52 NEW STREET / CAMBRIDGE, MA

VOLUME III - APPENDICES

9-10-2021

JUST A START
BUILDING HOMES, CAREERS, AND FUTURES

RODE

Green Building Requirements

52 New Street Green Building Report – Comments on AHO Review Stage

Status: Pursuant to Section 22.25.1 of the Zoning Ordinance, the Community Development Department (CDD) received the final update to the Green Building Report (GBR) for the AHO review stage of this project on 7/8/2021. CDD staff have reviewed the project's GBR and offer the following Determination, Summary of Compliance and Advisory Comments on the project's sustainability.

CDD Determination: The GBR documentation provided by the Applicant sufficiently demonstrates compliance with the Green Building Requirements of Section 22.24 at the AHO review stage of review. A revised submission with additional documentation will be required at the building permit stage.

Project Summary: This project is subject to the City's Green Building Requirements (Section 22.20, Zoning Ordinance). The project is currently meeting the minimum requirements for PHI rating system and pursuing Passive House certification. The Green Building Report for this project is complete and meets Article 22 requirements.

Rating System: Passivhaus Institut (Classic)

Summary of Compliance

Green Building Professional Certification

- Kenneth R. Beck of BLW Engineers, Inc. has been identified as the Green Building Professional for the project. The affidavit states that this professional has reviewed all relevant documents for this project and confirm to the best of his/her 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.
- A copy of the professional's credential from Green Building Rating Program has been provided.

Rating System Checklist, Rating System Narrative and Net Zero Narrative

- The building is targeted to not exceed heating and cooling demands, heating and cooling loads and source energy consumption of the base design.
- The proposed site energy use intensity (EUI) is approximately 6.05 kBtu/sf-yr.
- The energy use reduction is approximately 71.34% relative to ASHRAE Baseline.
- Proposed GHG emissions will be 81.37% reduction from baseline.
- Window to Wall Ratio at 23% and proposed window U-value at .09.

Advisory Comments:

The City's goal is to promote environmentally sustainable and energy-efficient design and development practices in new construction and the renovation of existing buildings. For example, strategies that are relevant for this project include the rehab of existing buildings and reuse of materials, conservation of natural resources and reduction of toxins in building materials and construction methods, reduction in energy use in construction and daily operations. To support the City's goal in sustainability, staff recommend the following as we move forward with the next phases:

- Use of non-emitting materials.
- Continue assessment information on embodied carbon.
- It would be helpful to share comments provided by Passive House certification reviewer—BLW, Inc. at future stages of design to confirm that the standards are on track to be met.

Staff appreciate the Project team in providing the requested information and would encourage continuing to pursue the highest level of sustainable and energy-efficient design possible as the project moves through design development.

The project will be subject to review prior to receiving Building Permit and Certificate of Occupancy. CDD Staff is available to work with the Applicant through continuing design review and looks forward to receiving updates on metrics including projected building performance, Annual Projected Energy Consumption, Greenhouse Gas (GHG) Emissions and information on building materials and resources.

Green Building Project Checklist

Green Building
Project Location: 52 New St. Cambridge, MA

Applicant

Name: Just-A-Start Corporation
Address: 1035 Cambridge Street, Ste. 12, Cambridge, MA 02141
Contact Information
Email Address: elizabethmarsh@justastart.org
Telephone #: 617-918-7555

Project Information (select all that apply):

- ☑ New Construction – GFA: 145,000 sf
- ☐ Addition – GFA of Addition: _____
- ☐ Rehabilitation of Existing Building – GFA of Rehabilitated Area: _____
  - ☐ Existing Use(s) of Rehabilitated Area: _____
  - ☐ Proposed Use(s) of Rehabilitated Area: _____
- ☐ 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: Classic
  - ☐ PHIUS+
  - ☑ Passivhaus Institut (PHI)
  - ☐ Other: _____
- ☐ Enterprise Green Communities – Version: _____

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)

Project Phase

☐ **BUILDING PERMIT**

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

Required Submissions

All rating programs:

- ☐ Rating system checklist – updated from any prior version
- ☐ Rating system narrative – updated from any prior version with additional supporting information from construction documents
- ☐ Net zero narrative – updated from any prior version (see example template for guidance)
- ☐ Energy Simulation Tool results demonstrating compliance with selected rating system. *[Note: For Passive House rating program, must use WUFI Passive, Passive House Planning Package (PHPP), or comparable software tool authorized by Passive House.]*
- ☐ Credentials of Green Commissioning Authority (or copy of contract between developer and Commissioning Authority if an independent consultant or subcontractor), including documentation of Green Commissioning process experience on at least two building projects with a scope of work similar to the proposed project extending from early design phase through at least ten (10) months of occupancy
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Building Permit)

Passive House rating program only:

- ☐ Letter of intent from Passive House rater/verifier hired for on-site verification, with credentials of rater/verifier
- ☐ Credentials of Certified Passive House Consultant who has provided design, planning, or consulting services (if different from the Green Building Professional for the project)
- ☐ Construction drawings and specifications

Project Phase

☐ **CERTIFICATE OF OCCUPANCY**

Before applying for a certificate of occupancy, submit this documentation to CDD for review and approval.

Required Submissions

All rating programs:

- ☐ Rating system checklist – updated from any prior version
- ☐ Rating system narrative – updated from any prior version with additional supporting information from as-built conditions
- ☐ Net zero narrative – updated from any prior version (see example template for guidance)
- ☐ Energy Simulation Tool results demonstrating compliance with selected rating system, updated to as-built conditions. *[Note: For Passive House rating program, must use WUFI Passive, Passive House Planning Package (PHPP), or comparable software tool authorized by Passive House.]*
- ☐ Affidavit with schedule of commissioning requirements signed by Green Commissioning Authority, with attached credentials – use City form provided (Certificate of Occupancy)
- ☐ Affidavit signed by Green Building Professional with attached credentials – use City form provided (Certificate of Occupancy)

Passive House rating program only:

- ☐ Pressure Test Verification
- ☐ Ventilation Commissioning
- ☐ Quality Assurance Workbook
- ☐ Final testing and verification report from rater/verifier

Green Building Requirements
Net Zero Narrative

Last Updated – 2/23/2021

Introduction

The "Net Zero Narrative" is required for projects subject to Green Building Requirements, Section 22.20 of the Cambridge Zoning Ordinance. The requirement is based on the recommendations of the City's Net Zero Action Plan (adopted in 2015), which seeks to neutralize greenhouse gas emissions in Cambridge by 2050. This plan sets a timeframe of 2025 for most new construction to be designed to a "net zero" standard, meaning that on an annual basis, all greenhouse gas emissions resulting from building operations are offset by carbon-free energy production. In the meantime, the goal is to reduce greenhouse gas emissions to the maximum extent possible, and to design and develop buildings to adapt to net zero emissions in the future.

This Net Zero Narrative is provided for advisory review only. It is intended to inform City staff and officials on how the Net Zero Action Plan has influenced the design of the project, and to begin a dialogue so that all parties can better understand what building improvements are possible and what the major barriers are to achieving net zero emissions. As research, design, and development of the project continues to unfold, this narrative must be updated and included in the submission for the Building Permit and Certificate of Occupancy.

Example Narrative Template

This document provides an example format for the Net Zero Narrative as a guide for developers and designers. Variations are appropriate to account for the unique conditions of a case. However, any Net Zero Narrative must include the components set forth in Paragraph (c), Section 22.25.1 of the Zoning Ordinance:

(1) anticipated building envelope performance, including roof, foundation, walls and window assemblies, and window-to-wall ratio;

(2) anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions;

(3) description of ways in which building energy performance has been integrated into aspects of the Green Building Project 's planning, design, and engineering, including building use(s), orientation, massing, envelope systems, building mechanical systems, on-site and off-site renewable energy systems, and district- wide energy systems;

(4) description of the technical framework by which the Green Building Project can be transitioned to net zero emissions in the future (acknowledging that such a transition might not be economically feasible at first), including future net zero emissions options for building envelope, HVAC systems, domestic hot water, interior lighting, and on- and off-site renewable energy sources;

(5) description of programs provided by local utility companies, government agencies, and other organizations that provide technical assistance, rebates, grants, and incentives that can assist in achieving higher levels of building performance, summarizing which entities have been contacted and which programs could be utilized in the Green Building Project; and

(6) assessment of the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building as noted above in (2) using energy systems that do not consume carbon-based fuels on-site compared to code-compliant energy systems that consume carbon-based fuels on-site, which shall include the cost of installation, maintenance and upkeep of the energy system and its components (incorporating programs and incentives as noted above in (5).

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By: Just-A-Start

Date of Submission:

Project Profile

Development Characteristics

Lot Area (sq.ft.):	43,800 sf
Existing Land Use(s) and Gross Floor Area (sq.ft.), by Use:	21,442 sf existing structure - retail (currently a fitness center) surface parking (asphalt lot)
Proposed Land Use(s) and Gross Floor Area (sq.ft.), by Use:	107 residential units and an approximately 3,000 sf first floor commercial tenant space. The first floor will also consist of 16,500 sf covered parking, 1,500 sf lobby and approximately 1,000 sf of utility and storage space.
Proposed Building Height(s) (ft. and stories):	69'-11" / 6 stories
Proposed Dwelling Units:	107 residential units
Proposed Open Space (sq.ft.):	12,875 sf at grade / 3,053 sf on elevated landscape decks
Proposed Parking Spaces:	43 - 16,500 sf
Proposed Bicycle Parking Spaces (Long-Term and Short-Term):	112 long term sheltered and secure long-term spaces 11 exterior short-term spaces

Green Building Rating System

Choose the Rating System selected for this project:

LEED-Leadership in Energy & Environmental Design (U.S. Green Building Council)					
Rating System & Version:		***Seeking Certification?****	Yes	No	TBD
Rating Level:		***# of Points:***			

Enterprise Green Communities					
Rating System & Version:		***Seeking Certification?****	Yes	No	TBD
Rating Level:		***# of Points:***			

Passive House Institute US (PHIUS) or Passivhaus Institut (PHI)					
Rating System & Version:	PHI Classic	***Seeking Certification?****	Yes	No	TBD

**NOTE: Certification is not required through the Green Building Requirements. However, you may choose to indicate if the Project Team intends to pursue formal certification through these Green Building Rating Programs (or their affiliates).*

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Proposed Project Design Characteristics

Building Envelope

Assembly Descriptions:

Roof:	Cover Board, sloped rigid insulation, rigid insulation, sheathing, trusses with blown in insulation - R55
Foundation:	Where slab on grade is present, it will be fully insulated with EPS under the slab with a minimum of R-15
Exterior Walls:	Assemblies with 5-1/2" or 6" of cavity insulation will be installed (varies with wood and metal stud assemblies) and 6" of rigid insulation on the exterior of the sheathing/air barrier.
Windows:	Triple glazed windows
Window-to-Wall Ratio:	23%
Other Components:	The design is exploring additional external solar shading devices on certain windows, configured and oriented to optimize shading and reduce solar heat gain during summer months.

Envelope Performance:

Provide estimates of the thermal transmittance (U-value) for the building envelope compared to "Baseline" standards required by the Massachusetts Stretch Energy Code, latest adopted edition.

	Proposed		***Baseline***	
	Area (sf)	*U-value*	*Area (sf)*	*U-Value*
Window	14,388.25	.09	19,126 sf *	.30
Wall	63,753	.0221	63,753 sf	.045
Roof	22,289	.0303 - .01818		.024

* 30% of project wall area per IECC 2018

Envelope Commissioning Process:

During the building certification process, the detailed planning is carefully and comprehensively examined. Supporting documents from the construction, such as the airtightness test, complete the quality control. A certificate is only issued if the exact criteria as defined are met without exception.

Preliminary - Project Consultation Meeting to discuss Passive House specification; Conducted by Certified Passive House Consultant and third-party certifier

Start-Up - PHPP Final Modeling, Verification of Assemblies & Specs, Site Meetings;Conducted by Certified Passive House Consultant and third-party certifier

Construction - PH Pre-Certification & Consulting Support, Inspections, Pre-Drywall Air Tests, Energy Modeling & Revisions

Completion - Final Inspection, Air-Tests, Vent Flow Rates, Energy Model Verification & Rating; Conducted by independent commissioning agent

Submission - PH File Admin, PHI; Conducted by Certified Passive House Consultant and third-party certifier

Building Mechanical Systems

Systems Descriptions:

Space Heating:	Heating and cooling shall be provided by an air-source heat pump and a fan coil unit located in mechanical closet or above low ceiling. The apartment heat pump (1 ton for apartments up to 800 sf; 1-1/2 ton for apartments up to 1,200 square feet; 2 tons for apartments up to 1,600 square feet; and 2-1/2 tons for apartments up to 2,000 square feet), shall be installed on roof
Space Cooling:	Heating and cooling shall be provided by an air- source heat pump and a fan coil unit located in mechanical closet or above low ceiling. The apartment heat pump (1 ton for apartments up to 800 sf; 1-1/2 ton for apartments up to 1,200 square feet; 2 tons for apartments up to 1,600 square feet; and 2-1/2 tons for apartments up to 2,000 square feet), shall be installed on roof
Heat Rejection:	N/A for Passive House Certification
Pumps & Auxiliary:	
Ventilation:	Apartment ventilation and exhaust will be provided by energy recovery units located in each apartment as required by the 2018 IMC.
Domestic Hot Water:	The domestic hot water supply for the building will be centrally located and will be provided via two direct gas fired storage tank water heaters with capacity of a 120 gallons each. The domestic hot water distribution will have an on-demand circulation to provide constant temperature within the loop.
Interior Lighting:	Interior lighting will be all-LED to meet required lighting criteria
Exterior Lighting:	Exterior lighting will be all-LED to meet required lighting criteria
Other Equipment:	N/A

Systems Commissioning Process:

Passive House certification does not require independent systems commissioning as the systems shall be designed to meet the reduced energy load perquisite for certification. A systems balancing report shall be submitted to the certifier for certification, but can be conducted by the installer.

