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May 19, 2017

Matthew A. Beaton
Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Alex Strysky, EEA No. 15293
100 Cambridge Street, Suite 900
Boston MA 02114

Re: City of Cambridge Comments on Final EIR for EF Education First Expansion

Dear Secretary Beaton:

The City of Cambridge submits the attached comments on the Final EIR for the EF Education First Expansion Projection at North Point. Our comments are intended to address the anticipated impacts to ensure that Cambridge can reap the benefits of the development while ensuring that the community's quality of life and environment are protected. EF has been working closely with my staff as they prepare to submit the project for Planning Board review and has been responsive to our comments. The EIR process has helped focus our discussions.

If your agency has any questions about the comments, please contact John Bolduc of my staff at jbolduc@cambridgema.gov or 617-349-4628. We appreciate your consideration of these comments.

Yours very truly,

Louis DePasquale
City Manager

City of Cambridge
Comments on Final Environmental Impact Report
EF Education First Expansion at North Point
EEA No. 15293

EF Education First and their consultant team have been conferring with City staff since the beginning of 2017 on their proposed EFIII development project. EF has been responsive to the City's comments on the project design. Their application for a Special Permit under the Cambridge Zoning Ordinance has been submitted

Transportation

A Transportation Impact Study (TIS), required as part of the City's Development Review process was also recently certified by the City on May 12, 2017. The TIS is a more recent document than the FEIR and includes various project updates from the FEIR, such as slight changes to the project's square footage and parking.

According to the TIS the EFIII project will have approximately 161,343 SF student resident uses (up to 500 beds), 28,429 SF academic space, 22,754 SF office (approximately 250 employees), and 12,042 SF fitness center. The TIS indicates that the project proposes 110 automobile parking spaces, 55 short-term bicycle parking spaces and 264 long-term bicycle parking spaces. The project will generate the following trips:

- 710 daily vehicle trips including, 76 AM and 90 PM peak hour vehicle trips,
- 1,850 daily transit trips (176 AM/221 PM peak hour transit trips),
- 1,190 daily pedestrian trips (105 AM/139 PM peak hour pedestrian trips) and
- 298 daily bicycle trips 32 AM/38 PM peak hour bicycle trips).

Overall, the EFIII project will replace a non-public maintenance facility with an active new building that includes public amenities. A major benefit of the project will be the completion of a missing segment of the multi-use path along the project frontage along North Point Boulevard.

Because the project will include housing for international students that do not have cars, the project will have a relatively low increase in vehicle trips. The project's low vehicle trips can also be attributed to the good walking, bicycling and transit access in the area. However, the City recommends that the state work with EF to provide an even better direct connection to the Brian P Murphy Staircase underneath the Gilmore Bridge. This would make connecting to the Orange Line even better.

The proposed 110 parking spaces will meet the City's minimum zoning parking requirements. It should be noted however, that 110 spaces is more spaces than the estimated demand in the TIS for the EFIII building (74 parking spaces). It will be important for EF to make sure that the parking spaces not shift people to driving that are currently walking, bicycling or taking transit. The City will be discussing this concern with EF through the Planning Board Special Permit process.

Because the project will be creating new parking spaces, EF will need to amend its Parking and Transportation Demand Management (PTDM) plan with the City, which must be completed before the project can receive a Planning Board Special Permit from the City.

With the TIS being recently certified, the City's next step will be to work with EF on determining appropriate transportation mitigation for the project. We expect to have suggestions in a few weeks but they may include items such as the following:

- Became a member in the Charles River TMA.
- Evaluate opportunities for coordinating the Charles River TMA EZ ride shuttle with the EF Shuttle.
- Construct a modified raised crossing at the North Street/North Point Boulevard intersection.
- Modify the multi-use path at the end of Education Street so that it does not run into the bridge support columns, such as providing a sidewalk bulb-out.
- Provide on-going Operations and Maintenance fees for the Hubway station they purchased (instead of just three years of O+M).
- Other funding toward transit, walking or bicycling, such as Lechmere Station, Inlet Bridge.

Sustainability & Resilience

Compliance with Cambridge Article 22 Green Building Requirement

When the Final EIR was published, the project was designed to achieve LEED Silver. Since then, the EF Project Team has expressed that LEED Gold is achievable and is now the target, with a projected 62 points and an additional 10 points listed as "likely". At this point, the EF III project is on track to meet, at minimum, its projected certification level and point total.

Credit-specific comments:

- *Credit SS c2 & c6 – On-Site Renewable Energy & Green Power –* According to the FEIR, rooftop solar would not be feasible, providing an estimated total energy savings of less than 2% of the overall demand. To reiterate a comment made at a previous meeting, while on-site solar power maybe not be feasible for building operating systems, there are smaller, user oriented systems which could benefit from renewable sources (i.e. cell phone charging, emergency lighting, etc.). While this might not satisfy the requirements for this credit, the City encourages the Project Team to explore other ways that solar power can be used in this project.

Other Comments

In terms of energy performance, the total design energy use intensity (EU) is lower than the average for residence halls as reported under the City's Building Energy Use Disclosure Ordinance. It would be useful to evaluate opportunities to further improve the building envelope. We note that there is no difference in building envelope roof and wall factors between the base and design cases reported in table 3-1. In addition to energy efficiency and greenhouse gas mitigation, Improving the building envelope would also contribute to providing a greater measure of passive thermal resilience in the event active energy systems fail. This would be important for a residential building.

In regard to the evaluation of air source heat pumps, the proponent is indicating that this technology would reduce energy use and greenhouse gas emissions, but that it does not make sense financially. It is not clear that the proponent factored in the commercial air source heat pump incentive offered by the Massachusetts Clean Energy Center. For VRF systems, the incentive can be as much as $180,000 for private buildings ($800 per 12 kbtu/hour). Consideration of this incentive might change the cost-benefit calculation and should be considered.

EF III Sustainability & GHG Meeting – 3/29/17

Response to DEIR Comments

Comment 10.21

Regarding energy modeling, we appreciate the complexity involved with meeting the state energy standards and local green building standards. The City finds it preferable to see modeling based on what the requirements the project will have to meet, which in Cambridge is the recently adopted upgrade to the Stretch Energy Code, or about 10% better than ASH RAE 90.1- 2013. If the proponent is going to continue using the ASH RAE 90.1-2010 base case, it would be very useful if the proponent would provide a side-by-side comparison of the base case with the new Stretch Energy Code and the LEED version 4 requirements.

Response:

The baseline code has been updated to ASHRAE 90.1-2013.

Comment 10.22

The DEIR states the project will demonstrate a 12-15 percent energy savings over the base condition using ASHRAE 90.1-2010. The City believes this will fall short of the Stretch Energy Code requirement. It appears the project will need to do better to meet the minimum energy efficiency requirement. The City encourages the proponent to go beyond the minimum in the final design.

Response:

Please refer to Section 3.4.2 and Table 3-2 for the revised GHG analysis and anticipated energy savings.

Comment 10.23

The DEIR indicates the project is aiming for certifiability at the LEED Silver level. This is a very modest goal. The City is currently working toward amending the Zoning Ordinance to require LEED Gold for projects needing special permits. The Net Zero Action Plan adopted by the City in 2015 recommends that new development meet LEED Gold and achieve a minimum of 6 energy points and this standard is being met by other projects currently going through permitting in Cambridge.

Response:

Please refer to Section 3.3 for an updated discussion of the Project's Sustainability and LEED approach.

Comment 10.24

As described on pages 3-8 and 3-9, it appears the building envelope is just meeting minimum standards for energy efficiency. We encourage the proponent to employ cost-effective strategies to improve energy performance and reduce greenhouse gas emissions.

Response:

Please refer to Section 3.4.4 for a summary of Project's fenestration and insulation alternatives assessment.

Comment 10.25

We note that this building will be subject to the City's Building Energy Use Disclosure Ordinance. The building will be required to benchmark energy and water usage in Energy Star Portfolio Manager and report the results to the City. Under the ordinance, the City posts this data on its website to enable real estate stakeholders to compare energy performance.

Response:

Please refer to Section 3.2.6 for a discussion of the Building Energy Use Disclosure Ordinance.

Comment 10.26

The City adopted the Net Zero Action Plan (http://www.cambridgema.gov/netzero) in 2015, which serves as a roadmap for how Cambridge will achieve net zero greenhouse gas emissions from building operations by 2050. As part of the City's review, the project will be asked to describe a pathway to net zero emissions for the building in the future whereby the proposed design will not preclude retrofitting or conversion to building systems that eliminate fossil fuel use and greenhouse gas emissions. Projects are also expected to be at least "solar ready" for rooftop solar energy installations and have cool roofs.

Response:

Please refer to Section 3.2.5 for a discussion of the City's Net Zero Action Plan.

Comment 10.27

The DEIR indicates that the proponent does not wish to pursue a solar RV system because the installation has an estimated payback of 6 years, which exceeds the proponent's internal goal of achieving paybacks of 3 to 5 years. The cost estimate is based on an assumed installation cost of $4.48/watt. We believe this cost factor is too high, particularly for a new development. In addition, it appears the DEIR does not account for financial incentives in terms of RECs and tax credits. There is also the possibility of using a power purchase agreement (PPA) with a third party installer. The proponent should re-visit this measure based on more realistic installation costs that account for incentives as well as the PPA option. The analysis also considered available roof space. The planned *penthouse would occupy an estimated 11,000 square feet which the DEIR assumes would not be available for solar PV. The proponent should evaluate structural enhancements to enable the space over the penthouse to be used for solar, which could allow a larger system.*

Response:

Please refer to Section 3.4.6 for a summary of the Project's updated on-site PV analysis.

Comment 10.28

The DEIR notes that vertical helix wind turbines are being considered. While wind turbines are a desirable technology, we note that Cambridge has generally unfavorable wind conditions for energy production. The nearby Museum of Science conducted extensive wind testing before installing the various turbines on its roof. They found that the wind conditions were insufficient for the turbines to be financially cost effective. Their turbines were installed for educational purposes. It should be possible to consult with the Museum to help inform the proponent's decision, but we believe solar PV is a better approach to renewable energy generation at this location If visibility of the project's renewable energy generation is a consideration a screen can be installed in the building lobby to visualize the production levels and environmental benefits of the system.

Response:

Please refer to Section 3.4.6 for a discussion of the Project's consideration of wind energy generation.

Comment 10.29

The DEIR indicates that the Veolia district steam system's distribution system does not reach the project site and that in the past Veolia has indicated it is not interested in extending their system. The proponent should contact Veolia to determine if this is still the case. The City has been informed that Veolia is interested in serving the North Point area. The City will ask the proponent as part of its review process to assess the

Response:

Please refer to Section 3.4.6 for a summary of the Project's potential use of district steam expansion.

Comment 10.30

In regard to climate change resilience, the project has referenced the Cambridge Climate Change Vulnerability Assessment and the DEIR incorporates the 2030 and 2070 climate change projections. In terms of addressing heat vulnerability, it would be helpful if the proponent would describe in more detail how the urban heat island effect will be mitigated (e.g., change in land cover from pavement to more reflective surfaces; amount of vegetated surface) in before and after terms. Also, the proponent should specify that the building will have operable windows. This will be an *important resilience measure as temperatures rise and will help protect occupants in the event that electricity supply is interrupted and air conditioning becomes unavailable.*

Response:

As described in Section 3.1, all parking will be located within the building, eliminating the heat island effect from non-roof areas associated with parking (typically surface parking). The Project will also use techniques and materials –such as high-albedo roof membrane or other means- that will help reduce the heat island effect from roofed surfaces. The Project will also incorporate operable windows in the residential portion of the building.

Comment 10.31

The DEIR notes that there are some inconsistencies in topographic information for the site. It would be useful to resolve this issue to ensure that the assumed elevations are correct.

Response:

Please refer to section 3.5.3 for a discussion of the proposed building elevation.

3

Sustainability and Greenhouse Gas Emissions Assessment

This chapter provides an overview of the local and state regulatory context related to sustainable design and presents the results of the Greenhouse Gas (GHG) emissions assessment, in accordance with the MEPA Greenhouse Gas Emissions Policy and Protocol (the "MEPA GHG Policy").[1] The Proponent is committed to incorporating many key aspects of sustainability and high performance building design as well as addressing climate change impacts and planning for resilience, where applicable and feasible, as it is their intent to operate the proposed buildings in a sustainable manner. The analysis presented in this chapter reflects all the changes to the Project incorporated since the DEIR filing as detailed in Section 1.1.1 of this FEIR, and respond directly to Secretary's Certificate and comment letters received on the DEIR.

3.1 Summary of Key Findings and Benefits

The key findings related to sustainable, high-performance design and climate change preparedness include:

› The Project is located on a Site adjacent to the current EF buildings, in an area well served by existing infrastructure and transit. This is a previously developed Site in an area of urban density.

› The Project Site is within half-mile of four MBTA stations: the Green Line stations at Lechmere and Science Park, and the MBTA Orange Line station at Community College and North Station, as well as bus routes and shuttle service. Parking capacity will comply with the zoning maximum, and bicycle usage will be encouraged through the inclusion of exterior bicycle racks, and covered long-term bicycle parking, indoor bicycle storage, and shower/changing rooms.

› The design of the Site will feature significant open space areas and an emphasis on storm water quantity and quality control.

› All parking will be located within the building, eliminating the heat island effect from non-roof areas associated with parking (typically surface parking). The Project will also use techniques and materials – such as high-albedo roof membrane or other means – that will help reduce the heat island effect from roofed surfaces.

› The Project will use water efficient landscape strategies for irrigation efficiency.

