built	1903
Gross Square Feet	2,952 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	14,033	25,260	11,227	80%
Natural Gas (Therm/yr)	1,436	-	(1,436)	-100%
TOTAL Energy Use (kBTU/yr)	191,526	86,187	(105,339)	-55%
Electric Utility Cost ($/yr)	$2,235	$4,024	$1,789	80%
Natural Gas Utility Cost ($/yr)	$209	$-	$(209)	-100%
TOTAL Utility Cost ($/yr)	$2,444	$4,024	$1,580	65%
TOTAL Emissions (MTCO2e/yr)	14	5	-9	-64%

STRUCTURE	Rubble foundation, lally columns and timber framing, some beams are twisting and becoming unsupported from the lally column. Wood framed walls, wood trusses and wood plank roof deck.
EXTERIOR WALLS	Wood siding, painted, with additional repainting reported as forthcoming. Insulation generally appears lacking with some batt stuffed into open cavities.
EXTERIOR OPENINGS	Single paned wood windows, with exterior storms. Rotting wood on egress stair side. Wood doors, also rotting. Wood swinging garage doors.
ROOFING AND RAINWATER MANAGEMENT	Asphalt roof replacement 2010. No rainwater management, one gutter on egress stair side planned to address water running down exterior wall.
STAIRS AND VERTICAL CIRCULATION	Residential winder stair serves basement, second floor, and attic. An exterior metal stair serves as a second egress from the second floor. Stair is not suitable for public use, no lift.
INTERIORS AND FINISHES	Unfinished concrete floor in basement, hardwood floor on first and second. Painted plaster walls and wood paneling throughout. ACT ceiling on first and second floor is beyond useful life and incomplete. New finishes will be required to bring building up to useable condition.
SEALANTS AND CAULKING	Minimal sealants at openings, at end of useful life
PLUMBING	Water Service: ¾" Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: There is Electric Water Heaters throughout the facility. These heaters appear to be old and appear to be past their useful life. Plumbing Fixtures: All plumbing fixtures appear to be past their useful life. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears to be past its useful life.
FOSSIL FUEL APPLIANCES	There is a gas stove existing in this building, though assumed non-operational. Any future appliance needs will need to be evaluated in terms of the program to be served. AST recommends the use of induction units to avoid on site combustion and fossil fuels.
HEATING	There is Natural gas furnace located in basement. The furnace is not currently in use, as the building is not currently in use.
COOLING	There are no cooling systems in the building.

VENTILATION	Ventilation is achieved through infiltration and natural ventilation through the use of operable windows. This system is currently not in use. All ductwork is sheet metal and appears to be in fair condition.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - Fed overhead from pole in street. - Direct metered. - 200Amp-1phase-3wire- 120/240volt. Electrical Distribution: - (1) 200Amp circuit breaker type panelboard - General power - 15a and 20a duplex receptacles. - Wiring - nonmetallic type wiring with metal back boxes. Interior lighting: - Surface mounted fluorescent strips and fluorescent lensed wraparound fixtures - Porcelain socket in basement. - Emergency Lighting - individual dual head battery units. - Exit Signs - None were present. Exterior Lighting: - Wall mounted incandescent sconces. Lighting Controls: - single and three-way toggle switches. Fire Alarm System: - Zoned hardwired system. (ESL 1500 series) - Exterior master box. - Smoke Detectors.
HVAC	The building is currently vacant with the heat and water turned off. The condition of the system in operation has not been evaluated, however, a certain level of investment will need to be made into this building to bring up to a functioning use. Electrification of the existing systems is evaluated to understand what would be needed to bring this building into the next phase of its' life.
ACCESSIBILITY	Designated parking and accessible route are not delineated. Many barriers identified in most recent Title 2 assessment, and it was noted that the age and historic nature of the structure will limit the ability to make this building fully compliant. Request for a waiver from MAAB should be considered.

CODE CONSIDERATIONS	Work to the exterior envelope of this building will need to conform to the newest Stretch Energy code. The future program of this building is unknown at this time. Therefore, evaluation of programmatic-related code requirements can not be evaluated. Confirmation of egress and plumbing requirements will need to be determined. In addition, it is anticipated that interior work may include the reconfiguration of interior space, triggering a Level 3 alteration. The installation of a new automatic fire sprinkler system may be required depending on building use under MEBC Chapter 8. It is anticipated that the stair may need to be replaced/rebuilt to be compliant and to be in a rated enclosure, which has been estimated in the recommendations.
APPEARANCE	The exterior appearance of the building is generally well kept, and has been recently painted with some windows in need of repair. The interior needs substantial work to bring up to a useable appearance.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the West Acton Historic District. It is also listed on the National Historic Register District.

Windsor Building

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Walls for Subgrade Enclosures	Moisture issues evident	$66,000	1
Floor Construction	Insulate the floor of the first floor	$13,500	1
Stairs	Interior egress stair appears non-compliant with current regulatory standards due to width, winders, riser height and /or tread depth. Replace stair with compliant stair and lift shown in design drawings. This would resolve (6) barriers from the accessibility report	$135,000	1
Exterior Wall Veneer	Repair rotting siding and window sills on fire escape side	$7,500	1
Exterior Wall Interior Skin	Remove existing lath and plaster/ beadboard and add cavity insulation, with a smart vapor barrier on the inside and 4" of continous mineral wool insulation, new drywall & paint	$135,000	1
Exterior Operating Windows	Replace windows	$255,000	1
Exterior Entrance Doors	Replace exterior door, wood single	$24,000	1

Windsor Building

CAPITAL RECOMMENDATIONS

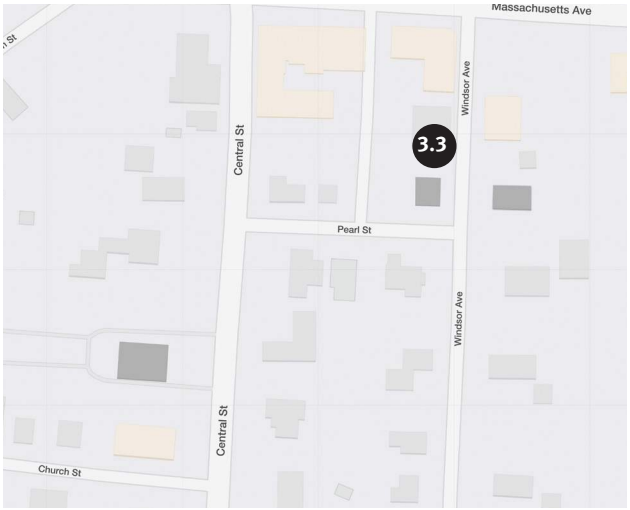
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Exterior Oversize Doors	Replace exterior door, wood oversized - hinged pair	$19,500	1
Roof Insulation & Fill	Repair and add to existing insulation to achieve R-30, add smart vapor barrier to interior side of insulation when ceiling is removed and replaced	$105,000	1
Rainwater Management	Install gutter and downspout system to direct rainwater away from washing down the exterior walls.	$10,500	1
Interior Doors	Replace interior doors and hardware, correct (5) accessibility barriers	$52,500	1
Information Specialties	Update signage program, including code required egress signage	$10,500	1
Wall Finishes	Install new drywall and paint on all walls	$165,000	1
Flooring	Replace all flooring	$94,500	1
Ceiling Finishes	Replace all ceiling finishes	$90,000	1
Domestic Water Distribution	Install/replace domestic water piping, type 1	$42,000	1
Domestic Water Distribution	Replace all plumbing fixtures	$25,500	1
HVAC	Provide new air source heat pump HVAC system to replace the existing gas fired furnace heating system, including new indoor units, outdoor units, and associated insulated piping and ductwork. Provide new energy recovery ventilation unit and insulated ductwork to provide mechanical ventilation. Provide new ATC/BMS controls and integrate into Town Wide energy management system (EMS)	$540,000	1
Electrical Service and Distribution	Upgrade service to 400Amp 120/240V single phase	$450,000	1
Lighting	Install emergency lighting system	$22,500	1
Lighting	Upgrade interior lighting to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$75,000	1
Lighting Fixtures	Install exit signage	$7,500	1
Priority 1 Total	22	$2,346,000	
Exterior Walls, Painting and Coating	Refinish/repaint	$19,500	2
Electrical Service and Distribution	Install/replace distribution and wiring system	$24,000	2

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Priority 2 Total	2	$43,500	
Domestic Water Equipment	Replace electric domestic water heater	$18,000	3
Priority 3 Total	1	$18,000	
Steep Slope Roofing	Replace asphalt shingle roofing in approximatly 12 years	$15,000	4
Interiors	Correct (4) accessibility barriers associated with miscellaneous interior conditions	$30,000	4
General Purpose Electrical Power	Replace romex cable with new MC branch circuits	$18,000	4
General Purpose Electrical Power	Upgrade and add electrical devices when upgrading branch circuits	$24,000	4
Lighting	Install/replace exterior lighting	$7,500	4
Site	Correct (22) accessibility barriers associated with parking, exterior accessible route, including exterior stairs, and building entrances	$112,500	4
Priority 4 Total	6	$207,000	
Detection and Alarm	Install/replace fire alarm system with new addressable type	$36,000	5
Priority 5 Total	1	$36,000	
Grand Total	32	$2,650,500	

TIMELINE RECOMMENDATIONS

The building is currently vacant with little use outside of book storage and the occasional book sale. The building will need a significant renovation to bring up to condition for everyday use. It is recommended that the building be electrified at the time of this renovation.

West Acton Citizen Library



Facilities Information

Address	21 Windsor Avenue
Department	Library
Year(s) Built	1815
Gross Square Feet	2,008 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	6,526	15,827	9,301	143%
Natural Gas (Therm/yr)	657	-	(657)	-100%
TOTAL Energy Use (kBTU/yr)	87,967	54,003	(33,963)	-39%
Electric Utility Cost ($/yr)	$1,040	$2,521	$1,481	142%
Natural Gas Utility Cost ($/yr)	$763	$-	$(763)	-100%
TOTAL Utility Cost ($/yr)	$1,803	$2,521	$718	40%
TOTAL Emissions (MTCO2e/yr)	5	3	-2	-40%

STRUCTURE	Rubble foundation, rough granite and lally columns in basement. Heavy timber frame construction, exposed in many locations. Wood framed roof.
EXTERIOR WALLS	Painted wood siding and trim, generally appears in good condition. Unknown level of insulation in exterior walls. No insulation at basement walls.
EXTERIOR OPENINGS	Single-pane wood with storm windows. Wood exterior doors.
ROOFING AND RAINWATER MANAGEMENT	Asphalt shingle roof, date of replacement 1998 per property card. No rainwater management. Chimneys appear to be properly flashed. Potential roof leak reported, water damage above entry but source unknown.
STAIRS AND VERTICAL CIRCULATION	Wooden stair accesses upper attic levels and basement. Not suitable for public use. Exterior granite stairs have been reset/rebuilt at public entrances.
INTERIORS AND FINISHES	Finishes are worn. Mix of carpet and wood flooring. Exposed timber floor system, with some parts containing a GWB infill. Front meeting areas have a finished GWB ceiling.
SEALANTS AND CAULKING	Minimal air sealing apparent between top of foundation wall and floor framing to above. Minimal sealants visible. Sealants at windows assumed to be at end of life due to age of units.
PLUMBING	Water Service: ¾" Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: There is a point of use Electric Water Heaters at the single sink. This heater is an unknown age and appears to be in good condition. Plumbing Fixtures: Plumbing fixtures are vitreous china and appear to be in good working condition. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears in good working condition.
HEATING	The first floor of the building is heated though a Natural Gas Furnace located in the basement. This unit was replaced in November of 2022 and is in good condition. The second floor is heated by a ductless heat pump that was installed in 2014 and manufactured by Mitsubishi (R-410A model). The ductless heat pump appears to be in good condition.
COOLING	The ground floor is cooled though a direct expansion (DX) cooling coil that is attached to the furnace. It is our understanding that the condensing unit is being replaced this Spring/Summer and will be connected to a new furnace DX cooling coil. The second floor is cooled by a ductless heat pump (2014 Mitsubishi R-410A unit) that appears to be in good condition.

VENTILATION	Ventilation for the first floor is achieved via infiltration and natural ventilation through use of operable windows. Ventilation for the second floor is achieved via natural ventilation through the use of operable windows. Ductwork System: All ductwork is sheet metal and appears to be in good condition.
CONTROLS	The HVAC equipment is controlled via stand alone electric/electronic controls.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - Building fed overhead from utility pole at street. - Direct metered - 100Amp - 1phase - 3wire - 120/240volt. Electrical Distribution: - (1) Circuit breaker type panelboard. - Power distribution - 15A and 20A duplex receptacles. - Wiring - combination of non-metallic and armored cabling. Interior lighting: - Surface mounted lensed fluorescent wraparound fixtures. - Emergency Lighting - dual head battery units. - Exit Signs - LED thermoplastic type. Exterior Lighting: - Surface mounted enclosed fixtures. Lighting Controls: - Single pole and three-way toggle type switches. Fire Alarm: - Zoned hardwired system (Fire Lite MS-50D series). - Master box. - Smoke Detectors - Manual pull stations - Horn/ strobe units.
HVAC	The major components for this mechanical system have been/will be recently replaced due to breakdown of boiler during last heating season. The boiler was replaced in kind due to emergency nature of replacement, which did not allow for electrification. Cooling system is electrified.
ACCESSIBILITY	Not handicapped accessible. May not be feasible to make all interior spaces accessible. Most recent Title 2 assesment identified 28 priority 1 and 1 priority 2 barriers. A waiver has not been requested or obtained from MAAB. It is anticipated that the $100,000 threshold for upgrading entrances, toilet rooms, drinking fountains, and public telephones will be triggered by these recommendations.

CODE CONSIDERATIONS	It is not anticipated that the scope of work would trigger major code requirements, other than the accessibility issues noted above. Reroofing and window replacements will need to comply with the current energy code. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. Vertical circulation enclosure/rating requirements should be reviewed in conjunction with accessibility requirements for the vertical circulation to determine the appropriate scope of work.
APPEARANCE	The exterior appearance is generally in good order and well kept. The interior is also well kept, but the age of the finishes is evident.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the West Acton Historic District. It is also listed on the National Historic Register District.

West Acton Citizen's Library

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Floor Construction	Deflection issues evident	$75,000	2
Floor Construction	Levelness issues evident	$67,500	2
Steep Slope Roofing	Replace asphalt shingle roofing within the immediate future, during replacement investigate potential sources of water inflitration into exteiror wall	$30,000	2
Interior Swinging Doors	Refinish/repaint door and frame	$5,250	2
Domestic Water Distribution	Install/replace sanitary sewerage piping	$30,000	2
HVAC	Continue Preventative Maintanance of existing systems.	$7,500	2
Priority 2 Total	6	$215,250	
Floor Construction	Insulate the floor of the first floor	$37,500	3
Exterior Walls, Painting and Coating	Refinish/repaint	$18,000	3
Exterior Operating Windows	Replace windows, wood double pane - Histoic considerations	$562,500	3
Exterior Door Supplementary Components	Refinish/repaint door	$1,350	3
Interiors	Perform additional air sealing	$9,000	3
Wall Finishes	Refinish all walls	$12,000	3
Flooring	Replace all flooring	$30,000	3
Ceiling Finishes	Replace all ceiling finishes	$36,000	3
Domestic Water Distribution	Install/replace domestic water piping, type 1	$30,000	3
HVAC	Replace ductless mini split at end of life	$12,000	3
Priority 3 Total	10	$748,350	
Stairs	Correct (8) accessibility barriers associated with vertical circulation and stairs. Variance request from MAAB may be required.	$600,000	4

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Interiors	Correct (6) accessibility barriers associated with interior doors and accessible route	$7,500	4
Interiors	Correct restroom dimensions for accessibility	$12,000	4
Information Specialties	Provide new signage program, including missing accessibility signage	$7,500	4
General Purpose Electrical Power	Replace romex cable with new MC branch circuits	$15,000	4
General Purpose Electrical Power	Upgrade and add electrical devices when upgrading branch circuits	$9,000	4
Lighting	Install/replace exterior lighting	$10,500	4
Lighting	Install/replace emergency lighting system	$6,000	4
Site	Provide ramp and address (17) accessibility issues associated with the exterior accessible route and parking	$147,000	4
Priority 4 Total	9	$814,500	
Lighting Fixtures	Install/replace exit signage	$2,700	5
Detection and Alarm	Install/replace fire alarm system with new addressable type	$22,500	5
Priority 5 Total	2	$25,200	
Grand Total	27	$1,803,300	

West Acton Citizen's Library

ELECTRIFICATION RECOMMENDATIONS

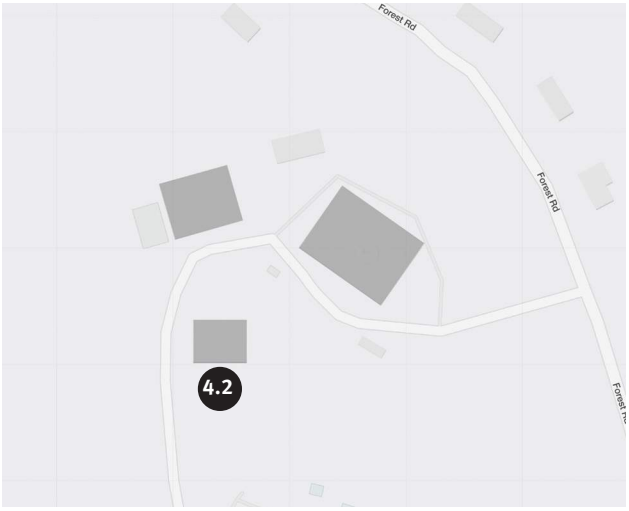
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
HVAC	Replace the existing first floor gas-fired furnace located in the basement and split AC condensing unit located on grade and replace with new air to air heat pump system including indoor air handling unit, outdoor heat pump unit, associated insulated refrigerant piping, and controls. Provide new mechanical ventilation system including new energy recovery ventilation unit with associated insulated ductwork and controls. The existing second floor heat pump can remain.	$262,500	4
Electrical Service and Distribution	Upgrade service to 400Amp 120/240V single phase	$120,000	4
Electrical Service and Distribution	Upgrade distribution system to support all electric HVAC system and connect to upgraded service equipment	$19,500	4
Lighting	Upgrade interior lighting that has not been upgraded to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$37,500	4
Grand Total	4	$439,500	

TIMELINE RECOMMENDATIONS

The mechanical systems were replaced within the last year on an emergency in-kind basis. This puts their end of life well beyond the electrification goal of 2030.

The most immediate capital investment need for this building will be to replace the roof. Electrification work could be done in two phases, the first being the new roof and exterior improvements, such as new windows and resolving accessibility barriers. Then a second phase for interior renovations and mechanical systems could follow. A variance from MAAB may need to be requested as not all accessibility barriers may be able to be resolved.

Transfer Station



Facilities Information

Address	14 Forest Road
Department	Public Works
Year(s) Built	1985
Gross Square Feet	5,525 SF
Historic District	No
On site Combustion	No
Capacity for Solar	Likely Possible

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	31,072	29,518	(1,554)	-5%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	106,018	100,717	(5,301)	-5%
Electric Utility Cost ($/yr)	$4,950	$4,702	$(248)	-5%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$4,950	$4,702	$(248)	-5%
TOTAL Emissions (MTCO2e/yr)	8	6	-2	-25%

STRUCTURE	Slab-on-grade, precast concrete foundation walls, steel long span framing. Truck pit.
EXTERIOR WALLS	Corrugated metal siding, some rusting may need to be repaired prior to repainting. No insulation
EXTERIOR OPENINGS	Windows are open fixed band on two opposite exterior walls. Doors appear nonoperational in the open position. Pigeons are nesting in the doors.
ROOFING AND RAINWATER MANAGEMENT	Corrugated metal roof, light well opening in middle of span. Insulation has completely failed and is hanging in some areas. No rainwater management.
STAIRS AND VERTICAL CIRCULATION	No vertical circulation or conveying
INTERIORS AND FINISHES	No interior finishes.
SEALANTS AND CAULKING	No sealants observed.
PLUMBING	There are no Plumbing Systems in the building.
HEATING	No heating system.
COOLING	No cooling system.
VENTILATION	There is an abandoned exhaust system in the building. This system is nonoperational. Ventilation occurs through open doors and windows.
FIRE PROTECTION	Building has a fire panel and master box. There was a fire in September 1994.
ELECTRICAL	Electrical Service: - Fed from main Public Works Garage Lighting: - 5 pendant mounted enclosed HID high bay fixtures Lighting Control: From circuit breaker in panel.
HVAC	There are no HVAC systems in the building.
ACCESSIBILITY	Appears to be compliant for its intended use. The most recent Title 2 assesment noted multiple priority 1 barriers, mostly related to the parking areas and exterior accessible route. We understand the site design will likely be reconfigured during the upcoming potential replacement of the DPW building, located on the same site. This project should address accessibility barriers as appropriate.

CODE CONSIDERATIONS

It is not anticipated that scope of work would trigger any major code compliance thresholds. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. The strucutre is unconditioned so energy code does not apply to window projects.

APPEARANCE

The exterior and interior appearance of the building is poor, but is serviceable for current use. Removal of the failed insulation and other places for roosting to discourage pigeon population could assist with the interior appearance and sanitation. Cleaning of the exterior could be a low investment, high return improvement on the appearance.

HISTORIC DISTRICT CONSIDERATIONS

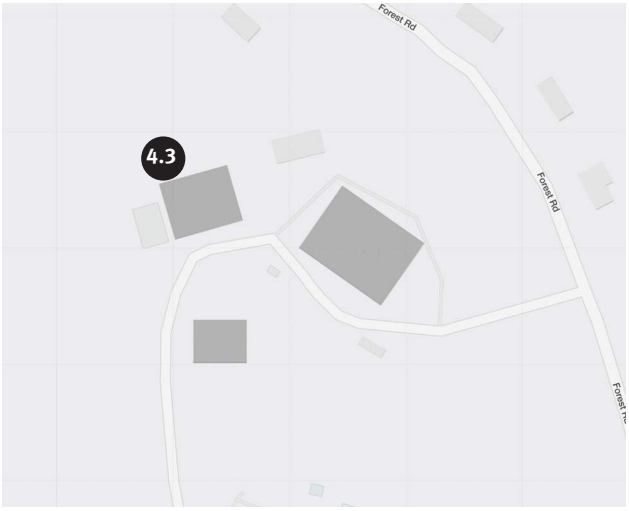
This structure is not in a Historic District.

Transfer Station

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Roof Construction Supplementary Components	Remove failed insulation and vapor retarder	$15,000	1
Exterior Walls, Metal	Cleaning	$15,000	1
Exterior Fixed Windows	Replace glazing in open window bands	$81,000	1
Exterior Oversized Doors	Remove doors and other surfaces for pigeon roosting	$15,000	1
Steep Slope Roofing	Repair/replace corrugated metal roof	$300,000	1
Priority 1 Total	5	$426,000	
Roof Construction	Leaking issues evident	$22,500	2
Electrical Service and Distribution	Install/replace distribution and wiring system	$22,500	2
Wiring Devices	Install/replace outlet	$7,500	2
Site	Correct accessibility barriers as part of site design for new DPW building	$30,000	2
Priority 2 Total	4	$82,500	
Lighting	Replace lighting with vapor tight rough service type LED lighting and provide occupancy sensors, photocell and time clock for controls	$135,000	4
Priority 4 Total	1	$135,000	
Grand Total	10	$643,500	

Salt Shed



Facilities Information

Address	14 Forest Road
Department	Public Works
Year(s) Built	2012
Gross Square Feet	10,488 SF
Historic District	No
On site Combustion	No
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	3,625	3,625	-	0%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	12,369	12,369	-	0%
Electric Utility Cost ($/yr)	$577	$577	$-	0%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$577	$577	$-	0%
TOTAL Emissions (MTCO2e/yr)	1	1	0	0%

STRUCTURE	Precast concrete walls on concrete grade, pre-engineered truss roof framing.
EXTERIOR WALLS	Precast concrete walls are unfinished, wood paneling on ends of structure. No insulation.
EXTERIOR OPENINGS	Building does not contain any operable windows or doors, except at a small shed in the rear.
ROOFING AND RAINWATER MANAGEMENT	Large gambrel style, metal corrugated roof on plywood sheathing. No insulation. Clear polycarbonate corrugated sheet skylights.
STAIRS AND VERTICAL CIRCULATION	No vertical circulation exists in the building.
INTERIORS AND FINISHES	Some protection to the interior side of the concrete wall is advisable to prevent long-term effects of salt interacting with the concrete.
SEALANTS AND CAULKING	No sealants observed.
PLUMBING	There is a water meter located in the building.
HEATING	There is no heating system.
COOLING	There is no cooling system.
VENTILATION	Natural ventilation through door openings only.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - Fed from Main Public Works service, metered separately. Interior Lighting: LED Flood lights Exterior Lighting: - LED Flood lights - Wall mounted HID wall packs Lighting Controls: - interior flood lights controlled by toggle type wall switch. - Exterior flood lights and wall packs - from DPW Garage
HVAC	There is no HVAC Systems in the building.
ACCESSIBILITY	Appears to be fully compliant for its intended uses.

CODE CONSIDERATIONS

If repairs trigger the definition of "major" per the advisory document, sprinklers may be required. The building is currently larger than the 7,500 GSF threshold. Enforcement is via the local fire department, and an exception may be feasible given the unconditioned, unoccupied nature of the building. In addition, sufficient water pressure would have to exist in order to require the installation of a automatic sprinkler system. See the code section under "Assumptions & Limitations" for a summary of the definition of "major repairs"; for more detail refer to the Advisory regarding MGL c 148 s 26G in the appendix.

APPEARANCE

The exterior and interior appearance are generally well kept and in good condition.

HISTORIC DISTRICT CONSIDERATIONS

This structure is not in a Historic District.