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Building Energy Performance Measures

Overview

Broadly describe the ways in which building energy performance has been integrated into the following aspects of the project's planning, design, engineering, and commissioning. More detail on specific measures can be provided in appendices.

Land Uses:	All-affordable multi-family residential development with a street-level retail component. Direct adjacency to Danehy Fields and multiple bike / walking paths encourages outdoor recreation and alternate modes of transportation. Low parking ratio, transit connections, and ample bicycle storage encourages sustainable modes of transportation. On-site retail component reduces need for automobile trips. Solar orientation and greenspace exposure and access for the residential units creates optimal living conditions.
Building Orientation and Massing:	Site constraints allow for the building to be oriented with a deviation of 60 degrees from true north. The building mass extends from the NW to the SW. This orientation will allow for sufficient solar gains during the colder months and allow for reduced heat gains during the summer.
Envelope Systems:	In order to reduce heating and cooling loads of the building, 5-1/2" or 6" of cavity insulation will be installed (varies with wood and metal stud assemblies) and 6" of continuous rigid insulation on the exterior of the air vapor barrier. A sheet applied weather resistive barrier will be used to help in meeting the very rigorous infiltration criteria of 0.6 ACH50 and to control bulk water and vapor drive. Roof insulation will have an approximate R- Value of 40-55 depending on the location. This will be achieved with a combination of blown-in insulation and rigid EPS insulation. Where slab on grade is present, it will be fully insulated with EPS under the slab with an R-Value of 15. Units located above parking will benefit from R-12.5 insulation below their floors. Windows will be casement type to further reduce infiltration and will achieve a U-value of 0.09 while the SHGC and shading devices will be dictated by the modeling requirements.
Mechanical Systems:	Heat pumps and ERVs as described in previous sections
Renewable Energy Systems:	Passive House International certification requires the total energy use of the building to be Å 3.71 kWh/sf.yr. To achieve net-zero, we need to produce this amount of power from the solar array, this will require Å 19,700 ft2. This number exceeds the available space on the roof for PV and as such we will use Renewable Energy Credits to meet the net zero benchmark.
District-Wide Energy Systems:	*N/A*
Other Systems:	The project will provide EV charging stations for a portion of the on-site parking. EV charging station type and quantity to be determined.

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Integrative Design Process

Describe how different parties in the development process (owners, developers, architects, engineers, contractors, commissioning agents) have collaborated in the design. Include the Basis of Design and Owner's Project Requirements and describe how they have been informed by planning activities such as meetings or design charettes. Describe how continuing collaborative processes will inform Schematic/Design and Construction Documents.

Throughout the schematic design process the developers, architects, engineers, and Certified Passive House Consultant have worked closely together to ensure the developments to the design and systems comply with a Passive House approach and are certifiable within the framework set by Passive House International. During subsequent phases the team will be including the Construction Manager, third-party Passive House Certifier as part of this integration, and during construction, an independent commissioning agent shall joing the team for envelope commissioning.

Green Building Incentive Program Assistance

Describe any programs applicable to this project that would support improved energy performance or reduced greenhouse gas emissions, and which of those programs have been contacted and may be pursued. Programs may be offered by utility companies, government agencies, and other organizations, and might include rebates, grants, financing, technical assistance, and other incentives.

The project is enrolled in the MassSave Passive House Incentives program. The program provides financial incentives for pre-construction related to feasibility, modeling and pre-certification. Post-construction incentives for certification and net-performance bonuses based on actual energy usage.

The project will also explore tax credit availability for the solar array planned for the building.

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Net Zero Scenario Transition

Describe the technical framework by which the project can be transitioned to net zero greenhouse gas emissions in the future, acknowledging that such a transition might not be economically feasible at first. This description should explain the future condition and the process of transitioning from the proposed design to the future condition.

	Net Zero Condition:	***Transition Process:***
Building Envelope:	Passive House design standards require the building to use approximately 80% less energy per square foot than ASHRAE code-compliant building of the same type. This is achieved through a robust, super-insulated, and fully-air sealed building envelope, effectively reducing the size of the mechanical systems by conserving energy.	N/A
HVAC Systems:	Mechanical systems shall be of reduced size and energy use due to the conserved energy requirements of the building envelope. Further, highly efficient ventilation systems aid in passive climate control.	N/A
Domestic Hot Water:	The domestic hot water supply for the building will be centrally located and will be provided via two direct gas fired storage tank water heaters with capacity of a 120 gallons each. The domestic hot water distribution will have an on-demand circulation to provide constant temperature within the loop.	N/A
Lighting:	Lighting will be all-LED to further conserve the energu requirements of the buling. Compared to CFLs and incandescent bulbs LEDs can produce 100 lumens per watt. In addition the lifetime use of LED products is greatrer than that of CFls or incandescent.	N/A
Renewable Energy Systems:	PHI requires the total energy use of the building to be 3.71 kWh/sf.yr. Based on the Passive House cap for the primary/source energy demand and the production losses for the given location (provided in the PHPP). The total treated floor area is approx. 105,000SF, this yields an annual energy demand of approx. 389,550 kWh. To achieve net-zero, we need to produce this amount of power from the solar array, this will require approx.19,700 ft2. This number exceeds the available space on the roof for PV and as such we will use Renewable Energy Credits to meet the net zero benchmark.	N/A
Other Strategies:	Any deficiency in solar generation to achieve Net Zero will be resolved through the purchase of 3rd party offsets.	N/A

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Energy Systems Comparison

Overview

This section should describe the results of an analysis comparing the technical and financial feasibility to meet the projected HVAC and domestic hot water demands of the building using energy systems that do not consume carbon-based fuels on-site compared to code-compliant energy systems that consume carbon-based fuels on-site.

The project is expecting an all electric HVAC system with heating and cooling provided by an air source heat pump. A central domestic hot water system is planned for the initial development of the project, with the option to switch to an electric system when such systems are competitive on initial and operational costs.

Assumptions

Describe what building energy systems were included and excluded in your analysis and why.

	Included in analysis?		***Describe the systems for which this was analyzed or explain why it was not included in the analysis:***
	Yes	***No***	
Solar Photovoltaics:	X		Solar photovoltaic studies were performed and determined to be the most effective path, in conjuction with a high performace thermal envelope, to reach the net-zero goal.
Solar Hot Water:		X	Climate conditions in this location make this type of heating inefficient in the colder winter months when it's most needed.
Ground-Source Heat Pumps (Geothermal):		X	Subsurface environmental conditions on the site preclude Geothermal as a viable option.

Water-Source Heat Pumps:		X	Subsurface environmental conditions on the site preclude water-source heat pumps as a viable option.
Air-Source Heat Pumps:	X		Air-source heat pump are the basis of design, and are an efficient means of achieving the project's Passive House energy goals.
Non-Carbon-Fuel District Energy:		X	To the best of the team's knowledge, there are no available district energy sources for the project to make use of.
Other Non-Carbon-Fuel Systems:		X	No other energy systems considered at this time.

Non-Carbon-Fuel Scenario

Describe the final scenario used in this analysis.

The Final Scenario assumed is to use electric powered HVAC and heat recovery systems, and a gas-fired Domestic Hot Water system. On-site PV systems will off-set power demand.

Solar-Ready Roof Assessment

The purpose of this assessment is to determine the technical feasibility of solar energy system installation, either as part of the proposed project or in the future. It is helpful to supplement this narrative with a plan depicting the information provided.

Total Roof Area (sq. ft.):	22,289 sf
Unshaded Roof Area (sq. ft.):	22,289 sf is unshaded; 8,330-8,600 sf is available do to mechanical equipment on roof
Structural Support:	The above noted roof areas will be designed to accommodate structural loads of PV systems. The roof has a stair headhouse offering access for installation and maintenance. The optimal solar angle will be determined in partnership with a PV vendor as design develops.
Electrical Infrastructure:	The capacity of the main switchboard bus shall be sized in accordance with NEC requirements. It is estimated that the bus will be 3500A. There will be an empty 4" conduit routed from the main electric room to the roof for future infrastructure. Areas for future inverters will be coordinated with the architect.
Other Roof Appurtenances:	Elevator overrides and one stair headhouse will occupy the roof, along with common space and unit-dedicated mechanical equipment, and building venting, and their associated screening. The design team has designated southern-oriented portions of the roof for potential PV arrays, ensuring that mechanical equipment has minimal shading effect.
Solar-Ready Roof Area (sq. ft.):	8,330-8,600 sf is available do to mechanical equipment on roof
Capacity of Solar Array:	174.2kVA array is possible with 8,600 sf at an approximate cost of $330,990
Financial Incentives:	The project does not intend to use Solar Thermal for hot water. The project will look to available tax credits for the production of Solar PV.
Cost Feasibility:	*N/A*

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By: Just-A-Start

Date of Submission:

Results

Briefly summarize the results of the analysis and how it has informed the design of the project. Also include figures for the "Non-Carbon-Fuel Scenario" in the concluding Summary Table at the end of the Net Zero Narrative. Attachments can be provided with more specific figures and metrics regarding installation, maintenance, and upkeep costs (exclusive *of operating fuel expenses), but a full report is not necessary.*

	Proposed Design		***Non-Carbon-Fuel Scenario***	
	Installation Cost	*Maintenance Cost*	*Installation Cost*	*Maintenance Cost*
Space Heating	$1,683,943	$2,500	$1,683,943	$2,500
Space Cooling	$950,158	$2,500	$950,158	$2,500
Heat Rejection	$225,780	$5,000	$225,780	$5,000
Pumps & Aux.	$37,630	$5,000	$37,630	$5,000
Ventilation	$865,490	$10,000	$865,490	$10,000
Domestic Hot Water	$318,000	$10,000	$265,000	$19,250
(Financial Incentives)	($328,500)		($328,500)	
Total Building Energy System Cost	$3,752,500		$3,699,500	

The current plans are for heating, cooling, pumps & ventilation systems to be electric powered. We are still evaluating the trade-offs in changing from a gas to an electric domestic hot water system.

The early pricing exercise we've done thus far has many assumptions that may change as the drawings develop further. These values will be updated as better pricing is obtained.

Net Zero Narrative

Project Name/Address: 52 New St. Cambridge, MA

Submitted By:

Date of Submission:

Anticipated Energy Loads and Greenhouse Gas Emissions

Assumptions

Describe the assumptions and methodology used to conduct preliminary energy modeling and set energy targets for the project. Specifically describe what components of the building were included and excluded.

Passive House is a rigorous, performance-based, energy efficiency construction standard. Passive House International uses the Passive House Planning Package (PHPP), an excel-based energy modeling software that forms the standard's backbone. The five core principles of passive house design are; super-insulated envelopes, airtight building envelope, thermal bridge free design, high performance windows with orientation & shading as required & continuous ventilation with heat recovery. All assumptions and methodology revolve around those 5 core principles and use of the PHPP. The PHPP uses precise climate conditions, building orientation, window performance, building assembly R-values, and equipment performance, among other criteria, to provide consistent and reliable building performance data.

Annual Projected Energy Consumption and Greenhouse Gas (GHG) Emissions

The preliminary energy modeling results should be shown in a concluding table format similar to what is shown at the end of this document. It should compare the "baseline building" (Massachusetts Stretch Energy Code) to the proposed design, as well as the future "net zero" scenario described later in this narrative.

