MDS ARCHITECTS SASAKI

Path to Zero Energy, and Zero Carbon

Feasibility Study

Town of Brookline - The John R. Pierce School

MSBA SCHOOLS EMBRACE A SUSTAINABLE FUTURE 12/2/2021

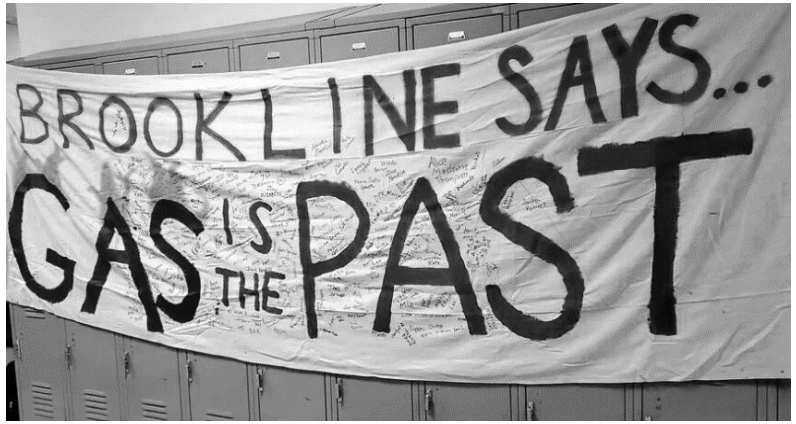
PIERCE SCHOOL
Learning & Growing Together.

Goal: Zero Carbon Design

Brookline Goals: Zero Carbon by 2050, No Fossil Fuels

Electrification = best strategy

- Road Map to Net-Zero with renewables
- Grid is increasingly clean
- Reduced health risk from toxic fumes
- Potential to reduce costs



MSBA Core Values: NE-CHPS, LEED

Recipe for Net-Zero: integrated design process

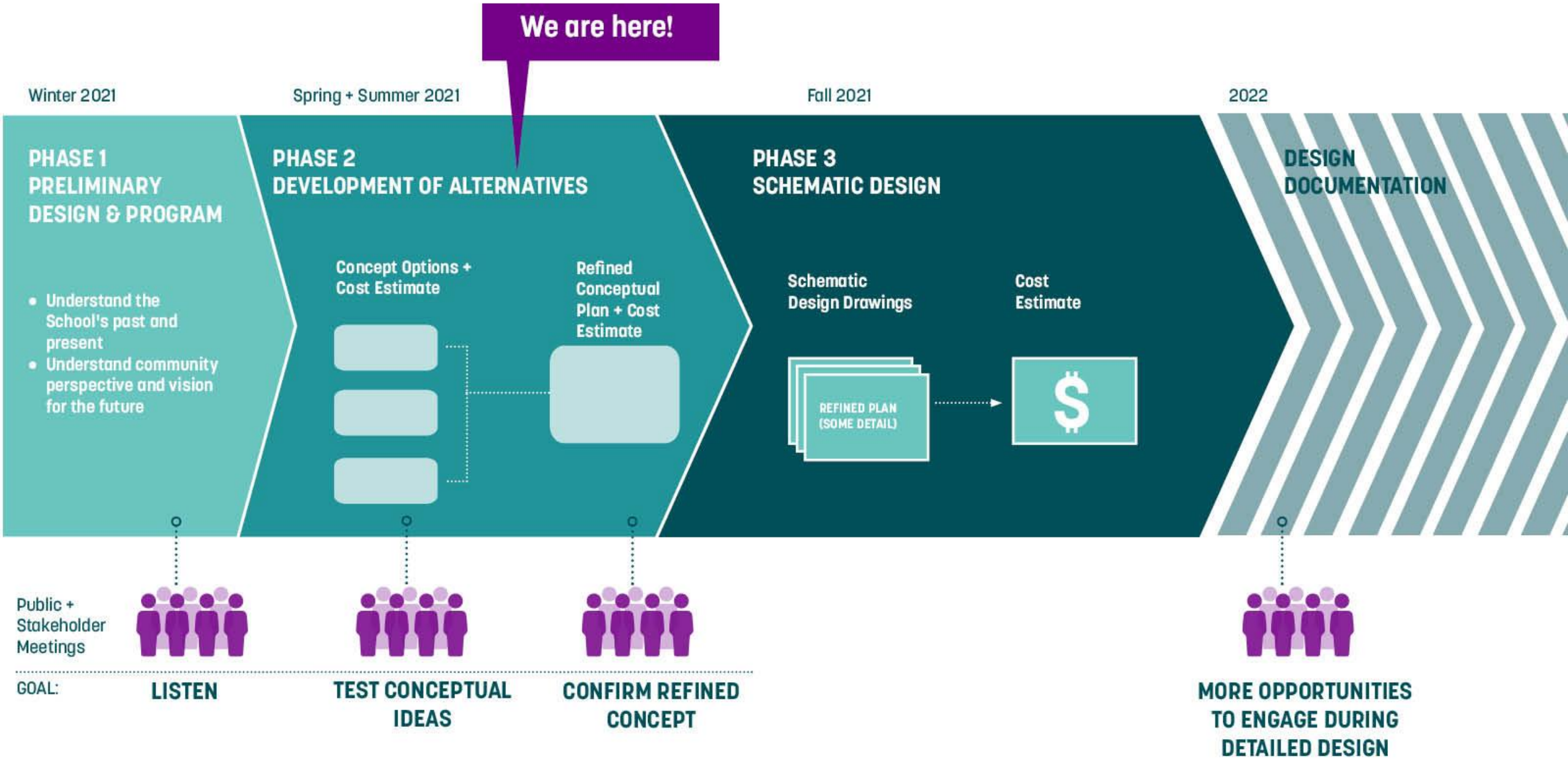
- Consistent with Commonwealth Initiatives
- Massachusetts new Climate Legislation
- Governor's Executive Order 594- Carbon Neutrality by 2050

Sustainability Strategy:

Modeling integrated into design workflow

CHPS COLLABORATIVE FOR HIGH PERFORMANCE SCHOOLS

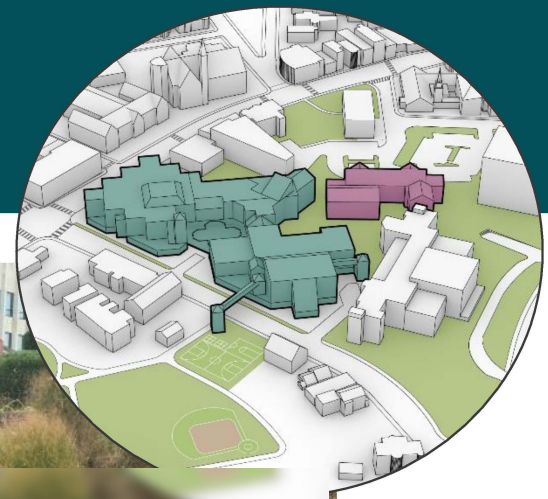
U.S. GREEN BUILDING COUNCIL USGBC


We are here!
Winter 2021
Spring + Summer 2021
Fall 2021
2022
PHASE 1
PRELIMINARY
DESIGN & PROGRAM
• Understand the School's past and present
• Understand community perspective and vision for the future
PHASE 2
DEVELOPMENT OF ALTERNATIVES
Concept Options + Cost Estimate
Refined Conceptual Plan + Cost Estimate
PHASE 3
SCHEMATIC DESIGN
Schematic Design Drawings
Cost Estimate
REFINED PLAN (SOME DETAIL)
$
DESIGN
DOCUMENTATION
Public + Stakeholder Meetings
GOAL:
LISTEN
TEST CONCEPTUAL IDEAS
CONFIRM REFINED CONCEPT
MORE OPPORTUNITIES TO ENGAGE DURING DETAILED DESIGN

