Green Building Policy Update
Task Force

Meeting #2

Topic: Consultants’ Preliminary Analysis and Recommendations

January 30, 2019
I. Welcome 8:30 – 8:35 a.m.

II. Consultants’ Analyses and Recommendations

A. Integral Group Presentation 8:35 – 8:50 a.m.
   1. Task Force Comments 8:50 – 9:10 a.m.

B. WSP Presentation 9:10 – 9:25 a.m.
   1. Task Force Comments 9:25 – 9:45 a.m.

III. February Education Program 9:45 – 10:00 a.m.

IV. Public Comments 10:00 – 10:10 a.m.

V. Adjournment 10:10 – 10:15 a.m.
Green Building Policy Update
Workplan and Timeline

Task Force Meeting #1
November 14, 2018
Establish and prioritize topics for consultants’ studies

Task Force Meeting #2
January 30, 2019
Review consultants’ analyses and recommendations

Task Force Meeting #3
March 13, 2019
Review staff outline for Green Building Policy Report

Education Event
February 2019

Task Force Meeting #4
April 24, 2019
Review final staff draft of Green Building Policy

Planning Commission
June 4, 2019

City Council
June 15, 2019

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<thead>
<tr>
<th>Nov 2018</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>June 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>consultants prepare preliminary analyses and recommendations</td>
<td>consultants prepare final reports</td>
<td>staff drafts GB Policy Update</td>
<td>public review period</td>
<td>staff finalizes GB Policy Update based on task force and public input</td>
<td>pc recommendation CC approval</td>
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# Task Force Priority Green Building Strategies

<table>
<thead>
<tr>
<th>Task Force Strategy</th>
<th>Integral Group (Recommendations)</th>
<th>WSP (Cost Analysis)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy A:</strong> Increase LEED or equivalent third-party green building certification standards for private development.</td>
<td><strong>Combined Strategy A + D</strong></td>
<td><strong>Combined Strategy A + D</strong></td>
</tr>
<tr>
<td><strong>Strategy B:</strong> Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Strategy C:</strong> Establish incentives for private development participation in green building certifications.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Strategy D:</strong> Prioritizing specific green building elements in private development projects.</td>
<td><strong>Combined Strategy A + D</strong></td>
<td><strong>Combined Strategy A + D</strong></td>
</tr>
<tr>
<td><strong>Strategy E:</strong> Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.</td>
<td>Split Strategy for Analysis: 1) Introduce voluntary green building practices for existing buildings (including historic) 2) Introduce voluntary green building practices for small buildings not subject to review.</td>
<td>✓</td>
</tr>
</tbody>
</table>
Consultant Reports – Preliminary Analysis and Recommendations

Integral Group
- Analysis of the 5 priority green building strategies for recommendations that the City can consider to achieve EAP energy, water and stormwater targets in public and private buildings.

WSP
- Analysis of costs to implement green building strategies for public and private buildings
- Private development case studies
- Applicability of incentives in Alexandria
City of Alexandria
Green Building Policy:
Preliminary Analysis & Recommendations
Meeting Agenda

• Who we are
• Approach
• Alexandria’s Green Building Context
• Overall summary of recommendations
• Green Building certification equivalency
• Specific recommendations for each strategy
• Discussion
Integral Group – Office Locations

- Vancouver
- Seattle
- Oakland
- San Jose
- Los Angeles
- Calgary
- Victoria
- Toronto
- New York
- Washington
- Richmond
- Austin
- Atlanta
- Toronto
- London
- Oxford
- Sydney

16 OFFICES
550 STAFF
Integral Group – Deep Green Engineering

➢ 100+ NET ZERO ENERGY PROJECTS
➢ 50+ LEED PLATINUM CERTIFIED
➢ 10 AIA COTE TOP TEN BUILDINGS
➢ 9 LIVING BUILDING PROJECTS
➢ 5 PASSIVE HOUSE PROJECTS
Integral Group – Policy and Planning
Overall Approach:

• Current State Review
• Best Practice Review
• Impact Assessment
• Recommendations
• Equivalency Review (where applicable)
• Additional policy options
Review of the Five Strategies

• **Strategy A:** Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development projects.

• **Strategy B:** New and Existing Public Buildings - Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

• **Strategy C:** New Private Development (not subject to site plan review) - Introduce voluntary green building practices for small buildings not subject to site plan review.

• **Strategy D:** Existing Private Buildings (Commercial, Multifamily, and Single Family) - Introduce voluntary green building practices for existing buildings (including historic).