	Baseline Building		***Proposed Design***		***Future Net Zero Scenario***		***Non-Carbon-Fuel Scenario***	
	kWh or Therms	*% of Total*	*kWh or Therms*	*% of Total*	*kWh or Therms*	*% of Total*	*kWh or Therms*	*% of Total*
Space Heating	p ≈367,392.89 kWh		p ≈151,611 kWh	≈ 17%	p ≈138,800 kWh	≈ 17%	p ≈138,800 kWh	≈ 17%
Space Cooling	p ≈367,392.89 kWh		p ≈151,611 kWh	≈ 17%	p ≈ 138,800 kWh	≈ 17%	p ≈ 138,800 kWh	≈ 17%
Heat Rejection			**n/a** for PHI certification - PHPP does not provide data					
Pumps & Aux.			**n/a** for PHI certification - PHPP does not provide data					
Ventilation			p ≈ 82,888kWh	≈10%	p ≈ 82,888kWh	≈10%		≈10%
Domestic Hot Water	p ≈ 182,658kWh		p ≈ 2741 therm	≈25%	p ≈ 2741 therm	**≈25%**	p ≈ 144,334kWh yr	≈25%
Interior Lighting	1 W/sf -- Varies by use		.75 w/sf - Varies by use	≈7%	.75 w/sf	≈7%	.75 w/sf	≈7%
Exterior Lighting	.4 W/sf - Varies by use		.4 w/sf - Varies by use	≈3%	.4 w/sf	≈3%	.4 w/sf	≈3%
Misc. Equipment	p≈ 286,611 kWh		p≈ 286,611 kWh	≈21%	p≈ 286,611 kWh	≈21%	p≈ 286,611 kWh	≈21%
	$US, kBTU, kBTU/SF		*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*	*$US, kBTU, kBTU/SF*	*% Reduction from Baseline*
Site EUI	p ≈21.11 kBTU/sf.yr		p ≈6.05 kBTU/sf.yr	≈80%	p 5.96 kBTU/sf.yr	80%		
Source EUI	p ≈59.12 kBTU/sf.yr		p ≈16.94 kBTU/sf.yr	≈80%	p 16.68 kBTU/sf.yr	80%		
Total Energy Use	p ≈76.06 kBTU/sf.yr		p ≈32.87 kBTU/sf.yr	≈ 80%	p ≈32.87 kBTU/sf.yr	≈ 80%		
Total Energy Cost								
	kWh or Therms	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*	*kWh or Therms*	*% Total Energy*
On-Site Renewable Energy Generation	122kW	≈ 13%	122kW	≈ 65%	122kW	≈ 65%	122kW	≈ 36%
Off-Site Renewable Energy Generation	n/a	n/a	n/a	n/a	66 kW	35%	210 kW	≈ 64%
	Tons CO_2 [/SF]		*Tons CO_2 [/SF]*	*% Reduction from Baseline*				
GHG Emissions	tons 614 CO2		tons 114.36 CO2	≈80%				
GHG Emissions per SF	tons .004 CO2/sf		tons .0009 CO2/sf	≈80%				

It may be helpful to present this information in a chart or graph. The following page provides examples.

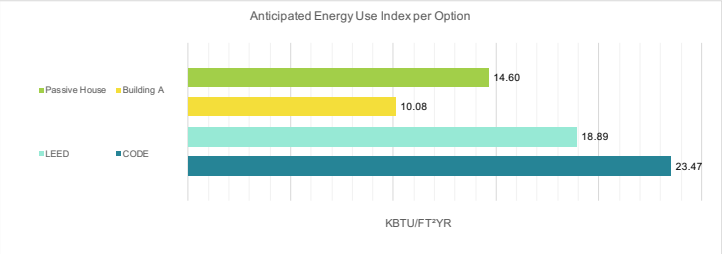
		Sensible Gains	Lighting Load Per Hour	Plug Load Per Hour	Occupant Use Factor	Electrical Use Factor
Proposed Occupancy:	450	250 BTUs/hr	0.25 Wh/sf	0.25 Wh/sf	33%	33%
Total Floor Area:	127,068.00	170135 kWh	163918 kWh	163918 kWh		
Treated Floor Area:	109,073.00					

Annual heat load, without passive solar gains	Building UA	Building UA over 24hrs	Heating Degree Days (deg. F)	Annual Heat Load	KWH Annual	Internal Gains Annual	Net Heat Load:
	8,902.98	213,671.41	5,621	1201.05 mBTUs	352006.74 kWh	*164330 kWh*	**187676.55 kWh**

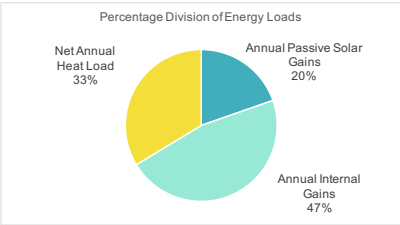
Factoring solar data and internal gains	Annual Heat Load	Passive Solar Contribution	Annual Heat Load2	Annual Passive Solar Gains	Annual Internal Gains	Net Annual Heat Load	Percentage Reduction for Shading
	1201.05 mBTUs	236.13 mBTUs	352006.74 kWh	69206.07 kWh	164330 kWh	118470.49 kWh	ete shade, 100% = com

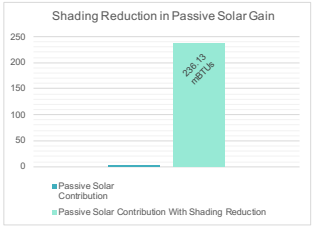
	Net KW Load	Qty. PV	Qty. Natural Gas (90% eff. Boiler)	Qty. Heat Pump (w/factored COP)	Qty. #2 Fuel (Boiler 85% eff.)	Qty. LP (Boiler 92% eff.)	Qty.Pellets (Boiler 90% eff.)	Heat Pump COP:
	375224 kWh	3380 kWh	4169151 therms	47388 kWh	3153139.79 gal.	4385502.98 gal.	27589.973 tons	2.50

Percent of Heat Load Supplied by Passive Solar Gain	0.196604379			
Building A	**10.08 kBTU/ft²yr**	14.60 kBTU/ft²yr	**Passive House**	
	2.95 kWh/ft²yr			



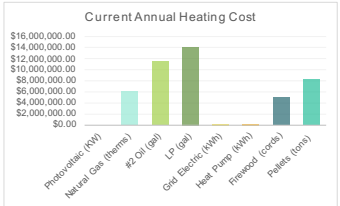
Actual electricity b	9.02
after accounting fo	8.73
PV array	2.6

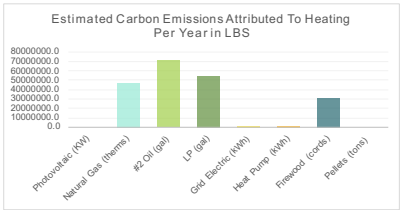


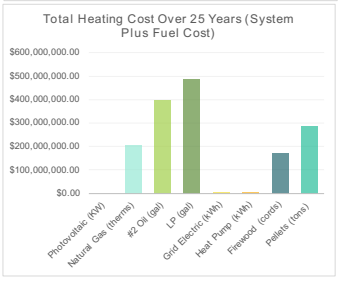


Duration: 25 Years

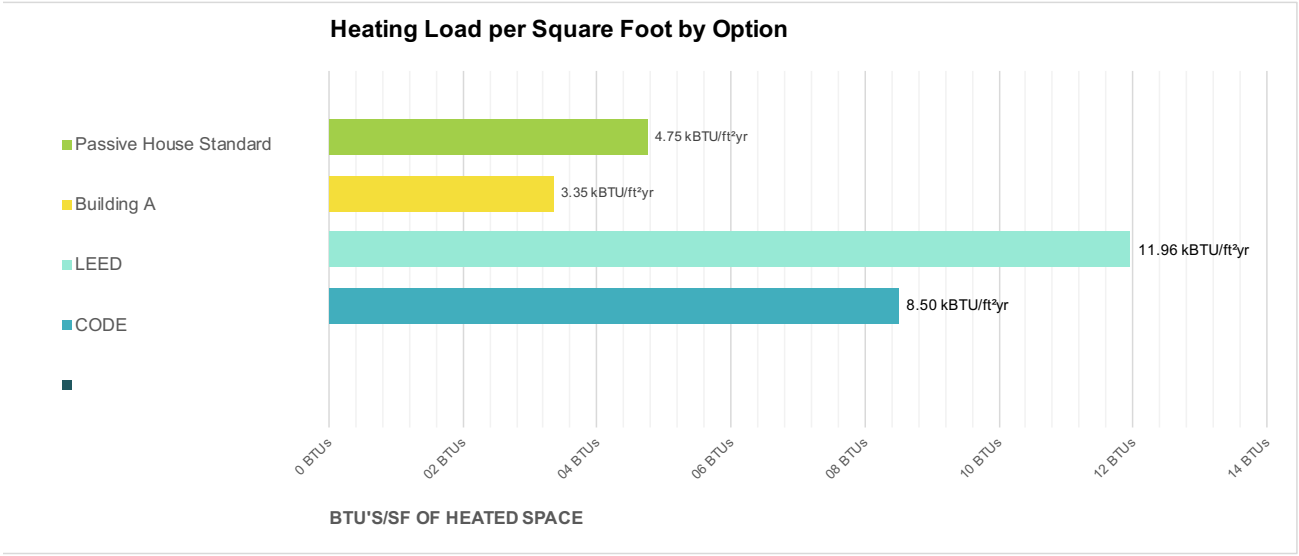
Fuel Type	Quantity of Fuel Required Per Year	Current Cost of Fuel ($/Unit Of Fuel)	Initial Cost of System	Fuel Cost Over 25 Years (Factored For Inflation)	Current Annual Heating Cost	Total Heating Cost Over 25 Years (System Plus Fuel Cost)	Annual Estimated Carbon Emissions Attributed To Heating in LBS	% Inflation
Photovoltaic (KW)	3380.1	$0.00	$11,830,951.35	$0.00	$0.00	$11,830,951.35	0.0	0%
Natural Gas (therms)	4169151.5	$1.45	$15,000.00	$208,117,296.39	$6,045,269.67	$208,132,296.39	46819571.3	3%
#2 Oil (gal)	3153139.8	$3.66	$15,000.00	$397,298,391.38	$11,540,491.63	$397,313,391.38	70945645.3	3%
LP (gal)	4385503.0	$3.22	$15,000.00	$486,147,188.46	$14,121,319.60	$486,162,188.46	54818787.3	3%
Grid Electric (kWh)	118470.5	$0.15	$500.00	$790,826.02	$17,770.57	$791,326.02	71082.3	5%
Heat Pump (kWh)	47388.2	$0.15	$15,000.00	$316,330.41	$7,108.23	$331,330.41	65869.6	5%
Firewood (cords)	25014.9	$200.00	$5,000.00	$172,235,003.91	$5,002,981.80	$172,240,003.91	31268636.2	3%
Pellets (tons)	27590.0	$300.00	$0.00	$284,947,616.77	$8,276,991.95	$284,947,616.77		3%

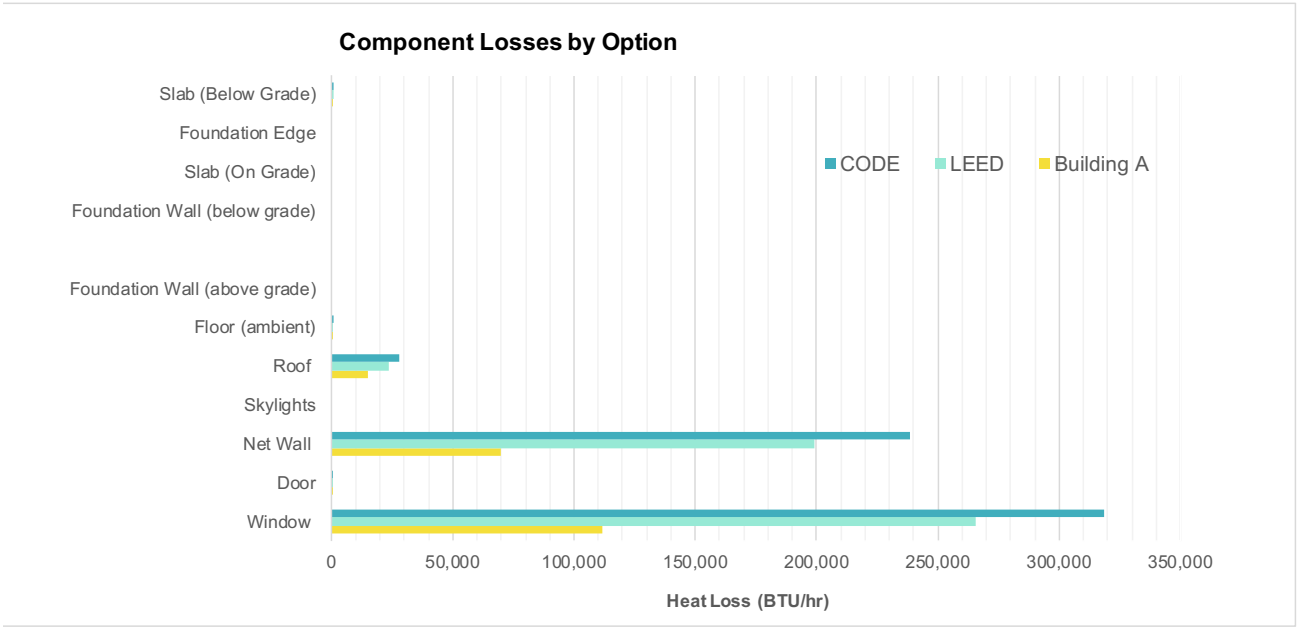






	CODE	LEED	Building A
Building Peak Heat Load			
[BTUs/hr]	1,792,551	1,629,349	551,984
[BTUs/SF]	8	12	3
Wall R-Value	15.0	18.0	51.2
Window R-Value	2.8	3.4	8.0





Affidavit Form for Green Building Professional
Special Permit

Green Building
Project Location: 52 New Street, Cambridge, MA

Green Building Professional

Name: Kenneth R. Beck

☐ Architect

☒ Engineer

License Number: 38446

Company: BLW Engineers, Inc.