Pierce School Today











Pierce School Today

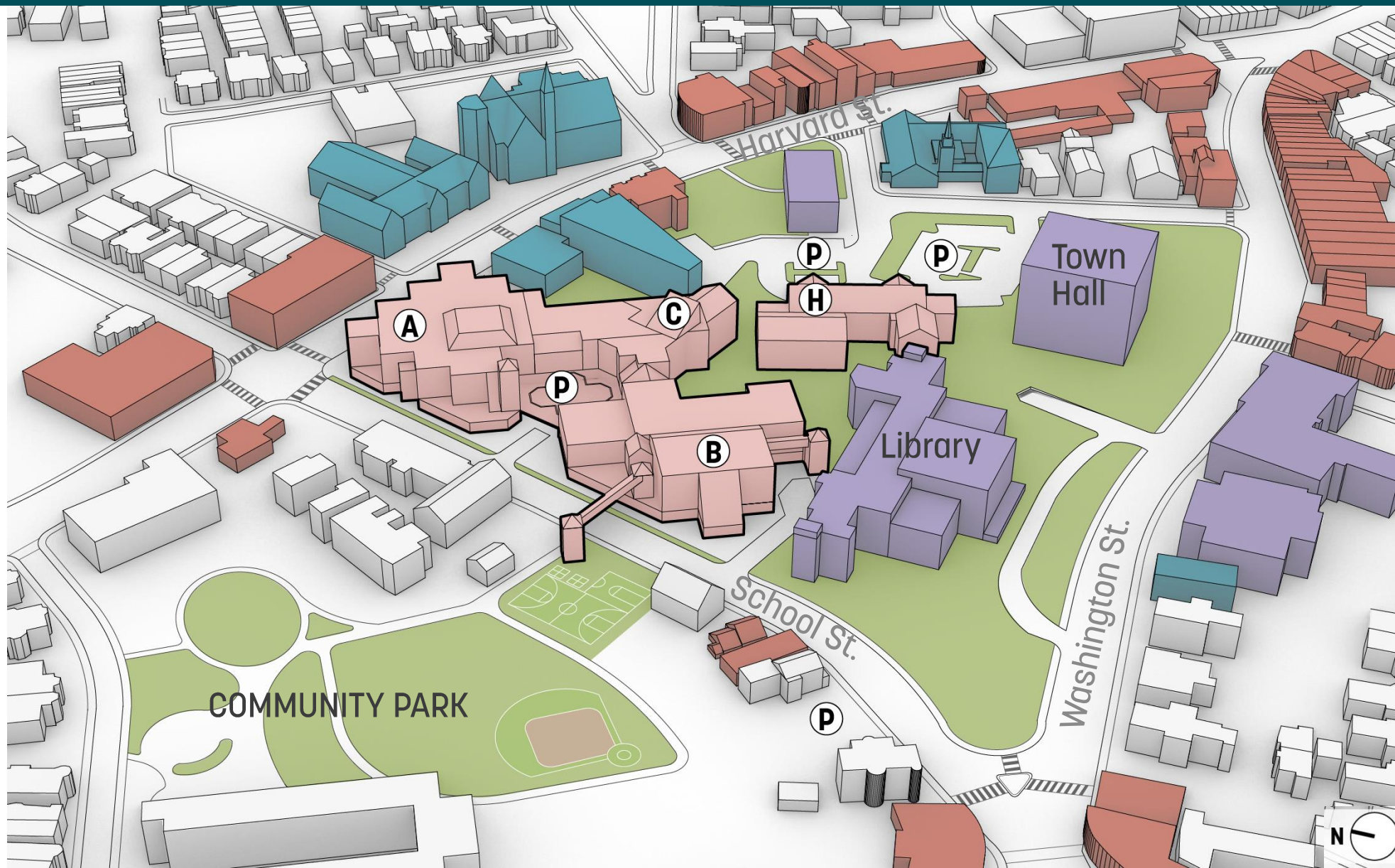
Brookline Village,
precinct of Town bldgs

2.5 acre site
725 students pre K-8
All parking below bldg
Playground = city park
Pickup/dropoff offsite
Steep topography

