DEPARTMENT OF PLANNING, BUILDING AND CODE ENFORCEMENT

Purpose of the Compliance Checklist

In 2020, the City adopted a Greenhouse Gas Reduction Strategy (GHGRS) that outlines the actions the City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions for the interim target year 2030. The purpose of the Greenhouse Gas Reduction Strategy Compliance Checklist (Checklist) is to:

- Implement GHG reduction strategies from the 2030 GHGRS to new development projects.
- Provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).

The 2030 GHGRS presents the City's comprehensive path to reduce GHG emissions to achieve the 2030 reduction target, based on SB 32, BAAQMD, and OPR. Additionally, the 2030 GHGRS leverages other important City plans and policies; including the General Plan, Climate Smart San José, and the City Municipal Code in identifying reductions strategies that achieve the City's target. CEQA Guidelines Section 15183.5 allows for public agencies to analyze and mitigate GHG emissions as part of a larger plan for the reduction of greenhouse gases. Accordingly, the City of San José's 2030 GHGRS represents San José's qualified climate action plan in compliance with CEQA.

As described in the 2030 GHGRS, these GHG reductions will occur through a combination of City initiatives in various plans and policies and will provide reductions from both existing and new developments. This Compliance Checklist specifically applies to proposed discretionary projects that require environmental review pursuant to CEQA. Therefore, the Checklist is a critical implementation tool in the City's overall strategy to reduce GHG emissions. Implementation of applicable reduction actions in new development projects will help the City achieve incremental reductions toward its target. Per the 2030 GHGRS, the City will monitor strategy implementation and make updates, as necessary, to maintain an appropriate trajectory to the 2030 GHG target.

Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the GHGRS.

Instructions for Compliance Checklist

Applicants shall complete the following sections to demonstrate conformance with the City of San José 2030 Greenhouse Gas Reduction Strategy for the proposed project. All projects must complete Section A. General Plan Policy Conformance and Section B. Greenhouse Gas Reduction Strategies. Projects that propose alternative GHG mitigation measures must also complete Section C. Alternative Project Measures and Additional GHG Reductions.

A. General Plan Policy Compliance

Projects need to demonstrate consistency with the Envision San José 2040 General Plan's relevant policies for Land Use & Design, Transportation, Green Building, and Water Conservation, enumerated in Table A. All applicants shall complete the following steps.

1. Complete Table A, Item #1 to demonstrate the project's consistency with the General Plan Land Use and Circulation Diagram.

2. Complete Table A, Items #2 through #4 to demonstrate the project's consistency with General Plan policies[1] related to green building; pedestrian, bicycle & transit site design; and water conservation and urban forestry, as applicable. For each policy listed, mark the relevant yes/no check boxes to indicate project consistency, and provide a qualitative description of how the policy is implemented in the proposed project or why the policy is not applicable to the proposed project. Qualitative descriptions can be included in Table A or provided as separate attachments. This explanation will provide the basis for analysis in the CEQA document.

B. Greenhouse Gas Reduction Strategies

Table B identifies the GHGRS strategies and recommended consistency options. Projects need to demonstrate consistency with the GHGRS reduction strategies listed in Table B or document why the strategies are not applicable or are infeasible. The corresponding GHGRS strategies are indicated in the table to provide additional context, with the full text of the strategies preceding Table B.

Residential projects must complete Table B, Part 1 and 2; Non-residential projects must complete Table B, Part 2 only. All applicants shall complete the following steps for Table B.

1. Review the project consistency options described in the column titled 'GHGRS Strategy and Consistency Options'.

2. Use the check boxes in the column titled "Project Conformance" to indicate if the strategy is 'Proposed', 'Not Applicable', 'Not Feasible', or if there is an 'Alternative Measure Proposed'.

[1] The lists in items # 2-4 do not represent all General Plan policies but allow projects to demonstrate consistency and achievement of policies that are related to quantified reduction estimates in the 2030 GHGRS.

3. Provide a qualitative analysis of the proposed project's compliance with the GHGRS strategies in the column titled "Description of Project Measure". This will be the basis for CEQA analysis to demonstrate compliance with the 2030 GHGRS and by extension, with SB 32. The qualitative analysis should provide:

    a. A description of which consistency options are included as part of the proposed project, or

    b. A description of why the strategy is not applicable to the proposed project, or

    c. A description of why the consistency options are infeasible. If applicants select 'Not Feasible' or 'Alternative Measure Proposed', they must complete Table C to document what alternative project measures will be implemented to achieve a similar level of greenhouse gas reduction and how those reduction estimates were calculated.

C. Alternative Project Measures and Additional GHG Reductions

Projects that propose alternative GHG mitigation measures to those identified in Table B or propose to include additional GHG mitigation measures beyond those described in Tables A and B, shall provide a summary explanation of the proposed measures and demonstrate efficiency or greenhouse gas reductions achievable though the proposed measures. Documentation for these alternative or additional project measures shall be documented in Table C. Any applicants who select 'Not Feasible' or 'Alternative Measure Proposed' in Table B must complete the following steps for Table C.

1. In the column titled "Description of Proposed Measure" provide a qualitative description of what measure will be implemented, why it is proposed, and how it will reduce GHG emissions.

2. In the column titled "Description of GHG Reduction Estimate" demonstrate how the alternative project measure would achieve the same or greater level of greenhouse gas reductions as the GHGRS strategy it replaces. Documentation or calculation files can be attached separately.

3. In the column titled "Proposed Measure Implementation" identify how the measure will be implemented: incorporated as part of the project design or as an additional measure that is not part of the project (e.g., purchase of carbon offsets).

Compliance Checklist

Evaluation of Project Conformance with the 2030 Greenhouse Gas Reduction Strategy

Table A: General Plan Consistency

Development Type: ☒ Commercial ☐ Residential ☒ Office ☐ Other: Specify

1) Consistency with the Land Use/Transportation Diagram (Land Use and Density)	Yes	No
Is the proposed Project consistent with the Land Use/Transportation Diagram?	☒	☐
If not, and the proposed project includes a General Plan Amendment, does the proposed amendment decrease GHG emissions (in absolute terms or per capita, per employee, per service population) below the level assumed in the GHGRS based on the existing planned land use? (The project could have a higher density, mix of uses, or other features that would reduce GHG emissions compared to the planned land use).[2]	☐	☐
If not, would the proposed project and the General Plan Amendment increase GHG emissions (in absolute terms or per capita, per employee, per service population)? Project is not consistent with GHGRS and further modeling will be required to determine if additional mitigation measures are necessary.	☐	☐

Response documentation: *[Either here or as an attachment]*

[2] For example, a General Plan Amendment to change use from single-family residential to multi-family residential or a General Plan Amendment to change the use from regional-serving commercial to mixed-use urban in a transit-served area might reduce travel demand, and therefore GHG emissions from mobile sources.

2) *Implementation of Green Building Measures*	Yes	No
***MS-2.2**: Encourage maximized use of on-site generation of renewable energy for all new and existing buildings.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] PV to be implemented on the roof of the building. See Atelier Ten's 50% DD report.		
***MS-2.3**: Encourage consideration of solar orientation, including building placement, landscaping, design and construction techniques for new construction to minimize energy consumption.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Extensive landscaping and vertical louvers have been incorporated onto the facade to reduce direct solar radiation thus reducing overall cooling needs of the building.See Atelier Ten's 50% DD report.		
***MS-2.7**: Encourage the installation of solar panels or other clean energy power generation sources over parking areas.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Parking is underground but solar panels will be incorporated on the roof of the building.		
***MS-2.11**: Require new development to incorporate green building practices, including those required by the Green Building Ordinance. Specifically, target reduced energy use through construction techniques (e.g., design of building envelopes and systems to maximize energy performance), through architectural design (e.g., design to maximize cross ventilation and interior daylight) and through site design techniques (e.g., orienting buildings on sites to maximize the effectiveness of passive solar design).*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Low carbon passive design is not an accessory to the building; it is inherent to the building and shaped early decisions about its massing and planning. Core design features of the project include the 'green lung' and outdoor terraces which provide perimeter envelope access for majority of the office space. Additionally, operable windows will be controlled to deliver natural ventilation and passive cooling. Further analysis and quantification of the energy benefits of natural ventilation are in the 50% DD Appendix.		
***MS-16.2**: Promote neighborhood-based distributed clean/renewable energy generation to improve local energy security and to reduce the amount of energy wasted in transmitting electricity over long distances.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Solar panels are incorporated onto the roof to improve energy security. All exccess power generated will be sent back to the grid for distribution.		

3) Pedestrian, Bicycle & Transit Site Design Measures	**Yes**	**No**
***CD-2.1**: Promote the Circulation Goals and Policies in the Envision San José 2040 General Plan. Create streets that promote pedestrian and bicycle transportation by following applicable goals and policies in the Circulation section of the Envision San José 2040 General Plan.*		
a) Design the street network for its safe shared use by pedestrians, bicyclists, and vehicles. Include elements that increase driver awareness.	☑	☐
b) Create a comfortable and safe pedestrian environment by implementing wider sidewalks, shade structures, attractive street furniture, street trees, reduced traffic speeds, pedestrian-oriented lighting, mid-block pedestrian crossings, pedestrian-activated crossing lights, bulb-outs and curb extensions at intersections, and on-street parking that buffers pedestrians from vehicles.	☑	☐
c) Consider support for reduced parking requirements, alternative parking arrangements, and Transportation Demand Management strategies to reduce area dedicated to parking and increase area dedicated to employment, housing, parks, public art, or other amenities. Encourage de-coupled parking to ensure that the value and cost of parking are considered in real estate and business transactions.	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] The streets adjacent to the project site, including Park Avenue, Almaden Boulevard, San Carlos Street, and Market Street, have sidewalks that are a minimum of 10ft wide on both sides of the street.		
***CD-2.5**: Integrate Green Building Goals and Policies of the Envision San José 2040 General Plan into site design to create healthful environments. Consider factors such as shaded parking areas, pedestrian connections, minimization of impervious surfaces, incorporation of stormwater treatment measures, appropriate building orientations, etc.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment]		

	Yes	No
***CD-2.11**: Within the Downtown and Urban Village Overlay areas, consistent with the minimum density requirements of the pertaining Land Use/Transportation Diagram designation, avoid the construction of surface parking lots except as an interim use, so that long-term development of the site will result in a cohesive urban form. In these areas, whenever possible, use structured parking, rather than surface parking, to fulfill parking requirements. Encourage the incorporation of alternative uses, such as parks, above parking structures.*	☐	☐
Not applicable	☒	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] No above ground parking is being implemented.		
***CD-3.2**: Prioritize pedestrian and bicycle connections to transit, community facilities (including schools), commercial areas, and other areas serving daily needs. Ensure that the design of new facilities can accommodate significant anticipated future increases in bicycle and pedestrian activity.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Long and short term bicycle storage to be provided, as well as on-site shower and changing facilities.		
***CD-3.4**: Encourage pedestrian cross-access connections between adjacent properties and require pedestrian and bicycle connections to streets and other public spaces, with particular attention and priority given to providing convenient access to transit facilities. Provide pedestrian and vehicular connections with cross-access easements within and between new and existing developments to encourage walking and minimize interruptions by parking areas and curb cuts.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment]		
***LU-3.5**: Balance the need for parking to support a thriving Downtown with the need to minimize the impacts of parking upon a vibrant pedestrian and transit oriented urban environment. Provide for the needs of bicyclists and pedestrians, including adequate bicycle parking areas and design measures to promote bicyclist and pedestrian safety.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Long and short term bicycle storage to be provided, as well as on-site shower and changing facilities.		

	Yes	No
TR-2.8: *Require new development to provide on-site facilities such as bicycle storage and showers, provide connections to existing and planned facilities, dedicate land to expand existing facilities or provide new facilities such as sidewalks and/or bicycle lanes/paths, or share in the cost of improvements.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Long and short term bicycle storage to be provided, as well as on-site shower and changing facilities.		
TR-7.1: *Require large employers to develop TDM programs to reduce the vehicle trips and vehicle miles generated by their employees through the use of shuttles, provision for car-sharing, bicycle sharing, carpool, parking strategies, transit incentives and other measures.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] TDM report to be submitted once complete which outlines how the project is consistent with the items above.		
TR-8.5: *Promote participation in car share programs to minimize the need for parking spaces in new and existing development.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] Car share parking spots to be accommodated on-site.		

4) Water Conservation and Urban Forestry Measures	Yes	No
MS-3.1*: Require water-efficient landscaping, which conforms to the State's Model Water Efficient Landscape Ordinance, for all new commercial, institutional, industrial and developer-installed residential development unless for recreation needs or other area functions.*	☑	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] An on-site black water treatment system is proposed for the project to provide non-potable recycled water for irrigation, flushing and mechanical applications.		

	Yes	No
***MS-3.2**: Promote the use of green building technology or techniques that can help reduce the depletion of the City's potable water supply, as building codes permit. For example, promote the use of captured rainwater, graywater, or recycled water as the preferred source for non-potable water needs such as irrigation and building cooling, consistent with Building Codes or other regulations.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] An on-site black water treatment system is proposed for the project to provide non-potable recycled water for irrigation, flushing and mechanical applications.		
***MS-19.4**: Require the use of recycled water wherever feasible and cost-effective to serve existing and new development.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] An on-site black water treatment system is proposed for the project to provide non-potable recycled water for irrigation, flushing and mechanical applications.		
***MS-21.3**: Ensure that San José's Community Forest is comprised of species that have low water requirements and are well adapted to its Mediterranean climate. Select and plant diverse species to prevent monocultures that are vulnerable to pest invasions. Furthermore, consider the appropriate placement of tree species and their lifespan to ensure the perpetuation of the Community Forest.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment] The landscape design is still being developed but all species will have low water requirements and be adapted to the Mediterranean climate.		
***MS-26.1**: As a condition of new development, require the planting and maintenance of both street trees and trees on private property to achieve a level of tree coverage in compliance with and that implements City laws, policies or guidelines.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment]		

	Yes	No
***ER-8.7**: Encourage stormwater reuse for beneficial uses in existing infrastructure and future development through the installation of rain barrels, cisterns, or other water storage and reuse facilities.*	☒	☐
Not applicable	☐	☐
Describe how the project is consistent or why the measure is not applicable. [Either here or as an attachment]		

GHGRS Strategies

GHGRS #1: The City will implement the San José Clean Energy program to provide residents and businesses access to cleaner energy at competitive rates.

GHGRS #2: The City will implement its building reach code ordinance (adopted September 2019) and its prohibition of natural gas infrastructure ordinance (adopted October 2019) to guide the city's new construction toward zero net carbon (ZNC) buildings.

GHGRS #3: The City will expand development of rooftop solar energy through the provision of technical assistance and supportive financial incentives to make progress toward the Climate Smart San José goal of becoming a one-gigawatt solar city.

GHGRS #4: The City will support a transition to building decarbonization through increased efficiency improvements in the existing building stock and reduced use of natural gas appliances and equipment.

GHGRS #5: As an expansion to Climate Smart San José, the City will update its Zero Waste Strategic Plan and reassess zero waste strategies. Throughout the development of the update, the City will continue to divert 90 percent of waste away from landfills through source reduction, recycling, food recovery and composting, and other strategies.

GHGRS #6: The City will continue to be a partner in the Caltrain Modernization Project to enhance local transit opportunities while simultaneously improving the city's air quality.

GHGRS #7: The City will expand its water conservation efforts to achieve and sustain long-term per capita reductions that ensure a reliable water supply with a changing climate, through regional partnerships, sustainable landscape designs, green infrastructure, and water-efficient technology and systems.

Table B: 2030 Greenhouse Gas Reduction Strategy Compliance

GHGRS Strategy and Consistency Options	Description of Project Measure	Project Conformance
PART 1: RESIDENTIAL PROJECTS ONLY		
Zero Net Carbon Residential Construction 1. Achieve/exceed the City's Reach Code, and 2. Exclude natural gas infrastructure in new construction, or 3. Install on-site renewable energy systems or participate in a community solar program to offset 100% of the project's estimated energy demand, or 4. Participate in San José Clean Energy at the Total Green level (i.e., 100% carbon-free electricity) for electricity accounts associated with the project until which time SJCE achieves 100% carbon-free electricity for all accounts. **Supports Strategies**: GHGRS #1, GHGRS #2, GHGRS #3	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☐ Proposed ☒ Not Applicable ☐ Not Feasible* ☐ Alternative Measure Proposed ** The 2030 GHGRS assumed this strategy would be feasible for 50% of residential units constructed between 2020 and 2030.*
PART 2: RESIDENTIAL AND NON-RESIDENTIAL PROJECTS		
Renewable Energy Development 1. Install solar panels, solar hot water, or other clean energy power generation sources on development sites, or 2. Participate in community solar programs to support development of renewable energy in the community, or 3. Participate in San José Clean Energy at the Total Green level (i.e., 100% carbon-free electricity) for electricity accounts associated with the project. **Supports Strategies**: GHGRS #1, GHGRS #3	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☐ See Part 1 (Residential projects only) ☒ Proposed ☐ Not Applicable ☐ Not Feasible ☐ Alternative Measure Proposed

ALL PROPOSED METHODS HAVE BEEN HIGHLIGHTED

GHGRS Strategy and Consistency Options	Description of Project Measure	Project Conformance
Building Retrofits – Natural Gas[3] This strategy only applies to projects that include a retrofit of an existing building. If the proposed project does not include a retrofit, select "Not Applicable" in the Project Conformance column. 1. Replace an existing natural gas appliance with an electric alternative (e.g., space heater, water heater, clothes dryer), or 2. Replace an existing natural gas appliance with a high-efficiency model **Supports Strategies:** GHGRS #4	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☐ Proposed ☒ Not Applicable ☐ Not Feasible ☐ Alternative Measure Proposed
Zero Waste Goal 1. Provide space for organic waste (e.g., food scraps, yard waste) collection containers, and/or 2. Exceed the City's construction & demolition waste diversion requirement. **Supports Strategies:** GHGRS #5	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☒ Proposed ☐ Not Applicable ☐ Not Feasible ☐ Alternative Measure Proposed

[3] GHGRS Strategy #4 applies to existing building retrofits and not to new construction; Strategy #2 applies to new construction to reduce natural gas related GHG emissions

GHGRS Strategy and Consistency Options	Description of Project Measure	Project Conformance
Caltrain Modernization 1. For projects located within ½ mile of a Caltrain station, establish a program through which to provide project tenants and/or residents with free or reduced Caltrain passes or 2. Develop a program that provides project tenants and/or residents with options to reduce their vehicle miles traveled (e.g., a TDM program), which could include transit passes, bike lockers and showers, or other strategies to reduce project related VMT. **Supports Strategies:** GHGRS #6	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☐ Proposed ☐ Not Applicable ☐ Not Feasible ☐ Alternative Measure Proposed
Water Conservation 1. Install high-efficiency appliances/fixtures to reduce water use, and/or include water-sensitive landscape design, and/or 2. Provide access to reclaimed water for outdoor water use on the project site. **Supports Strategies:** GHGRS #7	*Describe which, if any, project consistency options from the leftmost column you are implementing.* *OR,* *Describe why this strategy is not applicable to your project.* *OR,* *Describe why such measures are infeasible.*	☑ Proposed ☐ Not Applicable ☐ Not Feasible ☐ Alternative Measure Proposed

Table C: Applicant Proposed Greenhouse Gas Reduction Measures

Description of Proposed Measure	Description of GHG Reduction Estimate	Proposed Measure Implementation
[Describe the proposed project measure and why it is proposed] **Supports Strategies/Sectors:** GHGRS #	*[Demonstrate the effectiveness of the proposed measure to reduce the project's GHG emissions.* *Include a description of how your measure will reduce emissions and provide supporting quantification documentation/assumptions.]*	☐ Part of Design ☐ Additional Measure
[Describe the proposed project measure and why it is proposed] **Supports Strategies/Sectors:** GHGRS #	*[Demonstrate the effectiveness of the proposed measure to reduce the project's GHG emissions.* *Include a description of how your measure will reduce emissions and provide supporting quantification documentation/assumptions.]*	☐ Part of Design ☐ Additional Measure
[Describe the proposed project measure and why it is proposed] **Supports Strategies/Sectors:** GHGRS #	*[Demonstrate the effectiveness of the proposed measure to reduce the project's GHG emissions.* *Include a description of how your measure will reduce emissions and provide supporting quantification documentation/assumptions.]*	☐ Part of Design ☐ Additional Measure
[Describe the proposed project measure and why it is proposed] **Supports Strategies/Sectors:** GHGRS #	*[Demonstrate the effectiveness of the proposed measure to reduce the project's GHG emissions.* *Include a description of how your measure will reduce emissions and provide supporting quantification documentation/assumptions.]*	☐ Part of Design ☐ Additional Measure

50% DD Sustainability Narrative

Park Habitat

November 25, 2020

atelier ten

Environmental Design Consultants + Lighting Designers

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Introduction

Westbank has proposed a bold sustainability agenda for its new development proposals in downtown San Jose, including for the Park Habitat project. Three major environmental themes for the Westbank San Jose portfolio include:

- Zero Carbon Development
- Healthy, Climate Responsive Design
- Water Smart Development

During the design development phase, the design team worked to integrate a range of environmental strategies into the Park Habitat project to achieve this ambitious sustainability vision. This narrative provides an mid-phase status update of progress toward Westbank's sustainability targets, as well as select analyses undertaken by Atelier Ten during DD to develop the project environmental design.

Key Sustainability Features

All-electric Building Design

The proposed project design provides space heating, domestic hot water, and cooking through all-electric means, eliminating fossil fuel combustion.

Electrification of the building sets the project up to achieve significant reductions in greenhouse gas emissions over the long term. As the electric utility grid in California grows ‘cleaner’ through increased deployment of renewable energy generation, an electric building will have a reduced greenhouse gas emissions impact over time. Natural gas systems, in contrast, will remain a consistently emitting end use over the life of the building.

All-electric design is a foundational component of the project’s operational carbon strategy. The design team will explore smart controls technology solutions, on-site renewable energy, and low impact refrigerants to further optimize the project greenhouse gas footprint.

Blackwater Treatment

Minimizing potable water consumption is a key susainability strategy in drought-prone California. An on-site blackwater treatment system is proposed for the project to provide non-potable recycled water for irrigation, flushing, and mechanical applications.

While graywater collection and treatment was explored as an option, the on-site availability of this resource will be limited given the office program in the building. As such, blackwater treatment has been recommended.

Sherwood Design Engineers has developed alternative schematic options for the blackwater treatment system, which will be sized to meet the building non-potable needs. Given Westbank’s interest in creating place and providing an enhanced biophilic experience, the design team has developed a preferred treatment concept that includes a visible wetland feature for tertiary treatment. An integrated landscape water treatment solution will provide a visible demonstration of the project’s robust, embedded sustainable design.