[1] MEPA Greenhouse Gas Policy and Protocol, Executive Office of Energy and Environmental Affairs, effective November 1, 2007 (revised version effective May 5, 2010).

- Indoor potable water consumption will be reduced through the selection of low-flow and high-efficiency plumbing fixtures.
- The building systems and envelope will be optimized with high-efficiency HVAC equipment, daylight dimming controls, and high-performance building envelope design which are anticipated to contribute substantially to energy savings. Together, these mitigation measures are expected to provide a 21.8 percent energy savings and 15.7 percent GHG emissions savings over the baseline condition. This energy savings goes well beyond the savings required through the Stretch Code requirements of 10 percent energy savings and demonstrates the resolve of the Proponent to build a successful sustainable project.
- Through a variety of design strategies, the Project will promote health and wellness and assist in improving indoor air quality. The Project will provide improved pedestrian facilities and bicycle accommodations to support healthy alternate modes of transport.
- The Project will integrate strategies that reduce vulnerability to future climate change impacts related to flooding, severe precipitation and extreme heat.

3.2 Regulatory Context

3.2.1 MEPA Draft Climate Adaptation and Resiliency Policy

In September 2014, the MEPA Office issued a draft policy for addressing potential impacts associated with climate change. The policy's intent is to facilitate the consideration and assessment of risk and vulnerabilities of a project or action under foreseeable scenarios or conditions associated with climate change to identify potential mitigation measures.

3.2.2 MEPA Greenhouse Gas Policy and Protocol

The Executive Office of Energy and Environmental Affairs (EEA) has developed the MEPA Greenhouse Gas Emissions Policy and Protocol (the "MEPA GHG Policy"), which requires project proponents to identify and describe feasible measures to minimize both mobile and stationary source GHG emissions generated by their proposed project(s). Mobile sources include vehicles traveling to and from a project while stationary sources include on-site boilers, heaters, and/or internal combustion engines (direct sources) as well as the consumption of energy in the form of electricity (indirect sources). Greenhouse gases include several air pollutants, such as carbon dioxide (CO_2), methane, hydrofluorocarbons, and perfluorocarbons. The MEPA GHG Policy calls for the evaluation of CO_2 emissions for a land development project because CO_2 is the predominant man made contributor to global warming. This evaluation makes use of the terms CO_2 and GHG interchangeably.

The MEPA GHG Policy states that all projects undergoing MEPA review requiring the submission of an Environmental Impact Report (EIR) must quantify the project's GHG emissions and identify measures to avoid, minimize, or mitigate such emissions. In addition to quantifying project-related GHG emissions, the MEPA GHG Policy requires proponents to quantify the effectiveness of proposed improvements in terms of energy savings, and therefore, potential emissions reductions. The goal of the MEPA GHG Policy is to identify and implement measures to minimize or reduce the total GHG emissions anticipated to be generated by that respective project.

3.2.3 Massachusetts Stretch Energy Code

As part of the Green Communities Act of 2008, Massachusetts developed an optional building code, known as the "Stretch Energy Code," that gives cities and towns the ability to choose stronger energy performance in buildings than otherwise required under the state building code. Codified by the Board of Building Regulations and Standards as 780 CMR Appendix 115.AA of the 8th edition Massachusetts Building Code, the Stretch Energy Code is an appendix to the Massachusetts building code, based on further amendments to the International Energy Conservation Code (IECC). The Stretch Energy Code increases the energy efficiency code requirements for new construction and major residential renovations or additions in municipalities that adopt it. The Stretch Energy Code applies to both residential and commercial buildings and, specifically, to new commercial buildings over 5,000 SF in size, including multi-family residential buildings over three (3) stories. The City of Cambridge adopted the Stretch Energy Code, which became mandatory on July 1, 2010.

Effective January 1, 2017, the IECC 2015 standard was adopted as the new/updated state-wide energy code as an amendment to the 8^{th} edition of the State Building Code, and the Stretch Energy Code was amended to require 10 percent greater energy efficiency compared to ASHRAE 90.1-2013. The Proponent has updated the energy analysis to show compliance with this updated Stretch Energy Code per the recommendations of the DEIR MEPA certificate/FEIR scoping determination and DOER.

3.2.4 Article 22 – Green Buildings of the Cambridge Zoning Code

In 2010 the City of Cambridge adopted Article 22.20, a green building zoning amendment which requires all large construction to be green and energy efficient, as a strategy to address the City's greenhouse gas emission reduction goals.

Beginning November 1, 2016, the City accepts the newest version of LEED, LEED v4. Article 22.20 states that all projects that require a special permit will submit a preliminary LEED v4 check and narrative explaining how all the credits will be achieved. For projects greater than 50,000 SF, LEED Silver Certifiable is required through the Article 22 Process. The Project will comply with Article 22.20 when a special permit application is submitted to the City during the spring of 2017.

In accordance with Article 22.20, all new Project buildings must meet the LEED minimum building performance requirement of a 5% improvement in energy use by cost when compared to a baseline building performance as calculated using the rating method in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2010. The energy analysis has been updated to reflect a baseline of ASHRAE 90.1-2013 per the recommendations of the DEIR MEPA certificate/FEIR scoping determination and DOER. As the ASHRAE 90.1-2013 version is more energy restrictive than its 2010 predecessor, showing at least a 5 percent improvement over ASHRAE 90.1-2013 should satisfy the Article 22.20 requirement.

3.2.5 Cambridge Net Zero Action Plan

In June 2015, the City Council of Cambridge adopted the City's Net Zero 25-Year Action Plan. Under this plan, new institutional and commercial buildings are targeted to reach net zero energy by 2025. These aggressive targets are set as goals for both industry and the City of Cambridge staff to work towards. It is understood in the action plan that there is a varying degree of complexity associated with achieving net zero and regulation will be dependent on multiple factors, including: the number of existing net zero buildings in Cambridge, technical capability and industry capacity, access to renewable energy, economic feasibility, and contribution to other goals. Cambridge plans to provide an incentive package (FAR bonuses, height relaxation, market-based incentives, etc.) to encourage the achievement of net zero. EF is devoted to constructing a sustainable building that will be LEED Silver certifiable with points likely beyond LEED Silver in an effort to make improvements that create steps towards LEED Gold.

EF is committed to constructing a building that will not preclude the advancement toward net zero, as technology becomes available. The Project is being designed and constructed towards this goal by reducing energy demand through incorporation of efficient building systems and design elements, such as installing an Energy Management System (EMS) and designing a well-insulated building envelope. The Project is also working toward the goal of net zero by considering on-site renewable & alternative energy sources as described in Section 3.4.6. The Project will be designed with a cool roof that is at a minimum "solar ready." In addition, the Project will incorporate best management practices by implementing a sustainable education program after construction completion that will focus on energy conservation and changing occupant behavior; and by monitoring the building's EMS and confirming that the building is operating efficiently.

As the technology becomes available, and operational processes are refined, the Project will continuously consider implementation of measures to improve energy performance toward net zero and net positive.

3.2.6 Building Energy Use Disclosure Ordinance

The City of Cambridge passed a Building Energy Use Disclosure Ordinance in 2014. The ordinance is considered a key step in efforts to reduce GHG emissions city-wide. Efforts to improve the energy performance of the City's building stock is hampered by the invisible nature of energy use. The ordinance is intended to address this problem by requiring owners of larger buildings to track and report annual energy use to the City and publicly disclose the data. Disclosure places the information in the marketplace, where various users such as potential property buyers, tenants, realtors, energy service providers, and others can use the data to help create value for higher energy performing properties. The data will also aid the City and others in planning for higher energy performance in the building stock. The ordinance is a foundational strategy for various community sustainability initiatives including the Community Compact for a Sustainable Future, Kendall Square EcoDistrict, and efforts to move the community toward net zero emissions.

EFIII will comply with the Building Energy Use Disclosure Ordinance. The Proponent will periodically benchmark energy and water usage of the building in the Energy Star Portfolio Manager. These results will be reported to the City where they will be publicly disclosed for the benefit of real estate stakeholders to compare energy performance.

3.3 Sustainability/Green Building Design Approach

The Project is being designed to achieve LEED v4 for New Construction as Silver Certifiable. The Proponent and its design team participated in a process that resulted in concrete design strategies that focus on strong environmental, economic, and social goals for the Project.

The Project will be constructed, operated and maintained with a focus on energy efficiency, indoor environmental quality, and occupant health and wellness. The building will use materials, fixtures, and systems that reduce resource use including water, energy, and raw materials. The team will reduce the environmental impact of the Project by diverting at least 75 percent of construction and demolition waste and by providing user-friendly recycling facilities for future building occupants.

The design, construction, and operation of the facility will result in a 21.8 percent overall reduction in annual energy use savings over the ASHRAE 90.1-2013 standard. Strategies to achieve energy savings include a building envelope that exceeds code minimum and high efficiency chillers and boilers to provide building cooling and heating. Enhanced Commissioning will be performed to verify that the building will operate as it was designed and meet the Project's goals for energy, water, indoor environmental quality, and durability. Emphasis will be placed on training the facilities staff in the building systems to optimize long-term sustainability.

The facility will be designed and built to maintain comfort for occupants and employees with special attention paid to thermal comfort. The Project will use materials with low or no volatile organic compounds (VOCs) to reduce off-gassing of harmful chemicals during occupancy. In addition, the contractor will develop a plan to protect absorptive materials and mechanical systems during construction from contaminants, chemicals, and moisture. After construction, measures will be put in place to control chemicals and pollutants from entering and spreading throughout the building, including walk-off mats, MERV 13 filtration, and exhausting of spaces where hazardous chemicals may be present. The ultimate result of these measures will be enhanced indoor air quality and a healthy environment for employees and residents.

The design will connect the indoor environment with the outdoors by providing natural daylight and views of the outdoors for a majority of regularly occupied spaces, creating a more pleasant indoor environment for building occupants.

The Project will create a desirable outdoor environment for residents and employees as well as for the commuting public. The Project will create a public way to connect North Point Park and the Charles River to the rest of the North Point neighborhood, as well as outdoor recreation facilities, allowing residents and employees to connect directly to the outdoors. The Project will be an asset to the community and the Proponent hopes it will serve as an example of "responsible" citizenship to the residents of the City of Cambridge.

In preparing this DEIR, the team has engaged in multiple collaborative exercises to evaluate the overall environmental impacts of the Project. This included studies focused on site selection, employee commuting, energy efficiency measures, renewable and alternative energy systems, and water use. The team has also conducted a preliminary evaluation of the other LEED impact categories, including sustainable construction practices, building materials selection, and measures for occupant health and wellness.

The Project is on track to meet definitively LEED-NC v4 Silver Certifiable. As demonstrated by the draft LEED Scorecard provided in Figure 3.1, a total of 50 "Yes" points have been determined, and 17 "Likely" points are being targeted. As indicated earlier, EF is devoted to constructing a sustainable building that will be LEED Silver certifiable with points likely beyond LEED Silver in an effort to make improvements that create steps towards LEED Gold.

Credits marked "No" in the attached scorecard are either inapplicable to this Project, or are considered infeasible due to Project constraints. Credits marked "Unlikely" have not yet been fully evaluated, due to the complexity of analysis, or because a critical team member has not yet joined the Project. These measures are considered unlikely, but have not yet been completely ruled out. Credits marked "Likely" have been evaluated and deemed practical and achievable, subject to more detailed analysis as the design of the Project advances. Credits marked "Yes" are considered highly likely to be achieved, due to the inherent qualities of the Site, requirements of the Project (such as Cambridge zoning), a completed evaluation, or a Project commitment. The total of "Yes" and "Likely" are expected to exceed the LEED "Silver" minimum required by Cambridge's zoning ordinance.

3.4 Greenhouse Gas Emissions Assessment

This section presents the results of the GHG emissions assessment, in accordance with the MEPA GHG Policy. The Proponent is committed to incorporating many key aspects of sustainability and high performance building design, where applicable and feasible, as it is their intent to operate the buildings in a sustainable manner.

The goal of the MEPA GHG Policy is to identify measures to reduce or minimize GHG emissions. As a way of quantifying project-related stationary source GHG emissions, the MEPA GHG Policy requires proponents to quantify the impact of proposed GHG reduction measures against a baseline to estimate energy usage savings. The Proponent is committed to incorporating many key aspects of sustainability and high performance building design as well as addressing climate change impacts and planning for resilience, where applicable and feasible, as it is their intent to operate the building in a sustainable manner.

While GHG emissions include several gases, Carbon Dioxide (CO_2) was selected for evaluation because it is the most significant component of project-related GHG emissions. EPA has not set National Ambient Air Quality Standards for GHGs; however, they do encourage strategies to reduce emissions and save fuel.

On July 19, 2016, Massachusetts completed the review process to update the base and stretch energy code and update the building code to include the IECC 2015 and ASHRAE 90.1-2013 codes. Effective January 1, 2017 the updated Stretch Code requires that projects demonstrate a 10% energy savings over an ASHRAE 90.1-2013 design case. The Project will incorporate sustainable design, including energy conservation measures, to not only meet the Stretch Code requirements but go well above and beyond its requirements.

3.4.1 Stationary Source Emissions Assessment

This section presents the results of the GHG stationary source emissions assessment for the Project, in accordance with the MEPA GHG Policy.

Methodology

To provide for energy efficiency and reduced stationary source GHG emissions, the Proponent has evaluated the following key planning and design criteria:

1. Methods/strategies to reduce overall energy demand through appropriate design and sizing of building systems;
2. Evaluation and incorporation, where feasible, of cost-effective energy-optimizing and high-performance systems; and
3. Consideration of the ability to supplement the required energy demand with self-generated energy (i.e., on-Site clean and/or renewable energy source).