Salt Shed

CAPITAL RECOMMENDATIONS

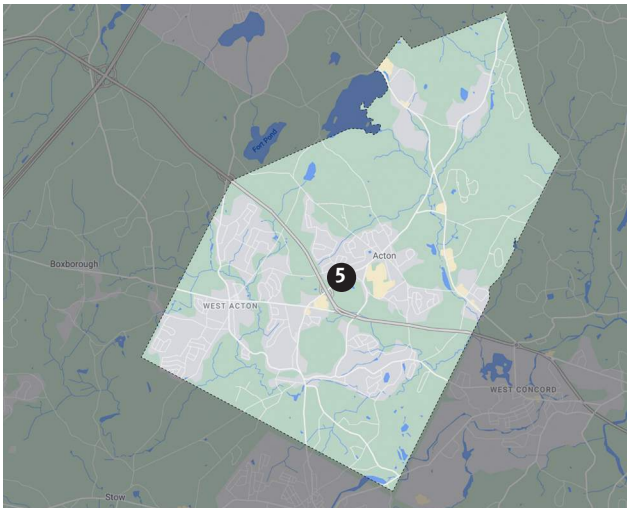
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Electrical Service and Distribution	Install/replace distribution and wiring system	$48,000	2
General Purpose Electrical Power	Install/replace all wiring devices	$60,000	2
Priority 2 Total	2	$108,000	
Exterior Wall Veneer	Replace wood siding near entrance due to vehicle damage	$12,000	3
Exterior Wall Interior Skin	Install liner or protection board over concrete walls	$60,000	3
Priority 3 Total	2	$72,000	
Steep Slope Roofing	Repair/replace corrugated metal roof	$615,000	4
Priority 4 Total	1	$615,000	
Grand Total	5	$795,000	

TIMELINE RECOMMENDATIONS

The Transfer Station and Salt Shed are already electric only, therefore, only capital recommendations have been made. This alleviates any pressure to accelerate capital repairs in order to meet electrification goals.

These recommendations could be approached in a envelope phase and an electrical work phase. As both of these buildings' electricity is fed from the DPW building, replacement of the service/ distribution and site improvements should occur concurrently with any work associated with the replacement of the DPW building.

Public Safety Facility



Facilities Information

Address	371 Main Street
Department	Police/Fire
Year(s) Built	2005
Gross Square Feet	26,033 SF
Historic District	No
On site Combustion	Yes
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	412,950	643,517	230,567	56%
Natural Gas (Therm/yr)	15,000	-	(15,000)	-100%
TOTAL Energy Use (kBTU/yr)	2,908,985	2,195,679	(713,306)	-25%
Electric Utility Cost ($/yr)	$65,783	$102,512	$36,729	56%
Natural Gas Utility Cost ($/yr)	$10,978	$-	$(10,978)	-100%
TOTAL Utility Cost ($/yr)	$76,761	$102,512	$25,751	34%
TOTAL Emissions (MTCO2e/yr)	179	137	-42	-23%

STRUCTURE	Concrete foundation, appear to be metal columns, and corrugated metal deck. Regular cracking of exterior masonry base suggests that the cast stone does not support the weight of the brick above. Differential settlement does not appear to be occurring. Monitor condition and investigate further if differential settlement or rapid deterioration begins to occur.
EXTERIOR WALLS	Brick veneer, some spots indicate discoloration due to corrosion. Base exhibits damage from snow and lawn equipment. R-19 batt insulation in exterior walls, or 2" rigid insulation on CMU load bearing walls.
EXTERIOR OPENINGS	A mixture of metal doors with correct accessible hardware, garage doors and storefront doors. New weatherstripping work is planned to be completed this summer. Glass is multi-layered for blast protection. Windows are double pane. All original to building.
ROOFING AND RAINWATER MANAGEMENT	Asphalt shingle and EPDM roof. Rainwater management is taken of by a gutter and downspout system from the shingle roof and roof drains on the EPDM. Scupper overflows in brick do not appear to be often needed. An attic air barrier and new insulation is being installed this summer.
STAIRS AND VERTICAL CIRCULATION	Metal pan stair, appear to be in conforming condition. Elevator appears compliant and serves both ground and upper floors.
INTERIORS AND FINISHES	Standard VCT, painted wall and ACT finishes in most of the corridors and public areas. A raised floor system is located in the dispatch area.
SEALANTS AND CAULKING	Most sealants appears to be in good condition, though some were observed to be damaged and/or moldy and should be replaced, primarily at sills.
PLUMBING	Water Service: 2" Service, This system appears to be original to the building and in good working order. Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. The septic tank is 3,000 Gallons. The building is supplied with a Natural Gas Service. Water Heating Systems: This system comprises of one (1) Natural Gas fired 150,000 BTU Boiler with an 80 Gallon Indirect Storage Tank, and recirculation pump. Boilers manufactured by Lochinvar model Armour, Store Tank is manufactured by Lochinvar. This system was installed in 2012 and is in good working order. Plumbing Fixtures: Fixtures in Bathrooms are vitreous China with Manual Flush Valves for Toilets and Urinals, Counter Mounted Sinks not in Bathrooms are Stainless Steel with Manual Faucets, Fixtures in the Holding Cells are Stainless Steel Institutional Fixtures with combination Toilets and Sinks. All Fixtures appear to be original to the building and in good working order. Piping System: Domestic Water Supply Piping that was observed in the building was copper. Waste and Vent Piping that was observed was Cast Iron. All piping appears to be original to the building and is in good condition.

HEATING

The building is heated by a hot water heating system that consists of two (2) natural gas fired 1,200 MBH Boilers (each boiler has four (4) 300 MBH modular sections), and associated hot water piping and heating equipment (fintube, unit hears, VAV box heating coils and AHU heating coils). The majority of the HVAC system was installed circa 2005. The boilers are atmospheric vented and were manufactured by HydroTherm. The boilers are piped with a set of primary and standby hot water pumps that distribute the heating hot water to HW heating equipment located throughout the building. This system appears to be original to the building, and the appearance of boiler piping suggests that there are frequent leaks. The 2022 Electrification Report recommend replacement of the existing boilers with two (2) Air to Water ASHP units and replacement of the existing terminal heating equipment.
Piping System: Heating Hot Water piping is a combination of Steel and Copper, this piping appears to be original to the building and in fair condition but some of the boiler piping appears to indicate past hot water system leaks.

COOLING

Cooling is provided to the building by four (4) Air Handling Units, with a total cooling capacity of approximately 18,000 CFM and 65 tons that were manufactured by York, and associated ductwork distribution systems located throughout the building. The majority of the HVAC system was installed circa 2005. Each one of these units has a direct expansion (DX) Cooling Coil and Hot Water Heating Coil. The DX coils are connected to grade mounted air cooled condensers units with insulated refrigerant piping. This system appears to be original to the 2005 building HVAC system installation and in fair condition. The 2022 Electrification Report also recommended the replacement of the existing AHUS and serving them by (2) Air to Water ASHP units. There are three (3) computer room style cooling systems located in the facility, which cool the Dispatch Center, 911 Computer Room and 2nd Floor Server Room. These computer room style units have a combined capacity of 11 tons, and appear to be original to the 2005 HVAC system installation and in fair condition. The computer room units were installed circa 2005.

VENTILATION

Ventilation is supplied to building areas by the (4) Air Handling Units. This system appears to have been installed circa 2005 and in fair condition. The building exhaust is connected to centralized exhaust fans.
Ductwork System: The Ductwork Distribution System is constructed of sheet metal ductwork. There are VAV Boxes with Hot Water Reheat Coils located though the facility for airflow and temperature Zoning Control. The ductwork appears to be original to the building and in fair condition.

CONTROLS

The majority of the building ATC/BMS controls appears to be earlier DDC controls that are original to the 2005 HVAC system installation, with a DDC front end controller manufactured by Honeywell Tridium having been installed in more recent years.

FIRE PROTECTION

8" Service, Wet System Main Building, Steel Piping. This system appears to be original to the building and in good working order.

ELECTRICAL

Electrical Service:
- 120/28Volt- 3Phase - 4Wire - 1200Amp.
- Building fed underground from utility pad- mount transformer.

Electrical Distribution:
- Main Switchboard and C.T.'s and metering
- Circuit Breaker type Panelboards
- Power distribution - 15A and 20A duplex receptacles.
- Wiring - combination of conduit (EMT)/wiring and Metal-clad cabling.

Generator:
- Manufacturer - Caterpillar
- Fuel Source - Diesel
- Size - 250Kw -120/208volt - 3phase.
- Single 1200Amp Automatic Transfer Switch.
- Generator annunciator located in Dispatch.
- Auxiliary portable generator hook-up with ATS - feeds Cell Block, 911, & Dispatch Center.

Interior Lighting:
- LED retrofit in 2019
- Exit Signs - LED type - brushed aluminum face with black housing with Red letters.

Exterior Lighting:
- Parking Area - Pole mounted LED full cut-off architectural area fixtures.
- Building surface mounted wall pack type fixtures with LED Lamps.

Lighting Controls:
- Lutromn dimming switches with occupancy sensors
- Exterior lighting is controlled via time clock.
- Corridors - Ceiling mounted occupancy sensors.
- Cell Block Area - Standard toggle switches located at control area.
- EOC - Architectural Lighting Control system (Crestron).

Fire Alarm System:
- Addressable type system.
- Wired Alarm Master Box.
- Smoke Detectors.
- Manual pull stations.
- Sprinkler flow and tamper switches.
- Duct mounted smoke detectors.
- Annunciator - Located in main lobby.

Security System:
- Access Control via card readers.
- CCTV - Camera's located inside and out.

Miscellaneous:
- Cell Block has intercom system between cell block control area and each cell.
- Motorized doors in Sallyport.
- Hydraulic Elevator.
- 20kva Liebert UPS for 911 system and Dispatch.

HVAC

Overall this mechanical system appears to be in good condition. With additional weatherization work to install an effective air barrier between the conditioned space and the attic, air leakage and system performance should improve. The boilers appears to be the first major component to be nearing end of life.

ACCESSIBILITY

Appears to be generally compliant. The most recent Title II accessibility report identified (6) barriers associated with accessible parking. The remainder appears to be relatively minor accessibility barriers associated with reach ranges and protruding objects. It is anticipated that the scope of recommendations would at least trigger the $100,000 threshold for upgrades to the entrance, toilet rooms, drinking fountains, and public telephone as applicable.

CODE CONSIDERATIONS

It is not anticipated that major code thresholds would be triggered as part of the recommended capital repairs. The building is already protected by an automatic sprinkler system. Due to its relatively recent construction, it is primarily in compliance with modern codes. Reroofing and electrification projects will need to be in compliance with the energy code.

APPEARANCE

The building's appearance is generally in good condition and well maintained although areas of discoloration and efflorescence effect the rear wing. Masonry cleaning would be recommended to maintain the good condition and appearance.

HISTORIC DISTRICT CONSIDERATIONS

This building is not in a Historic District.

Public Safety Facility

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Exterior Walls, Masonry	Replace sealant at building control joint	$4,500	1
Exterior Utility Doors	Paint at overhead door frames with rust inhibitor	$600	1
Rainwater Management	Add coping/gutter to divert water to lower roof at building mass step with current water infiltration	$10,500	1
HVAC	Continue to provide preventative maintenance for existing HVAC systems.	$7,500	1
Priority 1 Total	4	$23,100	
Exterior Walls, Masonry	Replace coping cap causing corrosion	$6,750	2
Exterior Walls, Masonry	Monitor cracking in base, investigate if differential settlement starts to occur	$6,000	2
Exterior Windows	Replace window sealant in areas of needed repair	$15,000	2
Rainwater Management	Cleanout gutters/downspouts	$4,500	2
HVAC	In order to electrify the existing building HVAC heating system that is gas fired boilers, hot water terminal heating equipment and air handling unit systems should be removed and replaced with a new all electric heating HVAC system. During the project renovation design process, we recommend that several HVAC system replacement options be studied as part of a lifecycle cost analysis. We concur with the majority of the 2022 Salas O'Brien report recommendations for HVAC system electrification for this building. Within this report it is recommended that two (2) new air source to hot water heat pump units (2 units @ approx. 90 tons each) and a supplemental electric boiler (680 MBH) are installed to replace the gas boilers and rooftop unit gas fired heating systems. The ASHPs provide low temperature hot water (approx. 130 deg F) to new building terminal heating equipment and air handling units. New hot water pumps and accessories would also need to be provided, and the existing terminal heating equipment (fintube, unit heaters, VAV heating coils) and air handling units would need to be replaced as additional heating areas is required for low temperature hot water heating. We also recommend that a supplemental electric boiler be provided to	$3,000,000	2

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
HVAC, cont.	provide backup and additional heating required for peak loads. The majority of the existing ductwork and hot water piping systems could be re-used but should be cleaned and pressure tested. New ductwork and piping would need to be provided to connect to new HVAC equipment. The replacement AHUs should also be provided with energy recovery ventilation for improved energy savings. This would also allow the majority of existing general exhaust fan systems to be connected to the new energy recovery system. The existing computer room units (total 11 tons cooling) should also be replaced as they are nearing the end of their expected service life. We recommend that a new ATC/ BMS system be installed to control all new and existing remain HVAC systems and be integrated into a Town Wide EMS.	$225,000	2
Facility Power Generation	Replace emergency generator with a new 350kW, 208/120 V, 3-phase, 4-wire generator	$645,000	2
Priority 2 Total	7	$3,902,250	
Exterior Walls, Masonry	Cleaning & Repointing	$75,000	3
Battery Equipment	Replace battery equipment, 20KVA UPS	$30,000	3
Site	Correct (6) accessibility issues associated with the exterior accessible route and parking	$75,000	3
Priority 3 Total	3	$180,000	
Exterior Entrance Doors	Install/replace door, Type: Metal pair	$9,450	4
Exterior Utility Doors	Install/replace door, Type: Metal single	$6,750	4
Steep Slope Roofing	Replace asphalt shingle roofing in approximately 7 to 12 years	$187,500	4
Low-Slope Roofing	Replace mechanically fastened roofing membrane in approximately 7 to 12 years	$195,000	4
Interiors	Correct (14) accessibility barriers associated with the toilet and locker rooms	$75,000	4
Interiors	Correct (13) accessibility barriers associated with accessible reach ranges and clearances in publicly accessible interior locations	$22,500	4
Wall Finishes	Refinish all walls	$195,000	4

Public Safety Facility

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Flooring	Replace all flooring	$465,000	4
Ceiling Finishes	Replace all ceiling finishes	$712,500	4
Priority 4 Total	9	$1,868,700	
Facility Power Generation	Add second transfer switch and 2 hour rated room, capture and extend existing emergency lighting circuits and feed from new life safety lighting panel	$2,400,000	5
Priority 5 Total	1	$2,400,000	
Grand Total	24	$8,374,050	

ELECTRIFICATION RECOMMENDATIONS

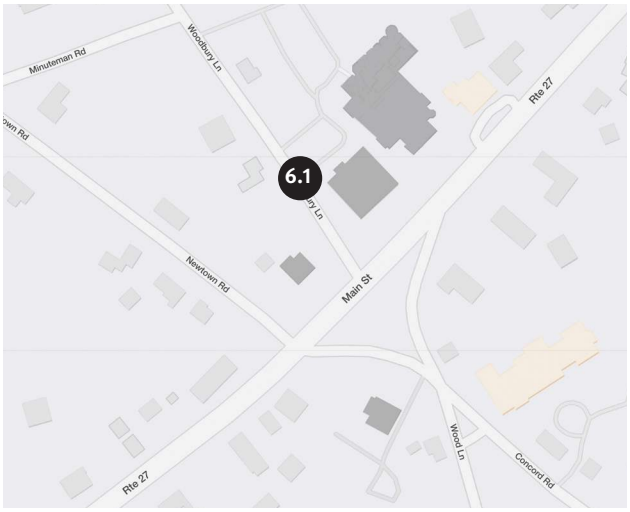
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
HVAC	Replace missing insulation on hot water piping	$187,500	4
Total	1	$187,500	

TIMELINE RECOMMENDATIONS

The 2022 Salas O'Brian report recommended that this building be electrified by 2025 ahead of both the Town Hall and Memorial Library. This recommendation was based on Acton Facilities team's indication that the mechanical systems may be nearing the end of their life due to an increased need for maintenance. In 2025, the boiler will be 21 years old and the roof will be 20 years old.

However, based on the issues with the mechanical system present at Town Hall, it is recommended that Town Hall takes priority, if they can't be done at the same time, as the systems at the Public Safety Facility appear to be in working condition with no health concerns.

Town Hall



Facilities Information

Address	472 Main Street
Department	Municipal Offices
Year(s) Built	1864/1988
Gross Square Feet	24,144 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	135,200	228,530	93,330	69%
Natural Gas (Therm/yr)	8,987	-	(8,987)	-100%
TOTAL Energy Use (kBTU/yr)	1,360,002	779,743	(580,259)	-43%
Electric Utility Cost ($/yr)	$21,537	$36,405	$14,868	69%
Natural Gas Utility Cost ($/yr)	$5,368	$-	$(5,368)	-100%
TOTAL Utility Cost ($/yr)	$26,905	$36,405	$9,500	35%
TOTAL Emissions (MTCO2e/yr)	80	49	-31	-39%

STRUCTURE	Foundation is a combination of slab-on-grade, and subgrade walls. Foundation walls are a combination of rubble, brick and poured concrete (done in 1986). The adjacent floors are wood framed with wood deck. Roof is a combination of wood truss and sheathing in main building, sloped deck and tapered insulation in adjacent areas.
EXTERIOR WALLS	Wood siding, recently painted with some areas exhibiting areas of premature peeling, possibly due to moisture within the wall. Wood walls were estimated to have a U-value of .05 and cement foundation walls to have a U-value of .15 in 2011, although it is unclear how .05 could have been obtained for the wall and we assume that this value is incorrect.
EXTERIOR OPENINGS	Windows are wood single-pane with exterior storm units, it was reported that they shake violently in the wind. Windows were estimated to have a U-value of .66 and a SHGC of .59 in 2011. Main St. door is historic wooden, no recent weatherstripping, rear entrance door installed in 1987.
ROOFING AND RAINWATER MANAGEMENT	Slate shingles on main building, asphalt shingles in rear, EPDM on adjacent sides. Slate portion, 2006, Asphalt shingle portion, 2013, Flat roof, 2000. Town Hall bell equipment ($17K) 2012. Skylights on North wing capped over with roofing during 2015 renovations, still open on south side. EPDM roof portion reported to suffer from frequent punctures.
STAIRS AND VERTICAL CIRCULATION	Two stairs serve as egress stairs. Carpet finish may not be appropriate for its use. Egress path issues are present, and the stairs are not in a fire rated enclosure. Elevator serves all floors including top-most level, but is not sized for an ambulance stretcher.
INTERIORS AND FINISHES	Ceilings are mixed lath/plaster, ACT, and painted gypsum. Walls are primarily painted gypsum. Floors are mixed carpet, VCT, and wood in renovated wing. Stairs are carpeted and is 4.5 years old (from ground to 3rd floor). All other carpet is beyond useful life. Many ceiling tiles exhibit damage from condensation issues and from being moved multiple times.
SEALANTS AND CAULKING	Minimal sealants visible. Sealants at windows assumed at end of life due to level of air movement felt against hand.
PLUMBING	Water Service: 1 ½" Service, This system appears to be older and nearing the end of its useful life. Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. The building is supplied with a Natural Gas Service. Water Heating Systems: This system comprises of an electric water heater. Water Heaters is 40 gallon storage and 4.5 KW Input. This unit appears to be newer and in good working condition. Plumbing Fixtures: Fixtures in bathrooms are vitreous china with manual flush valves for toilets and urinals. Counter mounted sinks not in bathrooms are

PLUMBING	stainless steel with manual faucets. All fixtures appear to be in good condition. Piping System: Domestic water supply piping that was observed in the building was copper. Waste and vent piping that was observed was cast iron. All piping appears to be in good condition but nearing the end of its useful life.
FOSSIL FUEL APPLIANCES	Multiple kitchenettes in building, no stove/ovens
HEATING	The building heating system includes one (1) Natural Gas fired boiler with 491MBH input/ 396 MBH output capacity that was manufactured by Weil McLain (Model 480). The boiler is atmospheric vented. The boilers are piped with a primary-standby set of pumps to distribute the heating water to the building heating equipment located throughout the building. The majority of spaces are heated by 2-pipe heating and cooling fan coil units. The heating and cooling system is 2-pipe seasonal change-over system. It is our understanding that the boiler was installed circa 2008, and is in fair condition. The majority of the heating system equipment and piping was installed in 1987 and is nearing the end of its useful expected service life. In addition, a small air source variable refrigerant flow (VRF) heat pump system installed in 2015 serves the North Wing.
COOLING	The building is cooled by an air cooled split chiller plant. There is a single split 40 ton evaporator chiller located in the ground floor mechanical room, and the condenser unit is located outside on grade. The indoor and outdoor chiller units (which were manufactured by Trane) and associated inter-connecting refrigerant piping was installed in 2015 to replace the original equipment and interconnecting refrigerant piping. The chiller appears to be in good condition. Some of the refrigerant piping covers have been damaged and should be repaired. Chilled water is piped to the 2-pipe heating and cooling fan coil units located throughout the building. Primary and standby chilled water pumps with EC motors that were installed in 2015 distribute the chilled water to the fan coil units. It is our understanding that indoor air quality issues are experienced in cooling mode due to lack of humidity control within the building and condensation. In addition, a small air source variable refrigerant flow (VRF) heat pump system installed in 2015 serves the North Wing.
VENTILATION	Ventilation for the building is achieved through a combination of natural ventilation through the use of operable windows for perimeter areas and fan coil unit ventilators with ducted fresh air ducts that were intended to provide fresh air to the interior areas of the building. These units were installed in 1987 and are in poor condition and are past their useful life. These units also do not appear to provide sufficient code required ventilation for the building (Per 2011 report by RDK Engineers). There are roof mounted exhaust fans that provide exhaust ventilation for the building. New air purifiers for at least the ground floor are planned to be installed in order to improve air quality concerns.

VENTILATION	We concur with the 2011 RDK Report also noted that the lack of outdoor air ventilation from the unit ventilators combined with excess exhaust airflow from the fans can also result in a negative pressurization of the building. Excessive Negative pressurization can lead to increased HVAC energy consumption and building envelope issues.
CONTROLS	The building HVAC systems are controlled by a combination of newer DDC controls for the chiller plant and older Electric/electronic controls for the heating plant and terminal heating/cooling units.
FIRE PROTECTION	6" Service, Wet System. This system appears to older and nearing the end of its useful life.
ELECTRICAL	Electrical Service: - Building fed underground from utility pad mount transformer - 277/480Volt- 3Phase - 4Wire - 600Amp. Electrical Distribution: - CT's and Metering - Circuit Breaker type Panelboards - Power distribution - 15A and 20A duplex receptacles. - Wiring - combination of conduit (EMT)/wiring and Metal-clad cabling. Generator: - Manufacturer - Katolight - Fuel Source - Diesel - Size - 50Kw -120/208volt - 3phase - 4wire - Single Automatic Transfer Switch - Annunciator located on upper level lobby. - Exterior above ground fuel tank. - Day Tank. Interior Lighting: - 2016 and 2018 LED retrofits are reported to have covered entire building. - Emergency - Dual Head battery units. - Exit Signs - Thermoplastic LED - White with Red letters. Exterior Lighting: - Parking Area - Pole mounted HID flood lights - Building mounted HID wall packs Lighting Controls: - Standard toggle switches - Exterior lighting is controlled via time clock. Fire Alarm System: - Zoned Hardwired type system. (Simplex) - Wired Alarm Master Box. - Smoke Detectors. - Manual pull stations.

- Sprinkler flow and tamper switches.
- Duct mounted smoke detectors.
- Annunciator - Located in main lobby.

HVAC

There are fan coil units throughout the building to heat & cool the spaces. These units appear to be nearing the end of their useful life.
Piping System: Heating Hot Water and Cooling Chilled Water piping is a combination of Steel and Copper, this piping appears to be original to the building. The chilled water piping in the mechanical room show lots of corrosion and needs to be replaced. Most of the piping in the building appears to be in good condition but nearing the end of its useful life. Pipe insulation throughout the building is affected by mold and should be replaced.
Summary: Air quality and thermal comfort issues appear to be major concerns at this building. Lack of humidity control, negative pressurization, stack effect, and down drafts from poor thermal envelope noted in 2011 report all contribute to these issues. The 2022 Electrification Roadmap recommended replacement of the boiler and chiller with (2) ASHPs. This approach alone is unlikely to resolve the air quality issues present at the building.

ACCESSIBILITY

Appears to be significantly in compliance. Attention may be needed relative to the designated parking spaces and the slopes of the walkway to the building. The most recent Title 2 assessment noted 11 priority 1 and 8 priority 2 barriers. It is anticipated that the electrification project may exceed the 30% trigger of the value of the building, requiring the full upgrade to the building.

CODE CONSIDERATIONS

Code/Life safety issues were flagged in the 2011 report for having refrigerant in the same room as the boiler. The refrigeration system wants a leak detection and exhaust system which would be in conflict with the operation of the boiler. A detailed code review of mechanical requirements that are not in compliance was not performed. This condition should be evaluated as part of future mechanical upgrades.
Reroofing and window replacement projects will need to comply with the new energy code. Repair to the exterior walls can be performed without requiring them to also meet the new energy code due to Historic Building exemptions. The building is already served by an automatic sprinkler system. Due to the modification of the HVAC system, renovations would be considered at least a level 2 alteration. The main egress stair has doors that swing into the landing create a code issue regarding clearances and flow of egress. The correction of the door would be triggered by either (1) the condition is cited as “hazardous” by the building official or (2) the Level 2 or 3 alteration to upgrade the mechanical system AND the door serves a work area or exit path from the work area with an occupant load greater than 50 (MEBC 805.4.2). In addition the Level 2 or 3 alteration would trigger the need to enclose and potentially rate this main egress stair in the 1988 portion of the building. The full scope of work to these stairs should be considered and designed with resolving the accessibility, egress, and life safety issues at once.

APPEARANCE	The appearance of the building is generally good. The building has been recently painted and is kept in good repair. Minor repainting is peeling areas will be needed to maintain the appearance of the building.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the Acton Center Historic District. It is also listed on the National Historic Register District.

