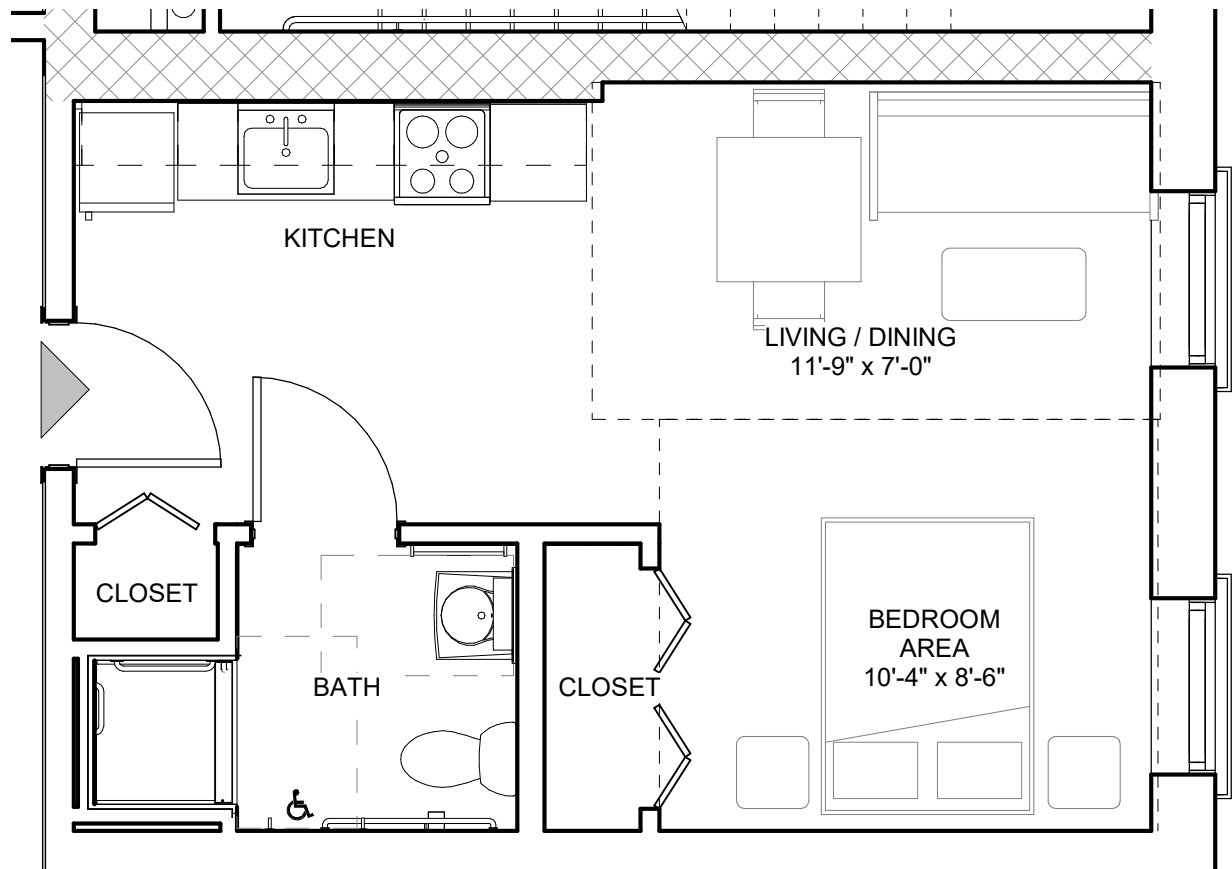
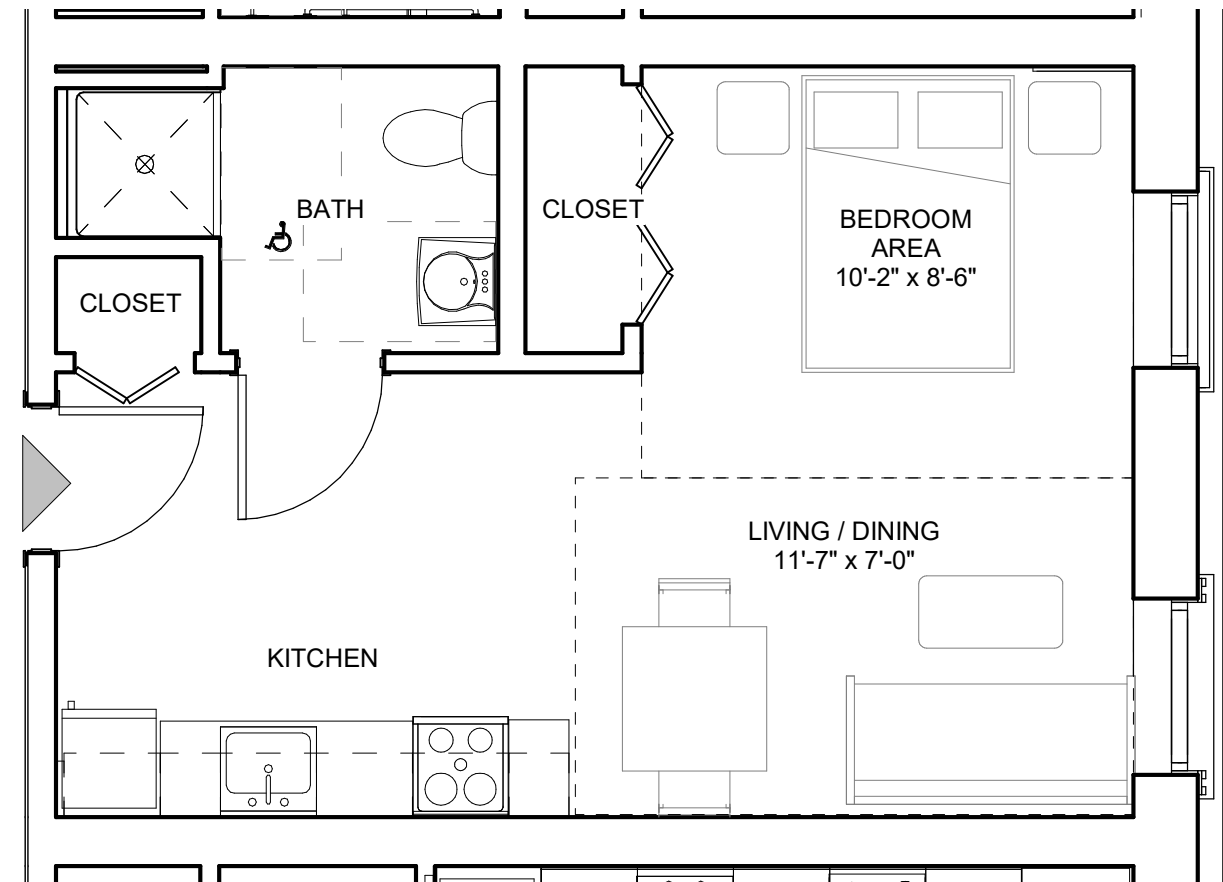