A = Existing Wing A
B = Existing Wing B
C = Existing Wing C

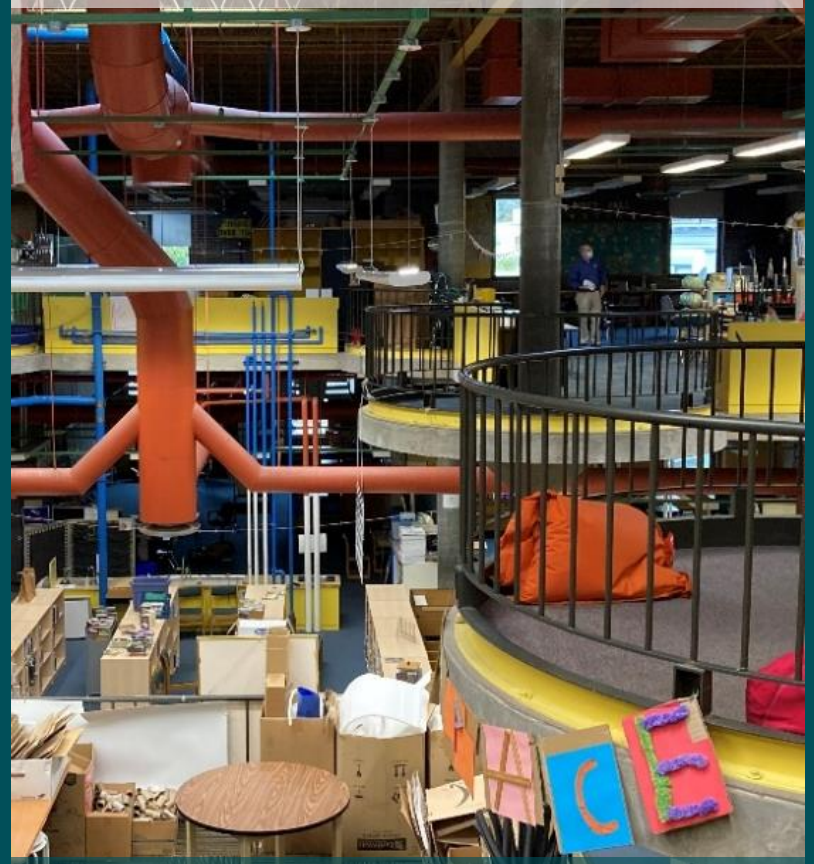
H = Historic Building

P = Parking



Pierce School Today

1974 Open School



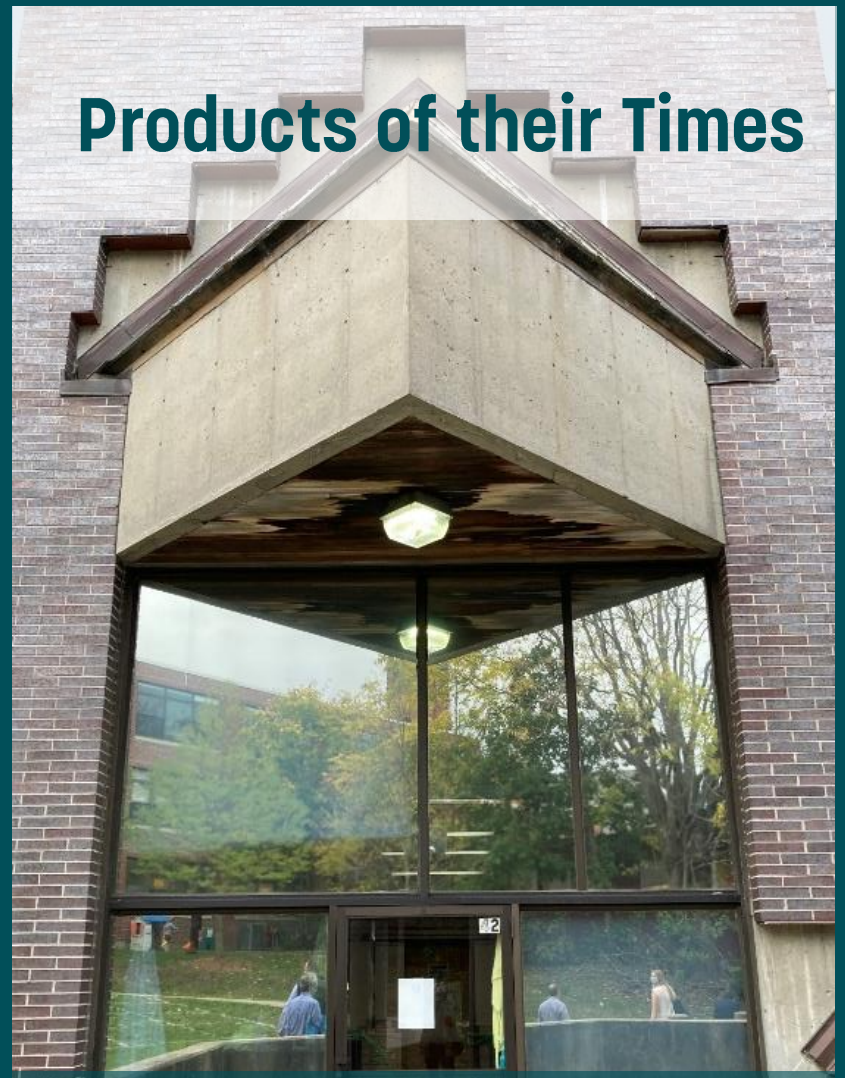
Visually + acoustically intense
Moments of quirky delight
Difficult to navigate

1854 Age of Reform



Generously proportioned
Quiet craft + quality
Now an island on the campus

Products of their Times



Inward-looking
Could be more inviting + accessible
Systems and envelope need upgrading

Sustainability Priorities

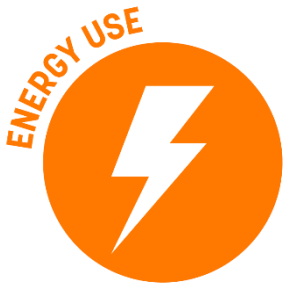


Maximizing daylighting

Indoor Air Quality, ventilation/filtration, healthy materials, acoustics

Sustainable transportation, encouraging non-car transportation

Great outdoor learning and play spaces

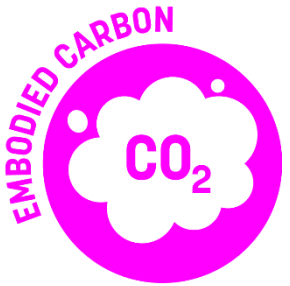


Decarbonization: electrification of building systems

Minimizing loads / energy efficiency, heat pumps and geothermal

Maximizing onsite renewable energy generation: PV

Purchasing any additional electricity from renewable resources



Potential reuse of existing building elements

New construction with low-carbon materials for structure, envelope and interiors

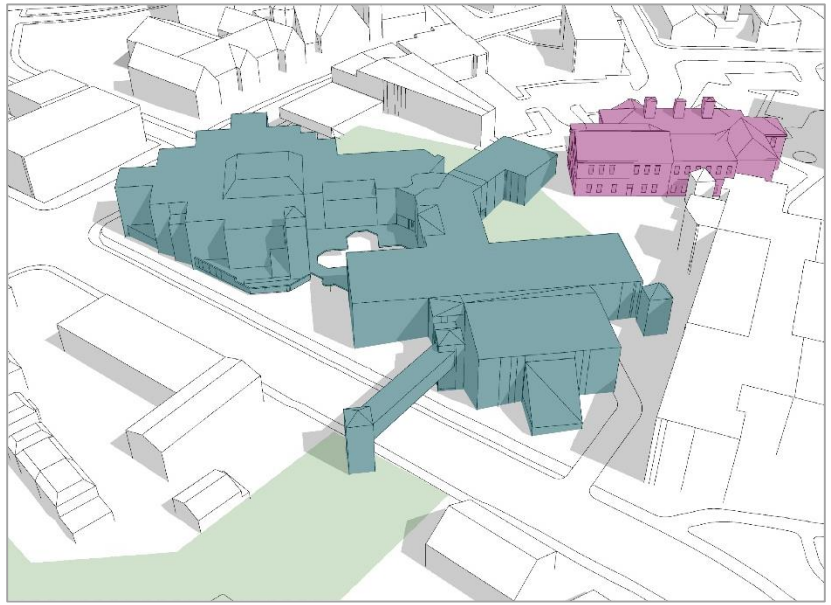


Certifications, MSBA: LEED or NE-CHPS

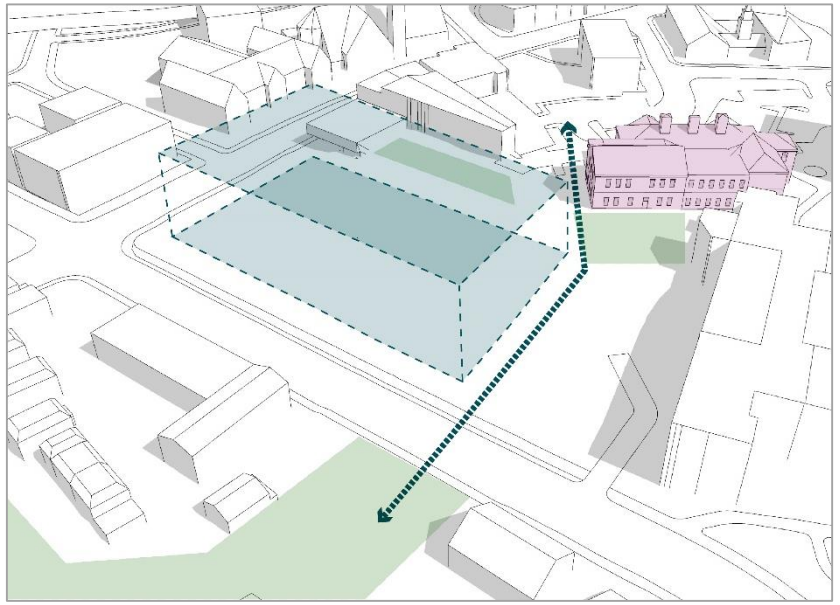
Possible ILFI Zero Carbon: aligns with Town of Brookline and MSBA goals