Town Hall

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Stairs	Egress stair appears non-compliant with current regulatory standards due to width, winders, riser height and /or tread depth. (2) accessibility barriers flagged	$450,000	1
Stairs	All or portion of stair shaft not in a rated assembly	$105,000	1
Ceiling Finishes	Clean entire above ceiling area affected by mold as recommended in the February 2023 air quality report; Remove & replace mold damaged materials including drywall & pipe insulation (above ceiling)	$150,000	1
HVAC	Install temporary measures such as installing portable filter units, dehumidifiers and/or repair the existing fresh air fan coil unit ventilators to improve indoor air quality.	$480,000	1
Priority 1 Total	4	$1,185,000	
Exterior Wall Interior Skin	Investigate extents of any damaged or compromised insulation, replace (include repair/replacement of smart vapor barrier); Repair drywall in areas where fan coil units have been removed and replaced	$75,000	2
Low-Slope Roofing	Replace fully adhered roofing membrane within the next few years	$510,000	2
Low-Slope Roofing	Consider installation of a green roof tray system to protect low slope roof, this will impact amount of allowable snow drifting	$600,000	2
Ceiling Finishes	Replace all ceiling finishes	$450,000	2
Domestic Water Distribution	Install/replace domestic water piping, type 1	$450,000	2
HVAC	Continue preventative maintenance of existing HVAC systems	$45,000	2
Priority 2 Total	6	$2,130,000	
Exterior Walls, Painting and Coating	Refinish/repaint	$465,000	3
Exterior Operating Windows	Replace windows, wood double pane - Historic considerations	$1,950,000	3
Exterior Entrance Doors	New weatherstripping on main Historic door	$6,000	3
Interior Partition Supplementary Components	Install 4” of rigid mineral wool insulation between addition and original building attic to form a continuous thermal boundary	$7,500	3

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Interior Doors	Replace all doors and hardware, resolves (1) accessibility barriers	$412,500	3
Wall Finishes	Refinish all walls	$135,000	3
Flooring	Replace all flooring	$270,000	3
HVAC	The existing HVAC system should be removed and replaced with a new all electric heating HVAC system, in order to electrify the heating system. During the project renovation design process, we recommend that several HVAC system replacement options be studied as part of a lifecycle cost analysis. We concur with the 2022 Salas O'Brien report recommendations for HVAC system electrification for this building. This potential replacement option would be to replace the existing gas fired boiler plant and air cooled chilled plant with a new air source to hydronic hot and chilled water heat pump system that would provide low temperature hot water (approx. 130 deg F) and chilled water to building terminal heating and cooling fan coil units. The existing terminal heating and cooling units would need to be replaced as they are in poor condition and past their useful service life. In addition, increased heating element is required for lower temperature hot water heating. It is also recommended that the existing 2-pipe dual temperature piping is flushed, cleaned and pressure tested. Consideration should be given to upgrading from a 2-pipe to a 4-pipe fan coil unit system.	$3,750,000	3
HVAC	The existing ductwork should be replaced with new. Existing exhaust fan system should also be replaced, and the general exhaust air systems shall be connected to the new energy recovery system. A new energy recovery ventilation system should also be installed to provide mechanical ventilation to all occupied building areas. The existing ductless split AC heat pump system in the North wing could potentially remain. A new ATC/ BMS system should be installed to control all new and existing to remain HVAC system and should be integrated into a Town Wide EMS.	$1,050,000	3
Fire Suppression	Replace sprinkler system	$262,500	3

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Facility Power Generation	Replace generator with a 150KW 120/208V exterior generator within a sound attenuated enclosure	$375,000	3
Electrical Service and Distribution	Upgrade service to 1200Ampere 120/208V, 3phase 4wire	$450,000	3
Priority 3 Total	12	$9,133,500	
Steep Slope Roofing	Repair/replace slate tiles	$3,000,000	4
Roof Specialties	Repair/maintain roof specialty, bell equipment	$75,000	4
Interior Specialties	Correct accessibility barrier at Finance Wing service counter	$10,500	4
Information Specialties	Wayfinding signage is inadequate, provide new signage program which would resolve (5) ADA barriers flagged	$7,500	4
Domestic Water Distribution	Replace all plumbing fixtures, resolve all (18) ADA barriers associated with plumbing fixtures and restroom layout	$187,500	4
General Purpose Electrical Power	Install additional branch wiring for new devices where needed to support added electrical equipment	$150,000	4
General Purpose Electrical Power	Install additional new receptacles where needed to support added electrical equipment	$75,000	4
Lighting	Install/replace exterior lighting to LED dark sky compliant type	$37,500	4
Site	Correct (8) accessibility issues associated with the exterior accessible route and parking	$97,500	4
Priority 4 Total	9	$3,640,500	
Floor Construction	Deflection issues evident	$37,500	5
Facility Power Generation	Install/replace emergency power system	$600,000	5
Facility Power Generation	Add second transfer switch and 2 hour rated room, capture and extend existing emergency lighting circuits and feed from new life safety lighting panel	$225,000	5
Priority 5 Total	3	$862,500	
Grand Total	34	$16,951,500	

Town Hall

ELECTRIFICATION RECOMMENDATIONS

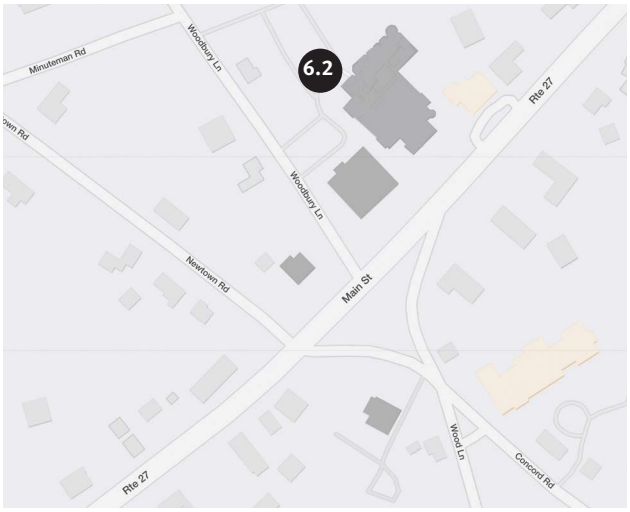
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Perimeter Insulation	Complete insulation at foundation wall in areas where new insulation has gaps, combination of board cut to fit and spray around obstructions	$6,000	4
Perimeter Insulation / Exterior Walls, Veneer	Insulate slab edge with new 4" rigid insulation, provide new composite trim cladding to protect	$75,000	4
Electrical Service and Distribution	Upgrade distribution system to support all electric HVAC system and connect to upgraded service equipment	$142,500	4
Total	3	$223,500	

TIMELINE RECOMMENDATIONS

The 2022 Salas O'Brian report recommended that this building be electrified by 2028 between the Public Safety Facility and Memorial Library. This recommendation was based on current equipment's expected end of life in 2038, but accelerated to meet the Town's goal of being fully electrified by 2030.

Based on current fresh air and air quality issues, it is recommended that these buildings be reversed in their prioritization. It is recommended that Town Hall's renovation & electrification be approached as a comprehensive project that studies the envelope, programmatic needs, mechanical issues, and accessibility as a whole.

Memorial Library



Facilities Information

Address	486 Main Street
Department	Library
Year(s) Built	1899/1997
Gross Square Feet	48,259 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	Likely Possible

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	383,112	569,883	186,771	49%
Natural Gas (Therm/yr)	18,490	-	(18,490)	-100%
TOTAL Energy Use (kBTU/yr)	3,156,178	1,944,439	(1,211,739)	-38%
Electric Utility Cost ($/yr)	$61,030	$90,782	$29,752	49%
Natural Gas Utility Cost ($/yr)	$13,034	$-	$(13,034)	-100%
TOTAL Utility Cost ($/yr)	$74,064	$90,782	$16,718	23%
TOTAL Emissions (MTCO2e/yr)	191	121	-70	-37%

STRUCTURE	Original portion has a rubble stone foundation, brick columns, and timber framing. Newer addition's foundation is poured concrete, with steel beam and metal deck with poured concrete floor and roof decks.
EXTERIOR WALLS	Original portion is brick and limestone. The addition is brick veneer w. metal panel at bay windows. 1997 addition has 6" batt insulation in cavity walls, with 2" foundation wall insulation. There are frequent thermal gaps at slab edges. Areas of water infiltration are evident.
EXTERIOR OPENINGS	Openings are a mixture of operable and fixed window units. The original 1886 portion of the building appears to have fixed single-pane units with exterior storms. The 1997 addition has double plane IGU's in double hung windows and 4 curtain wall "bay" units that contain tempered glass. Some of the bay units need resealing and show evidence of water infiltration. The entrance has been relatively recently replaced with a swinging double door. The original historical door at the front of the building.
ROOFING AND RAINWATER MANAGEMENT	Original portion slate shingle roof. 1997 addition is made of built-up EPDM roof, tapered insulation (4"), and slate shingle on exposed (visible) sides. Roof was replaced in 2018. Rainwater collects in copper downspouts at valleys, copper gutters at low eaves. Additional attic insulation and air sealing occurred in 2022, this required venting of the slate roof (confirm this occurred).
STAIRS AND VERTICAL CIRCULATION	Atrium stair is comprised of carpeted wood treads on metal pan stair, ornamental metal handrails. A concrete metal pan stair leads to the basement. One ladder leads up to the roof hatch. Elevator stops at Upper Level, Lower Level, and Lower Level Rear (Staff only). Controls appear to be accessible and properly labeled.
INTERIORS AND FINISHES	Floors: Primarily carpet or VCT. Carpet nearing end of life. Walls: Primarily painted GWB or painted/stained wood panel. Ceilings: Primarily ACT or painted GWB Issues with groundwater seeping up through the slab on grade on the ground floor were reported.
SEALANTS AND CAULKING	Some joints & caulking are in poor condition and need repair at the 1997 addition - particularly at the North and West facades on the lower level. Some repointing and cleaning at the original 1889 building underway at the time of the visit.
PLUMBING	Water Service: 1 ½" Service, This system appears to be in good working order. Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. The building is supplied with a Natural Gas Service. Water Heating Systems: This system comprises of an electric water heater and recirculation pump. Water Heaters is 50 gallon storage and 4.5 KW Input.

PLUMBING

Plumbing Fixtures: Bathroom fixtures are vitreous China with Manual Flush Valves for Toilets and Urinals, Counter Mounted Sinks not in Bathrooms are Stainless Steel with Manual Faucets. All Fixtures appear to be in good working order, however, potential water pressure issues were observed on the main level drinking fountains.
Piping System: Domestic Water Supply Piping that was observed in the building was copper. Waste and Vent Piping that was observed was Cast Iron. All piping appears to be in good condition.

FOSSIL FUEL APPLIANCES

No gas appliances are located in this building

HEATING

The heating system comprises of one (1) Natural gas fired 1,876 MBH Boiler. The boiler is a standard 80% efficiency cast iron sectional boiler which is atmospheric vented and was manufactured by Burnham. The boiler experienced a leak and the damaged sections were replaced in 2017 and a new burner in November 2018. The boilers are piped with a set of primary/ standby hot water pumps that distribute the heating water to HW heating equipment (fintube radiation, unit heaters, VAV box heating coils) located throughout the building. The hot water boiler and associated HW heating equipment appear to be in fair condition. Piping System: Heating Hot Water piping is a combination of Steel and Copper, this piping appears to be original to the building and in good condition. All piping appears to be in good condition. In addition, there are (4) Rooftop units installed in 2018 which provide an additional 1,332 MBH of heating. The RTUs appear to be in good condition.

COOLING

Cooling for the building is provide by packaged direct expansion (DX) cooling and gas fired heating rooftop units. The RTUs have a combined cooling capacity of 102 tons. The RTUs were installed in 2018 and appear to be in good condition. Auxiliary Cooling Systems: There is a computer room style cooling systems located in the basement serving the server and electrical room. This unit appears to be in good condition.

VENTILATION

Ventilation for the building is supplied though the Rooftop Units that serve the building.
Exhaust Systems: The building exhaust is connected to centralized exhaust fans, with the majority of exhaust fans being roof mounted.
Ductwork System: The Ductwork Distribution System compress of sheet metal ductwork. A celling cavity return air plenum is utilized for return air back to the RTUs. There are variable air volume (VAV) Boxes with Hot Water Reheat Coils located though the building for airflow and temperature zone control. The ductwork appears to be in good condition.

CONTROLS	The original ATC system was recently replaced with a direct digital DDC controls system (Johnson Control FX-80 Niagara 4 Web Supervisor system installed by FX Automation, ATC Contractor) in 2020. The new ATC system appears operational and in good condition, and that no major thermal comfort issues have been reported. However, one RTU unit is reported to throw a high temperature lock out during heating mode. It is our understanding that the previous ATC system was a Siemens Apogee system which is no longer supported.
FIRE PROTECTION	6" Service, Wet & Dry System, Two (2) zone valves, this system appears to be in good working condition.
ELECTRICAL	Electrical Service: - 120/28Volt- 3Phase - 4Wire - 1600Amp. - Building fed underground from utility pad- mount transformer. Electrical Distribution: - Main Switchboard and C.T.'s and metering - Circuit Breaker type Panelboards - Power distribution - 15A and 20A duplex receptacles. - Wiring - combination of conduit (EMT)/wiring and Metal-clad cabling. Generator: - Manufacturer - Caterpillar - Fuel Source - Diesel - Size - 125Kw -120/208volt - 3phase. - (1) 400a Automatic Transfer Switch & (1) 100A Automatic Transfer Switch. Interior Lighting: Lighting upgrade occurred in 2020, lamps updated to LED - Common Areas: - Recessed open downlights - Vaulted Ceilings - Recessed open downlights & wall mounted indirect fixtures. - Track lighting for displays. - Office - 2x2 recessed lensed troffers - Stack Areas - Pendant direct/indirect and pendant indirect fixtures - Utility spaces - 1x4 surface/pendant enclosed fluorescent fixtures - Toilet rooms- recessed open downlights and wall mounted direct/indirect fixtures. - Stairwells - Surface wall mounted wraparound fixtures. - Exit Signs - LED type - thermoplastic housing with Red letters. Exterior Lighting: - Parking Area - Pole mounted LED full cut-off architectural area fixtures. - Building - surface mounted wall pack type fixtures with LED Lamps.

ELECTRICAL	Lighting Controls: - Standard toggle switches with occupancy sensors. - Lighting Control panels and low-voltage switches for common areas. - Exterior lighting is controlled via photocell. Fire Alarm System: - Addressable type system. - Wired Alarm Master Box. - Smoke Detectors. - Manual pull stations. - Sprinkler flow and tamper switches. - Duct mounted smoke detectors. - Annunciator - Located in main lobby. Security System: - Access Control via card readers. - CCTV - Camera's located inside and out. - Intrusion Alarm System. Miscellaneous: - Hydraulic Elevator. - 30kva Emerson UPS for Telecommunication System.
HVAC	The mechanical system appears to be well maintained and functioning as intended. No major thermal comfort issues are apparent. The 2022 Electrification Roadmap recommends replacement with (2) ASHPs and a supplementary electric boiler for peak heating loads.
ACCESSIBILITY	Appears to be significantly in compliance. Attention to the outdoor walkways and playground area may be needed in the future. (4) accessibility barriers related to the restrooms. In addition, it is anticipated that the scope of recommendations would at least trigger the $100,000 threshold for upgrades to the entrance, toilet rooms, drinking fountains, and public telephone as applicable.
CODE CONSIDERATIONS	Window replacement will need to comply with the energy code. No major code thresholds are anticipated to be triggered by the recommended scope of work. The building is already protected by an automatic sprinkler system. The electrification project would trigger a Level 2 alteration, and the vertical opening rating requirements. However, it is anticipated that an exception can be identified due to the fact that both levels egress to grade, the building is protected by a sprinkler system, and the addition is relatively recent construction and built under similar code standards; therefore, the stair will not need to be enclosed and rated.
APPEARANCE	The appearance of the building is well maintained. Some efflorescence and water damage affects the North facade.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the Acton Center Historic District. It is also listed on the National Historic Register District.

Memorial Library

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Roof Construction	Active or inactive water infiltration evident at North facade	$30,000	1
Exterior Operating Windows	Replace all windows in 1997 portion of building within the immediate future	$1,050,000	1
Exterior Window Wall	Replace spandrel and reseal glass units at bay windows along West façade (both levels), some glass units also need to be replaced	$30,000	1
Exterior Entrance Doors	Door width within a masonry-framed opening requires modification	$22,500	1
Exterior Louvers and Vents	Vent attic per RISE Engineering Air Sealing and Insulation Recommendations dated March 23, 2021 to provide at least 368.64 net free square inches of intake and exhaust each	$37,500	1
Ceiling Finishes	Replace water damaged ceiling	$25,000	1
Priority 1 Total	6	$1,195,000	
Under slab Drainage	Investigate solutions for below slab water infiltration near west entrance	$112,500	2
HVAC	Continue providing preventative maintenance for existing HVAC systems.	$7,500	2
Battery Equipment	replace batteries and service the 30KVA UPS system for town wide Technology Equipment. Mfr - Leibert	$15,000	2
Priority 2 Total	3	$135,000	
Exterior Fixed Windows	Replace storm units on 1886 portion of building	$105,000	3
Acoustical Suspended Ceilings	Install/replace acoustical suspended ceiling system	$585,000	3
Wall Finishes	Refinish all walls	$300,000	3
Interior Fabrications	Repair wood sills at millwork built ins at Lower Level West bay windows	$22,500	3
Carpeting	New Carpet Tile	$500,000	3
Plumbing Fixtures	Replace/install additional drinking fountains to provide the minimum number	$22,500	3
Lighting	Install/replace exterior lighting	$600,000	3
Lighting	Install/replace emergency lighting system	$125,000	3
Lighting Fixtures	Install/replace exit signage	$20,000	3
Priority 3 Total	9	$2,280,000	
Stair Railings	Replace ornamental railings, number of runs	$100,000	4

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Interiors	Correct (5) accessibility issues associated with miscellaneous interior conditions	$75,000	4
Information Specialties	Provide an updated signage program that resolves (5) accessibility barriers	$50,000	4
Site	Correct (14) accessibility issues associated with the exterior accessible route and parking	$170,000	4
Priority 4 Total	4	$395,000	
Grand Total	22	$4,005,000	

Memorial Library

ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
HVAC	In order to electrify the existing building HVAC heating system that existing gas fired boiler, hot water terminal heating equipment and gas fired rooftop unit systems should be removed and replaced with a new all electric heating HVAC system. During the project renovation design process, we recommend that several HVAC system replacement options be studied as part of a lifecycle cost analysis. We concur with the majority of the 2022 Salas O'Brien report recommendations for HVAC system electrification for this building. Within this report it is recommended that two (2) new air source to hot water heat pump units (approx. 60 tons each) and a supplemental electric boiler (680 MBH) are installed to replace the gas boilers and rooftop unit gas fired heating systems. The ASHPs provide low temperature hot water (approx. 130 deg F) to building terminal heating equipment and the electric boiler would provide additional heating required for peak loads. New hot water pumps and accessories would also need to be provided, and the existing terminal heating equipment (fin tube, unit heaters, VAV heating coils) would need to be replaced as additional heating areas is required for low temperature hot water heating. The existing ductwork and piping systems could be re-used but should be cleaned and pressure tested. In addition to the 2022 Report recommendations, we would also recommend that replacement RTUs be provided with energy recovery ventilation for improved energy savings. This would also allow the majority of existing general exhaust fan systems to be connected to the new energy recovery system. We recommend that a new ATC/BMS system be installed to control all new and existing remain HVAC systems and be integrated into a Town Wide EMS.	$6,600,000	4
Facility Power Generation	Upgrade emergency generator to 250KW 120/208V 3phase, 4 wire.	$450,000	4
Electrical Service and Distribution	upgrade service to a 2000ampere 120/208V, 3phase, 4 wire.	$600,000	4

ELECTRIFICATION RECOMMENDATIONS

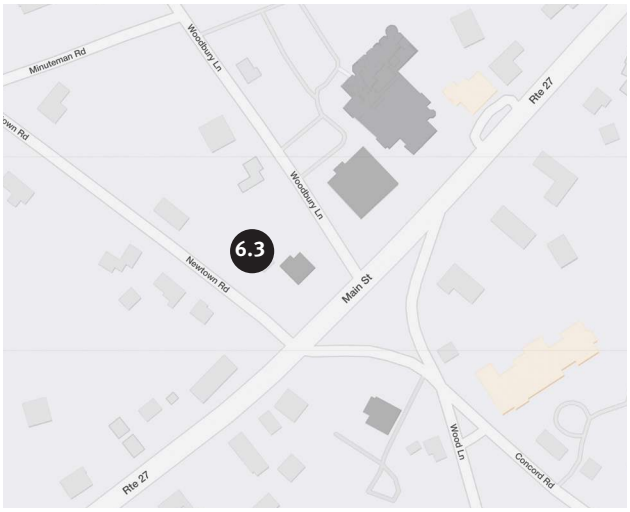
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Electrical Service and Distribution	Upgrade distribution system to support all electric HVAC system and connect to upgraded service equipment	$300,000	4
Lighting	Upgrade interior lighting that has not been upgraded to LED. Provide new lighting controls that include occupancy sensors and daylight sensors in compliance with current energy codes.	$900,000	4
Total	5	$8,850,000	

TIMELINE RECOMMENDATIONS

The 2022 Salas O'Brian report recommended that this building be electrified by 2029 after the Public Safety Facility and Town Hall. This recommendation was based on current equipment's expected end of life in 2033, but accelerated to meet the Town's goal of being fully electrified by 2030.

Some capital repair work associated with the bay windows and water infiltration as well as the venting of the attic should be addressed prior to this timeline.

Red House



Facilities Information

Address	468 Main Street
Department	Municipal Offices
Year(s) Built	1915
Gross Square Feet	5,404 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	13,074	28,159	15,085	115%
Natural Gas (Therm/yr)	1,107	-	(1,107)	-100%
TOTAL Energy Use (kBTU/yr)	155,328	96,077	(59,251)	-38%
Electric Utility Cost ($/yr)	$2,083	$4,486	$2,403	115%
Natural Gas Utility Cost ($/yr)	$3,897	$-	$(3,897)	-100%
TOTAL Utility Cost ($/yr)	$5,980	$4,486	$(1,494)	-25%
TOTAL Emissions (MTCO2e/yr)	9	6	-3	-33%

STRUCTURE	Rubble foundation wall, brick columns, wood framed floor and roof. Main beams in basement have been sistered using steel. Wood balloon framed construction. Wood roof framing and deck. Rubble foundation exhibits deterioration of mortar as typical of this construction method from gradual ground water seepage. Detailed analysis of the continued suitability of the foundation and/or any dry rot present is beyond the scope of this report. Review by a strucutral engineer to confirm if there are any long term concerns that need to be addressed would be recommended.
EXTERIOR WALLS	Wood siding, areas around new lift have been more recently painted. Some repainting needed in other areas. Unknown level of wall insulation. Uninsulated foundation walls. New air sealing and insulation at rim joists occurred in 2021.
EXTERIOR OPENINGS	Single pane wood windows. Basement are original with no storms. First floor has original single pane windows and exterior and interior storms. Some of the first floor storms are missing on the parking lot side of the building. The second floor has single pane windows that have been remade/replaced, with exterior storms only. The doors are residential wood doors with recent weatherstripping.
ROOFING AND RAINWATER MANAGEMENT	3-tab asphalt shingle roof, metal gutters and downspouts at entry only, age unknown. Recent repair of leaks near the interface with dormer. Chimney has been blocked off, but is listing. Recent insulation upgrades at Kneewall in attic.
STAIRS AND VERTICAL CIRCULATION	One ADA lift exists at the exterior entry of the building. External stairs are satisfactory. Internal stair is not compliant and prevent any public activity from happening on second floor.
INTERIORS AND FINISHES	All painted wall and ceiling surfaces. The first floor walls have had recent work and finishes appear in good condition. Ceilings have multiple locations in need of repair due to cracking and/or water damage. The second floor has older finishes including wallpaper, but are acceptable for current storage use.
SEALANTS AND CAULKING	Sealants at windows appear largely absent. Masonry joints in basement columns are crumbling.
PLUMBING	Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. The building is supplied with a Natural Gas Service. Water Heating Systems: This system comprises of a natural gas fired water heater replaced in 2019. Water Heaters is 40 gallon storage and 40,000 BTU Input. This unit appears to be new and in good working condition. Plumbing Fixtures: The ground floor plumbing fixtures have been recently replaced and are in good working condition. Fixtures include ADA compliant toilet & kitchen on first floor. The upper floor fixtures are older/noncompliant, at the end of their useful life, and have effectively been abandoned in place.

PLUMBING	Piping System: Domestic Water Supply Piping that was observed in the building was copper. Waste and Vent Piping that was observed was Cast Iron. All piping appears to be in good condition but nearing the end of its useful life.
FOSSIL FUEL APPLIANCES	Gas cooking stove in staff kitchen
HEATING	This system comprises of one (1) Oil fired hot water boiler with 145 MBH capacity. The Boiler is atmospheric vented and manufactured by Weil McLain. The boiler is piped with a single circulator pump to distribute the heating water to the building radiation heating equipment located throughout the building. The radiation heating equipment at Upper floor are reported as non-operational, and these spaces are passively heated. The heating system is old and nearing the end of its useful life. There is a 275 gallon oil tank and associated fuel oil lines in the basement that serve the oil fired boiler. The tank appears to be in good condition. Piping System: The majority of the Heating Hot Water piping is Copper, and appears to be nearing the end of its useful life.
COOLING	This ground floor of the building is cooled by a direct expansion (DX) cooling fan coil unit that is located in the basement and piped to a grade mounted AC condensing unit that was manufactured by York. The cooling indoor and outdoor unit appear to be in fair condition.
VENTILATION	Ventilation is achieved infiltration and via natural ventilation through the use of operable windows. There is an exhaust fan installed on the second floor that appears oversized, and it is our understanding that the fan is not used. The ductwork distribution system is comprised of sheet metal ductwork. All ductwork appears to be in fair condition.
CONTROLS	The HVAC systems are controlled by stand-alone electric/electronic controls.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - Building fed overhead from pole in street. - Direct metered. - 200Amp - 1phase - 3wire - 120/240volt. Electrical Distribution: - Circuit breaker type panelboard. - Power distribution - 15A and 20A duplex receptacles. - Wiring - Combination of non-metallic and armored cabling Generator: - 12kw- 1phase- 120/240volt (Kohler) - Natural gas. - Automatic Transfer Switch.

ELECTRICAL	Interior Lighting: - Surface ceiling mounted wraparound fixtures w. LED retrofit lamps - Surface wall mounted sconces - Combination of fluorescent strips and porcelain sockets - First floor retrofitted with LEDs in 2018, second floor is still incandescent Exterior Lighting: - Surface mounted incandescent flood lights with LED bulbs. Lighting Controls: - Single pole and three-way toggle type switches.
HVAC	The system generally appears to be serving its intended purpose, though major components such as the boiler and DXC may be nearing the end of their useful life. Level of service to the upper floor should be considered during replacement.
ACCESSIBILITY	Building is generally compliant with some exceptions related to accessible parking and route to the building as well as a few outstanding interior barriers on Level 1. Level 2 is not publicly accessible. The most recent Title 2 assesment identified 10 priority 1 and 2 priority 2 barriers. It is anticipated that the electrification of the building may exceed the 30% threshold for the cash value of the building, resulting in the entire building being subject to CMR 521 and the remaining accessibility barriers required to be addressed. The Town may want to consider a MAAB waiver if not all barriers are deemed to be feasible to address.
CODE CONSIDERATIONS	It is not anticipated that the scope of work would trigger major code requirements, other than correcting accessibility deficiencies and energy code requirements for reroofing, window replacement, and new mechanical system. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. As the electrification project will trigger a Level 2 alteration, the vertical opening rating requirements will need to be evaluated to identify if an exception for the building exists.
APPEARANCE	The appearance of the building is well kept and generally in fair condition. Replacing missing storms, repainting, and reroofing will ensure the continued good appearance.
HISTORIC DISTRICT CONSIDERATIONS	This building is in the Acton Center Historic District.