3 Appendices

3.1 Typical Unit Plans

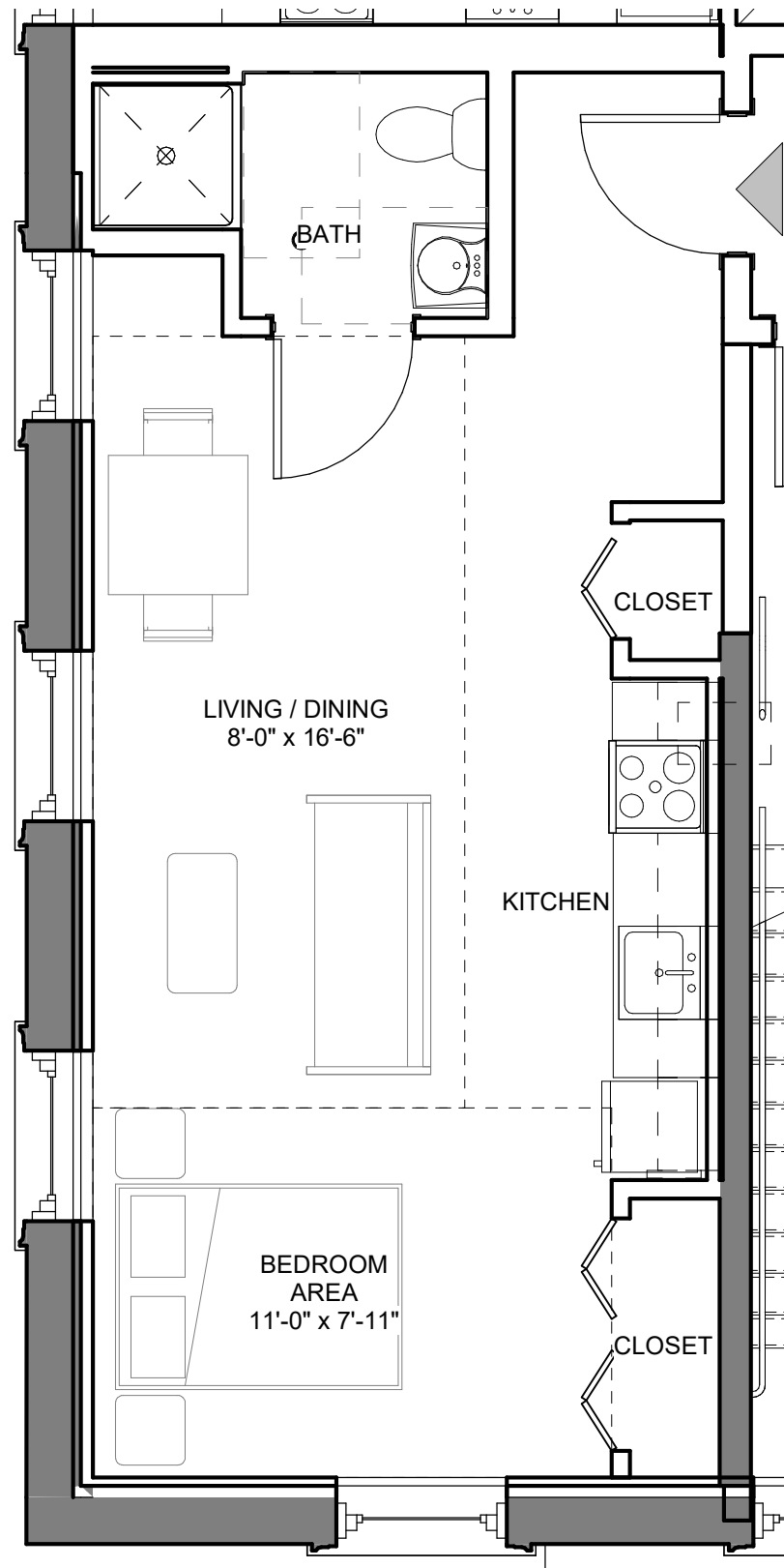


UNITS 116, 216, 316 ①
350 SF

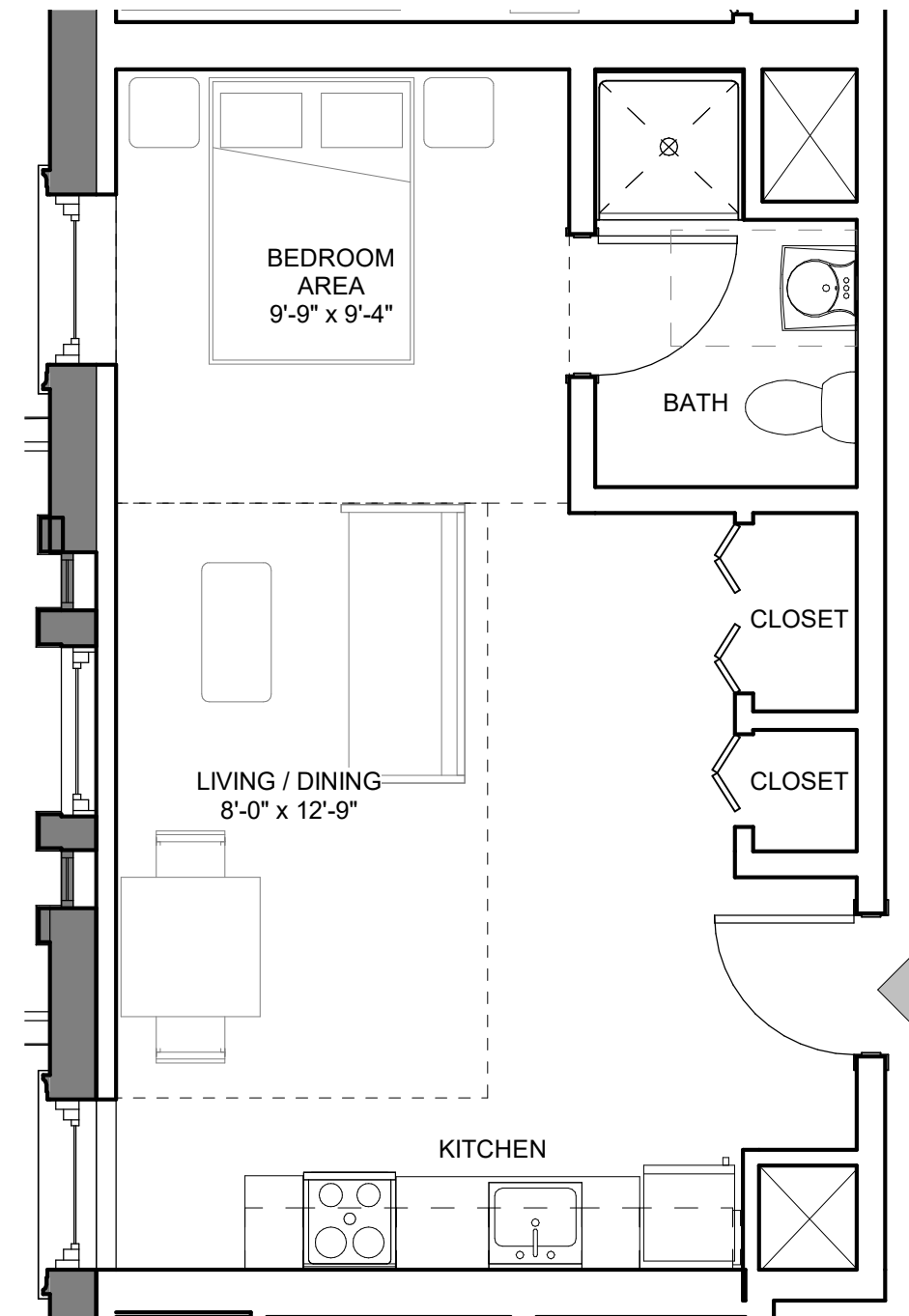


UNITS 118, 218, 318 ②
350 SF



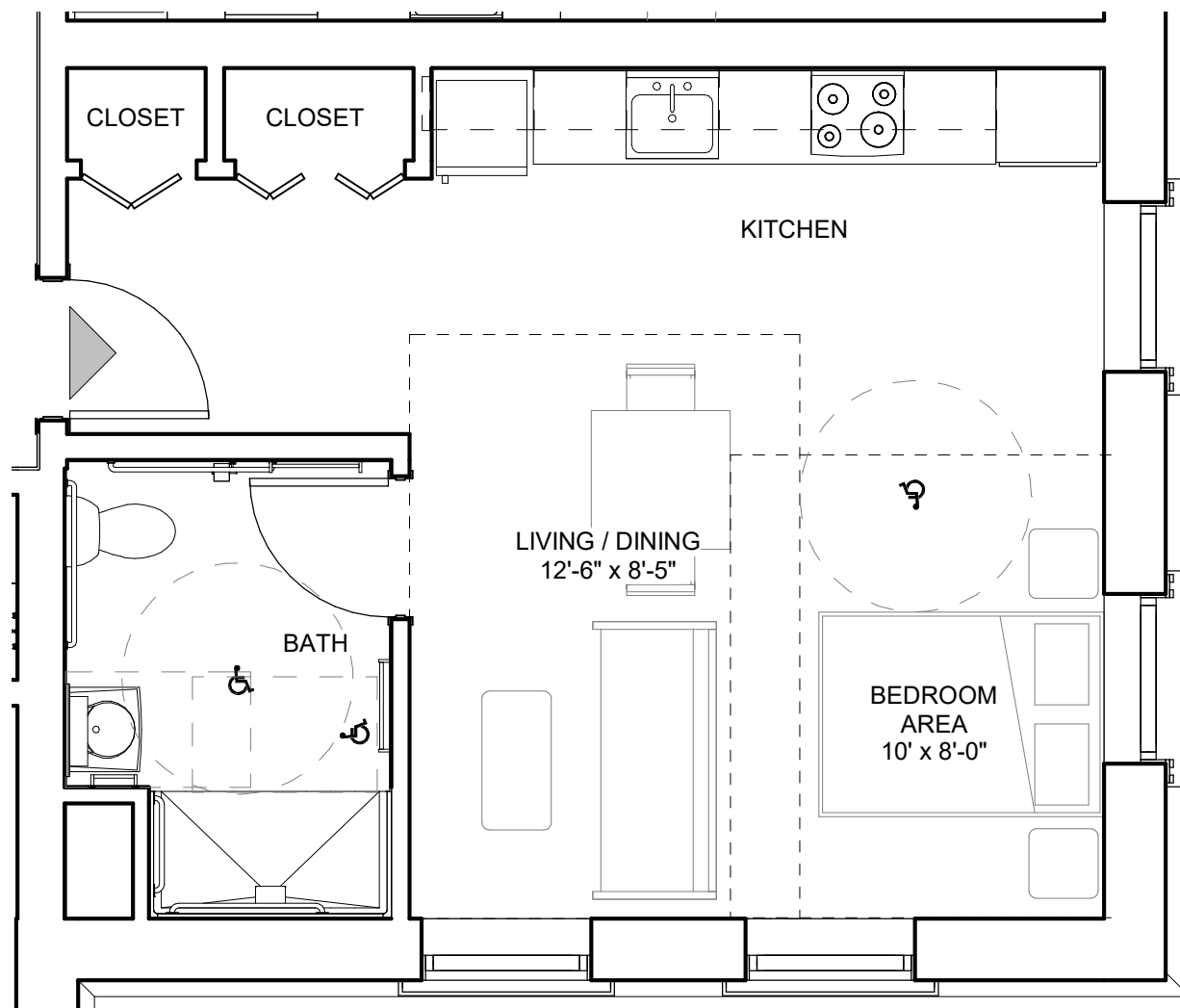


UNITS 203, 303, 403
400 SF **1**

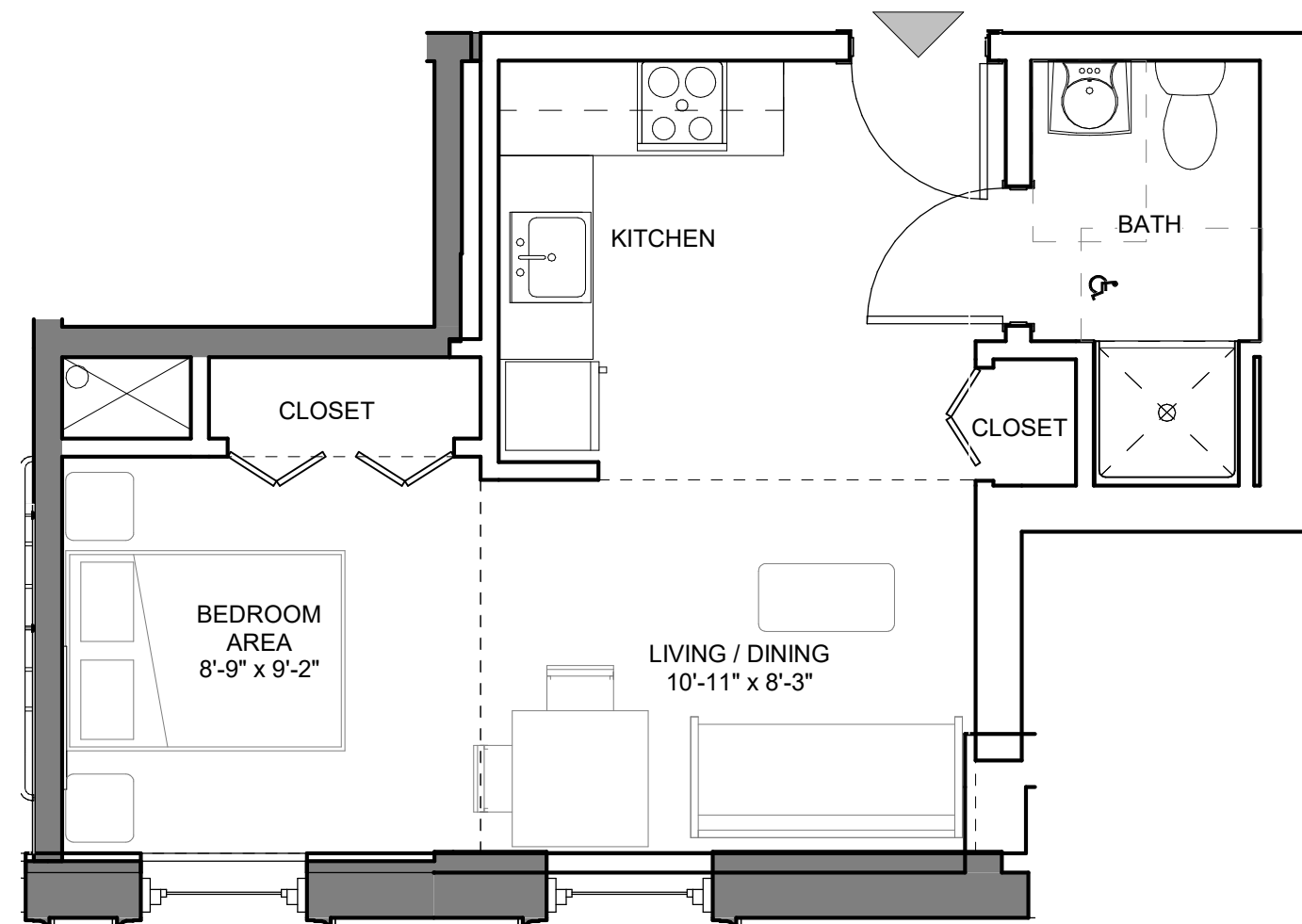


UNITS 205, 305, 405
400 SF **2**



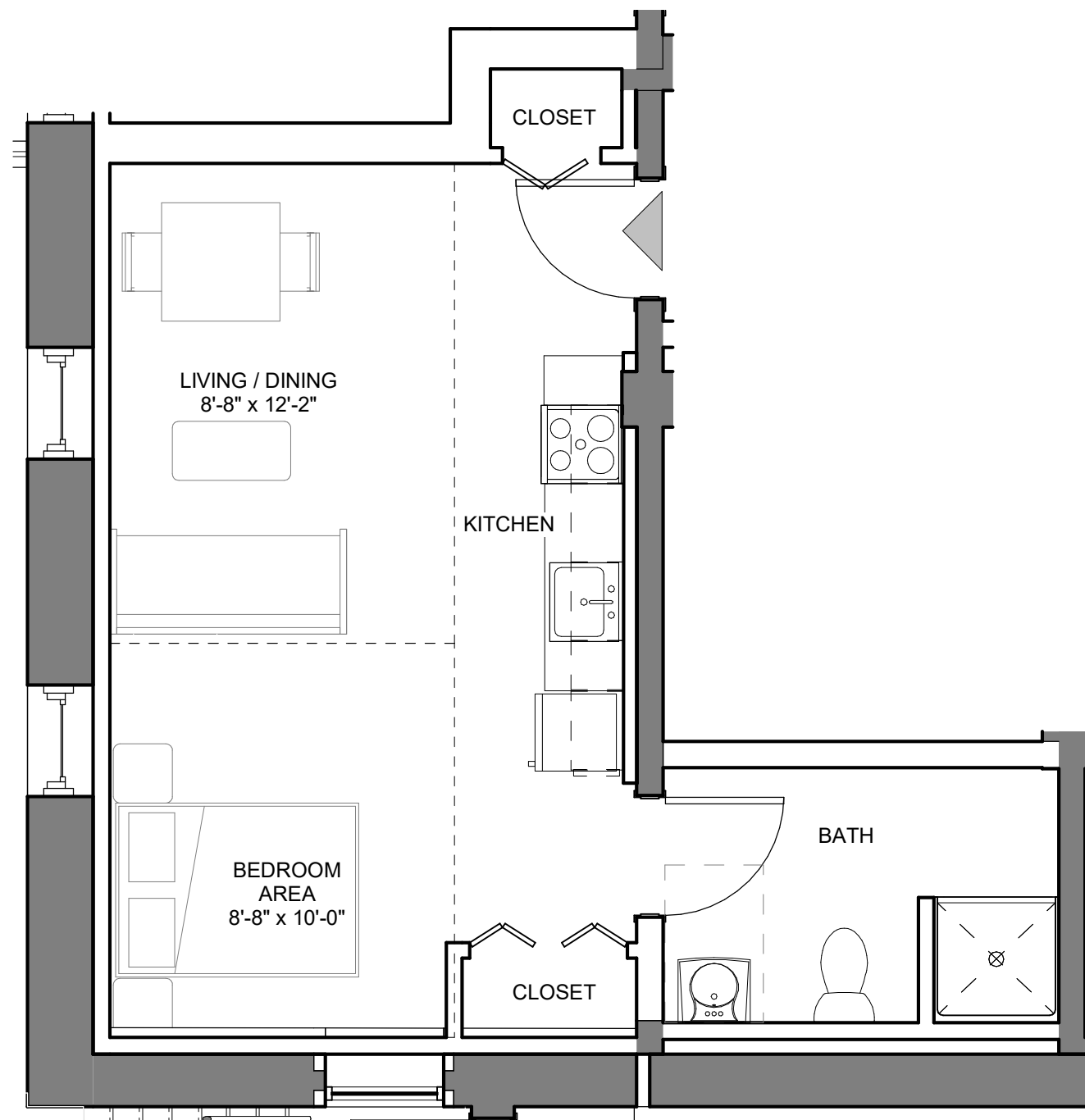


UNITS 120, 220, 320
GROUP 2A UNIT - 405 SF 1

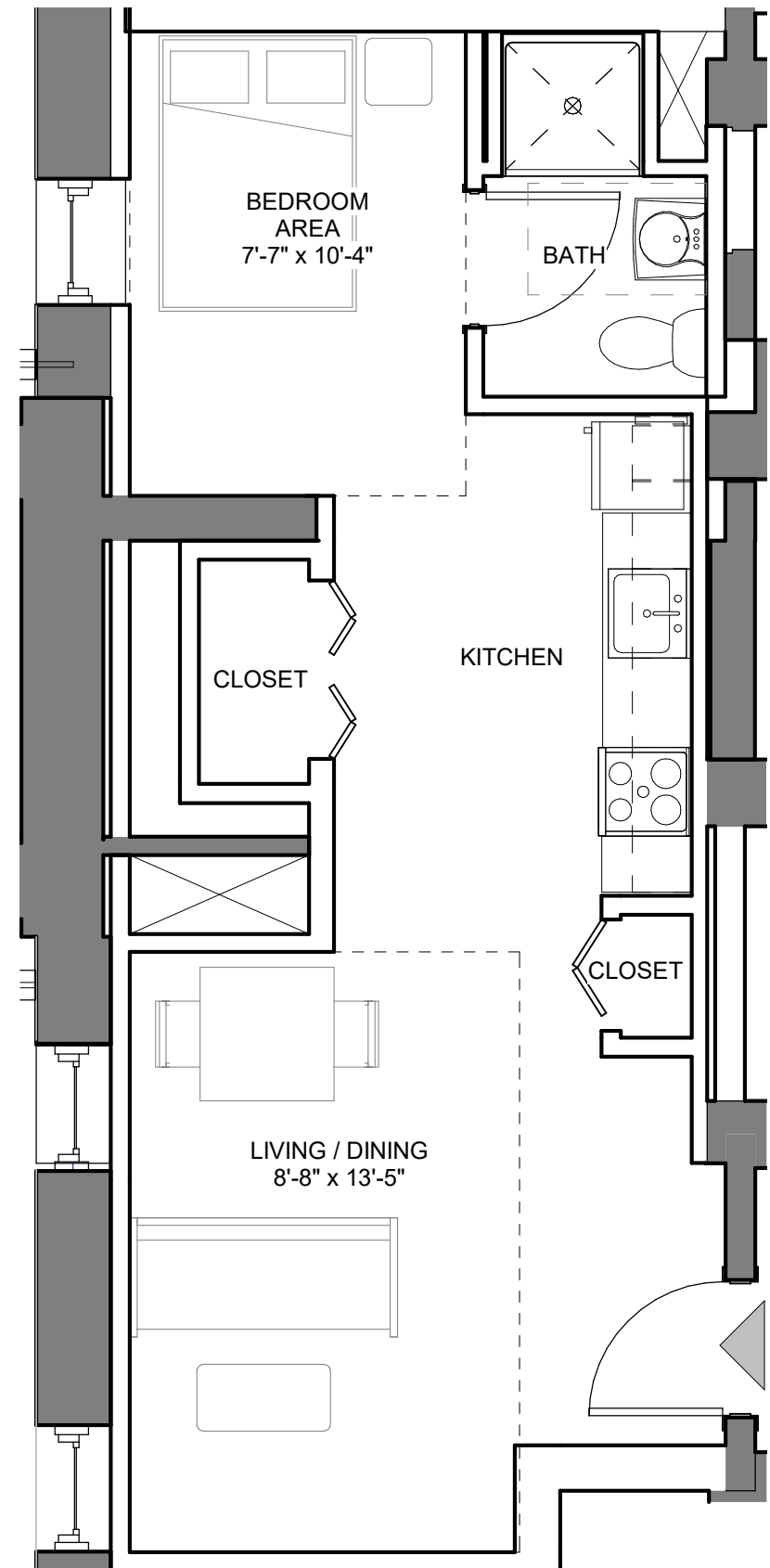


UNITS 202, 302
335 SF 2





UNIT 003 ①
355 SF

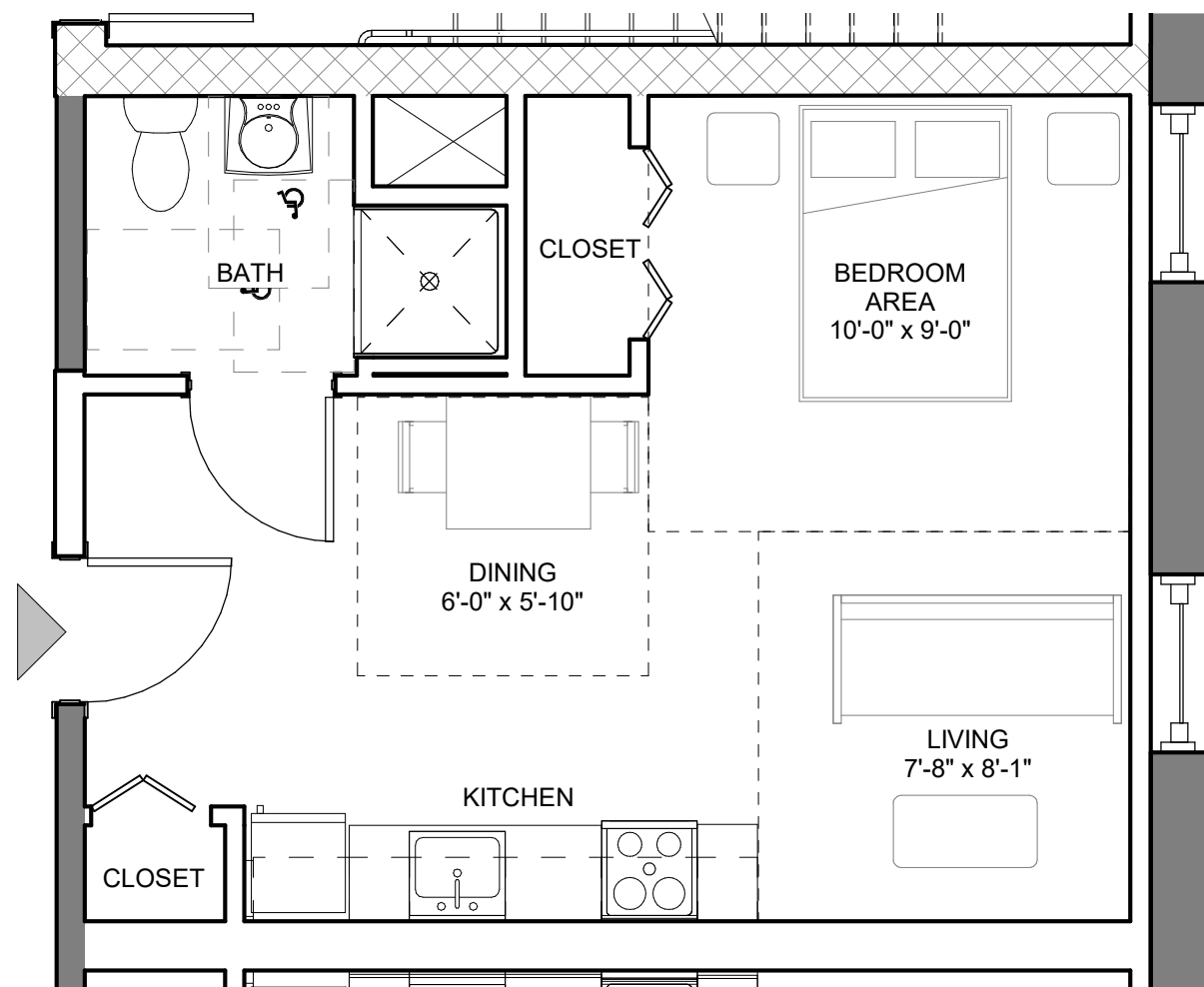


UNIT 005 ②
390 SF



UNIT ENTRY

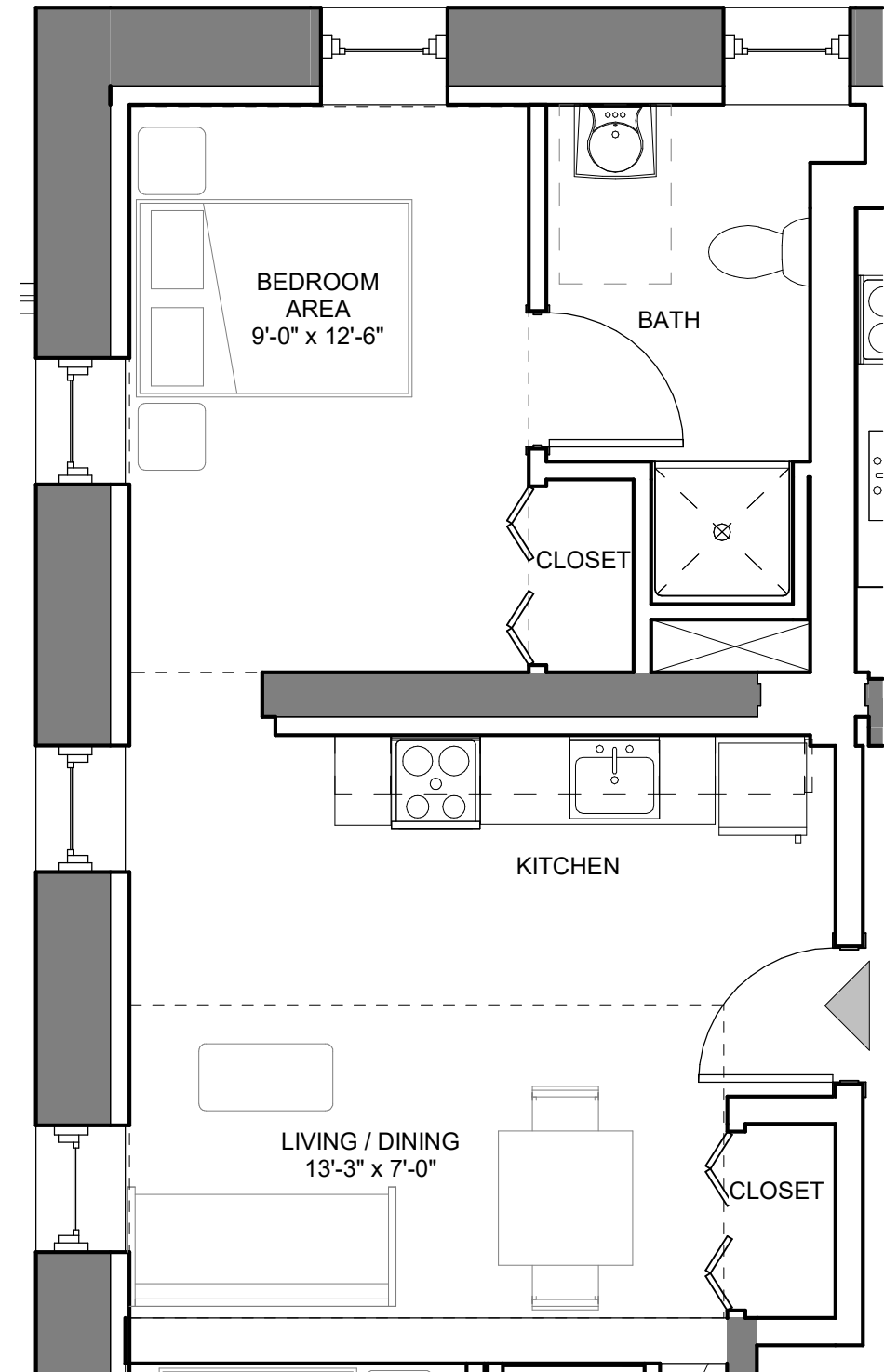




UNITS 006, 106, 206, 306, 406

365 SF

1



UNIT 007

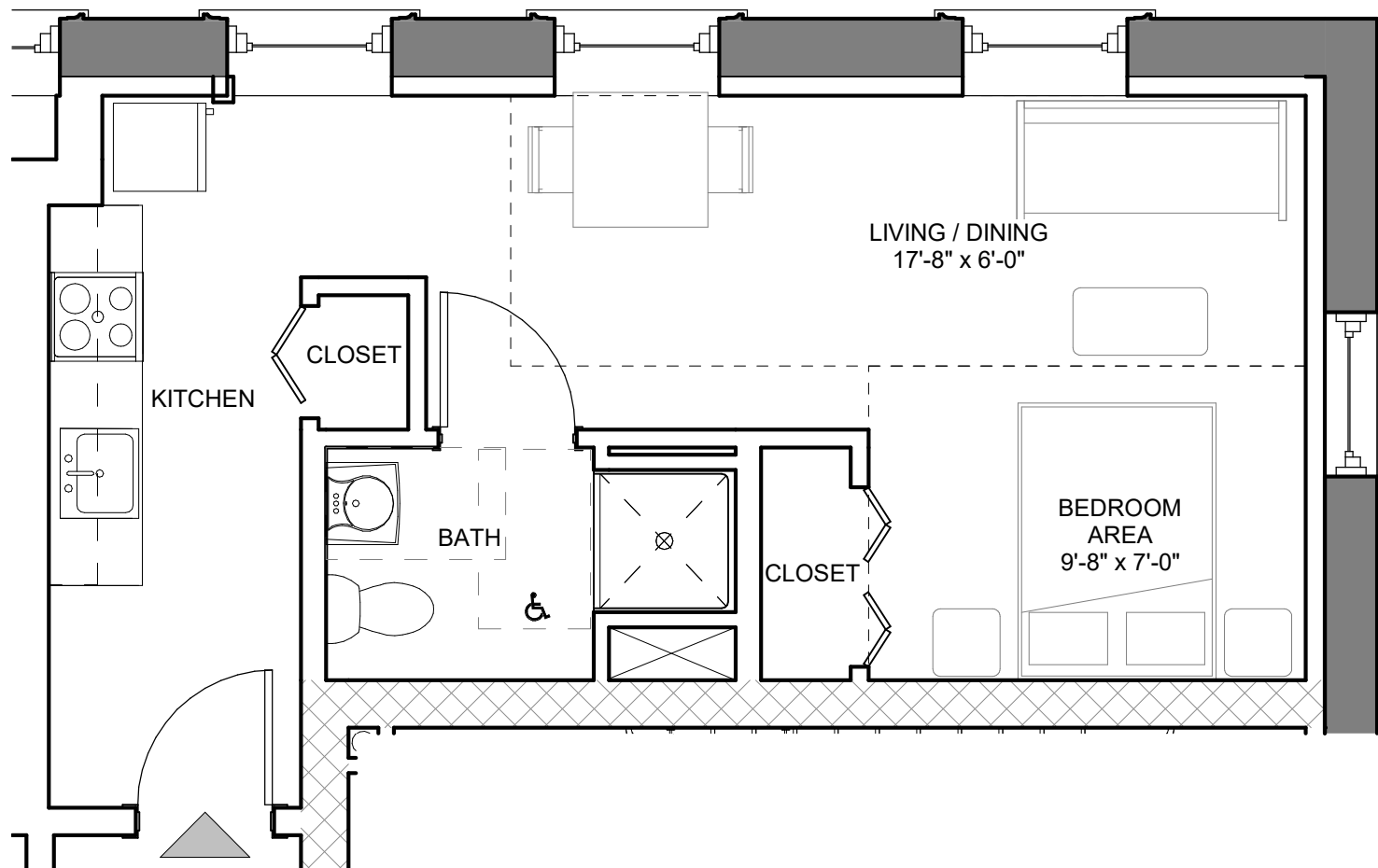
395 SF

2

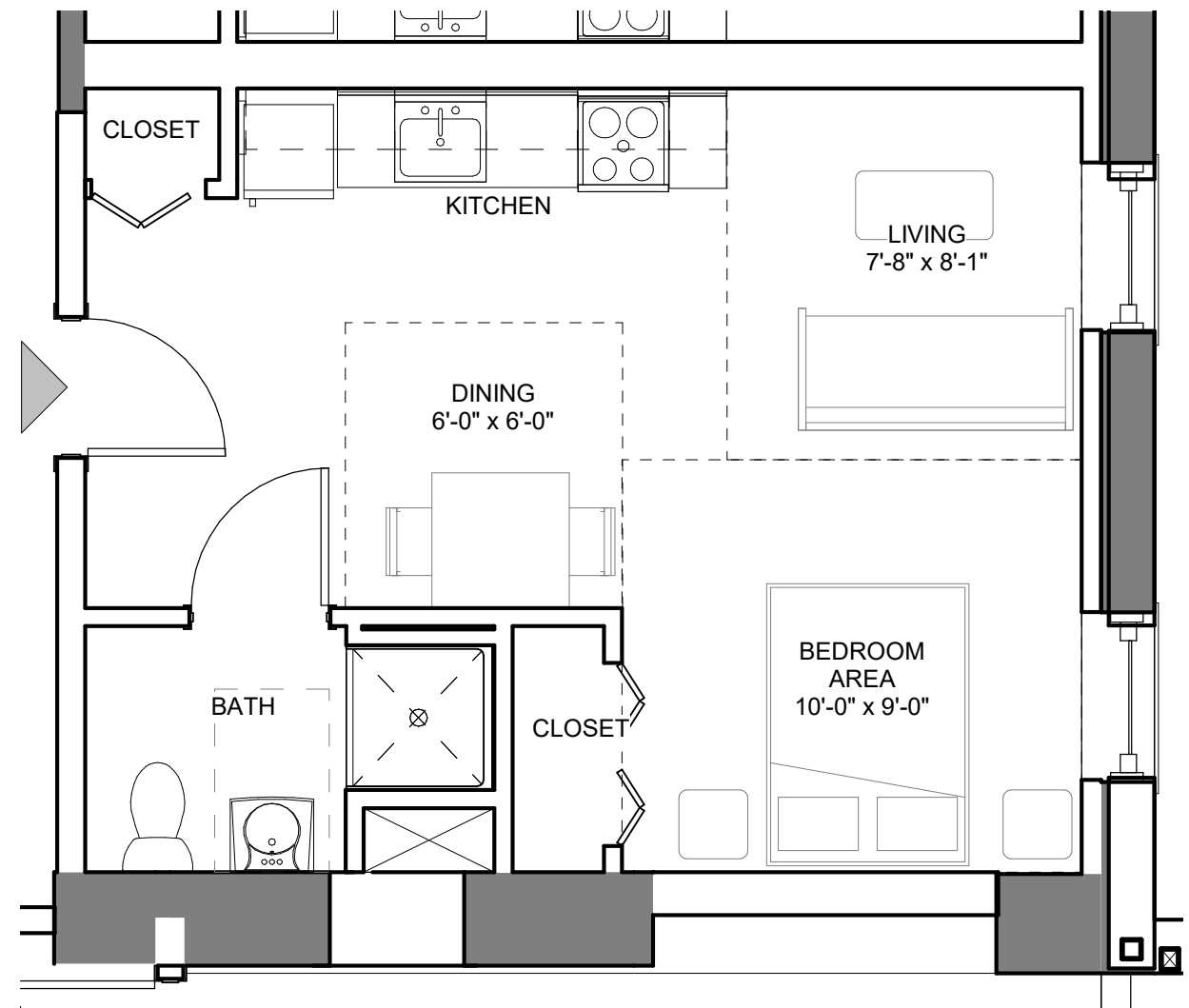


UNIT ENTRY



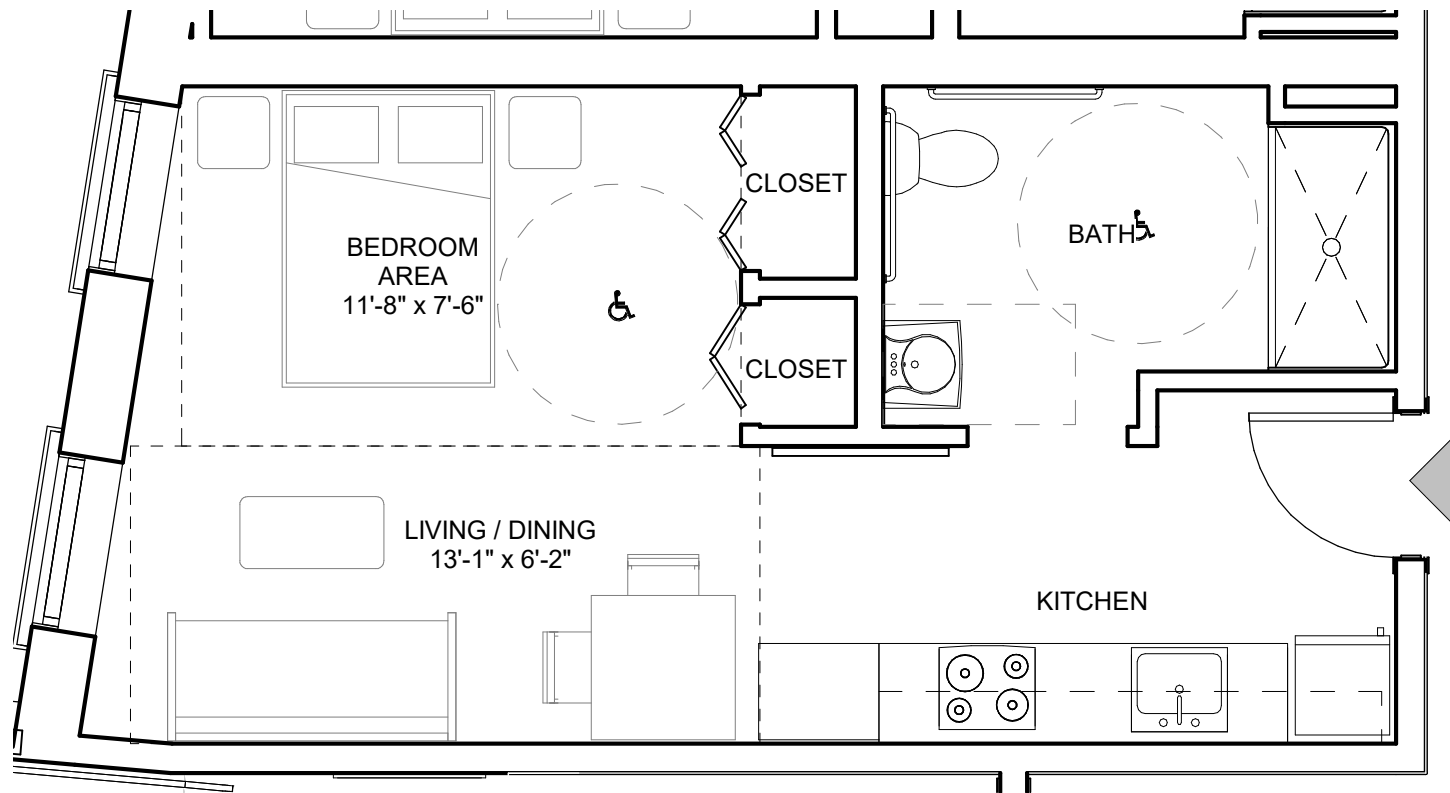


UNITS 008, 108, 208, 308, 408 ①
370 SF

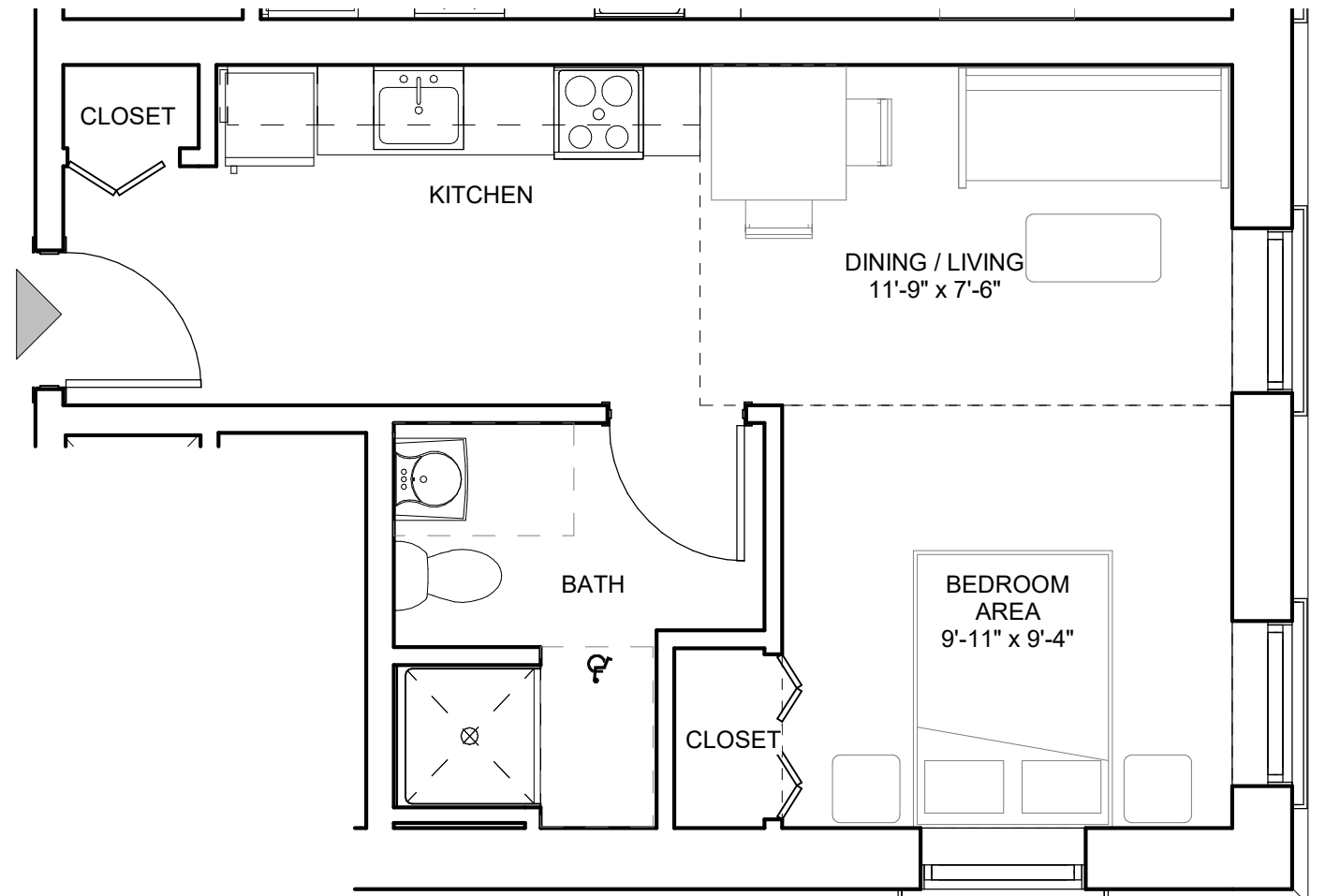


UNITS 104, 204, 304, 404 ②
365 SF



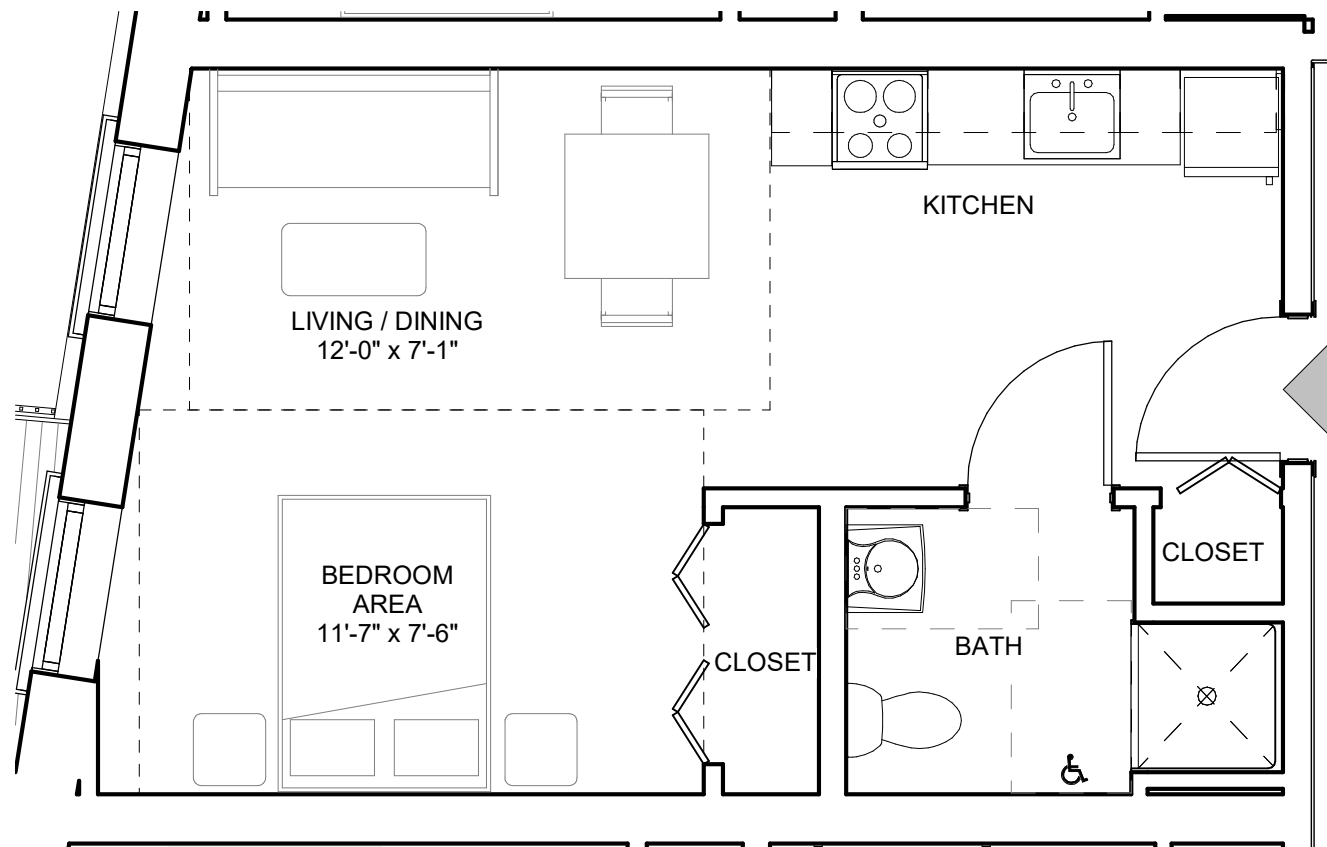


UNIT 111 ①
GROUP 2A - 360 SF

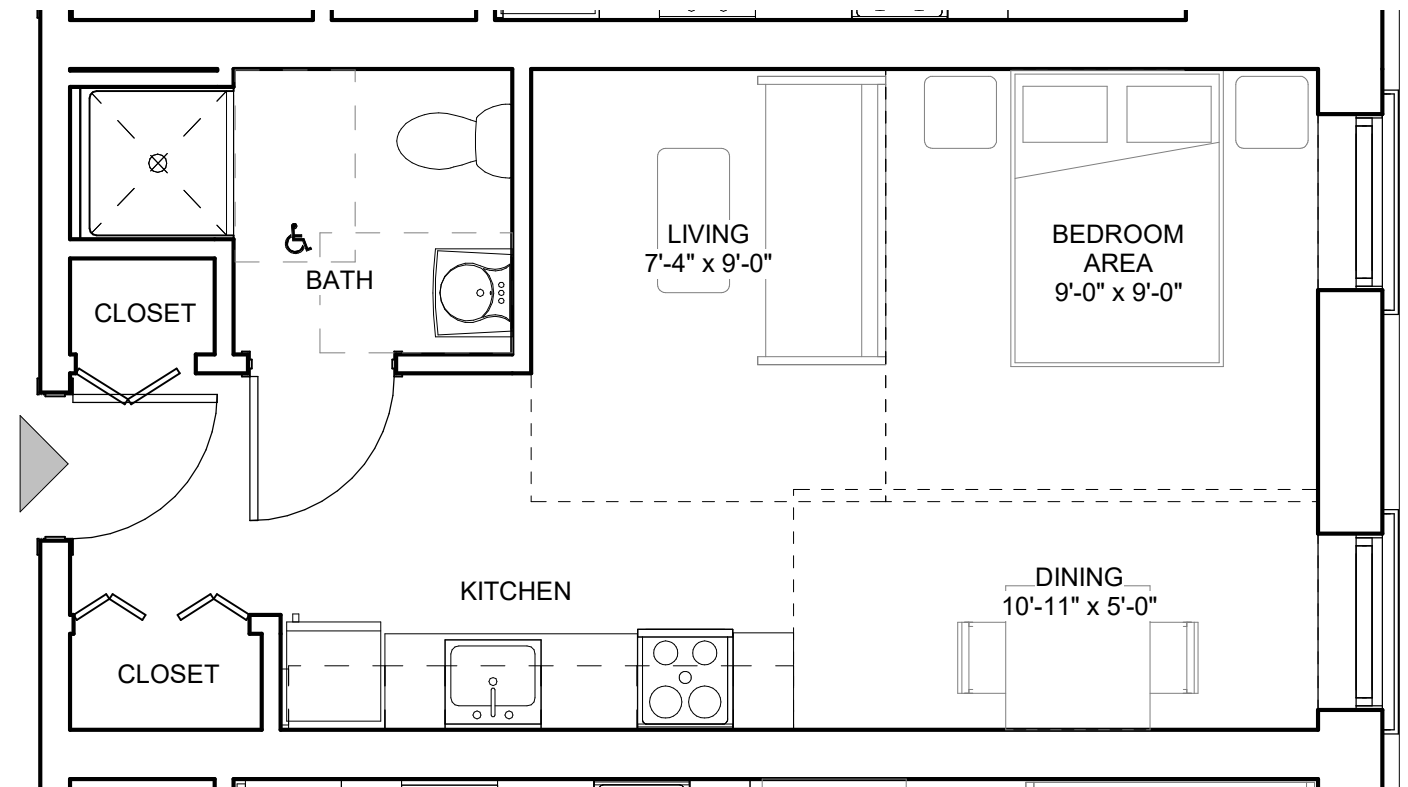


UNITS 110, 210, 310 ②
370 SF



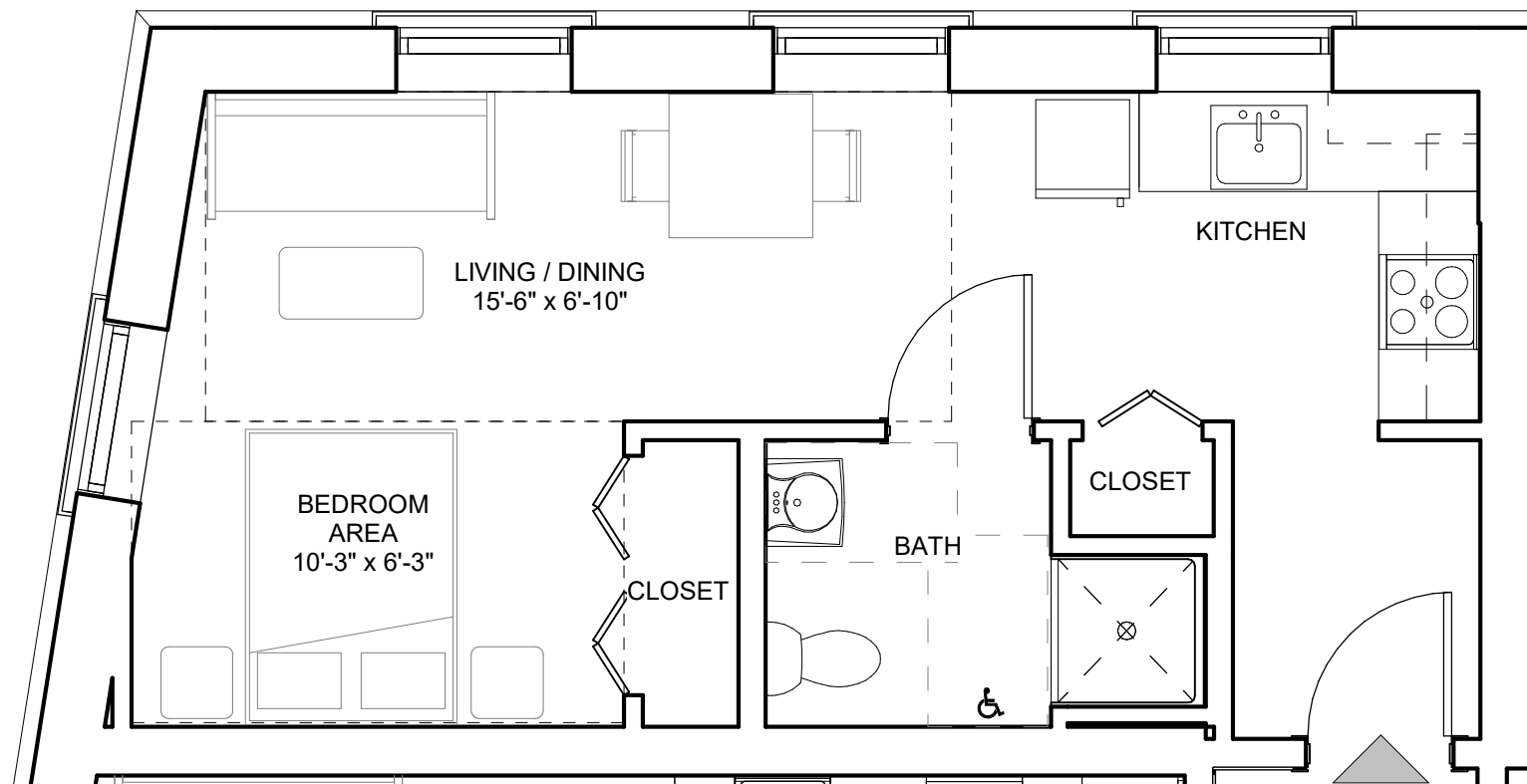


UNITS 113, 213, 313 ①
360 SF

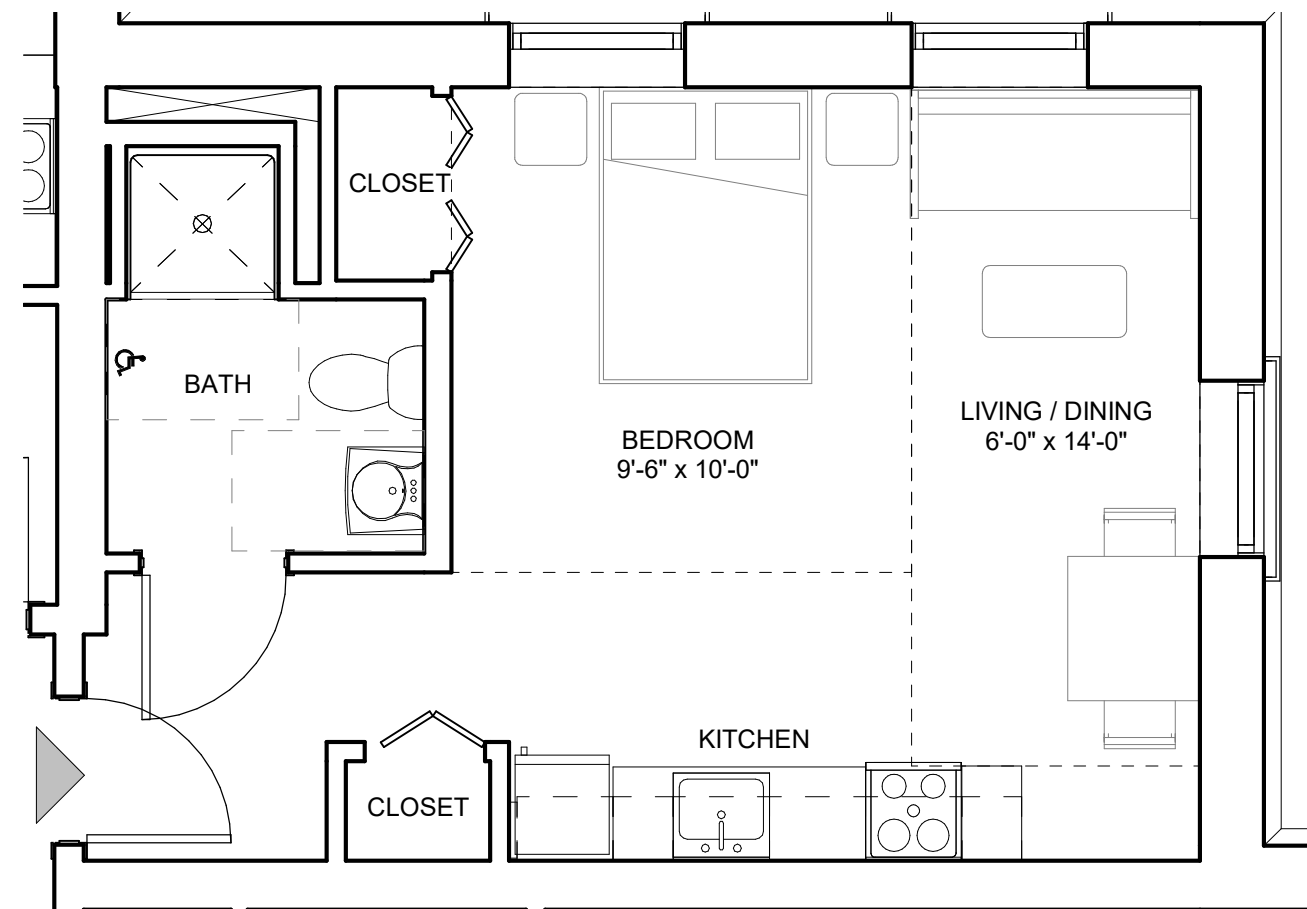


UNITS 112, 212, 312 ②
350 SF



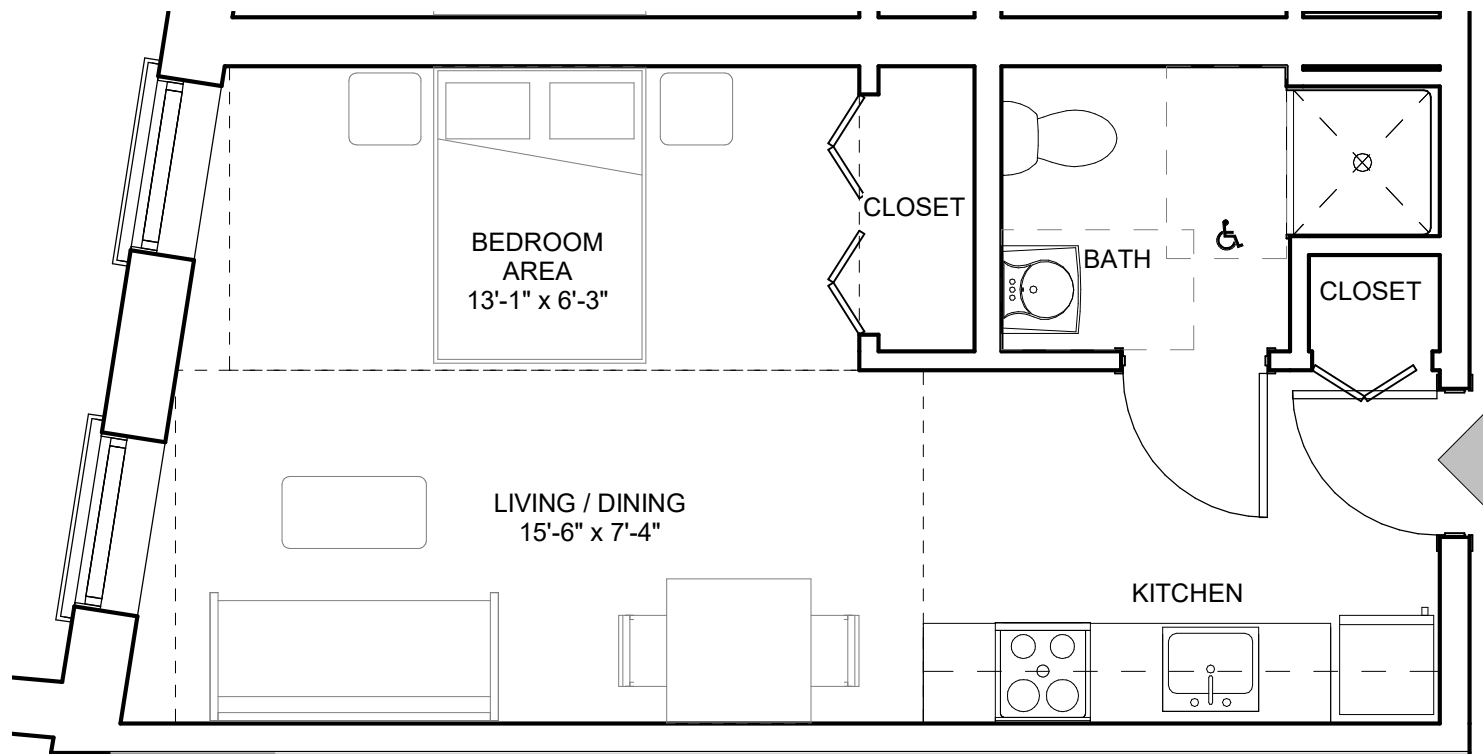


UNITS 115, 215, 315 ①
365 SF

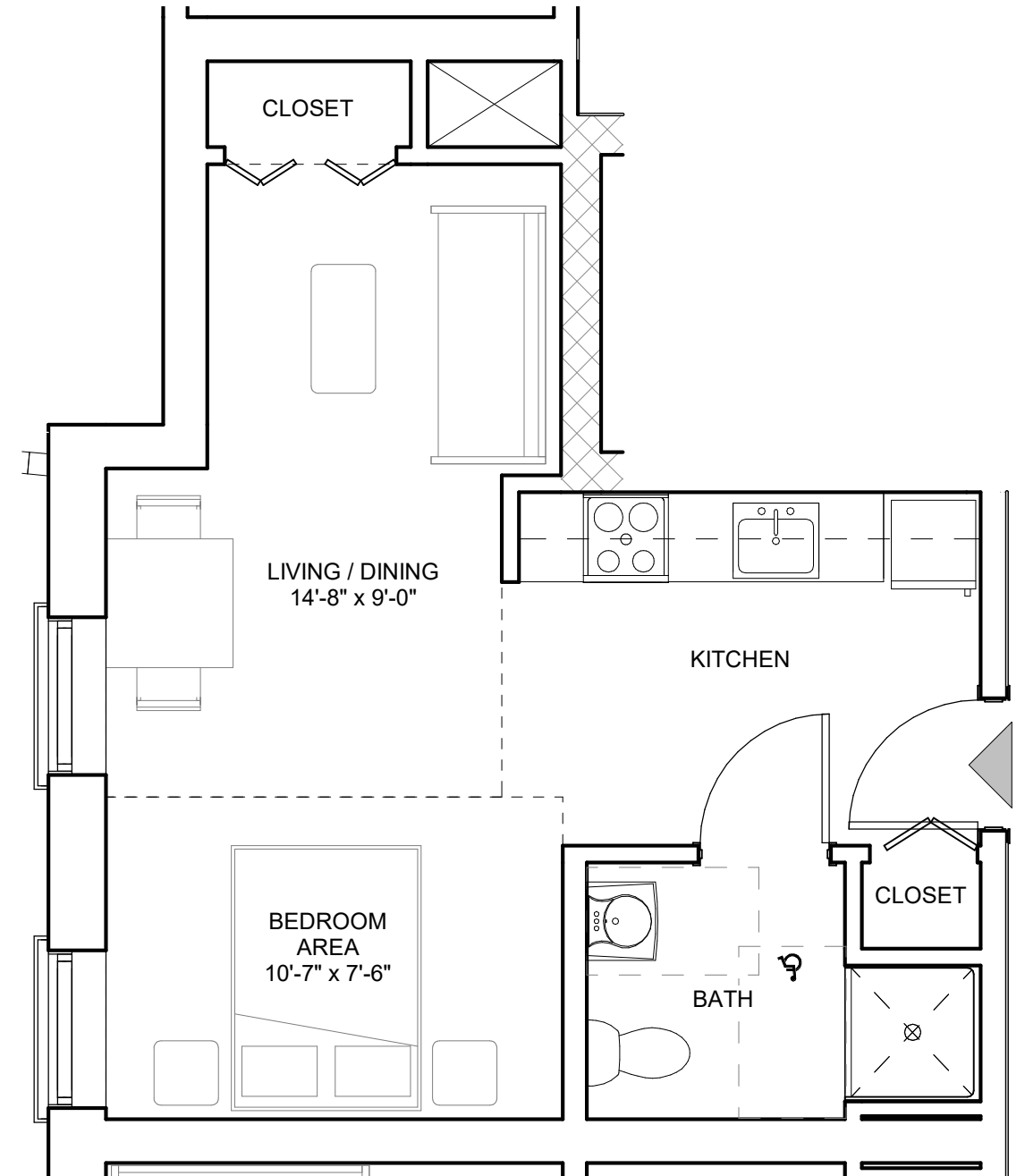


UNITS 114, 214, 314 ②
350 SF





UNITS 211, 311 ①
360 SF

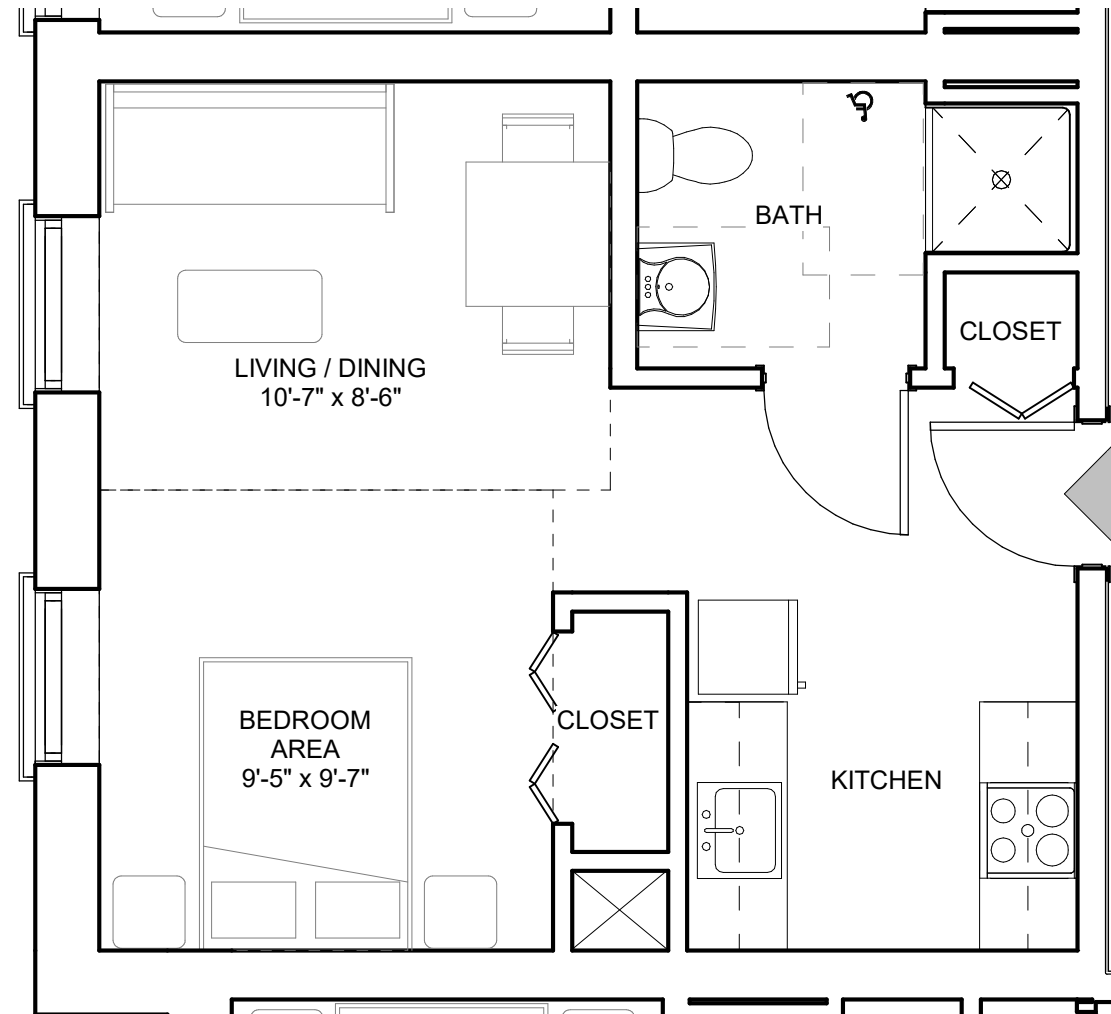


UNITS 217, 317 ②
370 SF

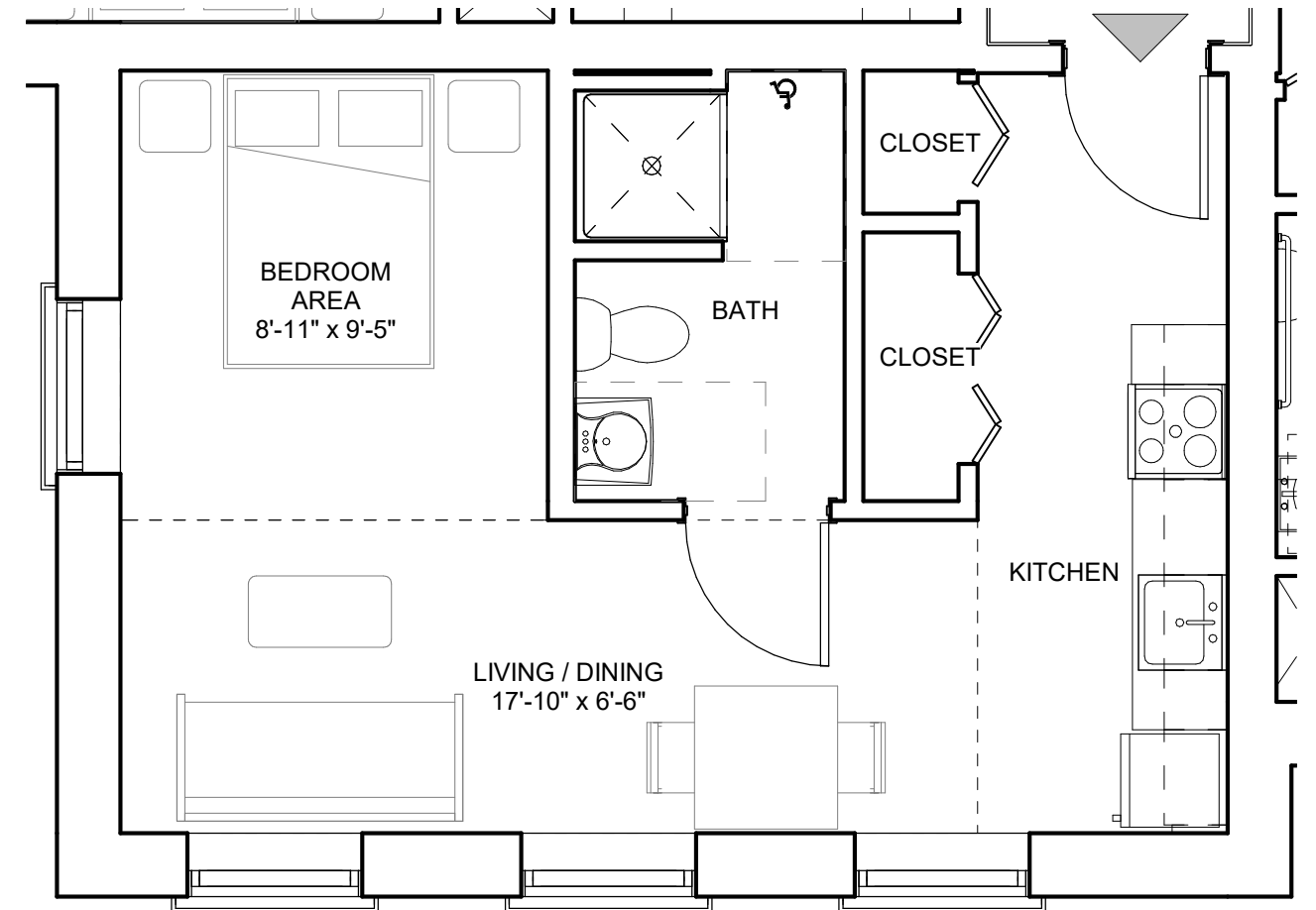


UNIT ENTRY





UNITS 219, 319 ①
360 SF



UNITS 221, 321 ②
370 SF



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3.2 Arborist Report



Arboriculture Services
154 Buffam Road □ Pelham, Massachusetts 01002

Peter Rust, AIA
HMFH Architects
130 Bishop Allen Drive
Cambridge, MA 02139

March 4, 2021

RE: Tree Inventory and Assessment: 116 Norfolk Street, Cambridge

Peter,

This report is a follow-up to our February 24, 2021 meeting at the 116 Norfolk Street property proposed for renovation by the Cambridge Housing Authority. The purpose of this meeting was to inventory and assess the health of trees on and near the grounds that may be impacted by the renovation.

Pursuant to our January 25th email correspondence, my assignment is as follows.

- Site visit, meeting, tree inventory and assessment for 20 trees
- Inventory will include identification number, diameter measurements, species, location, overall health, construction viability, critical root zone and maintenance/preservation needs.
- Install numbered, aluminum identification tags to each tree.
- Submit an inventory summary, data in spreadsheet form, site plan with trees located and numbered with corresponding photographs of each tree.
- Report shall include tree preservation recommendations before, during and after construction.

Thank you for the opportunity to assist HMFH with this project. Please contact me at any time if you have any questions or need additional services.

Best regards,

David Hawkins, Consulting Arborist
Urban Forestry Solutions Inc.

Contents

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Site Illustrations	4
Inventory Data	5
Photographs	7
General Tree Protection and Maintenance Recommendations.....	12
Disclaimer	14
Certification	15

Summary

Twenty trees are included in the inventory for the Cambridge Housing Authorities property at 116 Norfolk Street. Sixteen of these are located on the CHA grounds while the remaining four trees are city-owned public street trees located in sidewalk planting areas on the west side of the building. Fifteen of the twenty trees are mature Norway maples (*Acer platanoides*) ranging in condition from fair to good. The remaining tree species consist of one common lilac (*Syringa vulgaris*) one sycamore maple (*Acer pseudoplatanus*), two Callery pears (*Pyrus calleryana*) and one thornless hawthorn (*Catgeagus spp.*)

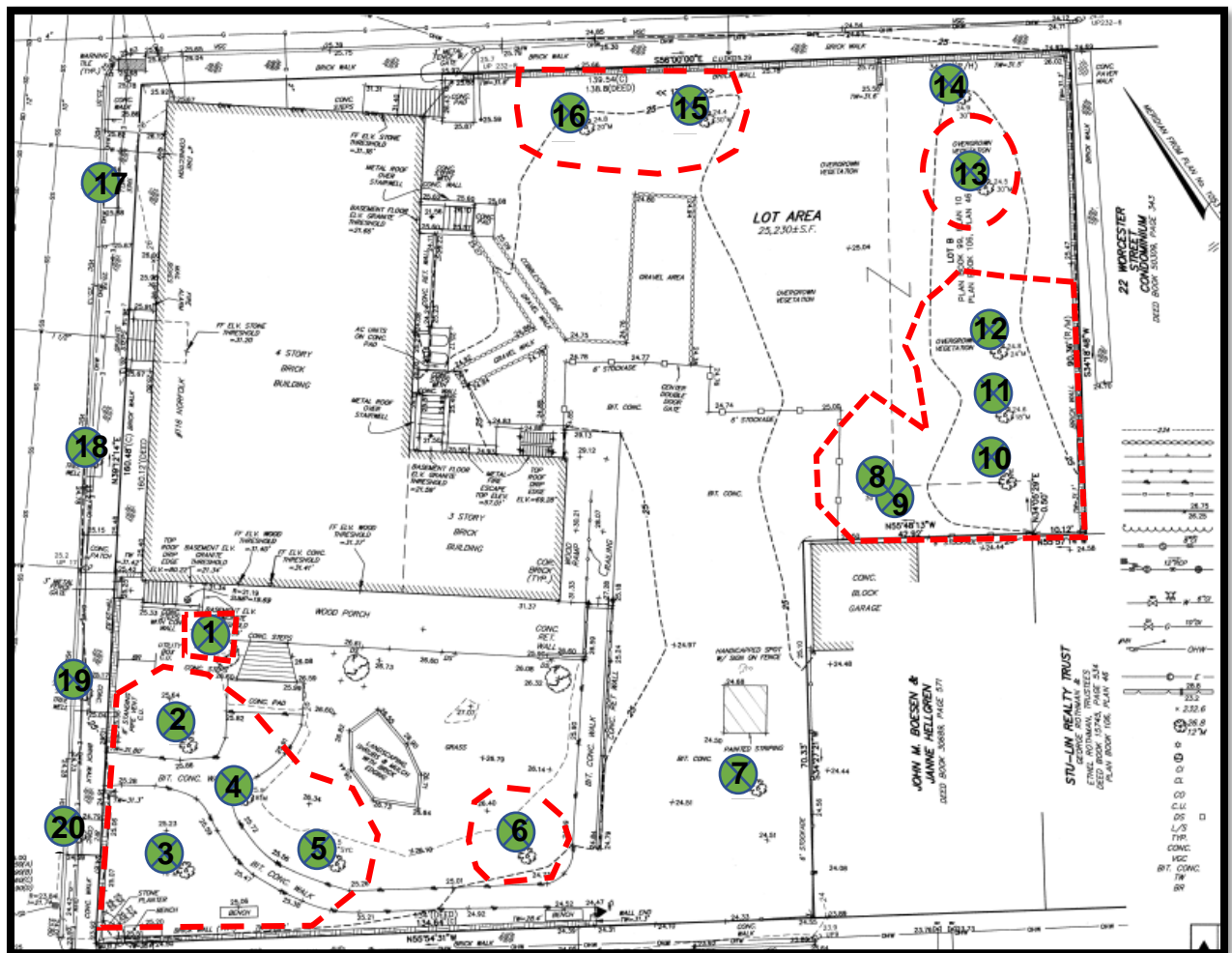
Maintenance recommendations include pruning for deadwood, broken branches and, for one tree (#10), reduction of weight on one leader. Three of the mature Norway maples have multiple leaders that would benefit from the installation of support cables.

Since at the time of this inventory, the proposed renovation plans were not available, the tree protection recommendations are general and follow industry standards for protection trees during construction. This include a tree protection zone (TPZ) that is based on 1 to 1.5 feet of protected root zone per in diameter of the tree's trunk measure at 4.5 feet (DBH) above ground level (Ex: 10-inch DBH – 10 to 15 feet radius of TPZ). Since the building, walls, walkways, and driveways limit a symmetrical TPZ, recommendations may refer to suitable root zone areas between the infrastructures. Trees in groups, such as those south of the building, have one designated TPZ that encompasses all trees in the that group.

The site illustration on the next page shows each of the 20 trees highlighted with the inventory number. This number also corresponds with the aluminum tags affixed to each tree and the inventory data in page 4.