Building Organization

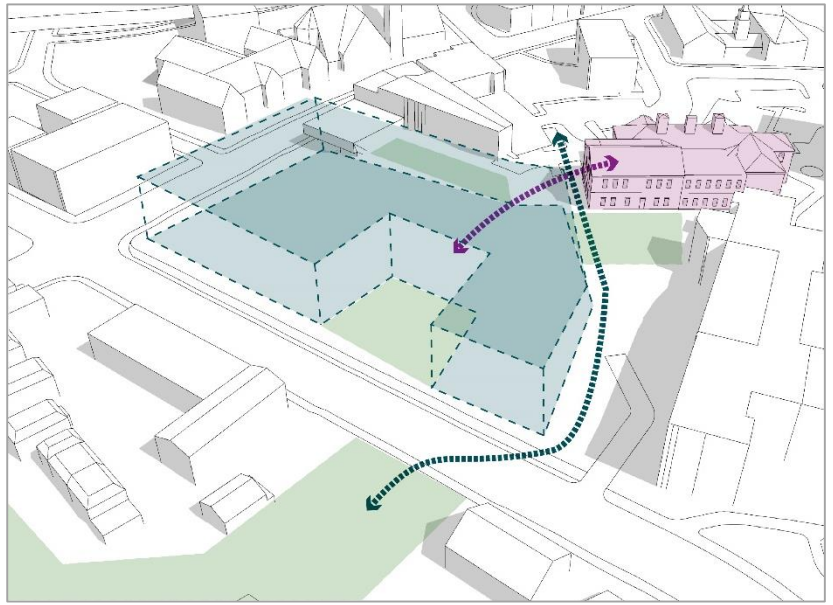
Existing Conditions
No through the site connection
Lack of outdoor space



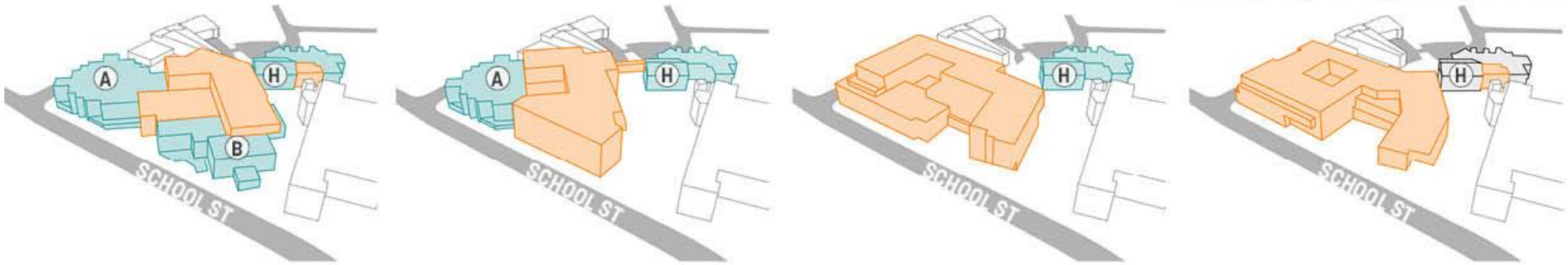
Compact Footprint
Provides through the site connection
Requires 4+ stories to fit the program



Creating Outdoor Spaces and Connection
Provides through the site connection
3 Stories to fit all the program



Energy Use



Energy Use Intensity (EUI)



Energy Use Intensity by different loads

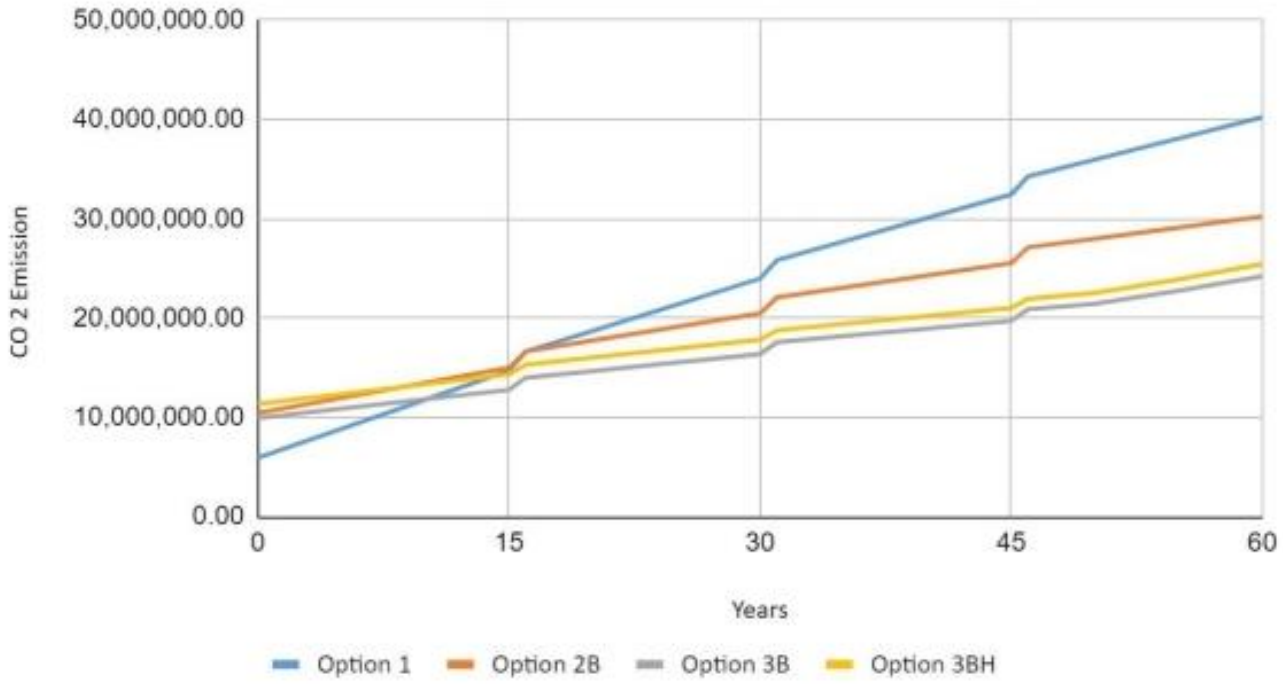


Note: Preliminary analysis meant for comparison. Final values will vary as the design progresses.