Passive Ventilation Design

Low carbon passive design is not an accessory feature of this project; it is inherent to the building and shaped early decisions about its massing and planning.

Core experiential design features of the project include the ‘green lung’ and outdoor terraces, which will provide perimeter envelope access for the majority of open office space.

Operable windows will be controlled to deliver natural ventilation and passive cooling, reducing mechanical energy use and enhancing project resilience. These windows will also serve as an important biophilic and healthy building amenity, connecting occupants to the San Jose climate.

During the DD phase, Atelier Ten quantified the energy benefits of natural ventilation. Further analysis to refine the strategy will be undertaken during the design development phase.

Biophilic Facade Design

A high performance building envelope is proposed for the project to increase access to useful daylight, reduce direct solar exposure, and extend hours when views can be maintained without interior blind deployment.

The optimized exterior shading system includes vegetative screening elements, which will not only provide a performance benefit to the project but also a biophilic amenity for occupants. As major components of the project’s facade, the plantings will also enhance the building’s exterior treatment for the public realm.

Sustainability Goals - Path to Zero Carbon

The following table provides a DD phase status update of project sustainability goals, with notes on critical path to achievement.

ZERO CARBON DEVELOPMENT

		Goal	Description	Critical Path	Key Disciplines	Key Milestone	Status	50% DD Comments
	Electrification	All Electric Systems	All-electric systems for space heating, domestic hot water, and office floors. Any tenant kitchens/amenities on office floors will also be all-electric.	--	M+ A10	100% SD		All electric systems are in the current design for office floors.
		No Natural Gas connection	Stretch goal: No natural gas utility connection	Study energy, cost, and leasing pros/cons of eliminating natural gas connection	A10 M+ Westbank	100% DD		Atelier Ten has circulated a pros/cons matrix for Westbank to review. Design team developing strategies to limit or disincentivize use of natural gas equipment in L1 retail spaces.
	Energy Efficiency	Title 24 compliance	Achieve 2019 Title 24 compliance	Confirm performance path is preferred for Title 24 compliance, given penalties for all-electric design.	A10 M+ KKA Adamson	100% SD		M+ completed energy analysis for 100% SD, showing a path to compliance. A10 will complete DD phase T24 analysis using 50% DD drawing set.
		25% Energy Use Savings	25% energy use savings from ASHRAE 2010 Baseline, or a maximum EUI of 28 kBtu/sq.ft./year, as per ILFI Zero Carbon Certification requirements	Develop energy model & test energy efficiency measures. Identify pathway to achieve each savings target.	A10 M+ KKA Adamson	100% SD		DD phase performance energy analysis was completed by A10. Project is on track to achieve EUI target for office program.
		40% Savings using LEED v4 ACP95	40% savings from ASHRAE 2010 baseline, calculated using LEED v4 ACP95 (which combines GHG, energy use, and/or energy cost as metrics)		A10 M+ KKA Adamson	100% DD		DD phase performance energy analysis was completed by A10. With cumulative energy efficiency measures, including equipment power reductions, the building can achieve the 40% reduction target. Further coordination and discussion is needed to ensure that recommended energy efficiency measures are included in the design.
		Target AIA 2030 EUI	Stretch goal: Meet AIA 2030 target for 2020. (Target EUI is 20 kbtu/sf/yr for office space.)	Identify AIA 2030 target. Develop energy model & test energy efficiency measures. Identify pathway to achieve each savings target.	A10 M+ KKA Adamson	100% DD		Project can achieve the stretch EUI target established for the office program incorporative the cumulative energy efficiency measures recommended through A10's DD energy analysis.
	Renewable Energy	5% of total energy generated on site PV	5% of energy demand met through on-site PV across the Westbank San Jose portfolio; individual building targets to be developed.	Analyze on-site PV feasibility for all projects. Identify more appropriate target for Park Habitat.	A10 Westbank	100% SD		Park Habitat-specific goal of 240-50 kW on-site PV was recommended to the architectural design team during early DD. The design team has allocated sufficient roof area to install this target PV array size.
		Carbon Free Electricity	100% carbon-free electricity purchasing for whole building.	Confirm carbon-free electricity purchase approach for tenants: pass-through as part of lease or other means.	Westbank A10	100% CD		Westbank and A10 to develop portfolio-wide carbon-free electricity purchasing strategy.
		Green Power vs. Virtual PPA	Carbon-free electricity purchasing procured through virtual PPA or similar to achieve true additionality (may not be San Jose Clean Energy) and meet LEED Tier 1 requirements.	Develop details on renewable power procurement strategy - green power vs. virtual PPA	Westbank A10	100% CD		Westbank and A10 to develop portfolio-wide carbon-free electricity purchasing strategy.

Sustainability Goals - Path to Zero Carbon

ZERO CARBON DEVELOPMENT

		Goal	Description	Critical Path	Key Disciplines	Key Milestone	Status	50% DD Comments
	Embodied Carbon	10% Embodied Carbon Reduction	Reduce embodied carbon of structure & enclosure by 10% as per ILFI Zero Carbon Certification requirements. Existing materials may be counted towards the 10% requirement.	Develop LCAs for buildings.	A10 Glotman Simpson KKA Adamson Westbank	50% DD		DD phase LCA was completed by A10 and shows a path to achieving the 10% embodied carbon reduction target.
		Maximum embodied carbon emissions of 500 kg-CO2e/m²	Maximum embodied carbon emissions of 500 kg-CO2e/m², averaged across the Westbank San Jose Portfolio, as per ILFI Zero Carbon Certification requirements		A10 Westbank	100% DD		DD phase LCA was completed by A10. Embodied carbon emissions density, calculated across the Westbank SJ portfolio will be conducted at a later stage.
		100% remaining Carbon Emissions to be offset	Offset 100% of remaining embodied carbon emissions across the Westbank San Jose portfolio.		Westbank A10	100% CD		Westbank and A10 to develop portfolio-wide carbon offset purchase.
		50% reduction in embodied carbon across the Westbank San Jose portfolio	Stretch goal: 50% reduction in embodied carbon across the Westbank San Jose portfolio. Individual building stretch goals to be developed	Establish target for interiors	A10 Westbank	100% CD		This is a portfolio-wide goal, that will be fully evaluated at a later stage.
	Low GWP Refrigerants	Achieve LEED Enhanced Refrigerant Management credit	HVAC: Achieve LEED Enhanced Refrigerant Management credit	Develop low-GWP refrigerant guideline for project teams; for projects where chiller types have already been determined, identify available refrigerants with the	M+ A10 Westbank	100% DD		M+ to complete LEED refrigerant calculation by 100% DD.
		Use refrigerants with GWP close to zero	Stretch goal: Use refrigerants with GWP as close to zero as possible			50% CD		M+/A10 to evaluate very low GWP refrigerants.
		Offset all refrigerant GWP	Stretch goal: offset refrigerant GWP across the Westbank San Jose Portfolio	Recommend method for offsetting refrigerant GWP.	A10 Westbank	100% CD		A10 to recommend a method for offsetting refrigerant GWP.
	Smart Building Controls	Smart Controls for energy efficiency	Consider smart controls as part of each building's energy efficiency strategy.	Establish goals and budget for smart building features. Establish a single point of contact or a coordinated platform for smart building controls	M+ A10	100% DD		M+ to confirm controls approach for Park Habitat. Is there a recommended vendor/ what are key controls?
		Use smart building controls to reduce GHGs further	Stretch goal: Use smart building controls to control loads/renewables/energy storage across the Westbank San Jose portfolio, to reduce GHGs beyond what energy efficiency measures accomplish.	Develop "virtual microgrid" concept for coordinating renewables, energy storage, and loads to reduce GHGs	M+ Westbank A10	100% DD		Portfolio-wide goal. A10 to study what potential there is for this concept and coordinate with M+.
	Transportation	Achieve 17 LEED v4/4.1 Location & Transportation points	Achieve 17 LEED v4/4.1 Location & Transportation points	--	A10	n/a		A10 confirms that this is on track for Park Habitat. Detailed calculations to be provided during DD phase.
		10% EV parking on opening day & 100% EV-ready spaces	10% EV parking on opening day (measured by number of cars that can be charged); 100% EV-ready including empty conduit and space for future electrical equipment.	Confirm number and type of chargers and operational strategy to achieve 10% EV on opening day	A10 KKA Westbank	100% DD		A10 to study EV parking goal for Park Habitat during 50% DD Drawing Review, but the project is on track to achieve the 10% target.

Sustainability Goals - Climate-Responsive, Water Smart Design

		Goal	Description	Critical Path	Key Disciplines	Key Milestone	Status	50% DD Comments
HEALTHY, CLIMATE RESPONSIVE DESIGN	**Daylight**	55% of spaces to be daylit	Stretch goal: Achieve LEED Daylight credit criteria - 55% of floorplate daylight autonomous	Develop daylight analysis & test facade options to improve glare-free daylight	M+ KKA	100% DD		M+ is conducting daylight analysis to evaluate benefit of exterior plantings. Team to focus on blind selection, specification, and controls to ensure high quality daylight access is maintained. Shade configuration to be coordinated with operable windows.
	Natural Ventilation	All spaces to have an operable window within 25 ft.	All locations adjacent to a perimeter wall (exterior or courtyard) should have an operable window within 25 ft.	Natural ventilation strategy to be developed for each building	M+ KKA A10	100% DD		This spacing of windows and operable windows are planned. Design team to further develop NV concept.
		Natural Ventilation for space conditioning	All buildings should integrate natural ventilation as part of the space conditioning strategy.	Develop air quality and noise criteria brief for project teams. Study natural ventilation options (night flush, mixed-mode, etc.) and advise on most effective scheme.	M+ KKA A10	100% DD		M+ had proposed an actuated night-flush controlled passive cooling system. KKA has included operable windows in documents for costing at 100% SD.
	Biophilia/ Landscape	Secondary benefit provided by 50% of open spaces	At least 50% of all open space and vegetated areas must be provide a secondary benefit such as stormwater management, food production, pollutant filtration, or habitat restoration.	Evaluate project designs to develop feasible target green roof/planted surface area and strategy for secondary benefits.	KKA A10	100% DD		Large wetland at ground plane to provide on-site treatment of grey/blackwater -- though a final decision on the inclusion of this design strategy has not been made. Green roof area has also been allocated to mitigate the urban heat island effect with tree canopy to provide habitat & shade
WATER SMART	**Landscape Water Use**	Irrigation Water Savings	50% reduction in potable water use for landscape irrigation.	Develop and evaluate water conservation & reuse strategies. Irrigation water use estimate	Sherwood CMG M+	50% DD		Water balance has been developed by Sherwood to inform reuse strategy. Coordination with CMG/Habitat Horticulture regarding application of non-potable irrigation water for plantings.
		Net Zero Irrigation	Stretch goal: No potable water for landscape irrigation					Stretch goal of no potable water for irrigaiton is not feasible due to seasonal (summer) deficiency in non-potable water
	Indoor Water Use	Potable Water Savings	40% reduction in potable water use for indoor fixtures & cooling	Develop project water balances	Sherwood M+ A10	50% DD		Project is on track to achieve a 40% reduction in potable water use (indoor fixtures) through the use of recycled non-potable water. Stretch goal of zero water waste is likely not feasible for this project as there is a seasonal deficit of non-potable water supplies during the summer season, when irrigation and cooling tower water demand is highest.
		Net Zero Water	Stretch goal: Zero water waste (i.e., maximum water conservation and non-potable water used for all end uses that allow it by code)					
	Certifications	LEED C&S Platinum Certification	LEED C&S Platinum Certification	Confirm Park Habitat will not pursue LEED certification	Westbank	100% DD		A10 50% DD scorecard shows the project on track to achieve its LEED Platinum target. Detailed drawing review and comments will be provided after 50% DD.
		ILFI Zero Carbon Certification	ILFI Zero Carbon Certification	Meet with ILFI to approve portfolio-scale approach to certification. Confirm embodied carbon requirements for Park Habitat.	A10 Westbank	100% DD		A10 to issue memo outlining portfolio-scale approach, and set up meeting with ILFI to review.
		WELL Portfolio Certification	WELL Portfolio Certification	Confirm WELL Portfolio vs. WELL certification for Park Habitat.	Westbank A10	50% CD		Westbank has established a WELL Gold-equivalence target for all San Jose projects. A10 will coordinate consultants to track WELL equivalent measures through 50% CD.

LEED Scorecard - Path to Platinum

The table below summarizes the current LEED status of the project, relative to the project goal of LEED Platinum Core & Shell - Platinum certification. There are some credits currently tracked as in the 'medium' category, that will be confirmed by 100% DD.

CREDITS FOR FOCUS DURING DD

CA ACP **STREAMLINED DOCUMENTATION FOR CALGREEN 2019 EQUIVAELENT PROJECTS**

10314 Park Habitat - 50% DD Appraisal

LEED v4 for Core & Shell

Achievability						
high	med	low	NP			
80	17	9	4	83	**Projected Points**	

Certified 40 to 49 points **Silver** 50 to 59 points **Gold** 60 to 79 points **Platinum** 80 or more points
Achievability rating: **High** = 90%, **Med** = 60%, **Low** = 10%, **NP** = not possible.

1	0	0	0		**Integrative Process**		**Standard**
1					IP Credit 1	**Integrative Process**	Perform preliminary energy model and water budget before the completion of SD and document in OPR & BOD.
19	0	0	1		**Location & Transportation**		**Standard**
			20		LT Credit 1	**LEED for Neighborhood Development Location**	Locate the project in within a development certified under LEED for Neighborhood Development.
2					LT Credit 2	**Sensitive Land Protection**	Locate the development footprint on land that has been previously developed - OR - does not meet LEED criteria for sensitive land (prime farmland, floodplains, habitat for threatened species, near water bodies, in or near wetlands).
2			1		LT Credit 3	**High Priority Site and Equitable Development (v4.1)**	Locate the project in an economically disadvantaged community (2pts) - OR - a brownfield site (2pts) - OR - develop an equitable development plan (2pts) - OR - include affordable housing units (1pt).
6					LT Credit 4	**Surrounding Density and Diverse Uses**	Locate on a site with an existing density of 22,000sf/acre - 35,000 sf/acre and within 1/2 mile of 4-8 basic services.
6					LT Credit 5	**Access to Quality Transit (v4.1)**	Locate project within 1/2 mile of a rail station or ferry terminal that meets min. daily transit service - OR - 1/4 mile of bus, streetcar or rideshare that meets min. daily transit service.
1					LT Credit 6	**Bicycle Facilities (v4.1)**	Provide short term (2.5% peak visitors) and long term (5% all regular occupants) bike parking within 100 ft of main entrance, FTE showers, and access to bicycle network.
1					LT Credit 7	**Reduced Parking Footprint**	Provide parking capacity that is 40% below base ratios determined by ITE Planning Handbook
1					LT Credit 8	**Electric Vehicles (v4.1)**	Install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the project or at least two spaces
6	3	2	0		**Sustainable Sites**		**Standard**
Y				CA - ACP	SS Prereq 1	**Construction Activity Pollution Prevention**	Create and implement erosion control plan that meets the 2003 EPA Construction General Permit.
1					SS Credit 1	**Site Assessment**	Complete comprehensive site survey; topography, hydrology, climate, vegetation, soils, human use and human health effects.
	2				SS Credit 2	**Site Development (v4.1):** Protect or Restore Habitat	Protect 40% of greenfield area, restore soils, and restore 25% of previously developed site with native/adapted plants (2pts) - OR - provide $0.20/sf to accredited land trust (1pt).
1					SS Credit 3	**Open Space (v4.1)**	Provide outdoor space greater than or equal to 30% of the total site area (including building footprint), with min. 25% vegetated.
	1	2			SS Credit 4	**Rainwater Management (v4.1)**	Manage runoff for the 80th percentile (1pt) 85th percential (2 pts) or 90th percentile (3 pts) using low-impact development (LID) and green infrastructure.
2					SS Credit 5	**Heat Island Reduction**	Meet high albedo requirements for roof and site (2pts) - OR - place a minimum of 75% parking under cover (1pt).
1				CA - ACP	SS Credit 6	**Light Pollution Reduction**	Meet uplight and light trespass requirements, and do not exceed exterior signage luminance requirements.
1					SS Credit 7	**Tenant Design and Construction Guidelines**	Publish an illustrated document to educate tenants in implementing sustainable design and construction features in their tenant improvement build-outs.

LEED Scorecard - Path to Platinum

9	2	0	0			Water Efficiency	Standard
Y				CA - ACP	WE Prereq 1	**Outdoor Water Use Reduction:** 30%	Reduce outdoor water use by 30% over the baseline specified in LEED.
Y				CA - ACP	WE Prereq 2	**Indoor Water Use Reduction:** 20%	Reduce indoor water use by 20% over the baseline specified in LEED, use fixtures with WaterSense label, and meet requirements for process water use.
Y					WE Prereq 3	**Building-Level Water Metering**	Install permanent water meters for building and grounds, and commit to share data with USGBC for 5 years.
1	1			CA - ACP	WE Credit 1	**Outdoor Water Use Reduction (v4.1)** 50% / 75% / 100% Reduction	Reduce potable water used for irrigation by 50% (1pt), 75% (2 pts) or 100% (3 pts).
6					WE Credit 2	**Indoor Water Use Reduction:** 25% / 30% / 35% AND / OR 40% / 45% / 50%	Reduce building water use over LEED baseline.
1	1				WE Credit 3	**Cooling Tower and Process Water Use (v4.1)**	Conduct a water analysis to optimize cooling tower cycles. Maximizing cycles (1pt), >25% improvement OR 20% non-potable water use (2pts,) increase cycles by 30% OR 30% non-potable water use (3 pts).
1					WE Credit 4	**Water Metering**	Install permanent water meters for two or more water subsystems.
21	10	2	0			Energy & Atmosphere	Standard
Y				CA - ACP	EA Prereq 1	**Fundamental Commissioning and Verification**	Engage commissioning agent by end of DD, develop and execute a commissioning plan, and prepare O&M plan for current facilities.
Y					EA Prereq 2	**Minimum Energy Performance**	Reduce energy cost by 5%, compared to ASHRAE 90.1-2010, Appendix G; meet mandatory provisions of ASHRAE 90.1-2010. -OR Comply with HVAC and service water heating requirements for the climate zone in ASHRAE 50% Advanced Energy Design Guide, and meet ASHRAE 90.1-010 mandatory and prescriptive provisions.
Y					EA Prereq 3	**Building-Level Energy Metering**	Install meters to provide data on total energy consumption, and commit to share data with USGBC for 5 years.
Y				CA - ACP	EA Prereq 4	**Fundamental Refrigerant Management**	Eliminate CFCs in building HVAC&R, and complete CFC phase-out conversion before project completion for any CFC equipment to remain.
4	2				EA Credit 1	**Enhanced Commissioning**	Complete CD review, post occupancy review, and recommissioning manual (3pts), and develop monitoring procedures (+1pt) - AND/OR - complete envelope Cx (+2pts)
3				CA - ACP	EA Credit 2	**Optimize Energy Performance:** 3% / 5% / 7%	Reduce building energy cost by 3% / 5% / 7% compared to ASHRAE 90.1-2010, Appendix G.
3					EA Credit 2	**Optimize Energy Performance:** 9% / 11% / 13%	Reduce building energy cost by 9% / 11% / 13% compared to ASHRAE 90.1-2010, Appendix G.
3					EA Credit 2	**Optimize Energy Performance:** 15% / 17% / 19%	Reduce building energy cost by 15%/ 17%/ 19% compared to ASHRAE 90.1-2010, Appendix G.
3					EA Credit 2	**Optimize Energy Performance:** 21% / 23% / 26%	Reduce building energy cost by 21% / 23% / 26% compared to ASHRAE 90.1-2010, Appendix G.
	3				EA Credit 2	**Optimize Energy Performance:** 29% / 32% / 35%	Reduce building energy cost by 29%/ 32%/ 35% compared to ASHRAE 90.1-2010, Appendix G.
	2	1			EA Credit 2	**Optimize Energy Performance:** 39% / 43% / 47%	Reduce building energy cost by 39%/ 43%/ 47% compared to ASHRAE 90.1-2010, Appendix G.
1					EA Credit 3	**Advanced Energy Metering**	Install meters for tenant spaces to independently meter energy consumptions for all systems dedicated to tenant space, with minimum of one meter per energy source per floor. Install advanced metering for base-building energy sources, per reference guide.
	1	1			EA Credit 4	**Grid Harmonization (v4.1)**	Design building and equipment for participation in demand response programs through load shedding or shifting (2pts) - OR - if DR program not available, provide infrastructure for future (1pt). Implement other load flexibility and management strategies (1-2pts)
2	1				EA Credit 5	**Renewable Energy Production:** 1% / 3% / 5%	Produce renewable energy on-site for 1% / 3% / 5% of building energy consumption, calculated by cost.
	1				EA Credit 6	**Enhanced Refrigerant Management**	Select refrigerants with low global warming potential and ozone depletion potential.
2					EA Credit 7	**Green Power and Carbon Offsets**	Engage a 5 year contract for at least 50% or 100% of the project's energy from green power, carbon offsets, or RECs.