The plan on the next page shows the estimated TPZ for each tree, or groupings of trees. The city-owned street trees (#17 - #20) do not have a TPZ as they are in the sidewalk. Trunk protection and high visibility fencing is recommended for these before construction commences.

Site Illustrations (not to scale)



Site plan with trees number and highlighted. The red dotted lines represent the approximate recommended tree protection zone (TPZ). No TPZ for Trees #7 & #14 as they are recommended for removal.

Inventory Data

Tree No.	Species	DBH/Caliper (in.)	Est. Height	Condition	Risk Tree	Const. Tolerance	Critical Root Zone	Maintenance Needs	Notes
1	Common Lilac (Syringa vulgaris)	3,3, 1.5	10	Good	No	High	4 feet radius	None	Multi-leader. Next to building and stairs
2	Norway Maple (Acer platanoides)	20.0	45	Fair Poor	No	High	Lawn area inside of SW	None	Dieback, low vigor. Old storm damage.
3	Norway Maple	14.5	45	Fair Good	No	High	Lawn area	Prune	Low vigor. Some small deadwood
4	Norway Maple	16.0	45	Good	No	High	10 feet into lawn area	Prune	Small deadwood. Trunk seam east side. Sounded solid
5	Sycamore Maple (Acer pseudoplatanus)	12.0	35	Fair Poor	No	Mod	10 feet into lawn area	Prune	Dieback, low vigor. Some small deadwood
6	Norway Maple	17.0	50	Good	No	High	15 feet into lawn area	Prune	Small deadwood. Trunk seam east side. Sounded solid
7	Norway Maple	17.0	50	Good	No	High	NA	Rem?	In parking lot. Surrounded by asphalt.
8	Norway Maple	24.5	60	Good	Pos.	High	Fence to 24 feet radius	Cable Rem?	Two leaders each ID'd as separate tree. West leader (#8) signif. lean to west. Poss. decay at 15'.
9	Norway Maple	18.0	60	Good	No	High	Fence to 24 feet radius	Prune	East leader (#9) OK. Small hanging branch. Cable both leaders or remove #8
10	Norway Maple	25.0	60	Good	No	High	Fence to 20 feet radius	Prune	2-leaders. Reduce limb weight on east leader
11	Norway Maple	6,9.5	60,40	Good	No	High	15 feet radius	None	2 leaders. Branch attachment OK
12	Norway Maple	17,14	60	Good	Pos.	High	20 feet radius	Cable	2 leaders. Pos. decay at 20' (north lead). Pos. weak branch attachment.
13	Norway Maple	20.5	65	Good	Pos.	High	20 feet radius	None Rem?	Signif. lean and and weight to west. Decay east side. Sounded solid.
14	Norway Maple	19,16	55	Fair Good	Yes	High	NA	Rem.	2 leaders. Both decayed and hollow. North lead over road and wires

Tree No.	Species	DBH/Caliper (in.)	Est. Height	Condition	Risk Tree	Const. Tolerance	Critical Root Zone	Maintenance Needs	Notes
15	Norway Maple	29.5	65	Fair Good	No	High	Wall to 25 feet radius	Prune Cable	2 leaders. Pos. weak branch attachment. Clear branches from wires.
16	Norway Maple	21.0	60	Good	No	High	Wall to 20 feet radius	Prune	Clear branches from wires
17	Callery Pear (Pyrus calleryana)	9.5	20	Good	No	Mod	NA	None	City tree in sidewalk. Install tree protection on trunk
18	Callery Pear	12.5	20	Good	No	Mod	NA	None	City tree in sidewalk. Install tree protection on trunk
19	Hawthorne (Crataegus spp.)	2.5	9	Good	No	Mod	NA	None	City tree in sidewalk. Install tree protection on trunk
20	Norway Maple	8.5	15	Fair	No	High	NA	Prune	City tree in sidewalk. Install tree protection on trunk. Deadwood over road.

Photographs



Tree #1. Lilac bush



Tree #2. 20 in. DBH Norway Maple



Tree #3. 14.5 in. DBH Norway Maple



Tree #4. 16 in. DBH Norway Maple



Tree #5. 12 in. DBH Sycamore Maple

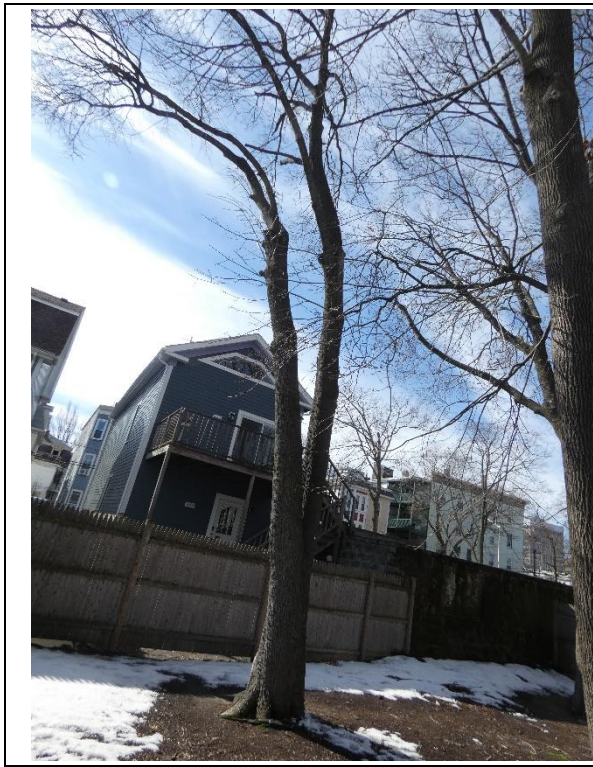


Tree #6. 17 in. DBH Norway Maple



Tree #7. 17 in. DBH N. Maple. Consider removal. Trees #8 & 9. 24.5 & 18 in. DBH Norway Maple. Cable (red) or remove #8 (arrow)





Tree #10. 15 in. DBH Norway Maple.



Tree #11. 6 & 9.5 DBH Norway Maple



Tree #12. 19 & 16 DBH Norway Maple



Tree #13. 20.5 in. DBH Norway Maple. Note lean and decay location



Tree #14. 19 & 16 in. DBH Norway Maple.
Arrows point to decayed areas



Tree #15. 20.5 in. DBH Norway Maple



Tree #16. 21 in. DBH Norway Maple



Tree #17. 9.5 in DBH Callery Pear. City
owned tree.



Tree #18. 9.5 in DBH Callery Pear City owned tree



Tree #19. 2.5 in. Hawthorne. City owned tree



Tree #20. 8.5 Norway Maple. City owned tree.

General Tree Protection and Maintenance Recommendations

Pre-construction

- Establish a Tree Protection Zone (TPZ) around all trees in and near the construction zone where feasible. The TPZ should be established at the edge of disturbance, or at a distance of 1 to 1.5 feet per inch of tree diameter (ex. 10-inch DBH tree would have a 10 to 15-foot radius TPZ). The TPZ should be delineated by a high visibility plastic fence. If the tree is within striking distance of excavation equipment, two by four wooden boards should be installed around the lower trunks and fastened with wire. Burlap should be installed where the boards contact the trunk.
- Root Pruning: trees identified as high value and close to the construction zone (CZ) should have the soil excavated at the limit of disturbance to expose any roots that may otherwise be damaged during the sidewalk or road building process. The soil should be excavated with a device design to expose roots with a high-pressure air flow (commonly referred to as an Airspade or Airknife). It is recommended that this process be performed or supervised by a certified arborist with experience in tree preservation and air excavation operations.