Address: P.O. Box 1551, 311 Great Road, Littleton, MA

Contact Information

Email Address: kbeck@blwengineers.com

Telephone Number: 978-486-4301 x13

I, Kenneth R. Beck , 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.

06/29/2021

(Signature) *(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.

CPHC®

Ken Beck

has fulfilled the requirements for becoming a

PHIUS CERTIFIED PASSIVE HOUSE CONSULTANT

3215
Professional Number

11/20/2020
Date Issued

1/15/2024
Valid Through

This certificate hereby attests that the above-named Consultant has completed training provided by PHIUS relating to construction of buildings that can meet the criteria of the PHIUS+ Passive Building Standard for North American climate zones and has passed PHIUS' examination.

Buildings designed, modeled and constructed to meet the PHIUS+ Passive Building Standard are ultra-efficient and characterized by superior indoor air quality, thermal comfort and durability.

The minimized energy demands of passive houses and buildings reduce building operating costs permanently, while also mitigating the impact of energy price increases over time. The low power requirements provide resilience during outages and help avoid time-of-use surcharges.

Buildings successfully designed and quality assured to the PHIUS+ Passive Building Standard can achieve carbon neutrality with the addition of a small renewable generation system, thereby putting owners and occupants firmly on the path to a carbon-neutral lifestyle.

PHIUS is the leading North American organization conducting research, training and certification relating to passive buildings. PHIUS' training is the most comprehensive in the industry. Consultants who complete PHIUS' training and pass its rigorous examination are prepared to design buildings maximizing energy efficiency.

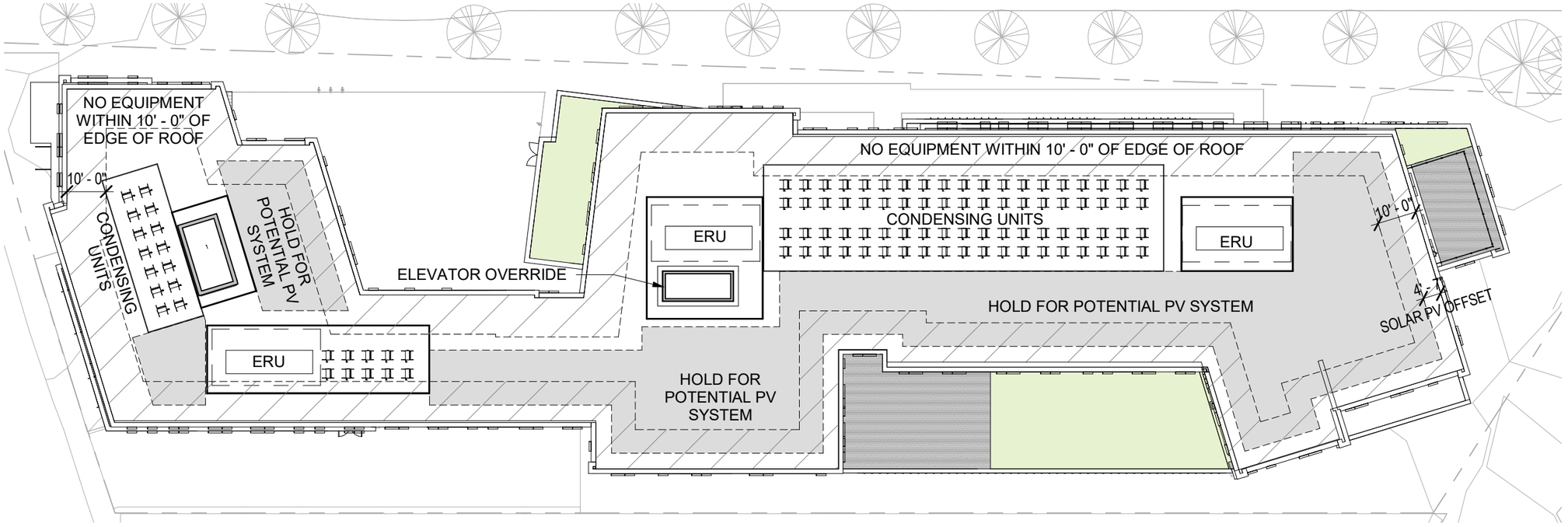
Executive Director

PHIUS

52 NEW STREET
RESPONSES TO ARTICLE 22 REVIEW
7.06.21

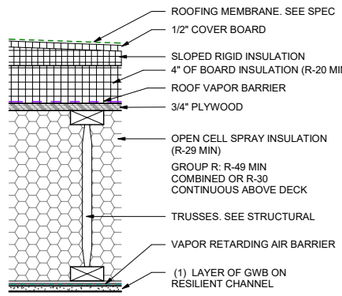
#	COMMENT FROM CITY	RESPONSES
		*** Please note, the project is pursuing PHI (Passive House Institute) Certification, and not PHIUS certification. Both certifications are acceptable for Article 22 compliance**
1	It is our understanding that there is a potential for 8,600 SF available roof space (from the 22,289 SF roof area) to be used for solar PV array. Staff recommend exploring other potential building/site areas including façade to accommodate additional PVs. For example, consider using a fixed awning frame over window openings of south/south west facing building façade to serve as shading and providing solar exposure for thermal energy.	*The project team will finalize the roof top equipment during the DD stages to confirm the available roof area. Additionally, the team will work with a PV vendor to study other available options and conduct a cost-benefit analysis to determine how best to increase additional PV's. Window surrounds are already planned at some windows, and we will need to balance the additional electrical output with the increased structural requirements for additional PV's.*
2	Staff appreciate the energy performance achieved by PHIUS certification for reducing operational carbon, but also concerned about embodied carbon in construction materials and resources. Indicate if any modeling tools or strategies in the design process to tackle embodied carbon would be used moving forward. For example, use open source embodied carbon assessment tools to gage environmental impacts of different materials options before selected for final specs and procurement.	*The project will be pursuing PHI (Passive House Institute Certification) and fulfil all the requirements for this certification. In the DD phase, the project team will consider an LA tool such as Tally or other equivalent open source carbon assessment tools to study impacts of various materials prior to making final selections. However, this is currently not in the scope of the project, since it is not a requirement for PHI.*
3	The proposed U-value for 'Window' is noted to be .09? There is no 'Baseline' information in the matrix. Complete envelope performance information.	*ICC 2018 states the minimum U-Value performance for vertical fenestrations is. 0.3 - this is the baseline. The 0.09 is the U-value for the proposed window. Please refer to updated table on Page 3 of the Net Zero Narrative for addtionall information.*
4	As the schematic/DD phase move forward, staff recommend including an a architect's schematic typical wall section (not PHIUS model section) to list the materials selected and modeled so far. For example, include proposed interior finish and exterior clad materials and those input in the WUFI model.	*Sheet with typical wall sections is attached to the responses. Also attached is the compliance report from the model that confirms that these inputs were used.*
5	For the health and wellbeing of building workers and tenants, ensure building material safety data sheets (MSDS) for materials are available upon request. Use non-emitting or low-VOC materials and identify the testing standards used. List emission levels for composite wood products, paints, sealants and finishes as well as those for carpet, carpet pads and adhesives.	*The project team will provide MSDS material sheets after final sections are made in the DD phase. Low emitting and Low VOC materials will be used, and emission levels will be specified in the DD Project Specifications and included in the DD submission*
6	On energy system comparison, we appreciate using heat-pump for space heating and cooling. We also understand that you are currently evaluating changing from gas to heat-pump system for domestic hot water system. Central, modular air-source heat pump system technology is available. What is an estimate for the upfront, operational cost and payback year for switching to Central, modular air-source heat pump system technology to include domestic hot water?	*The efficiency of the the heat pump is its coefficient of performance in the phase change of the refrigerant. Centralizing it would produce more losses because the ductwork to the space would have losses even if the ductwork was highly insulated. The losses would be minimal but it would still be less efficient. Centralized heat pumps would require more energy but this would probably be negligible. Please see the updated table on Page 10 of the Net Zero Narrative for additional information*
7	As we move forward through the process, identify the MEP infrastructure design necessary to accommodate solar PV on the building, and confirming that the roof structure and roofing will be designed to support the system.	*MEP infrastructure and structural requirements will be coordinated in the DD phase and included in the DD submission*
8	Provide a schematic roof plan showing the extent of roof-top mechanical equipment and identify area that could potentially be dedicated to green roof or solar array ready.	*A schematic roof plan is attached. The roof top equipment and the available space for PV arrays will be finalized in the DD phase and included in the DD submission*
9	Please note that as per zoning, the Green Building Professional has to be a licensed architect or engineer who holds a credential from a Green Building Rating Program indicating advanced knowledge and experience in environmentally sustainable development in general as well as specific Green Building Rating Systems. Please identify an individual Green Building Professional who meets this definition. Since zoning does not specifically indicate that a team can be identified as the Green Building Professional, a determination by the Building Commissioner will be required otherwise.	***OPAL is the Green Building Consultant firm for the project. Tim Lock is a licensed architect in MA and a principal in the firm. Michael Bailey is an employee od OPAL and OPAL is the firm performing the Green Building analysis.***
10	Other projects that are pursuing Passive House rating have included cost comparison information, which is a requirement under current zoning. Hence kindly include that information.	*Please see updated tables on Pages 10 & 11 of the Net Zero Narrative for Additional information*
11	Net Zero narrative must include anticipated energy loads, baseline energy simulation tool assumptions, and proposed energy targets, expressed in terms of site energy use intensity ("EUI"), source EUI, and total greenhouse gas emissions	*Please see updated Net Zero Narrative (dated July 6, 2021)*

Item	Unit	Project Information
Energy Cost (LEED project - savings compared to baseline reported in EA)	%	≈80%
Energy Use (LEED project - reduction compared to baseline reported in EA)	%	≈80%
ASHRAE Version (Stretch Code standards)	Standard-Year	ASHRAE 90.1-2016
HERS Rating (Residential Projects)		PHI Classic (Passive House Institut)
Site EUI (Stretch Code standards)	kBTU/SF	p ≈6.05 kBTU/ft2
Source EUI (Stretch Code standards)	kBTU/SF	p ≈16.94 kBTU/ft2
GHG intensity	kg CO2/sf	≈3.5 kgCO2/sf
Solar Ready	Yes / No	Yes
Solar Capacity	kW	≈122kW
Solar Ready (Roof area)	SF	8,105 sf
Any Green Roof (Type:extensive or intensive)	yes / No (SF)	2,220 sf extensive
Any Bio-Solar Roof	yes / No (SF)	No
Building Envelope commissioing	yes or no	No
District energy	yes or no	No
Fossil Fuel use	yes or no	Yes, DHW Sytems
GHG reduction	mmtCO2e	≈80%
Domestic water use reduction below LEED baseline	%	n/a (project is not seeking LEED certification). Water Use of selected plumbing fixtures meets LEED baseline
Lighting design/plug load reduction	%	n/a (project is not seeking LEED certification). Meets stretch code
Number of EV ready spaces	% of total parking	11 spaces provided with Level 1 charging, with power capacity for an additional 9 spaces in the future
LEED certifiability	Platinum, gold, or silver	n/a - PHI Classic (Passive House Institut)
Total square footage	sf	129,230 sf
# Residential units	units	107



SOLAR READY ROOF AREA = 8,105 SF
GREEN ROOF AREA = 2,220 SF

1" = 30'-0"



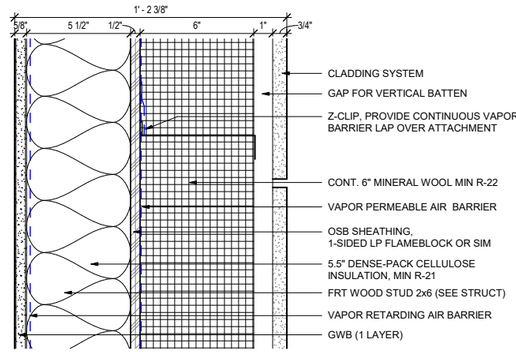
1 HR RATED UL #P531

RF-3 1 HR ROOF ASSEMBLY - TYPE IIIA/VA
1 1/2" = 1'-0"

RAINSCREEN - WOOD STUD - NR/1 HR

INTERTEK LPB/WPPS-60-01 1HR RATING

TYPE IIIA - NON-BEARING EXTERIOR WALL WITH <30 FT FIRE SEP. DIST.