• **Strategy E:** Incentives for All New and Existing Privately-Owned Buildings - Establish incentives for private development to incorporate green building elements.
Alexandria and 8 peer jurisdictions on LEED policy and LEED achievement

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Washington, DC</td>
<td>693,972</td>
<td>68.3</td>
<td>10,155</td>
<td>1009</td>
<td>181.1</td>
<td>261.0</td>
<td>452</td>
<td>140.3</td>
<td>International Green Construction Code, LEED Silver for private / LEED Gold for public, Optional NZE Code Path</td>
</tr>
<tr>
<td>Cambridge, MA</td>
<td>113,630</td>
<td>7.1</td>
<td>15,937</td>
<td>198</td>
<td>18.6</td>
<td>161.5</td>
<td>49</td>
<td>7.7</td>
<td>LEED Silver, NZE goal by 2040</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>685,094</td>
<td>89.6</td>
<td>7,644</td>
<td>377</td>
<td>100.1</td>
<td>146.1</td>
<td>187</td>
<td>70.8</td>
<td>LEED Certified plus local priority credits</td>
</tr>
<tr>
<td>Seattle, WA</td>
<td>724,745</td>
<td>83.8</td>
<td>8,651</td>
<td>400</td>
<td>88.8</td>
<td>122.5</td>
<td>234</td>
<td>65.4</td>
<td>Aggressive EUI targets, LEED Gold for zoning amendments, Living Building incentives</td>
</tr>
<tr>
<td>Sunnyvale, CA</td>
<td>153,656</td>
<td>22.7</td>
<td>6,772</td>
<td>99</td>
<td>18.4</td>
<td>120.9</td>
<td>50</td>
<td>5.5</td>
<td>Density bonus for LEED Gold Certification.</td>
</tr>
<tr>
<td>Alexandria, VA</td>
<td>160,035</td>
<td>15.5</td>
<td>10,325</td>
<td>87</td>
<td>12.6</td>
<td>79.0</td>
<td>99</td>
<td>15.7</td>
<td>LEED Silver for Commercial / LEED Certified for Multifamily</td>
</tr>
<tr>
<td>Santa Monica, CA</td>
<td>92,306</td>
<td>8.4</td>
<td>10,963</td>
<td>63</td>
<td>6.7</td>
<td>73.1</td>
<td>46</td>
<td>6.2</td>
<td>NZE for single-family and low-rise mf. Density bonus for non-residential projects that meet LEED Platinum along with other local requirements.</td>
</tr>
<tr>
<td>St. Paul, MN</td>
<td>306,621</td>
<td>56.2</td>
<td>5,458</td>
<td>37</td>
<td>6.8</td>
<td>22.1</td>
<td>55</td>
<td>13.2</td>
<td>LEED Silver or better, along with local priority credits</td>
</tr>
<tr>
<td>Berkeley, CA</td>
<td>122,324</td>
<td>17.7</td>
<td>6,915</td>
<td>44</td>
<td>2.4</td>
<td>19.7</td>
<td>21</td>
<td>1.3</td>
<td>LEED Gold for buildings in downtown area (LEED Certified elsewhere)</td>
</tr>
</tbody>
</table>
High-level Summary of Recommendations:

**Strategy A: Private Development**
- All projects meet LEED Silver (including multifamily)
- Minimum performance/design standards for specific elements
  - Creates a baseline performance level to prevent gaming of rating systems.
  - Growing best practice across cities.
  - It is also essential to setting any equivalence between rating systems.
- We reviewed other rating systems to determine where equivalencies exist.

**Strategy B: New and Existing Public Buildings**
- We recommend specific energy and water targets that exceed the level of ambition set for private development
- We recommend the city utilize performance-based procurement to get higher-performing buildings without additional costs.
- We recommend the city undertake a deep energy retrofit program for existing buildings. However, specific planning for retrofits and identification of high priority buildings was not within the scope of this project
High-level Summary of Recommendations:

**Strategy C: New Private Development not subject to plan review**
- Home rating and labeling programs
- Education and Capacity building

**Strategy D: Existing Private Buildings**
- For EAP Phase II, explore challenge programs and educational programs
- Continue to move forward on C-PACE
- Advocate for enabling legislation from Commonwealth to allow mandatory programs

**Strategy E: Incentives for All New and Existing Private Buildings**
- Structural Incentives
- Tax Incentives
Equivalency Review

**LEED**: Base certification system

**Living Building Challenge**: exceeds all requirements and could be accepted as an alternate compliance path

**Living Building Petal Certification**: could be alternate compliance path so long as buildings achieve both the energy and water petals.

**Enterprise Green Communities**: could be alternate compliance path so long as equivalent performance criteria and points are met or exceeded.

**Green Globes** could be alternate compliance path, provided the applicant achieves minimum three green globes, plus equivalent energy, water and stormwater performance—this may require verification as equivalent standards not in place for all elements.