 - If pruning is required, all roots must be severed clean at or outside of the limits of disturbance. Any potential root impact within the protective root zone should be explored using air excavation prior to any mechanical excavation.
 - Roots larger than 3" in diameter shall not be cut without approval of the Engineer in consult with the Consulting Arborist.
 - Root pruning must be performed with an approved sharp cutting type of equipment, such as a chainsaw, hand saw, or other cutting equipment.
 - Pruned roots should be backfilled with soil suitable for planting as soon as possible. If that is not practical, the roots shall be covered with burlap cloth that is maintained moist until proper backfilling.

- Install 3 to 4 inches of partially composed woodchip mulch within the TPZ and any other areas of the root zone that may be compacted or impacted by construction activities.
- Prune limbs that may interfere with equipment and vehicles during the construction process and any deadwood or broken branches over the construction zone or areas that will be frequented. Pruning should be done by a Certified Arborist and conform to ANSI A-300 (Part 1) – 2017. Tree Shrub and Other Woody Plant Management – Standard Practices (Pruning)

Support cable installation should be installed on multileader trees with weak or compromised main branch attachment. Cable installation should be done by a Certified Arborist and conform to ANSI A300 (Part 3) - 2013. American National Standard; Tree, Shrub and Other Woody Plant Management – Supplemental Support Systems

During Construction

- Monitor construction activities to ensure no unnecessary damage is inflicted on the trees and the TPZ remains intact
- No materials or vehicles are to enter or be stored in the TPZ
- Ensure tree is watered during periods of extended drought.

Post Construction

- Continue to water tree during periods of extended drought
- Monitor trees for signs of stress or dieback over the next two growing seasons
- Treat as necessary
- Any tree(s) assessed for risk should be monitored and re-assessed in 3 years.

Disclaimer

By the nature or their size, weight and miscellaneous structure, constant exposure to the weather and the elements, susceptibility to insect's pest and decay organisms, use as homes to birds and animals and other reasons, trees always pose an inherent degree of hazard and risk from breakage, failure and other causes and conditions.

Recommendations made by Urban Forestry Solutions, Inc. are intended to minimize, reduce, or eliminate hazardous conditions associated with trees. However, there is not, and can never be, any guarantee or certainty that these recommendations will totally correct unsafe conditions or prevent failure or breakage of a tree, or that conditions will not change.

The recommendations carried out as stated, should reduce the risk but they cannot completely eliminate it (except when the tree is removed), especially in the event of future growth, further deterioration, subsequent insect attacks, extreme weather conditions, eternal factors, (lightning strikes, fallen objects, vehicular damage, act.), storms or other acts of God or man.

Certification

I certify the statements in this report are, to the best of my knowledge, true, accurate and represent my professional opinion.



Date March 4, 2021

David C. Hawkins, Consulting Arborist

Certified Arborist: Mass. Arborists Association

MCA#1425

International Society of Arboriculture
Board Certified Master Arborist
Tree Risk Assessment Qualification (TRAQ)

ISA# NE-0541-B
February; 2014; Renewed October 2018

Licensed Arborist: Rhode Island Department of
Environmental Management

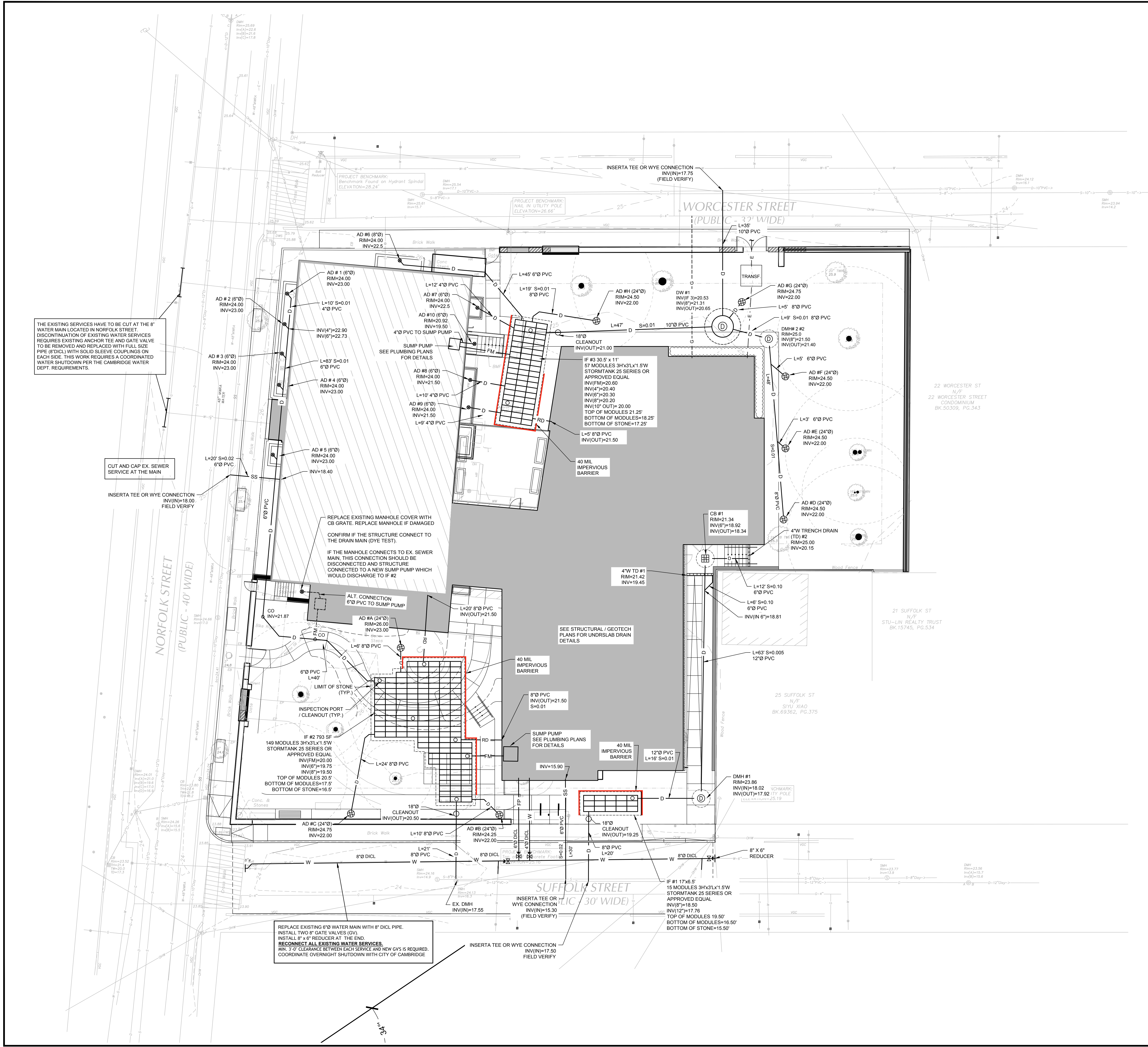
RI # 696

Member:
American Society of Consulting Arborists

The Tree Care Industry

Mass. Tree Wardens and Foresters Assoc
Executive Board Member

3.3 Civil Plan



NOTE:
ELECTRIC, GAS AND DATA LINES ARE SHOWN FOR ILLUSTRATIVE PURPOSE ONLY. SEE MEP PLANS FOR SITE E/G/D STRUCTURES AND LINES LAYOUT.

NOTE:
THE CONTRACTOR SHALL CONFIRM ALL EXISTING INVERT LOCATIONS AND ELEVATIONS AT TIE-IN POINTS / CROSSING PRIOR TO PLACEMENT OF ANY STORM DRAINAGE, SANITARY SEWER, FIRE PROTECTION AND DOMESTIC WATER STRUCTURES/PIPING.

- LEGEND:
- D — PROPOSED STORM DRAINAGE LINE
 - RD — PROPOSED ROOF DRAIN LINE
 - UD — PROPOSED UNDERDRAIN LINE
 - W — PROPOSED WATER LINE
 - FP — PROPOSED FIRE PROTECTION LINE
 - SS — PROPOSED SANITARY SEWER LINE
 - FM — PROPOSED FORCE MAIN
 - DMH — PROPOSED STORM DRAINAGE MANHOLE
 - CB — PROPOSED CATCH BASIN
 - AD — PROPOSED AREA DRAIN
 - CO — PROPOSED CLEANOUT
 - W — PROPOSED WATER GATE VALVE
 - W — PROPOSED DRYWELL W COVER
 - G — PROPOSED GAS LINE (BY OTHERS)
 - E — PROPOSED UNDERGROUND ELECTRIC LINE (BY OTHERS)

REVISIONS NO.	DATE	REMARKS	BY

HM
FH

HMFH ARCHITECTS

300 Blinn Allen Drive
Cambridge, MA 02139
T 617 487 2200
B HMFHarch hmfh.com

samiotes

Samiotes Consultants Inc.
Civil Engineers - Land Surveyors
20 A Street
Framingham, MA 01701
T 508 877 6688
F 508 877 6689
www.samiotes.com

50% CONSTRUCTION DOCUMENTS

04.22.2022

CHA - 116 Norfolk Street
Cambridge, MA 02139

CIVIL UTILITIES PLAN

SCALE: 1" = 10'-0"

CHECKED BY: DRAWN BY:

REVISIONS NO.