Embodied and Operational Carbon Emissions

Operational Carbon Emissions

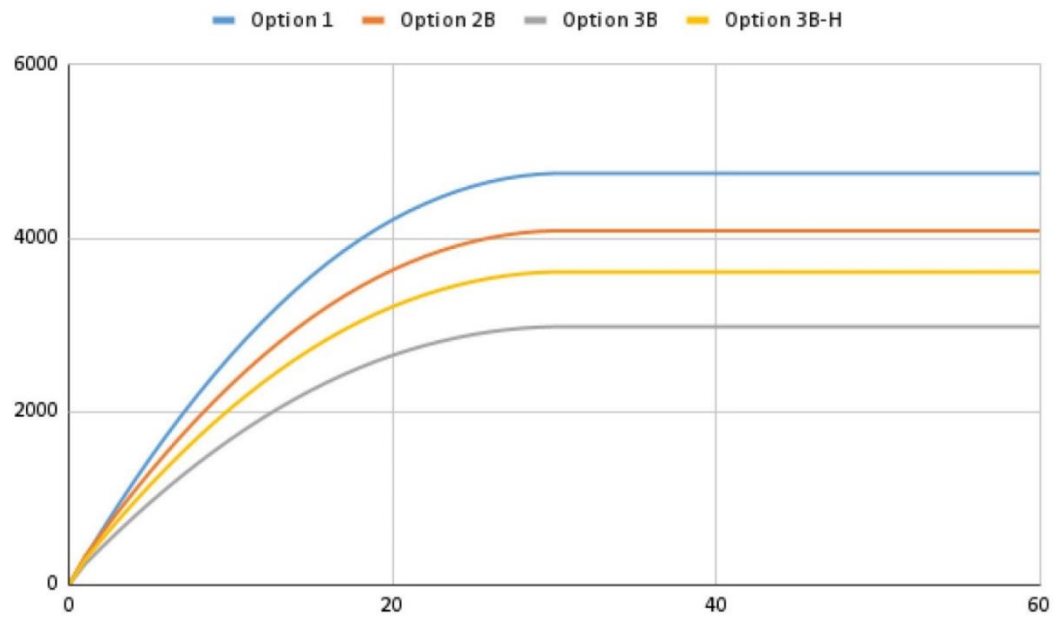
Total Carbon Emissions

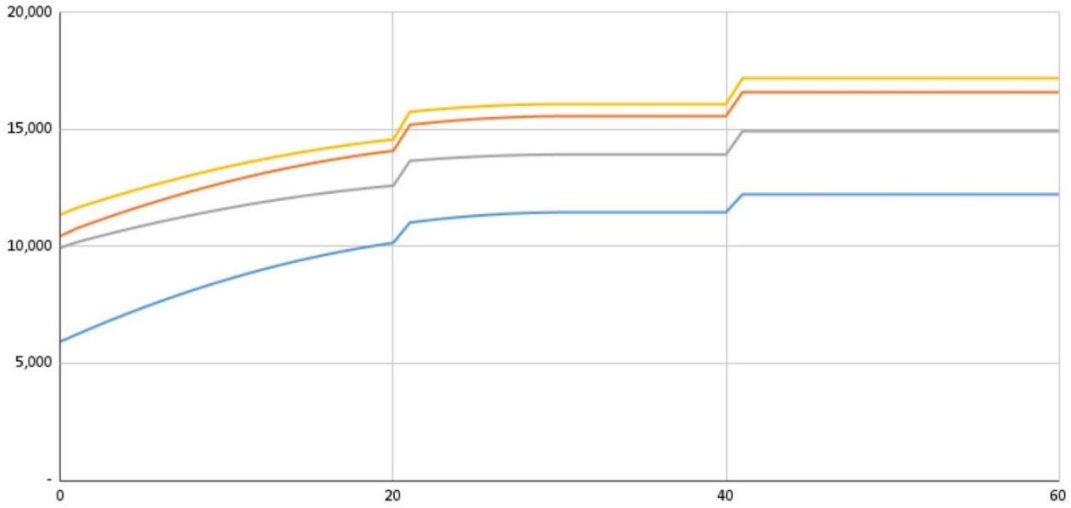


Embodied and Operational Carbon Emissions

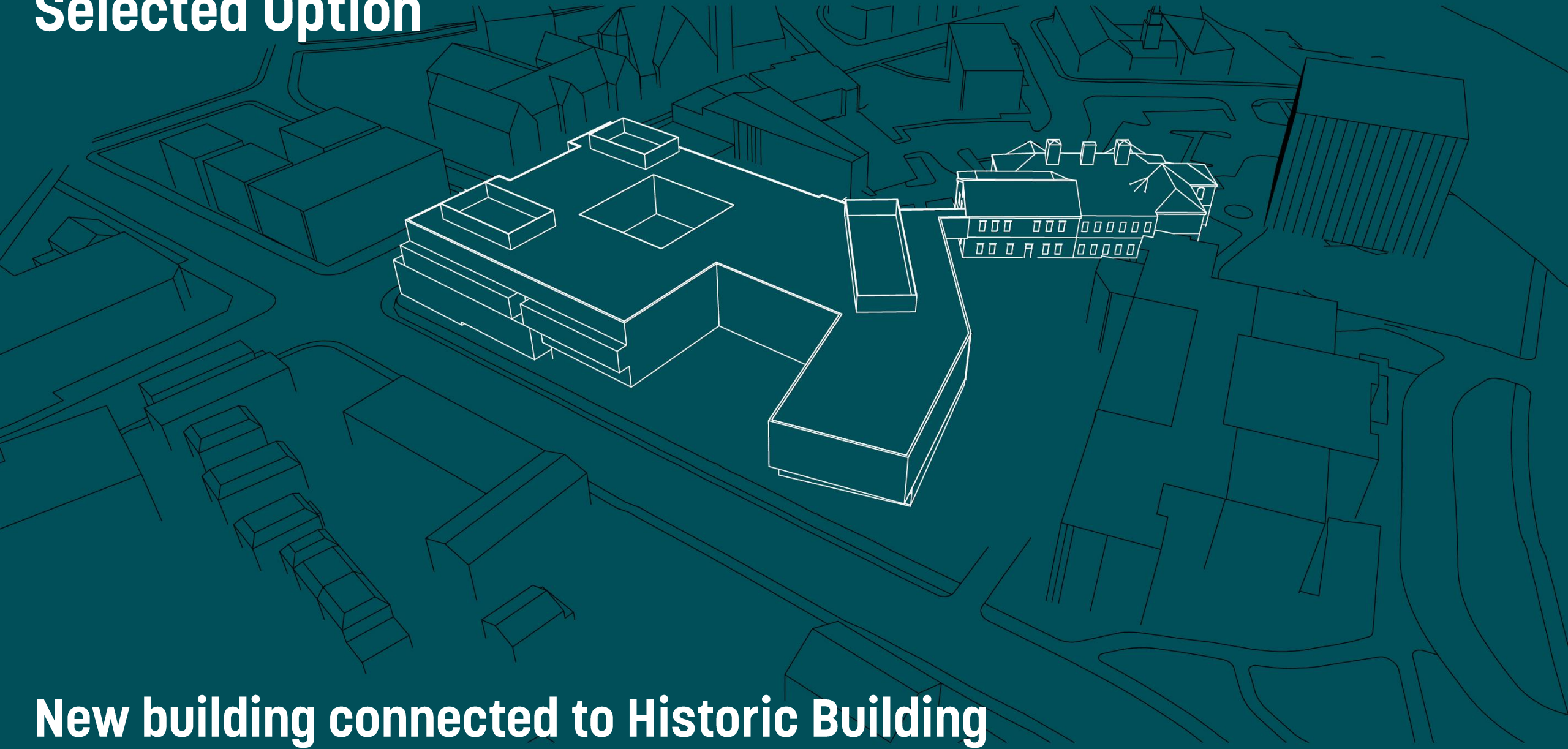
Operational Carbon Emissions
commitment to purchase 100% renewable energy by 2050