Red House

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Floor Construction	Levelness issues evident	$37,500	1
Roof Construction	Active or inactive water infiltration evident	$15,000	1
Roof Accessories	Chimney strucutral issues evident, stabilization of leaning	$18,000	1
Priority 1 Total	3	$70,500	
Subgrade Enclosure Wall Construction	Reparging of masonry columns in basement	$10,500	2
Subgrade Enclosure Wall Construction	Miscellaneous stone resetting and hole repair in rubble foundation	$40,500	2
Exterior Operating Windows	Replace all windows with double paned wood windows with aluminum cladding - Historic consideration	$225,000	2
Steep Slope Roofing	Replace asphalt shingle roof within the immediate future	$60,000	2
Roof Insulation & Fill	Correct/finish installing insulation and/or air sealing in attic space	$12,000	2
Ceiling Finishes	Replace all ceiling finishes	$50,000	2
HVAC	Replace existing oil fired boiler, oil tank, oil piping, hot water piping, pumps, terminal heating equipment, DX cooling fan coil unit, AC condenser unit, refrigeration piping and all accessories and controls. Replace existing heating and cooling system with a new air source to air heat pump HVAC system. Replace existing exhaust fan system and replace with a new energy recovery ventilation system. Provide new ATC/BMS controls for new HVAC system and integrate into Town Wide EMS.	$675,000	2
Lighting	Install/replace emergency lighting system	$18,000	2
Priority 2 Total	8	$1,091,000	
Exterior Entrance Doors	Install/replace door, Type: Wood single	$7,500	3
Wall Finishes	Refinish all walls	$45,000	3
Flooring Treatment	Refinish/repaint floor	$120,000	3
Domestic Water Distribution	Install/replace domestic water piping, type 1	$60,000	3
Lightning Protection	Install Lightning Protection System	$7,500	3
Priority 3 Total	5	$240,000	

Red House

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Stair Construction	Repair/replace exterior stairs to address (6) accessibility barriers	$67,500	4
Exterior Walls, Painting and Coating	Refinish/repaint exterior siding (house and garage), replace areas of deterioration as necessary	$45,000	4
Rainwater Management	Install gutters and downspouts on remaining edges. Direct stormwater to dry wells/infiltration away from the foundation.	$18,000	4
Interiors	Correct (4) accessibility barriers associated with interior plumbing fixtures and accessories	$12,000	4
Information Specialties	Update the signage to address (2) accessibility barriers	$10,500	4
General Purpose Electrical Power	Replace romex cable with MC cable	$22,500	4
General Purpose Electrical Power	Upgrade and add electrical devices when upgrading branch circuits	$10,500	4
Lighting	Replace interior lighting and controls that has not been previously upgraded with new LED fixtures, primarily on the second floor	$25,000	4
Lighting	Install/replace exterior lighting	$7,500	4
Site	Provide a van parking space/signage/accessible route	$255,000	4
Priority 4 Total	10	$473,500	
Stair Construction	Replace wood stair run, during replacement ensure adjacent hallway is widened to eliminate accessibility barrier associated with clear width.	$52,500	5
Detection and alarm	Replace fire alarm system with addressable type	$45,000	5
Priority 5 Total	2	$97,500	
Grand Total	28	$1,972,500	

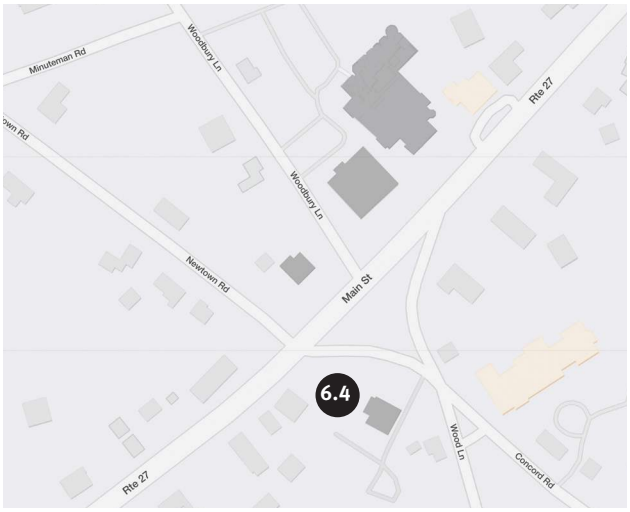
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Domestic Water Equipment	Replace gas fired water heater with electric type.	$52,500	4
Facility Power Generation	Upgrade generator to 70KW 120/240, single phase within a sound attenuated weather proof enclosure	$300,000	4
Electrical Service and Distribution	Upgrade service to 400Amp 120/240V single phase	$142,500	4
Electrical Service and Distribution	Upgrade distribution system to support all electric HVAC system and connect to upgraded service equipment	$135,000	4
Foodservice Equipment	Replace stove with induction unit	$4,500	4
Grand Total	5	$634,500	

TIMELINE RECOMMENDATIONS

Both the mechanical systems and the roof are nearing the end of their useful life. A comprehensive envelope and mechanical system project should be completed together. While the electrical service is not in need of immediate action it will need to be done at the time of mechanical system replacement as that replacement should be an electrified system.

Center Fire Station



Facilities Information

Address	7 Concord Road
Department	Fire
Year(s) Built	1960
Gross Square Feet	4,678 SF
Historic District	Yes
On site Combustion	Yes
Capacity for Solar	No

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	38,530	52,664	14,134	37%
Natural Gas (Therm/yr)	2,740	-	(2,740)	-100%
TOTAL Energy Use (kBTU/yr)	405,464	179,691	(225,773)	-56%
Electric Utility Cost ($/yr)	$6,138	$8,389	$2,251	37%
Natural Gas Utility Cost ($/yr)	$2,285	$-	$(2,285)	-100%
TOTAL Utility Cost ($/yr)	$8,423	$8,389	$(34)	0%
TOTAL Emissions (MTCO2e/yr)	24	11	-13	-54%

STRUCTURE	Slab-on-grade, reinforced concrete slab floors metal columns, wood roof deck and rafters, supporting structure unknown. Gambrel roof structure.
EXTERIOR WALLS	Stucco, repaired in 2015 over uninsulated CMU block. Generally appears well maintained but shows age and cracking in some locations. Painted wood at the cupula, some paint is flaking.
EXTERIOR OPENINGS	Single paned wood windows, with exterior storms. Windows without storms are rotting. Many windows have rotting sills. Oversized garage doors appear newer and are in good condition.
ROOFING AND RAINWATER MANAGEMENT	Sloped roof is constructed of wood plywood deck, ice and water shield, asphalt shingle. Metal gutter and downspout system. Weathervane. Flat roof is an adhered EPDM system with rigid thermal insulation on gypsum board. Ponding issues have been reported and should be addressed in any reroofing project. A wood frame walkway is built directly on top of the flat roof, not on proper pads, and may impact the durability of the membrane. Both roof systems were replaced in 1997.
STAIRS AND VERTICAL CIRCULATION	Metal construction stair with rubber treads. Adequate rise/run dimensions. Stair does not appear to be in a fire rated enclosure.
INTERIORS AND FINISHES	Wall finishes include a mixture of painted CMU and GWB in public areas, painted CMU and GWB and wainscoting in the private areas. All areas contain painted trim. Floors finishes include VCT in the public areas, a faux-wood vinyl product in the private areas. Vinyl product was recently installed. Garage is unfinished concrete. Ceiling finishes include painted concrete in the garage and painted GWB in the building. All floor finishes except the vinyl product in the private space is close to or has exceeded useful life.
SEALANTS AND CAULKING	Joint between edge of stucco and foundation and/or roof shows deterioration. Window sealants obscured by storms but appear in marginal condition.
PLUMBING	Water Service: 2” Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: This system comprises of a 50 Gallon Storage, Natural Gas Fired, 40,000 BTU Water Heater. This heater appears to be in good working condition. Plumbing Fixtures: All plumbing fixtures appear to be original to the building and nearing the end of their useful life. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears to be original to the building and nearing the end of its useful life.

FOSSIL FUEL APPLIANCES	Gas stove in the kitchen on the second floor. Stove is not vented.
HEATING	A high efficiency gas boiler and hot water pumps were installed in 2017. The boiler was manufactured by Lochinvar (Model KBN 400 with 370 MBH output). This boiler provides heating hot water to unit heaters that supply the Apparatus Bay and hot water fin tube radiation heating in the office and living areas of the building. The fin tube radiation appears original to the building and in fair to poor condition. An air source VRF heat pump system also provides heating to the second floor office, bunk rooms, kitchen, and day room areas. Piping System: Heating Hot Water piping is a combination of Steel and Copper. The majority of hot water piping appears to be original to the building and in fair condition. New boiler loop main header piping was installed in 2017. The majority of hot water piping appears to be original to the building nearing the end of its useful life. The VRF system piping is in good condition.
COOLING	The second floor office, bunk, kitchen, and day room areas are cooled by two (2) 4 ton VRF systems that was manufactured by Mitsubishi (4 ton, R-410a refrigerant) installed in 2017. The VRF system consists of seven (7) ductless indoor units that are connected to two (2) roof mounted outdoor units. The VRF system is in good condition.
VENTILATION	Ventilation for the office and living areas of the building is achieved via windows though natural ventilation. The toilet rooms and janitor's closet are exhausted by exhaust fan systems that were installed in 2017. The Apparatus Bay has a Vehicle Exhaust System which appears to be in good condition.
CONTROLS	A DDC ATC/BMS system was installed in 2017 to control the boiler plant and VRF system.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: 120/240Volt- 1Phase - 3Wire - 200Amp Electrical Distribution: - Direct metered - Circuit Breaker type Panelboards Emergency Generator: - Manufacturer - Kohler - Fuel Source - Diesel - Size - 50Kw -120/240volt - Single 200Amp Automatic Transfer Switch Interior Lighting: Updated in 2018 - Truck Bay Area - 1x8 enclosed and gasketed wraparound LED luminaires with LED lamps. - Common areas - 1x4 wraparound LED luminaires with LED lamps.

ELECTRICAL

- Emergency - LED upgrade does not appear to include emergency functions, no emergency dual head battery units observed
- Exit Signs - Thermoplastic LED - White with Red letters.

Exterior Lighting:
- Parking Area - Pole mounted HID flood lights
- Building mounted HID wall packs

Lighting Controls: Upgraded in 2018 as part of LED retrofit
- Occupancy and vacancy sensors with dimming wall switches
- Exterior lighting is controlled via time clock.

Fire Detection:
- Addressable single station smoke detectors in common areas.
- Wired Alarm Master Box.

Security System:
- S2 access control system

HVAC

Generally, the primary components of the mechanical system have all been relatively recently replaced and are in good working condition. However, these systems are currently fossil fuel based and will be evaluated for electrification.

ACCESSIBILITY

Appears to be mostly in compliance with applicable ADA and MAAB requirements. West walkway and entry platform to apparatus bays are the main entry to the building and are not ADA / MAAB compliant due to a step up from the walk to the entry platform. No compliant entry point is designated. These accessibility issues, and all others, would need to be resolved as part of future projects as the recommendations are anticipated to exceed 30% of the cash value of the building.

CODE CONSIDERATIONS

Reroofing, overcladding, electrification, and window replacements will need to comply with the most recent energy code. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building. Sprinkler protection may be triggered under the Existing Building Code Chapter 8 if the work area exceeds 50% of the floor area. This threshold is not anticipated to be triggered at this time. However, scope of work renovating the restrooms may create work areas that impact the bunk areas/R occupancy that may trigger the installation of sprinklers. The installation of an automatic sprinkler system throughout the building would impact the need to rate/enclose the egress stair.

APPEARANCE

The building's appearance is generally well-maintained and in good condition. The exterior stucco is cracking in some locations and shows the building's age.

HISTORIC DISTRICT CONSIDERATIONS

This building is in the Acton Center Historic District. It is also listed on the National Historic Register District. This may make over cladding more difficult.

Center Fire

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Steep Slope Roofing	Replace asphalt shingles within the immediate future	$37,500	1
HVAC	Install vent hood for gas stove	$12,000	1
Priority 1 Total	2	$49,500	
Standard Slabs-on-Grade	Repair cracked slab	$4,500	2
Fire Escapes	New Fire Escape Stair on roofing pads after reroof, correct (5) accessibility barriers	$45,000	2
Exterior Walls	Repair stucco and repaint if not replaced per electrification recommendations	$15,000	2
Exterior Operating Windows	Replace all windows with double paned wood windows with aluminum cladding - Historic consideration	$127,500	2
Low-Slope Roofing	Replace fully adhered roofing membrane, install minimum of R-30 insulation within the immediate future	$9,000	2
Domestic Water Distribution	Renovate restroom including: replace all plumbing fixtures, including showers; replace domestic water piping & sanitary sewer piping; correct (9) accessibility barriers	$150,000	2
HVAC	Continue preventative maintenance of existing HVAC systems	$7,500	2
Lighting	Remove any remaining nonoperational emergency lighting system components, including boxes that currently are nonoperational but draw power	$4,500	2
Priority 2 Total	8	$363,000	
Exterior Walls	Remove stucco, insulate: 4" of continuous insulation EIFS stucco finish	$90,000	3
Exterior Entrance Doors	Replace entrance doors (hollow metal)	$19,500	3
Interior Swinging Doors	Refinish/repaint door and frame	$2,250	3
Interior Door Supplementary Components	Replace hardware set 1	$12,000	3
Wall Finishes	Refinish all walls	$18,000	3
Flooring	Replace all flooring, abate existing flooring	$33,000	3
Ceiling Finishes	Replace all ceiling finishes	$25,000	3
Priority 3 Total	7	$199,750	

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Stairs	Correct (6) accessibility barriers associated with interior vertical circulation	$52,500	4
Interiors	Create new gear room	$195,000	4
Interiors	Correct (2) miscellaneous interior accessibility barriers	$12,000	4
Interior Swinging Doors	Replace doors and/or hardware to make compliant, including clearance adjustments to resolve (8) accessibility barriers	$67,500	4
Information Specialties	Update the signage to address (2) accessibility barriers	$7,500	4
General Purpose Electrical Power	Install additional branch wiring for new devices where needed to support added electrical equipment	$10,500	4
General Purpose Electrical Power	Install additional new receptacles where needed to support added electrical equipment	$9,000	4
Lighting	Replace exterior lighting	$6,000	4
Lighting Fixtures	Replace exit signage	$6,750	4
Site	Correct (10) accessibility issues associated with the exterior accessible route and parking	$15,000	4
Priority 4 Total	10	$381,750	
Lighting	Replace emergency lighting system	$12,000	5
Site Furnishings	Provide accessible picnic table	$4,500	5
Priority 5 Total	1	$16,500	
Grand Total	29	$1,010,500	

Center Fire

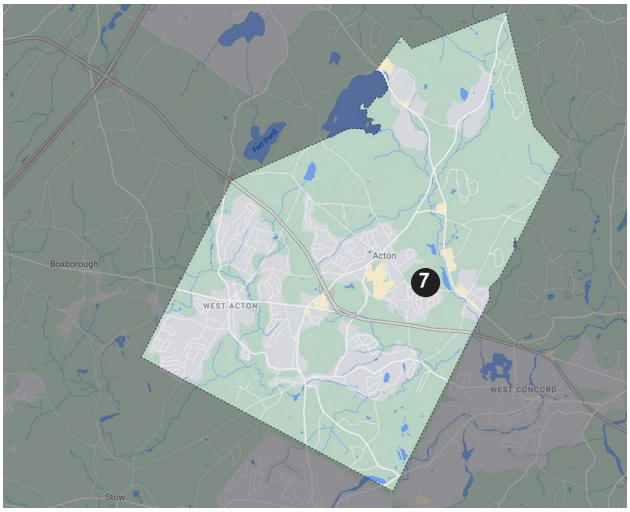
ELECTRIFICATION RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Roof Insulation & Fill	Repair and add insulation to attic to achieve R30	$18,000	4
Domestic Water Distribution	Replace natural gas water heater with electric type	$10,500	4
HVAC	Remove existing hot water boiler, pumps, older terminal heating equipment and associated hot water piping and controls. Provide new air source to hot water heating heat pump unit to provide hot water heating to new hot water terminal heating equipment (unit heaters and supplemental fin tube radiation heating) that can operate at a lower HW temperature of 130 deg F. Provide new hot water piping, pumps, accessories, terminal heating equipment and associated insulated hot water piping. Provide a new energy recovery ventilation unit and associated insulated ductwork distribution system to provide mechanical ventilation to the office and living areas of the building. Provide new apparatus bay unit heaters to provide additional heating requirements in addition to the existing unit heaters which can be reused. Provide new ATC/BMS controls for all new HVAC equipment and systems. The existing second floor VRF system can remain and be reused to continue to provide heating and cooling to the second floor areas.	$562,500	4
Facility Power Generation	Upgrade generator to 75KW 120/208V, 3phase, 4 wire within sound attenuated weatherproof enclosure	$225,000	4
Electrical Service and Distribution	Upgrade distribution system to support all electric HVAC system and connect to upgraded service equipment	$37,500	4
Electrical Service and Distribution	Upgrade service to 400 Ampere 120/208V, 3phase	$135,000	4
Foodservice Equipment	Replace gas fired stove with induction unit, remove (3) accessibiliy barriers in Kitchen	$9,000	4
Total	7	$997,500	

TIMELINE RECOMMENDATIONS

Architectural conditions and programmatic upgrades are likely going to drive the need to further invest in the building prior to the anticipated end of life of the mechanical system. The roof is 26 years old and windows are past their useful life. Both are in need of replacement within the immediate future. The interiors of the building are in generally good condition, although asbestos has not been abated and the restroom is in need of a gut renovation. Accommodating new gendered code compliant restrooms with new showers may be challenging in the given footprint. The mechanical systems should have approximately 20+ years of life on the lower level system and 9 years of life on the upper level system left. This would put them being replaced after the 2030 goal for complete electrification. Therefore, it is recommended that electrification be accelerated to when architectural and programmatic priorities are addressed.

Kennedy Service Building



Facilities Information

Address	104 Concord Road
Department	Cemetery
Year(s) Built	1967
Gross Square Feet	2,520 SF
Historic District	No
On site Combustion	Yes
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	8,472	18,815	10,343	122%
Natural Gas (Therm/yr)	918	-	(918)	-100%
TOTAL Energy Use (kBTU/yr)	120,746	64,197	(56,549)	-47%
Electric Utility Cost ($/yr)	$1,350	$2,997	$1,647	122%
Natural Gas Utility Cost ($/yr)	$2,237	$-	$(2,237)	-100%
TOTAL Utility Cost ($/yr)	$3,587	$2,997	$(590)	-16%
TOTAL Emissions (MTCO2e/yr)	9	4	-5	-56%

STRUCTURE	Parged masonry foundation walls, concrete floor deck. One story wood framing, wood truss and wood sheathing roof deck.
EXTERIOR WALLS	Brick veneer, stucco in rear of building, Some efflorescence found on rear of building at ground. Level of insulation unknown, assumed minimal if any.
EXTERIOR OPENINGS	Windows have been replaced with new IGU double hung units in 2018. Hollow metal exterior entrance doors at upper level, wood oversized utility doors at lower level.
ROOFING AND RAINWATER MANAGEMENT	3-tab asphalt shingle roof replaced 2012. Aluminum gutters and downspouts. Attic is insulated with batt. Appears to be in good condition.
STAIRS AND VERTICAL CIRCULATION	Wood tread stair to basement. Guardrail not suitable for public use and missing from exterior wall side. Door at foot of stair is in path of travel. Last tread is a tripping hazard.
INTERIORS AND FINISHES	Primarily painted CMU and concrete on lower level, painted GWB on upper level. Exposed concrete floor on lower level, wood look composite on upper level in good condition. Ceiling is painted GWB.
SEALANTS AND CAULKING	Masonry joints appear to be in good condition and well maintained. Sealants at windows are in good condition.
PLUMBING	Water Service: 1” Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be past their useful life. Water Heating Systems: Electric hot water heaters relocated as part of recent interior renovations. Plumbing Fixtures: New plumbing fixtures as part of recent interior renovations are in good condition. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears to be original to the building and nearing the end of its useful life.
FOSSIL FUEL APPLIANCES	No gas appliances are located in the building. There is a kitchenette. Future projects should evaluate programmatic needs.
HEATING	This system comprises of an Oil Fired Furnace located in the garage ceiling that services the first floor. This unit is over 20 years old and nearing the end of its expected service life. Some additional heat is supplied to the first floor via a mini split heat pump AC unit that was installed in 2018. An Oil Fired Unit Heater that was installed circa 2012 heats the garage space. The garage oil fired unit heater appears to be in fair condition. There is an outdoor grade mounted fuel oil tank that serves the furnace and unit heater. The exterior casing of the fuel oil tank appears to be in poor condition.

COOLING	Only the first floor is cooled. The first floor is cooled by two (2) wall mounted Ductless Split Air Conditioner units. One system was manufactured by Mitsubishi and the other system was manufactured by Fujitsu. The systems were installed in 2015 and 2018 and appear to be in good condition.
VENTILATION	Ventilation is achieved via natural ventilation through the use of operable windows . Ductwork System: The Ductwork Distribution System associated with the first floor furnace is sheet metal ductwork that appears to be original to the building. Some new ductwork was added in 2018 renovation and the older duct was resealed. Overall the ductwork appears to be in good condition.
CONTROLS	The building HVAC systems are controlled by stand-alone electric/electronic controls.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - 100amp-1phase-3wire- 120/240volt - Direct metered. Electrical Distribution: - 100amp fused main switch. - Circuit type panelboards - General power - 15a and 20a receptacles - Wiring - combination of MC cable and conduit with conductors. Interior Lighting: - Recent interior renovation included new LED lighting fixtures & combination exit sign and egress lights Exterior Lighting: - Wall mounted compact fluorescent wall packs. - Wall mounted PAR Lamp Holders with CFL Lamps Lighting Controls: - Toggle type wall switches. Fire Alarm System: - ESL 1500 series control panel - Hardwired zoned system - manual pull stations - smoke detection - Horn / Strobe units
HVAC	The garage level and upper level operate independently mechanically. The heating system appears to be functional but nearing end of its life. Cooling for the upper floor only is in good condition.

ACCESSIBILITY	Building is mostly compliant. Some barriers from most recent Title II report have been addressed by recent interior renovation. Exterior access route barriers and interior barriers associated with noncompliant interior stair remain, though represent fairly minor barriers to address. It is anticipated that the electrification of the building may exceed the 30% threshold for the cash value of the building, resulting in the entire building being subject to CMR 521 and the remaining accessibility barriers required to be addressed.
CODE CONSIDERATIONS	It is not anticipated that the scope of work would trigger major code requirements, other than correcting accessibility deficiencies. The electrified mechanical system will need to comply with the energy code when it is replaced, and will trigger a Level 2 alteration. It is anticipated that an exception the fire rating and enclosure requirement could be identified due to the small nature of the building and the multiple exits to grade at both floors. However, the condition of the stairs is anticipated to trigger the need for replacement under accessibility requirements and is priced as a grandfathered condition. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building.
APPEARANCE	The overall appearance of this building is well maintained and in good order. The overhead doors and stucco finish on the rear of the building most show the building's age.
HISTORIC DISTRICT CONSIDERATIONS	This building is not in a Historic District, nor is it listed on the National Register.

Kennedy Service Building

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Ramps	Paint/seal ramp	$9,000	2
Rainwater Management	Clean/replace gutters	$7,500	2
HVAC	Continue Preventative maintenance of existing HVAC systems	$30,000	2
Priority 2 Total	3	$46,500	
Exterior Walls, Masonry	Cleaning	$22,500	3
Exterior Entrance Doors	Install/replace oversized door, Type: Metal single	$7,500	3
Domestic Water Distribution	Install/replace domestic water piping, type 1	$60,000	3
Priority 3 Total	3	$90,000	
Steep Slope Roofing	Replace ashphalt shingle roofing in approximately 14 years	$22,500	4
Interior Swinging Doors	Replace basement door, correct associated accessibility barriers	$6,750	4
Wall Finishes	Refinish all walls	$9,000	4
Flooring	Replace all flooring	$4,500	4
Ceiling Finishes	Repaint ceiling	$4,500	4
Lighting	Install/replace exterior lighting with LED dark sky compliant type	$6,000	4
Site	Correct at least (19) accessibility barriers associated with the parking, exterior accessible route, and building entrances.	$105,000	4
Priority 4 Total	7	$158,250	
Stair Construction	Stair treads are not uniform and do not have compliant riser heights and/or tread depths.	$37,500	5
Stair Railings	Replace railings, one run. Resolves (3) accessibility barriers.	$30,000	5
Priority 5 Total	2	$67,500	
Grand Total	15	$362,250	

Kennedy Service Building

ELECTRIFICATION RECOMMENDATIONS

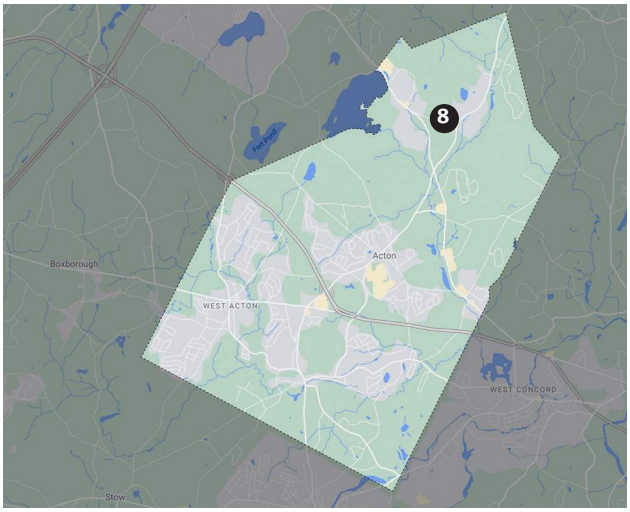
ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Floor Construction	Insulate the floor slab/Garage ceiling with min 2" rigid insulation	$67,500	4
HVAC	Replace the existing oil-fired furnace, unit heater, fuel oil tank, and fuel oil lines. Replace the existing furnace with a new air source to air heat pump unit including indoor air handling unit, outdoor heat pump unit and associated insulated refrigeration piping and controls. It is recommended to replace the existing ductwork distribution. Replace the existing garage unit heater with an air source to air heat pump system including indoor air handling unit, outdoor heat pump unit and associated insulated refrigeration piping and controls. Provide new mechanical ventilation system including a new energy recovery ventilation unit with associated insulated ductwork and controls. The two (2) existing split system heat pump units can remain to provide cooling and supplemental heating. Provide new ATC/ BMS controls for all new and existing to remain equipment and integrated into Town-wide EMS.	$195,000	4
Electrical Service and Distribution	Upgrade service to a 400ampere 120/240V, 1phase, 3 wire.	$225,000	4
Grand Total	3	$487,500	

TIMELINE RECOMMENDATIONS

The building has undergone a relatively recent refresh of the interior. However, the mechanical system is still fossil fuel based, and therefore additional investment will be necessary to achieve the goal of all buildings being electrified by 2030.