LEED Scorecard - Path to Platinum

8	**0**	**3**	**3**		**Materials & Resources**		**Standard**
Y				CA - ACP	MR Prereq 1	**Storage & Collection of Recyclables**	Provide space for the collection and storage of paper, cardboard, glass, plastic, metals, and at least two of the following: batteries, mercury-containing lamps, and electronic waste.
Y				CA - ACP	MR Prereq 2	**Construction and Demolition Waste Management Planning**	Develop and implement a construction and demolition waste management plan.
3			3		MR Credit 1	**Building Life-Cycle Impact Reduction (v4.1)**	Conduct a life-cycle assessment (1 pt) that demonstrates a minimum of 5% / 10% reduction in at least three of the six impact measures (2-3pts).
1		1			MR Credit 2	**Building Product Disclosure & Optimization (v4.1):** Environmental Product Declarations	Use 10 products sourced from three different manufacturers that meet disclosure criteria (1pt) - AND/OR - use products that exhibit optimized performance , 10% by cost (1 pt).
1		1			MR Credit 3	**Building Product Disclosure & Optimization (v4.1):** Sourcing of Raw Materials	Use products that meet responsible extraction criteria, from 3 / 5 different manufacturers for 20% / 40% of total material cost (1-2pts).
1		1			MR Credit4	**Building Product Disclosure & Optimization (v4.1):** Material Ingredients	Use 10 products sourced from three different manufacturers that demonstrate the chemical inventory of the products (1pt) - AND/OR - use products that document their material ingredient optimization, 10% material cost (1pt).
2					MR Credit 5	**Construction & Demolition Waste Management:** 50% / 75%	Divert 50%, two material streams (1pt) - OR - 75%, three material streams (2pts), - OR - generate less than 7.5 lbs waste/sf (2pts)
6	**2**	**2**	**0**		**Indoor Environmental Quality**		**Standard**
Y				CA - ACP	EQ Prereq 1	**Minimum IAQ Performance**	For mechanically ventilated spaces: Meet minimum outdoor air intake flow requirements determined by ASHRAE 62.1-2010 ventilation rate procedure, meet sections 4 through 7 of ASHRAE 62.1-2010, and monitor outdoor air intake flows. For naturally ventilated spaces: Meet minimum outdoor air opening and space configuration requirements determined by ASHRAE 62.1-2010 natural ventilation procedure; confirm natural ventilation is effective per CIBSE Applications Manual AM10, March 2005 Fig. 2.8.; and meet one of the following: measure exhaust airflow; provide automatic indication devices on natural ventilation openings; or monitor CO2 concentrations.
Y				CA - ACP	EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Prohibit smoking inside building, locate exterior smoking areas at least 25 feet away from building, and post no-smoking signage within 10 ft of all building entrances.
2					EQ Credit 1	**Enhanced Air Quality Strategies**	Provide entryway systems, prevent interior cross-contamination, and specify MERV 13 filters (1pt) - AND/OR - prevent exterior contamination or increase ventilation or monitor CO2 (1pt).
3					EQ Credit 2	**Low-Emitting Materials (v4.1):** 2 / 3 / 4 / 5 categories	Achieve the threshold level of compliance with VOC emissions and content standards for 2, 3, 4 or 5 product categories.
1				CA - ACP	EQ Credit 3	**Construction IAQ Management Plan**	Develop an IAQ plan for construction and preoccupancy phases that meets SMACNA IAQ Guidelines for Occupied Buildings Under Construction.
	1	2			EQ Credit 4	**Daylight (v4.1):** 40% / 55% / 75%	Meet spatial daylight autonomy and annual sunlight exposure requirements for percentage (40%/55%/75%) of regularly occupied floor area through simulation (1-3pts) - OR - meet illuminance level requirements for percentage (55%/75%/90%) of regularly occupied floor area through simulation (1-3pts) or measurement (1-3pts).
	1				EQ Credit 5	**Quality Views**	Provide direct views to the outside that meet 2 out of 4 LEED view criteria in 75% of regularly occupied spaces.
6	**0**	**0**	**0**		**Innovation**		**Standard**
1					IN Credit 1.1	**Innovation**, Parksmart Measures	Pursue Parksmart measures related to bicycle parking and tire inflation stations (1pt) - AND/OR - placemaking (1 pt) - AND/OR - wayfinding systems (1 pt).
1					IN Credit 1.2	**Pilot,** Walkable Project Site	Design project to achieve features that promote non-motorized transportation on the project site and surrounding community.
1					IN Credit 1.3	**Pilot,** Verified Construction Waste and Demolition Recycling Rates	Use a RCI CORR certified recycling facility to handle all commingled waste produced during construction and demolition.
1					IN Credit 1.4	**Exemplary Performance,** LTc7 Reduced Parking Footprint	Achieve a 60% reduction from the ITE 4th Edition Handbook baseline.
1					IN Credit 1.5	**Exemplary Performance,** SSc5 Heat Island Reduction	Pursue both Option 1 and Option 2 with 100% of parking over cover.
1					IN Credit 2	**LEED™ Accredited Professional**	LEED Accredited Professional on design team.
4	**0**	**0**	**0**		**Regional Priority**		**Standard**
1					RP Credit 1.1	**WEc2 Indoor Water Use Reduction (4 points, 40% reduction)**	This credit is earned if the project earns 4 points under LTc5 (40% reduction).
1					RP Credit 1.2	**LTc5 Access to Quality Transit (6 points, maximum trips)**	This credit is earned if the project earns 6 points under LTc5.
1					RP Credit 1.3	**MRc3 BPDO: Sourcing of Raw Materials (1 point, 20% threshold)**	This credit is earned if the project earns 1 point under MRc3.
1					RP Credit 1.4	**EAc2 Optimize Energy Performance (10 points, 21% savings)**	This credit is earned if the project earns 10 points under EAc2 (21% savings).

On-site Renewable Energy Target

Westbank Portfolio Renewable Energy Goal

Westbank has established an on-site renewable energy goal for its San Jose project portfolio. In aggregate, the development team is targeting on-site renewable energy equivalent to 5% of annual energy demand across all the buildings.

Renewable Energy at Park Habitat

Atelier Ten has developed project-specific targets to achieve the Westbank portfolio-wide goal, taking into consideration the unique challenges and opportunities of each project design. Table 1 below summarizes the energy implications of the current rooftop PV space allocation in relation to the project-specific target for the Park Habitat project. The project team has allocated the yoga pavilion & mechanical roof areas for on-site PV. Cases 1 through 3 describe various levels of PV coverage on these roof surfaces.

At a minimum, Atelier Ten recommends maximum coverage (90%) of both the yoga and mechanical roof areas. Flat-mounted panels will achieve this.

Atelier Ten and KKA have established a feasible PV roof area target of 14,100 sf for the Park Habitat project to contribute toward the Westbank San Jose portfolio goal. This translates to a PV array size of ~246 kW, which on an annual basis could meet more than 3% of the office program energy consumption. Achieving the target will not only contribute to the project's ambitious energy & carbon goals, but also align the project to achieve 2 LEED credit points for on-site renewable energy by exceeding the 3% threshold.

	CASE 1	CASE 2	CASE 3	CASE 4
	YOGA PAVILION (65% COVERAGE)	YOGA + MECH ROOF (65% COVERAGE)	YOGA + MECH ROOF (90% COVERAGE)	TARGET AREA PROPOSED BY KKA (85% COVERAGE)
AVAILABLE ROOF AREA (SF)	2,701	9,684	9,684	14,100
PV ROOF COVERAGE	65%	65%	90%	85%
PV SYSTEM SIZE (SF)	1,756	6,295	8,716	11,985
DC SYSTEM SIZE (KW)	36	129	179	246
ESTIMATED ANNUAL OUTPUT (KWH/YR)	51,488	184,500	256,011	351,837
% WHOLE BUILDING ANNUAL ENERGY OFFSET	0.4%	1.4%	2.0%	2.7%
% OFFICE ANNUAL ENERGY OFFSET	0.6%	2.3%	3.2%	**4.4%**

All-Electric Building Update

Westbank is considering whether to provide natural gas connections to podium spaces in each building. The podium spaces are intended for various forms of public-facing tenants (retail stores, food & beverages, performance venue, etc.) The San Jose Reach Code promotes buildings to be all electric and requires mixed-fuel buildings to achieve 14% savings over California Energy Code - Title 24, Part 6. This is a significant challenge for the Park Habitat project.

During the DD phase, the City of San Jose, Westbank, and Atelier Ten discussed an exceptional path for the project, meaning that a natural gas connection for the podium would be allowed. More detailed follow-up is needed with the City to document this Reach Code exemption, but the assumption is that natural gas will be supplied to the podium spaces.

The remainder of the buildings will be all-electric (including HVAC, domestic hot water, any tenant kitchens, etc.) in keeping with the project's overall carbon neutrality goals.

Considerations		All-Electric Design (No Natural Gas Connection)
ENVIRONMENTAL	GHGs	- Westbank can take advantage of California's plan to produce fossil fuel free electricity by 2040. - Purchase of carbon offsets reduces each year and buildings can be net positive in future.
	Title 24 Compliance	Preferred by City of San Jose's Reach Code
	Zero Carbon certification eligibility	Preferred by ILFI for Zero Certification, but not required.
BUILDING DESIGN	Electrical Sizing / Cost	- Electrical loads already account for an all-electric building design. - No additional impact
	Space / Access	- No impact

Considerations		All-Electric Design (No Natural Gas Connection)
TENANT	Flexibility	- All-electric design is more flexible spatially. - Equipment can be moved around easily over time without concern for where the gas connection is located (e.g., kitchen layout is more flexible and can be reconfigured over time).
	Familiarity	- Probably less familiar to tenants. - Some local jurisdictions are starting to require all-electric tenants spaces, so familiarity will increase locally.
	Safety	- Induction / electric cooking has other benefits to operators (safety, ability to program cooking, etc.)
	Kitchen equipment availability/cost for tenants	- For commercial kitchens, all-electric equipment (induction cooking especially) is quickly becoming more available (especially with natural gas ban adopted by many Bay Area cities). - Induction cooking is currently higher first cost in the US but this is changing as market demand equipment. - Operating cost is similar (electricity is more expensive than gas, but the higher electricity cost is offset by lower HVAC operating costs and faster cooking times).

Appendix 1 – DD Phase Performance Energy Analysis

Park Habitat, 50% DD – Sustainability Narrative Appendices

Energy Analysis Goals

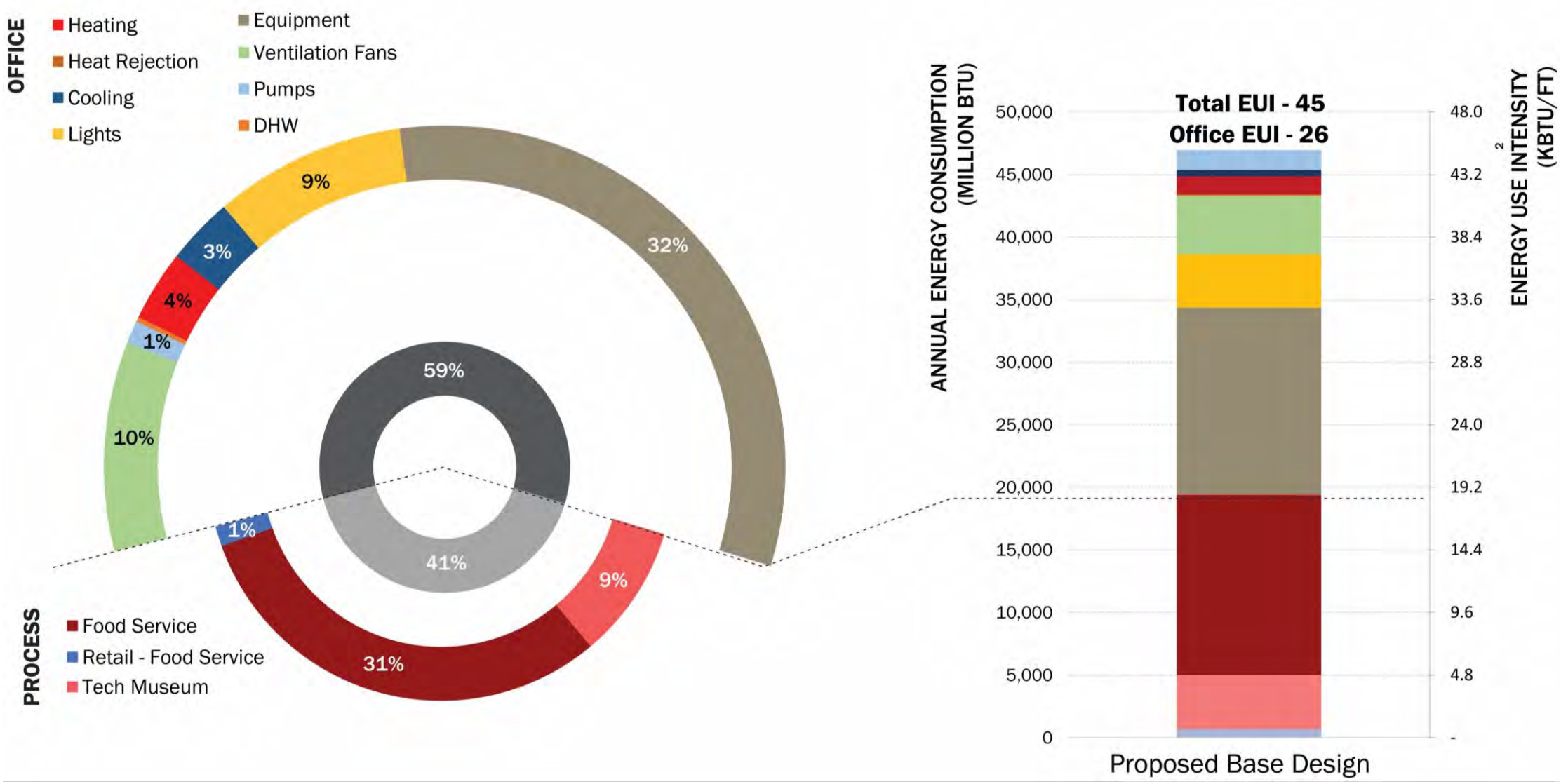
- Determine Energy Use Intensity of the project & develop energy use characterization that includes all space programs.
- Test central plant design options.
- Develop energy efficiency measures for the office program.
- Benchmark project against an ASHRAE 90.1 baseline to estimate savings for LEED rating.

Energy Use by Space Type

- **Office Program:** Analyzed using a typical core & shell office building. The energy results and EUI are as simulated in eQuest.
- **Additional Program:** Energy use for these program areas is presented separately and included in the overall building EUI
  - **Food Service:** This includes the food service areas in the building as well as the retail food service areas on the ground floor (7% of building area + 15% of Retail area).
  - **Tech Museum:** Space area is modelled as per total area from architectural plans.
  - **Server Room:** Data rooms serving the building comprise this space type.

Space Type	Area (sq. ft)	Energy Use Intensity (kBTU/sq.ft./yr)	Energy Use (mmBtu)	% Energy Use
Office Program Type	-	26	27,813	56.5%
Food Service	77,168	194	15,021	43.5%
Tech Museum	62,300	70	4,361	
Server Room	4,000	450	1,800	
TOTAL	**1,054,123**	**46**	**48,995**	

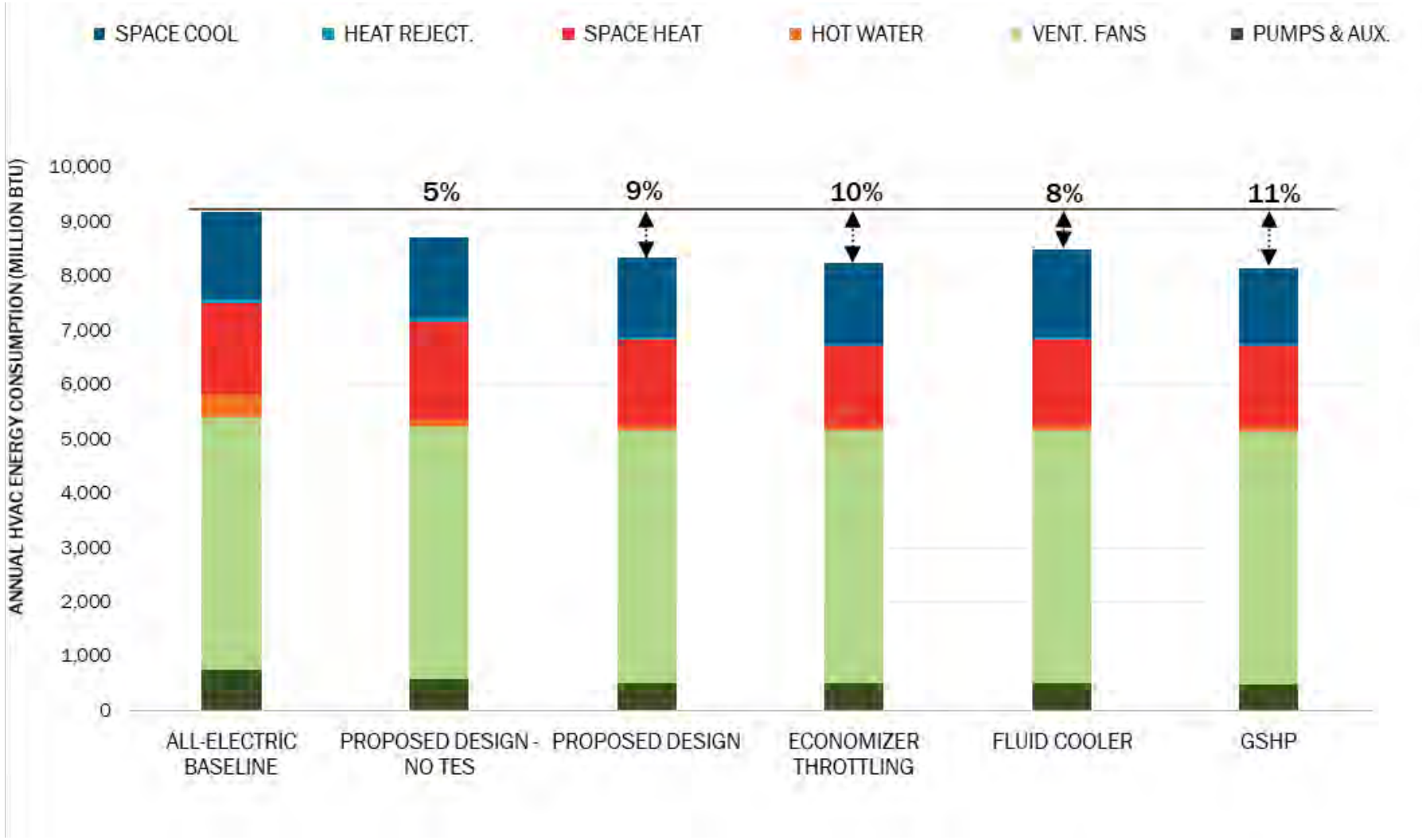
Park Habitat Energy Use Characterization



HVAC Options

HVAC Option	Description
1. Conventional All-Electric Baseline	Separate all-electric heating and cooling plant equipment serving the building
2. Proposed Design – No Thermal Energy Storage	Waterside equipment design includes a heat recovery chiller, without thermal tank storage
3. Proposed Design	Waterside equipment design includes thermal tank storage, waterside economizer, and heat recovery chiller
4. Proposed Design – Economizer Throttling	Air-side economizer is disabled except when heat recovery chiller is not able to meet the entire cooling load
5. Proposed Design – Fluid Cooler	A fluid cooler is utilized instead of a cooling tower to reduce mechanical water use
6. Ground Loop	A ground loop connected heat pump is used for heating to supplement the air-source heat pump

Summary of Results – HVAC Alternatives



Central Plant Summary – Load/HVAC Options Assumptions

The project tests 7 central plant configurations each with its own load profiles and waterside networks. The load and waterside assumptions for each case is listed below:

	1. All-Electric Baseline	2. Proposed Design – No TES	3. Proposed Design	4. Economizer Throttle	5. Fluid Cooler	6. GSHP	3A. Additional Space Programs
Cooling Source(s)	Centrifugal Chiller	Heat Recovery Chiller (9870 kBtu/h) + Centrifugal Chiller	Heat Recovery Chiller (9870 kBtu/h) + Centrifugal Chiller	Heat Recovery Chiller (9870 kBtu/h) + Centrifugal Chiller	Heat Recovery Chiller (9870 kBtu/h) + Centrifugal Chiller	Heat Recovery Chiller (9870 kBtu/h) + Centrifugal Chiller	Heat Recovery Chiller (10752 kBtu/h) + Centrifugal Chiller
Heating Source(s)	Air-source Heat Pump	Heat Recovery Chiller + Air-source Heat Pump	Heat Recovery Chiller + Air-source Heat Pump (2500 kBtu/h)	Heat Recovery Chiller + Air-source Heat Pump (2500 kBtu/h)	Heat Recovery Chiller + Air-source Heat Pump (2500 kBtu/h)	Heat Recovery Chiller + Ground-source Heat Pump (30% of Peak Heating Load: 2961 kBtu/h)*	Heat Recovery Chiller + Air-source Heat Pump (2500 kBtu/h)
Waterside Economizer	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Thermal Storage Tank	No	No	Yes (41,000 Gallons)	Yes (41,000 Gallons)	Yes (41,000 Gallons)	No	Yes (41,000 Gallons)
Air-side Economizer Throttle	No	No	No	Yes	No	No	No
Server Room Loads	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Food Service Loads	No	No	No	No	No	No	Yes
Tech Museum Loads	No	No	No	No	No	No	Yes

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* Previous analysis done by Meyers+ included a geo-loop sized at 4500 kBtu/h

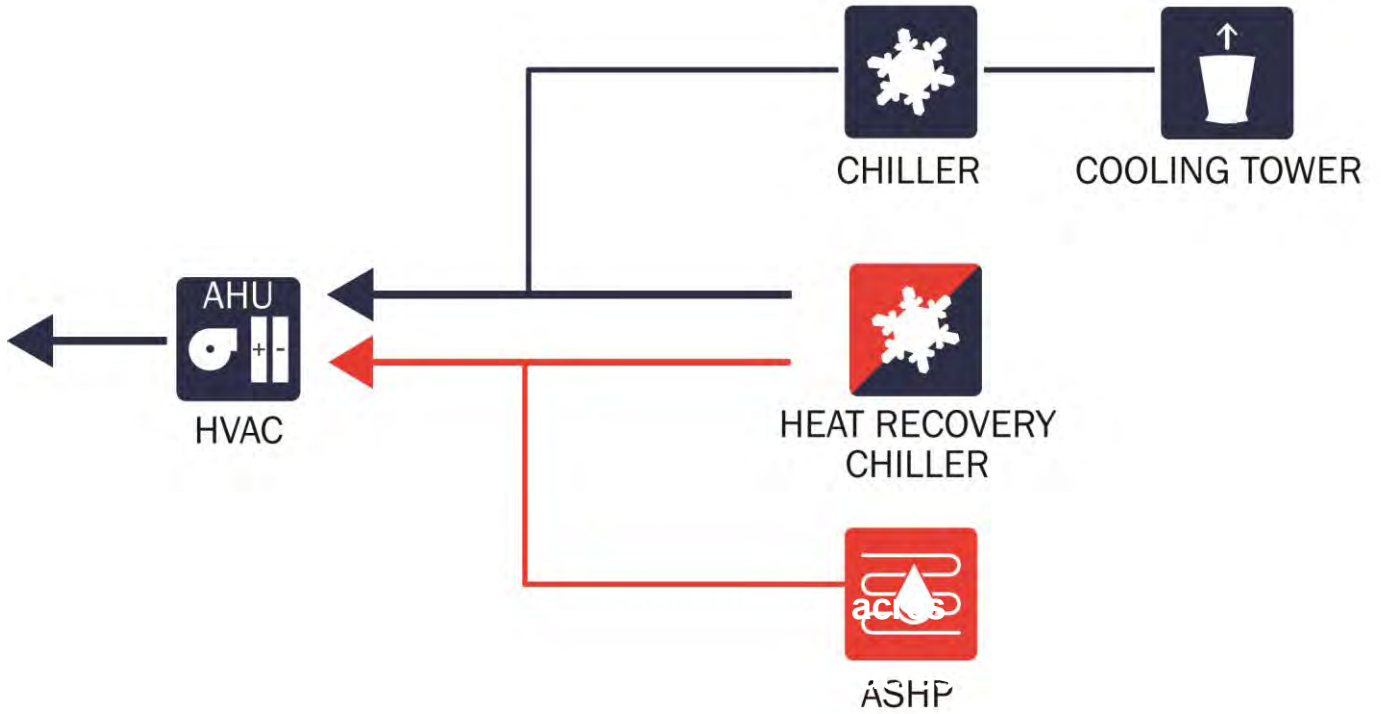
Baseline All-electric System

- Centrifugal chiller used as primary cooling source
- Air-source Heat Pump used as primary heating source for heating loads and DHW loads

OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR

Proposed Design – w/o TES

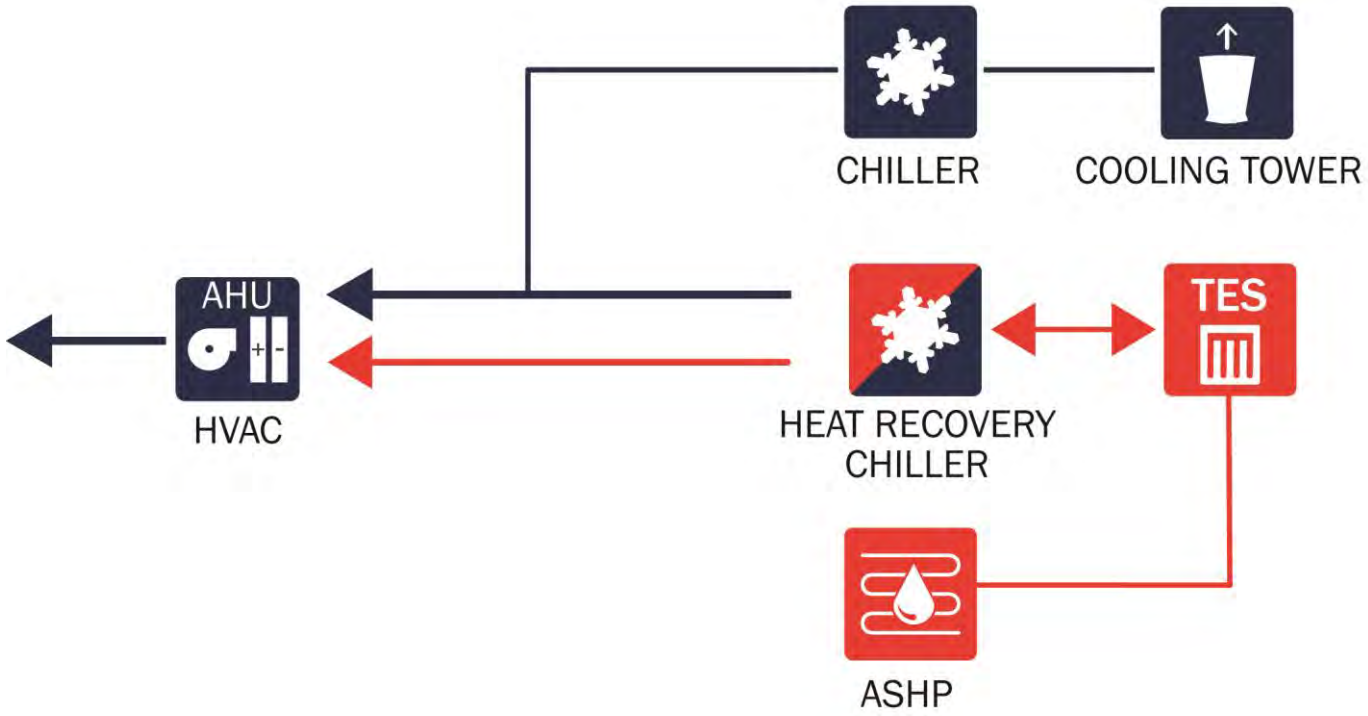
- Heat recovery chiller used as primary heating and cooling source
- Centrifugal chiller and Air-source Heat Pump used as secondary cooling and heating source



OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR
Proposed Design – No TES	27.9 MBTU (0.6% REDUCTION)	3,896 METRIC TONS (22 SAVED)	3.6 MGAL/YR

Proposed Design

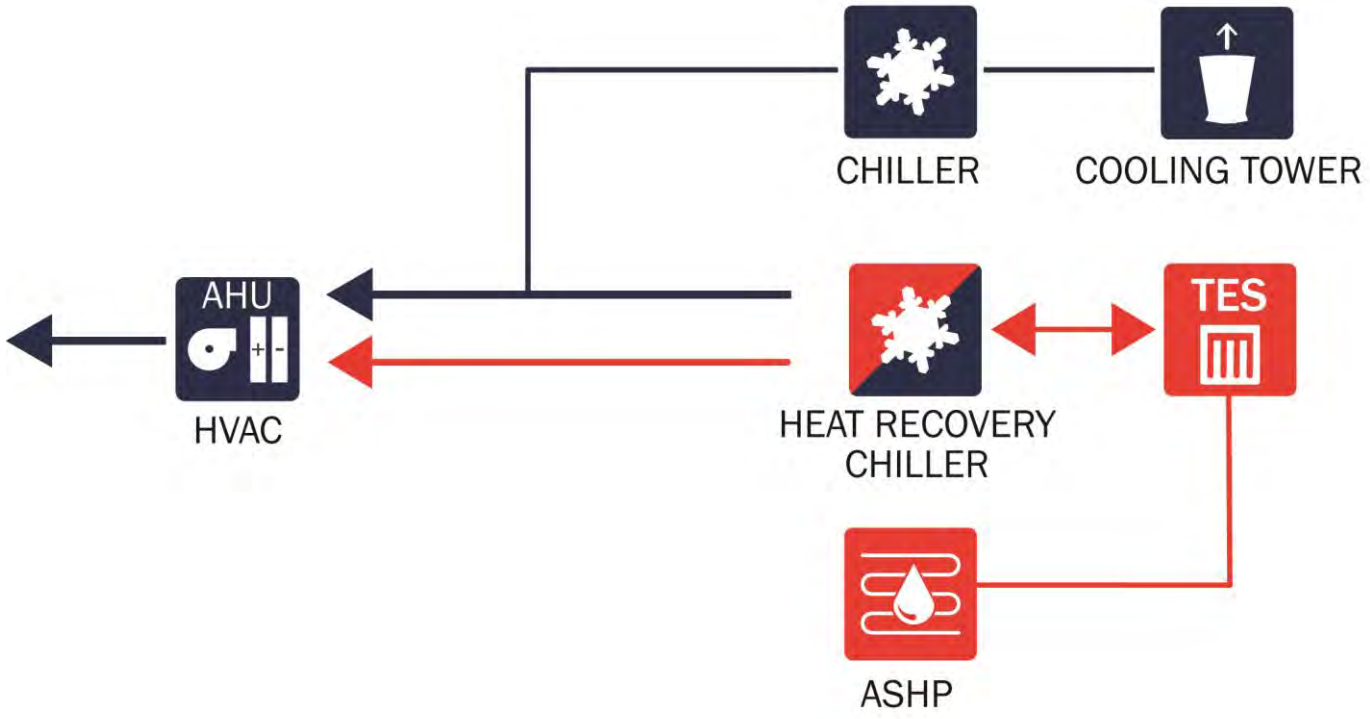
- Heat recovery chiller, with 41 kgal tank thermal storage
- Centrifugal chiller for supplementary cooling
- ASHP used to maintain thermal storage tank temperature



OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR
Proposed Design – No TES	27.9 MBTU (0.6% REDUCTION)	3,896 METRIC TONS (22 SAVED)	3.6 MGAL/YR
Proposed Design	27.8 MBTU (1.3% REDUCTION)	3,869 METRIC TONS (49 SAVED)	3.6 MGAL/YR

Proposed Design w/ Economizer Throttle

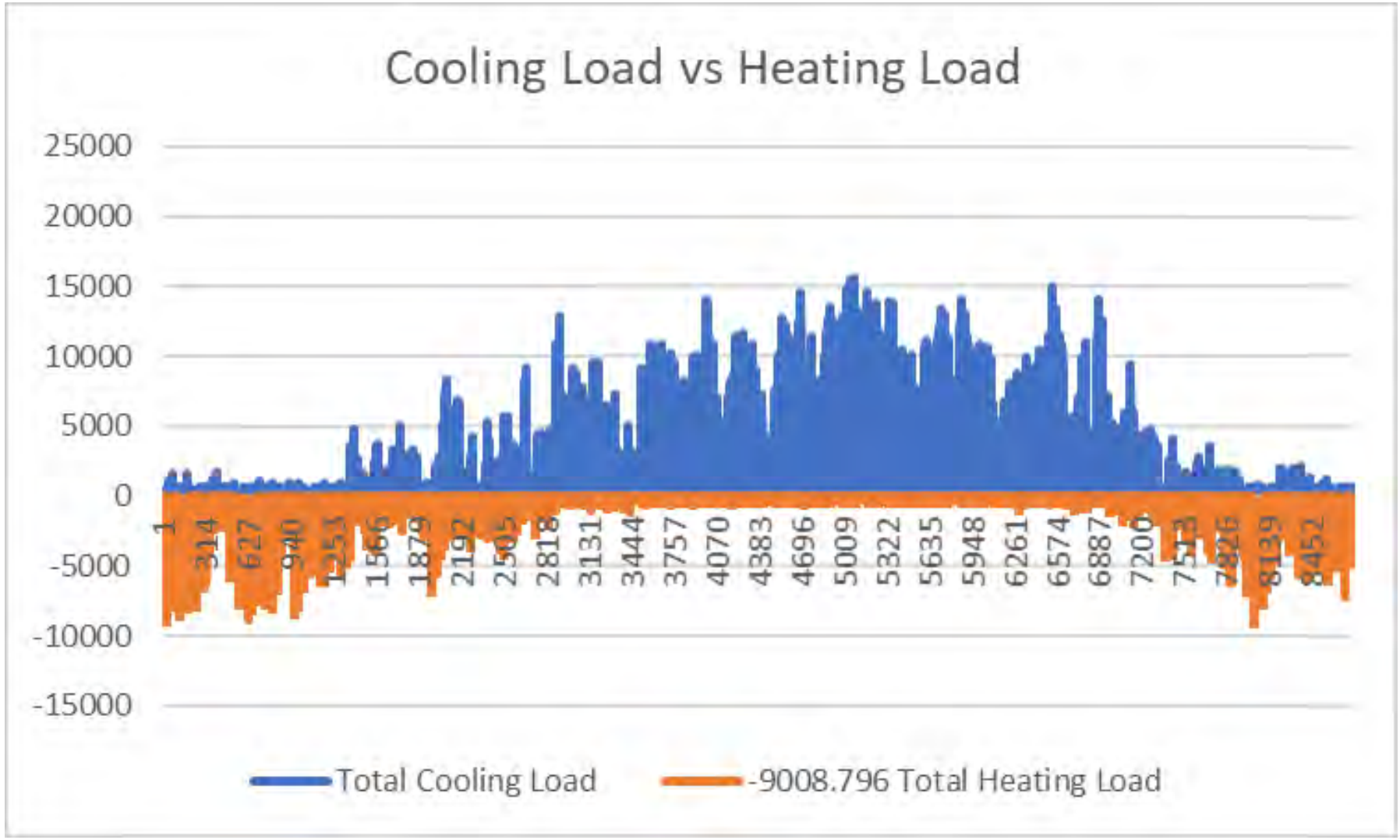
- Heat recovery chiller, with 41 kgal tank thermal storage
- Centrifugal chiller for supplementary cooling
- ASHP used to maintain thermal storage tank temperature
- Air-side economizer is throttled to induce cooling demand, increasing efficiency of heat recovery chiller



OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR
Proposed Design – No TES	27.9 MBTU (0.6% REDUCTION)	3,896 METRIC TONS (22 SAVED)	3.6 MGAL/YR
Proposed Design	27.8 MBTU (1.3% REDUCTION)	3,869 METRIC TONS (49 SAVED)	3.6 MGAL/YR
Proposed Design – Economizer Throttle	27.6 MBTU (2.1% REDUCTION)	3,840 METRIC TONS (79 SAVED)	3.6 MGAL/YR

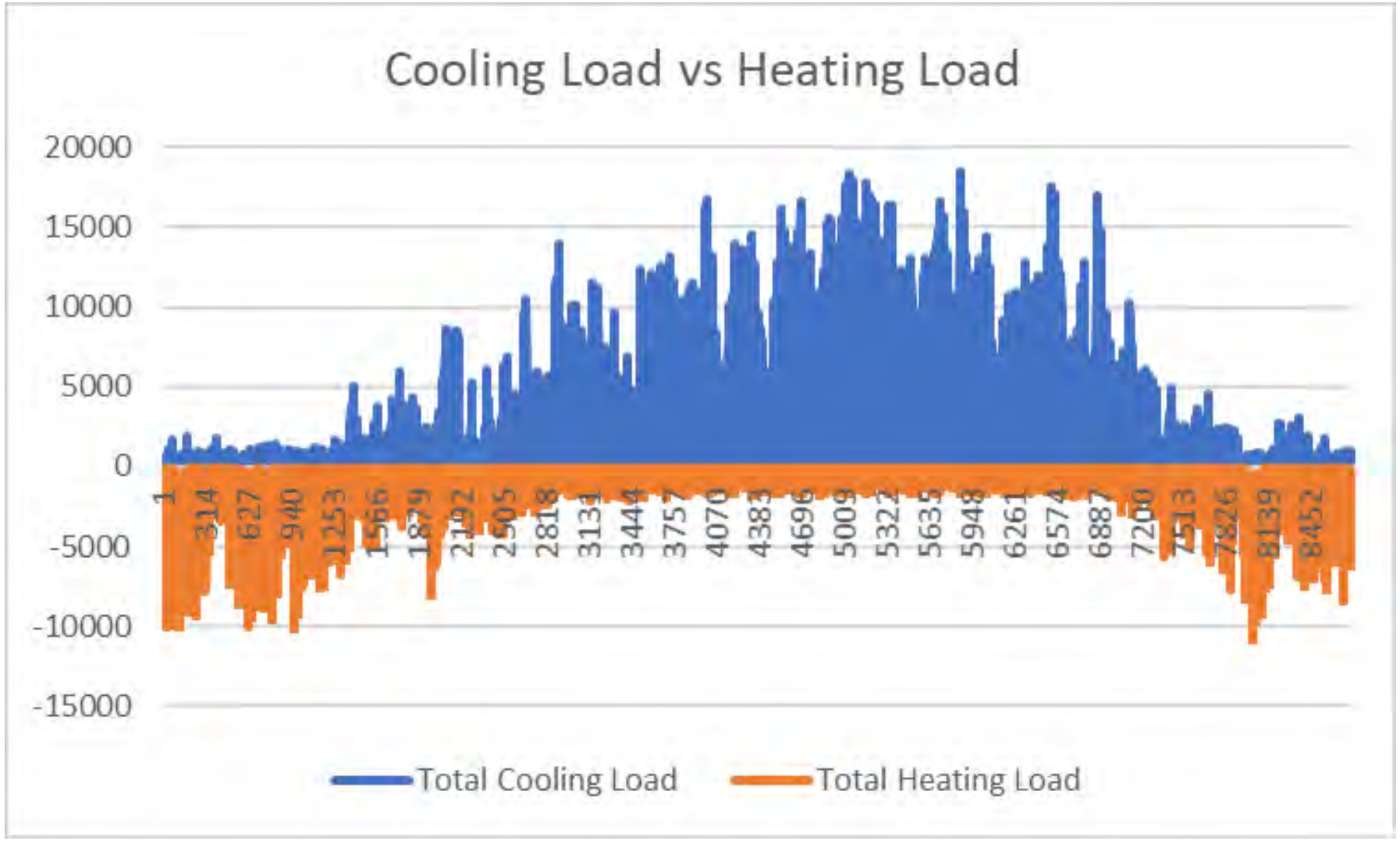
Load Profile – Proposed Design

- Includes all DHW loads and server room loads



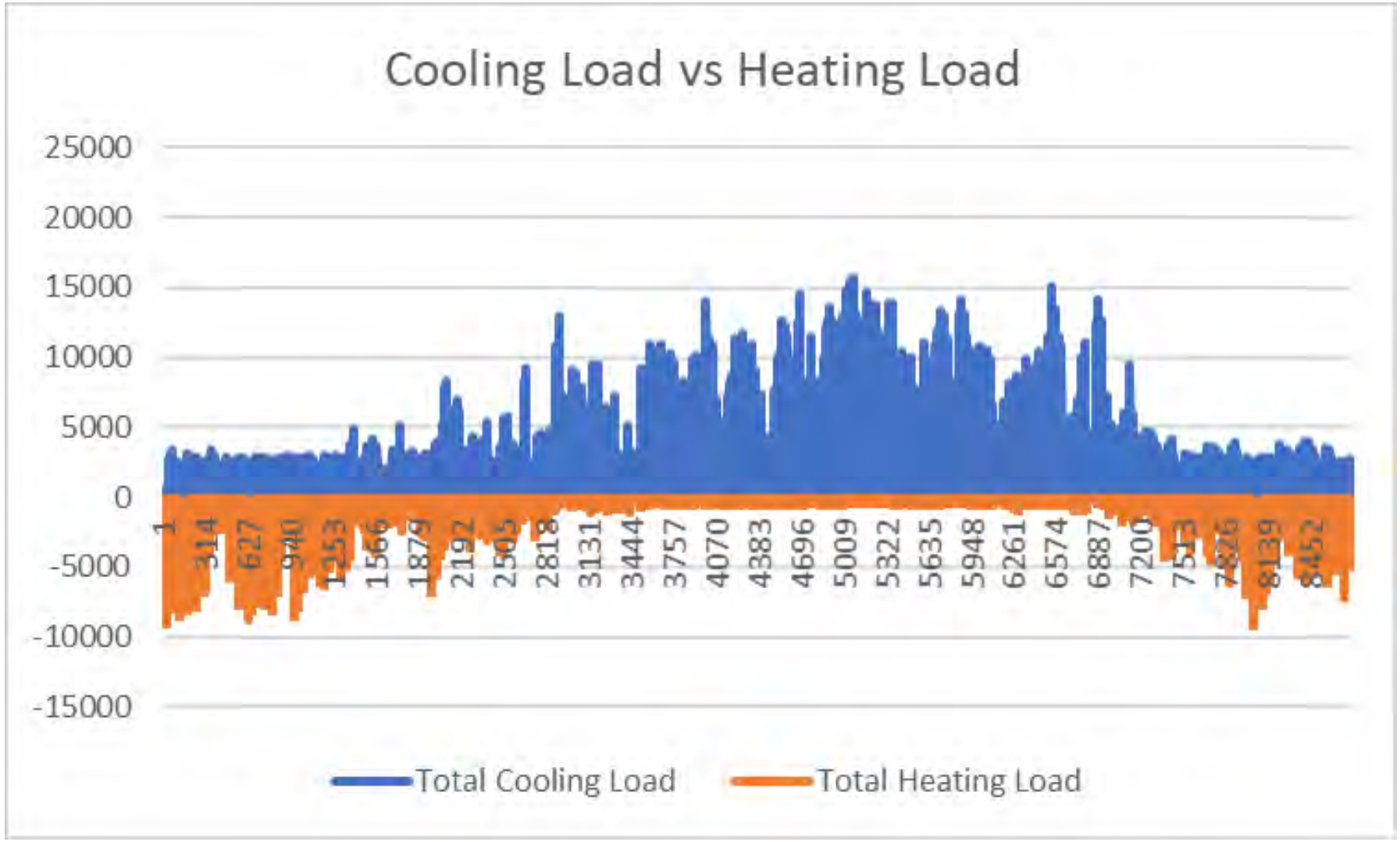
Load Profile – Proposed Design with Additional Spaces

- Tech museum, food service, and server rooms add cooling loads.
- This will increase the efficiency of the heat recovery chiller and thermal energy storage strategy.