We recommend that **Earthcraft** not be considered an equivalent standard at this time, as current maximum points fall short of the minimum requirements recommended for all performance elements.
## Strategy A: New Private Development

### Energy

<table>
<thead>
<tr>
<th>Past Performance</th>
<th>Suggested Target</th>
<th>LEED v4 equivalence</th>
<th>Other Equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Optimize Energy Performance:</strong></td>
<td><strong>EUI targets:</strong></td>
<td><strong>LEED V4 Optimize Energy Performance:</strong></td>
<td>✓</td>
</tr>
</tbody>
</table>
| Average achievement in Alexandria for LEED v2009 projects: 8 points = 26% reduction vs. 90.1-2007. | • < 35 kBTU/ft\(^2\) for multifamily residential  
• < 45 kBTU/ft\(^2\) for commercial  
• < 30 kBTU/ft\(^2\) for schools  
• Equivalent improvement over baseline for hospitals, food service, or energy intensive uses | Minimum 12 points  
• New Construction: 29% reduction  
• Major Renovation: 27% reduction  
• Core and Shell: >26% reduction  
• Healthcare: >22-24% reduction | ✓ Living Building Challenge  
✓ LBC Energy Petal  
✓ Green Globes  
✓ Enterprise Green Comm.  
× Earthcraft |
| 3 projects <20%  
4 projects 20%-30%  
3 projects >40% | This equates to:  
• > 30% reduction relative to average 90.1-2010 performance  
• 18-30% improvement over code |

This equates to:

- > 30% reduction relative to average 90.1-2010 performance
- 18-30% improvement over code
## Strategy A: New Private Development

### Energy

<table>
<thead>
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<th>LEED v4 equivalence</th>
<th>Other Equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Onsite Renewable Energy</strong>&lt;br&gt;One project: 13% Remainder: 0%.</td>
<td>Buildings subject to DSUP designed to have 5% of energy supplied by onsite renewables</td>
<td>LEED V4 Onsite Renewable Energy: X% of total energy cost 1 point = 1% 2 points = 5% 3 points = 10%</td>
<td>✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes (plus verification of installed renewable capacity) × Earthcraft: No mention</td>
</tr>
<tr>
<td><strong>Commissioning</strong>&lt;br&gt;50% of projects achieved credit.</td>
<td>Undertake Enhanced Commissioning per LEED guidelines</td>
<td>LEED V4 Enhanced Commissioning, 3 points</td>
<td>✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes × Earthcraft: No mention</td>
</tr>
<tr>
<td><strong>Measurement &amp; Verification</strong>&lt;br&gt;50% of projects achieved credit.</td>
<td>Advanced Energy Metering for the whole building and any end uses making up over 10% of the building load.</td>
<td>LEED V4 Advanced Energy Metering, 1 point</td>
<td>✓ Living Building Challenge ✓ LBC Energy Petal ✓ Enterprise Green Comm. ✓ Green Globes × Earthcraft: No mention</td>
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</table>
### Strategy A: New Private Development

#### Water Efficiency

<table>
<thead>
<tr>
<th>Past Performance</th>
<th>Suggested Target</th>
<th>LEED v4 equivalence</th>
<th>Other Equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Use Reduction</strong></td>
<td><strong>Indoor water use reduction</strong> Minimum 40% better than baseline</td>
<td>LEED V4 WEc2: Minimum 4 points 40% better than baseline</td>
<td>✓ Living Building Challenge ✓ LBC Water Petal ✓ Green Globes × Enterprise Green Communities: Maximum points for only 30% reduction currently × Earthcraft: No performance criteria</td>
</tr>
<tr>
<td>LEED v2009 average 16% reduction over baseline</td>
<td></td>
<td></td>
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<tr>
<td>50%: 0% 50% achieved 30%-35%</td>
<td></td>
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</tr>
<tr>
<td><strong>Water Efficient Landscaping</strong></td>
<td><strong>Outdoor water use reduction:</strong> Show that the landscape does not require a permanent irrigation system beyond a maximum two-year establishment period. OR 50% reduction in landscape water requirement from the calculated baseline for the site’s peak watering month.</td>
<td>LEED V4 WEc1: <strong>Option 1. No Irrigation Required (2 point):</strong> Show that the landscape does not require permanent irrigation OR <strong>Option 2. Reduced Irrigation (1-point):</strong> Reduce the project’s landscape water requirement by at least 50% from calculated baseline</td>
<td>✓ Living Building Challenge ✓ LBC Water Petal ✓ Enterprise Green Communities ✓ Green Globe (verify % reduction) × Earthcraft: No mention</td>
</tr>
<tr>
<td>LEED 2009 AVERAGE 80% reduction in potable water use</td>
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• Alexandria revised stormwater requirements less than 1 year ago, and State law limits local flexibility. Propose to maintain existing requirements for short term:
  • “A minimum of 65% of total phosphorus (TP) removal required by the Virginia Stormwater Management Program (VSMP) must be achieved using non-proprietary surface BMPs approved by the Virginia Stormwater BMP Clearinghouse.
  • A maximum of 25% of the TP removal required by the VSMP may be achieved using [Manufactured Treatment Devices] MTDs and/or sand filters approved by the Virginia Stormwater BMP Clearinghouse.
  • Any Approved BMP may be used to meet the balance of the Alexandria Water Quality Volume Default (WQVD).
  • MTDs may not be used on single-family detached residential projects.”
Strategy A: New Private Development
Energy and Water Impacts