The electrification recommendations should be able to be implemented with relatively little impact on the recent first floor renovation if the new air handlers are located high in the garage ceiling, similar to where the furnace is now.

North Fire Station



Facilities Information

Address	68 Harris Street
Department	Fire
Year(s) Built	2022
Gross Square Feet	11,800 SF
Historic District	No
On site Combustion	No
Capacity for Solar	Fulfilled

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	123,992	123,992	-	0%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	423,061	423,061	-	0%
Electric Utility Cost ($/yr)	$19,752	$19,752	$-	0%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$19,752	$19,752	$-	0%
TOTAL Emissions (MTCO2e/yr)	30	26	-4	-13%

STRUCTURE	Concrete slab on grade, steel and masonry, steel roof joists & deck
EXTERIOR WALLS	Mix of brick veneer, split face CMU water table and fiber cement panel, CVPC tongue and groove water table. 3” Rigid insulation on CMU loadbearing back up walls, stud walls have additional mineral wool batt in the stud cavity.
EXTERIOR OPENINGS	Hinged bifold oversized glass bay doors, overhead metal garage doors. Hollow metal passenger doors. Fiberglass punched windows, IGUs.
ROOFING AND RAINWATER MANAGEMENT	PVC roof membrane on 1/2” high density cover board on rigid insulation, some tapered on flat deck, some flat on sloped deck. Brand new in excellent condition. Water is managed through a series of scuppers, gutters, and downspouts.
STAIRS AND VERTICAL CIRCULATION	Larger mezzanine level accessed via metal pan stairs with concrete treads only, smaller mezzanine level is accessed via ladder only. All spaces in these mezzanine levels are mechanical/back of house spaces, no elevator or lift has been provided.
INTERIORS AND FINISHES	Interior finishes are new with the building. Walls: Painted gypsum and CMU, ceramic wall tile, specialty wall coverings Ceiling: Mixture of exposed painted structure, ACT, and painted gyp. Floors: Carpet tile, sealed concrete, LVP, ceramic tile, resinous flooring, rubber flooring
SEALANTS AND CAULKING	Masonry joints, sealants, and caulking are in excellent condition.
PLUMBING	Utilities: The water service is a 3” pipe connected to the centralized water system for the town. The 6” sanitary waste system is connected to a 1,500 gallon septic system located on site. These are new and in good condition. Water Heating Systems: Preheating of potable hot water is provided by the water-to-water ground source heat pumps via a heat exchanger. Two electric boilers finish bringing the water up to temperature. Plumbing Fixtures: Fixtures are vitreous China and stainless steel. Showers are in private toilet rooms. Laundry facilities. All are new with construction of the building and are in excellent condition. Piping Systems: Potable water piping is cement lined ductile iron (exterior) and copper (interior). Sanitary piping and venting is cast iron. Piping system is new and in good condition.
FOSSIL FUEL APPLIANCES	The kitchen contains an electric induction oven and stovetop. No gas appliances on site.

HEATING	Heating is provided by a vertical closed loop ground source (geothermal) wellfield system that serves a combination of water to air and water-to-water heat pumps. The Apparatus Bay is heated by a combination of radiant floor slab heating served by water to water heat pumps and ducted water-to-air heat pumps. The office, dayroom and living areas of the building are heated by ducted water to air heat pump units. The entryway vestibule is heated by an electric cabinet unit heater. The heating systems are new and in excellent condition. The HVAC system is already fossil fuel free.
COOLING	Cooling is provided by the ground source (geothermal) system and the associated water to air heat pumps. The IT room is cooled by a supplemental mini split type cooling unit. This system is new and in excellent condition.
VENTILATION	Mechanical ventilation is provided to the building occupied areas by an energy recovery ventilation (ERV) unit and associated insulated ductwork system. The kitchen hood has an exhaust air fan system. The Apparatus Bay has a Vehicle Exhaust System. These systems are new and in excellent condition.
CONTROLS	Building is supplied with a direct digital control building management system (DDC/BMS).
FIRE PROTECTION	6” service, wet service. Piping is cast iron. New system in excellent working condition.
ELECTRICAL	Electrical Service: - Building fed underground from utility pad mount transformer - 120/280Volt- 3Phase - 4Wire - 1,000 Amp. Electrical Distribution: - Circuit Breaker type Panelboards - Power distribution - 20A duplex receptacles. - Wiring - Generator: - Manufacturer - Blue Star - Fuel Source - Diesel - Size - 200Kw -120/208volt - 3phase - 4wire - Single Automatic Transfer Switch - Annunciator located in electrical room. - Exterior above ground with Level 2 factory enclosure with a 72 hr belly tank. Interior Lighting: - Recessed can, strip, and 2x2 LED fixtures - High bay LED pendants in garage bay - Emergency - Emergency variations of standard light fixtures - Exit Signs - Edge lit LED signs with battery - Clear with Red letters Exterior Lighting: - Pole, bollard, and wall mounted LED fixtures

Lighting Controls:
- Standard toggle switches
- Exterior lighting is controlled via time clock.

Fire Alarm System:
- Zoned Hardwired type system.
- Wired Alarm Master Box.
- Smoke Detectors.
- Manual pull stations.
- Sprinkler flow and tamper switches.
- Duct mounted smoke detectors.
- Annunciator - Located in Server room, secondary annunciator located in watch room, third annunciator located in Apparatus Bay near ladder to small mezzanine.
- BDA system

HVAC	The mechanical system is new with the construction of the building and in excellent condition. The system is already fossil fuel free.
ACCESSIBILITY	The building was not included in the most recent Title II study. Although a through accessibility review was not conducted, the facility is assumed compliant as it was recently constructed.
CODE CONSIDERATIONS	This building is new, therefore it is assumed that it is compliant with all current codes.
APPEARANCE	The building is new and the appearance reflects this excellent condition.
HISTORIC DISTRICT CONSIDERATIONS	This building is not in a Historic District nor is it on the National Register.

NARA Sports Pavilion

Facilities Information

Address	75 Quarry Road
Department	Recreation Center
Year(s) Built	2022
Gross Square Feet	1,600 SF
Historic District	No
On site Combustion	No
Capacity for Solar	On Future Canopy

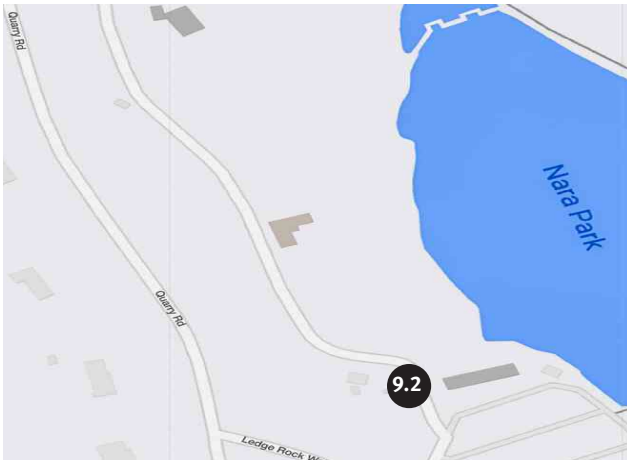
Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	18,387	18,387	-	0%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	62,736	62,736	-	0%
Electric Utility Cost ($/yr)	$2,929	$2,929	$-	0%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$2,929	$2,929	$-	0%
TOTAL Emissions (MTCO2e/yr)	4	4	0	0%

STRUCTURE	Cast in place concrete basement, wood framed floor, walls and roof. Wood roof sheathing
EXTERIOR WALLS	Shiplap cedar siding, 6" of fiberglass bat insulation for R-20. The system is in good condition.
EXTERIOR OPENINGS	Sliding aluminum-clad wood windows, and wood louvers. Exterior painted metal doors, wood interior doors. All new with the building and in good condition.
ROOFING AND RAINWATER MANAGEMENT	Painted standing seam metal roof (existing at the time of building move) with aluminum gutters and down spouts. Appears to be in good condition.
STAIRS AND VERTICAL CIRCULATION	Both buildings have stairs serving the basement level. The North building is accessed from the outside, and the South building is accessed from the inside. No elevators or lifts serve the basements, however, these basements are storage and mechanical spaces only.
INTERIORS AND FINISHES	Interior finishes consist of painted gypsum walls and ceilings. 4' epoxy wall finish in restrooms.
SEALANTS AND CAULKING	Sealants and caulking is new and in good condition.
PLUMBING	Water Service: Each building has a 1" water service. This was installed at the time of the building move and is in good condition. Utilities: The water service is connected to centralized town water system. The sanitary waste system is connected to an onsite septic system. Water Heating Systems: This system comprises of an electric water heater in each building. The North building has a 20 gal storage tank and 4.5KW input. The South building has a 40 gal storage take and 4.5 KW input. This system is new at the time of the building move and is in good condition. Plumbing Fixtures: Floor mounted vitreous China water closets, wall-mounted vitreous China urinal and lavatories. Three-part stainless steel sink and hand washing sink in South building connected to a grease interceptor. Fixtures are new and in good condition. Piping System: Domestic Water supply piping that was observed was copper. Waste and vent piping is cast iron. All piping is new to the building and in good condition.
FOSSIL FUEL APPLIANCES	No gas appliances on site
HEATING	Heating for the South building is via ductless heat pumps in main spaces and electric baseboard and wall unit heaters in the corridor, bathroom, and basement. The North building is heated via electric baseboard and unit heaters. This system is new (2022) and in good working condition.

COOLING	The North building appears to have humidity control only via the air supplied from the ERV with no active cooling. The South building is cooled via ductless heat pumps in main spaces. This system is new (2022) and in good working condition.
VENTILATION	The North and South building's ventilation is handled via an ERV. Ductwork and ERV are new (2022) and in good working condition.
FIRE PROTECTION	There is no fire protection system.
ELECTRICAL	Electrical Service: - 200amp-1phase- 3wire- 120/240volt Electrical Distribution: - Underground feed to utility mounted transformer - Reused circuit breaker type panel board - General power - 20A duplex receptacles Interior Lighting: - 1x4 & other surface mounted LED fixtures - Emergency battery units and exit signs Exterior Lighting: - Wall mounted LED cutoff wall packs Lighting Controls: - interior lighting is controlled by wall mounted toggle switches. - exterior lighting is controlled by photo-cell and time clock. Fire Alarm System: - Radio Master box. - addressable fire alarm system - area smoke detectors - manual pull stations Security: - Wall mounted card readers
HVAC	The mechanical system serves it's intended purpose and is in new condition. The building is already fossil fuel free.
ACCESSIBILITY	This building was moved & renovated after the latest round of Title 2 assessments was completed, therefore there are no previous reports available to review. From general site observations (No measurements were taken) the buildings are generally compliant with the exception of the basement spaces.
CODE CONSIDERATIONS	This building is practically new, therefore it is assumed that it is compliant with all current codes. The structural capacity of the roof was also already reinforced for the additional snow loads to be imposed by the future planned canopy as part of the construction phase. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building.

APPEARANCE	Evidence of graffiti removal- frequent painting may be necessary to maintain the appearance of buildings.
HISTORIC DISTRICT CONSIDERATIONS	This building is not in a Historic District nor is it on the National Register.

NARA Park Bathhouse



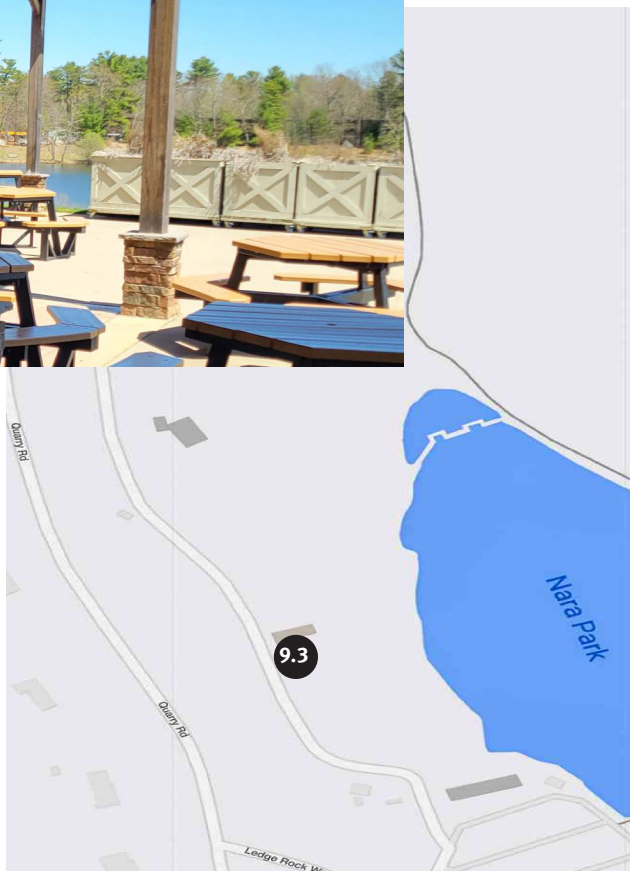
Facilities Information

Address	25 Ledge Rock Way
Department	Recreation Center
Year(s) Built	1999
Gross Square Feet	5,758 SF
Historic District	No
On site Combustion	No
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	18,477	14,782	(3,695)	-20%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	63,044	50,435	(12,609)	-20%
Electric Utility Cost ($/yr)	$2,943	$2,355	$(588)	-20%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$2,943	$2,355	$(588)	-20%
TOTAL Emissions (MTCO2e/yr)	4	3	-1	-25%

STRUCTURE	Concrete slab-on-grade, concrete piers, masonry piers, timber construction. Bathhouse is CMU construction.
EXTERIOR WALLS	Wood ship-lap siding and prefinished CMU block. No insulation.
EXTERIOR OPENINGS	Single pane wood frame windows and doors.
ROOFING AND RAINWATER MANAGEMENT	Wood shingle roofing, shakes appear to be in poor condition. No rainwater management.
STAIRS AND VERTICAL CIRCULATION	No vertical circulation, ground level only
INTERIORS AND FINISHES	Unfinished wood slat floors, unfinished concrete floors, unfinished cedar walls and ceilings. Bathhouse has unfinished/prefinished CMU
SEALANTS AND CAULKING	CMU joints appeared to be in good condition. Window sealants also appeared to be in good condition.
PLUMBING	Water Service: 1” Water Service Utilities: The water service is connected to a centralized water system for the town. The sanitary waste system is connected to a septic system located on site. All utilities appear to be original to the building and appear to be in good condition. Water Heating Systems: There is point of use Electric Water Heaters throughout the facility. These heaters appear to be original to the building and be in good condition but are nearing the end of their useful life. Plumbing Fixtures: Fixtures in Bathrooms are vitreous China with Manual Flush Valves for Toilets and Urinals, Eye Wash Stations and Hand Wash Stations are Stainless Steel with Manual Operation. All fixtures appear to be original to the building and in good working condition. Piping System: The supply piping that was observed was copper. The drainage piping that was observed was cast iron. All piping appears to be original to the building and in good working condition.
HEATING	The building is heated through the use of Electric Heaters. These heaters appear to be original to the building and in fair condition.
COOLING	There is no cooling.
VENTILATION	Ventilation is achieved via natural ventilation through the use of operable windows. Exhaust System: There is localized exhaust systems for the bathrooms along with the serving area. These fans appear to be original to the building and in fair condition.
CONTROLS	The existing heating equipment and exhaust fan are controlled by stand-alone electric controls.

FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - 200amp-1phase- 3wire- 120/240volt Electrical Distribution: - Building is direct metered - Circuit breaker type panelboard - General Power - 15A and 20A duplex receptacles Interior Lighting: - Wall and Ceiling mounted enclosed incandescent fixtures w. LED bulbs Exterior Lighting: - Wall and Ceiling mounted enclosed incandescent and fluorescent fixtures. Lighting Controls: - interior lighting is controlled by wall mounted toggle switches. - exterior lighting is controlled by photo-cell and time clock. Fire Alarm System: - zoned hardwired system - area smoke detectors - manual pull stations
HVAC	The mechanical system is minimal, with heating only. The building is seasonal in nature with limited winter time use. Building is already electrified.
ACCESSIBILITY	Appears to be mostly compliant. The most recent Title II assessment identified a number of relatively minor accessibility barriers associated with the parking lot and exterior route, the restrooms, signage, and the counters. It is anticipated that the scope of recommendations would at least trigger the $100,000 threshold for upgrades to the entrance, toilet rooms, drinking fountains, and public telephone as applicable.
CODE CONSIDERATIONS	It is not anticipated that the scope of work would trigger major code requirements, other than correcting accessibility deficiencies. The building is currently smaller than the State of Massachusetts MGL Ch. 148 Sec. 26G threshold for requiring sprinklers throughout the building.
APPEARANCE	The building is generally in good condition, with the exception of the roof.
HISTORIC DISTRICT CONSIDERATIONS	This building is not in a Historic District nor is it on the National Register.



NARA Park Picnic Pavilion

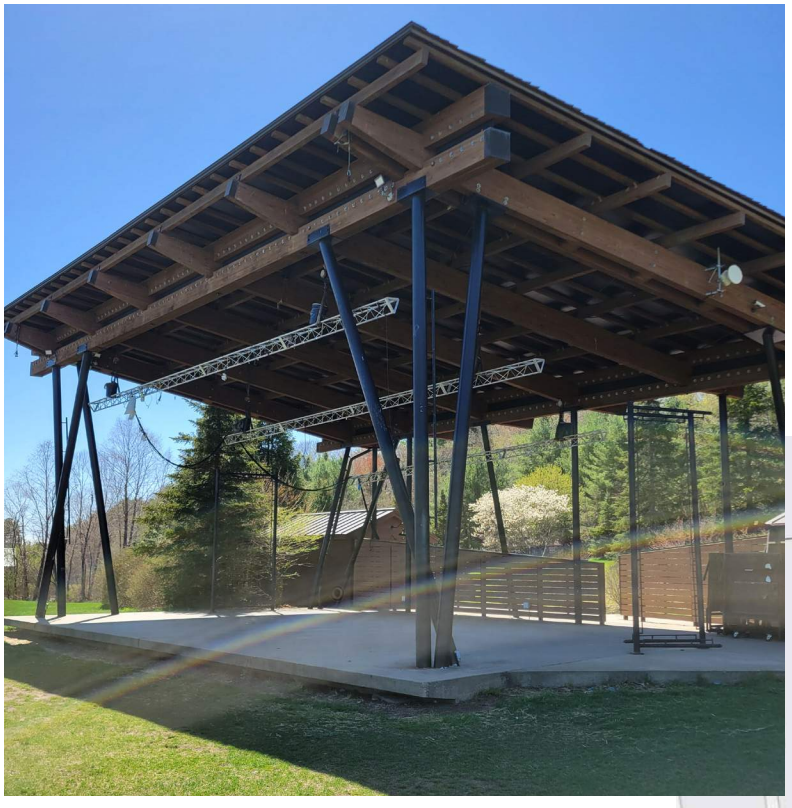
Facilities Information

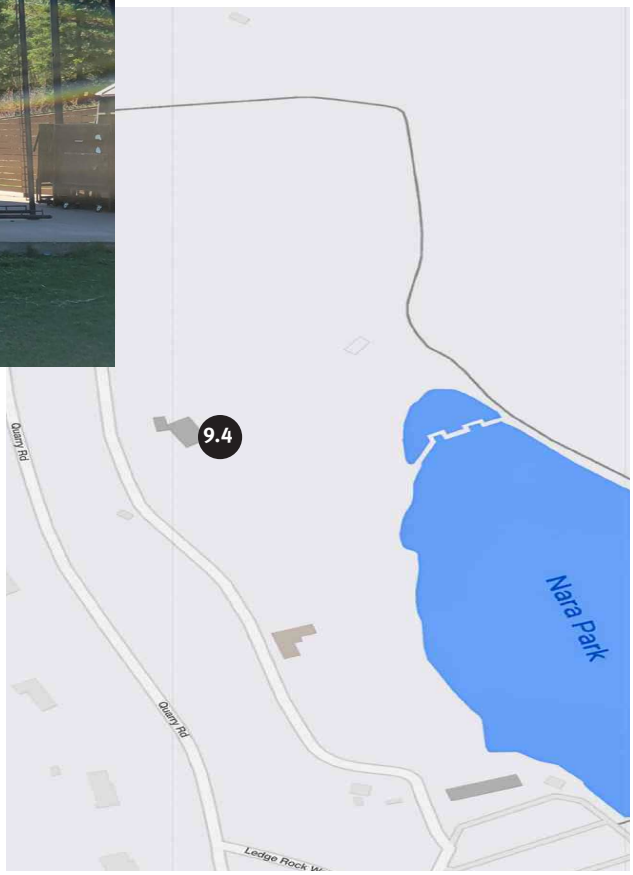
Address	25 Ledge Rock Way
Department	Recreation Center
Year(s) Built	2014
Gross Square Feet	3,415 SF
Historic District	No
On site Combustion	No
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	345	259	(86)	-25%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	1,177	883	(294)	-25%
Electric Utility Cost ($/yr)	$55	$41	$(14)	-25%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$55	$41	$(14)	-25%
TOTAL Emissions (MTCO2e/yr)	0	0	0	0%

STRUCTURE	Concrete slab-on-grade, concrete piers, masonry piers, timber construction
EXTERIOR WALLS	Open-air pavilion, with wood storage shed.
EXTERIOR OPENINGS	No windows, (2) single wood doors in storage shed. Door hardware needs maintenance and eventually to be replaced.
ROOFING AND RAINWATER MANAGEMENT	Standing seam metal roof. No rainwater management.
STAIRS AND VERTICAL CIRCULATION	No vertical circulation, one level only
INTERIORS AND FINISHES	Unfinished concrete floor and wood deck tiles, wood unfinished.
SEALANTS AND CAULKING	Stone piers joints appeared in good condition. Some caps were missing/ needed repair. No other sealants observed.
PLUMBING	Water Service: There is a water meter located in a pit outside the Pavilion. There is 1" Pex water line from that meter that is capped in the Pavilion for future use and this also feeds a hose bib in the Pavilion. This piping appears to be new and in good condition.
FIRE PROTECTION	There are no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - 120/240volt -1phase - 3Wire - 100Amp - Fed From Bathhouse. Electrical Distribution: - Circuit Breaker type Panelboard with M.C.B. - General power - 15A and 20A duplex receptacles. Lighting: - Decorative pendant Compact Fluorescent - Wall mounted indirect HID luminaires. Lighting Controls: - lighting control panel and switches. Raceway and Wiring: - Panel Feeder - Conduit and conductors - Branch Circuit Wiring - Conduit and conductors.
HVAC	There is no HVAC System in the structure.
ACCESSIBILITY	Appears to be fully compliant. Does not appear to have been included in most recent Title II accessibility review. No handicapped accessible tables observed.
CODE CONSIDERATIONS	It is not anticipated that these recommendations would trigger any code requirements. Structure is not a thermally conditioned space, therefore roofing project does not need to comply with the energy code.

APPEARANCE	The structure is in good condition and the appearance is picturesque. Regular cleaning and maintenance should maintain this good appearance.
HISTORIC DISTRICT CONSIDERATIONS	This structure is not in a Historic District or on the National Register.





NARA Park Amphitheater & Snack Bar

Facilities Information

Address	25 Ledge Rock Way
Department	Recreation Center
Year(s) Built	1999
Gross Square Feet	2,000 SF
Historic District	No
On site Combustion	No
Capacity for Solar	Not Rec, w/o analysis

Electrification Information	EXISTING	PROPOSED	DELTA	% CHANGE
Electric (KWH/yr)	2,891	2,024	(867)	-30%
Natural Gas (Therm/yr)	-	-	-	0%
TOTAL Energy Use (kBTU/yr)	9,864	6,905	(2,959)	-30%
Electric Utility Cost ($/yr)	$461	$322	$(139)	-30%
Natural Gas Utility Cost ($/yr)	$-	$-	$-	0%
TOTAL Utility Cost ($/yr)	$461	$322	$(139)	-30%
TOTAL Emissions (MTCO2e/yr)	1	0	-1	-100%

STRUCTURE	Concrete slab-on-grade, concrete piers, steel pipe columns, timber construction, wood sheds
EXTERIOR WALLS	Open-air pavilion, wood fence along rear is in good condition. Two small uninsulated wood sheds have been placed on the “back of house” concrete pad.
EXTERIOR OPENINGS	Open serving window with wood cover, wood double doors to access sheds.
ROOFING AND RAINWATER MANAGEMENT	Wood shingles, appear beyond useful life. Some leaders are in disrepair. Sheds have a standing seam metal roof that appears in good condition.
STAIRS AND VERTICAL CIRCULATION	No vertical circulation
INTERIORS AND FINISHES	No interior finishes, trellis wall made of unfinished wood.
SEALANTS AND CAULKING	No visible sealants
PLUMBING	There is no Plumbing System in the building.
VENTILATION	Natural ventilation only
FIRE PROTECTION	There is no Fire Protection Systems in the building.
ELECTRICAL	Electrical Service: - Feed from pad-mount transformer - 120/240Volt - 1Phase - 3Wire - 200Amp - Direct Metered Electrical Distribution: - Circuit Breaker type Panelboard with Main Circuit Breaker. - General Power - distributed by 15A and 20A straight blade duplex receptacles. Interior and Exterior Lighting: - Buildings- Surface mounted 1x4 wraparound luminaires with (2) T8 fluorescent lamps. - Covered Walkway - (6) flush inground luminaires. Lighting Controls: - Interior building lighting is controlled by toggle type wall switches - Exterior Amphitheater lighting is controlled by circuit breaker. Raceway and Wiring: - Exterior - Conduit and conductors - Panel Feeder - Conduit and conductors - Interior Branch Circuits - both AC and NM type wire.
HVAC	There is no HVAC System in the building.

