MXD Infill Development Concept Plan
Sustainability Strategies
Wednesday, May 18, 2016
MEETING OVERVIEW

03/16/2016 MXD Infill Development: Open Space Concepts
04/13/2016 ECPT Open Space Concepts

04/27/2016 MXD Infill Development: Massing Development Program
ADAPTATIONS TO ARTICLE 14 APPROACH C.

- Commercial
- 20% Innovation Space
- Housing
- 20% Inclusionary Housing
- 5% Middle Income

Potential rooftop open space:
Approx: 27,000 SF

Innovation Space #levels TBD
SUSTAINABILITY CERTIFICATION AND RECOGNITION

- 15+ million square feet LEED Certified
- 80% at Gold and Platinum Level
- All new development projects, totaling 4.5 million square feet, are pursuing LEED certification

- Executive Members of EPA’s Certification Nation program
- 52 ENERGY STAR labelled properties

- Ranked 2nd among US Office companies in 2015
- Ranked 24th out of 688 global companies in 2015 (among the top 4% of all participants)
- Achieved highest “Green Star” last 4 years

- 2014 Special Recognition – Most Improved Leader in the Light Award
- 2015 Leader in the Light Award Joint Winner
SUSTAINABILITY GOALS

We have adopted goals with the following specific time frames, metrics, and targets below a 2008 baseline:

15x20 Energy Use Reduction
Reduce energy use intensity, targets a 15% reduction by 2020. Units are kBtu/SF.

20x20 Greenhouse Gas Reduction
Reduce Scope 1 and Scope 2 greenhouse gas emissions intensity, targets a 20% reduction by 2020. Units are kgCO₂e/SF.

20x20 Water Use Reduction
Reduce water use intensity, targets a 20% reduction by 2020. Units are gallons/SF.

65x20 Waste Diversion
Increase waste diverted from landfill, targets a 65% diversion rate by 2020. Units are % diverted.
SUSTAINABILITY HIGHLIGHTS

Established energy, greenhouse gas emissions, water and waste goals, with 2020 reduction targets below a 2008 baseline

Reduced like-for-like energy use by 6.7% in the last three years, saving an estimated $9.7 M in annual utility costs

Generated more than 1,000 MWh renewably onsite in 2015

Reduced water use intensity 17.8% since 2008, saving $1.7 M in annual utility costs

Increased our recycling rate from 36% in 2008 to 59% in 2015

Selected as a Green Lease Leader by the Better Buildings Alliance in 2015
HIGHLIGHTS AND GOALS

OUTCOMES AND PERFORMANCE

• TARGET LEED V3 GOLD FOR ALL BUILDINGS
• LEED MASTER SITE APPROACH
• DISTRICT BASED APPROACHED TO SUSTAINABILITY
• INTEGRATIVE DESIGN PROCESS AND RESILIENT DESIGN
• INTERSECTION OF SUSTAINABILITY AND WELLNESS
• COMMITMENT TO OPERATIONAL SUSTAINABILITY
INTEGRATIVE PROCESS

Systems thinking
Front-loaded process
Collaboration
Shared Ideas
Transparency
Accountability

Get everyone at the table early
INTEGRATIVE PROCESS

DESIGN EFFORT

Less Effort

More Effort

COST OF DESIGN CHANGES

Concept  SD  DD  CD  Bidding  Construction

Maximum Effort

Minimal Effort

Maximum Cost

Minimal Cost
SITE AND WATER

- NATIVE / INDIGENOUS PLANTS
- LEFE PARKING, ESVE STATIONS, AND BIKE STORAGE
  - DEMAND RESPONSE / PEAK LOAD REDUCTION
  - SMART GRID COMPATIBILITY
  - HEAT ISLAND REDUCTION
SITE AND WATER GREEN ROOFS

Manulife Headquarters– Boston, MA
SITE AND WATER GREEN ROOFS

The Avenue – Square 54, Washington D.C.