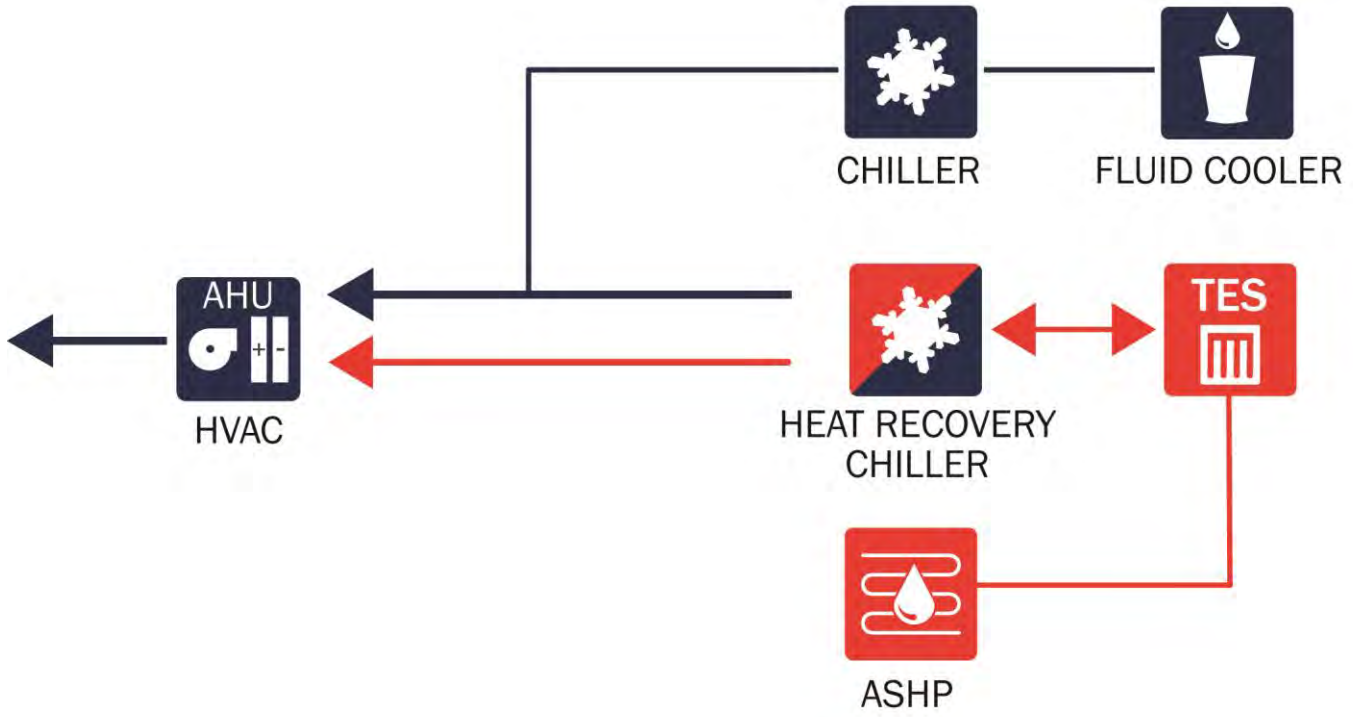
Load Profile – Proposed Design with Economizer Throttling

- Throttling the economizer to induce cooling load increases overall efficiency through additional use of the heat recovery chiller



Proposed Design – Fluid Cooler

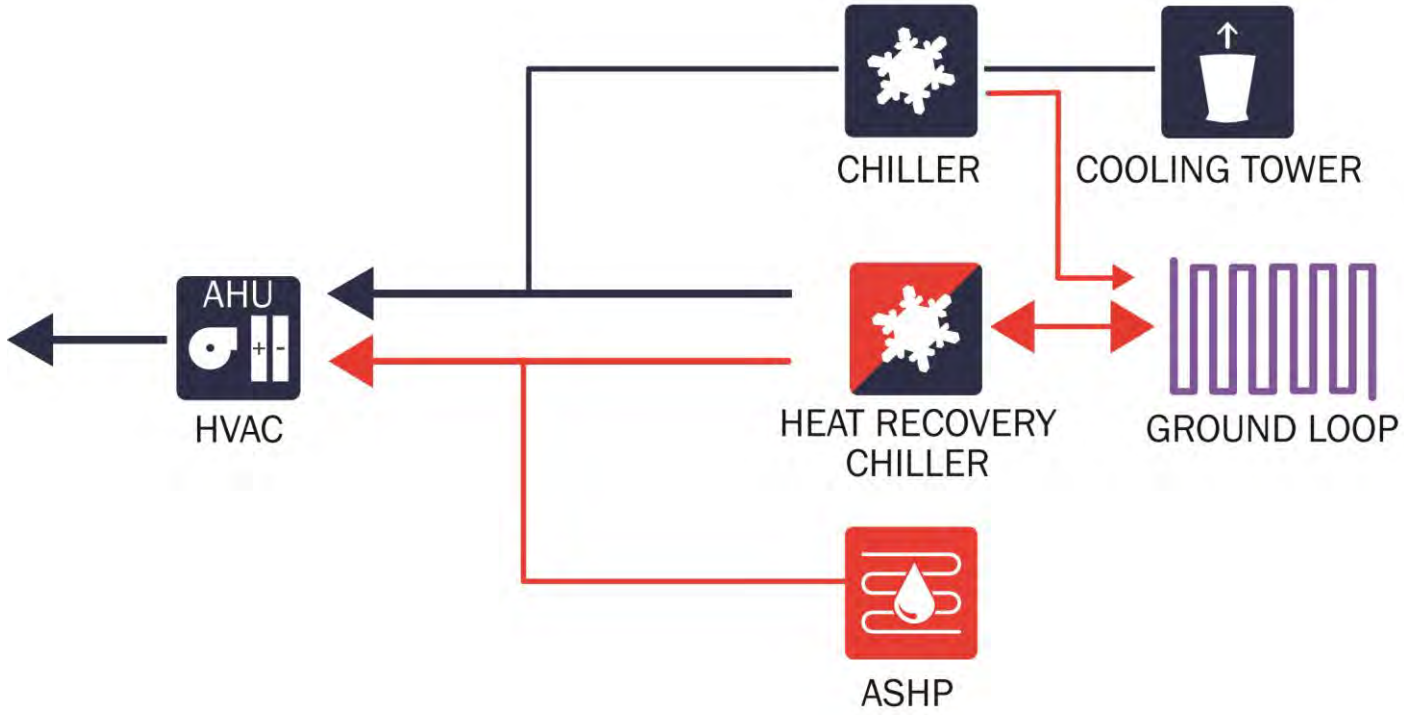
- **Use of a fluid cooler in lieu of cooling towers slightly reduces efficiency, but provides significant water savings**



OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR
Proposed Design – No TES	27.9 MBTU (0.6% REDUCTION)	3,896 METRIC TONS (22 SAVED)	3.6 MGAL/YR
Proposed Design	27.8 MBTU (1.3% REDUCTION)	3,869 METRIC TONS (49 SAVED)	3.6 MGAL/YR
Proposed Design – Economizer Throttle	27.6 MBTU (2.1% REDUCTION)	3,840 METRIC TONS (79 SAVED)	3.6 MGAL/YR
Proposed Design – Fluid Cooler	27.7 MBTU (1.5% REDUCTION)	3,860 METRIC TONS (58 SAVED)	~1.0 MGAL/YR

Alternate System - GSHP

- **A supplementary ground loop (down-sized from previous analysis) provides some benefit, though not significant enough to warrant the cost**



OPTION	ENERGY	CARBON	WATER
All-electric Baseline	28.1 MBTU	3,918 METRIC TONS	3.6 MGAL/YR
Proposed Design – No TES	27.9 MBTU (0.6% REDUCTION)	3,896 METRIC TONS (22 SAVED)	3.6 MGAL/YR
Proposed Design	27.8 MBTU (1.3% REDUCTION)	3,869 METRIC TONS (49 SAVED)	3.6 MGAL/YR
Proposed Design – Economizer Throttle	27.6 MBTU (2.1% REDUCTION)	3,840 METRIC TONS (79 SAVED)	3.6 MGAL/YR
Proposed Design – Fluid Cooler	27.7 MBTU (1.5% REDUCTION)	3,860 METRIC TONS (58 SAVED)	~1.0 MGAL/YR
Ground Loop	27.3 MBTU (2.8% REDUCTION)	3,811 METRIC TONS (108 SAVED)	~1.6 MGAL/YR

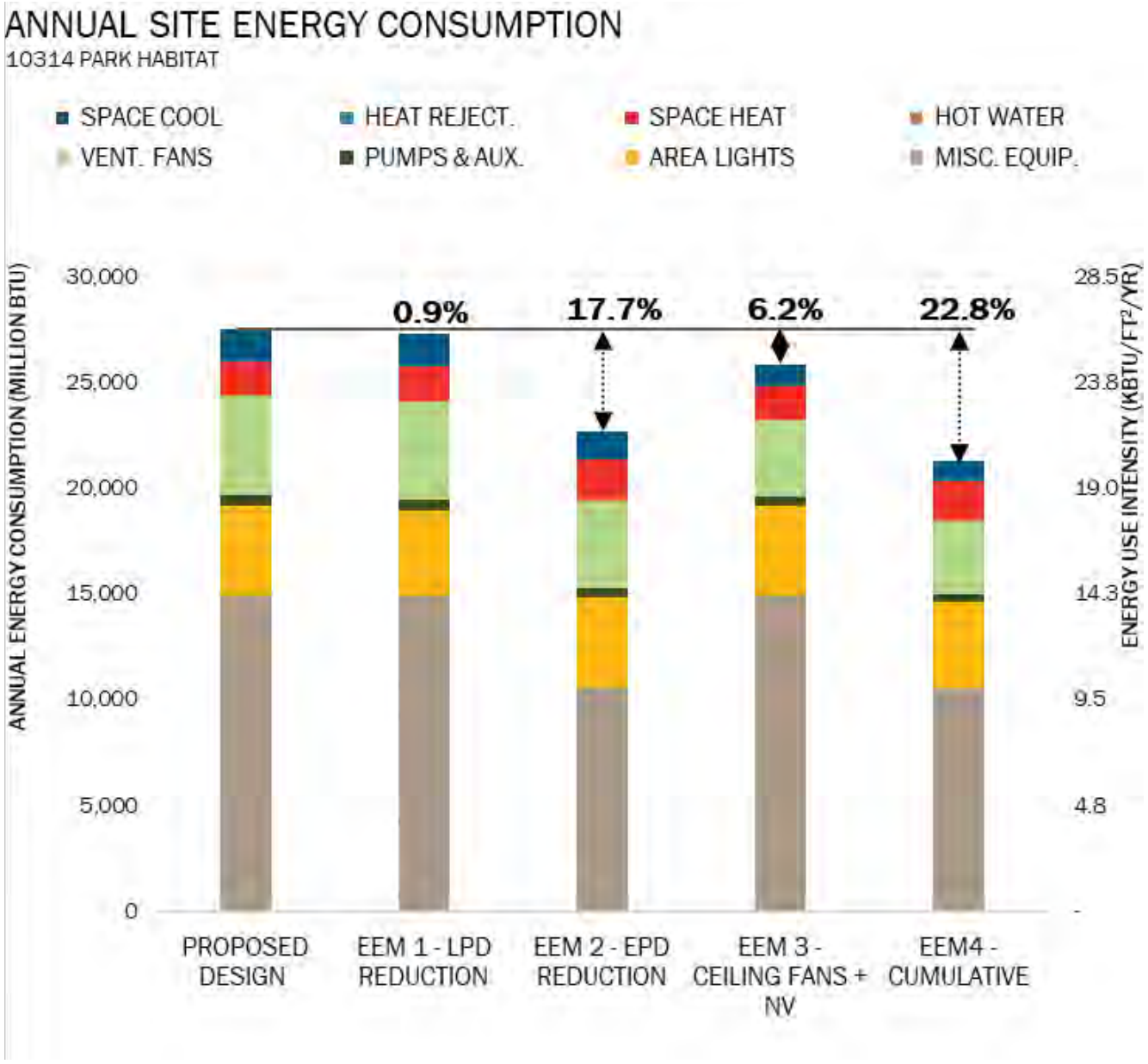
Waterside System Recommendation

- The proposed central plant system design, including thermal energy storage, is recommended.
- Air-side system controls to allow for economizer throttling are also recommended.
- A fluid-cooler in lieu of cooling towers should be considered if the water re-use system is not included in the project.
- A down-sized GSHP, as shown in this analysis, is still not a cost-effective solution in this climate.

Energy Efficiency Measures - Summary

The project contains the following EEMs:

1. **EEM 1 LPD Reduction:**
   20% Reduction in LPD for all core spaces (non-office spaces)
2. **EEM 2 EPD Reduction:**
   Plug load management with office EPD assumed to be 1 W/sqft (at 1.5 W/sqft for Proposed Design Case)
3. **EEM 3 Ceiling Fans + Natural Ventilation:**
   Analyzing combined effect of using ceiling fans to relax cooling temperature setpoints and use of natural ventilation
4. **EEM 4 Cumulative:**
   Combined used of EEMs 1, 2 and 3



Glazing Sensitivity Analysis

- The previous load options were evaluated for external glazing of U-value 0.36 Btu/hr.sqft.F and an SHGC of 0.21 (includes exterior shading)
- This load option looks at the sensitivity of the glazing properties - U-value 0.46 Btu/hr.sqft.F and a SHGC of 0.19 (minimally compliant with T24-2019 operable window requirements with a SHGC reduction factor based on daylighting studies)
- The results from the updated glazing values show a lower cooling load with a lower peak cooling load and a higher heating load with a higher peak heating load
- **The cooling and heating performance between the two cases show a marginal difference**

Load Option	Cooling Energy (mmBtu)	Heating Energy (mmBtu)	DHW Energy (mmBtu)	Cooling COP	Heating COP
Proposed Design	1570	1401	106	9.0	3.5
Window Sensitivity	1471	1762	114	9.1	3.4

Energy Efficiency Measure Recommendation

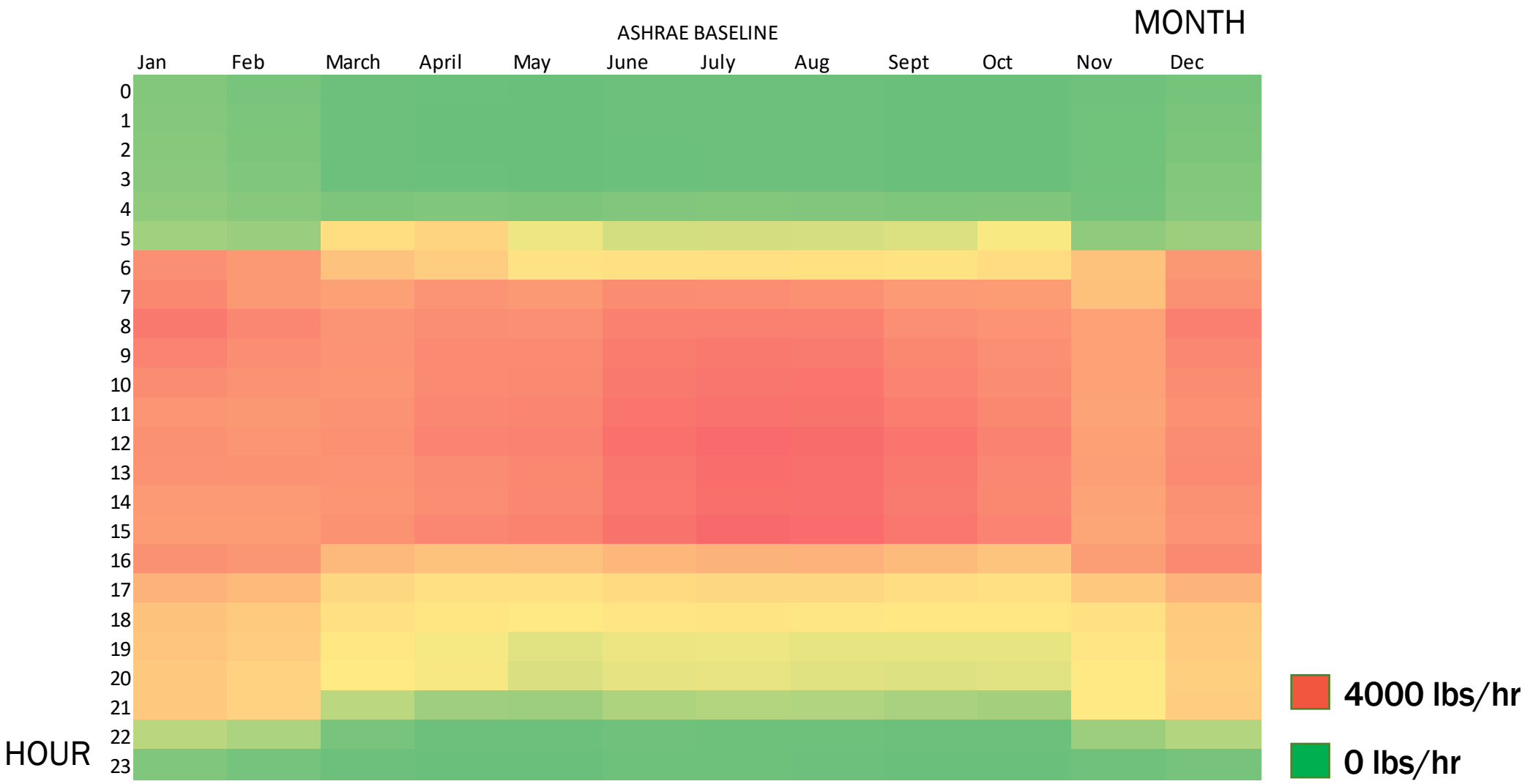
- Maintain natural ventilation night-flush cooling strategy in the project

- Pursue aggressive equipment power mitigation strategies through detailed design and TI scope

- Maintain the following glazing assembly performance targets:
  - U-value: 0.36 (fixed), 0.46 (operable)
  - SHGC: 0.25 – 0.3

Marginal Carbon Emissions Heat Map – ASHRAE Baseline

Code Compliant Building



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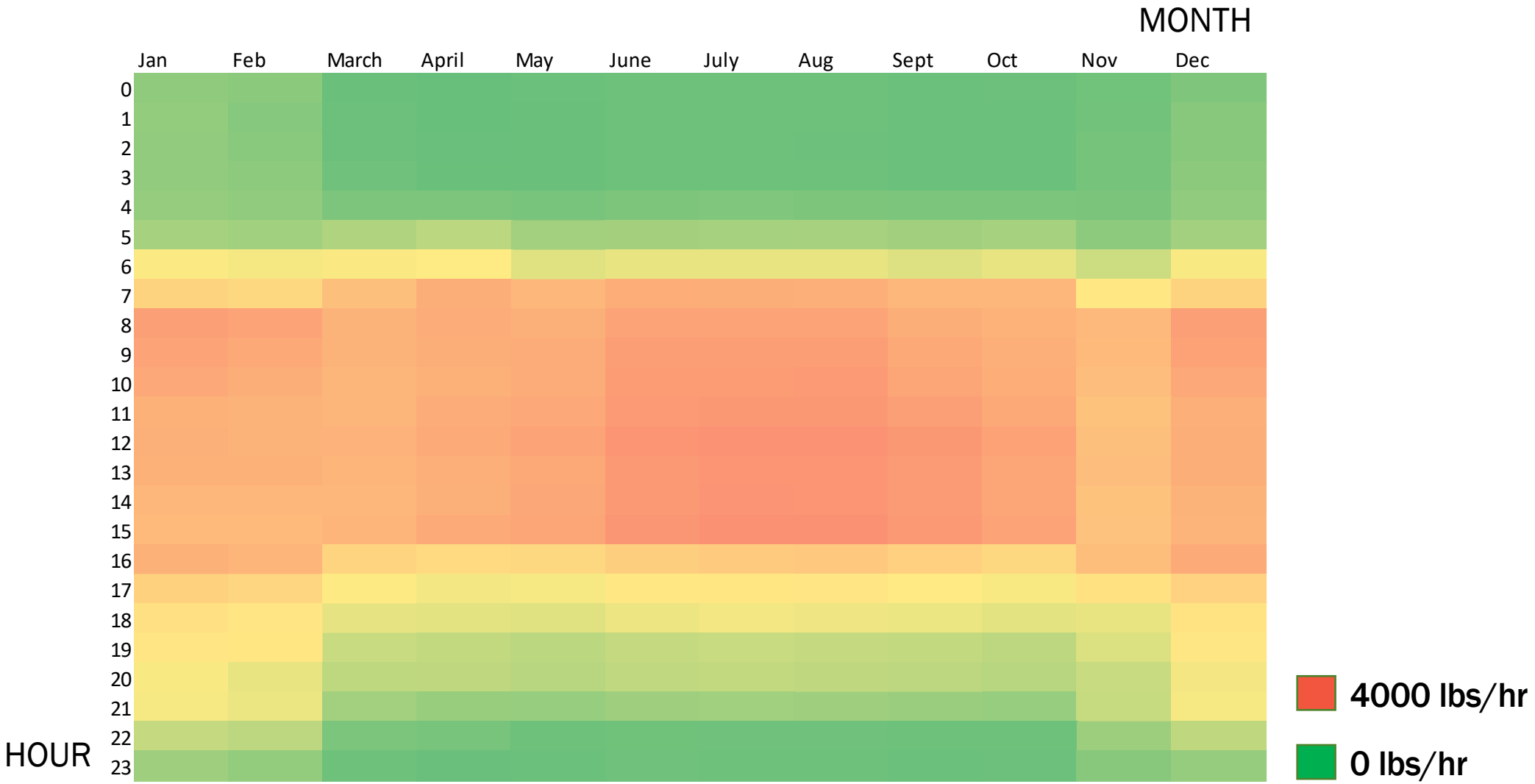
Marginal Carbon Emissions Heat Map – Proposed Design

Heat Recovery Chiller & ASHP key emissions reduction measures



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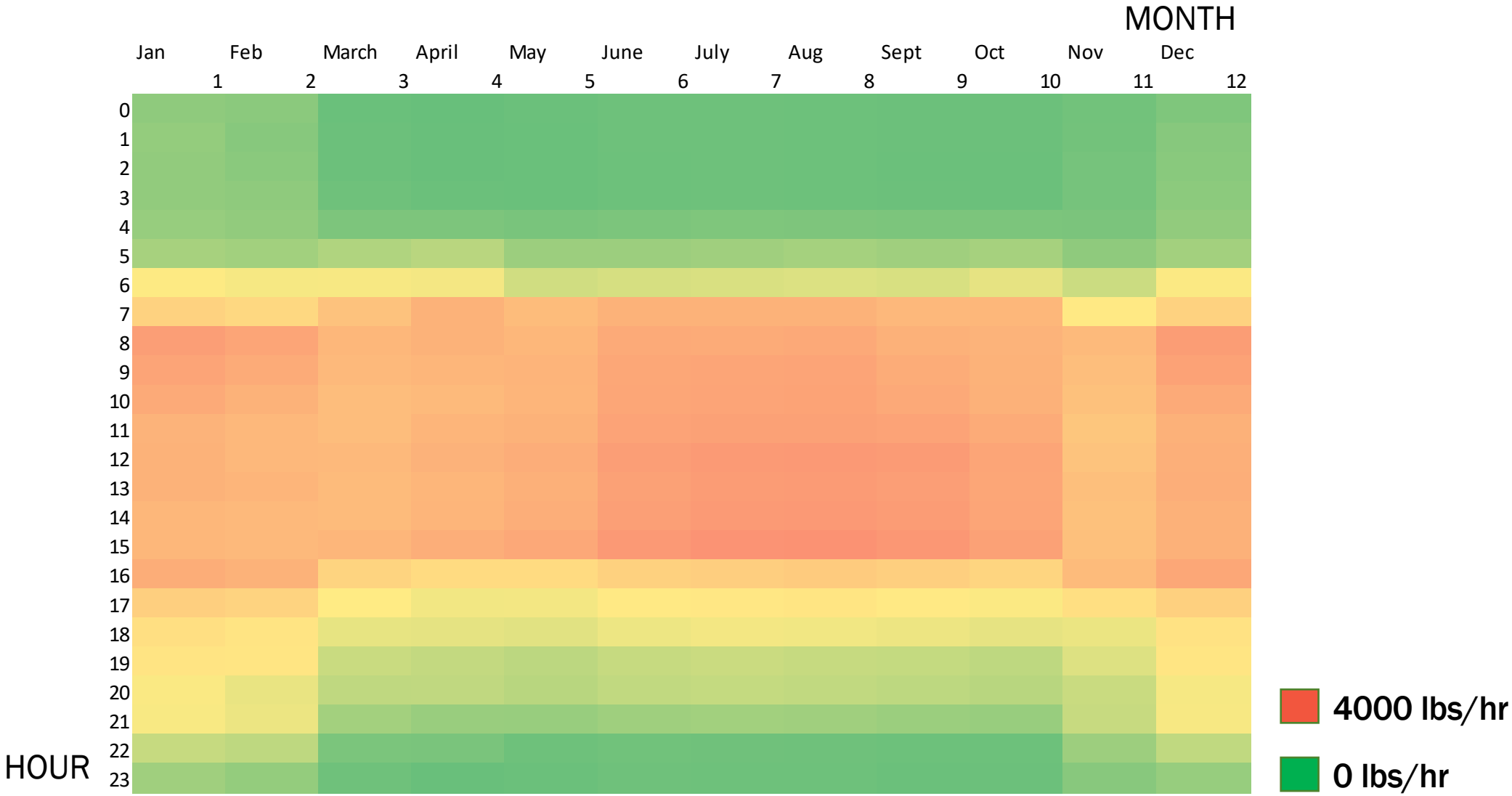
Marginal Carbon Emissions Heat Map – Proposed Design (with 250 kW PV)