ACCESSIBILITY	Appears to be fully compliant. Does not appear to have been included in most recent Title II accessibility review.
CODE CONSIDERATIONS	It is not anticipated that these recommendations would trigger any code requirements. Structure is not a thermally conditioned space, therefore roofing project does not need to comply with the energy code.
APPEARANCE	The structure is in generally good condition, except the roof over the stage.
HISTORIC DISTRICT CONSIDERATIONS	This structure is not in a Historic District or on the National Register.

NARA Park Sports Pavilion

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Roof Construction	Construct planned future phase timber shade canopy	$300,000	4

NARA Park Bathhouse

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Steep Slope Roofing	New sheathing, and standing seam metal roof	$480,000	1
Domestic Water Equipment	Replace electric point of use domestic water heaters	$18,000	1
Priority 1 Total	2	$498,000	
Interiors	Refresh of restrooms: paint toilet partitions, insulate any exposed hot water piping, correct (16) accessibility barriers associated with the restrooms and mounting locations	$22,500	3
Wall Finishes	Refinish all walls	$33,000	3
Interior Specialties	Correct (2) accessibility barriers associated with counter heights	$6,000	3
Information Specialties	Provide code signage to correct (2) accessibility barriers	$450	3
Site	Correct (13) priority 1 accessibility barriers associated with the exterior accessible route and parking spaces	$7,500	3
Priority 3 Total	5	$69,450	
HVAC	The building heating is currently electric. Electric heating and exhaust fans appear to be in fair condition and should have several years of useful remaining life. Replace electric heating and exhaust fans within 5-10 year range.	$115,000	4
Lighting	Install/replace exterior lighting with LED type	$15,000	4
Lighting	Install/replace interior lighting with LED type	$105,000	4
Priority 4 Total	3	$235,000	
Grand Total	10	$802,450	

NARA Park Picnic Pavilion

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Roof Structural Frame	Repair stone caps on piers	$2,850	2
Exterior Entrance Doors	New door & hardware on storage shed	$3,750	2
Priority 2 Total	2	$6,600	
Lighting	Replace exterior lighting. Four kinds: strips, decorative pendants, downlights in piers, and flood security lights	$37,500	4
Wall Painting and Coating	Refinish wood framing	$36,000	4
Priority 4 Total	2	$73,500	
Steep Slope Roofing	Repair/replace standing seam metal roof in 16 years	$292,500	5
Priority 5 Total	1	$292,500	
Grand Total	5	$372,600	

NARA Park Amphitheater

CAPITAL RECOMMENDATIONS

ELEMENT TITLE	RECOMMENDATIONS	PRICE ESTIMATE	PRIORITY
Rainwater Management	Install/replace metal (non-copper) downspouts	$10,500	1
Lighting	Install emergency lighting system	$7,500	1
Steep Slope Roofing	New sheathing, and standing seam metal roof over stage area	$190,500	1
Priority 1 Total	3	$208,500	
Exterior Walls, Painting and Coating	Repaint storage shed	$7,500	2
Priority 2 Total	1	$7,500	
Flooring Treatment	Refinish/repaint floor	$36,000	3
Priority 3 Total	1	$36,000	
Lighting	Install/replace interior fluorescent lighting with LED	$36,000	4
Priority 4 Total	1	$36,000	
Grand Total	6	$288,000	

TIMELINE RECOMMENDATIONS

All NARA Park buildings are already electric only therefore, only capital recommendations have been made. This alleviates any pressure to accelerate capital repairs in order to meet electrification goals.

As noted in the conditions section, the structures vary from new condition to average to fair condition. It is recommended that the reroofing projects at the Bathhouse and the Amphitheater occur in one package for economy of scale. During these projects, it is recommended that the structure be further analyzed to understand the feasibility of roof mounted PV and what reinforcement may be required.

III. ENERGY & EMISSIONS ASSESSMENT

A. Energy and Emission Reductions

INTRODUCTION

The Town of Acton adopted a Climate Emergency Declaration at Town Meeting in September 2020 calling for net zero carbon emissions as quickly as possible, with a target date of 2030. In support of meeting the Town's carbon emission reduction targets, the new North Acton Fire Station includes geothermal HVAC systems and on-site PV renewable energy generation, and the Town is currently pursuing an on-site PV installation at the Public Safety Facility, capable of providing 80% of the building's required annual electricity. The Town received a Leading by Example award by the Department of Energy Resources (DOER) in December 2021 for spearheading initiatives aimed at reducing environmental impacts and associated energy costs of government operations.

At Town Meeting 2023 the town passed warrant articles related to electrification. Article 12 adopts the 2023 Municipal Specialized Opt-in Energy Code 225 CMR 22 Appendix RC and 23 Appendix CC, which includes net-zero building performance standards and is designed to achieve greenhouse gas emission limits and sublimits. Article 13 adopts the General Bylaw Regulating Fossil Fuel Infrastructure in Buildings (in new buildings and major renovations) to align with participation in the Municipal Fossil Fuel Free Building Construction and Renovation Demonstration Project 225 CMR 24.

PROPOSED ELECTRIFICATION

For each building that currently contains fossil fuel systems, except emergency generators, the existing HVAC, domestic hot water, and cooking systems were evaluated for switching to high efficiency all-electric systems. While specific electric systems are recommended for each building, there are other potential systems that could be viable and should be considered as part of capital project design implementation for each building. The exterior envelope systems were also assessed for air leakage and thermal performance and upgrade recommendations provided. Envelope performance is an essential component for an all-electric building to function at the highest efficiency. HVAC, water heating, and envelope upgrades are intended to comply with the 2023 Stretch Energy Code 225 CMR 23.00, however, no modeling or detailed analysis was performed and would need to be done for any capital projects undertaken.

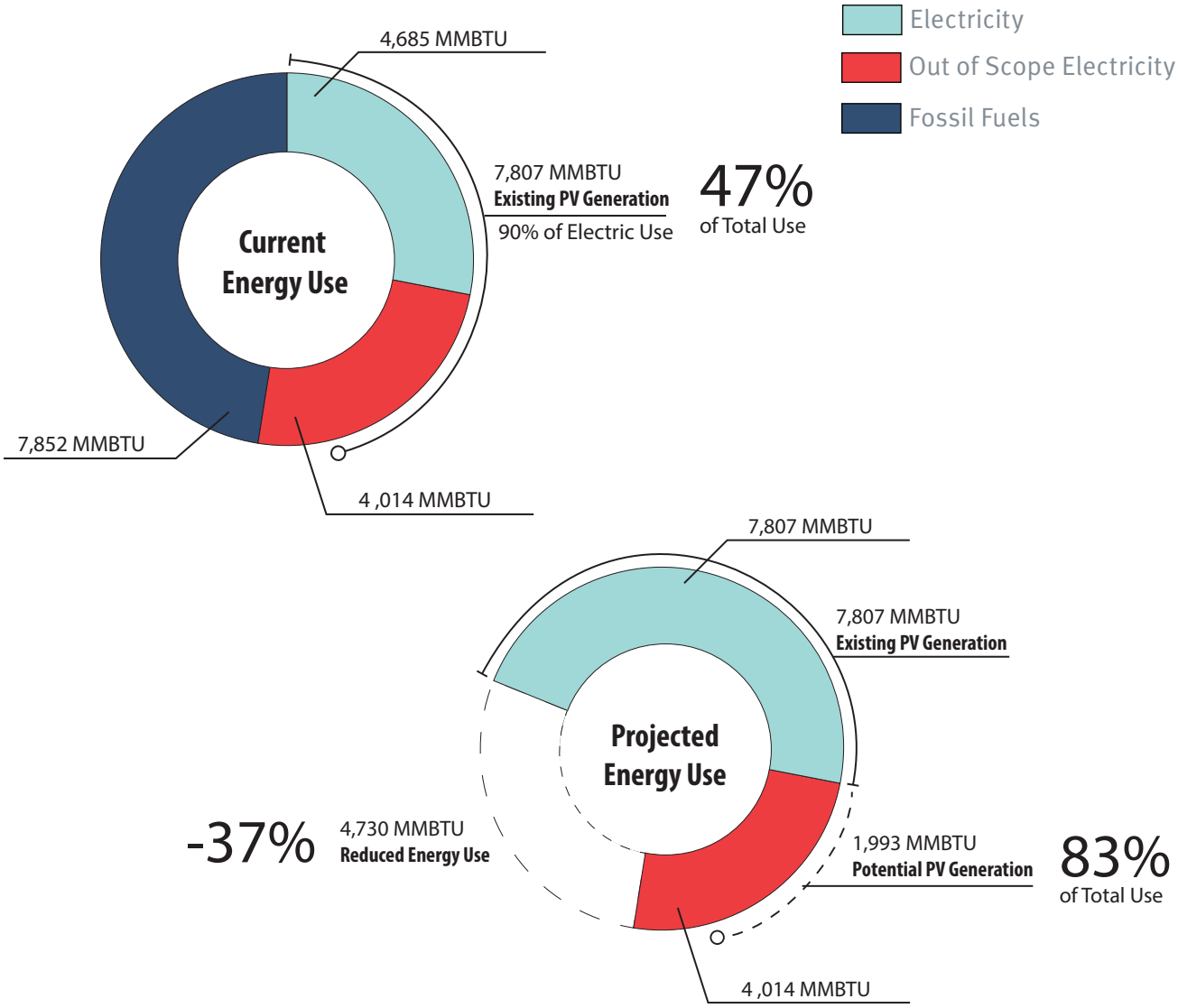
ENERGY REDUCTION

The existing average EUI across all buildings, based on existing utility data, is 65 kBTU/sf/yr. The combined energy use of all buildings included in this study currently amounts to 12,537 MMBTU/yr, with electricity use accounting for 4,685 MMBTU/yr and the remaining portion attributed to fossil fuels. Town wide electricity use outside the scope of this report, such as field and street lighting and pumps, is estimated at 4,014 MMBTU/yr based on fiscal year 2022 utility data provided by the Town. The Town current has 7,807 MMBTU of existing renewable solar PV generation. When looking at the total load of Town uses, including those outside the scope of this report, 90% of current electricity use and 47% of the current total energy use is covered by current renewable solar PV generation.

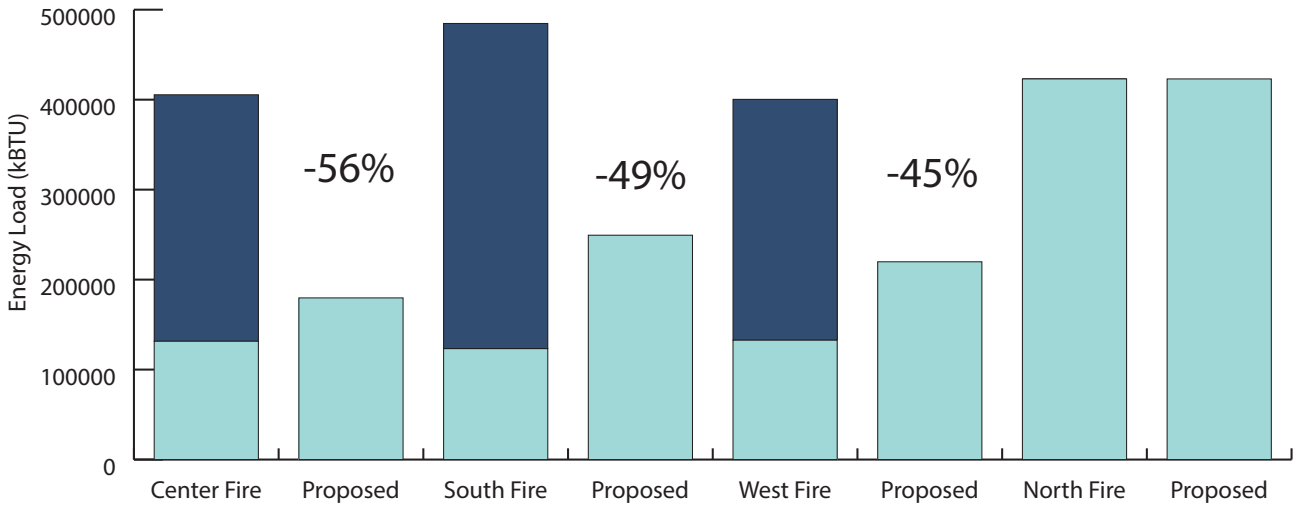
With the recommended electrification and system upgrades, the average EUI of all buildings within the scope of the report is predicted to be 41 kBTU/sf/yr. This represents a 37% reduction in energy use across all buildings. The total energy use of all buildings within the scope of the report after the proposed electrification is 7,807 MMBTU/yr. When looking at the total load of Town uses, including those outside the scope of this report, 83% of the future potential electric use would be covered by renewable solar PV generation.

The following charts illustrate the total portfolio-wide energy use, as well as individual building use, for the existing and proposed cases. The "Energy Use Charts" at the end of this section include detailed numerical values.

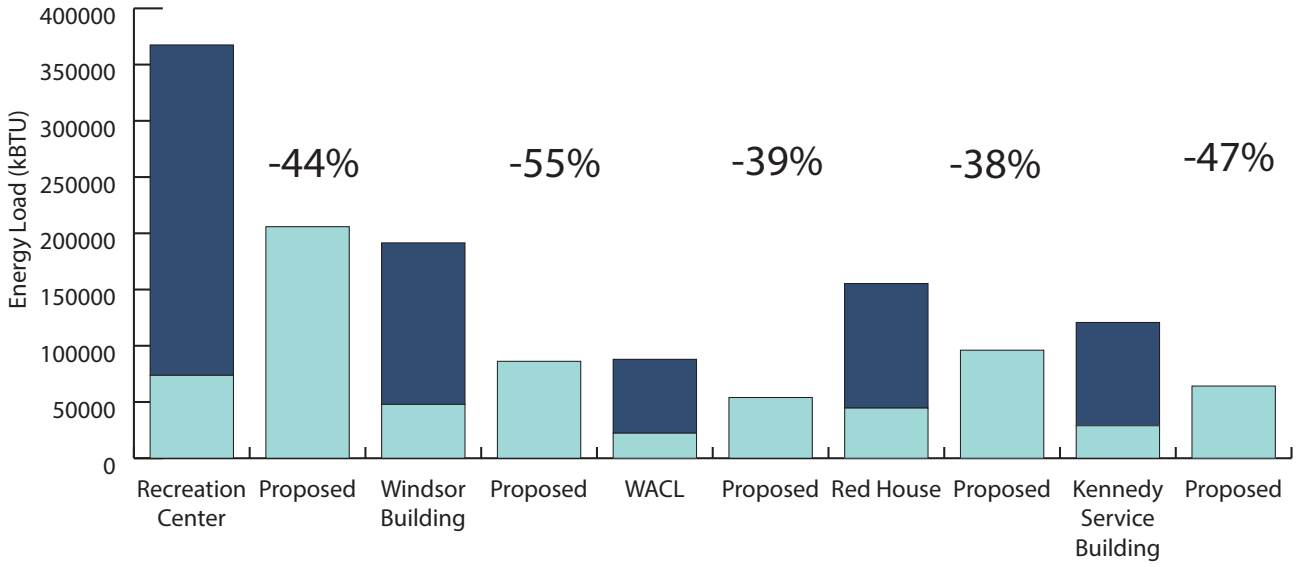
EXISTING & PROJECTED TOTAL ENERGY USE



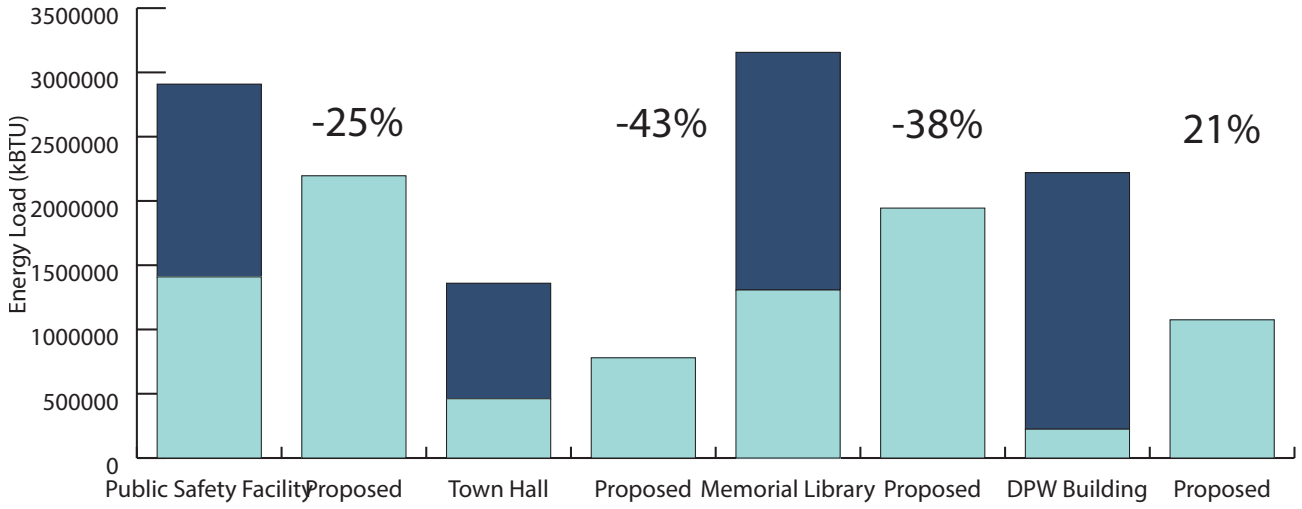
ENERGY USE - FIRE STATIONS



ENERGY USE - SMALL WOOD FRAMED STRUCTURES



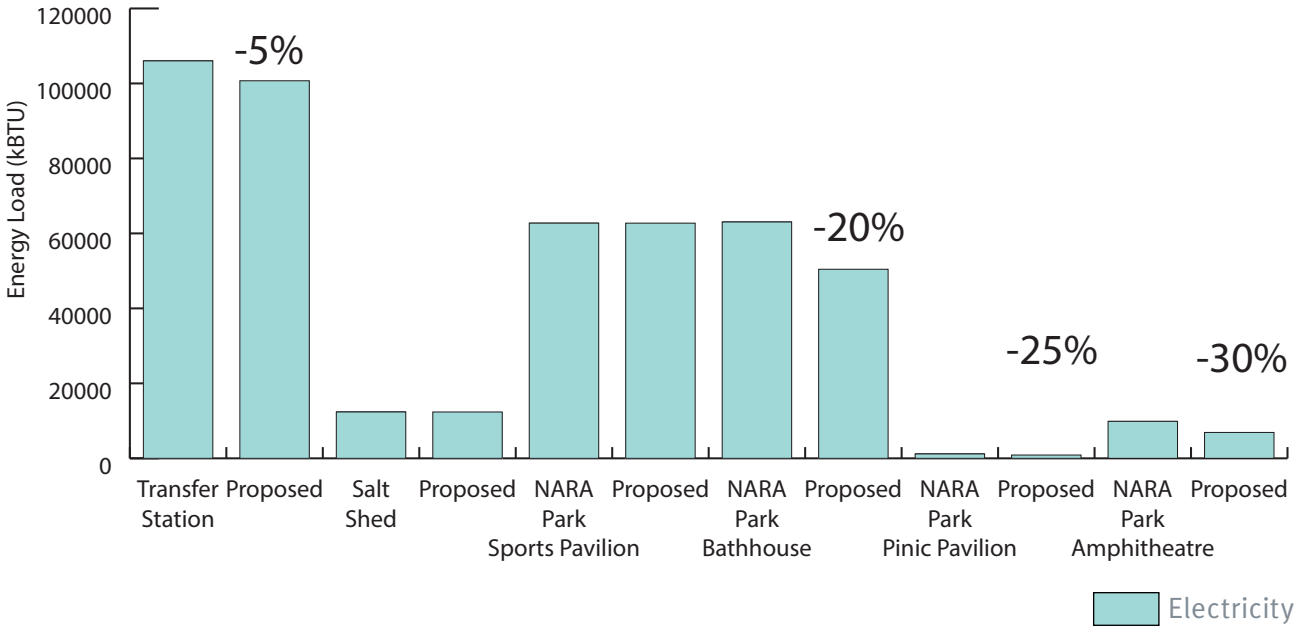
ENERGY USE - LARGE STRUCTURES



Electricity

Fossil Fuels

ENERGY USE - CURRENTLY FOSSIL FUEL FREE STRUCTURES



ENERGY USE ESTIMATIONS & BENCHMARKING

Utilizing 2022 utility data, the existing total annual building energy usage and energy use intensity (EUI) values for 16 of 19 buildings was calculated. For three of the buildings, this approach was not applicable and the existing usage data was extrapolated as follows. The existing building energy data was compared against typical EUIs for each building typology as per the Commercial Building Energy Consumption Survey (CBECS) database and Lawrence Berkeley Lab (LBL) Building Performance database for benchmarking validation.

Windsor Building

The building is currently vacant, therefore existing utility data is not representative of full building use. Instead, this study estimated existing EUI of 81 kBTU/sf based on CBECs data for public assembly buildings.

DPW Building

The provided utility data accounting was set up with the rooftop solar behind the meter, and information regarding received versus delivered energy was not included. Therefore it was not possible to accurately calculate the current energy use. Data from LBL Building Performance Database, which includes data for both office and autobody building typologies. An EUI of 66 kBTU/sf for office and 79 kBTU/sf for the autobody shop use were assumed, with a 60% office and 40% autobody split in the building use.

North Fire Station

The existing electricity usage was extrapolated from the Town provided self analysis of the building use vs PV system generation for March 2022 through November 2022. This data represents 9 months. An average of 11,272 kWh/month was assumed for the remaining three months.

Future potential EUI and energy savings for each building were estimated based on the retrofit and electrification recommendations found in Section II. To estimate the future energy usage, each building's total predicted energy use is broken down by end use based on typical building typology data via CBECs. The potential energy use reduction for each applicable end use was estimated based on the system electrification and other energy saving

measures recommended for each building. This estimation relies on the percentage breakdown from the CBECS database and provides an approximate prediction of the savings to be expected based on recommendations. The table below presents the energy end use breakdowns for each typology, as provided by CBECS.

DPW Building

The building is slated for replacement. It is assumed that the replacement building will be the same area and programmatic breakdown. Predicted EUI is calculated to be 21% better than estimated existing EUI.

Salt Shed

There are no anticipated energy upgrades for this building. Existing energy use is minimal.

North Fire Station & NARA Park Sports Pavilion

These buildings are recently completed and fully electric. There are no anticipated energy upgrades for these buildings, so predicted energy use is equivalent to current.

USE TYPE	HEATING	COOLING	VENTILATION	WATER HEATING	LIGHTING	PLUG LOADS
Office	31%	8%	20%	2%	12%	33%
Public Assembly	51%	19%	5%	1%	6%	27%
Public Order and Safety	35%	11%	7%	12%	13%	25%
Warehouse and Storage	49%	12%	5%	2%	16%	35%

CARBON EMISSIONS

For the purpose of this study emissions factors were used to develop the green house gas emissions (MTCO2e) for each building for both the existing and electrification conditions. The factors for existing emissions for electricity, natural gas, and oil are based on predicitvie carbon emissions intensity factors (pCEIs) as reported by the Energy Start Portfolio Manager Technical Reference (December 2022). For the future upgrade scenario, we utilized 2030 projected electricity emission factors based on data provided for the local grid.

The Town of Acton sources renewable electricity for all of its municipal buildings through an electricity contract, which entails purchasing Renewable Energy Certificates (RECs) from clean energy projects. The amount of RECs purchased is equal to the amount of electricity consumed by the buildings, achieving net-zero emissions in the Town of Acton's electricity use. The lifetime of proposed electrification improvements would last for many years across an increasingly cleaner grid. Eventually, a fully electric building stock will be completely net-zero, once the grid is made up of 100% renewable energy.

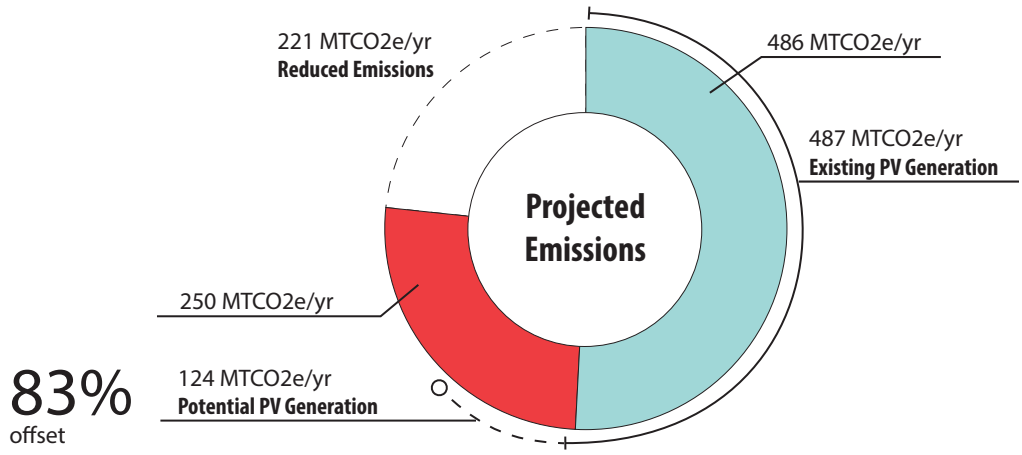
UTILITY CO2e EMISSIONS FACTORS	
Current Electricity Emissions (kg CO2e/MBtu)[1]	71
Current Oil Emissions (kg CO2e/MBtu)[1]	74
Current Natural Gas Emissions (kg CO2e/MBtu) [1]	53
2030 Electricity Emissions (kg CO2e/MBtu)[2]	62

The existing average carbon emission intensity across all buildings, based on existing utility data, is 3.7 kg CO2e/sf/yr. The gross emissions are estimated at 707 MTCO2e/yr. With the recommended electrification and system upgrades, the portfolio-wide average carbon emission intensity is predicted to drop to 2.5 kg CO2e/sf/yr. The gross emissions are estimated to be 486 MTCO2e/yr. This represents a 31% reduction in carbon emissions across all buildings. Refer to the table on the next page for emissions breakdown by building.

The existing solar generation would offset 66% of the future town wide emissions. With additional potential solar generation included, this increases to 83% of the future town wide emissions that would be offset.