Direct stationary source CO_2 emissions include those emissions from the facility itself, such as boilers, heaters, and internal combustion engines. Indirect stationary source CO_2 emissions are derived from the consumption of electricity, heat, or cooling from off-site sources, such as electrical utility or district heating and cooling systems. The direct and indirect stationary source CO_2 emissions from the proposed building sources are calculated using the computer-based eQUEST model based on assumptions for the Project's building elements, such as (but not limited to) the specific type of use(s) and users of the buildings, building configuration and architecture type, building envelope (walls/windows), interior fit-out (where known), and HVAC system and equipment efficiency ratings.

The GHG mitigation measures can be divided into the building's construction materials, architecture, and the heating and cooling processes. The following presents the specific proposed building improvements (and their correlating energy modeling parameters for reference, where applicable) that are assumed to be included as part of the Project for this analysis. Since the design and future users of the Project Components are conceptual, the specific proposed improvements may be subject to design modifications, as necessary, where the stationary source GHG emissions reductions goals established by this assessment will be used to guide final building design.

Energy Model and Analysis Conditions

The eQUEST model is used to estimate the amount of annual energy consumption by simulating a year of building operations based on typical yearly weather and user inputs. The model estimates the buildings' electricity and gas usage based on building design and system assumptions following the energy modeling protocol outlined in Appendix G of ASHRAE 90.1-2013. The amount of consumed energy is then converted into the amount of CO_2 emitted using the standardized conversion factor. The stationary source assessment calculated CO_2 emissions for the following build conditions:

- Build Condition with MA Building Code (the "Base Case"): The Project assuming typical construction materials and building equipment/systems that meet the minimum requirements of the MA Building Code, or the base code. This baseline is established by the energy code as being defined by ASHRAE 90.1–2013.
- Build Condition with Stretch Energy Code (the "Design Case"): The Project assumes building design and system improvements to meet or exceed the revised Stretch Energy Code (i.e., 10 percent over ASHRAE 90.1-2013).

3.4.2 Stationary Source GHG Emissions Assessment

The stationary source GHG emissions assessment presented in this report has been updated to reflect the design program as of this FEIR submission and incorporates the progress that has been made since the DEIR filing.

Future Stationary Source CO_2 Emissions

The Project includes the construction of a single building with various uses, including student apartment and dormitory units, a cafeteria, gym and fitness center, office space, and parking. The approach to and results of the building energy model for the Project Building is presented below.

The noteworthy improvements for the base building (or core and shell) are presented in the sections below. While specific improvements may be subject to design modification as design progresses, the Proponent is committed to achieving the stationary source GHG emissions reductions estimated herein for the final building program and design.

EFIII Building Assessment

Table 3-1 below presents a summary of the improvements that were included in the energy model for the new mixed use EFIII Building located on North Point Boulevard including updates that have been incorporated since the DEIR filing. Strategies to achieve energy savings include, but are not limited to:

- Fenestration that exceeds code minimum;
- More efficient lighting;
- High efficiency chillers with variable speed drive and boilers to provide building cooling and heating; and
- Energy recovery units.

Emphasis will be placed on training the facilities staff in the building systems to optimize long-term sustainability. In addition, as described in Section 3.4.6, the Proponent is strongly committed to continuing to investigate the potential of integrating cogeneration in the form of combined heat and power (CHP) into the building design. To be conservative, the following energy model assumptions for the design case does not include the addition of the CHP. The potential energy savings of this additional mitigation is discussed in Section. 3.4.6.

Table 3-1 EFIII Key Model Assumptions

Building Component	Base Case[1]	Design Case
Square Footage/Usage		
Space Use Type	Dormitory/Office/Restaurant/Public Accommodation	Dormitory/Office/Restaurant/Public Accommodation
Conditioned Square Feet	267,000	267,000
Building Envelope (Construction Assemblies)		
Roof Type	R-20 continuous above Deck Reflectance=0.3	R-20 continuous above Deck Reflectance=0.3
Roof U-Factor	U-0.032	U-0.032
Wall Type and R-Factor	R-13 cavity + R-7.5 continuous insulation	R-13 cavity + R-7.5 continuous insulation
Wall U-Factor	U-0.064	U-0.064
Fenestration and Shading		
Vertical fenestration area (of Wall area)	31%	31%
Vertical Glazing U-factor	U-0.42	Super Neutral 54 for all Glazing U-0.34
Vertical Glazing SHGC	0.4	0.28
Fenestration Visual Light Transmittance	0.9	0.54

Table 3-1 EFIII Key Model Assumptions (cont.)

Building Component	Base Case1	Design Case
HVAC (Air-side)		
Primary HVAC Type (All spaces except for dorms)	Common Areas = Packaged VAV with Hot Water Reheat - System Per Floor	Common Areas = Packaged VAV with Hot Water Reheat Corridor/Dwelling Ventilation = Dedicated Outside Air Units with gas heat, DX cooling and enthalpy wheel
Secondary HVAC Type (Apartment/Dorm Units)	Packaged Terminal AC (PTAC)	4-Pipe Fan Coil Units
AC Efficiency (EER)	9.8 pvav / 10.5 ptac	n/a
Fan System Operation	All systems on continuously during occupied hours. Cycled to meet load during unoccupied hours.	ERUs: On continuously Fan Coil Units: Cycled to meet loads
Total System Fan Power (Conditioned)	Per ASHRAE 90.1-2013 G3.1.2.9	VAV systems: Supply Static 4.5 in wg / Return Static 1.5 in wg Fan Coils: Total Static 1 in wg ERU: Supply Static 5.5 in wg / Return Static 3 in wg
HVAC (Water-side)		
Boiler Efficiency	80% Natural Draft	96% Condensing
Energy Recovery Ventilator		
Effectiveness	N/A	Enthalpy Wheel: 76% Sensible / 74% Latent
Domestic Water Heating		
DHW Equipment Type	Gas Heater	Condensing Gas Heater
Equipment Efficiency	80%	96%
Lighting		
Interior LPD by Building Area (W/SF)	Apartments: 0.38 w/SF Dorms: 0.38 w/SF Exercise Center: 0.72 w/SF Office: 1.11 w/SF Parking Garage: 0.19 w/SF Dining: 0.65 w/SF MER Space: 0.42 w/SF Corridors: 0.66 w/SF	Apartments: 0.38 w/SF Dorms: 0.38 w/SF Exercise Center: 0.72 w/SF Office: 0.7 w/SF Parking Garage: 0.19 w/SF Dining: 0.65 w/SF MER Space: 0.42 w/SF Corridors: 0.66 w/SF
Lighting Control Sensors	Occ sensors where required by code	Occ sensors where required by code

1 Based case represents ASHRAE 90.1-2013 conditions.

The total estimated annual electricity use and natural gas consumption, and associated emissions for the EFIII building are presented in Table 3-2 below. Under the Base Case, the CO_2 emissions are estimated to be 1,268.4 tons per year. With the currently proposed building design and system improvements, the estimated energy use reduction for the building is approximately 21.8 percent, which equates to a 15.7 percent reduction (198.6 tons per year) in stationary source CO_2 emissions when compared to the Base Case. The stationary source CO_2 emissions percent reduction for the EFIII Building under the Design condition was quantified as follows: 198.6/ 1,268.4 = 0.157 x 100 = 15.7%.

Reduction % = Emissions Reductions (End Use Savings) / Project-Generated Emissions (Base Case Emissions)

Table 3-2 EFIII Stationary Source CO_2 Emissions

	Energy Consumption			CO_2 Emissions		
	Electricity (kWh/yr)	**Natural Gas (MMBtu/yr)**	**Total (MMBtu/yr)**	**Electricity (tons/yr)[1]**	**Natural Gas (tons/yr)**	**Total (tons/yr)**
Base Case[2]	2,243,142	7,360.3	15,016	837.8	430.6	1,268.4
Design Case	2,202,755	4,223.8	11,742	822.7	247.1	1,069.8
End-Use Savings	40,387	3,136.5	3,274	15.1	183.5	198.6
Percent Savings			**21.8%**			**15.7%**

1 tons/yr = short tons per year
2 The Base Case represents current Base Energy Code ASHRAE 90.1-2013 standards.

3.4.3 Energy Use Index

The Energy Use Index (EUI) is a tool used to provide a common basis of comparison of the energy use for various building uses. It is the total amount of energy used at a project over a one-year period, divided by the square footage of that building and represents the energy consumed by a building relative to its size. The US Department of Energy ("DOE") has created prototype commercial buildings that are used for benchmarking a project's energy usage against expected energy consumption. Benchmarks for each building use are presented for a prototype building under the ASHRAE 90.1-2013 standard in Climate Zone 5A representing Massachusetts.[2] The EUI benchmark for the Public Accommodation Area is obtained from the Social/Meeting Space category and for the Fitness area from Recreation of the Energy Star Portfolio Manager.[3] Table 3-3 below provides the weighted Benchmark EUIs for each of the Building Uses and compares these to the total EUI of the Base and Design Cases of EFIII. The EFIII building is well below the EUI benchmark for the proposed building and is well below the base case EUI which is indicative of the continued sustainable elements of the proposed buildings.

2 "Cost-Effectiveness of the ASHRAE Standard 90.1-2013 for the State of Massachusetts". *US Department of Energy*. December 2015.

3 "US Energy Use Intensity by Property Type" *Energy Star Portfolio Manager*. March 2016.

Table 3-3 EFIII Energy Use Index (kBtu/ft²-yr)

	Conditioned Space		EUI Benchmarks		EFIII Building	
Building Use	Conditioned Area (SF)	% of Total	By Use	Area Weighted	Base Case	Design Case[1]
Fitness	23,022	10%	41.2	3.9	44.7	57.2
Dining	10,639	4%	673.5	29.6	235.8	249.7
Lobbies/Public Accommodation	47,015	19%	45.3	8.8	17.3	20.7
Office Space	26,564	11%	32.9	3.6	35.1	35.6
Residential/Dormitory	134,996	56%	52.7	29.4	72.1	43.3
Total	**242,236**	**100%**		**75.3**	**62.0**	**48.5**

1. EUI by building use is difficult to estimate as some uses share the same HVAC system. The Total EUI provides a more accurate depiction of the building's energy usage.

3.4.4 Passive House Design and Envelope Alternatives Assessment

The Proponent investigated the feasibility of pursuing Passive House certification in response to DOER comments on the DEIR. Passive house certification is a set of design principles that requires a rigorous level of energy efficiency to "maximize your gains and minimize your losses."[4] The program is relatively new in the United States but has been expanding across Europe. It requires implementation during a project's infancy to increase the likelihood that certification is obtained after construction.

To meet the requirements for Passive House certification, the Project would need to be constructed in a manner that reduced the infiltration rate to 0.6 air changed per hours ("ACH") at 50 pascals. Reducing the infiltration rate is often difficult to achieve as it requires not only proper building design, but thorough and quality workmanship throughout the construction process. In addition, the annual heating load would need to be reduced by 31% to 5.3 kBtu/sf, the annual cooling load would need to be reduced by 42% to 2.9 kBtu/sf and the total annual source energy load would need to be reduced by 46% to 6,200 kWh/person/year.

There are no prescriptive insulation requirements for Passive House certification, however, to meet the strict energy use requirements, a very insulated envelope is essential. For the Project to have a similar envelope to other Passive House projects in the area, the proposed design would need an additional 4"- 5" of under slab insulation, an additional 5"- 6" of continuous insulation in the wall assemblies, an upgrade to triple pane windows, and an additional 6"- 8" of continuous insulation in the roof assembly. These changes to the envelope are substantially cost intensive and are not financially feasible for the Proponent (a cost assessment is presented in Appendix E).

In response to the MEPA Certificate and DOER comment letter, multiple above-code fenestration alternatives optimizing the envelope thermal performance were

4 Passive House Institute United States. <http://www.phius.org/what-is-passive-building-/the-principles>

assessed for the proposed building. In the spirit of the Passive House investigation, the Proponent has considered the energy savings associated with additional under slab, wall and roof insulation (the envelope improvements suggested to meet Passive House Certification). The results of this alternatives assessment are presented in Appendix E, as energy conservation measures one through three of AKF's Energy Model Baseline Report. The envelope alternatives assessed include the following:

- An additional 5 inches of under slab insulation (U-0.017)
- An additional 1 inch of wall insulation (U-0.055)
- An additional 6 inches of roof insulation (U-0.021)

All the energy conservation measures were assessed relative to the currently proposed building design. The modeling resulted in the following conclusions related to each measure.

- Additional under slab insulation was found to result in greater energy consumption than the proposed design (-4.9 MWh per year of electricity and -21 Therms per year of gas) and result in additional utility costs.
- Providing 1 inch of additional wall insulation was found to consume an additional -2.1 MWh per year of electricity but save 68 Therms per year of gas. This resulted in an overall energy savings and would provide $196 in annual utility savings.
- An additional 6 inches of roof insulation was determined to have no effect on electricity consumption and result in gas savings of 5 Therms per year. The corresponding utility savings would be $179 annually.

A summary of the feasibility of these measures is presented later in this chapter in Table 3-4. Due to the high cost associated with these measures, the annual utility savings would not provide a sufficient payback to incorporate them into the building design.

The additional insulation options considered were shown to result in minimal energy and energy cost savings on the proposed design. Generally, this is a result of the relatively minor level of insulation that could be added when considered in the overall context of the building, the relatively efficient systems in the building and the low cost of gas.