The design team has allocated roof space for an approximately ~240-250 kW photovoltaic array



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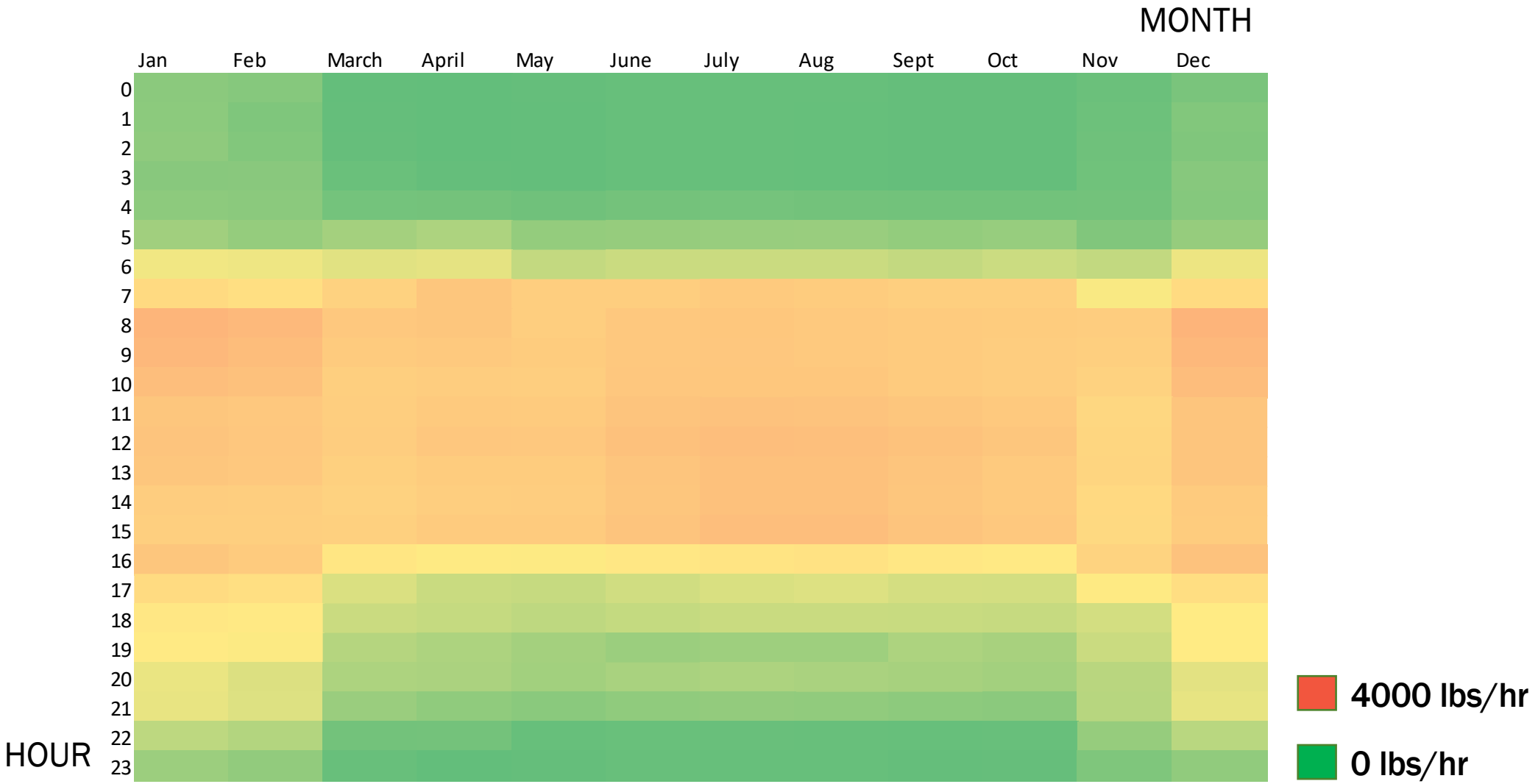
Marginal Carbon Emissions Heat Map – Cumulative Case

Equipment power reduction measures & natural ventilation cooling are key emissions reductions measures



Marginal Carbon Emissions Heat Map – Cumulative Case (with 250 kW PV)

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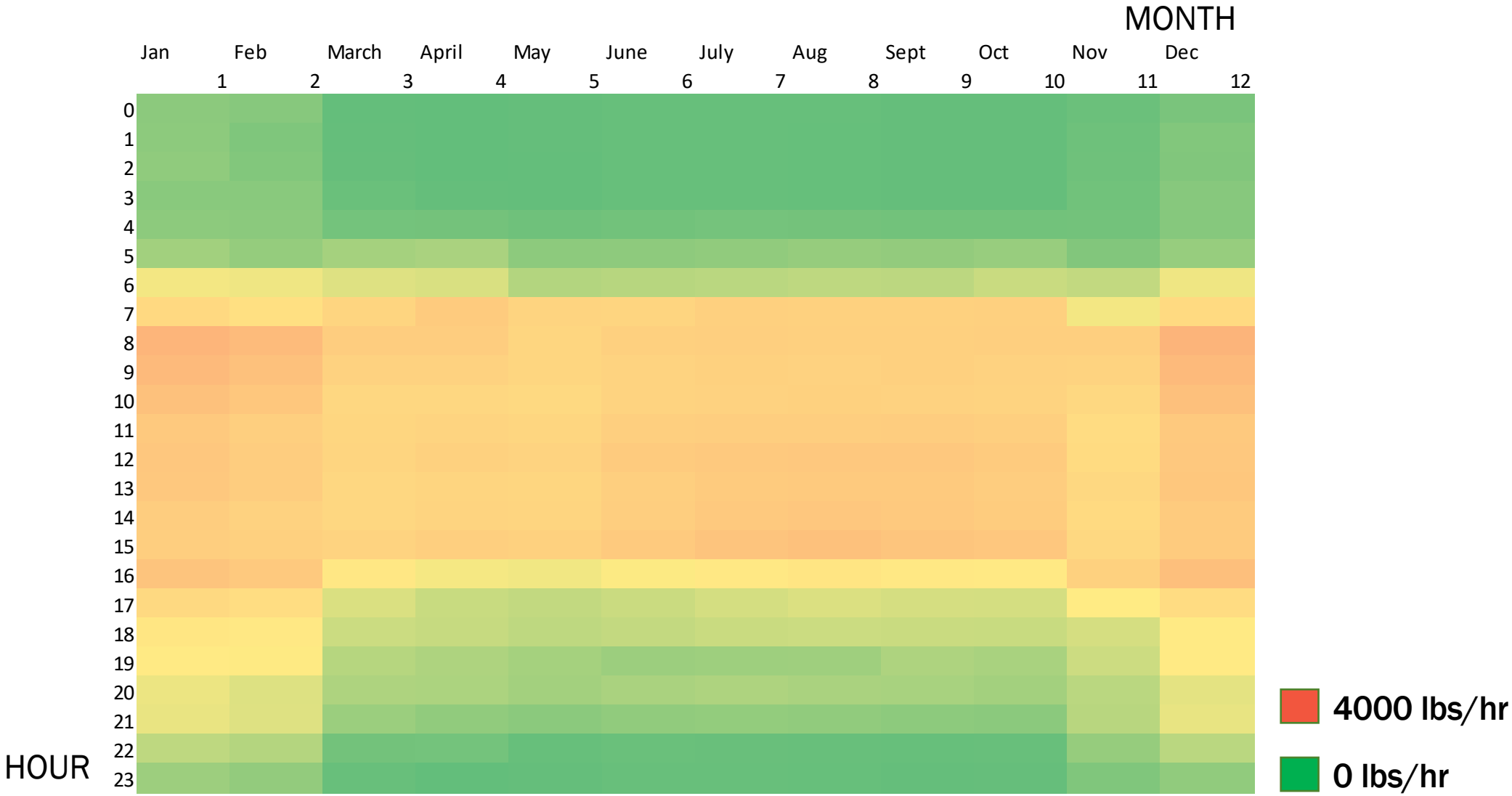

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California Grid Emissions (Marginal)

Annual Emission Profiles [lb CO2/MWh]

MARGINAL	Month →	1	2	3	4	5	6	7	8	9	10	11	12
		Wday	Wday	Wday	Wday	Wday	Wday	Wday	Wday	Wday	Wday	Wday	Wday
	Hour ↓	1_Wda	2_Wda	3_Wda	4_Wda	5_Wda	6_Wda	7_Wda	8_Wda	9_Wda	10_Wd	11_Wd	12_Wd
	0	989	961	937	934	935	1006	1023	1018	953	944	958	1002
	1	979	947	929	927	928	991	1015	1010	950	940	947	989
	2	978	943	928	926	924	981	1013	1008	949	939	942	982
	3	978	944	932	932	929	986	1012	1009	950	943	943	983
	4	987	958	954	956	948	999	1018	1015	954	957	953	994
	5	1004	989	995	996	982	1021	1024	1025	962	973	983	1015
	6	1034	1025	1026	1020	1018	1054	1042	1042	976	979	1022	1049
	7	1058	1041	1035	1038	1036	1079	1061	1064	1004	986	1041	1075
	8	1065	1046	1042	1052	1049	1088	1079	1079	1035	998	1050	1083
	9	1073	1049	1047	1053	1060	1093	1087	1085	1055	1011	1054	1085
	10	1070	1050	1045	1055	1062	1096	1088	1086	1061	1021	1058	1084
	11	1061	1047	1046	1057	1062	1097	1088	1086	1068	1027	1056	1083
	12	1060	1042	1045	1054	1064	1098	1088	1086	1076	1036	1059	1078
	13	1059	1044	1048	1055	1068	1099	1088	1086	1083	1044	1060	1078
	14	1056	1042	1049	1056	1073	1099	1087	1086	1086	1046	1060	1073
	15	1051	1041	1044	1057	1072	1099	1087	1086	1086	1045	1059	1070
	16	1060	1050	1044	1056	1068	1099	1087	1086	1085	1041	1060	1081
	17	1090	1073	1052	1057	1064	1099	1087	1086	1078	1039	1067	1099
	18	1094	1088	1067	1063	1064	1098	1087	1086	1078	1038	1065	1098
	19	1091	1082	1064	1066	1072	1098	1087	1086	1071	1026	1062	1096
	20	1083	1067	1046	1047	1053	1098	1086	1085	1050	1003	1060	1092
	21	1052	1036	1020	1015	1023	1087	1083	1078	1009	985	1050	1083
	22	1029	1015	986	976	990	1063	1057	1054	976	971	1024	1057
	23	1007	982	955	952	957	1038	1037	1031	960	957	990	1028

Heating season morning warm up

Evening ramp up throughout the year

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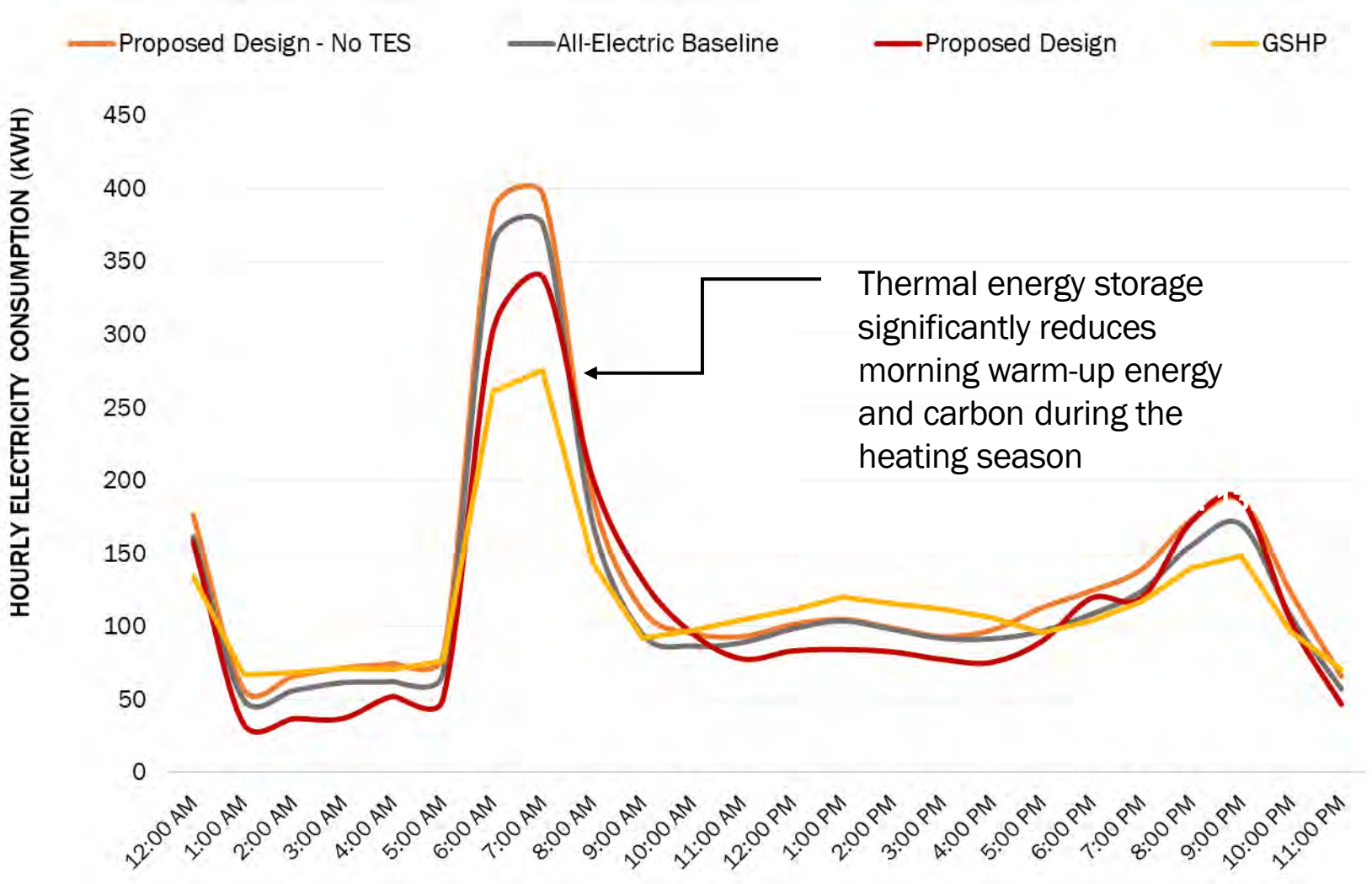
Hourly HVAC Energy Use – Average Winter Day (Nov-Feb)



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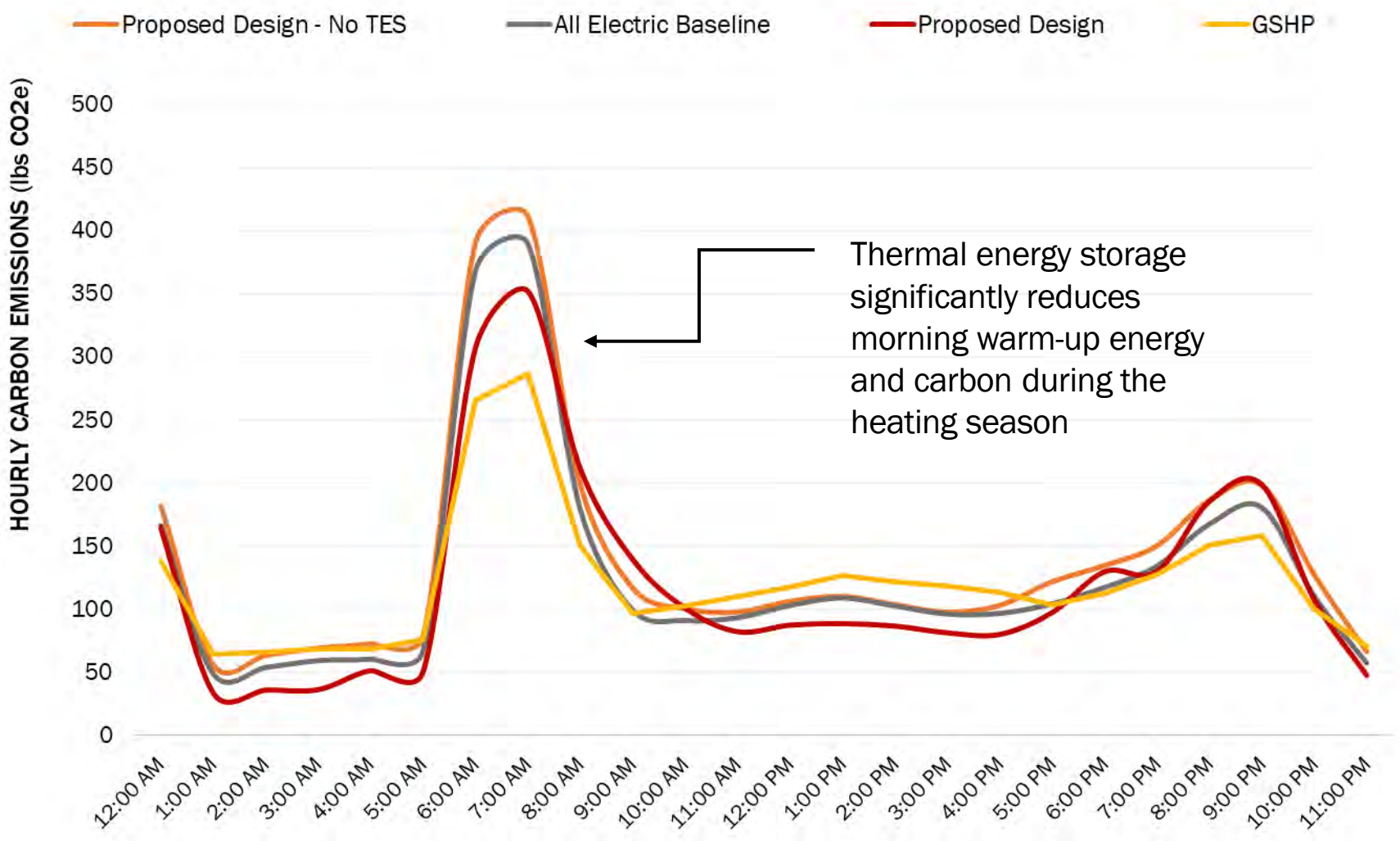
Hourly HVAC Carbon Emissions – Average Winter Day (Nov-Feb)



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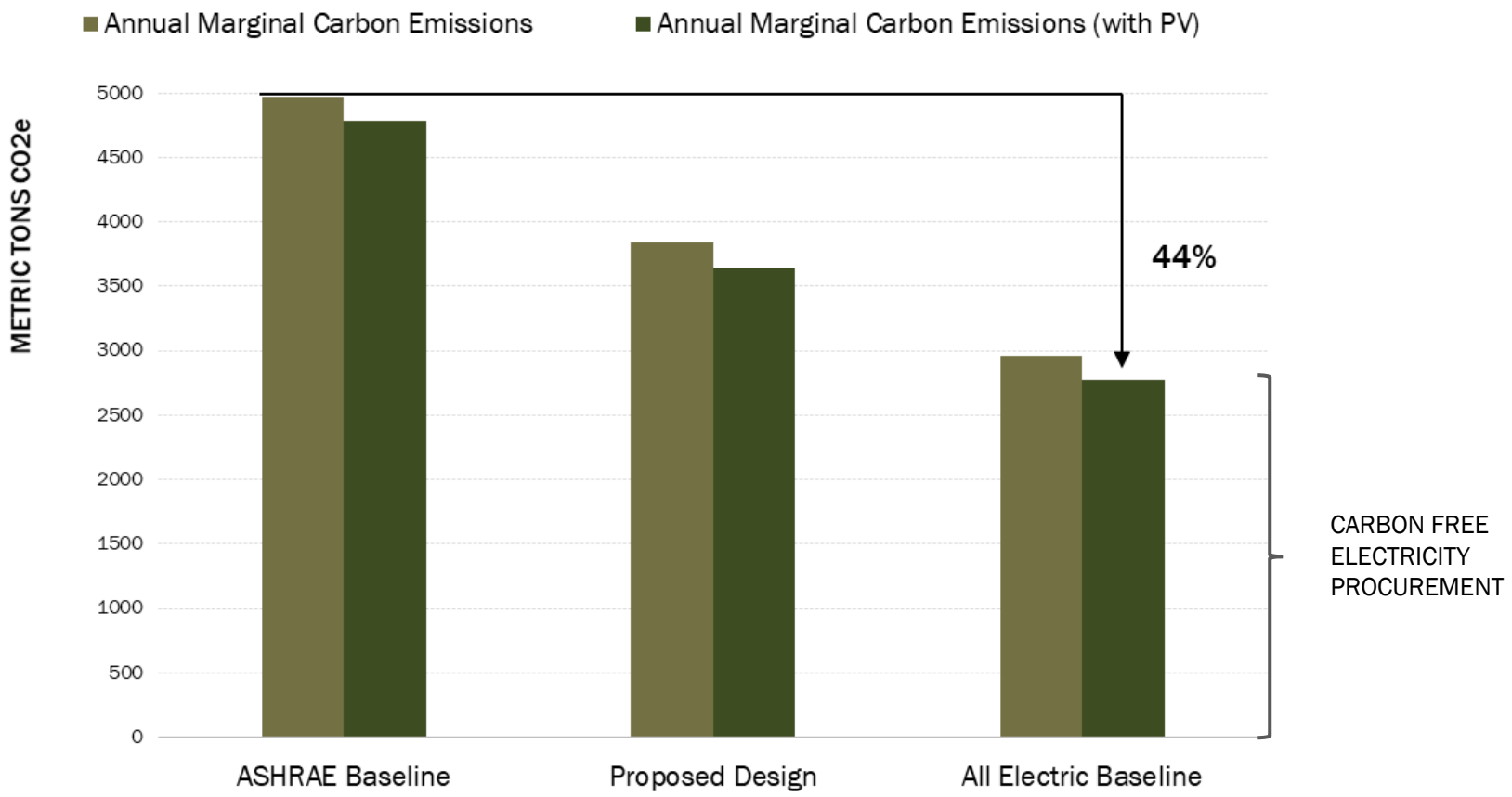
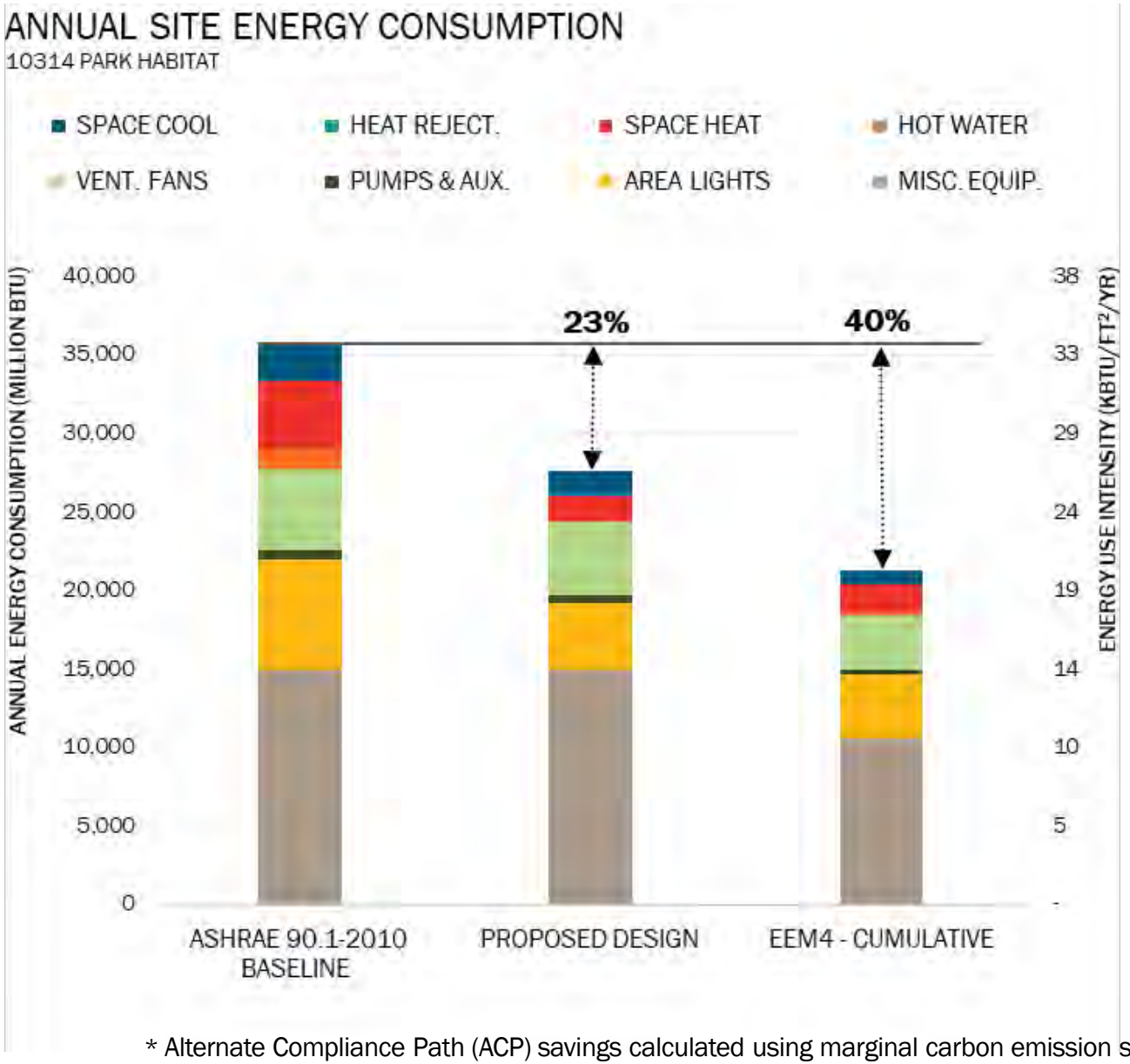
Annual Marginal Carbon Emissions – Office Program