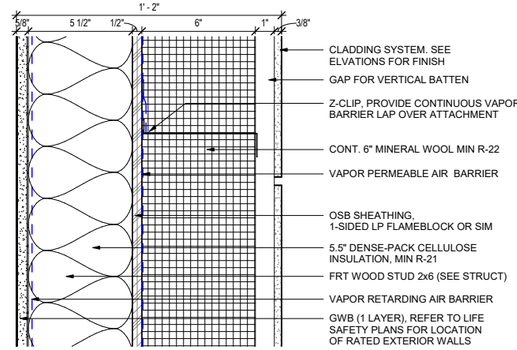


WD-2A RAINSCREEN - WOOD STUD - 1 HR
3" = 1'-0"

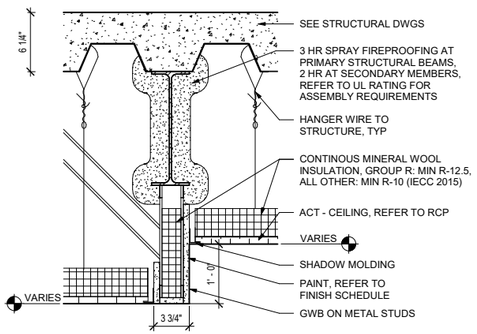
FIBER CEMENT - WOOD STUD - NR/1 HR

INTERTEK LPB/WPPS-60-01

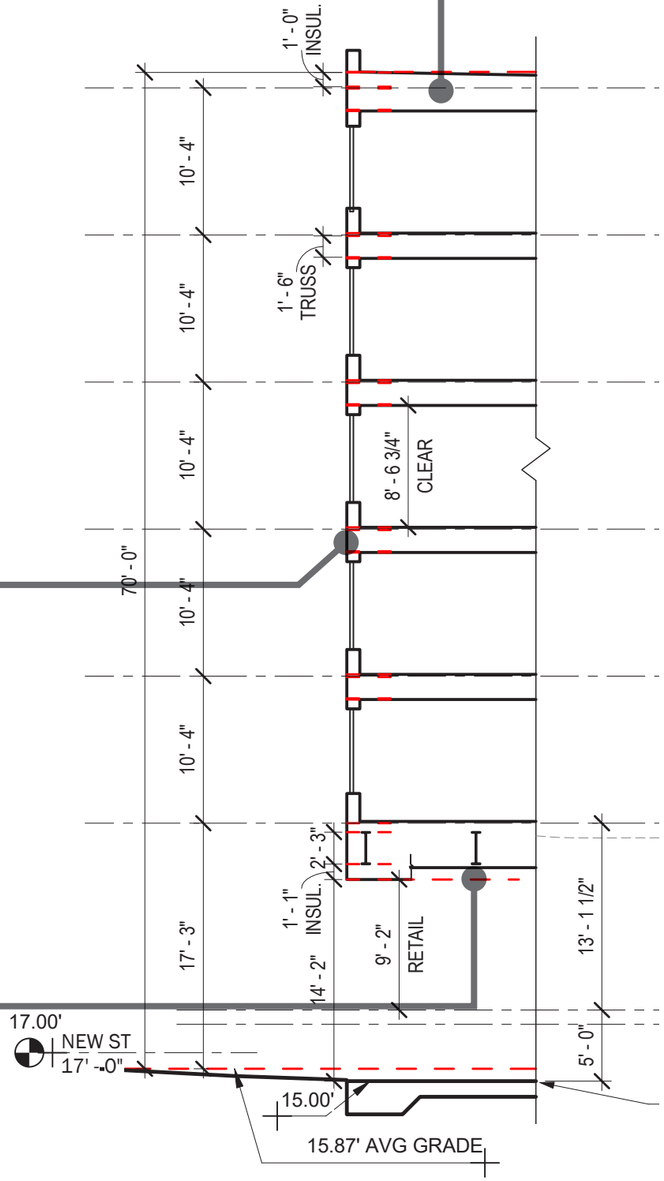
TYPE IIIA - NON-BEARING EXTERIOR WALL WITH <30 FT FIRE SEP. DIST.



FC-2 FIBER CEMENT - WOOD STUD*
3" = 1'-0"



FL-2 3 HR FLOOR ASSEMBLY - TYPE IA
1 1/2" = 1'-0"



1 TYPICAL BUILDING SECTION
3/32" = 1'-0"

MEMORANDUM

Date: September 10, 2021

To: RODE Architects
Ben Wan, AIA
Rashmi Ramaswamy
535 Albany Street #405
Boston MA 02118

From: Civil & Environmental Consultants, Inc.
Karlis Skulte, P.E.
Subject: 52 New Street
Engineering Utility Memorandum
CEC Project 301-558

CEC has prepared this Engineering Utility Memorandum to RODE Architects in support of the proposed redevelopment project located at 52 New Street in Cambridge, Massachusetts in order to summarize the design of the proposed utility and stormwater management systems for the redevelopment project.

The Project includes the redevelopment of a 1.0-acre parcel of land located 52 New Street in Cambridge, Massachusetts (the "Site") in order to construct a mixed-use redevelopment including 107 units of multifamily residential apartments along with 3,085 square feet of commercial retail use and a ground level parking garage (the "Project").

1.0 EXISTING CONDITIONS

The Project is proposed on a 1.0-acre parcel of land that is located within Fresh Pond area of the City of Cambridge. Under existing conditions, the Site contains a 21,422 square foot (sf) commercial building utilized as a gym and associated paved parking areas accessed from New Street. The Site is bounded to the northwest by New Street, northeast by Danehy Park, and to the south and southwest by commercial properties.

The site slopes down from New Street at approximate elevation 17-feet (ft) (Cambridge City Base (CCB)) to elevation 12.2-ft. Stairs lead up to the existing commercial facility with an existing first floor elevation of 17.5-ft.

Stormwater runoff is collected in catch basins at the low-point of the paved parking lot and pumped up to the municipal drainage system in New Street. Stormwater flows in excess of the capacity of the stormwater pumps overflows to the abutting commercial property to the south, where a larger stormwater pumping system maintained and operated by the City of Cambridge pumps flows to the municipal drainage system in New Street. The Site is not located in a Special Flood Hazard Area as identified by the Federal Emergency Management Agency (FEMA) however, is located in an area identified by the City of Cambridge as subject to flooding. The following flood elevations have been identified for the Site per the City of Cambridge Flood Data.

TABLE 1.0
FLOOD ELEVATIONS

Storm Event	Flood Elevation (ft) (CCB)
2070 – 100 Year SLR/SS	22.4
2070 – 100 Year Precipitation	20.2
2070 – 10 Year SLR/SS	21.9
2070 – 10 Year Precipitation	16.9
2030 – 100 Year Precipitation	19.6
2030 – 10 Year Precipitation	16.8
Present Day – 100 Year	18.9
Present Day – 10 Year	16.7
FEMA – 500 Year	22.4
FEMA - 100 Year	N/A

Sanitary sewer is pumped from the existing facility to the 8-inch sanitary sewer main in New Street. Water services are provided via a service connection to the existing 16-inch cast iron water main in New Street. Existing electric and telecommunications services are provided via overhead services located along the northeasterly side of the Site. Natural Gas service to the facility is provided via a service from the existing 2-inch main in New Street.

2.0 SANITARY SEWER ANALYSIS

The calculation of sewage to be generated by the project was performed utilizing the rates for specific uses identified in CMR 15.000, the State Environmental Code. Sewage generated by the project is estimated using 310 CMR 15.203 for residential and retail uses. 310 CMR 15.203 lists typical sewage generation values by the site use and are conservative values for estimating the sewage flows from the sites.

Under existing conditions, the sewage generated by the existing commercial property is estimated to be 1,071 gallons per day (gpd). See below for the calculations in Table 2.1.

TABLE 2.1
EXISTING SEWAGE GENERATION

Use	Requirement	Quantity	Units	Sewage Generation (gpd)
Commercial	50 gpd / 1,000 sf	21,422	sf	1,071
TOTAL				1,071

The project includes the redevelopment of the Site with a mixed-use development including 107 units of multifamily residential apartments along with 3,085 square feet of commercial retail use. The current building program includes a mix of 1-bedroom, 2-bedroom and 3-bedroom uses including a total of 212 bedrooms for the Project. Refer to table 2.2 below for a summary of the proposed sewage generation.

TABLE 2.2
PROPOSED SEWAGE GENERATION

Use	Requirement	Quantity	Units	Sewage Generation (gpd)
Commercial (Retail)	50 gpd / 1,000 sf	3,085	sf	154
Residential	110 gpd / bedroom	*107* 212	*Units* Bedrooms	23,320
TOTAL				23,474
NET INCREASE				22,403

As noted above, the project will generate approximately 23,474 gpd of sewer flows, which is a net increase of approximately 22,403 gpd when compared to the existing conditions.

2.1 Existing Sanitary Sewer Infrastructure

Existing sanitary sewer infrastructure is located within New Street consisting of a 12-inch Vitrified Clay (VC) sewer main that conveys sewer flows to the south at an approximate slope of 0.5%. The sewer continues to the south ultimately conferencing with a 24-inch sewer main at the intersection

of Bay Street and Concord Avenue flowing to the northwest. The existing 12-inch VC sewer main is proposed to be utilized for the connection for the Project.

2.2 Proposed Sanitary Sewer Infrastructure and Impacts

The proposed building sanitary services will tie into the existing 12-inch VC sewer main as noted above. This existing 12-inch sewer main has a full flow capacity of approximately 1.76 Millions of Gallons per Day (MGD). Utilizing a peaking factor of four (4), it is expected that the proposed peak sewage generated by the project will be approximately 0.094 MGD, which is approximately five (5) percent of the overall capacity of the existing sewer main. It is expected that the existing municipal infrastructure can accommodate this additional flow.

Floor drains from the covered portions of the site beneath building overhangs and within the parking garage will capture and convey the incidental snowmelt and stormwater runoff to a gas/oil and sand separator prior to discharging to the municipal infrastructure, in accordance with plumbing code requirements.

Water-efficient toilets, low-flow lavatory faucets, and aerated showerheads, in compliance with pertinent Code requirements are utilized to reduce sewage generation.

The Project Team will continue to work with the City of Cambridge throughout the design to ensure that the system is designed in accordance with the City's requirements, which will include an evaluation of the need for any sewage holding tanks which may be required due to downstream connections to Combined Sewer Overflows (if any). Refer to calculations in Appendix A for pipe capacity calculations.

3.0 WATER SYSTEM ANALYSIS

3.1 Existing Water Infrastructure

The City of Cambridge owns and maintains the existing water mains within New Street along the Project frontage. A 16-inch Cast Iron (CI) water main is present within New Street and provides service to the properties and area. An existing fire hydrant is located along the Project frontage with a connection to the existing 16-inch water main via a 6-inch service lateral. An existing service to the existing commercial facility is provided via a connection to the existing 16-inch main.

3.2 Proposed Water Infrastructure and Demand

As part of the Project, a new domestic water service and fire service connection will be provided to the facility. New infrastructure will be installed constructed with Cement Lined Ductile Iron (CLDI) pipe and gate valves as appropriate. All joints, tees and bends will include thrust blocks or will be mechanically restrained.

Under proposed conditions, the Project's water demand is calculated based on the redevelopment's proposed sanitary sewage generation. A factor of 1.1 (addition of 10%) is applied to the sanitary sewage generation flow of 23,474 gpd. Thus, the water demand associated with the proposed redevelopment is 25,822 gpd. This demand will be serviced for both the fire protection and domestic services from the 16-inch water main.

In support of the design of the water system for the proposed development, CEC coordinated with the City of Cambridge Water Department to perform a hydrant flow test to confirm the existing pressures and available flow in the existing infrastructure in New Street. The flow tests documented 1,250 gpm of flow at 55 pounds per square inch (psi) at the flowed hydrant, with a pressure drop of four (4) psi at the residual hydrant. Refer to Appendix B for the hydrant flow test results.

CEC will coordinate with the Project's MEP engineer to identify appropriate sizes for the water services, locations for fire department connections, backflow prevention measures and metering. Water conservation measures, in compliance with pertinent Code requirements, will be utilized within the building in order to reduce the demand for potable water associated with the project. These measures include water-efficient toilets, low-flow lavatory faucets and aerated showerheads. In addition, native and adaptive plantings will reduce the required water usage for landscape irrigation.

4.0 STORMWATER MANAGEMENT

A Stormwater Management Control Permit will be required from the City of Cambridge, and the stormwater management and drainage system has been designed in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the City of Cambridge Stormwater Design Requirements as appropriate. A detailed Stormwater Management Report will be prepared detailing the Project's design and compliance with the applicable standards and will be provided to the City of Cambridge for review and approval. The following sections provide a brief summary of the Project's design.