Specifically, the under-slab insulation was shown to have no savings, this is a result of the space above the slab being primarily Gym space, which has an internal cooling load throughout the year. Additional slab insulation will actually require more mechanical cooling energy during shoulder seasons and winter months in the Gym space. The additional roof insulation shows a slight savings in energy, but because of the buildings height the roof insulation affects a proportionally small area of the building, and does not result in significant savings. The additional 1" insulation on the wall also shows a small energy savings, but because the ability to insulate the wall to a significant extent was limited (as an increase beyond 1" would require custom wall brackets—significantly increasing cost), this small increase in insulation has a fairly minor impact. The heating load from the walls is still dominated by the windows. Finally, the addition of insulation generally results in heating savings during the winter months, however since the relative cost of the gas heat is much lower than the cost of the electric cooling for the building, the heating energy savings for the insulation additions explored does not translate well into a significant annual energy cost savings. The Project team will continue to investigate cost effective opportunities to improve the building envelope as the design progresses.

3.4.5 Building Energy Efficiency (Mitigation) Measures

The Proponent has committed, at the current stage of conceptual design, to Project design-related improvements that will exceed the MA State Building Code and the Stretch Code, and that will reduce GHG emissions for the Project. Project improvements, such as site and architectural design and treatments, were evaluated in the stationary source GHG emissions assessment. Additional operational improvements, including utilization of Energy Star appliances, where possible, will also be included in the mitigation. Because the Proponent of this Project will fully occupy the building, the Proponent is committed to incorporating energy reduction measures as part of their construction and/or fit-out, which will ensure meeting the CO_2 emissions benefits (reductions) calculated in this assessment and possibly resulting in additional stationary source CO_2 emissions benefits.

The Proponent's commitment to sustainable design and emissions reduction measures through the implementation of some combination of the measures outlined below will be finalized upon the further development of the design of the building. The chosen package will achieve a reduction in GHG emissions, meet the Stretch Code Requirements, the City of Cambridge requirements and become at least LEED Silver Certifiable. It is anticipated that this reduction, in part, will be accomplished by implementation of mitigation measures in the core and shell of the building.

Additional mitigation strategies, set-forth below, are expected to provide further stationary source CO_2 emissions benefits, but are not quantifiable at this stage of conceptual design and, therefore, any potential CO_2 emissions reductions are not included as part of this assessment.

Hybrid Vehicles and Electric Charging Station

The Proponent will reserve six preferred parking spaces for Low Emission, Fuel-Efficient vehicles as well as three dual electric vehicle curb-side universal charging stations within the parking garage. Drivers with electric vehicles can receive a free electric charge which will also help EF continue its commitment to clean energy and alternative transportation solutions. Electric vehicles do not have any tailpipe emissions (such as NOx or particulates-both of which contribute to respiratory illness) and emit practically no engine heat reducing the high temperature in congested corridors.

Building Commissioning

Additionally, to assure that all systems are installed and function as designed and are meeting the intended performance criteria for energy efficiency, the Proponent will follow the commissioning requirements provided in the current Massachusetts Building Code including Appendix G. The Proponent has contracted a consultant to develop a detailed overall Commissioning Program to ensure that all systems are complete and function properly—individually and together—upon occupancy. The Commissioning Plan will involve a description of the design reviews and schedules, construction and constructability reviews, system testing requirements, transitional requirements, monitoring program for environmental and energy performance, amongst other items. Accurate and detailed building commissioning will ensure that energy savings are maximized and GHG emissions are minimized.

Refrigerant Management

The Project will also include design criteria to eliminate and/or reduce of the use of ozone-depleting and global warming-contributing based refrigerants in HVAC systems. These elements are expected to further benefit the overall Project GHG impacts, but are not quantifiable at this stage of conceptual design.

Building Energy Tracking and Energy Management System

An Energy Management System (EMS) uses computer-based monitoring to coordinate, control and optimize the long-term performance of a heating/cooling and/or lighting system. The perimeter areas of the public spaces will contain local daylight harvesting controls that will automatically dim or turn off lighting fixtures (interior only) based on the available lighting levels of natural daylight as determined by the EMS. These public spaces will also contain local occupancy controls that will automatically turn lighting fixtures on/off based on occupancy of each space. Lighting fixtures in these areas will be connected to a networked lighting control system. This system will allow space wide control of dedicated lighting zones. Each zone will have the capability to have a separate time schedule for overall control. This lighting system will be connected to the EMS system.

The dormitory and apartment spaces will have individual control of light fixtures. The common spaces on each dorm/apartment floor will be controlled via local occupancy sensors and be connected to the network lighting control system.

The EMS may also include the capability to track over the long-term the overall energy consumption of the Project. Currently, the existing EF Building (EFII), located diagonally across the street from the Project Site, has an Energy Manager which will oversee the Project and will continue to use an EMS to monitor the building energy performance. This information will be submitted to the City of Cambridge as required by the Building Energy Use Disclosure Ordinance described above.

Plug Loads

The Proponent commits to encouraging the use of ENERGY STAR appliances and equipment where available and reasonably practicable. The building energy model does not take credit for reduced plug loads as the eQUEST model conducted for the Design Case did not account for energy conservation measures related to plug-in equipment. The use of ENERGY STAR appliances and equipment has proven to result in a reduction in overall energy use and, therefore, a reduction in stationary source CO_2 emissions for the Project.[5] A 10 percent reduction was applied to the total annual electrical output of the Miscellaneous [6] category derived from the eQUEST model. By applying the 10 percent reduction to account for ENERGY STAR appliances and equipment, the total annual Miscellaneous electricity would be reduced from 938 MWh to 844 MWh which is equivalent to a difference of 35 tons of CO_2 emissions. This results in an overall stationary source CO_2 emissions reduction of 18.4 percent for the Project and overall energy reduction of 23.9 percent compared to the baseline code.

Water Efficiency/Wastewater Reduction

Water efficiency is not only important for conserving potable water and reducing wastewater generation, but also for reducing energy. Nationally, about four (4) percent of electricity use can be attributed to the treatment of potable water and wastewater, excluding the energy use associated with water heating. Therefore, the Proponents' commitment to reducing water use and wastewater generation through the installation of low-flow fixtures, water-saving water closets and a rain water harvesting system for irrigation use supports the Project's overall sustainability goals and further mitigates the potential impacts from energy use on the climate.

As outlined in the current MEPA GHG Policy, projects that will consume greater than 300,000 gallons per day (gpd) of water or wastewater may be required to model GHG emissions associated with energy usage for water or wastewater treatment on a case-by-case basis. This Project will require approximately 54,454 gpd of potable water and will generate approximately 49,504 gpd of wastewater. The combined total is well below the MEPA threshold to assess the GHG emissions related to water and wastewater for the Project.

Solid/C&D Waste Reduction

To achieve whole-building sustainability performance, the Proponent supports and will follow the LEED Green Building Rating System guidelines. Therefore, it is anticipated that 100 percent of paper, corrugated cardboard, glass, plastic and metal

5 Compared to standard office equipment and home appliances (non-ENERGY STAR rated), ENERGY START-qualified products use 30 to 75 percent less electricity according to the ENERGY STAR website: <https://www.energystar.gov/index.cfm?c=ofc_equip.pr_office_equipment>

6 The Miscellaneous category is one of the six categories eQUEST breaks electrical use into and the most applicable to plug-in loads.

would be recycled during operations and it is assumed that a minimum 75 percent of C&D waste will be diverted, as required by Massachusetts law.

Energy Conservation Education for Student Residents

During the academic year, the Proponent is committed to providing an educational program about energy conservation and instructing students who reside in the dormitory on means and methods to conserve energy. This educational program will likely involve posting educational materials and posters in places of gathering around the dorms, having a website associated with the school that provides tips for simple daily routine changes that can conserve energy as well information on the school's campaign to reduce energy use and GHG production.

Educational programs will center on items that students have direct control over. Students will be encouraged to reduce water consumption, turn off lights and other electronics when not in use, and reduce air conditioning and space heating use. These simple educational programs have the potential to create meaningful GHG reductions when implemented across the EF campus.

Utility Incentives/Energy Efficiency Assistance

The Proponent is aware that the Project's electricity and natural gas service providers will offer technical assistance and incentives for implementing energy efficiency measures. By continuing to work with the utility providers throughout the design process, the Proponent will evaluate additional energy conservation strategies. During this process, additional energy savings and associated GHG emissions reductions may be achieved. The design team has already proposed an energy usage target for the Project that will yield significant energy and water performance improvements over a minimum code-compliant building. The Proponent has engaged energy modeling services and the services of multiple environmental and sustainability consultants to drive the Project to be as energy efficient as possible.

Since the DEIR filing, the Proponent has further engaged Eversource to inquire about the workings of these incentives and the required baseline code used in incentive modeling. Since engaging with Eversource, the Proponent has decided to incorporate additional energy conservation measures (such as reduced Lighting Power Densities relative to the DEIR) to achieve a 21.8 percent energy savings over baseline code and a higher (>20 percent energy savings) incentive tier than the previous design.

Eversource will be working with the team to focus on energy savings and will provide feedback on additional energy conservation measures. Contact with Eversource has also provided additional information about the incentives available for CHPs.

The Proponents will participate in the MassSave New Construction Program. This program is designed to incentivize energy efficient design for new commercial, industrial and governmental facilities and major renovations thereof. The Proponent will likely elect to pursue the "Custom" energy performance track, wherein whole-building energy modeling software is used to compare energy usage of the as-designed building to that a baseline code-compliant reference building. The local utility pays incentives based on the calculated savings between the two. Specifically, Eversource had indicated they provide increased incentives based on energy savings over a baseline code with incentive tiers in 10 percent increments.

Energy Recovery Units

The current building design for EFIII incorporates a mix of 4-pipe fan coil units and air handling units. The air handling units are split into two types:

Energy Recovery Units are 100 percent outside air units. The units provide all the ventilation air for the residences, apartments and corridors for floors 6 through 12. They are also ducted with all the exhaust air from the same floors. This exhaust air passes across an enthalpy wheel. Heat and moisture are given up to the wheel as it slowly rotates. Outside air (ventilation air) is brought in on the other side of the wheel which picks up the heat and moisture to help pre-condition the air. When the unit is in cooling mode the incoming ventilation is pre-cooled and dehumidified. No exhaust or return air is recirculated back into the building. Cooling and heating for the spaces where these units are ventilating is typically provided by the 4-pipe fan coil units.

Indoor Air Handling Units - These units provide heating, cooling and ventilation for floors 1 through 5 (except the garage areas). These units will not be provided with energy recovery. The ventilation air for these units is less than 30 percent of the total air supplied from the unit. The Proponent plans on these units being able to achieve 100 percent air side economizer (depending on available space). At this time, there are no plans for water economizers.

Lighting Power Density Reductions

The Proponent has examined the potential of reduced lighting power densities (LPD) for both interior and exterior lighting attached to the building. Since the DEIR, EFIII has reduced some lighting power densities to match or be better than the baseline code. The LPD for the office area is designed to have lower power density than the baseline code. EFIII will also feature occupancy sensors where required by code.

The Proponent is planning to install primarily Light-Emitting Diode (LED) lighting throughout the Project. LED lighting has been found to be more efficient, durable, versatile, and longer-lasting than traditional lighting. The efficiency of LED lighting can provide a substantial amount of energy savings and consequentially GHG savings.

3.4.6 On-Site Renewable & Alternative Energy Evaluation

A variety of clean and renewable and alternative energy sources were evaluated in response to the comments on the DEIR for the Project, including combined heat and power (CHP), solar panels, wind, solar thermal, water source heat pumps, variable refrigerant flow systems and steam.

The Proponent has thoroughly investigated the efficiency and feasibility of numerous renewable and alternative energy sources and energy conservation measures to reduce GHG emissions by the project. The analysis of the measures has shown that a CHP system is the most promising means to reducing energy consumption and GHG emissions. Solar solutions have been ruled out due to on-site shading from nearby buildings and structures. Wind generation is no longer being considered per the suggestion of the City of Cambridge and studies by the nearby Museum of Science showing its inefficiencies in this area. The following summarizes the Project Team's efforts to assess the feasibility of these various renewable and alternative energy options. Refer to Appendix E for additional details on each of the studies described below.

Combined Heat and Power (Co-Generation)

A small CHP engine was evaluated for the roof of the Project. The CHP engine utilizes natural gas fuel input to produce electricity and recoverable heat. For the apartments and dormitories, the recovered heat is used for domestic hot water heating reducing the load on the boilers. The analysis assumed the use of a 65 kW microturbine which was sized based on the estimated hot water demand during the summer months. CHP systems reduce GHG emissions by removing the inefficiencies of transmitting electricity and natural gas from a power plant to the Site and by using cleaner natural gas as a fuel source. Based on the EPA CHP Energy and Emissions Savings Calculator, the estimated GHG savings of the CHP is on the order of 10 tons per year[7].

EFIII is anticipated to house students for a minimum 9 months of the year with most of the building possibly unoccupied during the summer months. The unoccupied rooms during the summer cause a reduced domestic hot water load that reduces the economic performance of the system. The possibility of unoccupied months decreases the financial feasibility of the system and is being further assessed.

There are two events that occur with a CHP system in terms of fuel consumption/energy consumption and savings. The actual CHP microturbine consumes fuel (gas) to operate which is balanced against the amount of fuel consumption the CHP produces/saves by producing electric and thermal energy for the EFIII building instead of getting this energy from the grid and other building systems (the displaced electricity and thermal production).

The reduced summer demand shows that site energy would increase approximately 26 percent but source energy would be reduced (refer to Appendix E for additional details), providing GHG reductions. The utility savings provided by the CHP would be approximately $53,000 per year.

[7] *The Combined Heat and Power (CHP) Energy and Emissions Savings Calculator*, US. Department of Energy's Distributed Energy Program and Oak Ridge National Library/ ICF& EPA CHP Partnerships, https://www.epa.gov/chp/chp-energy-and-emissions-savings-calculator.