ASHRAE Baseline – LEED Summary

- **Proposed Design shows 23% energy and cost savings over ASHRAE 90.1 – 2010 Baseline Design**
  - 10 points under LEED v4 BD+C: Core & Shell
  - 10 points using the Alternative Compliance Path*
- **Cumulative case shows 40% energy and cost savings over ASHRAE 90.1 – 2010 Baseline Design**
  - 16 points under LEED v4 BD+C: Core & Shell
  - 16 points using the Alternative Compliance Path*



* Alternate Compliance Path (ACP) savings calculated using marginal carbon emission savings

Appendix 2 –DD Phase Embodied Carbon LCA Report

Park Habitat, 50% DD – Sustainability Narrative Appendices

Design Development Life Cycle Analysis

Park Habitat
November 25, 2020

atelier ten
Environmental Design Consultants + Lighting Designers
443 Tehama Street, 1st Floor San Francisco, CA 94103 T +1 (415) 351 - 2100 atelierten.com

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Executive Summary

The objective of this analysis is to develop a baseline embodied carbon emissions profile (also known as global warming potential) of Park Habitat at 50% DD and inform opportunities for impact reduction. The cases presented in this report are cradle-to-grave, whole building life cycle analyses (WBLCA) of the project including substructure, superstructure, enclosure and secondary façade. Nonstructural partitions and interior finishes are excluded from the scope of analysis but may constitute a significant portion of total building embodied carbon emissions. The exception, for this project is the inclusion of raised floor systems. These components represent a prominent feature throughout the building and consequently offer an opportunity for additional savings upon further study.

Optimizations proposed in this report offer up to a 27% reduction in embodied carbon compared to the current project. These savings are the result of the following measures exemplified by each analysis case as shown in Figure 1.

- 1. Procurement of insulation, including light-density mineral wool board, batt insulation and roof polyisocyanurate (polyiso) insulation.
- 2. Procurement of Nucor rebar manufactured at a plant in Seattle that runs on hydro power.
- 3-5. Reduction of cement through use of high quality aggregate and/or replacement with fly ash, slag or other pozzolans per minimum and maximum cement replacement recommendations determined by concrete use and strength.

Park Habitat has a baseline net global warming potential (GWP) of 70,008,688 kg CO2e; roughly half can be attributed to concrete and another 30% to steel and other metals. These materials, in addition to insulation, are the primary focus of optimizations in this study.

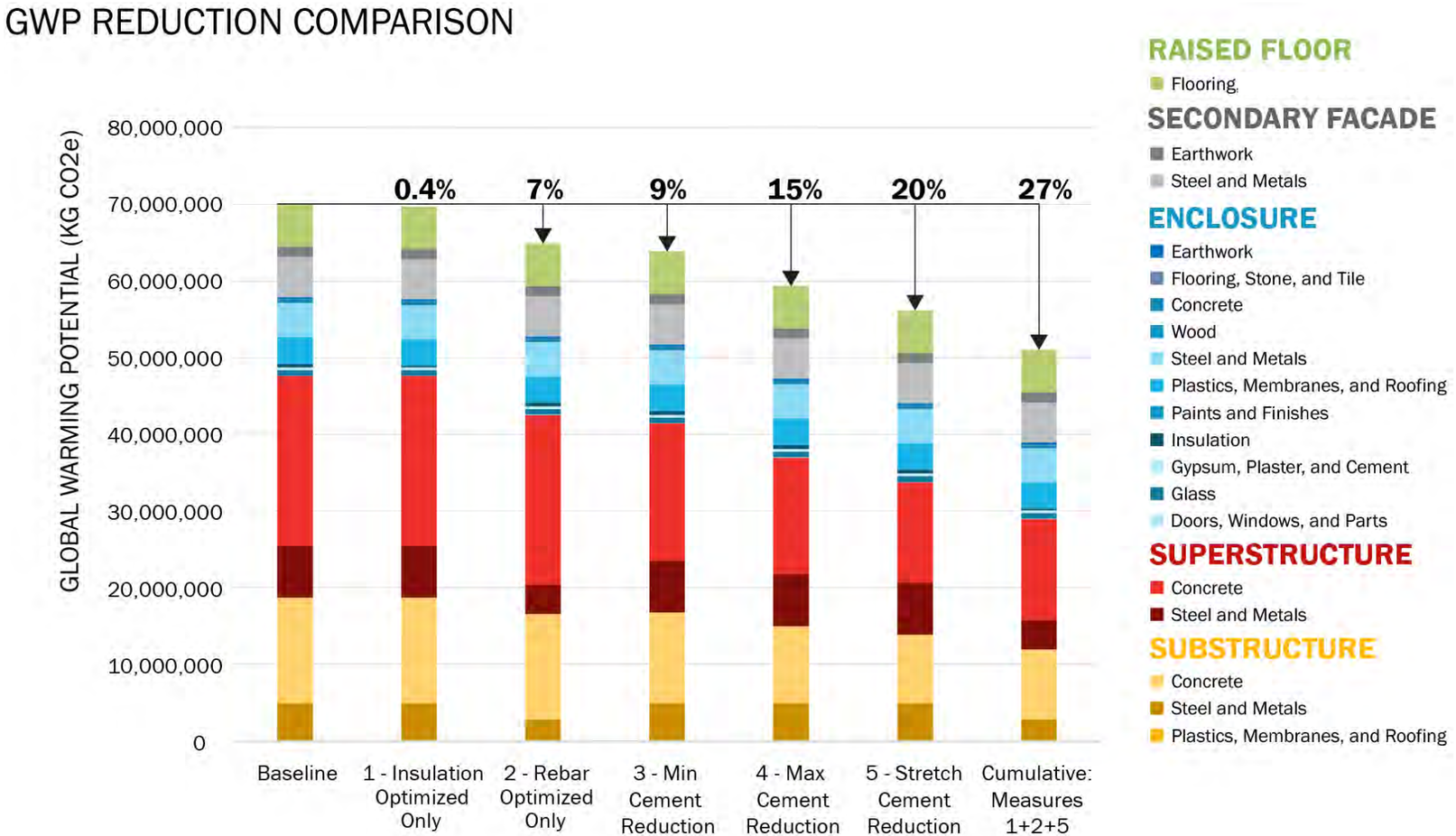

FIGURE 1 - OVERVIEW OF EMBODIED CARBON TOTALS BY IMPACT REDUCTION MEASURE

Introduction

Park Habitat is a ~1.0 million square foot commercial office building situated in downtown San Jose. The structure consists of four underground parking stories topped by twenties stories of reinforced concrete. The building is characterized by its envelope, enclosed with a patchwork of vegetated panels, curtainwall and terracotta panels, decorated with a secondary façade of steel to support a system of catwalks, terracotta louvers and planted structures. Vertical cutouts in the floorplate function as a 'green lung' to deliver daylight to vegetated terraces within the floorplate and along the perimeter. The project is crowned with a lush extensive green roof complete with walkways, an outdoor pavilion and a tea house.

According to Architecture 2030, the building industry's impact on the environment accounts for 40% of natural resources consumption, 40% of total primary energy consumption, 15% of the world's fresh water resources, 25% of all waste generation, and 40-50% of greenhouse gas emissions. Numerous scientific studies and governmental reports have established the importance of reducing carbon emissions within the next few decades to avoid irreversible climate change. Most notably, the Intergovernmental Panel on Climate Change (IPCC) recently released a special report outlining the impacts of global warming above 1.5°C which confirms that climate change is worse than expected. The report also outlines a few pathways to stabilize global warming all of which require us to cut emissions in half within the next 15 years.

As operational building energy efficiency increases, the proportion of the total emissions associated with the extraction, manufacturing and transportation of construction materials constitutes a larger share of a project's carbon footprint. When buildings are net zero energy or, better yet, achieve net zero operational carbon, the embodied carbon is the entirety of the carbon footprint of the project. It is estimated that embodied emissions will account for half of all building related emissions between 2020 and 2050, as most embodied emissions occur upfront, rather than diluted over the lifespan of a project. Addressing embodied carbon is therefore key in order to avoid surpassing climate tipping points in the coming decades.

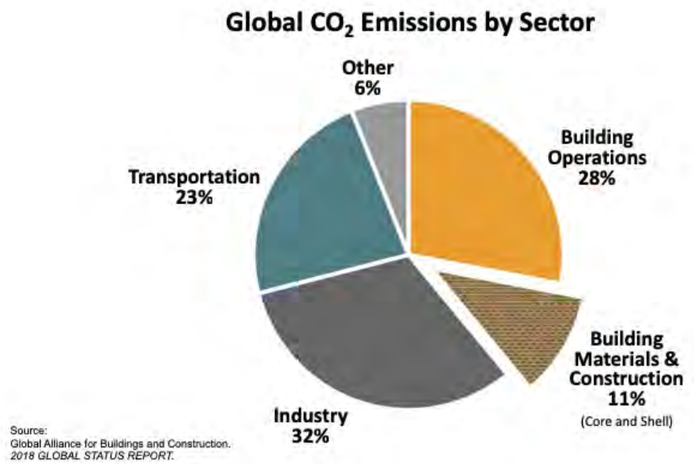

FIGURE 2 - GLOBAL CO2 EMISSIONS BY SECTOR

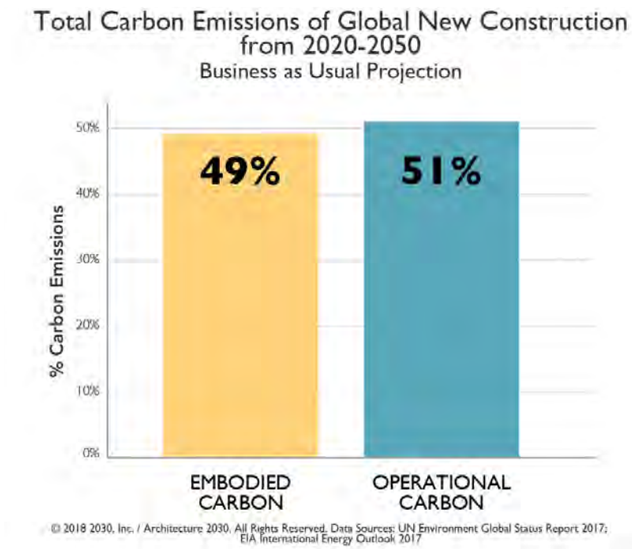

FIGURE 3 - CARBON EMISSIONS OF NEW CONSTRUCTION PROJECTS

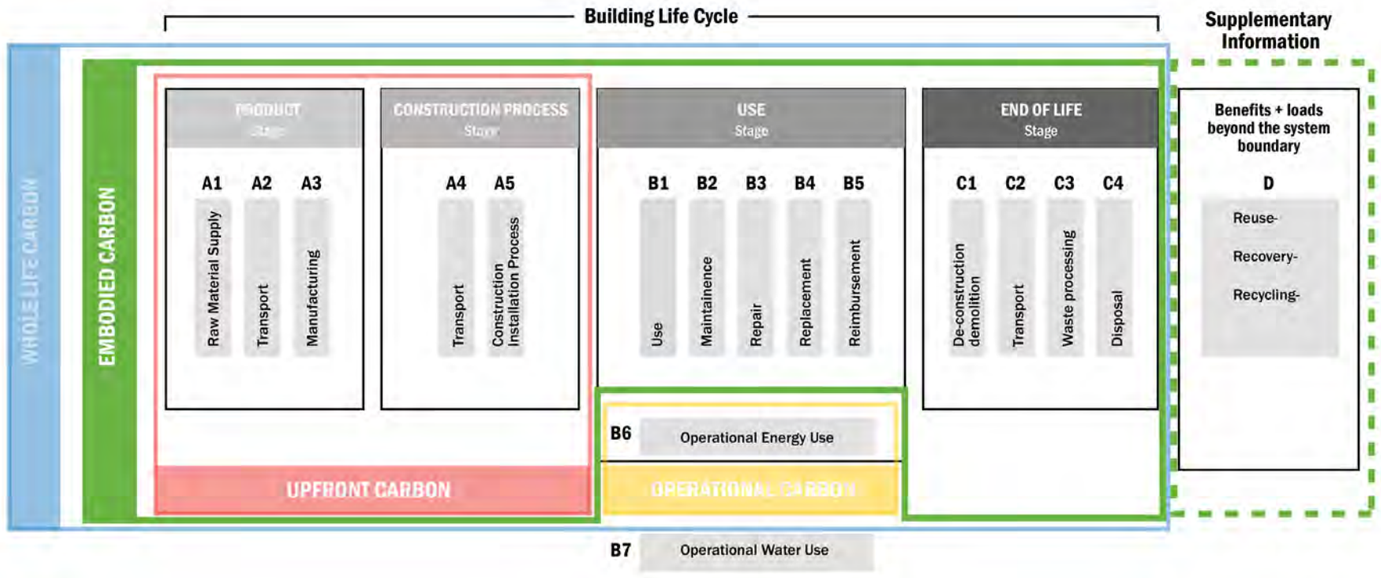

FIGURE 4 - STANDARD LIFE CYCLE STAGES AND MODULES, ADOPTED FROM EN 15978

FIGURE 5 - SCOPE OF BUILDING LIFE CYCLE ANALYSIS

Methodology

Atelier Ten conducted a whole building life cycle assessment (WBLCA) for Park Habitat during the early DD phase using industry standard baseline materials and an optimized case representing impact reduction measures (IRMs) proposed for the project. Both baseline and proposed buildings are designed with the same gross floor area, shape and function and achieve the same energy efficiency and thermal performance. The WBLCA assessing global warming potential (GWP) follows LCA guidelines outlined in EN 15978.

Scope

The system boundary of this LCA is a cradle-to-grave (life cycle stages A1-A5, B1-B5 and C1-C4) assessment of the material effects of primary building elements for the project. The operational carbon was not considered as part of this LCA. Following the LCA methodology prescribed by EN 15978, the Carbon Leadership Forum and ASTM E2921, the building service life is set at 75 years. The scope of primary building elements included in the assessment are substructure, superstructure and enclosure. The physical scope of the LCA excludes permanently installed interior partitions and finishes, furnishings, fittings, mechanical, electrical and plumbing (MEP) systems as well as site and infrastructure works. More detail about the physical scope of the assessment can be found in the Appendices.

Material Quantities & Properties

Material quantities were collected from the 100% SD set and architectural Revit models. Early DD updates to the structural design are captured in this analysis. Material properties were assigned based on the design documentation and preliminary discussions with the design team. In order to reflect business as usual, industry standard Environmental Product Declarations (EPDs) were used in the baseline and only replaced with product specific EPDs where the team has committed to or is considering particular products. Bionova's OneClick LCA software was used to develop a custom mix for each type of concrete. When no industry standard EPD exists for a certain material, a product specific EPD intended to represent the average conditions was used. Detailed analysis inputs and assumptions are included in Appendix B.

Baseline Characterization

Life Cycle Global Warming Potential Baseline Characterization

The intent of this analysis is to determine feasible embodied carbon reductions that can be achieved through optimizations to project material design and procurement process. To this end, Atelier Ten established a baseline for embodied carbon following the EN 15978 LCA guidelines using OneClick WBLCA software. The analysis includes all primary structural and enclosure materials that comprise the majority of the project's life-cycle impact. The raised floor was included as part of this analysis, given that it will be part of the core & shell scope. Detailed assumptions and results are included in the Appendices.

Figure 5 visualizes the GWP from the WBLCA of the baseline building, broken out by scope (substructure, superstructure, enclosure, secondary facde, and raised floor) and material type. The reinforced concrete and steel superstructure accounts for over 40% of the embodied carbon of Park Habitat at 50% DD. Concrete in the structure and foundation alone constitutes half of the baseline GWP. The regional NRMCA standard mix design of 13% cement replacement with fly ash and slag are assumed for these quantities. Similarly, CRSI industry standard rebar is used in the concrete reinforcing, which comprises 17% of the total baseline GWP. Conversely, the enclosure is composed of a variety of materials, including mineral wool insulation, glazing, and polysiocyanurate roof insulation.

In order to understand the critical factors that contribute to the embodied carbon of the project, it is necessary to look at the results through multiple lenses. As LCA addresses factors for each building product at each life cycle stage, it is important to understand which products are responsible for the most emissions and when they are occurring to inform design decisions that could reduce the project embodied carbon footprint.

Up front embodied carbon emissions, emissions that occur prior to building occupancy (life cycle stages A1-A5), account for 90% of lifetime emissions for the Park Habitat baseline case, as illustrated in Figure 6. The substantial contribution of up front emissions exhibits the importance of building design and product selection as the majority of a project's embodied carbon emissions are decided before the building is occupied.