Bruce C. Bolling Municipal Building – Boston, MA
SITE AND WATER STREET LEVEL OPEN SPACE HARVEST RAIN WATER GARDEN

The Avenue – Square 54, Washington D.C.
SITE AND WATER STORM WATER MANAGEMENT

The Avenue – Square 54, Washington D.C.
SITE AND WATER WATER USE REDUCTION

PRE-1980s TOILET
5.0+ gallons per flush

HIGH-EFFICIENCY TOILET TODAY
1.28 gallons per flush

Irrigated With RECYCLED WATER
Do Not Drink No Beber

WaterSense Meets EPA Criteria
SITE AND WATER

- NON POTABLE WATER REUSE FOR IRRIGATION

- NON POTABLE WATER REUSE COOLING TOWER MAKEUP
SITE AND WATER 6TH STREET CONNECTOR OPTIONS

- New 10’ Bicycle Path Permeable Asphalt / Flexi – Pave Surfacing
- Existing Trees Colonnade
- Existing Light to be Replaced (LED Baffled Lighting)
- Pedestrian Walk Permeable Asphalt / Flexi – Pave Surfacing
- Decomposed Granite Bench
- 2-Way Bike Lane
- 1’ Gravel Edge
- Accent Planting

Passage to Building 2-Way Bike Lane Planting Area Pedestrian Accent Planting
SITE AND WATER LIGHT POLLUTION REDUCTION

The Good  The Bad  The Ugly

Full cut-off downlight (LED)
SITE AND WATER SOUTHEAST RAIN GARDEN OPTION

- Existing Tree
- Existing Light To Be Replaced
- Low Groundcover
- Existing Walk To Remain
- Accent Planting
- Decomposed Granite
- Rain Garden
- Surface Mounted Bicycle Rack
  - "Bola"
  - 77 Racks
  - 154 Bicycles
- Ames Pedestrian Street

The Green Engineer

vhh SASAKI

Boston Properties
ENERGY

- CHILLED BEAMS
- DEMAND RESPONSE / PEAK LOAD REDUCTION / SMART GRID COMPATIBILITY
- SOLAR READY ROOFS
- HIGH PERFORMANCE BUILDING ENVELOPE
- COMBINED HEAT AND POWER (CHP) COGEN BOILER
<table>
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<tr>
<th>Lumens</th>
<th>Standard Incandescents</th>
<th>New Halogen Incandescents</th>
<th>CFLs</th>
<th>LEDs</th>
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<tbody>
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<td>450</td>
<td>40 W $5.34/yr</td>
<td>29 W $3.87/yr</td>
<td>10 W $1.34/yr</td>
<td>5 W $0.67/yr</td>
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<td>800</td>
<td>60 W $8.02/yr</td>
<td>43 W $5.74/yr</td>
<td>13 W $1.74/yr</td>
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<td>1100</td>
<td>75 W $10.02/yr</td>
<td>53 W $7.08/yr</td>
<td>16 W $2.14/yr</td>
<td>15 W $2.00/yr</td>
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<tr>
<td>1600</td>
<td>100 W $13.36/yr</td>
<td>72 W $9.62/yr</td>
<td>20 W $2.67/yr</td>
<td>19 W $2.54/yr</td>
</tr>
</tbody>
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*Rated life is based on 3 hours of use per day.*

**100W Incandescent**
- $13.36/yr
- 1 yr lifespan

**20W CFL**
- $2.67/yr
- 10 yr lifespan

**19W LED**
- $2.54/yr
- 15-25 yr lifespan
• BOSTON PROPERTIES INTERNAL PRECAUTIONARY REDLIST
• LIFE CYCLE ANALYSIS
• NO SMOKING BUILDINGS AND SITE
OPERATIONS

- GREEN TENANT GUIDELINES AND LEASING AGREEMENTS
- RECYCLING AND GREEN CLEANING
- BUILDING AND ENVELOPE COMMISSIONING
- BUILDING DASHBOARDS
- SMART BUILDING CONTROLS REMOTE ACCESS CONTROLS
INNOVATION AND EMERGING TECHNOLOGIES

- LOCAL FOOD / COMMUNITY GARDENS
- SOLAR ROADWAYS
Buildings use 40% of raw materials globally (3 billion tons annually).

- Worldwatch Institute, 1995.

Buildings account for 73% of all electricity use in the United States.