In the event that the Proponent introduces a summer program to the building, a scenario where the Project is fully occupied year-round has also been considered. This would prove more favorable to the Proponent and is currently being studied.

The unit cost for the CHP has been estimated to be $340,000 and an installed cost of approximately to be $735,000. These costs do not include the cost savings related to reducing the size of the proposed systems (boilers, etc.). After initial investigation, incentives for a CHP system have been estimated to reduce this cost by $45,000-$60,000, but it is likely that much higher incentives are available. As indicated, the Proponent is currently working with Eversource and DOER to explore the viability and incentives for a CHP system. Please refer to Appendix E for the CHP energy analysis.

The Proponent has found that CHP is likely to be the most feasible alternative energy source measure when considering annual energy and utility savings. The Proponent is strongly committed to continuing to investigate the potential to reduce the payback period and incorporate CHP into the building. The proponent has been advised by CHP specialists that the project is a great case for CHP and is now planning to prepare the building for a CHP system. The building will be constructed "CHP ready" with the appropriate structural support and electrical connections to not preclude the installation of CHP. The Proponent is having the design documents include a placeholder for a CHP so that, should CHP prove to be feasible, the measure could be incorporated as early as initial building construction.

Solar

Solar, or Photovoltaic (PV), panels are comprised of an array of small solar cells that convert sunlight to electricity. The constant and significant improvements in PV technologies are making PV systems lighter and more cost efficient. The Proponent has considered the potential for PV installation on the Building's rooftop and Bicycle storage rooftop. The Bicycle storage rooftop has been ruled out for PV due to shading from the nearby 20 Child Street apartment tower. The shade cast by the building would reduce the PV systems efficiency and cost feasibility. The roof area of the building will be used for a mechanical/electrical penthouse, mechanical equipment (cooling towers, stair pressurization fans, etc.), electrical equipment (generator in sound attenuated enclosure), and stair access from two locations. Much of the Building's rooftop is reserved for these mechanical systems already providing the 21.8 percent energy savings over the baseline code. The southern portion of the penthouse roof was determined as a potential location for PV systems when considering open roof space and the least amount of shading.

The usable roof area was calculated to be 2,431 sf assuming approximately 80 percent of the free roof area is usable for PV. The PV system size has been approximated based on 10 W/SF of URA for a total system size of 24.3 kW. Based on the assumed average cost of $3.1/W in Massachusetts[8], the installed system would have an estimated cost of $75,330.

The system is projected to produce an estimated 27,684 kWh per year, during its first year of operation. This represents approximately 1.2 percent of total anticipated electricity consumption (2,202,755 kWh) of the proposed EFIII building. The PV system would result in a reduction in approximately 10 tons per year of CO_2. The details of this PV analysis are presented in the Appendix E.

The economics of installing a PV system for this Project was calculated using the "Solar Photovoltaic Simple Financial Model" from DOER. The PV system for this project has a calculated Net Present Value of $29,799 and Simple Payback period of 5 years. However, the DOER calculator does not account for shading on the PV system from the nearby structures. Figures showing the building shading on the equinox, summer solstice and winter solstice are presented in Appendix E. Considering shading, it is likely that the efficiency of the system is worse than assumed in the calculator and the payback is longer. This shading would likely also preclude the ability to contract a third-party operator system.

Using the available roof area, PV will provide a very limited amount of energy savings. Since the estimated total energy savings would be less than 2 percent of overall demand, and due to the shaded nature of the roof the Proponent does not anticipate installing a PV system on this Project. If CHP is used, the projected energy savings could be more than 20 times greater than PV's projected energy savings. Therefore, even if there is a positive payback for PV after 5 years, the Proponent is reserving the rooftop for CHP which may become economically sensible based on incentives and higher electricity costs over time.

However, as per the CHP section, the space on the roof will be constructed "solar ready" (as byproduct to being "CHP ready") with the appropriate structural strength and electrical conduits available for a potential future PV installation.

Wind

Wind electricity generation has been considered at this Project location. Since the DEIR, the City of Cambridge has noted that on-site wind energy generation is generally unfavorable in the City. The nearby Museum of Science has conducted extensive testing on wind energy generation with different types of roof-mounted wind turbines in the built environment. The Museum's "Project History and Three-Year Performance Report" presentation indicates that roof-mounted turbines were not cost effective[9]. The Feasibility Study for the project indicates that the most cost effective wind turbine model costs approximately 35 cents per kilowatt-hour (on a 20-year basis)[10]. The Museum of Science paid approximately 12 cents per kilowatt-

[8] http://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/

[9] "Project History and Three-Year Performance Report" Museum of Science-Wind Turbine Lab. September 2014.

[10] "Feasibility Study for Wind Turbine Installations at Museum of Science Boston, MA" Museum of Science and Boreal Renewable Energy Development. October 2006.

hour for utilities at the time of the study, indicating the installation of the turbines would cost 23 cents more per kilowatt-hour.

The study indicated that average wind speeds experienced by the turbines (approximately 3 meters per second) were below the recommended average wind speed of 5 meters per second for energy generation. Based on information noted on the U.S. Department of Energy "WINDExchange" website for Massachusetts[11], this location is estimated to have an average wind speed of 5.5-6.0 meters/second at 80 meters in height. As indicated by the Museum of Science study, this is likely an overestimation that does not account for the built environment. The low average wind speeds further preclude the financial feasibility of wind generation.

This Project will be constructed in a location between the Gilmore Bridge and Route 93 off-ramp in Cambridge, near the Museum of Science. These two adjacent structures will create obstructions to the available space for possible standalone wind electricity generation equipment and disrupt wind flow.

This Project will also be creating a shared pedestrian and bicycle pathway to connect North Point Park and the Charles River with the network of pedestrian and bicycle pathways in the North Point neighborhood. Installing wind generation equipment on the ground at the front of the Project Site would compromise the pedestrian experience by elevating ambient noise, creating a shadow effect and a potential "flickering" effect.

Due to the multiple unfavorable aspects factoring into on-site wind energy feasibility and the disfavor from the City of Cambridge, the Proponent is no longer considering the installation of on-site renewable wind energy.

Solar Thermal

Solar thermal was considered at the Project Site. Solar thermal works in a manner similar to PV systems, except solar energy is used to create heat instead of electricity.

Like Co-Generation, solar thermal works best when there is a consistent annual load that can use the heat produced by the solar thermal panels. Typically, this renewable energy source works best when there is a consistent annual domestic hot water load associated with the building. Solar thermal systems generate the greatest energy during the summer months, when daylight hours are longer compared to the rest of the year. Since the facility may be unoccupied or only partially occupied during the summer months, the effectiveness and financial payback of a solar thermal domestic hot water system would be significantly reduced. If there is not consistent thermal (domestic hot water) load for the solar thermal system during the summer the solar thermal system will not be effective on an annual basis.

Akin to PV systems, solar thermal requires unhindered sunlight to operate at peak efficiency. The placement of a solar thermal system would be in the same place

[11] http://apps2.eere.energy.gov/wind/windexchange/wind_resource_maps.asp?stateab=ma

analyzed for the PV Systems. A solar thermal system on this site would suffer from reduced efficiency due to the shadows cast by nearby structures.

Since the summer domestic hot water load is expected to be significantly reduced and the site will likely be subject to shading, solar thermal is not being considered by the Proponent. The available roof area is being reserved for more feasible potential CHP system.

Water Source Heat Pumps

It does not appear that geothermal heat pumps are cost effective on the Site based on an initial investigation and analysis. The relatively small Site area limits the capacity of geothermal cooling and heating that could be installed. A water source heat pump, tower, and boiler system was investigated as Proposed Option 1 of the Energy Modeling Report in Appendix E. Under this option, the waterside system would be composed of cooling towers with variable speed fans and condensing boilers on a condenser water loop. Residential spaces would be conditioned by zonal water source heat pumps.

The energy modeling of this option shows that approximately 114 more MWh of electricity would be consumed compared to the proposed design while 557 Therms of gas would be saved. This would result in approximately 39 more tons per year of CO_2 emissions than the proposed design. Since the utility costs and GHG for electricity are higher than the costs for natural gas, the increase in electricity consumption outweighs the benefits of the natural gas savings. The system would result in a negative payback, with annual utility costs expected to be $25,237 more than the proposed design. Since the Water Source Heat Pumps are financially infeasible and would result in more GHG emissions, they are not being considered for the Project.

Air Source Heat Pumps / Variable Refrigerant Flow (VRF) System

The Proponent has analyzed the potential for using VRF system in place of the 4-pipe fan coils in the proposed design. A VRF system was chosen over air source heat pumps as it was anticipated to have a greater likelihood of being feasible. VRF systems use refrigerant as both a cooling and heating medium. A VRF system was investigated as Proposed Option 3 of the Energy Modeling Report in Appendix E. Under this option, the waterside system would be composed of condensing boilers. Residential spaces would be conditioned by zonal VRF units.

The energy modeling of this option shows that approximately 7 MWh of electricity and 603 Therms of gas would be saved compared to the proposed design. This would result in approximately 6 tons per year of CO_2 savings relative to the proposed design. However, the VRF system would never result in a payback, with annual utility costs expected to be $11,967 more than the proposed design. Since the utility costs for electricity are higher than the costs for natural gas, the shift in some heating burden from the boilers (running on natural gas) to the VRF system (running on in electricity) results in higher utility costs than the proposed design.

Since the VRF system is financially infeasible, it is not being considered for the Project.

Steam

Veolia Energy runs a steam distribution network located in the high-tech corridor near Harvard University and the Massachusetts Institute of Technology in Kendall Square. This network supplies "green" cogenerated process steam to global leaders in biotechnology and pharmaceuticals. Veolia Energy also operates a cogeneration plant on behalf of a major biotechnology company.

Since the DEIR filing, the Proponent has contacted Veolia Energy in Cambridge to explore the possibility of obtaining Green Steam at the EF III building. Veolia has indicated that it is interested in expanding its steam distribution network into the Northpoint area to service future development. However, Veolia has confirmed that this expansion will not occur before the anticipated construction date of the Project, due to the lack of available energy data for the NorthPoint Development. Additionally, the Proponent is hesitant to position themselves into a potential monopoly situation for steam/energy provision. The proponent and Veolia are currently discussing potential utility contracts that would address these concerns.

As such, the Proponent is not interested in steam energy for the initial operation of the building but is open to a future steam operation should Veolia expand and the conversion prove financially feasible.

Green Power/Renewable Energy Credits

Green power is the specific purchase of electricity from the energy provider that was generated using renewable energy, such as water, solar, wind, or geothermal. The purchase of Green Power has been evaluated although it will depend upon the availability from the energy provider and the final design of the Project. At this point in the Project's design, the Proponent is pursuing CHP as the preferred/optimal renewable energy source for this Project. If a CHP, through the continued feasibility study, is deemed unrealistic then the Proponent will reconsider the purchasing of Renewable Energy Credits (RECs).

On-Site Renewable & Alternative Energy Conclusion

A table summarizing the results of the feasibility studies conducted for the Project is presented in Table 3-4. Based on the energy and payback analysis, cogeneration in the form of combined heat and power is considered the most feasible strategy due to its high annual utility savings and potential payback with additional incentives. The Proponent is strongly committed to continuing to investigate the potential to reduce the payback period and incorporate a CHP into the building. The building will be constructed "CHP ready" with the appropriate structural support and electrical connections to not preclude the installation of a CHP. A CHP system would further reduce the Project's GHG emissions by producing energy on-site and reducing the inefficiencies of energy transmission over the grid.

PV is not being pursued as shadows cast from nearby structures would likely reduce the efficiency of the solar panels. Generating electricity from wind turbines is not likely to be cost-effective per the study by the nearby Museum of Science and the comments from the City of Cambridge. Both water source heat pumps and variable refrigerant flow systems were determined to result in higher annual utility costs relative to the proposed design and would not payback. Solar thermal is not being considered since the roof area competes with the CHP roof area and likely would not be efficient due to shading on the roof.

Table 3-4 Renewable & Alternative Energy Sources and Energy Conservation Measures Feasibility Analysis

Measure	Initial Cost	Available Incentives	Annual Energy Savings Over Design Scenario: Electricity (MWh)	Annual Energy Savings Over Design Scenario: Gas (Therms)	Annual Utility Savings[1]	Payback Period	Notes
CHP/CHCP[2]	$340,000 equipment cost $735,000 Installed	To be determined through continued Eversource incentive negotiations and research	-642	-10,495	$53,161	To be determined with additional incentives investigation	-More feasible if full year hot water demand -High first installation cost -Majority of cost savings is in the gas usage savings, if gas costs increase overall savings could be reduced -Largest potential utility savings -Smaller boilers possible and not included in this cost
Solar: Rooftop PV	$75,361	Federal Depreciation Expense, State solar tax deduction, Federal solar tax credit = ~$55,000 within first five years	27.6	0	$4,002	5 yrs	-Mostly shaded roof and site areas -Limited available roof area -May detract from other more feasible options. -Building roof will be "solar ready", consistent with Cambridge requirements.
Solar: Solar Thermal	Not feasible due to shade from surrounding buildings.						-Mostly Shaded Areas -Limited Available Area -More feasible if full year hot water demand
Passive House Design Components							
5" Under Slab Insulation	$205,538	-	-4.9	-21	($968)	None	-High cost and potential for higher energy consumption for cooling requirements.
1" Wall Insulation	$223,808	-	-2.1	68	$196	>100 years	-High cost with limited energy savings.
6" Roof Insulation	$435,456	-	0	5	$179	>100 years	-High cost with limited energy savings.
Triple Glazed Curtain Wall & Windows	$1,073,340						- Very cost intensive. -Late in design to incorporate needed conservation measures. -Certification is not certain due to quality workmanship requirements. -Intriguing for future projects.
Total Passive House Design	$1,938,142						
Water Source Heat Pumps[3]	N/A	-	-113.8	557	($25,237)	None	-Loss in utility savings compared to Design Scenario -No payback.
Air Source Heat Pumps / Variable Refrigerant Flow[3]	N/A	-	7.3	603	($11,967)	None	-Loss in utility savings compared to Design Scenario -No payback.
District Steam	Not feasible due to lack of infrastructure.						-Expansion into Northpoint seems unlikely by the time the Project is constructed. -With EF as owner and operator, a commitment to future long term cost of the utility is desirable and not available now.
Wind	Not feasible in this area based on recent Museum of Science study.						-Not preferred by City of Cambridge -Museum of Science study found wind in the area not likely to be cost-effective.

