Agenda

1. Climate, Energy, & Environment
   *Presentation & Discussion*

2. Transportation
   *Presentation & Discussion*

3. Housing
   *Presentation & Discussion*
Meeting Goals

• What outcomes should the Volpe redevelopment aim to achieve?

• How do these issues relate to the urban design principles that we have discussed?
Climate, Energy, & Environment

K2 Strategy and Vision (2013)

• Improve building energy performance
• Prevent urban heat gain
• Reduce reliance on automobiles
• Reduce stormwater runoff
• Increase use of renewable energy and/or district energy
• Go beyond existing approaches to sustainability
Climate, Energy, & Environment

The Bigger Picture

• Getting to “Net Zero”
• Climate Change Vulnerability
• Stormwater and Infrastructure

In the spring of 2016, the City of Cambridge achieved the highest rating in the country from STAR Communities for its leadership in sustainability.
Climate, Energy, & Environment

Getting to Net Zero

1. The Climate Imperative

Climate change poses a growing set of risks and challenges to cities.

80%

Combating climate change needs to start locally.

Buildings generate over 80% of Cambridge’s total greenhouse gas emissions.

That is why it is Cambridge’s aim to achieve Net Zero Emissions from buildings.

Residents, universities, businesses and the City are collaborating to address the immediacy of the climate imperative.
Climate, Energy, & Environment

Getting to Net Zero

2 WHAT IS NET ZERO?

THE TARGET:
Net zero annual emissions from buildings citywide.

A community of buildings for which, annually, all greenhouse gas emissions produced through building operations are offset by carbon-free energy production.
Climate, Energy, & Environment

Getting to Net Zero

3 ways to reduce emissions from buildings:

- Efficient Design & Retrofits
- Improved Operations
- Renewable Energy Supply
Climate, Energy, & Environment

Getting to Net Zero

The 25-Year Net Zero Strategy

The net zero action plan aims to cut energy demand significantly, and replace fossil fuels with renewable energy.

Cambridge Net Zero Plan

Emissions Reductions through Energy Efficiency

Achieve 70% reductions

Increased Renewable Energy Supply

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Climate, Energy, & Environment

Getting to Net Zero

Targets for Net Zero New Construction by Sector

<table>
<thead>
<tr>
<th>Type</th>
<th>Municipal</th>
<th>Residential</th>
<th>Multi-Family</th>
<th>Commercial</th>
<th>Institutional</th>
<th>Labs</th>
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<tbody>
<tr>
<td>target</td>
<td>2020</td>
<td>2022</td>
<td>2025</td>
<td>2025</td>
<td>2025</td>
<td>2030</td>
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</tbody>
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Implementation Strategies for New Construction:

• Citywide LEED Gold Standard
• Prioritize Optimize Energy and Enhanced Commissioning
• Building Energy Use Disclosure Ordinance (BEUDO) requirements
• Rooftop “Solar Ready” design standard
• Required “Pathway to Net Zero”
• Removal of barriers to increased insulation
Beyond Design/Development Standards:

• Optimizing solar orientation in site design
• District Energy Approaches (e.g., shared solar, microgrids, cogeneration, utilizing existing steam system)
• EcoDistricts (KSA collaboration)
• Low Carbon Energy Supply (City study underway)
Climate Change Vulnerability

Temperature

Precipitation

Sea Level Rise (SLR)

Cambridge is more vulnerable to increasing heat and precipitation-driven flooding in the near future than to sea level rise and coastal storm surges.

Alewife is likely to be the first of Cambridge neighborhoods to experience SLR/SS flooding as early as 2045.
Temperature Projections

1971 - 2000 (Baseline)

2015 - 2044 (2030)

2055 - 2084 (2070)

Above 90°F - Low Scenario
Above 90°F - High Scenario
Above 100°F - Low Scenario
High 100°F - High Scenario

*Summer is considered to be the 91 days of June through August
Heat Index

Present Conditions
Heat Index (83°F)

2030s Scenario
Heat Index (96°F)