• **Energy:**
  - Will reduce EUI of new commercial and multifamily buildings between 18%-33% depending on building type, relative to VA energy code
  - 20% reduction in total energy use of buildings forecast in small area plans, avoiding **592 billion** BTU of energy use per year

• **Climate:**
  - 20% reduction in GHGs from new construction, relative to BAU, avoiding Will 63,000 metric tons per year
  - 3% reduction in citywide GHG emissions, compared to citywide BAU
  - Comparable to similar savings seen for similar policies in other jurisdictions

• **Water:**
  - 29% reduction in indoor water use from new construction, relative to BAU, avoiding use of over **421 million** gallons of water a year
  - 9% reduction in indoor water use by multifamily and commercial sectors n Alexandria, relative to BAU
  - Does not include savings from irrigation
<table>
<thead>
<tr>
<th>Item</th>
<th>Achievement target</th>
<th>Exceeds private sector?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Green Building Certification</strong></td>
<td>Lead by example by being certified at LEED Gold level</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Energy Performance</strong></td>
<td>Be designed to achieve net zero energy (NZE) through a combination of energy efficiency and renewable energy systems, either on-site or sited on other City properties.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Renewable energy &amp; energy storage</strong></td>
<td>Examine the feasibility, costs and benefits of installation of on-site solar and storage for all new projects, and include where feasible</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Indoor water use</strong></td>
<td>Reduction minimum 40% better than baseline (per LEED V4 baseline values)</td>
<td>Equal</td>
</tr>
<tr>
<td><strong>Outdoor water use</strong></td>
<td>Reduce irrigation water use by at least 50% relative to the calculated baseline for peak watering month, and where possible, use plants that require no irrigation with potable water after a maximum two-year establishment period.</td>
<td>Equal</td>
</tr>
<tr>
<td><strong>Stormwater management</strong></td>
<td>Meet 100% of the stormwater treatment requirements for sites with green infrastructure and evaluate options for overtreating and/or detaining additional rainwater on site to the greatest extent feasible.</td>
<td>Yes</td>
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</table>
Strategy B: Public Buildings
Net Zero Energy

• A **Net-Zero Energy (NZE)** building: highly energy-efficient building where 100% of the site energy use is met with renewable energy in net over the course of a year, either from on-site or off-site renewable energy.

• A **Net-Zero Energy-ready** building is a building with a sufficiently low EUI (often <25 kBTU/ft²) that it could be NZE if solar were added.

• Leading net zero energy certification programs require buildings to be **all-electric** and have no **on-site fuel combustion**.

• Certification programs **now allow for off-site renewable energy** to count for net zero energy certification in certain conditions and as long as they are from **long-term contracts (PPAs)**

• **Integrated Design** allows delivery of NZE buildings at no additional cost
Strategy B: Public Buildings
Performance-Based Procurement for New Construction

PERFORMANCE-BASED PROCUREMENT PROCESS:

1. Select the Project Delivery Method
2. Develop Performance Goals:
3. Include Performance Goals in the RFP/Contract
4. Manage Design and Construction to Ensure Goals Are Met
5. Verify Performance Post-Occupancy

• Tier 1: “Mission Critical” outlines performance targets that are required in all buildings
• Tier 2: “Highly Desirable” outlines performance targets that represent a more ambitious level of performance overall
• Tier 3 “If Possible” outlines performance targets that are considered “best in class”

• Benefits:
  • Lower Risk:
    • Owner input into preliminary design
    • Assign firm fixed price for design
    • Bestows contractual responsibility for meeting or exceeding expectations to design team
  • Reduced time and cost
    • Fosters innovation and creativity
    • Creates significant reductions in design and construction costs
    • No contingency use
    • Reduces or eliminates claims, controversies and change orders
  • Higher Performance
    • Requires end-use metering to verify performance
    • Subcontractors must substantiate that design meets requirements
• EAP calls for a 20% reduction in energy use in existing public building portfolio by FY 2023

• Can be achieved through a combination of:
  • Basic energy efficiency measures such as lighting retrofits
  • Optimizing operations and maintenance across portfolio
  • Deep energy retrofits in select buildings
  • Deep energy retrofits target a 30%-50%+ improvement

• Alexandria already benchmarks all its buildings
  • Regular QA/QC of this data is best practice

• Strategic Energy Management Plan
  • Rocky Mountain Portfolio Optimization program is a good option
  • City is already pursing

• Need to align City’s asset valuation to prioritize green investments.
Strategy C: New Private Buildings not subject to plan review

- **Home Rating and Labeling Programs**
  - Targeting single-family market
  - HERS Index or DOE Home Energy Score
  - Ratings incentivize improvements, and inform buyers of opportunities
  - State enabling legislation needed for any mandatory program
  - Alexandria could work with MRIS to incorporate into home listing regardless

- **Education and Capacity Building – Private Sector**
  - Education programs for industry, including developers, architects and engineers
  - Improve the local capacity to deliver high performance buildings.
  - Training can include classes, direct TA, and online resources