DATE

REMARKS

BY

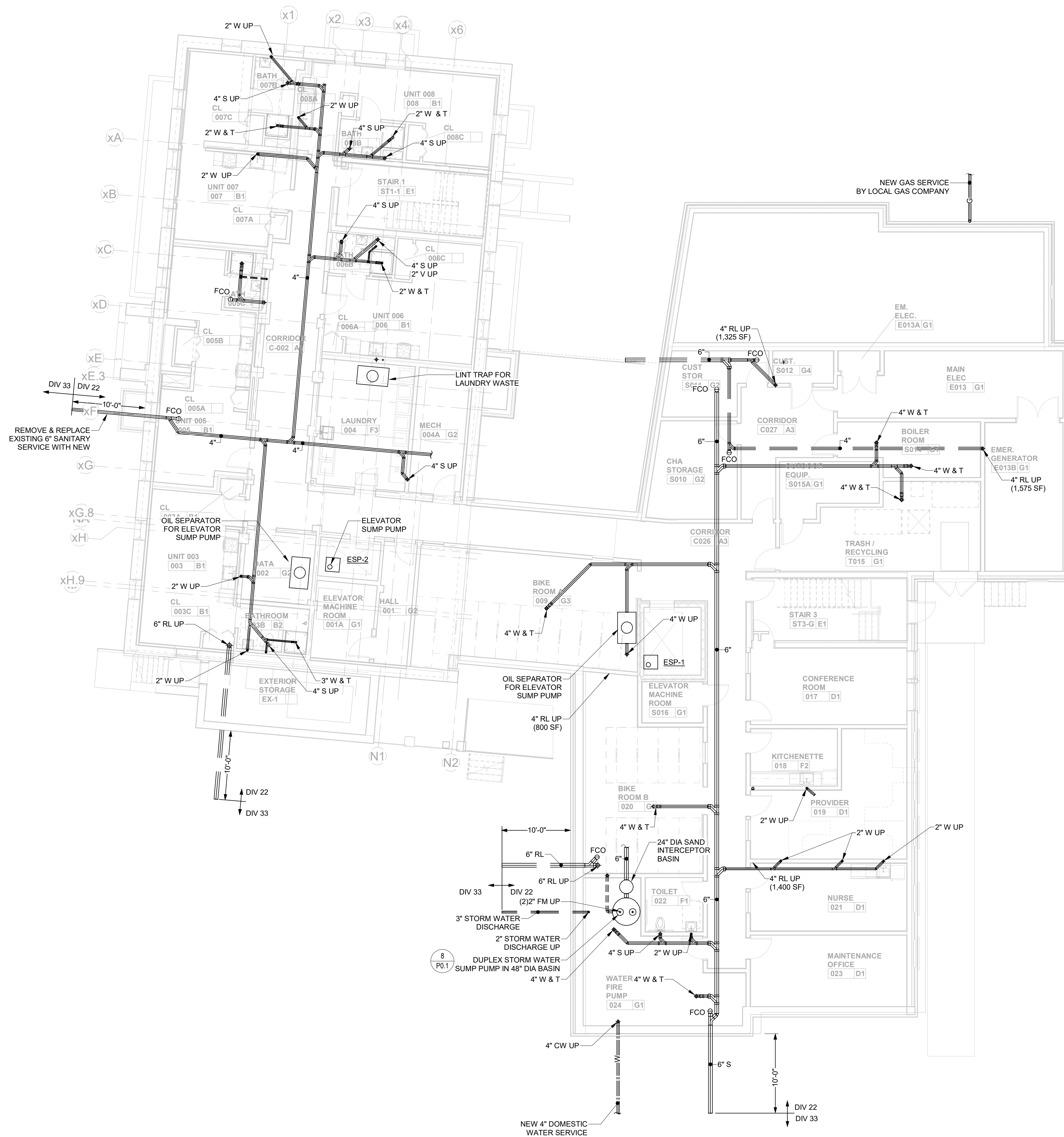
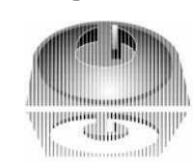
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3.4 Plumbing Plans



1 0.0 BELOW SLAB PLAN - PLUMBING
P 1.0 1/8" = 1'-0"

REVISIONS NO.	DATE	REMARKS	BY

DRAWING NUMBER

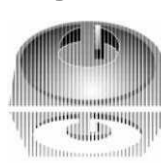
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2.0

JOB NUMBER 333220

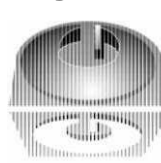


[illegible]



1 2.0 SECOND FLOOR PLAN - PLUMBING
P 2.2 1/8" = 1'-0"

REVISIONS NO.	DATE	REMARKS	BY



1 3.0 THIRD FLOOR PLAN - PLUMBING
P 2.3 1/8" = 1'-0"

REVISIONS NO.	DATE	REMARKS	BY

REVISIONS NO.	DATE	REMARKS	BY



1 4.0 FOURTH FLOOR PLAN - PLUMBING
P 2.4 1/8" = 1'-0"

3.5 Green Building Report

MEMORANDUM

date: 05.23.2022

from: Gary Brock, HMFH Architects

to: Khalil Mogassabi, City of Cambridge
Swaathi Joseph, City of Cambridge

re: 116 Norfolk Street - Draft Green Building Report Discussion (04.25.2022)

OFFICE. (617) 492 2200
FAX. (617) 876 9775

130 Bishop Allen Drive
Cambridge, MA 02139

hmfh.com

HMFH and their consultants, New Ecology and GGD Consulting Engineers, met with CDD and Cambridge Housing Authority (CHA) on April 25th to review the draft submission of the Green Building Report. After presenting a short summary of the content of the report and describing the progress to date, Cambridge CDD representatives asked CHA and the design team some clarifying questions and expressed some of their recommendations, a summary of which follows.

Overall, the design team was meeting CDD's expectations for a sustainable building per their requirements and guidelines. The following comments address forms and checklists which CDD asked the design team to provide.

Green Building Professional Affidavit: Per the Green Building Report's requirements, an affidavit must be signed by a person with experience in three representative projects that used the proposed green rating system for the project, in this case, Enterprise Green Communities (EGC). Since the architect has more experience with LEED, the design team will substitute New Ecology, who has experience in numerous projects certified in the EGC rating system, as signatory on the green building professional affidavit. This is included in this submission.

Green Building Checklist: CDD asked the design team to update the Green Building checklist, which has been done for this submission (see attachment).

Green Building Matrix: CDD asked the design team to update the Green Building Matrix, an Excel file. This has been updated for this submission and is attached as a separate file.

Cool Factor Score sheet: CDD asked the design team to fill out the Cool Factor Form, also a provided to the team as an Excel file. This has been filled out to the best of our ability at this time (see attachment).

In addition to the requested forms, CDD asked questions of the design team regarding some materials.

Roof Design: The design team confirmed that a vegetated roof is not planned to be installed on the project but the building will be PV ready for future installation of PV arrays.

Exterior Windows: We discussed the operation of the new exterior windows in the addition as tilt/turn, triple-glazed units made primarily from uPVC. uPVC is a low thermal transmission material which is a high-performance quality for an affordable cost. After questioning the use of uPVC by CDD, the design team has been investigating other material options for the exterior window frames. These options include aluminum clad wood, all aluminum, and fiberglass. A change has not been finalized and if implemented would likely increase the cost for this particular exterior assembly component.

MEP Systems: The CDD expressed their recommendation for the domestic hot water system to be all-electric so that the whole building operation could be electrically based. The design team explained that the building electrical service is designed to accommodate an electric domestic hot water boiler that can be added in the future. Currently, an all-electric system would be a large additional construction cost and operational cost for CHA. The design team has been directed to continue with the condensing domestic hot water boilers. The design team also investigated the use of a micro combined heat and power system that could also provided domestic hot water from the waste heat created by the generator.

document1

Green Building Project Checklist

Green Building

Project Location:

116 Norfolk Street

Applicant

Name:

Cambridge Housing Authority and 116 Norfolk Street LLC

Address:

362 Green Street, Cambridge, MA 02139

Contact Information

Email Address:

cfraden@cambridge-housing.org

Telephone #:

617-520-6346

Project Information (select all that apply):

- ☐ New Construction – GFA: _____
- ☒ Addition – GFA of Addition: 22,860 sf
- ☒ Rehabilitation of Existing Building – GFA of Rehabilitated Area: 20,240 sf
- ☒ Existing Use(s) of Rehabilitated Area: Multi-family housing. 37 single-residence occupancy units and 1 studio apartment.
- ☒ Proposed Use(s) of Rehabilitated Area: Multi-family housing. Studio apartments.
- ☐ Requires Planning Board Special Permit approval
- ☐ Subject to Section 19.50 Building and Site Plan Requirements
- ☐ Site was previously subject to Green Building Requirements

Green Building Rating Program/System:

- ☐ Leadership in Energy and Environmental Design (LEED) – Version: _____
- ☐ Building Design + Construction (BD+C) – Subcategory: _____
- ☐ Residential BD+C – Subcategory: _____
- ☐ Interior Design + Construction (ID+C) – Subcategory: _____
- ☐ Other: _____
- ☐ Passive House – Version: _____
- ☐ PHIUS+
- ☐ Passivhaus Institut (PHI)
- ☐ Other: _____
- ☒ Enterprise Green Communities – Version: 2020



Project Phase

☒ SPECIAL PERMIT

Before applying for a building permit, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☒ Rating system checklist
- ☒ Rating system narrative
- ☒ Net zero narrative (see example template for guidance)
- ☒ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Special Permit)

116 NORFOLK STREET APARTMENTS

Article 22 Special Permit Submission

Cambridge, MA
May 19, 2022



Submitted to

Cambridge Community Development Department
344 Broadway
Cambridge, MA 02139



Prepared by

New Ecology, Inc.
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NET ZERO NARRATIVE

Project Profile

Table 1: Development Characteristics	
Lot area (sf)	27,111 sf
Existing land use(s) and current GFA (sf) by use	Residential, GFA = 25,230 sf
Proposed land use(s) and total GFA (sf) by use	Residential, GFA = 53,000 sf
Proposed land use(s) and net new GFA (sf) by use	Residential, GFA = 27,770 sf
Proposed new building height(s) (ft and stories)	80'-4" & 4.5 stories
Proposed dwelling units	62
Proposed open space (sf)	11,858 sf
Proposed parking spaces	0
Proposed bicycle parking (long- and short-term spaces)	36 long-term, 4 short-term

Table 2: Green Building Rating System			
Enterprise			
Rating system & version	Enterprise Green Communities 2020	Seeking certification?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> TBD

Proposed Project Design Characteristics

Table 3: Building Envelope Assembly Descriptions		
Assembly Type	Renovation	Addition
Roof	Assembly R-40 minimum (6" CCSF)	Assembly R-40 minimum (10" polyiso)
Foundation	Assembly R-10 , 24' perimeter (concrete slab partially below grade)	
Exterior walls	Masonry w/ 2x4 wood framing: R-27 (3.5" closed-cell foam cavity insulation, 1" continuous interior insulation)	Wood-framed walls: R-24 (6" continuous mineral wool)
Windows	Double-pane, single-hung, aluminum windows (U-0.416, SHGC-0.34)	Triple-pane, Tilt-and-turn, low-e, polymer, argon gas (U-0.27, SHGC-0.4)
Window-to-wall ratio	15%	

Table 4: Building Envelope Performance

	Baseline	Proposed
	U-value	U-value
Window	0.50	Addition 0.27 / Reno 0.416
Wall	Steel-framed – 0.055	Addition 0.044 / Reno 0.047
Roof	0.032	Addition 0.023 / Reno 0.030

As of 4/1/2022, preliminary ASHRAE 90.1-2013 modeling is underway. The areas for windows, walls, and roof will be updated as design progresses and once Enterprise pre-certification modeling is complete.

Envelope Commissioning Process

The Project team plans to test and verify the envelope air barrier and air infiltration rates using bi-directional blower door testing both at construction midpoint and again after construction completion. Two (2) inspections will be performed after framing and air-sealing are complete but before insulation is installed, in order to identify any potential areas of thermal bridging and/or air infiltration. These inspections will be documented with site photos. Once installed, the air barrier will be tested with a bi-directional whole building blower door test conducted to EGC2020 and Energy Star MFNC standards. At the end of construction, 23 units will be blower door tested for air infiltration rates per RESNET sampling protocols.

Building Mechanical Systems

Table 5: Building Mechanical Systems Description

Space heating	VRF air-source heat pump with in-unit fan coils.
Space cooling	VRF air-source heat pump with in-unit fan coils
Heat rejection	See above systems.
Pumps & auxiliary	See above space conditioning and below DHW systems.
Ventilation	Central ERV with air-source heat pump
Domestic hot water	<u>Proposed</u> : Central, gas-fired domestic hot water plant with recirculation loop. Electrical service and space to allow for future conversion to all-electric DHW. <u>Net Zero Scenario</u> : Central, air-source heat pump domestic hot water plant with recirculation loop.
Interior lighting	In-unit lighting will be all LED; common area lighting will be all LED with occupancy sensors
Exterior lighting	All exterior lighting will be LED with outdoor lighting controls.

Mechanical Systems Commissioning Process

The project will retain a licensed commissioning agent (CxA) who will develop a detailed commissioning plan based on the building specifications and systems. The CxA will develop a functional performance test sheet for each system to be commissioned, and will commission the following systems: Mechanical systems and equipment including Energy Recovery Ventilation (ERV) systems, central VRF air-source heat pump systems, all apartment fan coils, and all direct digital controls. For lighting systems, all common space lighting control systems including occupancy sensors will be commissioned and sampled at the appropriate rate. For

plumbing systems, the domestic hot water heating system including central boiler plant, storage tanks, circulating pumps, thermostatic mixing valves, and controls will be sampled at the appropriate rate.

Building Energy Performance Measures

Table 6: Building Energy Performance Measures	
Land uses	Housing development promoting walking and bicycling, located close to multiple public transportation modes (bus, subway), close to groceries, schools, daycare, and other necessities, and close to parks. Bicycle storage provided onsite.
Building orientation and massing	The existing building structure limits the primary building axis is to a Northeast-Southwest. Dwelling units provided with at least one operable window to allow passive ventilation.
Envelope systems	Continuous insulation, high performance glazing, and white roof.
Mechanical systems	Energy recovery ventilators will be provided for ventilation. VRF distribution system will designed to minimize energy losses.
Renewable energy systems	A preliminary solar PV layout for a roof-mounted system is complete. The project team will continue to evaluate solar PV layout and capacity potential as design progresses.
District-wide energy systems	N/A

Integrative Design Process

As part of the integrative design process, the developer, architect, and mechanical engineer have participated in early-stage MEP- and envelope-focused Enterprise Green Communities charrette. The charrette was an early stage integrated design meeting with the design/development team to review preliminary design concepts and to define a comprehensive greening strategy that meets City of Cambridge Article 22, 2018 MA Stretch Energy Code, and EGC 2020 requirements. Several preliminary integrative design meetings have taken place with the project team to discuss the design and construction process and to develop consensus on building systems and design that is consistent with Enterprise requirements.

Green Building Incentive Program Assistance

The project plans to offset some of the costs of an energy efficient building envelope and electric heating and cooling system cost by utilizing all available rebate programs. The project will enroll in the Mass Save Residential New Construction incentive program, and expects to use the Passive House Feasibility incentives from this program to offset a portion of the costs of energy modeling to explore possible Passive House certification.

Net Zero Scenario Transition

Table 7: Net Zero Scenario Transition		
	Net Zero Condition	Transition Process
Building envelope	The building envelope will be built to meet or exceed the 2018 MA Stretch Energy Code standards, making it an ideal structure to achieve Net Zero in the future with on and off-site renewables. The envelope will be well-insulated and have a low level of air infiltration which will be tested and verified at construction.	This system will be a zero (site) emissions system at installation.
HVAC Systems	A VRF system is currently included in the proposed HVAC design for the building. Central energy recovery ventilation will be used to capture energy from the ventilation system and will be installed at construction.	VRF in current design will be a zero emissions system at installation. ERVs in current design will be a zero emissions system at installation.
Domestic Hot Water	A central gas-fired boiler plant will be included at construction. The plant will be located within a ground floor mechanical room and will allow for future conversion to an all-electric DHW system.	At the end of the system lifetime, the project team expects the all-electric DHW system technology, availability, and service capacity to have advanced sufficiently to allow for conversion of this system to all-electric.
Lighting	The project will use LED lighting throughout at construction. The building energy model for this project, will factor in Lighting Power Density as a calculation in overall building energy consumption. Fixtures will be modeled and will be specified in project documents to meet or exceed the energy requirement of the energy model.	The building and management team will include updated technology including: high efficacy lighting, occupancy sensors, and daylighting controls as applicable.
Renewable Energy Systems	The project will be solar-ready at construction.	The project will be solar-ready and will include PV panels as necessary to meet Article 22 requirements at time of construction.

Energy Systems Comparison

The Project team evaluated the financial feasibility of two (2) design scenarios for the 116 Norfolk Street. Operational and performance costs were estimated using the results of the preliminary ASHRAE 90.10-2013 model completed during schematic design phase of the project by Garcia, Galuska, & DeSousa, Inc. Using per-square-foot cost estimates and typical maintenance costs provided by Cambridge Housing Authority, the New Ecology team completed the following analysis using the updated gross floor area of the current proposed design.

Assumptions

Table 9: Energy Systems Included/Excluded in Analysis

	Included in Analysis?		Describe systems analyzed or explain why it was excluded from analysis
	Yes	No	
Solar photovoltaics	X		PV is assumed to be included in design, but will likely be procure through a PPA. Exact amount of PV required to meet needs is to be determined via WUFI model results.
Solar hot water heater		X	In combination with potential PV solar panels, there is not enough space on the roofs to justify both technologies.
Ground-source heat pumps		X	Due to the limited space of the site, GSHP was determined to be cost-prohibitive at this time.
Water-source heat pumps		X	Focus was on the ASHP VRF as the most feasible option.
Air-source heat pumps	X		High-efficiency ASHP VRF
Non-carbon fuel district energy		X	Building energy loads are expected to be too low for district energy system application.
Other non-carbon fuel systems	X		Purchase of carbon offsets would be included for the NZ scenario should the City of Cambridge require them in the future.

Non-Carbon Fuel Scenario

One non-carbon, all-electric scenario was examined. The tables below provide descriptions of each scenario.

Table 11: LCCA Scenario Description by Key Components

Scenario	Proposed	NZ Scenario
Heating & cooling	VRF ASHP, in-unit FCU	VRF ASHP, in-unit FCU
Ventilation	Central ERV	Central ERV
DHW	Central gas-fired	Central ASHP
Envelope	As described in Table 3	PH: R-60 ci roof, 2x6 wood-framed walls R-45 (5.5" mineral wool + 6" ci)
Window	Renovation: Existing windows to remain Addition: Triple-pane, tilt-and-turn, U-0.27	High performance, passive house rated windows, U-0.18 or better
Carbon offsets	No	Yes
Co-gen	No	No

Solar-Ready Roof Assessment

As of 4/1/2022, preliminary ASHRAE modeling is in progress. Results from the solar PV assessment presented below will be added to the future pre-certification energy model.

Table 13: Solar-Ready Roof Assessment	
Total roof area (sf)	16,073 sf
Unshaded roof area (sf)	2,500 sf
Structural support	Self-ballasted
Electrical infrastructure	(1) Trinergy Plus-25kW (400V) Inverter
Other roof appurtenances	Mechanical pads, stair and elevator overhangs. Designated mechanicals area located toward the North side of the roof structure.
Solar-ready roof area (sf)	5,800 sf
Capacity of solar array	28.8 kW
Financial incentives	TBD
Cost feasibility	TBD

Figure 1: PV Detailed Layout

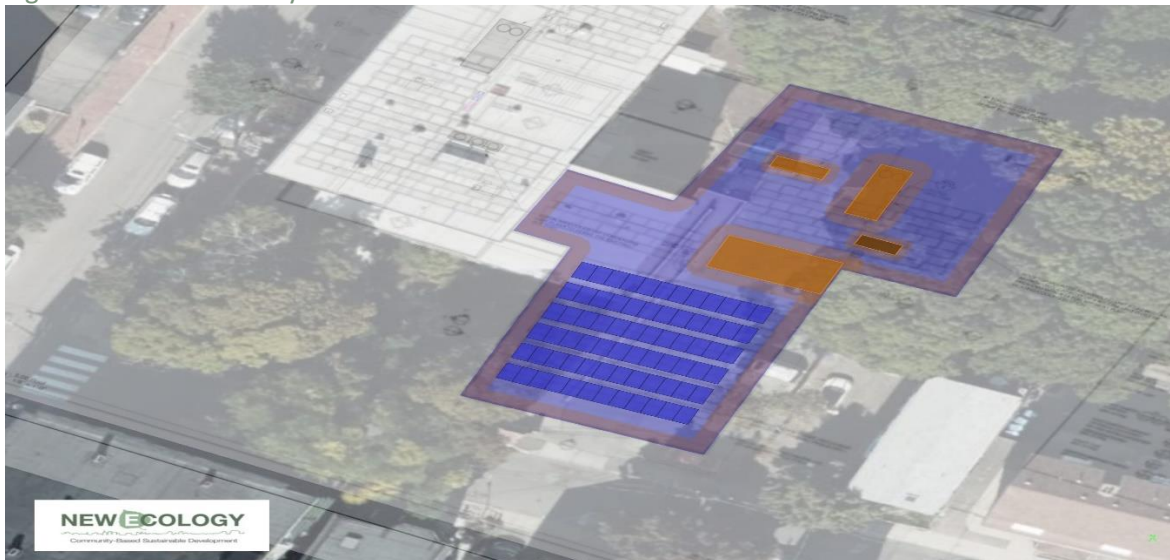


Figure 1 shows the detailed layout generated using the Helioscope PV system planning tool. PV array is designed to maximize available solar ready roof spaces.

Results

Cost estimation is currently in progress. Table 14 will be updated once all estimates are completed.

Table 14: Installation and Maintenance Cost Comparisons				
	Proposed Design		Non-Carbon-Fuel Scenario	
	<i>Installation cost</i>	<i>Maintenance</i>	<i>Installation cost</i>	<i>Maintenance</i>
Space heating	TBD	TBD	TBD	TBD
Space cooling	TBD	TBD	TBD	TBD
Heat rejection	TBD	TBD	TBD	TBD
Pump & auxiliary	TBD	TBD	TBD	TBD
Ventilation	TBD	TBD	TBD	TBD
Domestic hot water	TBD	TBD	TBD	TBD
(Financial incentives)	TBD	TBD	TBD	TBD
Total building energy system cost	TBD	TBD	TBD	TBD

Anticipated Energy Loads and GHG Emissions

As of 4/1/2022, preliminary ASHRAE 90.1-2013 energy modeling is in progress. Results for this assessment will be updated in future submissions as the pre-certification modeling is complete.

Assumptions

The project will pursue Enterprise Green Communities 2020 certification and utilize ASHRAE 90.1-2013 energy modeling to demonstrate energy loads and energy use. The anticipated baseline building (ASHRAE 90.1-2013 minus 10%) energy use is indicated in the table below. Building heating and cooling loads, hot water heating load, lighting in units and common spaces, appliance and plug loads, as well as miscellaneous system loads were included in this preliminary energy model.

Annual Projected Energy Consumption

As of 4/1/2022, ASHRAE modeling is underway. Results for this assessment will be added to report once modeling is complete.

Table 16: Annual Anticipated Baseline and Proposed Building Energy Use					
	Baseline	Proposed		Non-Carbon-Fuel Scenario	
	Energy Use and Cost	Energy Use and Cost	% Reduction from Baseline	Energy Use and Cost	% Reduction from Baseline
Site EUI (kBtu/sf/yr)*	48.74	40.79	16.3%	TBD	TBD
Source EUI (kBtu/sf/yr)*	85.38	92.48	-8.3%	TBD	TBD
Electricity (kWh)*	303,600	440,701	-45.2%	TBD	TBD
Gas (therms)	15,472	6,582	57.5%	TBD	TBD
Total Site Energy Use (kBtu/yr)*	2,582,476	2,161,934	16.3%	TBD	TBD
Total Energy Cost*	\$64,677	\$109,341	-69.1%	TBD	TBD

*Site EUI, Source EUI, Electricity, Total Site Energy Use, and Total Energy Cost are net of on-site solar PV energy production.

Table 17: Annual Projected Renewable Generation						
	Baseline		Proposed		Non-Carbon-Fuel Scenario	
	Energy Generation	% Total Energy	Energy Generation	% Total Energy	Energy Generation	% Total Energy
On-site Renewable Energy Generation (kWh)	0	0%	0	0%	36,900	TBD
Off-site Renewable Energy Generation and Carbon Offsets (site kWh and/or therms)	303,600 kWh, 15,472 therms	100%	440,701 kWh, 6,582 therms	100%	TBD	TBD

Annual Projected GHG Emissions

As of 4/1/2022 ASHRAE 90.1-2013 modeling is underway. Results for this assessment will be added to report once modeling is complete.

The annual expected CO₂ emissions for the proposed building based on the preliminary energy model are provided in the table below.

Table 18: Annual CO ₂ and CO ₂ e Emissions					
	Baseline	Proposed		Non-Carbon-Fuel Scenario	
	Emissions	Emissions	% Reduction from Baseline	Emissions	% Reduction from Baseline
Total GHG Emissions (mtCO ₂ and CO ₂ e/yr)	159.8	147.6	7.61	TBD	TBD
GHG Emissions per SF (mtCO ₂ and CO ₂ e/sf/yr)	3.02	2.79	7.61	TBD	TBD

RATING SYSTEM NARRATIVE

Project Description

The 116 Norfolk Street Apartments project (the Project) complies with the City of Cambridge Zoning Article 22: Sustainable Design and Development requirements. The Project will be designed and constructed under the guidelines of the Enterprise Green Communities 2020 (EGC 2020) certification. The building will meet the design, construction, and testing requirements of the program and will be certified as an EGC 2020 project.