1. Assumes utility rates based on recent EF utility bills.
2. Assumes student occupancy for 9 months of the year.
3. See respective sections and Appendix E for details on the additional utility costs when compared to the proposed design.

3.4.7 Mobile Source Emissions Evaluation

Mobile source GHG emissions are based upon the traffic volumes, the distance vehicles travel and GHG emission rates. The mobile source emissions were calculated in the DEIR by performing a mesoscale analysis to evaluate the changes in CO_2 emissions for the existing and future conditions within the traffic study area. The GHG mobile source analysis estimates the area-wide CO_2 emissions from vehicle traffic for a period of one year. Mobile source emissions were calculated by performing an annual GHG emissions mesoscale analysis to evaluate the estimated change in CO_2 emissions for the existing and future conditions within the study area.

Since the filing of the DEIR, the Proponent has amended the Project program. Based on the new FEIR development program, the Project will result in a slight increase in trip generation when compared to the DEIR. This increase in trips is less than 100 vehicles and is considered a minor change relative to the trip generation presented in the DEIR. The resulting capacity analysis shows minor changes in intersection delay due to the updated program with the only the change to LOS from DEIR occurring at the intersection of Monsignor O'Brien Highway (MOB) at Museum Way during the morning peak hour (as seen in *Chapter 2 – Environmental and Transportation Analysis*). Since the updated program does not substantially affect the transportation analysis conducted for the DEIR, no substantial change in air quality from the analysis presented in the DEIR is expected. A summary of the DEIR mobile source emissions analysis is presented herein.

DEIR Mobile Source Emissions Summary

As presented in the DEIR analysis, the 2016 Existing Condition, and 2023 future No-Build and Build Conditions were analyzed. The vehicle miles traveled data used in the air quality analysis were developed based on the traffic data analyzed in the DEIR.

A summary of the projected mobile source GHG emissions from the DEIR is presented in Table 3-5. The mobile source analysis estimated the existing CO_2 emissions to be 12,458 tons per year. The future transportation study included the roadway improvements expected to be implemented as part of the North Point development. Under the No-Build Condition, CO_2 emissions were estimated to be 14,176 tons per year. Under the Build Condition, the CO_2 emissions were estimated to be 14,297 tons per year.

The total Project-related mobile source GHG emissions are expected to be 121 tons per year. The 121 tons per year increase in CO_2 emission represents a 0.9 percent increase in CO_2 emissions for the mesoscale study area for future 2023 conditions.

Table 3-5 Mobile Source CO_2 Emissions Analysis Results (tons per year)

Pollutant	2016 Existing Conditions	2023 No-Build Conditions	2023 Build Conditions	Project-related CO_2 Emissions[1]
Greenhouse Gas (CO_2)	12,458	14,176	14,297	121

1 Represents the difference in CO_2 emissions between the Build and No-Build Conditions.

Proposed Mitigation Measures

The Proponent is committed to implementing a comprehensive TDM program. A full description of the TDM program was detailed in Section 2.6 of the DEIR. Implementation of the TDM program is expected to improve air quality in the study area by promoting the use of alternative forms of transportation over the use of single-occupant motor vehicle (SOV) trips to the Project Site. Although not easily modeled, previous estimates of similar TDM programs in an urban area have ranged on the order of two percent reduction in vehicle miles travelled from the Project generated trips. Assuming a similar relationship to GHG emissions, this would correlate to an approximately two tons of CO_2 per year reduction in mobile source GHG based on estimated Project emissions. This results in a final Project-related CO_2 emissions of 119 tons per year. A summary of the mitigation emissions reduction is seen in Table 3-6.

Table 3-6 Mobile Source CO_2 Emissions Mitigation Analysis Results (tons per year)

Pollutant	Project-Related CO_2 Emissions[1]	Estimated Reductions Due to TDM Measures[2]	Resulting Project-Related CO_2 Emissions
Greenhouse Gas (CO_2)	121	2	119

1 Represents the difference in CO_2 emissions between the 2023 Build and No-Build Conditions
2 Mitigation from TDM Measures estimated as 2 percent of unmitigated Project-related emissions.

3.5 Climate Change Adaptation

As detailed in the EOEEA's 2011 Climate Change Adaptation Report, the Commonwealth's climate is already changing and will continue to do so over the course of this century. This section reviews the time frames for considering future climate conditions, as well as projected changes in temperature, precipitation, and SLR. It also discusses how the Project will prepare for potential increases in flooding and heat.

The Project is expected to be completed in 2019 which will be considered the build year for the purposes of this analysis. Mixed-use buildings like that proposed for the Project are generally expected to have a lifespan of approximately 60 years. Therefore, climate conditions up to around the year 2079 will have an impact on the Project.

The City of Cambridge's Climate Vulnerability Assessment (CCVA) considers three planning horizons: present day, 2030, and 2070, each of which are based on thirty-year averages for temperature and precipitation data. These same planning horizons are used to evaluate the potential impacts of climate change on the Project. The sections below present projections for these time frames.

3.5.1 Temperature

As presented in the CCVA, over the coming century, mean annual and seasonal temperatures in Cambridge are expected to increase. Historically, annual temperature (night + day) averaged around 50°F in Cambridge.

Annual temperature is projected to be around 53°F by 2030s, and as much as around 56-59°F by 2070s, as reported in Table 2. For extreme temperature indicators, days per year with maximum air temperature greater than 90°F and 100°F were used. By 2030s, it is likely that days above 90°F per year will triple and, by 2070s, days above 90°F per year will increase six-fold, with 6-15 days per year above 100 F. Historically, there has been less than 1 day per year above 100°F in the Cambridge region (Table 3-6).

A critical measure for temperature is the heat index, which combines ambient air temperature and relative humidity to determine the "feels-like" or the human-perceived temperature. Heat index is a key indicator for reporting public health concerns since heat index exceeding 91°F is considered to be in the "extreme caution" zone from prolonged exposure to heat or strenuous activity. Historically, average daily summer heat index in Cambridge hovered around 85°F. By the 2030s, summer heat index is projected to average around 95°F, and by the 2070s, it is projected to exceed 100°F for the lower scenario and 115°F for the higher scenario (Table 3-7).

Table 3-7 Temperature Projections

Temperature Changes	Baseline (1971-2000)	2030s (2015-2044)		2070s (2055-2084)	
		Lower	Higher	Lower	Higher
Annual Temperature (°F)	50.0	53.3	53.5	55.8	58.7
Summer Temperature (°F)	70.6	74.5	74.8	77.4	80.6
Winter Temperature (°F)	29.8	32.2	33	34.6	38.0
Days >90°F (days/year)	11	29	31	47	68
Days >95°F (days/year)	<1	2	2	6	16
Heat Index (°F)	85.0	94.8	96.0	101.0	115.5

Source: ATMOS Report, CCVA, October 2013.

To address extreme weather conditions that the City of Cambridge is expected to experience in the future, the Project has been designed to withstand and mitigate for the increase frequency, duration, and intensity of heat events. The existing black asphalt parking lot will be replaced with a pedestrian level environment designed to mitigate for higher temperatures. Landscaping will be designed to provide a comfortable environment with shade trees and evapotranspirative cooling, while also including light colored surfaces and materials to mitigate for radiative heating

The use of native plant materials will minimize the need for irrigation and maintenance, while providing habitats for local fauna. To accommodate any irrigation needs, the Project is proposing stormwater capture and storage for water usage.

3.5.2 Precipitation

As described in the CCVA, annual precipitation is projected to remain fairly constant through the 2030s and increase by approximately 6 to 10 inches or 15-20 percent by the 2070s compared to the historical period. These increases are projected to occur primarily in winter and spring (Table 3-8). Precipitation intensity (a measure of the total annual average amount of precipitation falling per day, defined as total annual precipitation divided by the number of wet days per year) is expected to increase by around 5 percent by the 2030s and 15% by the 2070s. In the future, the projected increase in precipitation intensity is expected to continue, with greater changes by 2070s. The same holds true for the extreme precipitation events.

For the extreme precipitation projection, the City of Cambridge and Boston Water and Sewer Commission collaborated on development of design storm 'values' that take into consideration projected climate change for planning purposes. As shown in Table 3-8, for the 24-hour duration storms, the 25-year storm of today will be the 10-year storm by 2070s, and the 100-year storm of today will be the 25-year storm by 2070s. The recurrence interval for a storm refers to its probability of occurrence. Therefore, a "10-year storm", or a 1-in-10-year storm, is a storm that has a 10 percent probability of its rainfall amount being equaled or exceeded in any given year, a "25-year storm" is one that has a 4 percent annual probability of occurrence and a "100-year storm" is one that has a 1 percent probability of this occurring in any given year.

Table 3-8 Precipitation Projections

Precipitation Changes	Baseline (1971-2000)	2030s (2015-2044)		2070s (2055-2084)	
		Lower	Higher	Lower	Higher
Annual Precipitation (in.)	45.0	48.0	48.0	51.5	54.0
Summer Precipitation (in.)	9.5	9.8	9.8	10.1	10.3
Winter Precipitation (in.)	11.4	12.6	12.7	14.1	15.4
Days/Year >2 in. rain in 24 hrs.	2.0	3.0	3.0	3.0	3.0
Max 5 day precipitation per year (in.)	6.0	6.5	6.6	7.0	7.2
24-hr Design Storms					
10 yr	4.9	5.6		6.4	
25 yr	6.2	7.3		8.2	
100 yr	8.9	10.2		11.7	
48-hr Design Storms					
10 yr	5.5	6.4		7.2	
25 yr	7.0	8.6		9.8	
100 yr	10.0	13.2		15.7	

Source: ATMOS Report, CCVA, October 2013, BWSC Climate Projections

The City of Cambridge has stringent stormwater mitigation requirements for developers to help mitigate the potential for surcharging in the City's stormwater infrastructure. New projects are required to mitigate the 25-year precipitation event in the post-development condition such that runoff peak rates and total volumes are less than that for the 2-year storm in the pre-development condition. Given that the existing Project Site is almost entirely impervious and without stormwater mitigation measures, stormwater conditions will be greatly improved over the existing conditions. The Project will maximize infiltration to the ground to the greatest extent practicable replace impervious cover with absorptive landscaped areas, and explore the use of rainwater capture for use within the building. Landscaping will also be designed to minimize required irrigation, potentially sharing rainwater capture for irrigation use during times of drought. The Proponent will work the CDPW to ensure that stormwater is mitigated appropriately now and under future conditions.

3.5.3 Sea Level Rise

Cambridge is unlikely to be impacted by sea level rise or storm surge in the immediate future due to flood protection from both the Charles River and Amelia Earhart dams. The Project Site is currently located outside of the 'AE Zone' of the FEMA Flood Insurance Rate Map (FIRM) number 25017C0577E, effective June 4, 2010. According to FEMA's Flood Insurance Study (FIS), the base flood elevation (BFE) at the Site is 4.35 feet NAVD88, which is equivalent to 16.01 feet Cambridge City Base (CCB). This elevation is set by the pumping operations of the New Charles River Dam, which was originally designed to prevent damage to the cities of Boston and Cambridge by managed flood elevations. The existing Project Site grade ranges from approximately 21 feet CCB, which is approximately five feet above the current 100-year flood elevation, to 24 feet CCB where the contaminated soil pile will be removed and regraded. See Figure 3.3 for potential site flooding with sea level rise.

However, as the sea rises and coastal storms become stronger, risks will gradually increase to a point where the effectiveness of the dams as barriers diminishes and storm surges are able to flow overland around the dams and eventually overtop them, first with larger flooding events (e.g., the "100-year" or 1 percent probability of flooding), and then gradually over an extended period of time with smaller, more frequent flooding events. For this reason, the City has partnered with MassDOT to create a detailed model of flood impacts that would result from sea level rise and more intense and frequent storm events. The Boston Harbor Flood Risk Model (BH-FRM) is a dynamic model that incorporates local topography, dams, wind action, wave action, storm surge, and sea level rise to provide site specific flood elevations under certain sea level rise levels at specific time periods. The sea level rise data were from the CZM Sea Level Rise Report, which applied local subsidence to national sea level rise projections (see Table 3.9).

The results for 2030 indicate that the risk of storm surge flooding reaching Cambridge is less than 0.1%. This includes risks from both overtopping and flanking of the dams and incorporates factors such as increased river flows from runoff, increased pumping operations at the dams, and the twice-daily tide cycle. The

Proponent has contacted the City of Cambridge to ascertain what flood elevations should be incorporated into the Project design. Given the Project's susceptibility to flooding from both the Mystic and Charles River, Cambridge has recommended that the Proponent design the building to be resilient to the 2070 flood elevation of 23.8 CCB, which is representative of the highest flood model output for the 100-year flood event under 2070 sea level rise conditions, as determined by the dynamic BH-FRM.