- **Education and Capacity Building – Public Sector**
  - City staff need training to stay updated on standards and best practices
  - Recommend City offer training on updated Green Building Policy for relevant staff
  - Recommend permit review staff get training in reviewing energy models, or an additional staff member with this expertise hired
Strategy D: Existing Public Buildings
Voluntary Programs

- **Challenge Programs / Benchmarking**
  - Can be effective way to promote benchmarking without mandate.
  - Arlington Green Games – between buildings
  - Better Buildings Challenge – between communities

- **Educational Programs**
  - Sustainability Guide for Historic Properties (DC has good model guide)

- **Tenant Build-Out**
  - Many commercial tenant spaces turn over every 7 years
  - Tenant turnover is critical time for upgrades
  - Promote ENERGY STAR Tenant Star program as new rating system for tenant spaces
  - Provide education and resources on Green Leasing / Energy-aligned Leasing, which aligns incentives of owners and tenants for building upgrades.
  - Recent study found green leases could cut commercial energy use by 11% to 22%.

- **C-PACE (Property-Assessed Clean Energy)**
  - Alexandria already exploring introduction of C-PACE
  - Will need dedicated staff resources, strong partnerships with private sector, and outreach to entities needing off-balance-sheet credit, such as affordable housing.
Items Alexandria could advocate for with Virginia General Assembly, working with other jurisdictions:

• Enabling local jurisdictions to require owners of large private buildings to annually benchmark and report their energy and water performance, and authorizing public disclosure.

• Enable local jurisdictions to require energy performance disclosure by home sellers to home buyers.

• Allow owners of large portfolios to install and interconnect solar systems on buildings that exceed 105% of the building’s annual electricity demand, to serve other buildings in their portfolio.

• Make it easier of large users to purchase renewable energy directly from third parties via Power Purchase Agreements.

• Continue to adopt the most recent model energy codes, without weakening amendments.
Strategy E: Incentives

• **Structural Incentive**: Floor area exclusions for passive design elements
  - Exclude passive design elements, such as thicker walls or rain screens, from calculation of Floor Area Ratio
  - Promotes buildings with better insulation (instead of all-glass)

• **Structural Incentive**: Density and/or Height bonus
  - Important to not conflict with city’s existing bonuses for affordable housing
  - Green density bonuses best when the stack on affordability bonuses
  - Can be useful for non-residential buildings and/or in areas of the city with greater potential for additional density, such as Potomac Yards
  - A Green Zone could be used to structure such a bonus
  - Recommend District Energy Analysis also be required for large projects

• **Tax Incentives**
  - Tax incentives important especially for smaller developments
  - Tax incentive are best when carefully targeted to promote achievement well above requirements, such as NZE buildings and deep green building.
Discussion

Bill Updike
Principal
Integral Group
bupdike@integralgroup.com
(202) 558-5355
GREEN BUILDING STRATEGIES COST ANALYSIS

City of Alexandria
Jan. 30th, 2019
PROJECT OBJECTIVES

- Provide analysis to support the Green Building Policy Task Force policy recommendations
- Estimate costs of green building strategies (certifications, energy, water, and stormwater) from the perspective of developers and the City
- Build on existing pro forma analysis to assess financial impacts on new construction
- Evaluate potential use of incentives
AGENDA

1. Green building costs for new construction
2. Managing green building costs
3. Green building costs for the City and potential incentives
4. The Green Building Cost Matrix
5. Questions and next steps
GREEN BUILDING COST ANALYSIS SCOPE

1. Certifications
2. Individual and integrated strategies
3. Wide range of building types
4. Cost ranges and trade-offs
# GREEN BUILDING COST ANALYSIS SCOPE

<table>
<thead>
<tr>
<th>CERTIFICATIONS</th>
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<tbody>
<tr>
<td>LEED v4 Certified</td>
</tr>
<tr>
<td>LEED v4 Silver</td>
</tr>
<tr>
<td>LEED v4 Gold</td>
</tr>
<tr>
<td>LEED v4 Platinum</td>
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<tr>
<td>Net Zero Energy</td>
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# GREEN BUILDING COST MATRIX ASSUMPTIONS

## Green Building Cost Analysis

### Summary

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<thead>
<tr>
<th>Certifications</th>
<th>CPF</th>
<th>New PRI</th>
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<tbody>
<tr>
<td>LEED v4 Certified</td>
<td>$209,000</td>
<td>$104,000</td>
</tr>
<tr>
<td>LEED v4 Silver</td>
<td>$104,000</td>
<td>$1,164,000</td>
</tr>
<tr>
<td>LEED v4 Gold</td>
<td>$313,600</td>
<td>$1,046,000</td>
</tr>
<tr>
<td>Net Zero Energy</td>
<td>$493,000</td>
<td>$1,672,000</td>
</tr>
</tbody>
</table>