4.1 Existing Conditions and Infrastructure

The 1.0-acre Site consists almost entirely of impervious surfaces including the exiting commercial building and paved parking and circulation areas. Under existing conditions, stormwater runoff is captured by two drainage inlets located at the low point of the Site in the paved parking lot to the north of the existing building entrance. The flows collected by these catch basins are pumped to the existing municipal system in New Street. Stormwater flows in excess of the capacity of the stormwater pumps overflows to the abutting commercial property to the south, where a larger stormwater pumping system maintained and operated by the City of Cambridge pumps flows to the municipal drainage system in New Street.

4.2 Proposed Conditions and Improvements

The Project will include water quality and quantity controls designed to protect surface and groundwater resources and adjacent properties from potential impacts resulting from the proposed Project. The proposed improvements have been designed in accordance with the MassDEP Stormwater Management Standards and the City of Cambridge Stormwater Management Ordinance.

In the proposed condition, the Site will consist of impervious surfaces consisting of building roof areas for the proposed buildings, as well as site pavement and sidewalk areas. It is expected that there will be a net decrease of impervious area when compared to existing conditions due to the addition of new and expanded landscaped areas.

The overall drainage patterns on the Site will be maintained in the proposed condition, as the majority of the runoff will consist of clean stormwater runoff from roof areas, which will be routed into the existing municipal drainage system within New Street. New Water Quality Best Management Practices (BMPs) will be installed, and stormwater infiltration chambers will be constructed that provide additional groundwater recharge as well as stormwater detention. In accordance with the City of Cambridge requirements, the stormwater management system provides detention of stormwater so that post-development stormwater runoff rates are less than pre-development stormwater rates for all storm events, and the post-development stormwater runoff rates from the 25-year storm event are less than the existing conditions stormwater runoff rates from the 2-year storm event.

The proposed design will maintain existing drainage patterns, reduce peak rates of stormwater runoff, and provide stormwater recharge, while also reducing the amount of runoff draining to the abutting property to the west providing an improvement over the existing conditions. Refer to Appendix C for an exhibit depicting the preliminary Utility Design for the project.

4.3 Flood Resiliency

As noted in section 1.0, the Site is located in an area identified to be subject to localized flooding. The Project will incorporate measures designed to protect critical infrastructure such as electrical facilities and equipment from flooding via dry-flood proofing measures. Additionally, habitable retail and residential lobby areas will be protected from flooding with dry-flood proofing measures. Portions of the parking areas, storage, and outdoor plaza areas will be designed to allow localized flooding to pass freely and unobstructed as they do in the existing conditions. Refer to the narrative prepared by RODE architects for additional detail and description of the building elements in relation to the flood elevations.

5.0 PRIVATE UTILITIES

The Project Team will coordinate with the various private utility providers in order to provide electric, telecommunications, fire alarm, natural gas and/or other services as appropriate. Existing infrastructure is available within New Street along the project frontage.

Existing electric and telecommunications services are provided via overhead services located along the northeasterly side of the Site. New services will be provided via underground conduits and new transformers will be installed in accordance with the private utility provider's requirements. All critical electrical infrastructure will be designed to be protected from localized flooding with dry flood proofing measures.

Natural Gas service is available in New Street with via an existing 2-inch main. The design of natural gas infrastructure will be coordinated with the Project's MEP engineer to confirm the need for and extent of gas services and metering. Any meters will be located away from high traffic vehicular and pedestrian areas and will be appropriated screened and protected.

Attachments: Appendix A – Sanitary Sewer Calculations
Appendix B – Hydrant Flow Test
Appendix C – Utility Exhibit

APPENDIX A

SANITARY SEWER CALCULATIONS

Civil & Environmental Consultants, Inc.

Project Name:	52 New Street	**Date:**	9/9/2021
Project Location:	Cambridge, MA	**Calculated By:**	KPS
Project Number:	301-558	**Checked By:**	MJT

EXISTING 18" SANITARY SEWER HYDRAULIC CAPACITY ANALYSIS

Manning's Equation

(Flow Rate) $Q = V * A$

where: $V = \frac{k}{n} * (\frac{A}{P})^{\frac{2}{3}} * S^{\frac{1}{2}}$

k is a unit conversion factor: k=1.49 for English units (feet and seconds)
A=Flow area of the pipe, culvert, or channel.
P=Wetted perimeter which is the portion of the circumference that is in contact with water.
Q=Discharge (flow rate).
S=Downward (longitudinal) slope of the culvert.

AREA OF PIPE (A)

Sanitary Sewer: 12.00 in diameter
r: 0.50 ft^2
A: 0.79 ft^2

WETTED PERIMETER (P)

D: 1.00 ft
P: 3.14 ft

MANNING'S "N"

Manning's "n" is assumed to be 0.012 as an estimated value based on PVC sewer with manholes.

n: 0.012

[Manning's "n" for Closed Conduits Flowing Partly Full (Chow, 1959)]

SLOPE (S)

S: 0.005 ft/ft *Pipe Slope*

VELOCITY (V)

k: 1.49
n: 0.012
A: 0.79 ft^2

P: 3.14 ft
S: 0.005 ft/ft

V: 3.47 ft/s *Pipe Velocity*

FLOW RATE (Q)

V: 3.47 ft/s
A: 0.79 ft^2

Q: 2.73 cfs
Q: 1.76 MGD

The proposed peak sewer discharge from the project is expected to result in approximately 0.094 MGD (93,897 GPD) in peak flow conditions. This flow is approximately 5% of the full flow capacity of the existing 12-inch sewer main in New Street.

APPENDIX B

HYDRANT FLOW TEST

CWD HYDRANT FLOW TEST DATA SHEET

THE Cambridge Water Department assumes no responsibility for Design Calculations

FLOW TEST REQUESTER: 52 New Street Land, LLC

COMPANY NAME: Civil & Environmental Consultants

RESIDUAL HYDRANT LOCATION NEWS ID# 8142

FLOW HYDRANT LOCATION BAYSTATE NEWS ID# 8141

The flow test requester is liable for all damages to the fire hydrant, water distribution system and adjacent private property. (Cambridge Municipal Code 13.08.080)

Signature: _____ Date: 5/13/2021

WATER MAIN DIAMETER (FLOW HYDRANT) 16 inches

NOZZLE DIAMETER 2.5 inches

DISCHARGE COEFFICIENT (See Chart Below) .90

RESIDUAL HYDRANT DATA:

STATIC PRESSURE (PSI) 67 RESIDUAL PRESSURE(PSI) 63

FLOW HYDRANT DATA:

PITOT PRESSURE READING 35 PSI FLOW DURATION 1 min

(For Unaccounted for Water Tracking)

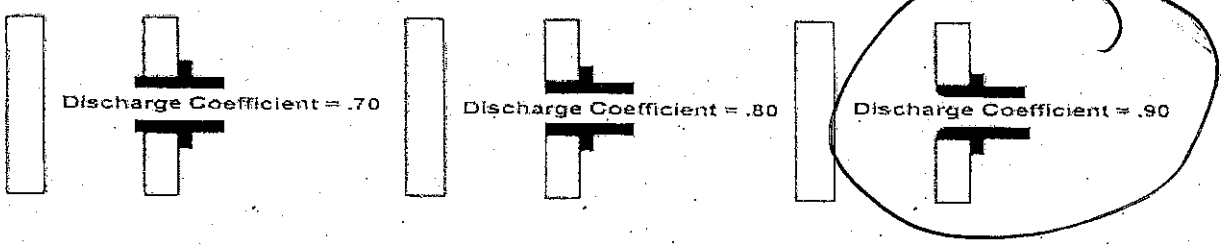
PITOT FLOW READING 1250 GPM

TEST PERFORMED BY: 1. _____

2. _____

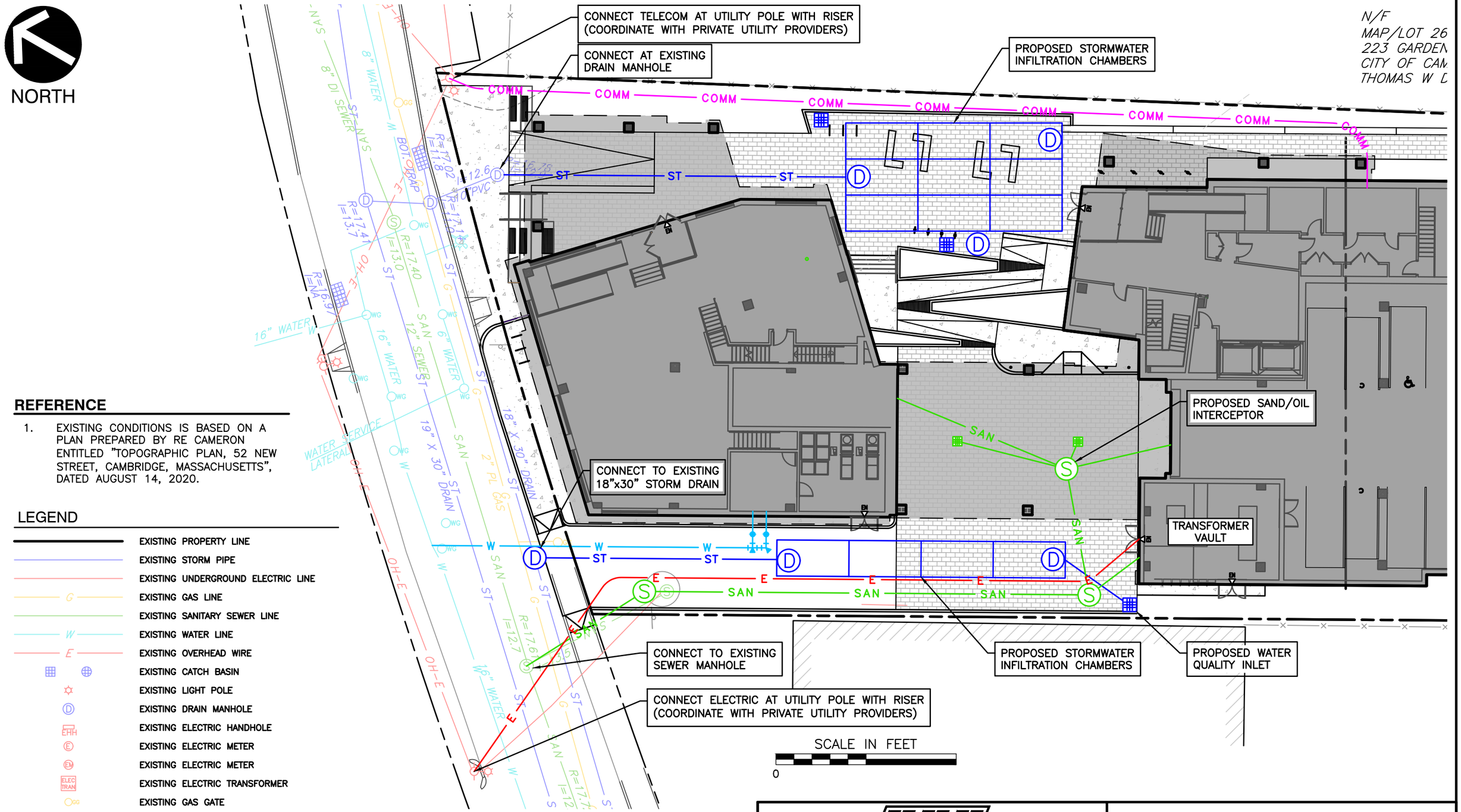
CHECK NUMBER: 26 AMOUNT PAID $175.00

Shown are three types of hydrant discharges or outlets and their respective discharge coefficients.



APPENDIX C

UTILITY EXHIBIT



REFERENCE

1. EXISTING CONDITIONS IS BASED ON A PLAN PREPARED BY RE CAMERON ENTITLED "TOPOGRAPHIC PLAN, 52 NEW STREET, CAMBRIDGE, MASSACHUSETTS", DATED AUGUST 14, 2020.