The Project is comprised of one (1) existing single-room occupancy residential building to be substantially rehabilitated and a new addition added. The total dwelling unit count will be increased from 37 to 62.

Integral to EGC 2020 certification is compliance with ENERGY STAR Multifamily New Construction and EPA Indoor airPLUS requirements. In combination with third-party, RESNET-approved quality assurance and control testing, the building will exceed the Cambridge Green Building Requirements as outlined in Article 22.20. CHA will retain a qualified RESNET HERS Rater for the project.

I. Enterprise Green Communities 2020 Criteria Checklist

New Ecology reviewed the project scope and understands the credit summary presented in Table 1: EGC 2020 Criteria Checklist to be reasonable and achievable. While 40 optional points are required for certification, and Cambridge Housing Authority commits to reaching that threshold, it is clear that approximately 112 optional points are within reach. Criterion that are not being pursued or are not applicable are omitted from this narrative. Attached in Appendix A, please find the preliminary checklist.

Table 1: EGC 2020 Criteria Checklist

Criteria Category	Optional Points
Integrative Design	0
Location and Neighborhood Fabric	22
Site Improvements	10
Water	0
Operating Energy	18
Materials	33
Healthy Living Environment	13
Operations, Maintenance, and Resident Engagement	(mandatory)
Total Optional Points	96

II. Narrative Enterprise Green Communities 2020 Criteria Credits

The 116 Norfolk Street Apartments project fulfills all the mandatory criteria for all categories.

A. Integrative Design

1.1 Project Priorities Survey	Mandatory
The 116 Norfolk Street Apartments project team, led by New Ecology, Inc. will complete a Project Priorities Survey during design development, to serve as a guide to the context, population and environmental considerations the project must address. This will ensure a well-informed integrative design process.	
1.2 Charrettes and Coordination Meetings	Mandatory
An EGC2020 charrette was completed June 2, 2021 which was attended by all member of the 116 Norfolk Street project design team. Meetings have taken place as necessary throughout the 2021 year to discuss the project goals and implement them into the building design. The discussion and outcomes are documented in a memorandum distributed to all team members.	
1.3 Documentation	Mandatory
116 Norfolk Street Apartments project team will include Enterprise Green Communities 2020 Criteria information into the design and construction documents.	
1.4 Construction Management	Mandatory
The Project team will create, implement, and document an education plan for the general contractor and subcontractors, ensuring that those working on-site understand the objectives found in the Project Priorities Survey. The education plan will include: <ul style="list-style-type: none">• A summary of the Project Priorities Survey• Sustainability goals• Anticipated roles of each party in regard to the performance of the building with respect to the stated goals and objectives	

B. Location and Neighborhood Fabric

2.1 Sensitive Site Protection	Mandatory
The site location at 116 Norfolk Street does not contain any of the EGC 2020 identified ecologically sensitive features (floodplains, aquatic ecosystems, endangered species habitats, or farmland).	
2.2 Connections to Existing Development and Infrastructure	Mandatory
The project site at 116 Norfolk Street falls within an existing neighborhood. The Project design team will work to connect the project to existing pedestrian and bicycle networks within proximity to the to the project site.	
2.4 Increased Compact Development	7 points
The 116 Norfolk Street Apartments project is 62 units, with a development density of 89.12 units/acre, well in excess of 3 times the existing census block density of 24.66 units/acre. This not only exceeds the mandatory requirement of 15 units/acre, it also meets the optional 7 point for 3x the residential density of the neighborhood census block group.	
2.5 Proximity to Services and Community Resources	Mandatory
The Project location at 116 Norfolk Street is located within a 0.5-mile walk distance of at least four services and community resources as outlined by EGC 2020 criteria. Services of note include: A farmer's market, public transportation, restaurants, and a pharmacy.	
2.7 Preservation of and Access to Open Space	4 points
The site location is within a 0.25-mile walk distance of Sennott Park, which is a minimum of $\frac{3}{4}$ acres, 80% of which is unpaved.	
2.8 Access to Public Transportation	2 points
The 116 Norfolk Street project is located well within a 0.5-mile walking distance of five MBTA bus lines which offer more than 45 weekday trips daily as well as weekend trips, as well as the Central Red Line MBTA stop (Mandatory). The is also located near dedicated bike lanes leading to high-quality transit (offering more than 100 trips/day) which meets 2 optional points.	
2.9 Improving Connectivity to the Community	3 points
116 Norfolk Apartments will include visitor bicycle parking, and is located less than 0.1 miles from a Blue Bike Station.	
2.12 Access to Fresh, Local Foods	6 points
The residents at 116 Norfolk Street Apartments will have access to farmers markets located within 0.5 miles of the project.	

C. Site Improvements

3.1 Environmental Remediation	Mandatory
The project team has completed a Phase 1 Environmental Impact Assessment at the site.	
3.2 Minimization of Disturbance during Staging and Construction	Mandatory
The 116 Norfolk Street Apartments project civil engineer will develop an erosion and sedimentation control plan in accordance with the EPA Construction General Permit of the NPDES and the general contractor will be responsible for implementing plan and monitoring the plan measures.	
3.3 Ecosystem Services/Landscaping	Mandatory
The Project will ensure all new plantings will be appropriate to the site's soils or to new soils added to the site as well as to the microclimate. No invasive species will be used.	
3.5 Surface Stormwater Management	6 points
The civil engineer for this project has designed the stormwater management system to exceed the minimum 60 th percentile precipitation event. The system is likely to meet a 70 th percentile precipitation event, with an 80 th percentile a possibility.	
3.6 Efficient Irrigation and Water Reuse	Mandatory
An irrigation system is planned for 116 Norfolk Street. The system will utilize a zoned drip irrigation, moisture sensor controllers, with other water efficiency strategies will being considered.	
3.7 Efficient Irrigation and Water Reuse	4 points
The irrigation system will be designed to be efficient and be controlled with a WaterSense-labeled weather-based irrigation controller.	

D. Water Conservation

4.1 Water-Conserving Fixtures	Mandatory
The 116 Norfolk Street Apartments project will include water-efficient fixtures including 0.5 gpm lavatory faucets, 1.5 gpm kitchen faucets, 1.1 gpf toilets, and 1.5 gpm showerheads. All toilets, showerheads, and lavatory faucets will be WaterSense certified.	
4.3 Water Quality	Mandatory
The 116 Norfolk Street project will replace all lead water service lines to the existing building that is being renovated. In addition to replacing all lead lines, a Legionella water management program will be developed.	

E. Operating Energy

5.1a Building Performance Standard	Mandatory
All dwelling units in the Project will be certified through the Energy Star Multifamily New Construction program. An energy use intensity (EUI) and emissions intensity will be calculated for this project as part of the Article 22 submission which also satisfies this mandatory requirement for EGC 2020.	
5.2a Moving to Zero Energy: Additional Reductions in Energy Use	5 points
The 116 Norfolk Street Apartments project team will document the additional energy cost savings beyond the ASHRAE path baseline with preliminary energy model results. The initial estimate and goal are for at least a 5% improvement over the baseline, for 5 additional optional points.	
5.5a Moving to Zero Carbon: All Electric Ready	5 points
The 116 Norfolk Street Apartments project team has designed the mechanical, electrical, and plumbing (MEP) systems in such a way that all of the systems can be upgraded to electric in the future. The current design has the heating, cooling, laundry and cooking as all-electric. The central gas domestic hot water boilers will be electric ready, allowing for future upgrades.	
5.6 Sizing of Heating and Cooling Equipment	Mandatory
The mechanical engineer for the Project will run calculations according to ACCA Manuals, Parts J and S, to size the heating and cooling systems appropriately.	
5.7 ENERGY STAR Appliances	Mandatory
116 Norfolk Street Apartments will include ENERGY STAR clothes washers, dishwashers and refrigerators.	

5.8 Lighting	Mandatory
The Project will include all LED lighting and high-efficacy lighting controls for all permanently installed fixtures.	
5.10 Resilient Energy Systems: Critical Loads	8 points
<p>The 116 Norfolk Street Apartments will have an efficient generator that will offer reliable electricity to at least three critical energy loads in the building. The critical energy loads the Project is targeting to meet are:</p> <ul style="list-style-type: none"> • Operation of water pumps to make potable water available to occupants • Lighting level that is a minimum of 3 footcandles in all building spaces to define a path of egress to all exits • Operation of one elevator in the building 	

F. Materials

6.1 Ingredient Transparency of Material Health	8 points
<p>The Project design team has set a goal to specify and install products that have inventories that have been publicly disclosed with Declare labels or Health Product Declarations (HPDs). Preference will be given to products with third-party verification in high priority categories such as adhesive, sealants, and windows when possible. It is anticipated that the project will meet the full 8 options points for this criterion.</p>	
6.3 Chemical Hazard Optimization	8 points
<p>The Project team has set a goal to achieve the full 8 optional points for this credit by specifying certified low VOC product that have less than 100ppm content. Products with GREENGUARD, FloorScore, Red-List Free, Green Label Plus certification will be prioritized.</p>	
6.4 Healthier Material Selection	15 points
<p>The Project team has committed to meeting the VOC reduction goals of this criterion and will select products that comply with SCAQMD or CDPH standards. The chemicals of concern that will be avoided or mitigated to meet this criterion are: Alkylphenol ethoxylates, Isocyanates, phthalates, and formaldehyde.</p>	
6.6 Bath, Kitchen, Laundry Surfaces	Mandatory
<p>All wet locations in the interior of the 116 Norfolk Street project; including bathrooms, kitchens, exterior entryways, laundry areas, and mechanical spaces, will be designed to have durable, cleanable surfaces.</p> <p>Moisture-resistant backing materials, such as cement board, will be specified behind tub/shower enclosures.</p>	

6.8 Managing Moisture: Foundations	Mandatory
Capillary breaks and/or a vapor retarder will be installed beneath the contract slabs in both the existing building and the addition.	
6.12 Construction Waste Management	Mandatory
The 116 Norfolk Street Apartments project will divert at least 75% of construction waste from landfill as required by EGC 2020. The project team will explore pursuing 1 optional point for meeting 95% of construction waste diversion.	
6.13 Recycling Storage for Multifamily Project	2 points
The 116 Norfolk Street project will incorporate separate recycling collection and storage bins and locations. Recycling collection procedures will be overseen by the management company.	

G. Healthy Living Environment

7.1 Radon Mitigation	Mandatory
116 Norfolk Street is located in EPA Zone 1 for radon, requiring a passive radon system to be installed. Post construction testing will be completed, and if necessary, the mitigation system will be made active.	
7.2 Reduce Lead Hazard in Pre-1978 Buildings	Mandatory
A lead risk assessment will be completed, with appropriate actions being taken as necessary.	
7.3 Combustion Equipment	Mandatory
The mechanical engineer for the Project has specified direct-vent, sealed combustion domestic hot water boilers. CO and smoke detectors will be hard wired to the domestic hot water system, ensuring activation if the equipment malfunctions.	
7.5 Integrated Pest Management	Mandatory
All wall, floor, and joint penetrations for the 116 Norfolk Street Apartments project will be sealed with low-VOC caulking to prevent pest entry.	
7.6 Smoke-Free Policy	10 points
116 Norfolk Street will be smoke free and smoking will be prohibited within 25 feet of the project. The smoke free rule will be included in lease language and posted with signage at building entrances.	
7.7 Ventilation	Mandatory
The 116 Norfolk Street Apartments project ventilation system will meet the ASHRAE 62.2-2010 and 62.1-2010 standards.	

7.9 Construction Pollution Management	3 points
<p>The 116 Norfolk Street Apartments project will have specified that all dwelling unit supply and return ducts (heating, cooling, ventilation) shall be sealed throughout construction to prevent construction debris from entering.</p> <p>Additionally, a flush of all dwelling units will be completed post-construction and prior to occupancy. The flush will be a cumulative of 48 hours with all windows and doors open and all HVAC fans running.</p>	

H. Operations, Maintenance, and Resident Engagement

8.1 Building Maintenance Manual	Mandatory
<p>The general contractor will provide a copy of the building maintenance manual including operations and maintenance guides for all appliances, HVAC operation, water-system shutoffs, lighting equipment, paving materials and plantings, and other system instructions.</p>	
8.2 Emergency Management Manual	Mandatory
<p>New Ecology, Inc. will create, with input from CHA, an emergency management manual for the 116 Norfolk Street Apartments project.</p>	
8.3 Resident Manual	Mandatory
<p>New Ecology, Inc. will create, with input from CHA, a resident green guide for the 116 Norfolk Street project.</p>	
8.4 Walkthroughs & Orientations to Property Operation	Mandatory
<p>New Ecology, Inc. and the general contractor, in coordination with CHA, will provide resident and property manager orientations to identify the green features of the building and to explain the use of the resident green guide and building maintenance manual.</p>	
8.5 Project Data Collection and Monitoring System	Mandatory
<p>The 116 Norfolk Street project will be tracking building performance in WegoWise. 100% of owner-paid accounts and full building data for tenant-paid accounts will be tracked.</p>	

APPENDIX A: ASHRAE 90.1 MODEL SUMMARY REPORTS

**MA Stretch Code Energy Report
for
The Cambridge Housing Authority
116 Norfolk Street**

Cambridge, MA

April 1, 2022

Prepared for:



Prepared by:





Cambridge Housing Authority 116 Norfolk Street
Stretch Code Energy Model Calculations

The Cambridge Housing Authority 116 Norfolk Street is an existing affordable housing building renovation with new construction addition with an approximate gross area of 53,000 s.f. located in Cambridge, MA. The building is intended for 24 hour operation.

To confirm that the design building meets the Massachusetts Stretch Energy Code requirements of at least 10% energy savings above code, energy model simulations have been performed comparing the design building to a baseline ASHRAE Standard 90.1-2013 w/ MA Amendments building.

1. The ASHRAE Standard 90.1-2013 baseline building is as follows:

- Envelope:
 - Wall: R-13 + R-10 c.i. (U-0.055)
 - Roof: R-30 c.i. (U-0.032)
 - Slab: R-15 for 24"
 - Windows: 0.50 U-Value, 0.40 SHGC
- Mechanical System:
 - Hot water coil heating/direct expansion packaged terminal AC units (System 1)
 - (2) 80% efficient gas-fired hot water boilers
- Domestic Hot Water System:
 - 80% efficient gas-fired domestic hot water system
- Lighting System:
 - 0.51 w/s.f.

2. The design building with is as follows:

- Addition Envelope:
 - Walls: R-19.76 c.i. (U-0.044)
 - Roof: R-40 c.i. (U-0.023)
 - Slab Insulation: R-10 for 24' perimeter
 - Windows: 0.27 U-Value, 0.40 SHGC
- Renovation Envelope:
 - Walls: R-17.7 c.i. (U-0.047)
 - Roof: R-30 c.i. (U-0.030)
 - Slab Insulation: R-10 for 24' perimeter
 - Windows: 0.416 U-Value, 0.34 SHGC
- Mechanical System:
 - High-efficiency variable refrigerant flow (VRF) heat pump units with energy recovery ventilation units
- Domestic Hot Water System:
 - 94% efficient gas-fired domestic hot water system
- Lighting System:
 - Residential Units 0.20 w/s.f.
 - Common Area 0.40 w/s.f.

Section 1.1: Energy Code Improvement Analysis Conclusion

A comparison of the Design Building against the ASHRAE Standard 90.1-2013 w/ MA Amendments Baseline Building results in a site energy savings of 16.3% Exceeding the Stretch Energy Code requirements of at least 10%. The Design Building results in a site EUI of approximately 40.79 kBTU/s.f./yr.

	Baseline	Proposed	
	Energy Use and Cost	Energy Use and Cost	% Reduction from Baseline
Site EUI (kBtu/sf/yr)	48.74	40.79	16.3%
Source EUI (kBtu/sf/yr)	85.38	92.48	-8.32%
Electricity (kWh)	303,600	440,701	-45.16%
Gas (therms)	15,472	6,582	57.46%

Note:

The values indicated above are based on energy modelling performed for system comparison purposes only. Our office strongly recommends adding a 30% safety factor to the calculated values of this report for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.



Garcia, Galuska & DeSousa
Consulting Engineers Inc.

375 Faunce Corner Road, Suite D, Dartmouth, MA 02747-1258

CHA 116 Norfolk St. - ASHRAE 90.1-2013 Energy Savings Summary

Baseline	Description	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility \$/s.f.	Site Annual kBTU/s.f. (EUI)	Source Annual kBTU/s.f. (EUI)	Energy Savings Percentage**
ASHRAE Standard 90.1-2013 Baseline w/ MA Amendments	1. ASHRAE Standard 90.1-2013 Envelope (Wall Insulation R-13 + R-10 c.i., Roof Insulation R-30 c.i., Windows 0.50 U-Value/0.40 SHGC) 2. ASHRAE Standard 90.1-2013 Mechanical Systems (System 1 - DX Cooling Packaged Terminal AC Units w/ Hot Water Coils with 80% Eff. Hot-Water Boilers) 3. ASHRAE Standard 90.1-2013 Lighting System (0.51 w/s.f.) 4. ASHRAE Standard 90.1-2013 Domestic Hot Water Systems (80% Eff. Hot Water Heaters)	303,600	15,472.0	\$49,882	\$14,795	\$64,677	\$1.22	48.74	85.38	-

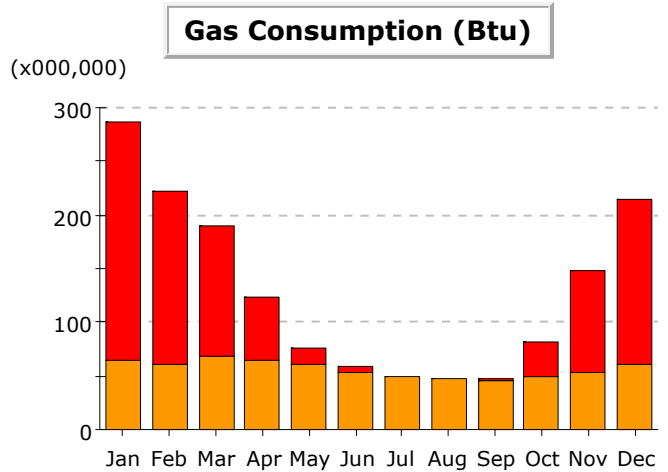
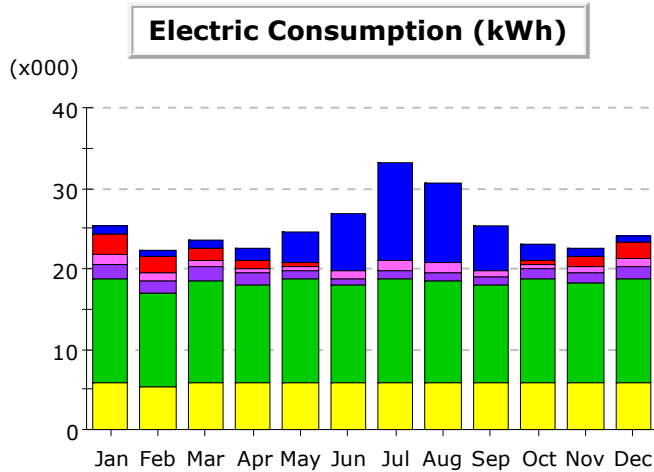
Option	Description	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility \$/s.f.	Site Annual kBTU/s.f. (EUI)	Source Annual kBTU/s.f. (EUI)	Energy Savings Percentage**
Design Building	1. Addition Envelope (Wall Insulation R-19.76 c.i., Roof Insulation R-40 c.i., Windows 0.27 U-Value/0.40 SHGC) 2. Reno Envelope (Wall Insulation R-17.7 c.i., Roof Insulation R-30 c.i., Windows 0.416 U-Value/0.34 SHGC) 3. Design VRF Systems with Dedicated Outside Air Handling Units w/ ERV 4. Design High-Efficiency Lighting System (0.2 & 0.4 w/s.f.) 5. Design High-Efficiency Domestic Hot Water Systems	440,701	6,582.2	\$110,497	\$8,096	\$118,593	\$2.24	40.79	92.48	16.3%

*Combined expense savings is the difference between the combined annual expense of the baseline and building in comparison.

**Energy savings percentage is the difference between the annual energy costs of the baseline and building in comparison.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

**Electric Consumption (kWh x000)**

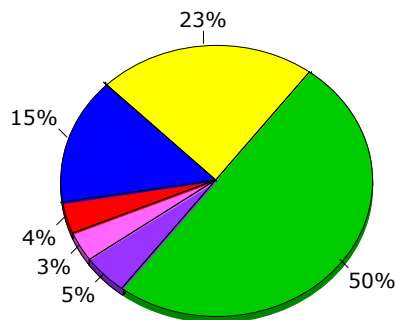
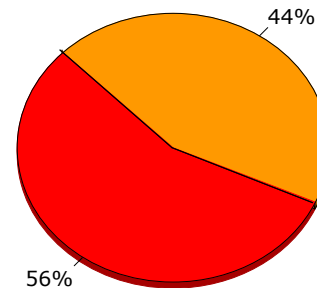
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.94	0.82	1.04	1.52	3.87	6.95	11.95	9.89	5.57	2.12	1.01	0.88	46.57
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	2.55	2.04	1.68	1.03	0.33	0.12	0.00	0.00	0.05	0.55	1.31	1.91	11.57
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	1.30	0.96	0.79	0.54	0.58	0.88	1.44	1.20	0.71	0.47	0.67	0.96	10.48
Pumps & Aux.	1.63	1.49	1.57	1.37	1.00	0.85	0.87	0.87	0.86	1.16	1.43	1.60	14.70
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	12.86	11.56	12.68	12.34	12.80	12.28	12.86	12.68	12.35	12.86	12.41	12.80	150.47
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	5.95	5.36	5.90	5.73	5.93	5.72	5.95	5.90	5.73	5.95	5.75	5.93	69.81
Total	25.23	22.24	23.66	22.52	24.51	26.80	33.07	30.55	25.26	23.10	22.58	24.08	303.60

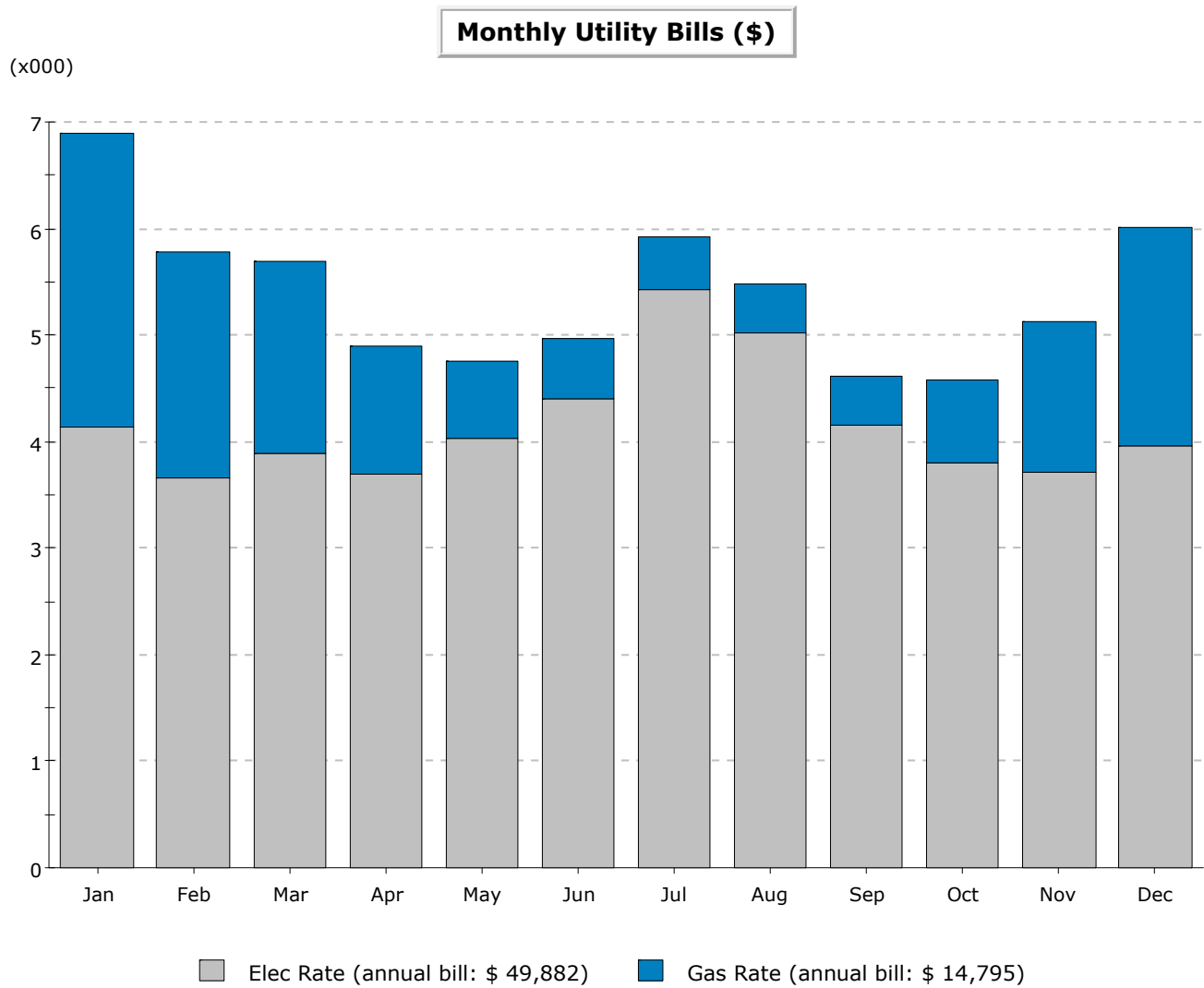
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	221.9	160.0	120.5	59.2	15.5	5.1	-	0.1	2.4	31.1	94.3	153.8	863.9
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	65.4	61.6	68.7	65.0	60.7	53.8	50.3	47.8	46.0	50.1	53.1	60.7	683.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	287.3	221.6	189.2	124.2	76.2	58.9	50.3	47.9	48.4	81.2	147.4	214.5	1,547.2