### Energy/NGO

<table>
<thead>
<tr>
<th>Certification</th>
<th>CPF</th>
<th>New PRI</th>
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<tbody>
<tr>
<td>Total</td>
<td>$950,299</td>
<td>$3,217,521</td>
</tr>
<tr>
<td>Total</td>
<td>$300,000</td>
<td>$900,000</td>
</tr>
</tbody>
</table>

### Water

<table>
<thead>
<tr>
<th>Certification</th>
<th>CPF</th>
<th>New PRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$190,000</td>
<td>$640,000</td>
</tr>
<tr>
<td>Total</td>
<td>$114,633</td>
<td>$340,000</td>
</tr>
</tbody>
</table>

### Stormwater

<table>
<thead>
<tr>
<th>Certification</th>
<th>CPF</th>
<th>New PRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>$912,184</td>
<td>$1,291,996</td>
</tr>
<tr>
<td>Total</td>
<td>$200,957</td>
<td>$522</td>
</tr>
</tbody>
</table>

---

**Note:** The table above provides a summary of the costs associated with various green building certifications. The values are presented in CPF and New PRI, with assumptions for low, medium, and high costs. Each certification category includes specific subcategories with their respective costs.
# GREEN BUILDING COST MATRIX ASSUMPTIONS

<table>
<thead>
<tr>
<th>ENERGY / GSG</th>
<th>TOTAL</th>
<th>$560,239</th>
<th>$3,217,321</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved Building Envelope</td>
<td>$0</td>
<td>$360,000</td>
<td></td>
</tr>
<tr>
<td>Efficient Building Systems</td>
<td>$150,000</td>
<td>$861,244</td>
<td></td>
</tr>
<tr>
<td>Integrated Building Controls</td>
<td>$75,000</td>
<td>$240,000</td>
<td></td>
</tr>
<tr>
<td><strong>Commissioning (Fund. + Enhanced)</strong></td>
<td><strong>$30,000</strong></td>
<td><strong>$90,000</strong></td>
<td></td>
</tr>
<tr>
<td>Ongoing Performance / M&amp;V</td>
<td>$50,239</td>
<td>$114,833</td>
<td></td>
</tr>
<tr>
<td>Energy Intensity Targets (EUI)</td>
<td>$255,000</td>
<td>$1,551,244</td>
<td></td>
</tr>
</tbody>
</table>
## GREEN BUILDING COST MATRIX ASSUMPTIONS

<table>
<thead>
<tr>
<th>Green Building Cost Analysis</th>
<th>City of Alexandria</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>ENERGY / GSG</strong></th>
<th><strong>Savings</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Improved Building Envelope</strong></td>
<td>ASHRAE 90.1 2010 energy code baseline w/ 60% WTW ratio</td>
</tr>
<tr>
<td></td>
<td>$0</td>
</tr>
<tr>
<td><strong>Efficient Building Systems</strong></td>
<td>ASHRAE 90.1 2010 energy code baseline for Water-cooled CX w/ VAV's</td>
</tr>
<tr>
<td></td>
<td>$104,600</td>
</tr>
<tr>
<td><strong>Integrated Building Controls</strong></td>
<td>Standard BMS and controls. Very limited submetering for lighting and HVAC.</td>
</tr>
<tr>
<td></td>
<td>$52,260</td>
</tr>
<tr>
<td><strong>Commissioning</strong></td>
<td>LEED 2009 Fundamental Commissioning</td>
</tr>
<tr>
<td></td>
<td>$20,960</td>
</tr>
<tr>
<td><strong>Ongoing Performance / M&amp;E</strong></td>
<td>LEED 2009 Measurement &amp; Verification Plan developed but not implemented.</td>
</tr>
<tr>
<td></td>
<td>$35,000</td>
</tr>
<tr>
<td><strong>EUI Target - 30% reduction</strong></td>
<td>See baseline assumptions above. *</td>
</tr>
<tr>
<td></td>
<td>$177,650</td>
</tr>
<tr>
<td><strong>EUI Target - 38 kBtu / SF / Yr.</strong></td>
<td>See baseline assumptions above. *</td>
</tr>
<tr>
<td></td>
<td>$313,600</td>
</tr>
</tbody>
</table>
GREEN BUILDING COSTS FOR NEW CONSTRUCTION

- Our team’s research resulted in the likely range of increased development costs by certification level

<table>
<thead>
<tr>
<th></th>
<th>Gold</th>
<th>Office</th>
<th>Platinum</th>
<th>Net Zero</th>
<th>Gold</th>
<th>Office</th>
<th>Platinum</th>
<th>Net Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>0.5%</td>
<td>2.0%</td>
<td>5.0%</td>
<td>8.0%</td>
<td>2.4%</td>
<td>1.4%</td>
<td>6.0%</td>
<td>9.6%</td>
</tr>
<tr>
<td>Platinum</td>
<td>1.3%</td>
<td>3.3%</td>
<td></td>
<td>3.0%</td>
<td>0.4%</td>
<td>1.2%</td>
<td></td>
<td>-1.6%</td>
</tr>
<tr>
<td>Net Zero</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