LEGEND

- EXISTING PROPERTY LINE
- EXISTING STORM PIPE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING GAS LINE
- EXISTING SANITARY SEWER LINE
- EXISTING WATER LINE
- EXISTING OVERHEAD WIRE
- EXISTING CATCH BASIN
- EXISTING LIGHT POLE
- EXISTING DRAIN MANHOLE
- EXISTING ELECTRIC HANDHOLE
- EXISTING ELECTRIC METER
- EXISTING ELECTRIC METER
- EXISTING ELECTRIC TRANSFORMER
- EXISTING GAS GATE
- EXISTING GAS METER
- EXISTING HYDRANT
- EXISTING SEWER MANHOLE
- EXISTING TELEPHONE MANHOLE
- EXISTING WATER GATE
- EXISTING WOOD UTILITY POLE
- EXISTING WOOD UTILITY POLE W/LIGHT
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE
- PROPOSED SANITARY CLEANOUT
- PROPOSED WATER LINE
- PROPOSED ELECTRIC
- PROPOSED GAS LINE
- PROPOSED COMMUNICATION LINE

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Ph: 774.501.2176 · 866.312.2024 · Fax: 774.501.2669
www.cecinc.com

JUST-A-START CORP.
52 NEW STREET
CAMBRIDGE, MASSACHUSETTS

UTILITY EXHIBIT

DRAWN BY:	MJT	CHECKED BY:	KPS	APPROVED BY:	KPS	FIGURE NO.:	SP-01
DATE:	9/9/2021	DWG SCALE:	1"=50'	PROJECT NO:	301-558		

RODE

/ DATE
September 10, 2021

/ PROJECT
52 New St
Cambridge MA

/ RODE PROJECT #
2025

/ PREPARED BY
BW

52 NEW STREET - FLOOD ELEVATIONS

The project at 52 New St proposes a new 6-story structure with parking, lobby, retail, and mechanical / service spaces on the ground level and 107 family-oriented affordable housing units on levels 2-6. Additional shared amenity spaces for the residents will be located on level 2 and level 5, and building management offices will have a presence on level 2. The project is proceeding under the Affordable Housing Overlay (AHO) zoning review process.

While the lot is not located in a Flood Plain Overlay District, the lot is projected to be impacted by potential floodwater events, at both current and future projections. These projections would require a project Design Flood Elevation of at least 22.4' CCB to be above all projected flood events.

Address: 52 New St

Ground Elevation Min:	11.00 ft-CCB
Ground Elevation Max:	20.00 ft-CCB
2070- 100 Year- SLR/SS	22.4
2070- 100 Year - Precip	20.2
2070- 10 Year - SLR/SS	21.9
2070- 10 Year - Precip	16.9
2030- 100 Year - Precip	19.6
2030- 10 Year - Precip	16.8
Present Day - 100 Year	18.9
Present Day - 10 Year	16.7
FEMA 500 Year	22.4
FEMA 100 Year	N/A

Selected Map-Lot: 273-47
Selected Address: 52 New St

The project is proposing to provide resilient protections for certain ground floor spaces up to a minimum of +22.5' CCB, but due to a series of additional project constraints, the project proposes a Finish Floor Elevation of +20.25' CCB for occupiable ground level spaces. Further, the Retail space is proposed to be located at elevation +19.00' CCB, flush with the exterior landscaped Arrival Terrace, to permit a zoning compliant 15' floor to floor height for non-residential uses (*CZO 11.207.7.4 (d)(i)*)

The various constraints affecting the project's ability to raise the occupiable spaces on the ground level include:

/ ADA accessible routes from grade up to the first level occupiable spaces
/ Emergency / Fire Department access requirements
/ Clearance requirements below the overhead residential, for both vehicular / truck access and for usable clear heights in the Lobby and Retail spaces
/ Relationship to the street grades, and coherence with the principles of the Envision Cambridge plan
/ Functional ceiling heights that accommodate MEP systems on the upper residential levels, staying within the 70' AHO zoning height.

As noted above, the project will provide additional precautions to protect critical infrastructure, including raising transformers and electric equipment, and protecting elevator pits with poured foundation walls extended up to the proposed +22.5' DFE. Deployable door protections will be provided for entries to raised spaces.

Please refer to the attached exhibits for additional information.

RODEARCHITECTS.COM

617 422 0090

535 Albany St #405
Boston MA 02118

LIST OF EXHIBITS

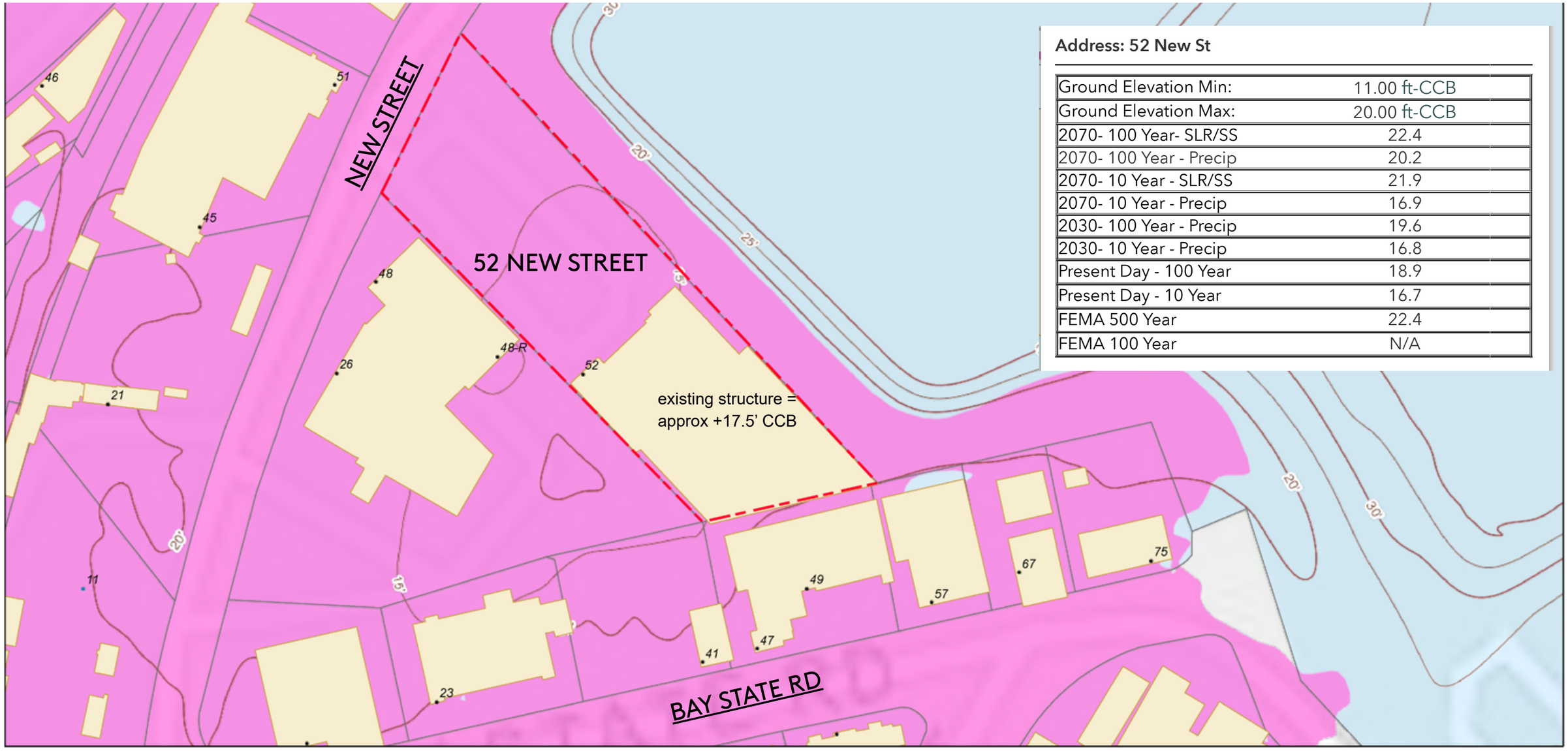
EXHIBIT A	-	CAMBRIDGE FLOOD VIEWER
EXHIBIT B	-	PROPOSED PLAN
EXHIBIT C	-	RESILIENCY PLAN
EXHIBIT D	-	BUILDING SECTION & DATUMS

The parcel is occupied by a 1-and 2-story structure containing a fitness center located at the rear southeastern corner of the lot, and asphalt paving.

The site slopes downward from New St (+17' CCB) to a low of approx. +13' CCB in the center of the lot.

The existing grade is below projections for precipitation and storm surge BFE conditions, per the Cambridge Flood Viewer.

The parcel is not in a Special Flood Hazard Area (SFHA).



Address: 52 New St

Ground Elevation Min:	11.00 ft-CCB
Ground Elevation Max:	20.00 ft-CCB
2070- 100 Year- SLR/SS	22.4
2070- 100 Year - Precip	20.2
2070- 10 Year - SLR/SS	21.9
2070- 10 Year - Precip	16.9
2030- 100 Year - Precip	19.6
2030- 10 Year - Precip	16.8
Present Day - 100 Year	18.9
Present Day - 10 Year	16.7
FEMA 500 Year	22.4
FEMA 100 Year	N/A

9/9/2021, 12:43:39 PM

HYDRO_WaterBodies
20ft Contour
10ft Contour
5ft Contour
2070 - 10 Year - SLR/SS Impacted Parcels
2070 - 10 Year - SLR/SS Flooding Extent
2070 - 10 Year - SLR/SS Impacted Parcels
Cambridge Buildings
Cambridge Parcels with Data

1:1,128

0 0.01 0.02 0.04 mi
0 0.01 0.03 0.06 km

City of Cambridge, Pictometry, Kleinfelder, City of Boston, City of Cambridge, MassGIS, Esri, HERE, Garmin, INCREMENT P, USGS, EPA

The project proposes to generally tie new grades in to meet the abutting condition at the property line. The project meets the sidewalk elevation along New St; requires fill to raise the side yard abutting Danehy Fields to meet the grade of that park's perimeter path; matches the existing rear yard elevations abutting bay State Rd parcels; and follows the existing grade as it drops down along the abutting parcel at 48 New St.

The project separates vehicular traffic from pedestrian / bicycle movements, enabling a design approach that raises pedestrian and program areas up above the flood elevation.

Vehicular access follows a driveaisle along the southern edge of the property line, which generally follows the natural grade to a drop-off and loading area under the building. Vehicular parking areas will be raised a few feet above the lowest existing grade to reduce the number of flood events.

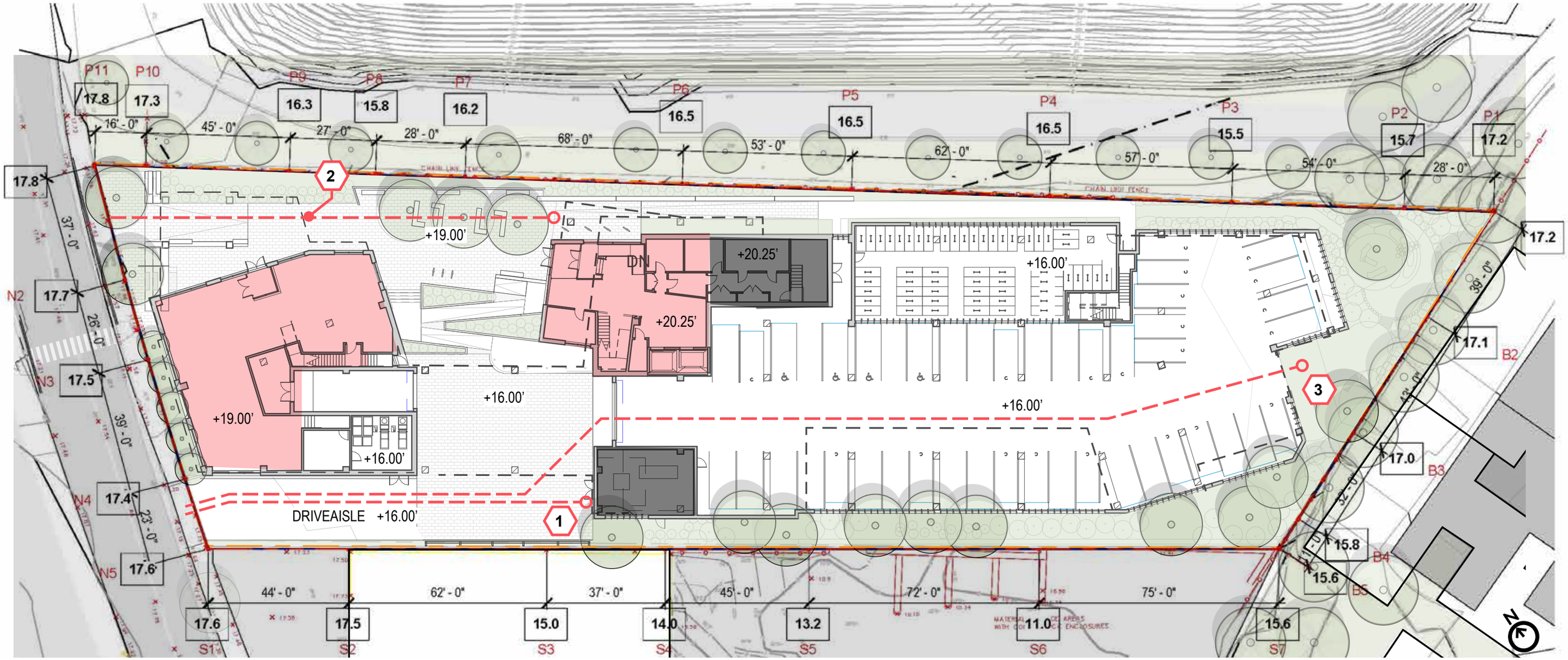
Pedestrian and bicycle access moves along the northeast portions of the project, along the Danehy Fields.