Total Carbon Emissions
(Operational and Embodied)
commitment to purchase 100% renewable energy by 2050





Selected Option



New building connected to Historic Building

Site Plan

Connection with Park
Raised Crosswalk

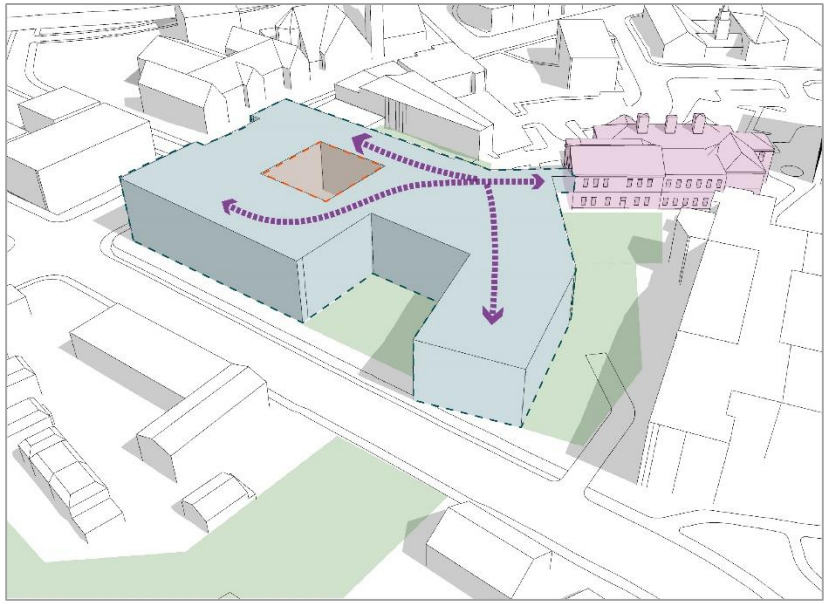


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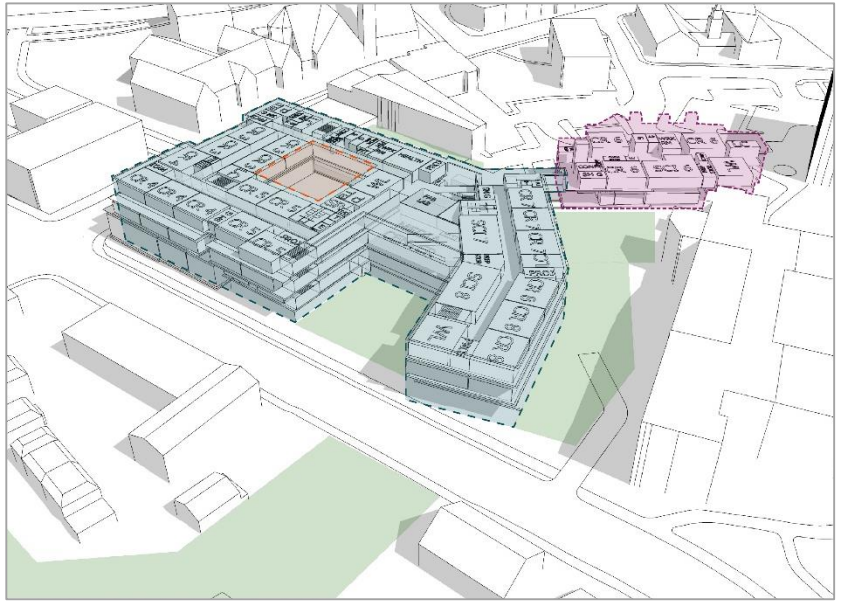


Massing

Daylight & Connection
Providing connection to historic Building
Adding Courtyards



Program Test-Fit
Organizing grade bands around heart of school: library, cafeteria



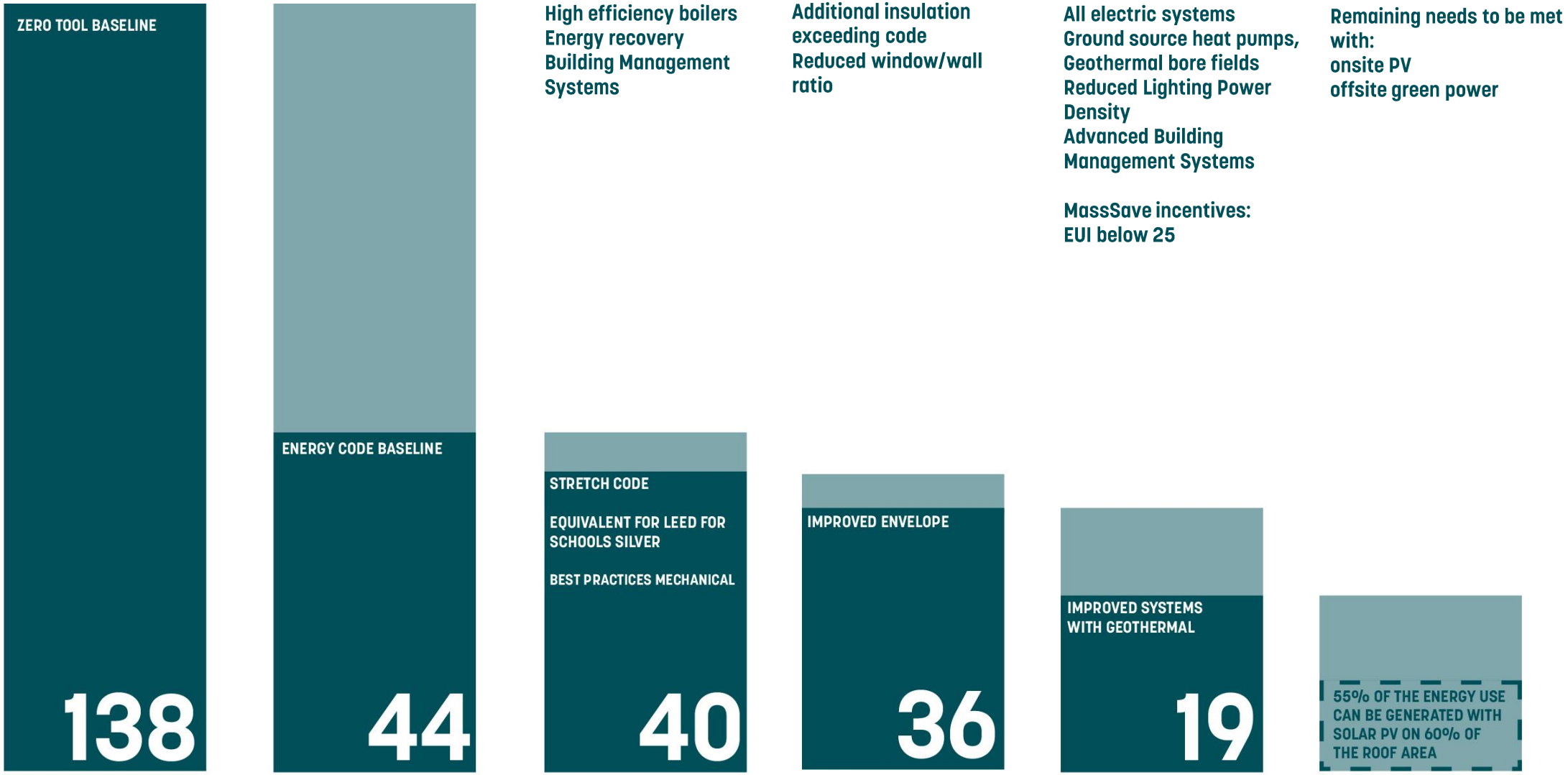
Façade Development
To continue in Schematic Design