2070s Scenario
Heat Index (115°F)
Climate, Energy, & Environment

Flooding from Precipitation

2070 Projections – 100-Year (1%) Flood Scenario

Kleinfelder, for City of Cambridge
Climate, Energy, & Environment

Sea Level Rise and Storm Surge Flooding

2070 Depth of Overall Flooding from SLR and Storm Surge and Propagation

2070 Percent Probability of SLR and Storm Surge Flooding

Fig. 9  Top map: 2070 Depth of Flooding from SLR and Storm Surge at 0.1% Probability  Bottom map: 2070 Percent Probability of Sea Level Rise and Storm Surge Flooding (Source: Kleinfield, February 2017, based on WHG MassDOT Boston Harbor Flood Risk Model)
Resilient Building Design

- Protecting critical building systems (e.g., elevating)
- Maintaining on-site energy, water (e.g., backup systems)
- Ensuring occupant safety and comfort during a flood event (e.g., operable windows)
- Recovering after a flood event

Cambridge DPW Standards:
- Build/Protect to the 2070 10% annual flood risk elevation
- Recover from the 2070 1% annual flood risk elevation
Managing Water with Infrastructure

DPW Requirements

- **Stormwater**: Manage quantity and quality through on-site storage and treatment
- **Sanitary Sewage**: Mitigate impacts by removing a proportional amount of stormwater from the City’s overburdened combined sewer system
  - Typically a 4:1 ratio ("I/I removal")
Managing Water with Infrastructure

Typical Stormwater Mitigation for New Buildings

- Traditional underground, “hidden” infrastructure
- Utilitarian, no ancillary community benefits
- Costly and disruptive to construct/maintain
Managing Water with Infrastructure

Low Impact Development (LID) Techniques

- Replicate natural hydrologic functions (infiltration, vegetative uptake, evapotranspiration)
- More “naturally” improve stormwater quality/reduce quantity prior to discharge
District-Wide Approach

- Holistic design integrating stormwater, open space, transportation
- Multifunctional infrastructure
- Public amenities
- Heat island mitigation
- Visible showcase for environmental commitment

Climate, Energy, & Environment

Managing Water with Infrastructure

Precedents

Stata Center, MIT

NorthPoint Common

Alewife Stormwater Wetland, City of Cambridge
Climate, Energy, & Environment

Questions:

• What are the opportunities to further the City’s climate & energy goals in the Volpe redevelopment?

• How do the City’s climate & energy goals align with the urban design principles that have been discussed?
Transportation

K2 Strategy and Vision (2013)

- Reduce Drive-Alone Rates (“Mode Share”)
- Improve Vehicular Traffic Management
- Enhance Pedestrian and Bicycle Pathway Network
- Enhance Transit Options
Transportation

The Bigger Picture

- Current and future transportation patterns in Kendall Square
- Planning tools
- Kendall Square Mobility Task Force (KSMTF) recommendations
- Bicycle Network Vision and Binney Street Redesign Process
Kendall Square Average Daily Traffic

- Broadway
- Binney St.
- Third St.

Dips in ADT due to construction:
- Craigie Bridge
- Longfellow Bridge

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Critical Sums Analysis

- Sum of all conflicting traffic movements (vehicles per hour).
- Intersections with 1,500 or fewer vehicles per hour considered to operate adequately.
- When thresholds are exceeded, intersection operation starts to deteriorate exponentially.
Transportation

Critical Sums Analysis – Updated Scenario 2015

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Transportation

1500 Critical Sum Threshold

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Note: The “No Build” scenario uses projected growth in the area but includes no transit improvements other than the Green Line Extension.
Transportation

Key Takeaways

• Sensitive intersection at Broadway/Third
• Continued implementation of parking supply/demand management and mitigation strategies
• Importance of investing in transit, bicycling, and walking as main modes of transportation
Transportation

Planning Tools: Regulation

• **Managing Supply:** Maximum Parking Ratios, Shared Use Parking

<table>
<thead>
<tr>
<th>Use</th>
<th>Auto Parking</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Based on analysis</td>
</tr>
<tr>
<td>Office</td>
<td></td>
</tr>
<tr>
<td>Retail/consumer service</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>0.5 sp/du</td>
</tr>
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</table>