The 'Terrace' is a protected pedestrian and bike space raised to +19.00', and offers access to the retail and lobby spaces.

Vehicular and Bike parking, as well as loading and trash room, are located at grade.

Emergency Response access to the long and narrow proportions of the site requires specific design considerations:

1. The vehicular driveaisle provides open air access for emergency vehicles
2. The pedestrian access ramp up to the Terrace must provide adequate vertical clear for emergency vehicle access
3. 14' clear height is provided in the garage for emergency vehicle access to the lot rear



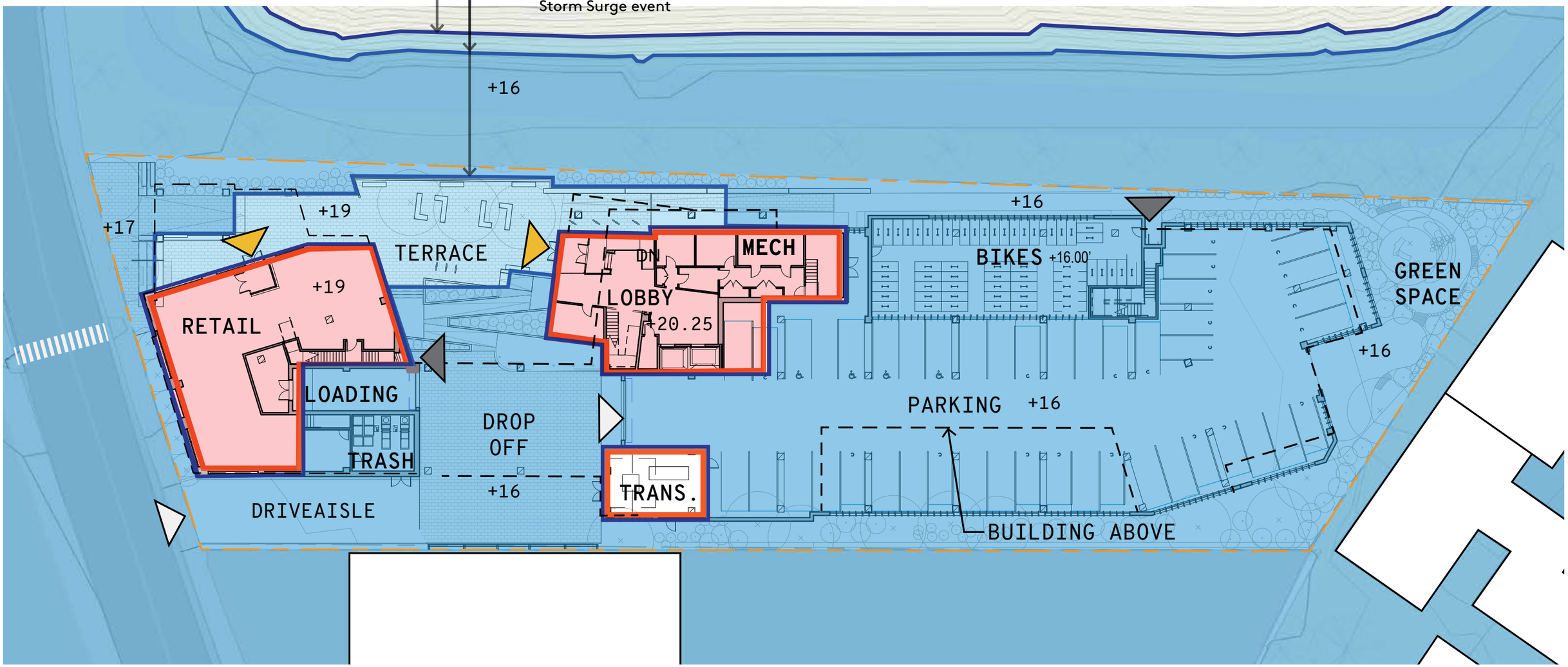
Program spaces (**shaded in red**) and building mechanical spaces are elevated to provide protection from flood waters. Retail is raised to a finish floor of +19.00’ CCB, providing a 15’ floor to floor height. Lobby and mechanical spaces are elevated to at least +20.25’ CCB, above all but the 2070 10-year and 100-year SLR-SS base flood elevations. Additional protections will be provided at the perimeter outlined in red to provide dry floodproofing design.

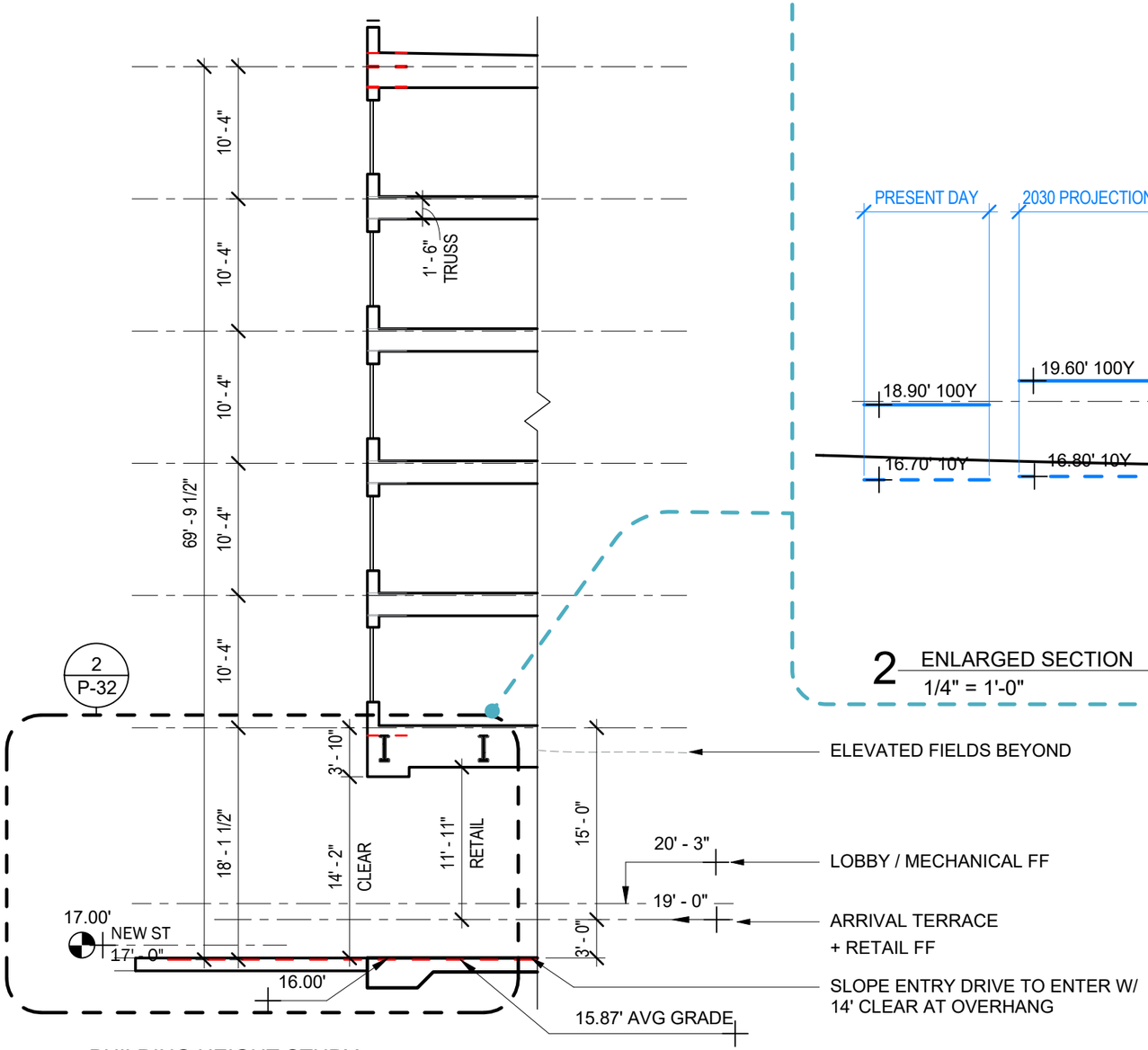
The pedestrian Terrace, at elevation +19.0’ CCB, would offer usable exterior space at grade during a majority of storm events. Sloped walkway designs ensure circulation paths meet ADA / MAAB goals for accessibility and visitability.

Mechanical / electrical rooms will be raised to +20.25’, and the transformer vault will be located at +16.0’ to allow for servicing access; these spaces will be provided with additional perimeter protections.

Passive House design provides the property extended habitability during power outages and other extreme weather events.

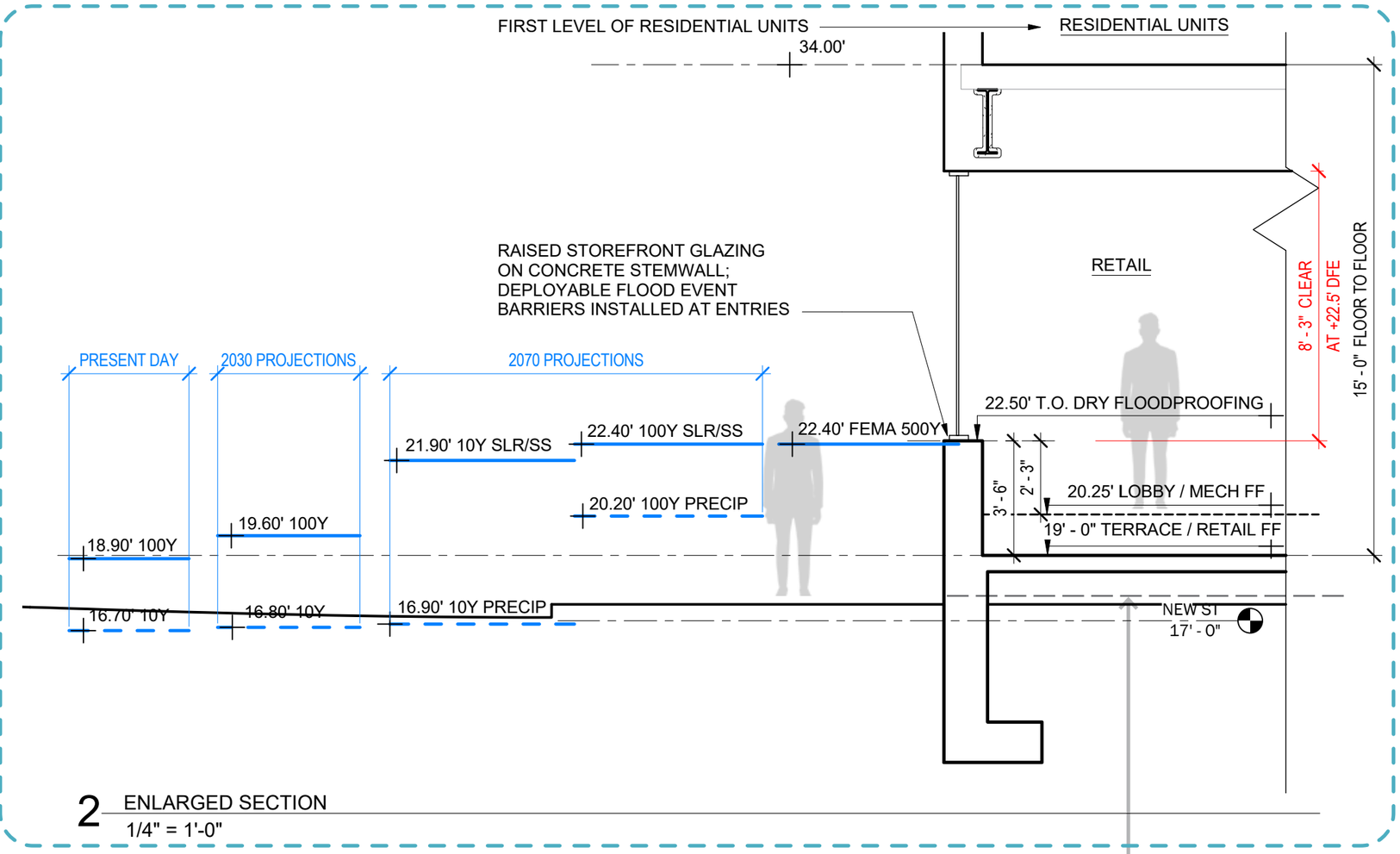
Vehicular Drop-off, loading, and parking areas, including bicycle parking, are located below the flood plain, and would be designed to permit flood waters to enter and recede without obstruction in extreme weather events.





1 BUILDING HEIGHT STUDY

3/32" = 1'-0"



2 ENLARGED SECTION

1/4" = 1'-0"

The existing fitness facility has a ground level FFE of approx. +17.5’ CCB

The proposed project improves the ground floor condition by raising up the retail space 1.50’ higher, and the lobby and mechanical spaces 2.75’ higher, with additional protection measures 5’ above the existing condition.