Strategies


ROOF GARDEN
Maker Space
Art
EVENT SPACES
Gym
Multipurpose
Music
HEART OF THE S
Library
Cafeteria
Entrance
REDACTED
ic Building
G WINDOWS
ble PV
on H-Level 1

EUI = Energy Use Intensity

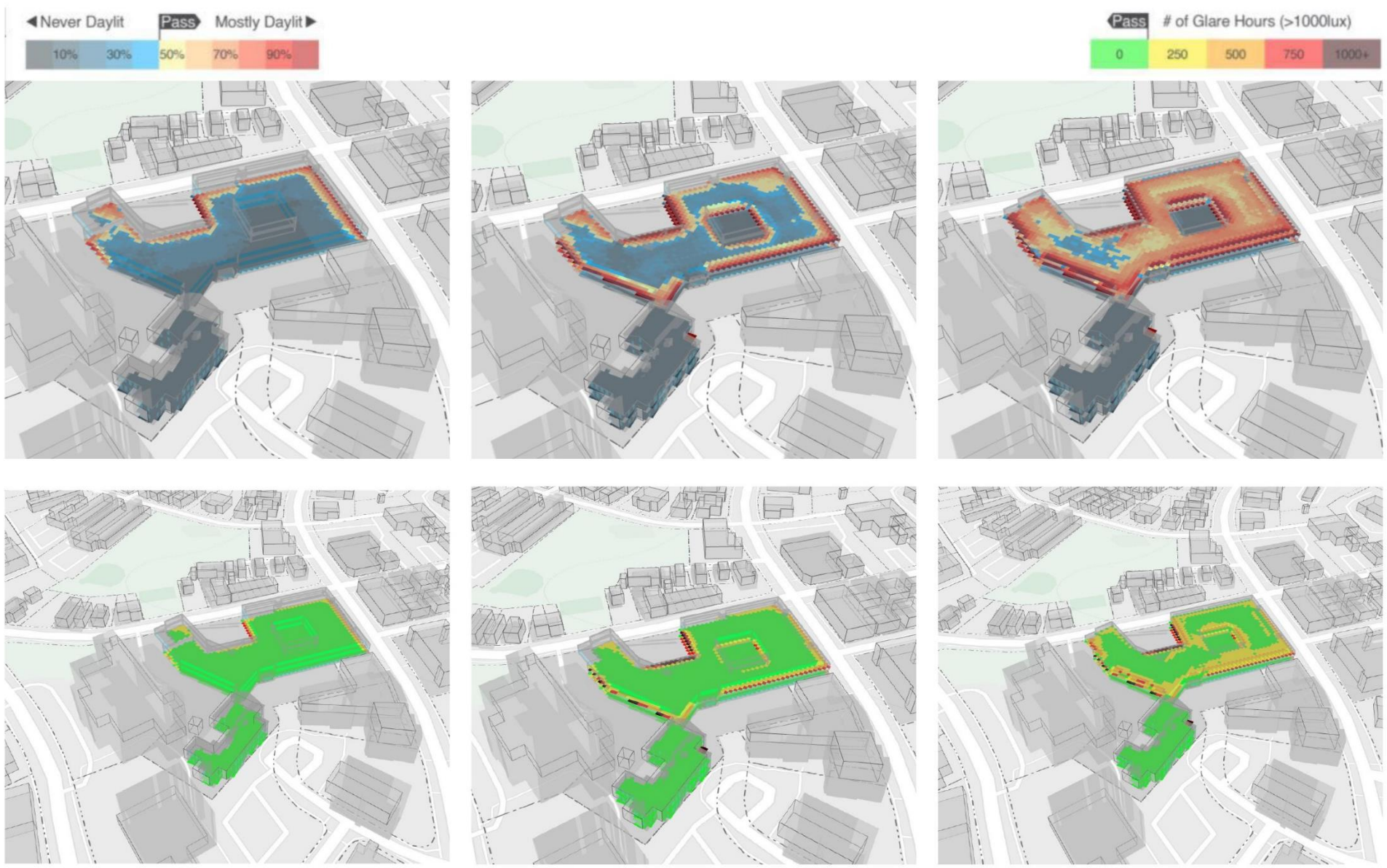


Daylight and Glare Control

> All options will benefit from exposure-specific design of windows and shading

Daylight Analysis

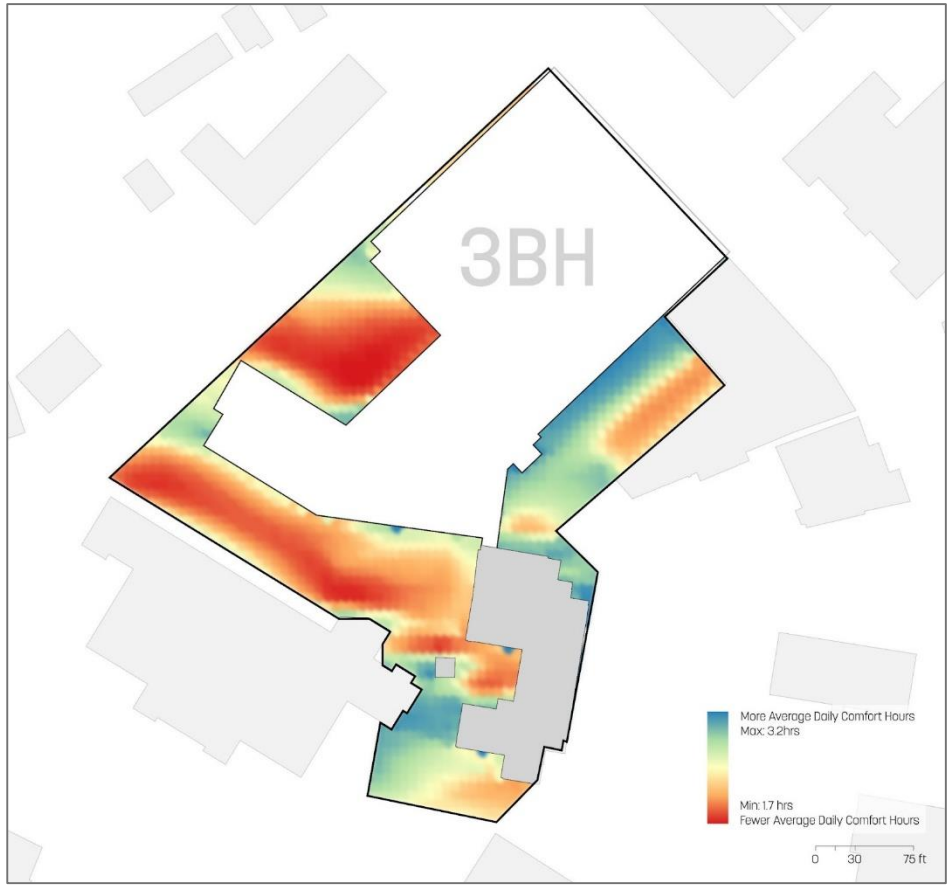
Glare Analysis



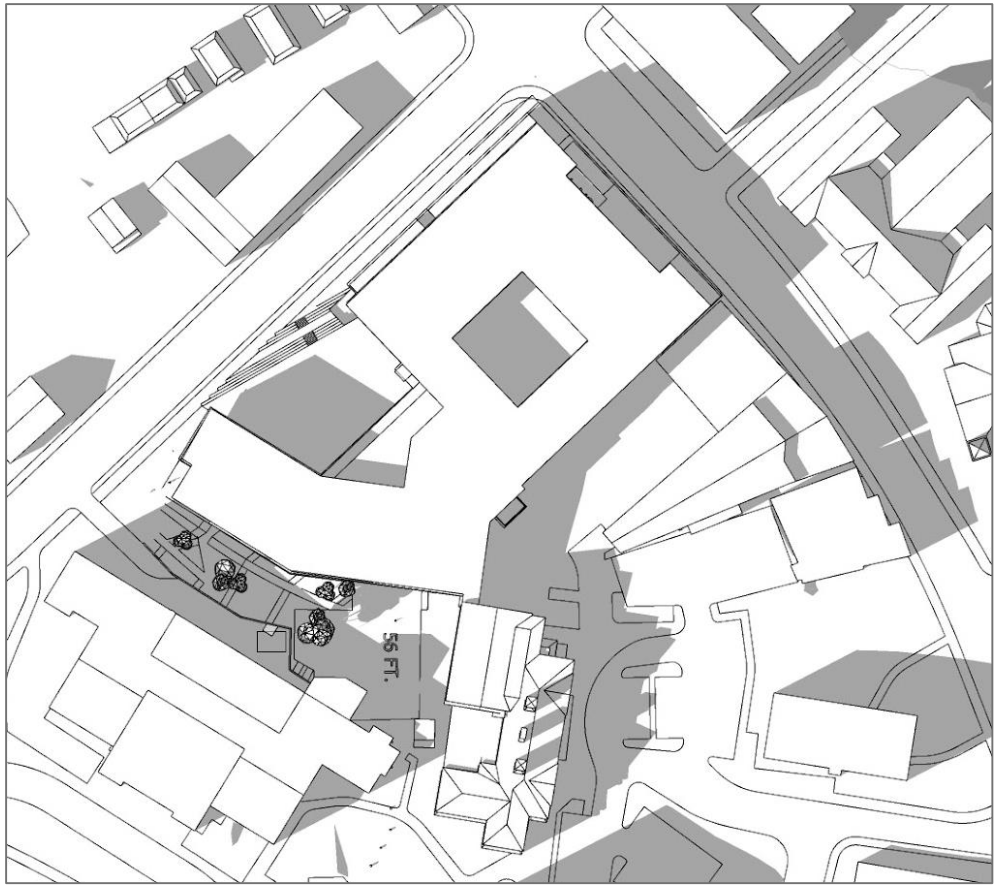
Outdoor Comfort & Shadow Studies

> As we develop plans for selected design, there is an opportunity to tune outdoor activities to best exposure