1 Source: Energy Star GHG Emissions (Dec 2022)
2 Source: Boston Article 37 ZNC Zoning/ BERDO

EXISTING & PROJECTED TOTAL EMISSIONS



EMISSIONS BY BUILDING

ELECTRIFICATION SUMMARY - TOTAL EMISSIONS (MTCO2E/YR)	EXISTING	PROPOSED	DELTA	% CHANGE
1.1 - Recreation Center	21	13	-8	-38%
2.1 - South Fire Station	28	16	-12	-43%
3.1 - West Fire Station	24	14	-10	-42%
3.2 - Windsor Building	14	5	-9	-64%
3.3 - West Acton Citizen's Library	5	3	-2	-40%
4.1 - DPW Building	75	67	-8	-11%
4.2 - Transfer Station	8	6	-2	-25%
4.3 - Salt Shed	1	1	0	0%
5.1 - Public Safety Facility	179	137	-42	-23%
6.1 - Town Hall	80	49	-31	-39%
6.2 - Memorial Library	191	121	-70	-37%
6.3 - Red House	9	6	-3	-33%
6.4 - Center Fire Station	24	11	-13	-54%
7.1 - Kennedy Service Building	9	4	-5	-56%
8.1 - North Fire Station	30	26	-4	-13%
9.1 - NARA Park Sporks Pavilion	4	4	0	0%
9.2 - NARA Park Bathhouse	4	3	-1	-25%
9.3 - NARA Park Picnic Pavilion	0	0	0	0%
9.4 - NARA Park Amphitheatre	1	0	-1	-100%
Total All Buildings	707	486	-221	-31%

UTILITY COSTS

The existing utility costs of the buildings was calculated based on reported 2022 natural gas and oil cost data for fossil fuels, and the existing electricity usage multiplied by the Town's future aggregate electricity rate of $0.1593/kWh as provided by the Town. The future utility costs after the recommended upgrades are based on the future predicted electricity usage multiplied by the Town's future aggregate electricity rate of $0.1593/kWh.

While the energy use and emissions is typically reduced for each building through the recommended upgrades, the utility costs actually increase for many buildings due to the current higher cost of electricity than natural gas. However, as the buildings are electrified, most of the utility cost can be offset with renewable generation. This study does not factor the solar savings that are achieved from the Power Purchase Agreements. With the solar savings factored in, the utility costs will be less in 2030 after electrification than they are currently.

UTILITY COST BY BUILDING

ELECTRIFICATION SUMMARY - UTILITY COST		EXISTING	PROPOSED	DELTA	% CHANGE
1.1 - Recreation Center	Electric ($/yr)	$3,440	$9,612	$6,172	179%
	Fossil Fuel ($/yr)	$2,644	$-	-$2,644	-100%
	TOTAL Energy Use ($/yr)	$6,084	$9,612	$3,528	58%
2.1 - South Fire Station	Electric ($/yr)	$5,756	$11,642	$5,886	102%
	Fossil Fuel ($/yr)	$2,692	$-	-$2,692	-100%
	TOTAL Energy Use ($/yr)	$8,448	$11,642	$3,194	38%
3.1 - West Fire Station	Electric ($/yr)	$6,193	$10,264	$4,071	66%
	Fossil Fuel ($/yr)	$2,462		-$2,462	-100%
	TOTAL Energy Use ($/yr)	$8,655	$10,264	$1,609	19%
3.2 - Windsor Building	Electric ($/yr)	$2,235	$4,024	$1,789	80%
	Fossil Fuel ($/yr)	$209	$-	-$209	-100%
	TOTAL Energy Use ($/yr)	$2,444	$4,024	$1,580	65%
3.3 - West Acton Citizen's Library	Electric ($/yr)	$1,040	$2,521	$1,481	142%
	Fossil Fuel ($/yr)	$763	$-	-$763	-100%
	TOTAL Energy Use ($/yr)	$1,803	$2,521	$718	40%
4.1 - DPW Building	Electric ($/yr)	$10,467	$50,192	$39,725	380%
	Fossil Fuel ($/yr)	$11,681	$-	-$11,681	-100%
	TOTAL Energy Use ($/yr)	$22,148	$50,192	$28,044	127%
4.2 - Transfer Station	Electric ($/yr)	$4,950	$4,702	-$248	-5%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$4,950	$4,702	-$248	-5%
4.3 - Salt Shed	Electric ($/yr)	$577	$577	$0	0%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$577	$577	$0	0%

ELECTRIFICATION SUMMARY - UTILITY COST		EXISTING	PROPOSED	DELTA	% CHANGE
5.1 - Public Safety Facility	Electric ($/yr)	$65,783	$102,512	$36,729	56%
	Fossil Fuel ($/yr)	$10,978	$-	-$10,978	-100%
	TOTAL Energy Use ($/yr)	$76,761	$102,512	$25,751	34%
6.1 - Town Hall	Electric ($/yr)	$21,537	$36,405	$14,868	69%
	Fossil Fuel ($/yr)	$5,368	$-	-$5,368	-100%
	TOTAL Energy Use ($/yr)	$26,905	$36,405	$9,500	35%
6.2 - Memorial Library	Electric ($/yr)	$61,030	$90,782	$29,752	49%
	Fossil Fuel ($/yr)	$13,034	$-	-$13,034	-100%
	TOTAL Energy Use ($/yr)	$74,064	$90,782	$16,718	23%
6.3 - Red House	Electric ($/yr)	$2,083	$4,486	$2,403	115%
	Fossil Fuel ($/yr)	$3,897	$-	-$3,897	-100%
	TOTAL Energy Use ($/yr)	$5,980	$4,486	-$1,494	-25%
6.4 - Center Fire Station	Electric ($/yr)	$6,138	$8,389	$2,251	37%
	Fossil Fuel ($/yr)	$2,285	$-	-$2,285	-100%
	TOTAL Energy Use ($/yr)	$8,423	$8,389	-$34	-0%
7.1 - Kennedy Service Building	Electric ($/yr)	$1,350	$2,997	$1,647	122%
	Fossil Fuel ($/yr)	$2,237	$-	-$2,237	-100%
	TOTAL Energy Use ($/yr)	$3,587	$2,997	-$590	-16%
8.1 - North Fire Station	Electric ($/yr)	$19,752	$19,752	$0	0%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$19,752	$19,752	$0	0%
9.1 - NARA Park Sporks Pavilion	Electric ($/yr)	$2,929	$2,929	$0	0%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$2,929	$2,929	$0	0%
9.2 - NARA Park Bathhouse	Electric ($/yr)	$2,943	$2,355	-$588	-20%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$2,943	$2,355	-$588	-20%
9.3 - NARA Park Picnic Pavilion	Electric ($/yr)	$55	$41	-$14	-25%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$55	$41	-$14	-25%
9.4 - NARA Park Amphitheatre	Electric ($/yr)	$461	$322	-$139	-30%
	Fossil Fuel ($/yr)	$-	$-	$0	0%
	TOTAL Energy Use ($/yr)	$461	$322	-$139	-30%
Total All Buildings	TOTAL Energy Use ($/yr)	$276,969	$364,504	$87,535	32%

EXISTING PV GENERATION

The existing renewable solar PV generation comes from three sources: the PelleVerde array at the landfill, the Nexamp array at the DPW site, and the Solect Energy array at the North Acton Fire Station. Annual PV generation for the PelleVerde and Nexamp system is based on the 2022 utility data. Generation for the Solect system is based on Solect dashboard data for March 2022 to March 2023. We assume that the existing PV arrays will continue to exist into the future at the same level of generation. The Nexamp array's PPA expires in 2030 with an optional 5 year extension. With the replacement of the DPW building under a portion of this array being planned, it is assumed that this existing generation will be replaced or expanded as part of the future project. In addition, the team understands that the Town is in the planning process to add solar to the back parking lot at the Public Safety Facility in alignment with recommendations from the 2022 Electrification Report. It is assumed that this will add about 309,400 kWh/year of generation to the existing generation.

NEW PV GENERATION STUDY

Buildings were categorized based on their anticipated structural capacity to support PV on their rooftops, with 10 of the 19 buildings being potentially suitable for future rooftop PV installation. A capacity study was conducted on these 10 buildings to determine the potential additional solar generation that could be installed on existing rooftops to help offset the additional electrical burden induced by removing dependence on fossil fuels.

As noted in each building's summary page the buildings fall into the following categories:

Not Recommended

- 2.1 - South Fire Station
- 3.1 - West Fire Station
- 4.3 - Salt Shed
- 5.1 - Public Safety Facility[1]
- 6.1 - Town Hall[1]
- 6.4 - Center Fire Station

Not Recommended w/o Additional Analysis and/or Upgrades[2]

- 1.1 - Recreation Center
- 3.2 - Windsor Building
- 3.3 - West Acton Citizen's Library
- 6.3 - Red House
- 7.1 - Kennedy Building Service
- 9.2 - NARA Park Bathhouse
- 9.3 - NARA Park Pinic Pavilion
- 9.4 - NARA Park Amphitheater

Likely Possible

- 4.2 - Transfer Station: *Roof framing members are light metal "Z" purlins spanning between steel bent plate members. It is likely not possible to support PV on these purlins. However, dunnage spanning to the main structural bent members may be feasible to support PV on.*
- 6.2 - Memorial Library: *Amount of generation per the 2022 Electrification report. Structure may have some reserve capacity. Further detailed analysis of the structure would be required to determine the reserve capacity. If it is determined that the roof framing members do not have adequate capacity, it may be possible to support PV panels on dunnage supported on the existing columns.*
- 9.1 - NARA Park Sports Pavilion: *Assumed future canopy planned for between the existing structures could be designed to accommodate PV*

Already Has Solar

- 4.1 - DPW Building
- 8.1 - North Fire Station

1 See "Building Specific Assumptions" section on page 18

2 See "Solar Capacity Analysis" section on page 13

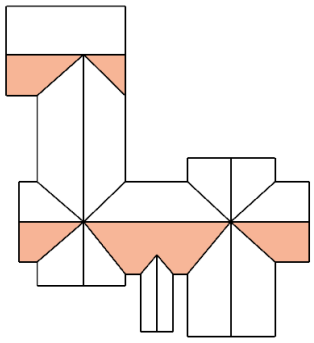
The annual solar energy generation potential on the rooftops is 274,552 KWH/yr. When combined with the existing generation and planned parking lot canopy at the Public Safety Facility, this comes to a total potential generation of 2,871,933 KWH/yr. This would offset approximately 83% of the total proposed town wide energy load and 63% of the total emissions.

PV GENERATION BY BUILDING

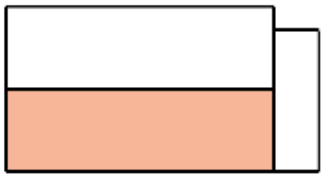
#	BUILDING NAME	CURRENT PV (KWH)	POTENT. PV (KWH)
1.1	Recreation Center	-	19,872
2.1	South Fire	-	-
3.1	West Fire	-	-
3.2	Windsor Building	-	9,996
3.3	West Acton Citizens' Library	-	6,273
4.1	DPW Building	82,631	-
4.2	Transfer Station	-	72,753
4.3	Salt Shed	-	-
5.1	Public Safety Facility	-	309,400
6.1	Town Hall	-	-
6.2	Memorial Library	-	50,000
6.3	Red House	-	15,775
6.4	Center Fire	-	-
7.1	Kennedy Serivce Building	-	10,592
8.1	North Fire	82,080	-
9.1	NARA Park Sports Pavilion	-	13,473
9.2	NARA Park Bathhouse	-	23,634
9.3	NARA Park Picnic Pavilion	-	25,703
9.4	NARA Park Amphitheatre	-	26,481
	Other Town Sources - Pelleverde	2,123,270	-
	Grand Total	2,287,981	583,952

POTENTIAL PV GENERATION AREAS

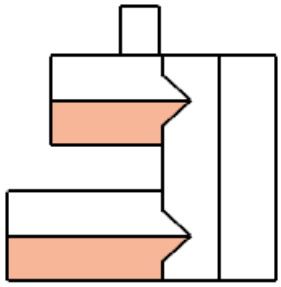
Building: 1.1 – Recreation Center
PV Panel Area: 984 SF
AC Energy: 19,872 kWh/year (67,807 kBtu/year)
AC Energy Intensity: 20.2 kWh/SF (69.9 kBtu/SF)



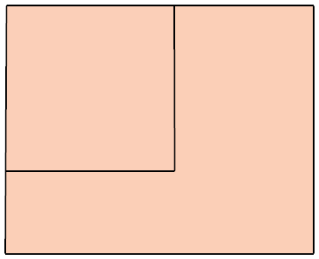
Building: 3.2 – Windsor
PV Panel Area: 498 SF
AC Energy: 9,996 kWh/year (34,106 kBtu/year)
AC Energy Intensity: 20.1 kWh/SF (68.5 kBtu/SF)



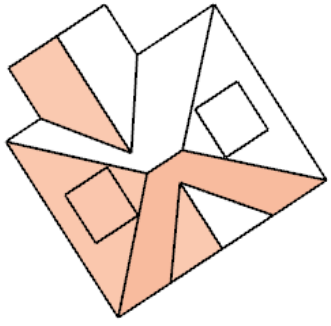
Building: 3.3- WA Citizens Lib
PV Panel Area: 311 SF
AC Energy: 6,273 kWh/year (21,405 kBtu/year)
AC Energy Intensity: 20.1 kWh/SF (68.8 kBtu/SF)

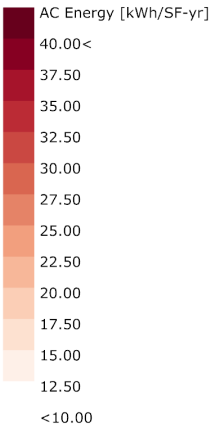


Building: 4.2 – Transfer Station
PV Panel Area: 4,191 SF
AC Energy: 72,753 kWh/year (248,242 kBtu/year)
AC Energy Intensity: 17.4 kWh/SF (59.2 kBtu/SF)

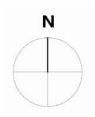


Building: 6.3 – Red House
PV Panel Area: 846 SF
AC Energy: 15,775 kWh/year (53,826 kBtu/year)
AC Energy Intensity: 18.5 kWh/SF (63.0 kBtu/SF)

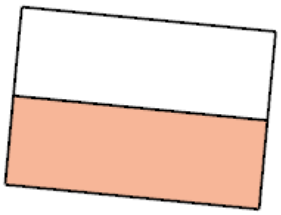




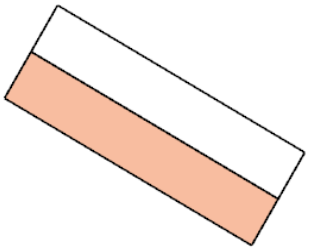
For visualization purposes, the roof plans are not in scale.



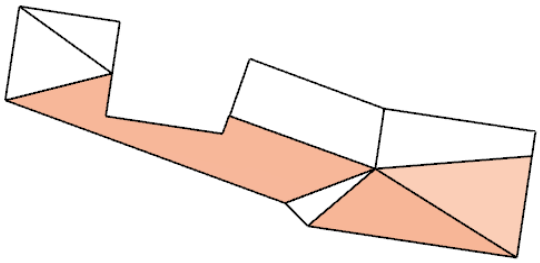
Building: 7.1 – Kennedy Service Buildings
PV Panel Area: 528 SF
AC Energy: 10,592 kWh/year (36.143 kBtu/year)
AC Energy Intensity: 20.1 kWh/SF (68.4 kBtu/SF)



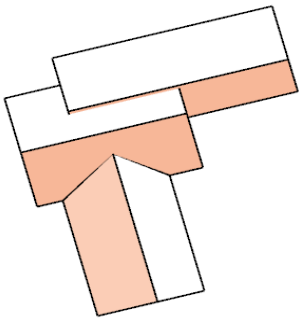
Building: 9.1 – NARA Park Sports Pavilion
PV Panel Area: 696 SF
AC Energy: 13,473 kWh/year (45,973 kBtu/year)
AC Energy Intensity: 19.4 kWh/SF (66.1 kBtu/SF)



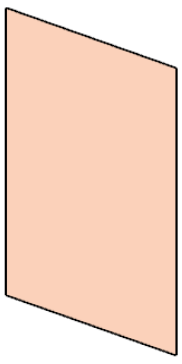
Building: 9.2 – NARA Park Bathhouse
PV Panel Area: 1,219 SF
AC Energy: 23,634 kWh/year (80,644 kBtu/year)
AC Energy Intensity: 19.9 kWh/SF (67.8 kBtu/SF)

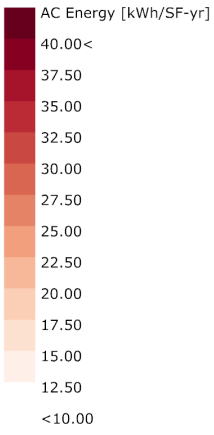


Building: 9.3 – NARA Picnic Pavilion
PV Panel Area: 1,335 SF
AC Energy: 25,703 kWh/year (87,701 kBtu/year)
AC Energy Intensity: 19.4 kWh/SF-year (66.2 kBtu/SF)

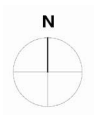


Building: 9.4 – NARA Park Amphitheatre
PV Panel Area: 1,548 SF
AC Energy: 26,481 kWh/year (90,358 kBtu/year)
AC Energy Intensity: 17.1 kWh/SF (58.4 kBtu/SF)





For visualization purposes, the roof plans are not in scale.



ENERGY USE CHARTS

ELECTRIFICATION SUMMARY - ENERGY		EXISTING	PROPOSED	DELTA	% CHANGE
1.1 - Recreation Center	Electric (KWH/yr)	21,596	60,338	38,742	179%
	Fossil Fuel (Therm/yr)	2,938	-	-2,938	-100%
	TOTAL Energy Use (kBTU/yr)	367,486	205,872	-161,614	-44%
	EUI (kBTU/SF)	55	31	-24	-44%
2.1 - South Fire Station	Electric (KWH/yr)	36,134	73,082	36,948	102%
	Fossil Fuel (Therm/yr)	3,614	-	-3,614	-100%
	TOTAL Energy Use (kBTU/yr)	484,689	249,356	-235,333	-49%
	EUI (kBTU/SF)	83	43	-40	-48%
3.1 - West Fire Station	Electric (KWH/yr)	38,878	64,430	25,552	66%
	Fossil Fuel (Therm/yr)	2,677	-	-2,677	-100%
	TOTAL Energy Use (kBTU/yr)	400,352	219,834	-180,518	-45%
	EUI (kBTU/SF)	78	43	-35	-45%
3.2 - Windsor Building	Electric (KWH/yr)	14,033	25,260	11,227	80%
	Fossil Fuel (Therm/yr)	1,436	-	-1,436	-100%
	TOTAL Energy Use (kBTU/yr)	191,526	86,187	-105,339	-55%
	EUI (kBTU/SF)	65	29	-36	-55%
3.3 - West Acton Citizen's Library	Electric (KWH/yr)	6,526	15,827	9,301	143%
	Fossil Fuel (Therm/yr)	657	-	-657	-100%
	TOTAL Energy Use (kBTU/yr)	87,967	54,003	-33,963	-39%
	EUI (kBTU/SF)	44	27	-17	-39%
4.1 - DPW Building	Electric (KWH/yr)	65,704	315,078	249,374	380%
	Fossil Fuel (Therm/yr)	19,958	-	-19,958	-100%
	TOTAL Energy Use (kBTU/yr)	2,219,982	1,075,046	-1,144,936	-52%
	EUI (kBTU/SF)	71	56	-15	-21%
4.2 - Transfer Station	Electric (KWH/yr)	31,072	29,518	-1,554	-5%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	106,018	100,717	-5,301	-5%
	EUI (kBTU/SF)	19	18	-1	-5%
4.3 - Salt Shed	Electric (KWH/yr)	3,625	3,625	0	0%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	12,369	12,369	0	0%
	EUI (kBTU/SF)	1	1	0	0%
5.1 - Public Safety Facility	Electric (KWH/yr)	412,950	643,517	230,567	56%
	Fossil Fuel (Therm/yr)	15,000	-	-15,000	-100%
	TOTAL Energy Use (kBTU/yr)	2,908,985	2,195,679	-713,306	-25%
	EUI (kBTU/SF)	112	84	-28	-25%
6.1 - Town Hall	Electric (KWH/yr)	135,200	228,530	93,330	69%
	Fossil Fuel (Therm/yr)	8,987	-	-8,987	-100%
	TOTAL Energy Use (kBTU/yr)	1,360,002	779,743	-580,259	-43%
	EUI (kBTU/SF)	56	32	-24	-43%

ELECTRIFICATION SUMMARY - ENERGY		EXISTING	PROPOSED	DELTA	% CHANGE
6.2 - Memorial Library	Electric (KWH/yr)	383,112	569,883	186,771	49%
	Fossil Fuel (Therm/yr)	18,490	-	-18,490	-100%
	TOTAL Energy Use (kBTU/yr)	3,156,178	1,944,439	-1,211,739	-38%
	EUI (kBTU/SF)	65	40	-25	-38%
6.3 - Red House	Electric (KWH/yr)	13,074	28,159	15,085	115%
	Fossil Fuel (Therm/yr)	1,107	-	-1,107	-100%
	TOTAL Energy Use (kBTU/yr)	155,328	96,077	-59,251	-38%
	EUI (kBTU/SF)	29	18	-11	-38%
6.4 - Center Fire Station	Electric (KWH/yr)	38,530	52,664	14,134	37%
	Fossil Fuel (Therm/yr)	2,740	-	-2,740	-100%
	TOTAL Energy Use (kBTU/yr)	405,464	179,691	-225,773	-56%
	EUI (kBTU/SF)	87	38	-49	-56%
7.1 - Kennedy Service Building	Electric (KWH/yr)	8,472	18,815	10,343	122%
	Fossil Fuel (Therm/yr)	918	-	-918	-100%
	TOTAL Energy Use (kBTU/yr)	120,746	64,197	-56,549	-47%
	EUI (kBTU/SF)	48	25	-23	-48%
8.1 - North Fire Station	Electric (KWH/yr)	123,992	123,992	0	0%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	423,061	423,061	0	0%
	EUI (kBTU/SF)	54	54	0	0%
9.1 - NARA Park Sporks Pavilion	Electric (KWH/yr)	18,387	18,387	0	0%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	62,736	62,736	0	0%
	EUI (kBTU/SF)	39	39	0	0%
9.2 - NARA Park Bathhouse	Electric (KWH/yr)	18,477	14,782	-3,695	-20%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	63,044	50,435	-12,609	-20%
	EUI (kBTU/SF)	11	9	-2	-18%
9.3 - NARA Park Picnic Pavilion	Electric (KWH/yr)	345	259	-86	-25%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	1,177	883	-294	-25%
	EUI (kBTU/SF)	-	-	0	0%
9.4 - NARA Park Amphitheatre	Electric (KWH/yr)	2,891	2,024	-867	-30%
	Fossil Fuel (Therm/yr)	-	-	0	0%
	TOTAL Energy Use (kBTU/yr)	9,864	6,905	-2,959	-30%
	EUI (kBTU/SF)	5	3	-2	-40%
Total All Buildings	TOTAL Energy Use (kBTU/yr)	12,536,974	7,807,230	-4,729,744	-38%
	EUI (kBTU/SF)	65	41	-24	-37%

B. Rebates and Incentives

INTRODUCTION

There are several state and federal incentives that provide rebates for the incorporation of efficient electric HVAC systems, efficient lighting and lighting controls, air leakage and thermal performance upgrades of exterior envelope, induction cooking appliances, and solar renewable energy.

MASS SAVE INCENTIVES

The utility companies which sponsor the Mass Save program have two incentive programs that are applicable to the types of renovations that are recommended in this report. Eversource is the utility for all Town of Acton buildings and is a sponsor of Mass Save.

Prescriptive Equipment Rebates

There are incentives available for qualifying individual equipment including switching from natural gas, electric resistance or oil to high efficiency heat pumps and heat pump water heaters, lighting and controls, weatherization and air sealing, and induction stoves. Some incentive amounts are shown in the tables below.

Comprehensive Incentives

If a project includes multiple efficiency upgrades, Eversource offers special incentive rates for multi-measure energy efficiency projects in existing commercial and industrial projects that may generate larger incentives than individual equipment rebates. These incentives are for renovation projects that include at least 2 energy conservation measures. See table on the next page for incentive amounts.

Deep Energy Retrofit

In addition to the above incentive programs the Deep Energy Retrofit (DER) program provides an additional $1.00 per SF for projects achieving 40% reduction in GHG emissions. Projects must be completed within a three year time frame. This path may be possible for the South, West, and Center Fire stations, as well as the Kennedy Service Building.

New Construction & Major Renovations

The Path 3 program is available to major renovations that include at least three of the following systems, HVAC, DHW, lighting, envelope and process equipment. In addition, the building must include a gut renovation such that occupancy is not possible during construction. Of the buildings in this study, the Windsor Building may qualify for this path.

PRESCRIPTIVE EQUIPMENT REBATES

Heat Pumps [1]		
Equipment Type[2]	Minimum Efficiency Requirements	Rebate ($/ton)[3]
Air-Source Heat Pumps (ASHP)	Refer to MassSave.com/cihpapl for list of equipment and minimum requirements	$2,500
Air-Source Variable Refrigerant Flow Heat Pump (VRF)		$3,500
Ground Loop Heat Pump (GLHP) or Ground Water Heat Pump (GWHP)		$4,500

1 For units not listed by AHRI or the QPL, please contact us by email at ne-heatpumps@energy-solution.com for guidance.
2 ASHP and VRF refer to air-to-air equipment. Please contact your Sponsor for information on air-to-water heat pump rebates.
3 Total rebate amount shall not exceed installed consts (Inclusive of both equipment and installation).

Heat Pump Water Heaters					
Equipment	Sector	Existing Heating System Fuel Type	Size	Required Efficiency	Customer Incentive ($/Unit)
Electric Heat Pump Water Heater (HPWH)	Residential	Electric, Propane, Oil, or Natural Gas	≤ 80 Gallon	UEF ≥ 3.2	$750
			≤ 80 Gallon	UEF ≥ 3.2	$1,000
	Commercial	Electric, Propane, Oil, or Natural Gas	81-120 Gallon	COP ≥ 3.6	$2,200

COMPREHENSIVE INCENTIVES

Incentive tier	Energy Conservation Measures	End Use	Buildings	$ per KWH	$ per therm	Not to exceed % cost	Not to exceed payback
Total Comprehensive*	3+	2+	1	$0.65	$5.50	75%	1 year
Total-Measure*	2	2	1	$0.45	$4.50	65%	1.5 years
Custom Retrofit Base	1	1	1	$0.30	$3.00	50%	2 years

*Multi-Measure requires 2 measures, impacting 2 end uses, in 1 building. Total Comprehensive requires 3+ measures, impacting 2+ end uses, in 1 building.