• **Managing Demand:** Parking and Transportation Demand Management (PTDM) Ordinance, TDM Programs
  • Subsidized transit use
  • Bicycle/pedestrian amenities
  • Removing “hidden subsidy” of driving/parking
Transportation

Planning Tools: Investment

Infrastructure Improvements:
• Main Street & Broadway (completed by City)
• Ames Street Cycle Track (required for MIT/Kendall Development)
• Sixth Street Pedestrian/Bicycle Improvements (required for Boston Properties Development)

Transit Investment:
• Kendall Square Transit Enhancement Program (KSTEP) – funding for future public transit improvements (MBTA, MassDOT, City)

Additional investment priorities were a focus of Kendall Square Mobility Task Force (KSMTF) work
Transportation

KSMTF: Red Line Improvements

- Capacity increase with new Red Line car purchase
- Station improvements (MIT, Boston Properties developments)

Source: MBTA data, modified
Transportation

KSMTF: Grand Junction Rail Corridor

Path constructed (2016, funded by MIT and CRA)

Path funded by City for $10 million, MassDOT ROW

Regional connections (Somerville, Sullivan, North Station)

Regional connections (West Station and beyond)

Path not funded (MIT ROW)

Path not funded (MassDOT ROW)

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Transportation

KSMTF: Bus Prioritization

Transit Priority for CT2/85

Extend 64/70 to Kendall Sq.

Bus priority corridor

Increase EZRide service

Assembley SQ.

SULLIVAN SQ.

CT2

New CT4

KENDALL SQ.

CENTRAL SQ.

LECHMERE

UNION SQ.

HARVARD SQ.

64/70

To Allston/Brighton

CT2

New CT4
Transportation

KSMTF: Shuttles and Ride-Hailing Services

- Many corporate shuttle services in the area, benefits of consolidation
- Not much data on ride-hailing services
- Long-term impacts on transportation system not well known
Transportation

Transportation

Binney/Galileo/Broadway Redesign Process

“Median Scheme”

“Island Scheme”

Cambridge Redevelopment Authority

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Transportation

Questions:

• What are the opportunities to further the City’s transportation goals in the Volpe redevelopment?

• What transportation priorities align with the urban design principles that have been discussed?
Housing

K2 Strategy and Vision (2013)

• Housing required along with commercial growth
• Twofold purpose: To increase housing supply in general, and to improve the mix of uses in Kendall in particular
• Diverse incomes and household types, including families with children

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Housing

The Bigger Picture

• Housing in Cambridge today
• Projected future population (Cambridge, regional)
• Changes in housing types
• Housing in Kendall Square
• Who is living in new Cambridge housing?
INTRODUCTION: KEY DRIVERS

FIGURE X: Housing Stock Key Drivers: 2016

110,402 TOTAL RESIDENTS

52,822 RESIDENTIAL UNITS

46,505 POST-SECONDARY STUDENTS

5 in 10 LIVE IN CAMBRIDGE

1.5 in 10 LIVE OFF CAMPUS

45,569 HOUSEHOLDS

2.1 CAMBRIDGE

2.6 MASSACHUSETTS

2.7 UNITED STATES

Housing

INTRODUCTION: KEY DRIVERS

**FIGURE X:** Housing Stock Key Drivers: 2016

- **135,400** TOTAL JOBS
- **2.6** JOBS TO HOUSING RATIO
- **$63,981** RENTER MEDIAN INCOME
- **$122,260** OWNER MEDIAN INCOME
- **6.4 mi²** TOTAL LAND AREA
- **10th** DENSET CITY IN THE U.S.
- **40%** RESIDENTIAL LAND USE

**IN CURRENT HOUSEHOLD FOR MORE THAN 5 YEARS:**
- **50%** OF RENTERS
- **86%** OF OWNERS

*Sources, from top left: Total workforce jobs, 2015 American Community Survey (ACS) 1-Year Estimates; Median Income by Tenure, 2015 ACS 1-Year Estimates; Population by Tenure by Year Household Moved into Unit, 2015 ACS 1-Year Estimates; Land Use and Area, 2016 Land Use and Roads GIS layer; Population Density, Population, Housing Units, Area and Density 2010, U.S. Census Bureau.*
**Housing**