The BH-FRM calculates a zero percent probability that the elevation of the 1 percent annual chance flood would inundate the Project Site under the high emission climate change scenario in the year 2030. However, the exceedance probabilities for the 1 percent annual chance flood at the Project Site range from 0 - 5 percent under the 2070 high emissions/2100 intermediate high scenario, with flooding depths of up to 2.0 feet. The topographic data used in this report require confirmation with the ground survey to be used accurately. The report's graphics do conflict with existing topographic data in that there are flooding exceedances shown on the contaminated soil pile, the highest portion of the Project Site, which is likely due to topographic errors in the model.

The elevation of the 100-year FEMA flood elevation downstream of the New Charles River Dam is 5.65 feet higher than upstream of the Dam, at 21.66 CCB. Applying the CZM Report sea level rise scenarios to the downstream flood elevation reveal the potential for flanking and overtopping the Dam, as shown in Table 3-9. This so called 'bath tub model' approach indicates that the Project site will be vulnerable to extreme flooding up to an elevation of 25.58 CCB. This bathtub model does not provide site level detailed information comparable to the BH-FRM dynamic model. Flood pathways, rates of flanking and overtopping, and local topography, prevent the flood elevation at the Project Site from reaching the 25.58 CCB elevation. The BH-FRM includes the required information to accurately depict flood elevations over the lifetime of the Project. For this reason, the BH-FRM flood elevation was used to evaluate mitigating flood risk to the Project.

It is clear that the Site is likely to be impacted by coastal flooding by around the year 2070, even for relatively frequent flooding events. It is not yet clear if the Site may be impacted by a combination of inland and coastal flooding sooner with frequent events. Part 2 of the CCVA will include data crucial to understanding the combined effects of inland flooding and coastal flooding, and will be incorporated into the analysis as Project design progresses.

At this time, the Proponent intends on designing the building finish floor elevation above the predicted 2070 flooding elevation at 23.8 CCB, which is well above the FEMA 100- and 500-year flood elevations. Setting the building above this elevation will make the building operational during expected extreme flooding events for the current building design life. Additional design measures to increase resiliency to sea level rise induced coastal flooding include the following:

- Excluding a building basement floor;
- Raising critical mechanical and life safety infrastructure above the first floor of the building;
- Installing backflow preventers on all sanitary sewer and stormwater infrastructure;
- Using materials resilient to saltwater exterior to the building;
- Installing native/adaptive landscaping resilient to flooding conditions;
- Watertight utility connections into the building; and
- The stormwater management system will retain stormwater on-Site in excess of the required 1-inch precipitation event, through a combination of roof rainwater capture, green infrastructure (i.e., on-Site infiltration, bioretention, extensive landscaping) and subsurface storage/infiltration. This reduction in stormwater provides relief to the existing drainage infrastructure by freeing up capacity in relation to the existing Site conditions.

As depicted in Figure 3.4, additional measures being considered include the installation of movable flood barrier systems, now or in the future, installing a sanitary holding tank to ensure building sanitary sewer operations are not impacted by flood propagation in the public sanitary system, on-Site energy generation, backup generators, and resilient fuel storage. The building first floor will be designed to facilitate recovery from a flooding event that exceeds the current expected flood elevations. In addition, as predicted flooding elevations are updated and realized in the future, the Proponent has the ability to implement additional flood barriers, as required to ensure the viability of the Project for the duration of its design life.

Table 3-9 Flood Elevations

Elevation (CCB)	High Emission Sea Level Rise	Intermediate High Emission Sea Level Rise	Intermediate Low Emission Sea Level Rise	Low Emission Sea Level Rise
Mean Higher High Water (MHHW)	El. +16.42			
FEMA 100-Year Flood Upstream of New Charles River Dam	El. +16.01			
FEMA 100-Year Flood Downstream of New Charles River Dam	El. +21.66			
CZM Report 2075	+3.92′	2.47′	1.21′	0.6′
MHHW + CZM 2075	El. +20.34	El. +18.89	El. +17.63	El. +17.02
FEMA Downstream + CZM 2075	El. +25.58	El. +24.13	El. +22.87	El. +22.26
New Charles River Dam	El. +23.79			
BH-FRM 2070 (Site Estimate)	El. +23.8			
EFIII Building FFE	EL. +24.00			

LEED v4 for BD+C: New Construction and Major Renovation

Project Checklist

Project Name: Education First EFIII

Date: 15-Mar-17

Y = Yes, L = Likely, U = Unlikely, N = No

Y	L	U	N			Points
1				Credit	Integrative Process	1
16	**0**	**0**	**0**		**Location and Transportation**	**16**
			16	Credit	LEED for Neighborhood Development Location	16
1				Credit	Sensitive Land Protection	1
2				Credit	High Priority Site	2
5				Credit	Surrounding Density and Diverse Uses	5
5				Credit	Access to Quality Transit	5
1				Credit	Bicycle Facilities	1
1				Credit	Reduced Parking Footprint	1
1				Credit	Green Vehicles	1
4	**1**	**5**	**0**		**Sustainable Sites**	**10**
Y				Prereq	Construction Activity Pollution Prevention	Required
1				Credit	Site Assessment	1
		2		Credit	Site Development - Protect or Restore Habitat	2
	1			Credit	Open Space	1
		3		Credit	Rainwater Management	3
2				Credit	Heat Island Reduction	2
1				Credit	Light Pollution Reduction	1
6	**2**	**1**	**2**		**Water Efficiency**	**11**
Y				Prereq	Outdoor Water Use Reduction	Required
Y				Prereq	Indoor Water Use Reduction	Required
Y				Prereq	Building-Level Water Metering	Required
2				Credit	Outdoor Water Use Reduction	2
2	1	1	2	Credit	Indoor Water Use Reduction	6
2				Credit	Cooling Tower Water Use	2
	1			Credit	Water Metering	1
10	**6**	**8**	**9**		**Energy and Atmosphere**	**33**
Y				Prereq	Fundamental Commissioning and Verification	Required
Y				Prereq	Minimum Energy Performance	Required
Y				Prereq	Building-Level Energy Metering	Required
Y				Prereq	Fundamental Refrigerant Management	Required
5	1			Credit	Enhanced Commissioning	6
5	1	3	9	Credit	Optimize Energy Performance	18
	1			Credit	Advanced Energy Metering	1
		2		Credit	Demand Response	2
		3		Credit	Renewable Energy Production	3
	1			Credit	Enhanced Refrigerant Management	1
	2			Credit	Green Power and Carbon Offsets	2
2	**4**	**2**	**5**		**Materials and Resources**	**13**
Y				Prereq	Storage and Collection of Recyclables	Required
Y				Prereq	Construction and Demolition Waste Management Planning	Required
	3		2	Credit	Building Life-Cycle Impact Reduction	5
	1		1	Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
		1	1	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
		1	1	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2				Credit	Construction and Demolition Waste Management	2
3	**3**	**8**	**2**		**Indoor Environmental Quality**	**16**
Y				Prereq	Minimum Indoor Air Quality Performance	Required
Y				Prereq	Environmental Tobacco Smoke Control	Required
1		1		Credit	Enhanced Indoor Air Quality Strategies	2
	1	1		Credit	Low-Emitting Materials	3
1				Credit	Construction Indoor Air Quality Management Plan	1
		2		Credit	Indoor Air Quality Assessment	2
1				Credit	Thermal Comfort	1
	1	1		Credit	Interior Lighting	2
		3		Credit	Daylight	3
	1			Credit	Quality Views	1
			1	Credit	Acoustic Performance	1
6	**0**	**0**	**0**		**Innovation**	**6**
1				Credit	Innovation Catalog: Green Building Education	1
1				Credit	Innovation Catalog: LEED O+M Starter Kit (2 measures)	1
1				Credit	Exemplary Performance: Reduced Parking Footprint	1
1				Credit	Exemplary Performance: Access to Quality Transit	1
1				Credit	Innovation TBD	1
1				Credit	LEED Accredited Professional	1
2	**1**	**1**	**0**		**Regional Priority**	**4**
0				Credit	Renewable Energy Production≥2 points	1
1				Credit	Cooling Tower	1
				Credit	Optimize Energy Performance ≥8 points	1
1				Credit	High Priority Site ≥2points	1
		1		Credit	Rainwater Management≥2 points	1
0	1			Credit	Building life-cycle impact reduction≥2 points	1
50	**17**	**25**	**18**		**TOTALS** — Possible Points:	**110**

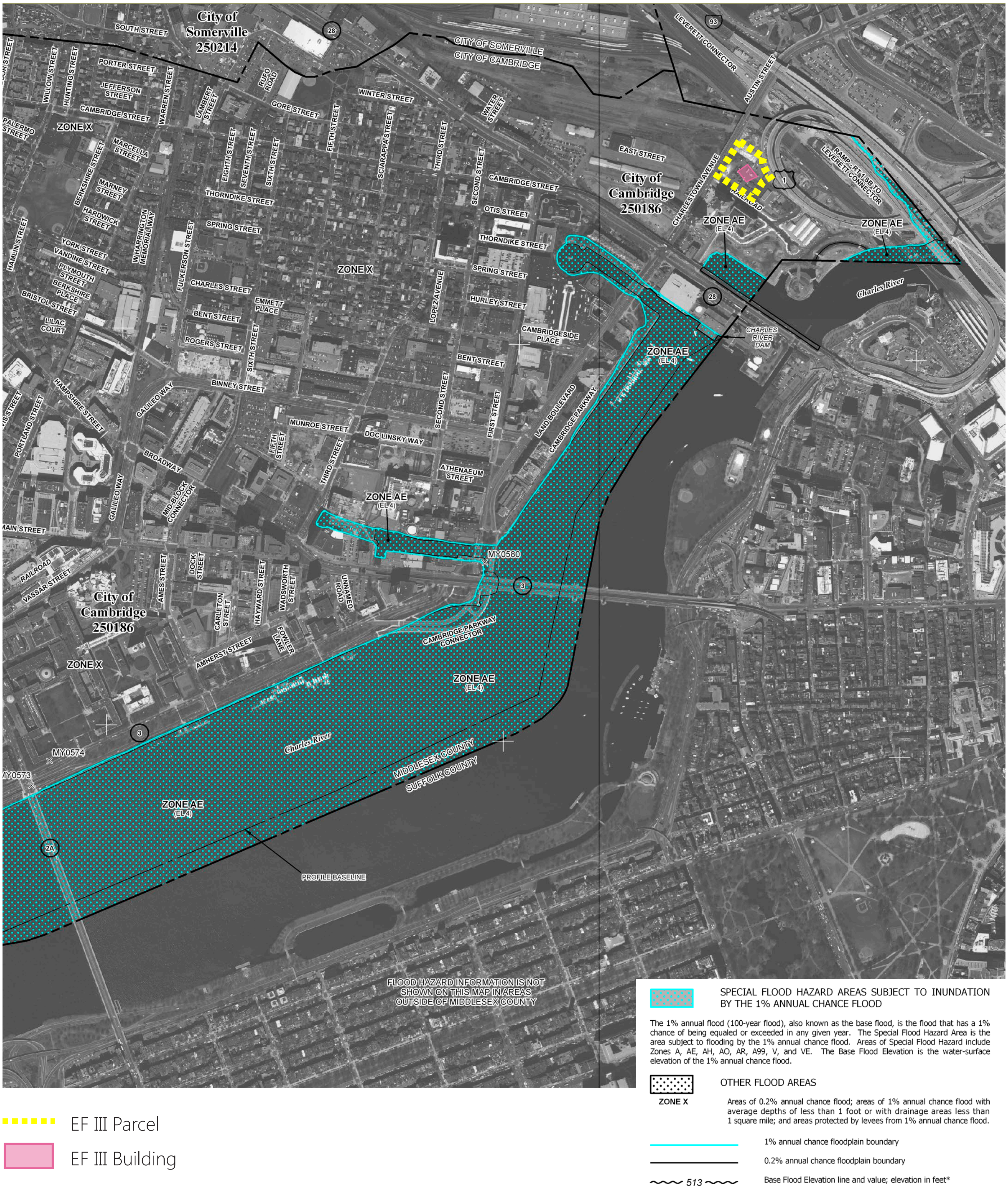
Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Source: Wilson Architects

Figure 3.1

LEED Checklist

EF Education First III
Cambridge, Massachusetts



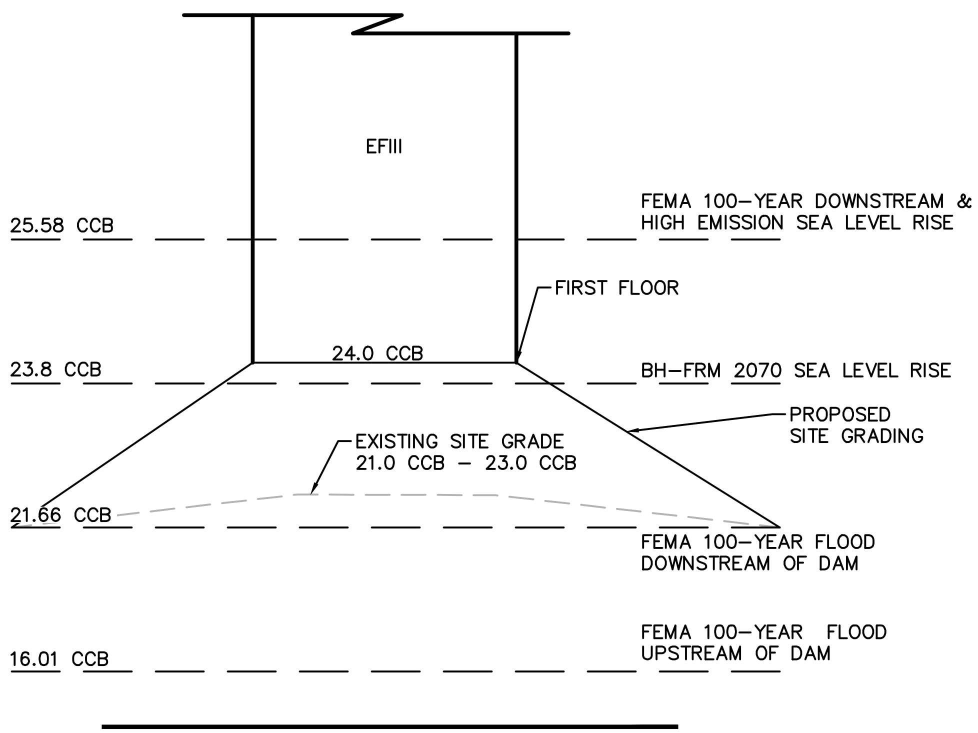
Source: National Flood Insurance Program

Note: This graphic is a modified version of the FEMA Flood Insurance Rate Map #25017C0577E, Panel 577 of 656, effective June 4, 2010

Figure 3.2

FIRM Flood Insurance Rate Map, Cambridge & Somerville

EF Education First III
Cambridge, Massachusetts



Section A-A'

N.T.S.