NEW CONSTRUCTION & MAJOR RENOVATIONS

Path 3: High Preformance Buildings	
Customer Incentives	
Custom: Envelope, lighting controls, unitary HVAC (RTU, AC), high efficiency chillers, energy recovery, demand control ventilation, variable flow kitchen hoods, DHW heaters, low flow water fixtures and other custom measures	$0.35/KWh $2.00/therm
Prescriptive: variable frequency drives	Current program rate
Space Heating Heat Pump* - Air Source Head Pumps - Variable Refrigerant FLow (VRF) - Ground Source Heat Pumps	$800/ton $1,200/ton $4,500/ton

AEC REVENUE

Advanced Energy Credits (AECs) are a state financial incentive for buildings adopting “clean heat” technology such as electrification. The MA Alternative Energy Performance Standard (APS) provides for minting AEC certificates quarterly as incentive payments for buildings hearing with efficient electric technology. AECs are calculated in accordance with the Massachusetts Guideline on Metering and Calculating the Useful Thermal Output of Eligible Renewable Thermal Generation Units. Calculated annual AECs for the largest buildings were outlined in the 2022 Acton Electrification Roadmap as shown below. The other town facilities would have much lower amounts.

BUILDING	NET THERMAL ENERGY OUTPUT EQUIVALENT (MWH)	RENEWABLE THERMAL GENERATION UNIT MULTIPLIER	AECS
Memorial Library	25	1	25
Public Safety Facility	20	3	60
Town Hall	11	3	33

DEMAND RESPONSE

Demand response solutions reduce a building's energy use during periods of high or costly demand and provide incentives when participating in demand response events.

Eversource offers two different participation options, which allow the customer to select the number of events and incentive amounts that work best. Daily participants will generally participate in more called events, which means more opportunity for incentives. Targeted participants will likely participate in fewer events and will see less in incentives.

Demand response programs may require specific technologies to be installed as part of the HVAC system.

FEDERAL TAX INCENTIVES

As part of the 2022 Inflation Reduction Act, several tax incentives were signed into law that cover certain energy efficiency and renewable energy projects. Tax exempt entities may now be eligible for Direct Payments of the tax credits. Most of the programs require prevailing wage requirements and some also have apprenticeship requirements. The US DOE is still releasing information about the specifics of the programs.

Section 48 Clean Electricity Tax Credit

This Investment Tax Credit covers between 30% - 50% of the cost of clean energy property investments including solar, geothermal heat pumps, and combined heat and power and energy storage, microgrid controllers and dynamic glass. In 2025 the credit will be tech neutral. In addition, the Production Tax Credit Provides a per kWh rate for the electricity produced and sold by the solar installation, starting on the date the facility is originally placed in service and lasting for ten years. The current PTC (adjusted for inflation) is 2.6 cents per kWh.

IV. APPENDIX

CODE RED CONSULTANTS
(617) 500-7633 | INFO@CRCFIRE.COM
(617) 500-2074 | WWW.CRCFIRE.COM
154 TURNPIKE ROAD, SUITE 200
SOUTHBOROUGH, MA 01772

Memorandum

Date:	June 5th, 2023	Project#:	231439
To:	Autumn Waldron - Arrowstreet		
From:	Paul Moan, P.E. - Code Red Consultants		
Re:	Acton Facilities Code Review		
Cc:	Ben Seeto, – Code Red Consultants		

This memorandum outlines key accessibility and sprinkler code thresholds to facilitate the scope of future work by informing the project team for the Acton Facilities Code Review project in Acton, MA. The contents of this memo are based on initial project questions sent via email.

Applicable Codes

The following codes form the basis of this memorandum:

- 780 CMR: Massachusetts State Building Code, 9th Edition, which is amended version of the 2015 International Building Code (IBC).
- 527 CMR 1.00: Massachusetts Comprehensive Fire Safety Code, which is an amended version of the 2021 Edition of NFPA 1.
- 2010 ADA Standards for Accessible Design
- 521 CMR – Massachusetts Architectural Access Board (MAAB) Rules and Regulations

Automatic Sprinkler Scoping

For buildings that are not currently provided with automatic sprinkler protection, retroactive installation of an automatic sprinkler system is governed by both (1) MGL Ch. 148 Section 26 G, and (2) the requirements of Chapter 8 of the Massachusetts Existing Building Code (MEBC) whose application is outlined below.

Massachusetts General Law – Sprinkler Protection

Massachusetts General Law Ch. 148 Sec. 26G requires every building or structure, including major alterations thereto, which totals more than 7,500 gross square feet to be protected throughout with an automatic sprinkler system. Note that the 7,500 sf threshold includes "the sum total of the combined floor areas for all levels, basements, sub-basements, and additions, in aggregate, measured from the outside walls, irrespective of the existence of interior fire resistive walls, floors and ceilings".

An advisory document published by the Sprinkler Appeals Board in 2009 expands upon the application of this MGL to existing buildings. An existing building is required to be protected with sprinklers where **all** the following **four (4)** conditions are satisfied:

1. Building gross square footage is more than 7,500 sf.
2. Sufficient water and water pressure exist to serve the system. This should be verified by the project's sprinkler design engineer of record, however, it is recommended that it be assumed adequate coverage is provided unless proven otherwise.

3. The nature of work to the building is considered as "major", including any one or more of the following.
    a. The demolition or reconstruction of existing ceilings or installation of suspended ceilings.
    b. The removal and/or installation of sub flooring, not merely the installation or replacement of carpeting or finished flooring.
    c. The demolition and/or reconstruction or repositioning or walls or stairways or doors.
    d. The removal or relocation of a significant portion of the building's HVAC, plumbing, or electrical systems involving the penetration of walls, floors, or ceilings.
4. The scope of work is proportional to the cost/benefit of sprinkler installation. To evaluate whether this is satisfied, the advisory document lists **either of the following** as thresholds for requiring sprinkler protection.
    a. Work affects 33% or more of the total gross square footage.
    b. The total cost of the work (excluding cost to install a sprinkler system) is equal to or greater than 33% of the assessed value of the building, as of the date of permit application. 33% of the assessed values of the buildings are listed below.

Building Name	Assessed Building Value[1]	Assessment Ratio[2]	33% of the assessed value[3]
Windsor Building	$175,200	0.98	$58,995
Town Hall	$3,484,500	0.98	$1,173,352
Salt Shed	$672,800	0.98	$226,555
Center Fire	$644,200	0.98	$216,924
South Fire	$718,600	0.98	$241,977
West Fire	$679,100	0.98	$228,676

It is the conclusion of the advisory document that if any of the buildings within the scope of this project meets the conditions of items 1 through 4, then it is reasonable to conclude that the alterations and modifications are considered as major, thus requiring sprinkler protection. However, ultimately it is the determination of the local fire code official to determine whether the renovation is considered as "major" or not.

[1] https://actonma.mapgeo.io/datasets/properties?abuttersDistance=300&latlng=42.486916%2C-71.436386

[2] https://dlsgateway.dor.state.ma.us/gateway/DLSPublic/LA19/ShowReport

[3] Calculated using the following equation: $Building\ Value * 33\% \ / \ Assessment\ Ratio$

MEBC Chapter 8 – Sprinkler Protection

Work classified as a Level 2 Alteration is subject to the provisions of MEBC Chapter 8 (MEBC 504.1). A Level 2 alteration is defined as:

> *A work area that is 50% or less of the total building area consisting of the reconfiguration of space, the addition or elimination of any doors or windows, the reconfiguration or extension of any system, or the installation of any additional equipment*. (MEBC 504 & MEBC 505).

MEBC Section 804.2.2 would require automatic sprinkler protection to be provided throughout the work area where **all** the following conditions exist.

1. The work area contains exits and corridors shared by more than 1 tenant or that have exits and corridors serving an occupant load greater than 30.
2. The work area is required to be provided with automatic sprinkler protection in accordance with 780 CMR Chapter 9 as applicable to new construction.
3. The work area exceeds 50% of the floor area. Work area is defined as

   "*That portion or portions of a building consisting of reconfigured spaces as indicated on the construction documents*" (MEBC 202).

Accessibility Scoping

Massachusetts Architectural Access Board Regulations (521 CMR)

Buildings in Massachusetts are subject to compliance with the Massachusetts Architectural Access Board Regulations (521 CMR). The requirements of 521 CMR are limited to buildings or portions thereof that are open to the public. Employee-only spaces are exempt from these requirements.

521 CMR Section 3.3 contains the following scoping requirements for projects in existing buildings. The costs referred to in the scoping requirements below are cumulative for all projects to the building within a rolling 36-month period:

1. If the work is less than $100,000, then only the work being performed is required to comply with 521 CMR.
2. If the work costs more than $100,000 but is less than 30% of the full and fair cash value of the building then in addition to the work being performed, the following accessible features are also required to be provided in the building:
   a. Accessible entrance
   b. Accessible toilet room
   c. Accessible drinking fountain (if provided)
   d. Accessible public telephone (if provided)
3. If the work, plus the cost of all work within the past 36-months, costs more than 30% of the full and fair cash value of the building, then all public portions of the building are subject to the requirements of 521 CMR. Full and fair cash value is defined as the assessed value of the property not including the land (521 CMR 5.38).

Americans with Disabilities Act – 2010 ADA Standards

The 2010 ADA Standards require altered portions of an existing building to be readily accessible to and usable by individuals with disabilities to the maximum extent feasible (ADA 35.151(b)). Further, alterations to primary function areas should be made such that the level of accessibility, including the path of travel to the space, is made accessible to the maximum extent feasible. When determining if the upgrade is feasible, the ADA requirements state that the upgrade to the path of travel is disproportionate to the project when the cost to perform the work exceeds 20% of the cost of the alteration to the primary function area.

Spaces and elements within employee work areas are required to be designed and constructed so that individuals with disabilities can approach, enter, and exit the employee work area (ADA 203.9). Elements within employee work areas are not required to be fully accessible, however consideration should be given to designing employee work areas as accessible at the outset of the project in order to accommodate the potential needs of future employees.

Where discrepancies exist between the ADA and 521 CMR, the regulation that provides the greater level of accessibility must be followed. Though 521 CMR does not regulate employee only areas, Title II makes it clear that employee-only areas are required to comply with the 2010 ADA Standards.

Work surfaces for use by other than employees, conference rooms, break rooms, dining surfaces are required to be provided with tables, chairs, stations, etc. that are accessible. At least 5% of all elements, but not less than one, are required to be accessible in accordance with ADA Section 902 (ADA 226.1).

If you have any questions or comments on the above information, please do not hesitate to contact us.

CODE RED CONSULTANTS

Prepared By:

Paul Moan, P.E.

The Commonwealth of Massachusetts
Executive Office of Public Safety and Security
Fire Safety Commission
Automatic Sprinkler Appeals Board
P.O. Box 1025 ~ State Road
Stow, Massachusetts 01775
(978) 567-3181 Fax:(978) 567-3121

DEVAL L. PATRICK
GOVERNOR

TIMOTHY P. MURRAY
LT. GOVERNOR

KEVIN M. BURKE
SECRETARY

JOHN J. MAHAN
CHAIRMAN

MAURICE M. PILETTE
VICE CHAIRMAN

MEMORANDUM

TO: **Interested persons**

FROM: **Commonwealth of Massachusetts, Fire Safety Commission's Automatic Sprinkler Appeals Board**

DATE: **October 14, 2009**

RE: **Advisory regarding recent amendments to M.G.L. c. 148, s. 26G (Chapter 508 of the Acts of 2008) which requires enhanced sprinkler protection in certain buildings which total more than 7,500 gross square feet in floor area.**

Introduction

Because of the unique characteristics of each building construction project, the Board realizes that it is not possible to address all aspects of this law in a single guidance document. As the Board hears appeals based upon the newly revised law, the Board anticipates that some of the conclusions found in this document may be subject to further review and possible modification. Accordingly, persons should closely monitor further guidance and decisions from the Board regarding this matter.

The Commonwealth of Massachusetts' Fire Safety Commission and the Automatic Sprinkler Appeal's Board (hereinafter referred to as "the Board"), has received several requests for guidance regarding the recent amendments to M.G.L. c.148, s.26G (Chapter 508 of the Acts and Resolves of 2008), which requires an adequate system of automatic sprinklers to be installed in certain buildings or structures totaling more than 7,500 square feet. Under s. 26G, this Board has jurisdiction to hear appeals from orders issued by heads of the fire department who are charged with enforcing the law. Under the authority of M.G.L. c. 30A, s. 8, the Board is issuing this advisory guidance document to assist heads of fire departments and building owners to understand the basic requirements of this law.

In developing this document, the Board has used its best efforts in developing guidance consistent with the language of the statute, legislative intent, related cases and common sense. This

document is not intended to be the final word on this matter or meant to be a substitute for a good faith, reasonable interpretation of the statute by the head of the fire department. In determining whether a building is subject to this law, the head of the fire department should make fair, consistent and well-reasoned determinations, based upon the reading of the law and the specific factors that exist for a particular building.

1. How did the law change?

The law changed in two significant ways. First, the law will now be applied uniformly throughout the state in all cities and towns. The provisions of M.G.L c. 148, s. 26G, in various forms, have been law since 1982. However, until this recent amendment to M.G.L. c. 148, s. 26G (c. 508 of the Acts of 2008), the law only applied within those cities and towns that adopted the law by local option. However the law now applies to all municipalities on a statewide basis.

The second major change expanded the instances in which sprinkler systems will be required. The law limits the installation of sprinklers to new buildings and buildings subject to major alterations or additions if said buildings feature more than 7,500 gross square feet in floor area. Under the old law, the construction of an addition required sprinklers in the "addition only." The new law requires sprinklers to be installed based upon the building's sum total of square feet (s.f.) in floor area "in the aggregate." As an example, under the new law, if you have an existing building that has 5,000 s.f. of floor area and you are constructing a 3,000 s.f. addition, you will now be required to install an adequate sprinkler system throughout the building, since the building will now total over 7,500 s.f. in the aggregate (8,000 s.f.).

2. Why was the law changed?

The legislative activity to amend the provisions of M.G.L. c. 148, s. 26G arose in the aftermath of a tragic commercial building fire, which occurred in Newton, Massachusetts in February, 2000, resulting in the death of five individuals. It was the Legislature's intent to apply the law throughout the state. This reasoning is based upon the long-standing, fire safety principal that sprinklers save lives. Additionally, there was the desire to eliminate a perceived loophole, which existed in the old s. 26G. Under the old law, if you were only constructing an addition to a building without any major modifications to the existing building, a sprinkler system was required in the "addition only" if the addition itself contained over 7,500 s.f. in floor area. A building could have been added to by means of a series of smaller additions (7,500 s.f. or less) over the course of many years, resulting in the significant enlargement of the original building without the need to ever install sprinklers.

3. When does the law take effect?

The new law clearly applies to "the construction of buildings, structures or additions or major modifications thereto which total, in the aggregate, more than 7,500 gross square feet ***permitted after January 1, 2010"***. (Sec. 6, c. 508 of the Acts of 2008). Therefore, if the date of the issuance of the permit is after January 1, 2010, the enhanced requirements will be applicable.

4. What type of buildings or structures are covered by the law?

The law, in general applies to "every building and structure…" and does not specify which particular use groups or building classifications are subject to the law. However the law does include several specific exemptions. The law does not apply to:

- Buildings or additions used for residential purposes;
- Rooms or areas of a telephone central office equipment building when such rooms or areas are protected with an automatic fire alarm system;
- Open-air parking structures, defined as: buildings, structures, or portions thereof, used for parking motor vehicles and having not less than twenty- five per cent of the total wall area open to atmosphere at each level, utilizing at least two sides of the structure; and
- Buildings used for certain agricultural purposes, as defined in M.G.L. c. 128 s. 1A.

Additionally, the statute contains some exceptions, if certain conditions or circumstances exist. They include:

- Buildings or structures, or certain areas of such buildings or structures, where the discharge of water would be an actual danger in the event of a fire, the head of the fire department shall permit the installation of such other fire suppressant systems as are prescribed by the state building code in lieu of automatic sprinklers; and
- No such sprinkler system shall be required unless sufficient water and water pressure exists.

It should also be noted that buildings owned by the Commonwealth are generally not subject to the provisions of s. 26G. In accordance with long standing case law and confirmed by a fairly recent Opinion of the Attorney General (No. 00/01-1), buildings owned by the state are not subject to the statutory requirements of laws such as s. 26G, unless there is express statutory language indicating that the state is subject to the law. However, buildings that are owned by state authorities or other similar entities created by the Legislature, may not necessarily be considered "state owned" and therefore exempt. In such situations, the particular statute creating the authority or entity should be reviewed by the head of the fire department with the assistance of the town attorney to determine if an exemption exists.

5. Does the law apply retroactively to all existing buildings, which are within the scope of the law?

No, the Legislature intended to give some protection to owners of existing or older buildings against the large expense of installing sprinklers by requiring the installation only upon some triggering event. The law is only triggered if: (1) a new building or structure is constructed or (2)

an addition is built onto an existing building or structure or (3) major alterations or modifications are planned for an existing building. Additionally, it should be noted that the building must total more than 7,500 gross s.f. in floor area, in the "aggregate" (existing building and addition). In short, if you are not constructing a new building, adding onto an existing building or undertaking major alterations to an existing building, or if the building does not total more than 7,500 gross s.f. in the aggregate, you are not required to install sprinklers under this particular law.

6. What method is used to determine if a building totals, in the aggregate, more than 7,500 gross square feet in floor area?

The statute specifically states that for the purposes of this law, "the gross square footage of a building or structure shall include the sum total of the combined floor areas for all floor levels, basements, sub-basements and additions, in the aggregate, measured from the outside walls, irrespective of the existence of interior fire resistive walls, floors and ceilings". It should be noted that this calculation is unique and is somewhat different from the method used in the state building code, which in general, uses interior measurements to determine floor area.

7. Is a sprinkler system always necessary when there is an addition to a building, which is within the scope of the law?

It will depend upon how large the building will be after the addition is built. If an addition is being constructed to an existing building and the addition creates a building with a combined total of more than 7,500 s.f. "in the aggregate", an adequate system of sprinklers will now be required throughout the building (addition and the existing building), without regard to the existence or extent of alterations, if any, to the previously existing building.

The legislative activity to amend the provisions of M.G.L. c. 148, s. 26G arose in the aftermath of a tragic commercial building fire, which occurred in Newton, Massachusetts in February 2000, resulting in the death of five individuals. The elimination of the limiting words "addition only," in the old law and the requirement that the square footage determination be conducted "in the aggregate", indicates the clear intent of the Legislature to require the enhanced sprinkler protection throughout the building when the building is added to and if the gross s.f. of the addition, combined with the existing building, totals more than 7,500 s.f. "in the aggregate." If the building, including the new addition, totals less than 7,500. s.f., sprinklers are not required under the provisions of this law.

8. Is a sprinkler system always required if renovations are taking place in a building, which is within the scope of the law?

This depends upon whether the renovations are considered ***"major"*** alterations or modifications, as those terms are used in the statute. The Board realizes that the determination to install sprinklers, is often difficult and should be decided on a case-by-case basis, based upon the unique characteristics of the building and the nature and extent of the work. However, the Board suggests that such decisions be made in a predictable and consistent manner throughout the Commonwealth. Therefore, the Board suggests that fire officials, in deciding if "major alterations or modifications" are taking place, should be guided by the Massachusetts Appeals Court case

Congregation Beth Shalom & Community Center, Inc. v. Building Commissioner of Framingham et. Al., 27 Mass. App. Ct. 276 (1989).

In this case, the Court discussed the meaning of the terms "major alterations" as those words are used in M.G.L. c. 148, s. 26G. (It should be noted that those terms remain in the law, notwithstanding the amendments to s. 26G) The Court said that the terms "major alterations" shall include "any work, not repairs, which is "major" in scope or expenditure, and which results in changes affecting a substantial portion of the building". In its decision, the Court looked at the nature of the planned work and would require sprinklers throughout the building if "the extra cost of installing sprinklers would be moderate in comparison to the total cost of the work contemplated…" or "if the physical work being done is of such scope that the additional effort to install sprinklers would be substantially less than would have been if the building were intact."

At this time, it is the intent of the Board to consider the following factors established in the Congregation Beth Shalom case, to determine whether "major" alterations or modifications are taking place, thus requiring sprinklers to be installed throughout a building in accordance with M.G.L. c. 148, s. 26G.

A. What is the nature of the actual work?

- Is the planned physical work the type of work that would make the effort to install sprinklers substantially less than it would have been if the building were intact?

- Is the work merely minor repairs or cosmetic vs. major alterations? Examples of "major" alterations or modifications, include, but may not be limited to:

    - The demolition or reconstruction of existing ceilings or installation of suspended ceilings;

    - The removal and/or installation of sub flooring, not merely the installation or replacement of carpeting or finished flooring;

    - The demolition and/or reconstruction or repositioning of walls or stairways or doorways; or

    - The removal or relocation of a significant portion of the building's HVAC, plumbing or electrical systems involving the penetration of walls, floors, or ceilings.

B. What is the scope of the work or cost/ benefit of sprinkler installation?

This involves a review of the scope of the major alterations or modifications. Does it affect a substantial portion of the building? This requires a review to determine how much of the building is being affected by the work; **or** a determination that the cost of installing sprinklers is moderate in comparison to the total cost of the work.

To assist fire officials, building owners and construction project managers in making decisions, the Board has established the following two presumptions that may be used to determine if the scope or the cost of the planned alterations or modifications are "major" thus requiring sprinklers to be installed throughout a building.

1) Major alterations or modifications are reasonably considered major in scope when such work affects thirty-three (33) % or more of the "total gross square footage" of the building, calculated in accordance with section 26G.

2) Major alterations or modifications are reasonably considered major in scope or expenditure, when the total cost of the work (excluding costs relating to sprinkler installation) is equal to or greater then thirty-three (33) % of the assessed value of the subject building, as of the date of permit application.

It is the conclusion of the Board, at this time, that if the nature of the work is the type of work described in **A and** also meets at least one of the two presumptions described in **B** above, then it can be reasonable to conclude that the alterations or modifications are "Major", thus requiring sprinklers throughout the building.

The Board is aware that buildings and circumstances vary from one project to another and that it would be unreasonable to expect that a single set of criteria could reasonably apply to all situations. Therefore, this list of described factors is not necessarily all-inclusive, but is meant to provide a common sense guideline for fire departments and building owners to determine if a sprinkler system is probably required under the provisions of this particular law.

9. What if the work is not "major" in scope for this particular permitted project, but appears to be part of a long-range plan?

If the specific permitted alterations or modifications are not considered "major," as described, but appear to be one phase of a series of modifications being conducted over a reasonably short period (i.e. 5 years or less), it may be reasonable to conclude that such work could be part of a long range project resulting in "major alterations" to the entire building, or a substantial portion of it, thus triggering the sprinkler requirements. Although this occurrence may be rare, fire officials should be aware of future and past recent projects to determine if there is a series of planned projects that, taken together, may be considered "major" alterations or modifications, which would trigger the sprinkler requirements.

10. The statute states that "no such sprinkler system shall be required unless sufficient water and water pressure exists". How is it determined if there is a lack of sufficient water and water pressure?

This language, creating an apparent exemption for situations involving lack of sufficient water and water pressure, has remained unchanged in the new amendments. In determining cases in which this issue has been raised, the Board has been guided by the Massachusetts Appeals Court case of *Chief of the Fire Department of Worcester v. John Wibley, et al. 24 Mass. App. Ct. 912 (1987).*

In that case the court concluded that:

> "The term "sufficient water and water pressure exists" means that the owner of a building or addition to which the statute applies must have access to a source of water sufficient to operate an adequate system of sprinklers, or the exemption applies. The source may be either on the land on which the new building or addition is constructed or off the land, provided that it is legally available to the owner of the building or addition."

In the Wibley case, the court, in agreeing with the fire chief, concluded that sufficient water and water pressure existed, notwithstanding the fact that the source of water was not on the owner's land, but was legally available by means of a connection requiring the excavation to a legally available water main located 500 yards away.

11. Who has the responsibility to enforce the sprinkler installation requirements of this new law?

Under both the old and new version of M.G.L. c. 148, s. 26G, the head of the fire department is given the statutory authority to enforce the law.

12. What action should be taken by the head of the fire department at this time?

It is recommended that the head of fire department coordinate with the local building official and confirm that the building official is aware of the new law, its applicability and the statute's unique method of determining a building's total floor area. Additionally, it is suggested that procedures be established to assure that the building official communicate to the appropriate fire department personnel the existence of construction activities to buildings in excess of 7,500 s.f., which may be subject to the provisions of M.G.L. c. 148, s.26G. Once the head of the fire department determines that a planned building construction project is subject to s. 26G, the building owner/construction manager should be informed of the determination and the reasons for it by a written notice signed by the head of the fire department. The notice should also contain the information about the ability to appeal such determination to the Commonwealth's Automatic Sprinkler Appeals Board within 45 days of the receipt of such notice.

13. How are appeals filed with the Board?

The law allows for any person aggrieved by an interpretation, order, requirement or direction of the head of the fire department, (or the failure to so act) to file an appeal with the Automatic Sprinkler Appeals Board. Such appeals must be filed ***within 45 days*** after receiving service of notice of the head of the fire department's determination. The Board has a formal application form that must be completed by the person seeking the appeal. In addition to the application form, a detailed statement of the basis for the appeal, a copy of the chief's determination and an appeal application fee ($100.00) must accompany each application. Automatic Sprinkler Appeals Board application forms may be obtained by calling: 978-567-3181 or on the web at www.mass.gov/dfs (right side of the page Mass. Automatic Sprinkler Appeals Board).

14. What are the Board hearings like?

Members of the Commonwealth's Fire Safety Commission hold hearings of the Automatic Sprinkler Appeals Board. The hearings are informal and the strict rules of evidence used in a court of law are not used. The hearings require the presence of the appellant and the head of the fire department or their agent or attorney. The parties should be fully prepared to present their positions at the hearing. All plans, drawings, photographs expert findings/analysis or any other documents, information and testimony and arguments should be presented at the hearing to assist the Board in making its findings and determination.

Arrowstreet inc.
10 post office square
suite 700n
boston ma 02109
617.623.5555

arrowstreet.com