Annual Average Outdoor Thermal Comfort



Shadow Studies
Example: September 2 at 3pm



Path to Zero Carbon: Issues to address at start of SD

Façade development: Building-Integrated Solar PV on overhangs on south facades

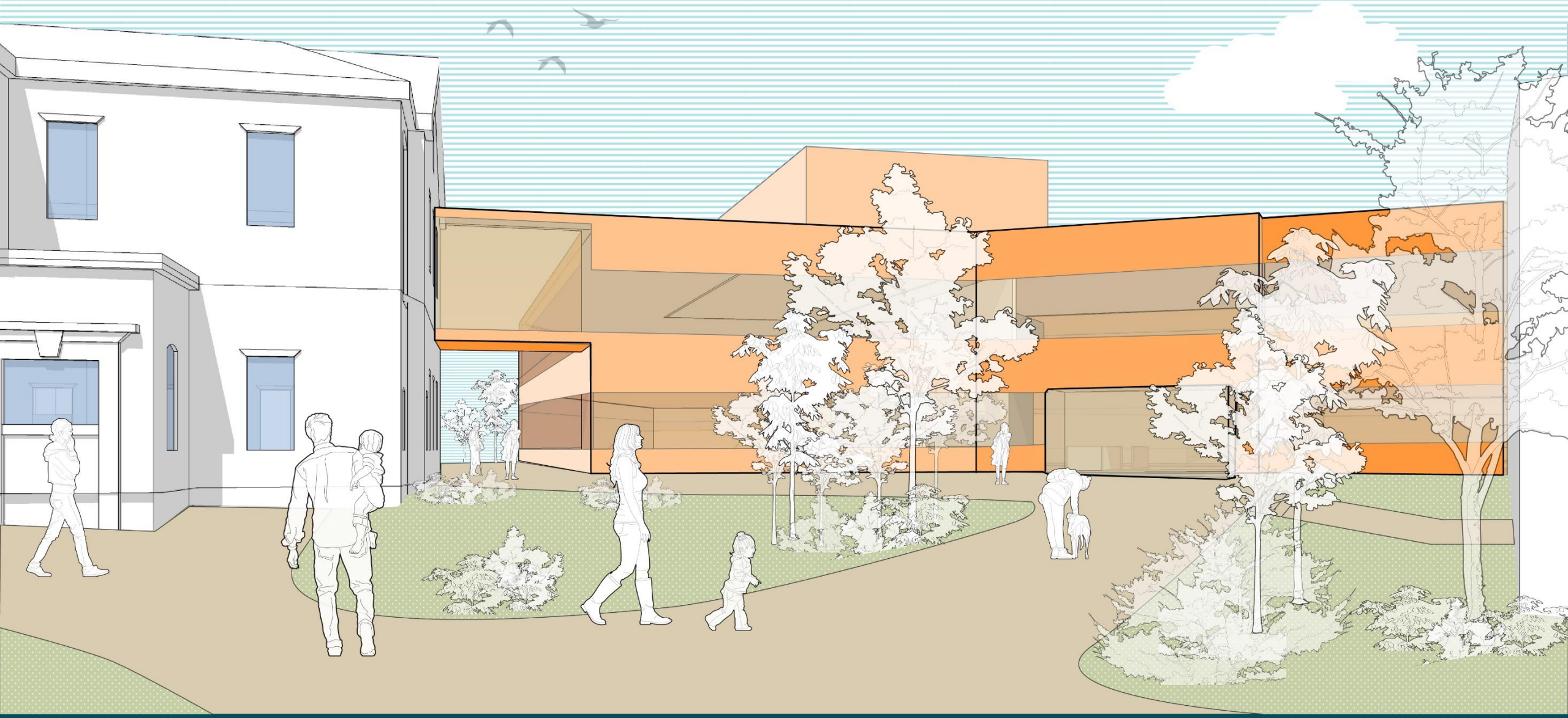
Refine roof plan: to maximize solar PV

All-electric kitchen: induction cooktops

Geoexchange bore fields: below building or in the park across the street

Occupancy schedule: refine summer programming

IAQ: interior and exterior building material HPDs



Thank you!