Source: VHB

0 30 60 120 Feet

EXISTING SITE BELOW 23.80 CCB

PROPOSED SITE BELOW 23.80 CCB

NOTE: THE 100-YEAR FLOOD EVENT W/ SEA LEVEL RISE IN 2070 IS PROJECTED TO FLOOD UP TO ELEVATION 23.80 CCB, ACCORDING TO THE CAMBRIDGE DEPARTMENT OF PUBLIC WORKS

Figure 3.3

Potential Site Flooding w/ Sea Level Rise

EF Education First III DEIR
Cambridge, Massachusetts

A: Flood Log

Source: Flood Panel

B: Flood Log

Source: Flood Panel

THESE PHOTOS REPRESENT DIFFERENT MEASURES THAT COULD BE EMPLOYED FOR PROTECTION. THE PRODUCT SHOWN IN A AND B REQUIRES A SMALL AMOUNT OF PERMANENT EQUIPMENT TO ACCEPT TEMPORARY BARRIERS. ITEMS C AND D ARE MORE TEMPORARY.

C: Portadam

Source: Portadam

D: Aquafence Flood Barrier System

Source: AquaFence

Figure 3.4

Potential Flood Control Measures

EF Education First III
Cambridge, Massachusetts

City of Cambridge
Executive Department

LOUIS DePASQUALE
City Manager

LISA C. PETERSON
Deputy City Manager

January 20, 2017

Matthew A. Beaton
Secretary of Energy and Environmental Affairs
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Alex Strysky, EEA No. 15293
100 Cambridge Street, Suite 900
Boston MA 02114

Dear Secretary Beaton:

The City of Cambridge submits the attached comments on the Draft EIR for the EF Education First Expansion Projection at North Point. Our comments are intended to address the anticipated impacts to ensure that Cambridge can reap the benefits of the development while ensuring that the community's quality of life and environment are protected. The City has had a positive working relationship with EF on their previous projects and expects to continue working cooperatively with EF on this proposed project, which will help EF achieve their goals while at the same time provide public benefits, such as public open space and multi-modal transportation improvements. The City will continue to work with EF during the local development review process.

If your agency has any questions about the comments, please contact John Bolduc of my staff at jbolduc@cambridgema.gov or 617-349-4628. We appreciate your consideration of these comments.

Yours very truly,

Louis A. DePasquale
City Manager

City of Cambridge

Comments on Draft Environmental Impact Report

EOEEA No. 15293
EF Education First Expansion Project at North Point

Urban Design & Transportation

The City provides the following comments and questions regarding the proposed site plan, and its connections to the broader transportation networks, such as the multi-use paths, and the proposed automobile and bicycle parking plans/management trip generation.

Urban Design

- The site design should carefully consider each of the site's interfaces and constraints, and provide ways to enhance the pedestrian environment and streetscape activity.
- The proposed building layout should consider opportunities to engage more directly with and reinforce North Point Boulevard as a key visual and physical connection.
- The location and design of the driveway should be reviewed to determine if it maximizes the quantity and quality of open space, and improves the streetscape experience between the nearby North Point development and North Point Park, which is compromised by Gilmore Bridge.
- To improve the quality of open space being provided the project should study options to soften and improve the attractiveness of the space under the Gilmore Bridge.

Site Plan/Transportation Connections

- It would useful for the proponent to provide more detailed information on the alternative site plan layouts that were considered; the pros and cons of each, and why the proposed site plan is the preferred version, especially regarding cars, trucks/loading/service, cyclists and pedestrian access. Was there a site plan alternative considered that extended Museum Way northward into a 4-way intersection, instead of having the site driveway located off of North Point Boulevard?
- The site plan should more clearly show the locations of doorways and bicycle connections/paths/doorways.
- The project should provide more detailed site plans for the site frontage on North Point Boulevard, including existing and proposed sidewalk widths, driveways, curb use regulations, landscaping, and multiuse path connections.
- The plan should be consistent with the New Charles River Basin Master Plan. This includes a multiuse path that connects on the back side of the site parallel with North Point Boulevard and lines up the connection from the Brian P. Murphy Memorial Stairway to the Skate Park more directly. There is an existing multi-use path behind EF II and the MWRA site that could connect to the Brian P. Murphy Memorial Stairway. This

should be incorporated into the plans, or a clear rationale made for why an alternate is being provided. For any alternative to be acceptable, it needs to be demonstrated that it will meet or exceed the performance of the original planned path.

- The design of the multi-use path in front along North Point Blvd will be important to ensure robust connections while avoiding potential conflicts with crossing vehicles and pedestrians.
- It would be helpful to have additional details showing connections to the existing and proposed multi-use paths in a broad context area (in more detailed site plans) and includes points such as the Brian P. Murphy Memorial Stairway and Orange Line, to North Bank Bridge, Somerville Community Path, etc.
- The DEIR should provide more detailed information about the EF shuttle service (i.e. schedule, routes, stops, ridership, etc.). The proponent should evaluate membership in the EZRide shuttle and providing free shuttle access to residents as an alternative to running a separate shuttle.
- The Inlet Bridge, included in the New Charles River Basin Masterplan, should be identified on the plans, and its status documented.
- Because the EF III project will be adjacent to the Gilmore Bridge, it would be useful for more information (i.e. ground level site plan) to be provided for the area below the Gilmore Bridge, including property ownership, easements, driveway for Twenty/20 Residences, bridge footings/columns, utilities, etc.). The information may be relevant to potential EF II site connections to the Brian P. Murphy Memorial Stairway as well as better understand how much space there is between the bridge and proposed site driveway.

Automobile Parking

- Additional information, data and analysis should be provided for the overall EF Campus parking supply and demand and how the proposed number of parking spaces for EF III is appropriate, such as how it matches the EF Campus and project's mode share goals.
- The proponent should describe in more detail how the automobile parking will be managed. For example, will parking be provided only to EF employees or also be available for users of the public facilities at the building?

Bicycle Parking

- Short-term and long-term bicycle parking layout plans should be shown in more detailed plans, such as 1":10' scale plans. The design of the bike shed and short term bike parking should be integrated with the architecture of the proposed building or the open space design.
- The proponent should explain more clearly the use of the long-term bicycle parking and how it will meet City zoning requirements as well as the public access to long-term bicycle parking. We

- More detailed plans should be provided showing exactly how cyclists will access the secure Bike shed from North Point Boulevard. For example, will cyclists be expected to share the driveway with vehicles?

Trip Generation

- It was unclear why the estimated Trip Generation was based on a "weighted average" mode share instead of calculating the trip generation for each user group separately (i.e. Employee/Staff/Faculty, Students, Public users of building) and then adding them together. This trip generation by user group may be important to evaluate parking demands by the various user groups too.
- The proponent should compare and discuss the existing AM and PM driveway counts at the EF II building parking garage with the proposed EF III building parking garage.
- In Figure 2.6 (2016 Existing Conditions. Pedestrian Volumes Morning Peak hour) it was unclear at the North Point Blvd/Education Street intersection if any pedestrians crossed the intersection diagonally? The diagram shows no pedestrians crossing the intersection diagonally but that seems unlikely given the desire line between the EF I and EF II buildings. The data should be verified or clarified.

Sustainability & Resilience

- Regarding energy modeling, we appreciate the complexity involved with meeting the state energy standards and local green building standards. The City finds it preferable to see modeling based on what the requirements the project will have to meet, which in Cambridge is the recently adopted upgrade to the Stretch Energy Code, or about 10% better than ASHRAE 90.1 – 2013. If the proponent is going to continue using the ASHRAE 90.1-2010 base case, it would be very useful if the proponent would provide a side-by-side comparison of the base case with the new Stretch Energy Code and the LEED version 4 requirements.
- The DEIR states the project will demonstrate a 12-15 percent energy savings over the base condition using ASHRAE 90.1-2010. The City believes this will fall short of the Stretch Energy Code requirement. It appears the project will need to do better to meet the minimum energy efficiency requirement. The City encourages the proponent to go beyond the minimum in the final design.
- The DEIR indicates the project is aiming for certifiability at the LEED Silver level. This is a very modest goal. The City is currently working toward amending the Zoning Ordinance to require LEED Gold for projects needing special permits. The Net Zero Action Plan adopted by the City in 2015 recommends that new development meet LEED Gold and achieve a minimum of 6 energy points and this standard is being met by other projects currently going through permitting in Cambridge.
- As described on pages 3-8 and 3-9, it appears the building envelope is just meeting minimum standards for energy efficiency. We encourage the proponent to employ cost-

effective strategies to improve energy performance and reduce greenhouse gas emissions.

- We note that this building will be subject to the City's Building Energy Use Disclosure Ordinance. The building will be required to benchmark energy and water usage in Energy Star Portfolio Manager and report the results to the City. Under the ordinance, the City posts this data on its website to enable real estate stakeholders to compare energy performance.
- The City adopted the Net Zero Action Plan (http://www.cambridgema.gov/netzero) in 2015, which serves as a roadmap for how Cambridge will achieve net zero greenhouse gas emissions from building operations by 2050. As part of the City's review, the project will be asked to describe a pathway to net zero emissions for the building in the future whereby the proposed design will not preclude retrofitting or conversion to building systems that eliminate fossil fuel use and greenhouse gas emissions. Projects are also expected to be at least "solar ready" for rooftop solar energy installations and have cool roofs.
- The DEIR indicates that the proponent does not wish to pursue a solar PV system because the installation has an estimated payback of 6 years, which exceeds the proponent's internal goal of achieving paybacks of 3 to 5 years. The cost estimate is based on an assumed installation cost of $4.48/watt. We believe this cost factor is too high, particularly for a new development. In addition, it appears the DEIR does not account for financial incentives in terms of RECs and tax credits. There is also the possibility of using a power purchase agreement (PPA) with a third party installer. The proponent should re-visit this measure based on more realistic installation costs that account for incentives as well as the PPA option. The analysis also considered available roof space. The planned penthouse would occupy an estimated 11,000 square feet which the DEIR assumes would not be available for solar PV. The proponent should evaluate structural enhancements to enable the space over the penthouse to be used for solar, which could allow a larger system.
- The DEIR notes that vertical helix wind turbines are being considered. While wind turbines are a desirable technology, we note that Cambridge has generally unfavorable wind conditions for energy production. The nearby Museum of Science conducted extensive wind testing before installing the various turbines on its roof. They found that the wind conditions were insufficient for the turbines to be financially cost effective. Their turbines were installed for educational purposes. It should be possible to consult with the Museum to help inform the proponent's decision, but we believe solar PV is a better approach to renewable energy generation at this location If visibility of the project's renewable energy generation is a consideration a screen can be installed in the building lobby to visualize the production levels and environmental benefits of the system.
- The DEIR indicates that the Veolia district steam system's distribution system does not reach the project site and that in the past Veolia has indicated it is not interested in extending their system. The proponent should contact Veolia to determine if this is still the case. The City has been informed that Veolia is interested in serving the North Point

area. The City will ask the proponent as part of its review process to assess the feasibility of using district energy.

- In regard to climate change resilience, the project has referenced the Cambridge Climate Change Vulnerability Assessment and the DEIR incorporates the 2030 and 2070 climate change projections. In terms of addressing heat vulnerability, it would be helpful if the proponent would describe in more detail how the urban heat island effect will be mitigated (e.g., change in land cover from pavement to more reflective surfaces; amount of vegetated surface) in before and after terms. Also, the proponent should specify that the building will have operable windows. This will be an important resilience measure as temperatures rise and will help protect occupants in the event that electricity supply is interrupted and air conditioning becomes unavailable.
- Regarding sea level rise and storm surges, the DEIR incorrectly states that the SLR modeling is unavailable for Cambridge. The modeling has been completed, only the CCVA Report Part 2 is yet to be issued, which will be released shortly. Nevertheless, the proponent has consulted the Boston Harbor Flood Risk Model, which is the same model Cambridge is using. So that is the proper source of SLR/storm surge data. And the Public Works Department has provided a design elevation based on the 2070 storm surge risk. The proposed resilience measures, including raising the first floor above 23.8 feet CCB, make sense. The DEIR notes that there are some inconsistencies in topographic information for the site. It would be useful to resolve this issue to ensure that the assumed elevations are correct.