FIGURE 5 - PERCENT CONTRIBUTION OF MATERIALS AND SCOPE TO THE BASELINE GWP

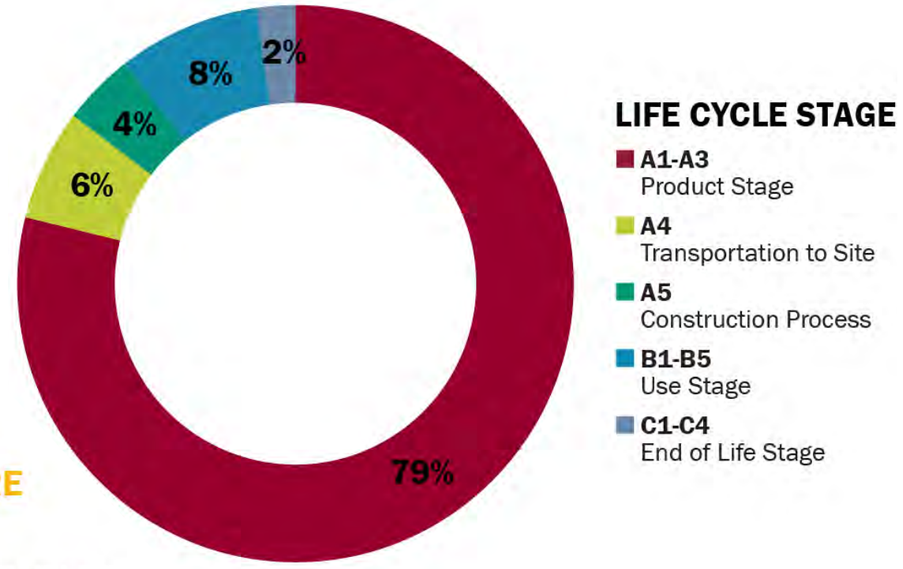

FIGURE 6 - BASELINE GWP FOR EACH LIFE CYCLE ANALYSIS STAGE BY MATERIALS

GWP REDUCTION COMPARISON

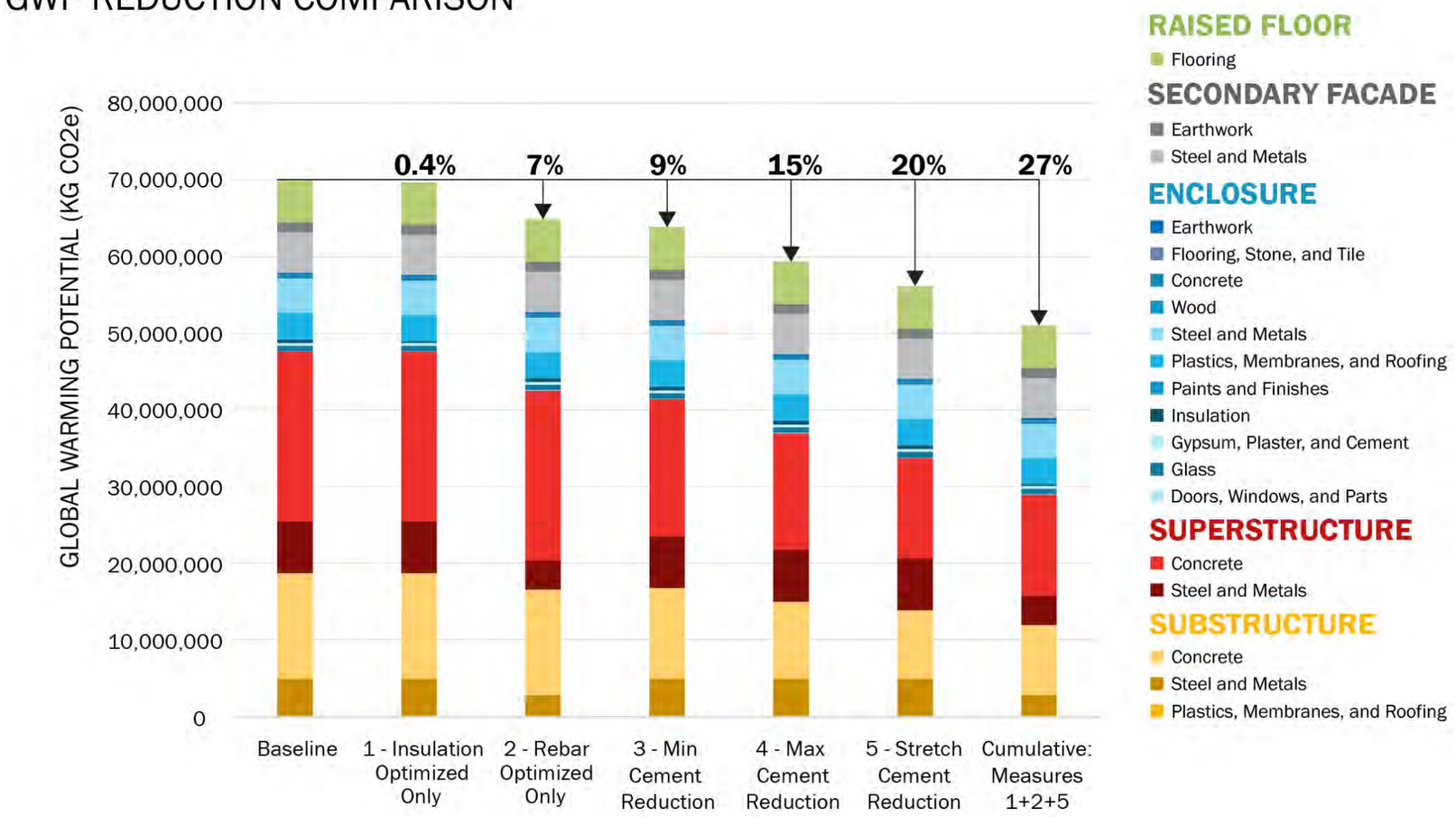

FIGURE 1 - OVERVIEW OF EMBODIED CARBON TOTALS BY IMPACT REDUCTION

Impact Reduction Measures

Insulation Optimization
Procurement of insulation from vendors that demonstrate low GWP manufacturing processes is recommended. This measure does not provide a substantial reduction because the baseline building design already includes mineral wool insulation for exterior envelope, which has the lowest GWP of common insulation materials.

Rebar Procurement
The majority of the steel used in this project is rebar. Reducing the amount of rebar could effectively reduce embodied carbon emissions as long as it does not cause a corresponding increase in concrete embodied carbon emissions. Any alternative design scenarios should be evaluated in parallel with concrete.

Steel procurement is likely to be the most effective strategy to reduce the embodied carbon associated with rebar. Rebar from Nucor's Seattle plant has 50% lower global warming potential than the industry standard rebar primarily because the steel is made in an electric arc furnace run on Seattle's "clean" energy grid. Using the electric arc furnace also results in a higher recycled content for Nucor steel products that rebar made in a basic oxygen furnace. The industry standard recycled content for basic oxygen furnace rebar is 28%, electric arc furnace rebar is 72%, and Nucor rebar is 96% recycled content. This procurement optimization was studied in this analysis.

Additional Opportunities - Higher grade rebar
An additional steel rebar optimization would entail selectively specifying higher grade rebar that can be used in reduced quantities to achieve the same reinforcement strength compared to lower grades.

Concrete Optimization

Concrete (excluding rebar) constitutes 52% of the building's total Global Warming Potential (GWP), and presents the largest opportunity to achieve savings. The bulk of the concrete's GWP impact comes from cement and the suggested impact reduction strategies are thus focused on reducing cement within the concrete mix designs, through cement reduction and replacement. A detailed summary of the concrete optimization is provided subsequently.

Concrete Mix Design
Atelier Ten conducted a detailed concrete optimization analysis that quantifies the proportional contribution of individual concrete structural mixes as well as the benefit of cement reduction. Cement reduction can be achieved through:

- Use of high quality aggregate, such as Orca aggregate OR
- Replacement of cement with flyash, slag, or other pozzolans.

Three cement reduction cases were modeled for each structural mix: a minimum recommended reduction, a maximum recommended reduction, and a stretch reduction, which may be pursued for specific mixes depending on desired cure time. The adjacent graphic summarizes the detailed analysis, breaking out individual concrete mixes/systems to assist the team in developing low-carbon concrete mix designs.

Cement Reduction
The use of high quality aggregate, such as Orca aggregate from Canada, can reduce the amount of cement needed in concrete mix. The applicability of this strategy will depend on the specific needs of the mix designs.

Cement Replacement
While Orca aggregate offers an effective means to reduce the cement in the concrete mixes, the savings are marginal compared to those that can be achieved with cement replacement.
The GWP of concrete can be reduced further by substituting cement with pozzolans such as slag or fly-ash that can have impacts on workability, curing time and finish. Based on the project needs, cast-in-place piles and footings tend to be the best applications for maximizing cement replacement, but given the distribution of concrete in the project, cement replacement in the slabs should be investigated.

The use of pozzolan made from post-consumer glass as cement replacement offers a significant opportunity to not only reduce the GWP of concrete, but also to implement the principles of circular economy. Glass pozzolans can reduce the GWP of concrete by 20-40% without the environmental concerns that are associated with fly-ash and slag. Testing has shown that glass pozzolan products meet ASTM standards, but implementation in structural applications is not common practice. Once the demand for glass pozzolans is consistent enough, this approach to cement replacement is expected to become mainstream.

Note on Carbon Curing
Carbon curing is increasingly provided as an embodied carbon reduction service by concrete suppliers. Carbon curing consists of collecting CO_2 from the smokestacks of local industrial emitters and injecting it into the concrete mix as it is curing. During the curing process, the CO_2 is chemically converted into solid calcium carbonate which is permanently embedded within the concrete. This strategy can reduce the GWP of the concrete by up to 5%. Carbon cure can reduce curing time and therefore allow higher cement replacement rates with limited construction schedule impacts.

Summary

- The post-tensioned slab, raft core footing, mild steel slab, and precast column mixes are the major drivers of embodied carbon in the project, and should be the focus for optimization.
- Each mix should be evaluated individually to determine the best combination of strategies that achieves the lowest GWP.
- Use of high quality aggregate (Orca) to reduce cement in major mixes such as the post-tensioned slabs is recommended.
- Further study is recommende to evaluate if the stretch targets can be achieved for any of the mixes.

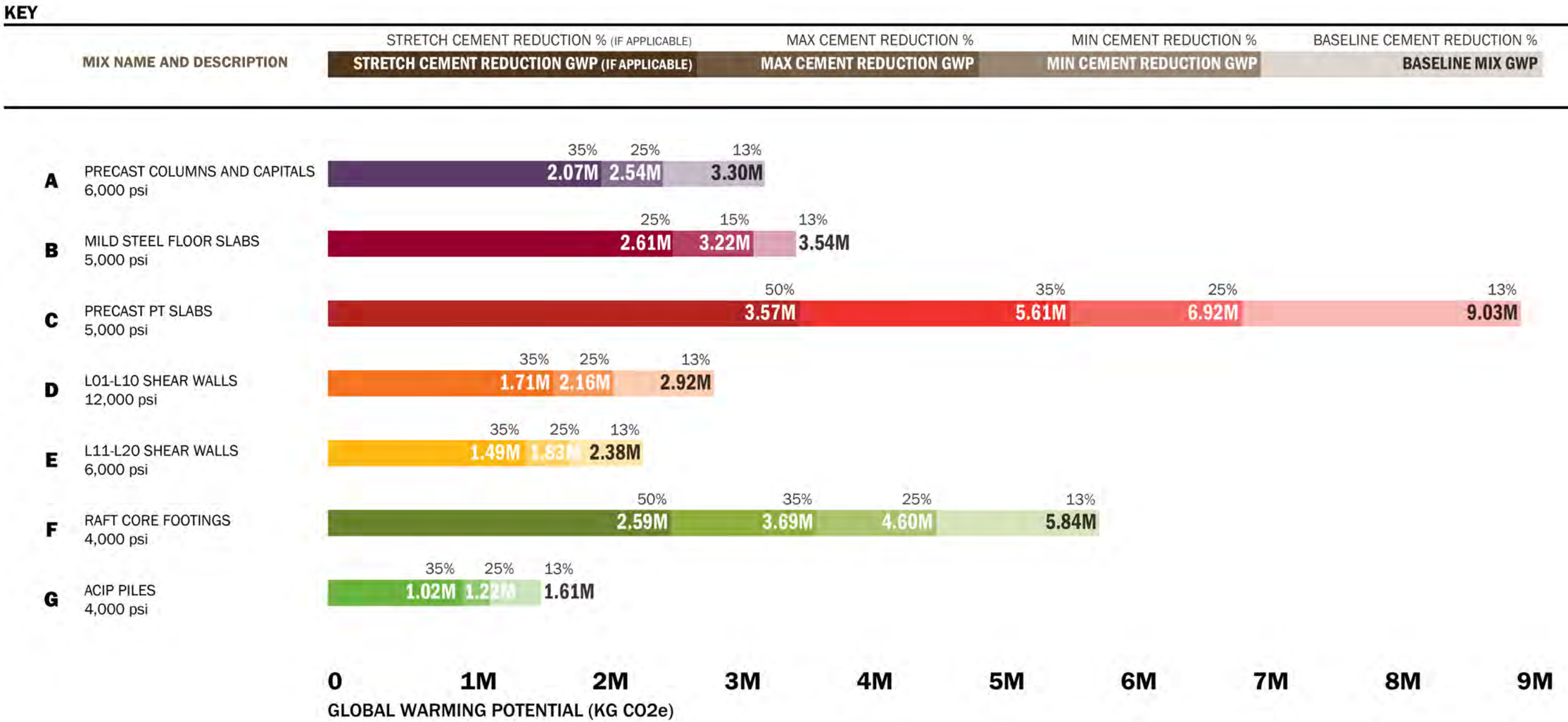

FIGURE 7 - DETAILED BREAKDOWN OF CONCRETE MIX DESIGN ANALYSIS

Recommendations & Next Steps

The following strategies have been proposed as IRMs for Park Habitat. Each of these measures should be discussed with the design and construction team as well as the manufacturer to determine feasibility and impact.

Concrete

- Build Group to pursue the performance-based approach and initiate competitive, early-bid concrete procurement.
- Discuss mix designs with suppliers and investigate CarbonCure and trial batches using Pozzotive glass powder.
- Concrete suppliers to be selected based on both cost and carbon footprint of their mixes.
- Design team / construction team to use the recommended concrete optimization and percent cement replacement as a basis for comparison against the results offered in the early bid process.

Rebar

- Discuss the potential for sourcing rebar from Nucor's Seattle plant.

Insulation

- Team to maintain mineral wool insulation for exterior envelope and pursue procurement from suppliers that provide EPDs

Raised floors

- Atelier Ten to coordinate with the team on the material make-up of the raised floor system to capture possible impact reductions from wood floor surface material.

Exterior skin system

- KKA to consider Ductal in lieu of terra cotta for exterior shading system, to dramatically lower embodied carbon emissions associated with this system.

Appendix A: LCA Input Assumptions

EPD Name	Baseline Quantity		Cumulative Optimization Quantity		Service Life
Foundation					
Concrete					
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	61,391,009	lbs	61,391,009	lbs	75
Fly ash	3,372,534	lbs	12,397,593	lbs	75
Gravel from gravel and sand quarry operations (Reference product: sand)	60,657,480	lbs	60,657,480	lbs	75
Portland cement, ASTM C150, ASTM C1157, AASHTO M85 or CSA A3001	22,997,988	lbs	13,992,323	lbs	75
Plastics, Membranes, and Roofing					
Vapor barrier, 0.06in	160,479	sq ft	160,479	sq ft	75
Steel and Metals					
Reinforcement steel bar, 490 lb/ft3 (CRSI)	10,166,102	lbs	–	–	75
Steel reinforcing bar and merchant bar products, 487 lbs/ft3 (Nucor Steel Seattle)	–	–	10,166,102	lbs	75
Structure					
Concrete					
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	84,752,765	lbs	84,752,765	lbs	75
Fly ash	5,509,518	lbs	22,793,921	lbs	75
Gravel from gravel and sand quarry operations (Reference product: sand)	83,763,920	lbs	83,763,920	lbs	75
Portland cement, ASTM C150, ASTM C1157, AASHTO M85 or CSA A3001	37,704,391	lbs	20,445,746	lbs	75
Steel and Metals					
Aluminum roofing, cold rolled plate, 2660-2840 kg/m3 (Aluminum Association)	1	cu ft	1	cu ft	40
Primary structural steel frame components (MBMA)	6	cu ft	6	cu ft	75
Reinforcement steel bar, 490 lb/ft3 (CRSI)	14,069,688	lbs	–	–	75
Steel reinforcing bar and merchant bar products, 487 lbs/ft3 (Nucor Steel Seattle)	–	–	14,069,688	lbs	75
Enclosure					
Concrete					
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	1,782,324	lbs	1,782,324	lbs	75
Fly ash	86,069	lbs	86,069	lbs	75
Gravel from gravel and sand quarry operations (Reference product: sand)	1,760,494	lbs	1,760,494	lbs	75
Pavers, 139 sq. in, T min 2.36 in, 2300 kg/m3, Grey Beige (Permacon)	1,163	cu ft	1,163	cu ft	50
Portland cement, ASTM C150, ASTM C1157, AASHTO M85 or CSA A3001	586,596	lbs	586,596	lbs	75
Doors, Windows, and Parts					
Anodized aluminum extrusions (Aluminum Extruders Council (AEC))	0	cu ft	0	cu ft	30
Steel door, 86x36x1.34in	220	cu ft	220	cu ft	30
Wooden interior flush, stile and rail doors, 1-3/4 in, 3ft x 7ft (Eggers)	31	cu ft	31	cu ft	75
Earthwork					
Aggregate (crushed gravel), generic, dry bulk density, 1600 kg/m3	5,078	cu ft	5,078	cu ft	75
Clay facing bricks, 120 pcf, 3178.3 lb/m3, kiln number: 4 (Interstate Brick)	2,521	cu ft	2,521	cu ft	75
Structural clay bricks, 120 pcf, 2754.5 lb/m3 (Interstate Brick)	2,889	cu ft	2,889	cu ft	75
Flooring, Stone, and Tile					
Natural stone cladding, 49.67 lbs/sqft, 167 lbs/ft3 (Arriscraft)	414	cu ft	414	cu ft	50
Pavers, 139 sq. in, T min 2.36 in, 2300 kg/m3, Grey Beige (Permacon)	809	cu ft	809	cu ft	50
Glass					
Double pane IGU	19,165	cu ft	19,165	cu ft	20
Gypsum, Plaster, and Cement					
Gypsum board with glass mat sheathing, 1/2in, 2.03 lb/ft2, DensDeck® Roof Board (Georgia-Pacific Gypsum)	3,227	cu ft	3,227	cu ft	35
Gypsum board, wallboard, type X, 0.625 inch (16 mm) (NREL)	278	cu ft	278	cu ft	35
Gypsum board, wallboard, type X, 0.625 inch (16 mm), 5/8in (GypsumAssociation)	18,635	cu ft	18,635	cu ft	40
Insulation, rock wool, 4.2 m2K/W, 1in, SAFB, HD (Thermafiber)	143	cu ft	143	cu ft	75
Insulation					
Insulation, rock wool, 4.3-30.1 m2K/W, 1-7in (1/2in incr.), 4 lb/ft3, VersaBoard 40 (Thermafiber)	–	–	12,728	cu ft	75
ISO foam insulation, 0.5-4.25in, Thermax Insulation (Dow)	34,469	cu ft	–	–	75
Light density mineral wool board, 1 m2K/W, 1.53 in (39 mm), 0.35 lb/ft2 (1.72 kg/m2),2.74 lg/ft3 (44.1 kg/m3), Indus	13,726	cu ft	–	–	75
Mineral wool insulation batt, unfaced, R11, EcoBatt Insulation with Ecose Technology, Unfaced (Knauf Insulation)	–	–	74,633	cu ft	75
Mineral wool insulation, loose, L = 0.048 W/mK, R= 1 m2K/W, 48 mm, 1.1 kg/m2, 22.9 kg/m3 (Aislantes Minerales, Ai	77,991	cu ft	–	–	75
Polyiso (PIR) insulation board, R5.68 / R = 1m2K/W, L = 0.025 W/mK , 0.98 in, 0.148 lbs/ft2 (Carlisle SynTec Systems	–	–	38,680	cu ft	75
Vapor barrier, 0.06in	37,354	sq ft	37,354	sq ft	20
Paints and Finishes					
Exterior paint, acrylic resin -based (Kelly-Moore Paints)	4,324	sq ft	4,324	sq ft	6
Interior paint, acrylic resin -based (Kelly-Moore Paints)	46,915	sq ft	46,915	sq ft	20
Plastics, Membranes, and Roofing					
Asphalt, generic, compacted, 5/95% bitumen-aggregate ratio, 2350 kg/m3	1,329	cu ft	1,329	cu ft	20
EPS insulation, lambda: 0.0401 W/mK, t = 4.01 centimeters (1.58 in), RSI = 1 m²K/W (R-value 5.68), (EPS Industry Alli	17,762	cu ft	17,762	cu ft	75
Façade cladding, from polypropylene, 0.11x41.49x13.13 in, 0.86 kg/panel, NovikStone DS (Novik)	1,040	cu ft	1,040	cu ft	40
Gypsum board, wallboard, type X, 0.625 inch (16 mm), 5/8in (GypsumAssociation)	1,946	cu ft	1,946	cu ft	40
ISO foam insulation, 0.5-4.25in, Thermax Insulation (Dow)	7,581	cu ft	–	–	75
Mineral wool insulation batt, unfaced, R11, EcoBatt Insulation with Ecose Technology, Unfaced (Knauf Insulation)	–	–	13,385	cu ft	75
Mineral wool insulation, loose, L = 0.048 W/mK, R= 1 m2K/W, 48 mm, 1.1 kg/m2, 22.9 kg/m3 (Aislantes Minerales, Ai	14,008	cu ft	–	–	75
Polycarbonate cladding, 1in	3,941	cu ft	3,941	cu ft	25
Polyiso (PIR) insulation board, R5.68 / R = 1m2K/W, L = 0.025 W/mK , 0.98 in, 0.148 lbs/ft2 (Carlisle SynTec Systems	–	–	8,508	cu ft	75
Precast concrete, architectural wall panel	1,026	cu ft	1,026	cu ft	75
Vapor barrier, 0.06in	320,137	sq ft	320,137	sq ft	20
Steel and Metals					
Anodized aluminum extrusions (Aluminum Extruders Council (AEC))	2,902	cu ft	2,902	cu ft	75

EPD Name	Baseline Quantity		Cumulative Optimization Quantity		Service Life
Enclosure Cont.					
Hot-dip galvanized steel sheets, recommended sheet steel thickness range: 0.4-3.0 mm (0.015-0.12 in), zinc coating: 2	879	cu ft	879	cu ft	30
Reinforcement steel bar, 490 lb/ft3 (CRSI)	188,292	lbs	–	–	75
Secondary structural steel frame components, 8-12inx20-40ft (MBMA)	149	cu ft	149	cu ft	75
Solid sheet steel for studs, industry average US and CN, 1ft 5/8in-14in x1ft 1/4in x 3ft 1/2in x0.0188in-0.1242in (SRI)	205	cu ft	205	cu ft	75
Steel plate, hot-dip galvanizing after fabrication, 487 lbs./ft.3 (AGA)	15	cu ft	15	cu ft	75
Steel reinforcing bar and merchant bar products, 487 lbs/ft3 (Nucor Steel Seattle)	–	–	188,292	lbs	75
Steel, stainless, 304 (NREL)	312	cu ft	312	cu ft	50
Structural steel cables	5	cu ft	5	cu ft	75
Wood					
Softwood lumber, kiln-dried and planed, 2x6in, 2x4in, 433.57 kg/m3 (American Wood Council Canadian Wood Council)	683	cu ft	683	cu ft	30
Secondary Façade					
Earthwork					
Structural clay bricks, 120 pcf, 2754.5 lb/m3 (Interstate Brick)	15,833	cu ft	15,833	cu ft	75
Steel and Metals					
Anodized aluminum curtainwall extrusion	3,945	cu ft	3,945	cu ft	75
Anodized aluminum extrusions (Aluminum Extruders Council (AEC))	437	cu ft	437	cu ft	75
Fabricated steel plate, 7800kg/m3 (AISC)	2,293	cu ft	2,293	cu ft	25
Hollow structural steel sections, 487 lbs./ft.3 (AISC, STI)	9	cu ft	9	cu ft	75
Secondary structural steel frame components, 8-12inx20-40ft (MBMA)	669	cu ft	669	cu ft	75
Steel plate, hot-dip galvanizing after fabrication, 487 lbs./ft.3 (AGA)	5	cu ft	5	cu ft	75
Structural steel cables	113	cu ft	113	cu ft	75
Raised Floor					
Flooring, Stone, and Tile					
Raised access floor system, 54.1 kg/m2, TecCrete 1250, Cornerlock (Global Integrated Flooring Solutions)	1,023,436	sq ft	1,023,436	sq ft	75