City of Alexandria
GREEN BUILDING COST RANGES

- What makes the difference?
  - Context dependent
    - Geographic, project specific, logistical, building codes, market forces
  - Not context dependent
    - Integrating the building design and systems
    - Right-sizing systems and the design
    - Green building as a program issue, not an added requirement
BEST PRACTICE: INTEGRATED GREEN BUILDING STRATEGY

1. Integrated team

- Early goal-setting and decision-making
- Maximize collaboration
- Avoid costly last minute additions
BEST PRACTICE: SHIFT THE MINDSET FROM BURDEN TO BENEFIT

2. Green building is a program issue... ...not an added requirement

- Treat sustainability as an investment to be maximized not a cost to be minimized

- Focus on building performance outcomes and increases project value to owner, users, operators

- Set qualitative or quantitative goals included in the building program accounts for emissions, energy, water, waste, occupant health, etc.
THREE EXAMPLES: HARD COSTS

- We applied these findings to three case study developments in Alexandria to test development financial sensitivity
- Development cost increases ranged from $3.00-$4.00/SF for LEED v4 Gold and $8.00-$10.00/SF for Platinum

<table>
<thead>
<tr>
<th>Project</th>
<th>Square Feet</th>
<th>Gold</th>
<th>Platinum</th>
<th>Net Zero</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1: Office w/GF retail</td>
<td>100,000</td>
<td>$391K</td>
<td>$992K</td>
<td>-$600K - $2.4M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$3.83/SF</td>
<td>$9.72/SF</td>
<td>-$5.89/SF - $24/SF</td>
</tr>
<tr>
<td>Type 2: Multifamily w/GF retail</td>
<td>300,000</td>
<td>$1.2M</td>
<td>$3.1M</td>
<td>-$1.4M – $8.2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$3.91/SF</td>
<td>$10.06/SF</td>
<td>-$4.47/SF - $27/SF</td>
</tr>
<tr>
<td>Type 3: For-Sale Attached Residential</td>
<td>120,000</td>
<td>$356K</td>
<td>$923M</td>
<td>-$210K – $2.7M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$3.02/SF</td>
<td>$7.82/SF</td>
<td>-$1.78/SF - $23/SF</td>
</tr>
</tbody>
</table>
THREE EXAMPLES: FINANCIAL RETURN

- Applicable profitability metrics include
  - internal rate of return (IRR) - all three projects
  - Yield on cost (YOC) – rental income profiles
  - Return on investment (ROI) – projects w/sales revenue

<table>
<thead>
<tr>
<th>Project</th>
<th>Base Case IRR</th>
<th>Gold IRR</th>
<th>Platinum IRR</th>
<th>Net Zero IRR</th>
<th>Base Case YOC</th>
<th>Gold YOC</th>
<th>Platinum YOC</th>
<th>Net Zero YOC</th>
<th>Base Case ROI</th>
<th>Gold ROI</th>
<th>Platinum ROI</th>
<th>Net Zero ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>10.7%</td>
<td>10.5%</td>
<td>10.2%</td>
<td>9.6 – 10.9%</td>
<td>7.9%</td>
<td>7.8%</td>
<td>7.7%</td>
<td>7.4 - 8.0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Type 2</td>
<td>8.2%</td>
<td>8.2%</td>
<td>8.0%</td>
<td>7.3 - 8.5%</td>
<td>5.9%</td>
<td>5.9%</td>
<td>5.8%</td>
<td>5.6 - 6.0%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Type 3</td>
<td>5.0%</td>
<td>4.7%</td>
<td>3.7%</td>
<td>0.6 – 5.9%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>8.2%</td>
<td>7.8%</td>
<td>6.1%</td>
</tr>
</tbody>
</table>
FINDINGS AND RECOMMENDATIONS: NEW CONSTRUCTION

FINDING

Experienced, integrated project teams more likely to achieve the lower costs

Updating to LEED v4 will likely have minimal cost impact for new development projects

RECOMMENDATION

The City can support the integrative design process through incentives and technical support

The City updates to LEED v4 and considers increasing certification level for most project types
The incremental costs for public buildings is similar to private developments.

A preliminary review of the 10-year Capital Improvement Program (CIP) suggests an additional $25-$40M from increased green building requirements.
FINDINGS AND RECOMMENDATIONS

The City’s increased public building costs could range from $25 to $40M over the next 10 years, depending on the level of green building certification.

Further refine this estimate with City staff and evaluate financial impacts on 10-year CIP, including debt capacity, bonding ratio, and prior capital commitments.
Density bonuses are the most commonly offered green building incentive at the local government level.

Density bonuses are classified as structural incentives, which require minimal direct cost to the City, as opposed to financial incentives such as tax credits.

Density bonuses are very attractive to developers, but a green building bonus must be structured in a way that does not force a decision between it and the City’s existing affordable housing bonus program.
FINDINGS AND RECOMMENDATIONS

The City’s increased public building costs could range from $25 to $40M over the next 10 years, depending on the level of green building certification.