**Housing Stock: Tenure**

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<tr>
<th></th>
<th>Massachusetts</th>
<th>United States</th>
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<tbody>
<tr>
<td>Tenure</td>
<td>57%</td>
<td>61%</td>
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<tr>
<td>Owner</td>
<td>34%</td>
<td>32%</td>
</tr>
<tr>
<td>Renter</td>
<td>9%</td>
<td>11%</td>
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</table>

**Housing Stock: Vacancy**

**Table X: Vacancy Status, 2010**

<table>
<thead>
<tr>
<th>Vacancy Status</th>
<th>On the Market</th>
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</thead>
</table>

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Regional Population Projections

MAPC projects that the region will add more than 400,000 residents over the next 20 years, and an additional 130,000 in the following decade under its Stronger Region scenario.
Citywide Population Growth

MAPC “Stronger Region” projections show Cambridge approaching its peak population by 2030.

Source: 2014 MAPC Population Growth Projections; US Census, 1950–2010. Projections based on historical births, deaths, migratory patterns of different age cohorts, and steps forward by applying variations on those historical patterns to each age cohort as they age over time.
Decline In Homeownership Has Driven Rental Demand

Homeownership Rate: Boston vs. U.S., And Renter Occupied Households (U.S. Only)

Sources: Moody's Analytics; U.S. Census Bureau (CPS/HVS); CoStar Portfolio Strategy
As of 1Q14

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Rent Growth Decelerating, Or Shrinking In Pricey Submarkets

Current Rents Ranked By Submarket And Growth 10Q4 To 15Q4 vs. Growth Over Last 4Q's

Source: CoStar Portfolio Strategy

As Of Mid-17Q1

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So What Happens Six Years From Now?

Population In Boston Aged 20-34

Sources: CoStar Portfolio Strategy, Moody's Analytics, U.S. Bureau of the Census

As of 16Q4
2,000 existing units (approx.)
1,200 units permitted or in construction (approx.)
1,000-1,400 units expected in Volpe redevelopment
### Six recent residential projects in Kendall Square:

<table>
<thead>
<tr>
<th>Unit Types</th>
<th>Number of Units</th>
<th>Percent of Total</th>
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<tbody>
<tr>
<td>Studio</td>
<td>303</td>
<td>22 %</td>
</tr>
<tr>
<td>One bedroom</td>
<td>600</td>
<td>44 %</td>
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<tr>
<td>Two bedrooms</td>
<td>425</td>
<td>31 %</td>
</tr>
<tr>
<td>Three bedrooms</td>
<td>31</td>
<td>2 %</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,359</td>
<td>100 %</td>
</tr>
</tbody>
</table>
Housing

What types of households are living in new housing units?

- 2016 survey of recent multifamily projects by CDD Housing Division
- Responses from 6 buildings, 756 units
- Projects in North Point, Kendall Square, North Cambridge, Cambridge Highlands, and Neighborhood Nine

Breakdown of Unit Types in Surveyed Multifamily Developments

- 1BRs 47%
- 2BRs 28%
- 3+BRs 1%
- 0BRs 24%

Breakdown of Household Types in Surveyed Multifamily Developments

- 1pp HHs 44%
- 2 pp HHs 40%
- 4 pp HHs 6%
- 5+ pp HHs 1%
- 3 pp HHs 9%
What types of households are living in new housing units?

- 101 children (under 18) in 756 surveyed units
- 108 seniors (55 and older) in 756 surveyed units
- Includes affordable units through inclusionary housing

**Household Types Occupying 2+ BR Units**

- Families with at least one child <18: 40%
- Married couples/domestic partners, without children: 28%
- Unrelated adults (eg roommates), without children: 22%
- Single individuals, without children: 10%

**Ages of Children in Surveyed Units**

- 0-5 years, 58%
- 6-10 years, 29%
- 10-18 years, 13%
Questions:

• What is the vision for Kendall Square’s future residential population?

• What mix of housing types and other amenities are needed to support a vibrant neighborhood?