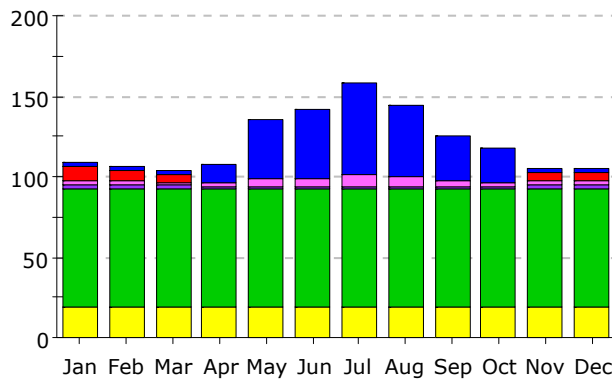
Annual Energy Consumption by Enduse

	Electricity kWh (x000)	Natural Gas MBtu	Steam Btu	Chilled Water Btu
Space Cool	46.57	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	11.57	863.9	-	-
HP Supp.	-	-	-	-
Hot Water	-	683.3	-	-
Vent. Fans	10.48	-	-	-
Pumps & Aux.	14.70	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	150.47	-	-	-
Task Lights	-	-	-	-
Area Lights	69.81	-	-	-
Total	303.60	1,547.2	-	-

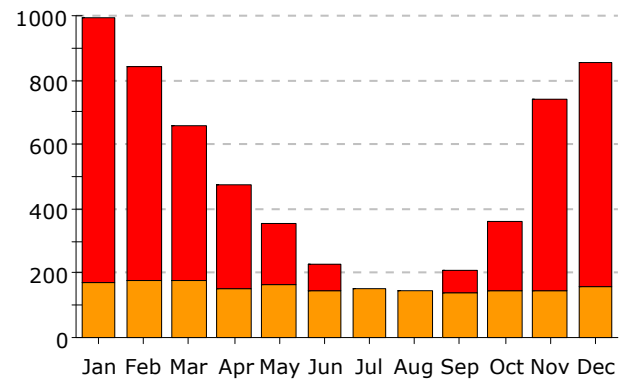
**Electricity****Natural Gas**



Total Annual Bill Across All Rates: \$ 64,677

Electric Demand (kW)**Gas Demand (Btu/h)**

(x000)

**Electric Demand (kW)**

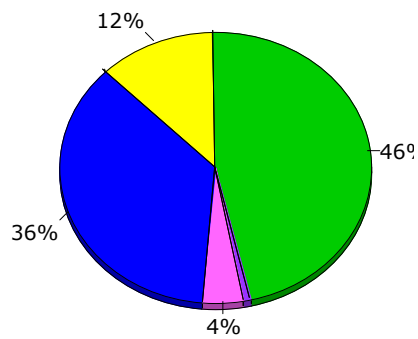
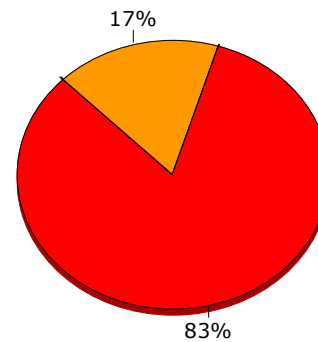
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	2.2	2.1	2.3	11.9	37.1	43.0	57.4	44.7	27.6	21.4	2.0	1.9	253.7
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	8.1	6.6	5.1	0.3	-	-	-	-	-	-	5.6	5.9	31.6
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	2.9	2.3	1.0	1.6	4.7	5.1	6.7	5.5	3.5	2.7	2.1	2.1	40.3
Pumps & Aux.	2.2	2.2	2.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	2.2	2.2	19.2
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	73.4	73.4	73.4	73.4	73.4	73.4	73.4	73.4	73.4	73.4	73.4	73.4	880.9
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	19.5	234.4
Total	108.4	106.2	103.5	107.9	135.9	142.2	158.2	144.4	125.2	118.3	104.8	105.1	1,460.0

Gas Demand (Btu/h x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	819.1	659.4	475.6	323.8	190.0	79.4	-	-	68.9	219.5	593.3	693.2	4,122.2
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	172.4	179.9	180.2	150.7	161.5	146.7	151.8	142.7	136.9	144.4	144.9	159.1	1,871.3
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	991.5	839.3	655.8	474.6	351.4	226.1	151.8	142.7	205.8	363.9	738.2	852.3	5,993.4

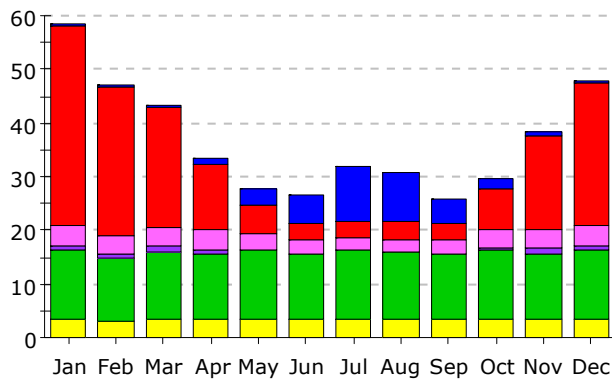
Annual Peak Demand by Enduse

	Electricity kW	Natural Gas Btu/h (x000)	Steam Btu/h	Chilled Water Btu/h
Space Cool	57.38	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	-	819.10	-	-
HP Supp.	-	-	-	-
Hot Water	-	172.43	-	-
Vent. Fans	6.73	-	-	-
Pumps & Aux.	1.17	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	73.41	-	-	-
Task Lights	-	-	-	-
Area Lights	19.53	-	-	-
Total	158.22	991.54	-	-

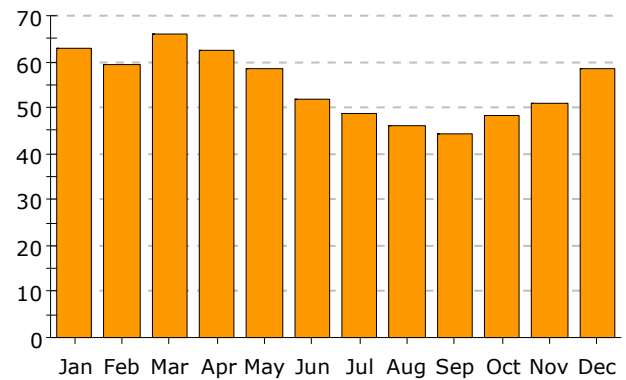
**Electricity****Natural Gas**

Electric Consumption (kWh)

(x000)

**Gas Consumption (Btu)**

(x000,000)

**Electric Consumption (kWh x000)**

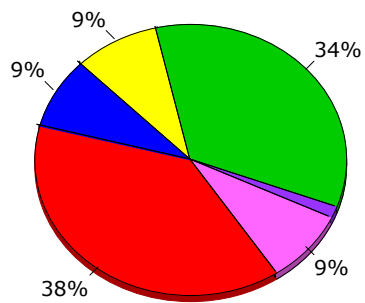
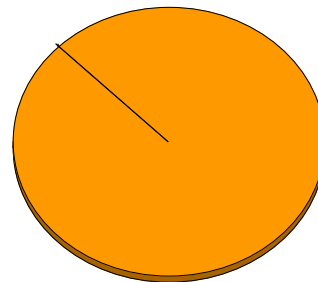
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	0.38	0.29	0.52	1.17	2.97	5.34	10.10	9.25	4.54	1.85	0.96	0.48	37.84
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	37.12	27.90	22.16	12.37	5.10	3.13	3.00	3.30	3.01	7.72	17.38	26.39	168.57
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	3.76	3.36	3.61	3.51	3.07	2.61	2.43	2.23	2.45	3.32	3.52	3.71	37.57
Pumps & Aux.	0.95	0.96	1.02	0.82	0.20	0.02	-	-	0.03	0.46	0.87	1.03	6.35
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	12.86	11.56	12.68	12.34	12.80	12.28	12.86	12.68	12.35	12.86	12.41	12.80	150.47
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	3.40	3.06	3.38	3.28	3.39	3.27	3.40	3.38	3.28	3.40	3.29	3.39	39.91
Total	58.46	47.13	43.35	33.48	27.53	26.65	31.79	30.84	25.65	29.61	38.43	47.79	440.70

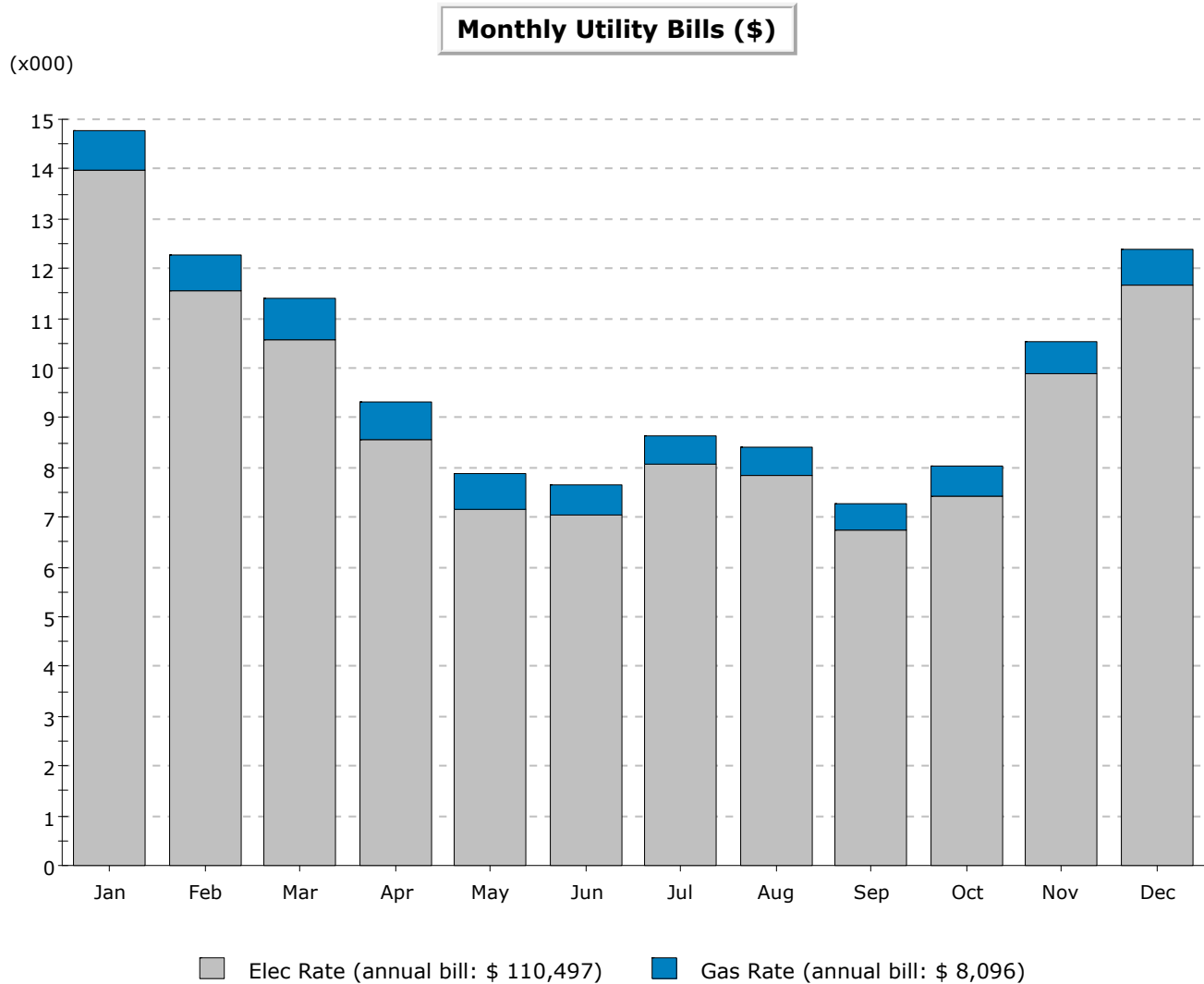
Gas Consumption (Btu x000,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	62.93	59.31	66.15	62.60	58.54	51.92	48.51	46.12	44.33	48.28	51.11	58.41	658.22
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	62.93	59.31	66.15	62.60	58.54	51.92	48.51	46.12	44.33	48.28	51.11	58.41	658.22

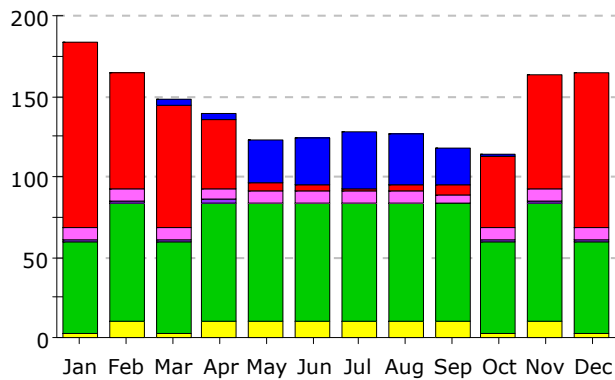
Annual Energy Consumption by Enduse

	Electricity kWh (x000)	Natural Gas MBtu	Steam Btu	Chilled Water Btu
Space Cool	37.84	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	168.57	-	-	-
HP Supp.	-	-	-	-
Hot Water	-	658.22	-	-
Vent. Fans	37.57	-	-	-
Pumps & Aux.	6.35	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	150.47	-	-	-
Task Lights	-	-	-	-
Area Lights	39.91	-	-	-
Total	440.70	658.22	-	-

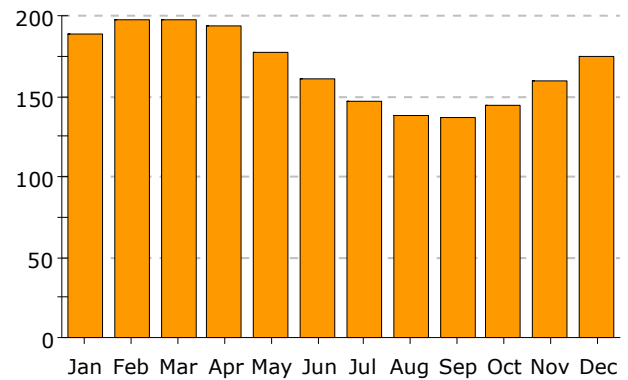
**Electricity****Natural Gas**



Total Annual Bill Across All Rates: \$ 118,593

Electric Demand (kW)**Gas Demand (Btu/h)**

(x000)

**Electric Demand (kW)**

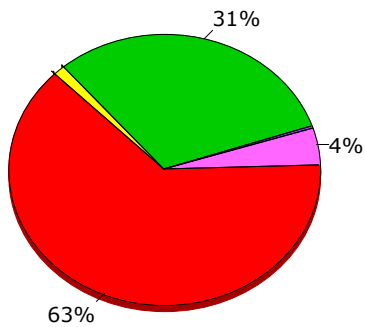
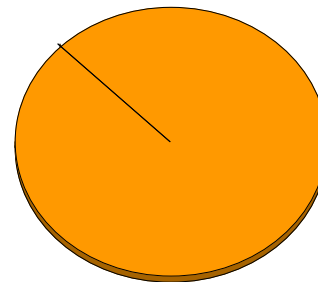
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	3.0	4.0	25.6	30.0	35.0	31.5	23.0	1.1	-	-	153.0
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	115.4	72.1	76.3	41.9	5.0	3.0	1.1	3.6	6.1	43.6	71.1	96.3	535.5
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	-	-	-	-	-	-	-	-	-	-	-	-	-
Vent. Fans	7.9	7.5	7.6	7.5	7.5	7.5	7.6	7.5	4.2	7.5	7.5	7.7	87.5
Pumps & Aux.	0.5	1.2	1.0	1.4	-	-	-	-	-	1.4	1.2	0.7	7.3
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	57.4	73.4	57.4	73.4	73.4	73.4	73.4	73.4	73.4	57.4	73.4	57.4	817.0
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	2.3	10.7	2.3	10.7	10.7	10.7	10.7	10.7	10.7	2.3	10.7	2.3	94.8
Total	183.5	164.8	147.6	138.8	122.2	124.6	127.8	126.7	117.4	113.3	163.8	164.5	1,695.0

Gas Demand (Btu/h x000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Space Cool	-	-	-	-	-	-	-	-	-	-	-	-	-
Heat Reject.	-	-	-	-	-	-	-	-	-	-	-	-	-
Refrigeration	-	-	-	-	-	-	-	-	-	-	-	-	-
Space Heat	-	-	-	-	-	-	-	-	-	-	-	-	-
HP Supp.	-	-	-	-	-	-	-	-	-	-	-	-	-
Hot Water	188.8	196.9	197.3	193.1	176.7	160.4	146.3	137.5	137.0	144.5	158.9	174.2	2,011.6
Vent. Fans	-	-	-	-	-	-	-	-	-	-	-	-	-
Pumps & Aux.	-	-	-	-	-	-	-	-	-	-	-	-	-
Ext. Usage	-	-	-	-	-	-	-	-	-	-	-	-	-
Misc. Equip.	-	-	-	-	-	-	-	-	-	-	-	-	-
Task Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Area Lights	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	188.8	196.9	197.3	193.1	176.7	160.4	146.3	137.5	137.0	144.5	158.9	174.2	2,011.6

Annual Peak Demand by Enduse

	Electricity kW	Natural Gas Btu/h (x000)	Steam Btu/h	Chilled Water Btu/h
Space Cool	-	-	-	-
Heat Reject.	-	-	-	-
Refrigeration	-	-	-	-
Space Heat	115.38	-	-	-
HP Supp.	-	-	-	-
Hot Water	-	197.35	-	-
Vent. Fans	7.91	-	-	-
Pumps & Aux.	0.48	-	-	-
Ext. Usage	-	-	-	-
Misc. Equip.	57.43	-	-	-
Task Lights	-	-	-	-
Area Lights	2.31	-	-	-
Total	183.51	197.35	-	-

**Electricity****Natural Gas**

APPENDIX B: HELIOSCOPE PV ANALYSIS REPORT

Ballasted, 10 deg. tilt, 20kW inverter, MEP setback 116 Norfolk Apartments, 116 Norfolk St., cambridge, ma

Design

Design	Ballasted, 10 deg. tilt, 20kW inverter, MEP setback
DC Nameplate	28.8 kW
AC Nameplate	20.0 kW (1.44 DC/AC)
Last Modified	Thomas Chase (Today at 9:16 PM)

Project Location



Components

Component	Name	Count
Inverters	TRINERGY PLUS 20KW (AEC)	1 (20.0 kW)
Strings	10 AWG (Copper)	4 (144.0 ft)
Module	LG Electronics, LG400Q1C-A6 (400W)	72 (28.8 kW)

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 2	Fixed Tilt	Portrait (Vertical)	10°	203.11453°	2.0 ft	1x1	72	72	28.8 kW

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	-	13-20	Along Racking

Detailed Layout



APPENDIX C: RATING SYSTEM CHECKLIST



2020 ENTERPRISE GREEN COMMUNITIES CRITERIA CHECKLIST

CRITERIA CHECKLIST

This checklist provides an overview of the technical requirements within the Enterprise Green Communities Criteria. To achieve Enterprise Green Communities Certification, all projects must achieve compliance with the Criteria mandatory measures applicable to that construction type. **New Construction projects must also achieve at least 40 optional points, and Substantial and Moderate Rehab projects must also achieve at least 35 optional points.**

These projects that also comply with Criterion 5.2b or Criterion 5.4 will be recognized with Enterprise Green Communities Certification Plus.

YES / NO	OPTIONAL POINTS		1. INTEGRATIVE DESIGN
Yes		M	1.1 Integrative Design: Project Priorities Survey Complete the Project Priorities Survey, which can be found in the Appendix.
Yes		M	1.2 Integrative Design: Charrettes and Coordination Meetings Develop an integrative design process that moves the outputs of the Project Priorities Survey into action through a series of collaborative meetings. Prioritize multi-benefit strategies. Assign responsibility within your design and development teams for accountability.
Yes		M	1.3 Integrative Design: Documentation Include Enterprise Green Communities Criteria information in your contract documents and construction specifications (Division 1 Section 01 81 13 Sustainable Design Requirements) as necessary for the construction team to understand the requirements and how they will be verified. Ensure, and indicate, that the drawings and specifications have been generated to be compliant and meet the certification goals.
Yes		M	1.4 Integrative Design: Construction Management Create, implement, and document your contractor/subcontractor education plan to ensure that all persons working on-site fully understand their role in achieving the project objectives. Include a summary of the Project Priorities Survey (Criterion 1.1), the sustainability goals, and anticipated roles of each party in regards to the performance expected of the project. Attach and reference this training plan to Division 1 Section 01 81 13 Sustainable Design Requirements. Include timeline estimates for performance testing and verification schedules in the overall construction schedule. As relevant, review requirements for Criteria 8.1, 8.2, and 8.3, and begin populating these documents with relevant information from design and construction.
	0	12 or 15	1.5 Design for Health and Well-Being: Health Action Plan Follow Steps 1-6 of the Health Action Plan framework per the full criterion. <i>[12 points with extra 3 points for Step 7]</i> This includes: 1) Commit to embedding health into the project lifecycle; 2) Partner with a project health professional; 3) Collect and analyze community health data; 4) Engage with community stakeholders to prioritize health data and strategies; 5) Identify strategies to address those health issues; 6) Create an implementation plan; and 7) Create a monitoring plan.
	0	10	1.6 Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment Conduct a four-part assessment (social, physical, functional, strategy) to identify critical risk factors of your property and implement at least two sets of strategies to enable the project to adapt to, and mitigate, climate related or seismic risks. See full criterion for more guidance.
	0	8	1.7 Resilient Communities: Strengthening Cultural Resilience Integrate community and resident participation in the development processes so that the built environment honors cultural identities, resident voices, and community histories. Option 1: Complete a Cultural Resilience Assessment OR Option 2: Convene a Cultural Advisory Group
			CRITERIA 1 SUBTOTAL 4 of 4 Mandatory Criteria 0 Optional Points
YES / NO	OPTIONAL POINTS		2. LOCATION + NEIGHBORHOOD FABRIC
Yes		M	2.1 Sensitive Site Protection All projects must: 1. Protect floodplain functions (e.g., storage, habitat, water quality) by limiting new development within the 100-year floodplain of all types of watercourses. 2. Conserve and protect aquatic ecosystems, including wetlands and deepwater habitats, that provide critical ecosystem functions for fish, other wildlife, and people. 3. Protect ecosystem function by avoiding the development of areas that contain habitat for plant and animal species identified as threatened or endangered. 4. Conserve the most productive agricultural soils by protecting prime farmland, unique farmland, and farmland of statewide or local importance. If your site contains any of these ecologically sensitive features, follow the specific Requirements under that subheading.
Yes		M	2.2 Connections to Existing Development and Infrastructure

Yes

7

Yes

No

4

Yes

2

3

0

0

6

M

5 or 7

M

M

6 max

M

2

2, 6, 8

6

2-8

5 max

6

6

(Mandatory for New Construction projects that do not qualify as Rural/Tribal/Small Town)

Locate the project on a site with access to existing roads, water, sewers, and other infrastructure and within or contiguous to (having at least 25% of the perimeter bordering) existing development. Connect the project to the existing pedestrian network. For sites over 5 acres, provide connections to the adjacent street network at least every 800 feet. Tie all planned bike paths to existing bike paths.

2.3 Compact Development

(Mandatory for New Construction)

At a minimum, build to the residential density (dwelling units/acre) of the census block group where the project is located. In Rural/Tribal/Small Town locations that do not have zoning requirements: Build to a minimum net density of 5 units per acre for single-family houses; 10 units per acre for multifamily buildings, single and two-story; and 15 units per acre for multifamily buildings greater than two-stories.

2.4 Increased Compact Development

Exceed the residential density (dwelling units/acre) of the census block group in which your project is located. Exceed by 2x for [\[5 points\]](#); exceed by 3x for [\[7 points\]](#). In Rural/Tribal/Small Towns that do not have zoning requirements, build to a minimum net density of 7.5 units per acre for single-family houses; 12 units per acre for multifamily buildings, single and two-story; and 20 units per acre for multifamily buildings greater than two stories. [\[5 points\]](#)

2.5 Proximity to Services and Community Resources

(Mandatory for New Construction) Locate the project within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, of the listed services. For projects that qualify as Rural/Tribal/Small Town, locate the project within 5 miles of at least four of the listed services.

2.6 Preservation of and Access to Open Space for Rural/Tribal/Small Town

(Mandatory for New Construction Rural/Tribal/Small Town)

Option 1: Locate the project within a 0.25-mile walk distance of dedicated public open space that is a minimum of 0.75 acres; at least 80% of which unpaved.

OR

Option 2: Set aside a minimum of 10% (minimum of 0.25 acres) of the total project acreage as open and accessible to all residents; at least 80% of which unpaved.

2.7 Preservation of and Access to Open Space

Option 1: Locate the project within a 0.25-mile walk distance of dedicated open space that is a minimum of 0.75 acres; at least 80% of which unpaved.

OR

Option 2: Set aside a percentage of permanent open space for use by all residents; at least 80% of which unpaved. 20% [\[2 points\]](#); 35% [\[4 points\]](#); 45% + written statement of preservation/conservation policy [\[6 points\]](#).

2.8 Access to Transit

(Mandatory for New Construction projects that do not qualify as Rural/Tribal/Small Town; Optional for all other project types)

Mandatory: New Construction, not Rural/Tribal/Small Town

Locate projects within a 0.5-mile walk distance of transit services (bus, rail and/or ferry), constituting at least 45 or more transit rides per weekday, with some type of weekend service.

Optional: New Construction, not Rural/Tribal/Small Town

Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 trips per day) within 3 miles. [\[2 points\]](#)

Optional: Rehabilitation, not Rural/Tribal/Small Town

Locate projects within a 0.5-mile walk distance of public transit services (bus, rail and/or ferry), constituting at least 45 or more transit rides per weekday, with some type of weekend service. [\[6 points\]](#) Locate the project along dedicated bike trails or lanes (Class I, II, or IV) that lead to high-quality transit services (100 trips per day) within 3 miles. [\[2 points\]](#)

Optional: New Construction and Rehabilitation, Rural/Tribal/Small Town

Locate the project within 0.5 mile walk distance of public transit services with at least 45 rides per weekday and some weekend service. OR, Install at least two charging stations for electric vehicles. OR, Locate the project with 5 miles of one of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; 5) public/private regional transportation.

2.9 Improving Connectivity to the Community

Improve access to community amenities through at least one of the options incentivizing biking mobility or improving access to transit.

2.10 Passive Solar Heating/Cooling

Design and build with passive solar design, orientation, and shading that meet the guidelines specified.

2.11 Adaptive Reuse of Buildings

Rehabilitate and adapt an existing structure that was not previously used as housing. Design the project to adapt, renovate, or reuse at least 50% of the existing structure and envelope.

2.12 Access to Fresh, Local Foods

Provide residents and staff with access to fresh, local foods through one of the following options:

Option 1: Neighborhood Farms and Gardens

Option 2: Community-Supported Agriculture

Option 3: Proximity to Farmers Market

	0	8	2.13 Advanced Certification: Site Planning, Design and Management Locate building(s) within a community that is certified in LEED for Neighborhood Development, LEED for Cities and Communities, Living Community Challenge, or SITES.
	0	6 max 2	2.14 Local Economic Development and Community Wealth Creation Demonstrate that local preference for construction employment and subcontractor hiring was part of your bidding process, and how it functioned during construction. OR Demonstrate that you achieved at least 20% local employment. OR Provide physical space for small business, nonprofits, and/or skills and workforce education.
Yes		3 3	
	0	M	2.15a Access to Broadband: Broadband Ready <i>(Mandatory for New Construction and Substantial Rehab Projects in Rural/Tribal/Small Town Locations)</i> Incorporate broadband infrastructure so that when broadband service comes to a community, the property can be easily connected. Include a network of mini-ducts or conduit throughout the building, extending from the expected communications access point to each network termination point in the building.
	0	6	2.15b Access to Broadband: Connectivity Ensure all units and common spaces in the property have broadband internet access with at least a speed of 25/3 mbs.
CRITERIA 2 SUBTOTAL			
6 of 7 Mandatory Criteria			
22 Optional Points			

YES / NO	OPTIONAL POINTS	3. SITE IMPROVEMENT	
Yes		M	3.1 Environmental Remediation Determine whether there are any hazardous materials present on the site through one of the four methods listed. Mitigate any contaminants found.
Yes		M	3.2 Minimization of Disturbance during Staging and Construction For sites >1 acre, implement EPA's National Pollutant Discharge Elimination System Stormwater Discharges from Construction Activities guidance, or local requirements, whichever is more stringent. For sites with an area <= 1, follow guidance in full criterion.
Yes		M	3.3 Ecosystem Services/Landscape <i>(Mandatory, if providing landscaping)</i> If providing plantings, all must be native or climate-appropriate (adapted) to the region and appropriate to the site, its soil and microclimate. Do not introduce any invasive plant species. Plant, seed, or xeriscape all disturbed areas.
Yes		M	3.4 Surface Stormwater Management <i>(Mandatory for New Construction; Mandatory for Substantial and Moderate Rehab projects if land disturbed is >= 5,000 sq.ft.)</i> Treat or retain on-site precipitation equivalent to the 60th percentile precipitation event. Where not feasible due to geotechnical issues, soil conditions, or the size of the site, treat or retain the maximum volume possible.
	6	10 max	3.5 Surface Stormwater Management Through on-site infiltration, evapotranspiration, and rainwater harvesting, retain precipitation volume from 70% precipitation event [6 points]. 80% precipitation event [8 points], or 90% precipitation event [10 points].
Yes		M	3.6 Efficient Irrigation and Water Reuse <i>(Mandatory, if permanent irrigation is utilized)</i> If irrigation is utilized, install an efficient irrigation system per the requirements listed.
	4	4 or 6	3.7 Efficient Irrigation and Water Reuse <i>(Optional, if irrigation is utilized)</i> Meet the requirements of Criterion 3.6 AND: Option 1: Install an efficient irrigation system equipped with a WaterSense labeled weather- based irrigation controller (WBIC) OR Option 2: At least 50% of the site's irrigation satisfied by water use from the sources listed.
CRITERIA 3 SUBTOTAL			
5 of 5 Mandatory Criteria			
10 Optional Points			

YES / NO	OPTIONAL POINTS	4. WATER
----------	-----------------	-----------------

Yes		M	4.1 Water-Conserving Fixtures Reduce total indoor water consumption by at least 20% compared to baseline indoor water consumption chart. Any new toilet, showerhead, and/or lavatory faucet must be WaterSense certified. For all single-family homes and all dwelling units in buildings three stories or fewer, the supply pressure may not exceed 60 psi.
	0	6 max	4.2 Advanced Water Conservation Reduce total indoor water consumption by at least 30% compared to baseline indoor water consumption chart. Any new toilet, showerhead, and/or lavatory faucet must be WaterSense certified.
Yes	0	M, 3	4.3 Water Quality Mandatory/Optional: Mandatory for Substantial Rehabs of buildings built before 1986; Optional for all other building types: Replace lead service lines [3 points]
		M	Mandatory: For multifamily buildings with either a cooling tower, a centralized hot water system, or 10+ stories: Develop a Legionella water management program
	0	8	Optional: Test and remediate as indicated for lead, nitrates, arsenic, and coliform bacteria
	0	4	4.4 Monitoring Water Consumption and Leaks Conduct pressure-loss tests and visual inspections to determine if there are leaks; fix leaks. AND Install an advanced water monitoring and leak detection system capable of identifying and shutting water off during anomalous water events. OR Install a device to separately monitor water consumption of each cold branch off the apartment line riser for each dwelling unit or each cold water riser and the domestic hot water cold water feed for each building or each toilet that allows remote monitor readings; common laundry facilities; boiler makeup water; outdoor water consumption; and water consumption in any non- residential space.
	0	4	4.5 Efficient Plumbing Layout and Design Store no more than 0.5 gallon of water in any piping/manifold between the fixture and the water heating source or recirculation line. No more than 0.6 gallon of water shall be collected from the fixture before a 10-degree Fahrenheit rise in temperature is observed. Recirculation systems must be demand-initiated.
	0	6 max	4.6 Non-Potable Water Reuse Harvest, treat, and reuse rainwater and/or greywater to meet a portion of the project,Ãs non-potable water needs: 10% reuse [3 points]; 20% reuse [4 points]; 30% reuse [5 points]; 40% reuse [6 points].
	0	8	4.7 Access to Potable Water During Emergencies Provide residents with ready access to potable water in the event of an emergency that disrupts normal access to potable water, including disruptions related to power outages that prevent pumping water to upper floors of multifamily buildings or pumping of water from on-site wells, per one of the three options listed.
		CRITERIA 4 SUBTOTAL 2 of 2 Mandatory Criteria 0 Optional Points	

YES / NO	OPTIONAL POINTS	5. OPERATING ENERGY	
Yes		M	5.1a Building Performance Standard (Mandatory for New Construction) Certify all buildings with residential units in the project through either ENERGY STAR Multifamily New Construction, ENERGY STAR Manufactured Homes, and/or ENERGY STAR Certified Homes as relevant. AND Provide projected operating energy use intensity and projected operating building emissions intensity.
No		M	5.1b Building Performance Standard (Mandatory for Rehab) Provide projected operating energy use intensity and projected operating building emissions intensity. AND Conduct commissioning for compartmentalization, insulation installation, and HVAC systems as indicated. AND one of the following options: - ERI Option: <= HERS 80 for each dwelling unit. Exception for some Rehabs built before 1980. - ASHRAE Option: Energy performance of the completed building equivalent to, or better than, ASHRAE 90.1-2013 using an energy model created by a qualified energy services provider according to Appendix G 90.1-2016.
	5	12 max	5.2a Moving to Zero Energy: Additional Reductions in Energy Use

	0	12-15	<p><i>(Not available for projects using prescriptive path for Criterion 5.1a or for projects following Criterion 5.2b or 5.4.)</i></p> <p>Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8.</p> <p>Design and construct a building that is projected to be more efficient than what is required by Criteria 5.1a/b. Achieve HERS score of 5 lower than required by 5.1a/b if following ERI path for compliance OR 5% greater efficiency than required if following ASHRAE path for 5.1a/b compliance <i>[5 points]</i>.</p> <p>Additional 1 point for each additional 2-point decrease in HERS score required by Criteria 5.1a/b if following ERI path for compliance OR for 1% greater efficiency if following ASHRAE path for Criteria 5.1a/b, up to a maximum of 12 optional points.</p>
	0	3-6	<p>5.2b Moving to Zero Energy: Near Zero Certification</p> <p>[Automatic Qualification for Enterprise Green Communities Certification Plus]</p> <p><i>(Not available for projects following Criterion 5.2a or 5.4.)</i></p> <p>Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8. Certify the project in a program that requires advanced levels of building envelope performance such as DOE ZERH <i>[12 points]</i> and/or PHI Classic or PHIUS+ <i>[15 points]</i>.</p>
	0	8 max	<p>5.3a Moving to Zero Energy: Photovoltaic/Solar Hot Water Ready</p> <p><i>(Not available for projects following Criterion 5.3b or 5.4.)</i></p> <p>Orient, design, engineer, wire, and/or plumb the development through the Photovoltaic Ready pathway or Solar Hot Water Ready Pathway to accommodate installation of photovoltaic (PV) or solar hot water system in the future.</p>
	0	4-8	<p>5.3b Moving to Zero Energy: Renewable Energy</p> <p><i>(Not available for projects following Criterion 5.3a or 5.4.)</i></p> <p>Install renewable energy source to provide a specified percentage of the project's estimated source energy demand. See full criterion for allowable sources.</p>
	0	1-5	<p>Option 1: For percentage of total project energy consumption provided by renewable energy.</p> <p>OR</p> <p>Option 2: For percentage of common area meter energy consumption provided by renewable energy.</p>
	0	24	<p>5.4 Achieving Zero Energy</p> <p>[Automatic Qualification for Enterprise Green Communities Certification Plus]</p> <p><i>(Not available for projects following Criterion 5.2a, 5.2b, 5.3a, or 5.3b.)</i></p> <p>Projects in CZ 1-4A following this criterion must also comply with Criterion 7.8. Achieve Zero Energy performance through one of the following options:</p> <p>Option 1: Certify each building in the project to DOE Zero Energy Ready Home program or PHI Plus AND Either install renewables and/or procure renewable energy, which in sum will produce as much, or more, energy in a given year than the project is modeled to consume.</p> <p>OR</p> <p>Option 2: Certify each building in the project in a program that requires zero energy performance such as PHIUS+ Source Zero, PHI Plus, PHI Premium, ILFI, ZERH Zero Energy Petal, Zero Carbon Petal, or Living Building Certification.</p>
	5	5 max	<p>5.5a Moving to Zero Carbon: All-Electric Ready</p> <p><i>(Not available for projects following Criterion 5.5b)</i></p> <p>Ensure the project has adequate electric service and has been designed and wired to allow for a seamless switch to electricity as a fuel source in the future for the following uses: space heating <i>[1 point]</i>, space cooling <i>[1 point]</i>, water heating (DHW) <i>[1 point]</i>, clothes dryers <i>[1 point]</i>, equipment for cooking <i>[1 point]</i>.</p>
	0	15	<p>5.5b Moving to Zero Carbon: All Electric</p> <p><i>(Not available for projects following Criterion 5.5a)</i></p> <p>No combustion equipment used as part of the building project; the project is all-electric.</p>
Yes		M	<p>5.6 Sizing of Heating and Cooling Equipment</p> <p><i>(Mandatory for Substantial and Moderate Rehabs that include replacement of heating and cooling equipment. Not relevant for projects following 5.1a, 5.2b, or 5.4.)</i></p> <p>Size and select heating and cooling equipment in accordance with ACCA manuals J and S OR in accordance with the ASHRAE Handbook of Fundamentals</p>
Yes		M	<p>5.7 ENERGY STAR Appliances</p> <p><i>(Mandatory for Substantial and Moderate Rehabs providing appliances. Not relevant for projects following 5.1a, 5.2b, or 5.4.)</i></p> <p>Install ENERGY STAR clothes washers, dishwashers, and refrigerators. If appliances will not be installed or replaced at this time, specify that at the time of installation or replacement, ENERGY STAR models must be used via Criterion 8.1 and Criterion 8.4.</p>
Yes		M	<p>5.8 Lighting</p> <p><i>(Mandatory for all lighting within New Construction and Substantial Rehab projects. Mandatory for new lighting in Moderate Rehab projects.)</i></p> <p>Follow the guidance for high-efficacy permanently installed lighting and other characteristics for recessed light fixtures, lighting controls, lighting power density, and exterior lighting.</p>
	0	8	<p>5.9 Resilient Energy Systems: Floodproofing</p> <p><i>(Not relevant for Rehab projects in Special Flood Hazard Areas)</i></p> <p>Conduct floodproofing of lower floors, including perimeter floodproofing (barriers/shields). Design and install building systems as specified by the full criterion so that the operation of those systems will not be grossly affected in case of a flood.</p>
	8	8	<p>5.10 Resilient Energy Systems: Critical Loads</p>

Loads Provide emergency power to serve at least three critical energy loads as described by the full criterion.

Option 1: Islandable PV system

OR

Option 2: Efficient generator

CRITERIA 5 SUBTOTAL

4 of 5 Mandatory Criteria

18 Optional Points

YES / NO

OPTIONAL
POINTS

6. MATERIALS

8

8 max

6.1 Ingredient Transparency for Material Health

Install products that have publicly disclosed inventories characterized and screened to 1,000 ppm or better:

- 1 point per 5 installed Declare or HPD products from at least three different product categories
- 1 point per 2 installed Declare or HPD products in any of these categories: adhesives, sealants, windows
- 1 point per each product with third-party verified HPD or third-party verified Declare label
- 2 points per each product with third-party verified HPD or third-party verified Declare label in any of these categories: adhesives, sealants, windows

0

3 max

6.2 Recycled Content and Ingredient Transparency

Use building products that feature, and disclose, their recycled content. The building product must make up 75% by weight or cost of a project category for the project and be composed of at least 25% post-consumer recycled content.

8

8 max

6.3 Chemical Hazard Optimization

Install products that have third-party verification of optimization to 100 ppm or better per the options listed within the full criterion.

Yes

15

M

6.4 Healthier Material Selection

Select all interior paints, coatings, primers, and wallpaper; interior adhesives and sealants; flooring; insulation; and composite wood as specified. Optional points also available.

0

12 max

6.5 Environmentally Responsible Material Selection

Select concrete, steel, or insulation with a publicly disclosed EPD [3 points], install a green or cool roof [3 points], use reflective paving [3 points], and/or use FSC certified wood [3 points]. Refer to criterion for specifics.

Yes

0

4 max

6.6 Bath, Kitchen, Laundry Surfaces

(Mandatory for New Construction and Substantial Rehab. Moderate Rehabs that do not include work in the shower and tub areas are exempt from the shower and tub enclosure requirement.)

Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens, and laundry rooms.

Use moisture-resistant backing materials per ASTM # D 6329 or 3273 behind tub/shower enclosures, apart from one-piece fiberglass enclosures which are exempt.

6.7 Regional Materials

Use products that were extracted, processed, and manufactured within 500 miles of the project for a minimum of 90%, based on weight or on cost, of the amount of the product category installed. Select any or all of these options (every two compliant materials can qualify for 1 point):

- Framing Cladding (e.g. siding, masonry, roofing)
- Flooring Concrete/cement and aggregate
- Drywall/interior sheathing

Yes

M

6.8 Managing Moisture: Foundations

(Mandatory for all New Construction projects and all Rehab projects with either basement and/or crawl space foundations)

Install capillary breaks and vapor retarders that meet specified criteria appropriate for the foundation type.

No

M

6.9 Managing Moisture: Roofing and Wall Systems

(Mandatory for all Rehab projects that include deficiencies in or include replacing particular assemblies called out below. New Construction projects are considered compliant per Criterion 5.1.)

Provide water drainage away from walls, window, and roofs by implementing the list of techniques.

Yes

0

M

6.10 Construction Waste Management

(6 max) Develop and implement a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging, or diversion strategies through one of the three options. Achieve optional points by going above and beyond the requirement.

2

2

6.11 Recycling Storage

For projects with municipal recycling infrastructure and/or haulers, provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms.

OR

For projects without that infrastructure, advocate to the local waste hauler or municipality for regular collection of recyclables.

CRITERIA 6 SUBTOTAL

4 of 5 Mandatory Criteria

33 Optional Points

YES / NO	OPTIONAL POINTS	7. HEALTHY LIVING ENVIRONMENT	
Yes		M	7.1 Radon Mitigation <i>(Mandatory for New Construction and Substantial Rehab)</i> For New Construction in EPA Zone 1 areas, install passive radon-resistant features below the slab and a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future. For Substantial Rehab projects in EPA Zone 1, test before and after the retrofit and mitigate per the specified protocols.
Yes		M	7.2 Reduce Lead Hazards in Pre-1978 Buildings <i>(Mandatory for Substantial Rehab of Buildings Constructed Before 1978)</i> Conduct lead risk assessment or inspection to identify lead hazards. Control identified lead hazards using lead abatement or interim controls, using lead-safe work practices that minimize and contain dust.
Yes		M	7.3 Combustion Equipment For New Construction and Rehab projects: Specify power-vented or direct-vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space. If there are any combustion appliances within the conditioned space, install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 72. For Rehabs: If there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct-vent and that is not scheduled for replacement, conduct combustion safety testing prior to and after the retrofit; remediate as indicated.
No		M	7.4 Garage Isolation <ul style="list-style-type: none"> • Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of any contaminants into the living space. Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed. • Do not install ductwork or air handling equipment for the conditioned space in a garage. • Fix all connecting doors between conditioned space and garage with gaskets or make airtight. • Install one hard-wired CO alarm with battery backup function for each sleeping zone of the project, placed per NFPA 72 unless the garage is mechanically ventilated or an open parking structure.
		M	7.5 Integrated Pest Management Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.
Yes	10	M	7.6 Smoke-Free Policy <i>(Mandatory and Optional)</i> Mandatory: Implement and enforce a smoke-free policy in all common areas and within a 25-foot perimeter around the exterior of all residential buildings. Lease language must prohibit smoking in these locations and provide a graduated enforcement policy. Make the smoke-free policy readily available. Optional: Expand the policy above to include all indoor spaces in the property.
Yes	0	M	7.7 Ventilation <i>(Mandatory for New Construction and Substantial Rehab; Optional for Moderate Rehab)</i> For each dwelling unit in full accordance with ASHRAE 62.2-2010, install: <ul style="list-style-type: none"> • A local mechanical exhaust system in each bathroom [3 points if Moderate Rehab] • A local mechanical exhaust system in each kitchen [3 points if Moderate Rehab] • A whole-house mechanical ventilation system [3 points if Moderate Rehab] Verify these flow rates are either within +/- 15 CFM or +/- 15% of design value. For each multifamily building of four or more stories, in full accordance with ASHRAE-162.1-2010, install: <ul style="list-style-type: none"> • A mechanical ventilation system for all hallways and common spaces [3 points if Moderate Rehab] For all project types, in addition to the above requirements: <ul style="list-style-type: none"> • All systems and ductwork must be installed per manufacturer's recommendations • All bathroom fans must be ENERGY STAR-labeled and wired for adequate run-time. • If using central ventilation systems with rooftop fans, each fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.
No	0	M or 5	7.8 Dehumidification <i>(Mandatory for properties in Climate Zones 1A, 2A, 3A, and 4A following Criterion 5.2a, 5.2b, or 5.4. Optional for all other properties.)</i> Option 1: Design, select, and install supplemental dehumidification equipment to keep relative humidity OR Option 2: Equip all dwelling units with dedicated space, drain, and electrical hook-ups for permanent supplemental dehumidification systems to be installed if needed and install interior RH monitoring equipment as described.
	3	3	7.9 Construction Pollution Management Option 1: Earn the EPA Indoor airPlus label OR Option 2: In all dwelling units, seal all heating, cooling, and ventilation return and supply floor ducts and returns throughout construction to prevent construction debris from entering. Flush all dwelling units after completion of construction and prior to occupancy for either 48 hours or with at least 14,000 ft3 per ft2 of floor area, then replace all air handling equipment filters.

0	3	7.10 Noise Reduction Option 1: Test and demonstrate that noise levels in bedrooms meet 30 dB LAeq (continuous) and 45 dB LMax, (single sound). OR Option 2: Provide a noise abatement plan specific to the site covering general noise mitigation techniques in accordance with 24 CFR 51B. OR Option 3: Ensure all exterior wall and party wall penetrations are sealed with acoustical sealant, all party walls and floor/ceiling assemblies have an STC rating of at least 55, and exterior windows and doors in projects near a significant exterior noise source have an STC rating of at least 35
0	8	7.11 Active Design: Promoting Physical Activity <i>(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)</i> Option 1: Encouraging Everyday Stair Usage (buildings that include stairs as the only means to travel from one floor to another are not eligible for this option.) Provide a staircase that is accessible and visible from the main lobby and is visible within a 25-foot walking distance from any point in the lobby per the specifications listed. Place point-of-decision signage. OR Option 2: Activity Spaces. Provide on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents; see criterion for specifics.
0	8	7.12 Beyond ADA: Universal Design <i>(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)</i> Select and implement at least one of the Options with at least three different strategies in at least 75% units. Option 1: Create welcoming and accessible spaces that encourage equitable use and social connections. Option 2: Create spaces that are easy and intuitive to use and navigate. Option 3: Promote safety and create spaces that allow for human error. Option 4: Create spaces that can be accessed and used with minimal physical effort. Option 5: Create spaces with the appropriate size and space to allow for use, whatever the user's form of mobility, size, or posture.
0	8	7.13 Healing-Centered Design <i>(All projects must comply with at least one of either Criterion 7.11, 7.12, or 7.13. Points are not available for that criterion, but, are available for projects that meet two or three of these criteria.)</i> Select and implement at least two of the Options with at least two different strategies listed in at least 75% units. Option 1: Provide an environment that promotes feelings of real and perceived safety. Option 2: Create flexible spaces that allow for personalization and/or manipulation to meet individual and community needs. Option 3: Connect residents and staff to a living landscape and the natural environment. Option 4: Utilize art and culture in project design and programming and promote social connectedness.

CRITERIA 7 SUBTOTAL
5 of 8 Mandatory Criteria
13 Optional Points

YES / NO	OPTIONAL POINTS	8. OPERATIONS, MAINTENANCE + RESIDENT ENGAGEMENT
Yes	M	8.1 Building Operations & Maintenance Manual and Plan <i>(For all Multifamily projects)</i> Develop a manual with thorough building operations and maintenance (O&M) guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development, and construction stages, and should include sections/chapters addressing the list of topics.
Yes	M	8.2 Emergency Management Manual <i>(For all Multifamily projects)</i> Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics, including but not limited to: <ul style="list-style-type: none"> • communication plans for staff and residents • useful contact information for public utility and other service providers • infrastructure and building, "shutdown" procedures • plan for regular testing of backup energy systems, if these exist
Yes	M	8.3 Resident Manual Provide a guide for homeowners and renters that explains the intent, benefits, use, and maintenance of their home's green features and practices. The Resident Manual should encourage green and healthy activities per the list of topics.
Yes	M	8.4 Walk-Throughs and Orientations to Property Operation Provide a comprehensive walk-through and orientation for all residents, property manager(s), and buildings operations staff.
Yes	M	8.5 Energy and Water Data Collection and Monitoring For rental properties, upload project energy and water performance data in an online utility benchmarking platform annually for at least five years from time of construction completion per one of the four methods provided; grant Enterprise view access for that period. For owner-occupied units, collect and monitor utility data in a manner that allows for easy access and review.

	CRITERIA 8 SUBTOTAL
5 of 5	Mandatory Criteria
0	Optional Points

	TOTAL
35 of 40	Mandatory Criteria
96	Optional Points

APPENDIX D: GREEN BUILDING PROFESSIONAL AFFIDAVIT

Affidavit Form for Green Building Professional Special Permit

Green Building

Project Location: 116 Norfolk Street, Cambridge, MA 02139**Green Building Professional**Name: Robert Baker☐ Architect☐ Engineer

License Number: _____

Company: New Ecology, Inc.Address: 15 Court Square, Suite 420, Boston, MA 02108

Contact Information

Email Address: robert.baker@newecology.orgTelephone Number: 617-557-1700 x7097

I, Robert Baker, as the Green Building Professional for this Green Building Project, have reviewed all relevant documents for this project and confirm to the best of my knowledge that those documents indicate that the project is being designed to achieve the requirements of Section 22.24 under Article 22.20 of the Cambridge Zoning Ordinance.

Robert J Baker
(Signature)

05/19/2022

(Date)

Attach either:

- ☐ Credential from the applicable Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as the applicable Green Building Rating System for this Green Building Project.
- ☒ If the Green Building Rating Program does not offer such a credential, evidence of experience as a project architect or engineer, or as a consultant providing third-party review, on at least three (3) projects that have been certified using the applicable Green Building Rating Program.



New Ecology, Inc.

Enterprise Green Communities Certified Projects - 4/11/22

STREET ADDRESS - LINE ONE	LINE TWO-optional	CITY	STATE	CERTIFICATION DATE
67 Timber Grove Rd.	Timbercroft Apartments	Owings Mill	MD	2016
525 Meadowood Dr.	Windsor Valley Apartments	Edgewood	MD	2016
305 E Joppa Rd.	Tabco Towers	Towson	MD	2017
6 ward St- Bldg A	Congress St Residences A	Salem	MA	2018
40 ward St- Bldg B & 71 Palmer St- Bldg E	Congress St Residences B&E	Salem	MA	2018
61 Congress St & 4 Lynch St- Bldg C & 32 Perkins St- B	Congress St Residences C&D	Salem	MA	2018
105 Congress St & 56 Palmer St.- Bldg F & 107 Congr	Congress St Residences F&G	Salem	MA	2018
52- 50 Dow St- Bldg H	Congress St Residences H	Salem	MA	2018
101 Ferris Ln.	Bristol Commons and Lenox Green	Taunton	MA	2014
30 Gurney St	Roxbury Crossing Senior Building	Boston	MA	2016
825 Kings Hwy	Jefferson II	Lewes	DE	2018
200 Waldemar Ave	Orient Heights Phase I Townhomes	East Boston	MA	2019
160 Stanton Ave	Orient Heights Phase I Midrise	Newton	MA	2019
160 Stanton Ave	Golda Meir House	Auburndale	MA	2019
671-675 Concord Ave.	Concord Ave	Cambridge	MA	2020
200 Waldemar Ave	Orient Heights Phase II Townhomes	East Boston	MA	2021
160 Stanton Ave	Orient Heights Phase II Midrise	East Boston	MA	2021
West and Hall Streets	Carter School	Leominster	MA	2020
32-34 Mt. Auburn Street	St. Paul's	Cambridge	MA	2022
370 Harvard Street	Harvard Street	Brookline	MA	2021