There is broad appeal for density bonus incentive mechanisms from developers and municipalities alike.

Further refine this estimate with City staff and evaluate financial impacts on 10-year CIP, including debt capacity, bonding ratio, and prior capital commitments.

Consider implementing a green building density bonus structured to ensure that it complements the affordable housing program, rather than competing with it.
Thank you!

Questions?

wsp.com
Task Force Discussion – Integral Group Recommendations

Strategy:

**Strategy A (A+D Combined):**
Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

**Strategy B:**
Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

**Strategy C (Partial E):**
Introduce voluntary green building practices for small buildings not subject to review.

**Strategy D (Partial E):**
Introduce voluntary green building practices for existing buildings (including historic).

**Strategy E (Former C):**
Establish incentives for private development participation in green building certifications.

Recommendations to Consider:

- All private development (residential and non-residential) achieve LEED Silver certification as a minimum with energy and water performance targets that equate to specific LEED credits.
- No additional requirements over and above the City’s current standards for stormwater (updated April 2018).
- All new public development projects, including schools, be certified at the LEED Gold level, as well as be designed to achieve net zero energy (NZE), water, and stormwater performance targets.
- Home Rating and Labeling Programs, and Education and Capacity Building for small buildings not subject to site plan review.
- Establishing challenge and benchmarking programs, educational programs, and green leases as voluntary green building practices for existing buildings, including historic.
- Incentives such as FAR exclusions, tax reductions, and/or density/height bonuses in designated areas of the City “stacked” with affordable housing bonuses.
Task Force Discussion – WSP Cost Analysis

Strategy:

Strategy A (A+D Combined):
Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

Strategy B:
Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

Strategy C:
Establish incentives for private development participation in green building certifications.

Strategy E:
Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.

Summary WSP Analysis:

- Costs associated with increasing certification standards can range from -2% to +13% with many of the variables that impact first costs can be managed by an experienced, integrated project team.
- Water efficiency strategies have the lowest up-front costs to implement but have the lowest operational cost savings.
- Energy upgrades and ongoing performance verification of energy systems have the highest up-front costs but have the largest operational savings.
- An increased standard for public buildings has the potential to increase City capital costs by $25-$40 million over the next ten years.
- Incremental cost increases for new private development are nearly equivalent to that of new public development for levels of green building certification greater than or equal to LEED Gold with NZE performance targets.
- A green building density bonus is an effective mechanism for private development but has the potential to impact existing affordable housing density program unless the combine to meet the parcel’s maximum FAR.
- Smaller scale incentives such as tax credits or fee reductions/waivers are most effective in gaining participation in voluntary green building practices.
Green Building Education Event

Topic:  Building Green

Program Focus:  Provide builders, developers, and property owners with examples of building green for residential properties, public facilities, and private large-scale developments.

Date and Time:  February 28 from 6:30 to 8:30 p.m.

Location:  Alexandria Renew Enterprises, 1800 Limerick Street (LEED Platinum)
Public Comments
Green Building Policy Update

Next Steps

- **Task Force Meeting #1**
  November 14, 2018
  Establish and prioritize topics for consultants’ studies

- **Task Force Meeting #2**
  January 30, 2019
  Review consultants’ analyses and recommendations

- **Task Force Meeting #3**
  March 13, 2019
  Review staff outline for Green Building Policy Report

- **Education Event**
  February 2019

- **Task Force Meeting #4**
  April 24, 2019
  Review final staff draft of Green Building Policy

- **Planning Commission**
  June 4, 2019

- **City Council**
  June 15, 2019

- Consultants prepare preliminary analyses and recommendations
- Consultants prepare final reports
- Staff drafts GB Policy Update
- Public review period
- Staff finalizes GB Policy Update based on task force and public input
- PC Recommendation CC Approval
Five Priority Green Building Strategies

Task Force Meeting #1:

**Strategy A:** Increase LEED or equivalent third-party green building certification standards for private development.

**Strategy B:** Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

**Strategy C:** Establish incentives for private development participation in green building certifications.

**Strategy D:** Prioritizing specific green building elements in private development projects.

**Strategy E:** Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.

Integral Group (Recommendations):

**Strategy A (A+D Combined):** Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

**Strategy B:** Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

**Strategy C (Partial E):** Introduce voluntary green building practices for small buildings not subject to review.

**Strategy D (Partial E):** Introduce voluntary green building practices for existing buildings (including historic).

**Strategy E (Former C):** Establish incentives for private development participation in green building certifications.

WSP (Cost Analysis):

**Strategy A (A+D Combined):** Increase LEED or equivalent third-party green building certification standards for private development and prioritize specific green building elements in private development.

**Strategy B:** Establish a separate green building standard for new public development, at a level more ambitious than required for private development and evaluating the feasibility of a net zero standard for new public development, including schools.

**Strategy C:** Establish incentives for private development participation in green building certifications.

**Strategy E:** Introducing mandatory and/or voluntary green building practices for existing buildings (including historic) and for small buildings not subject to site plan review.
Appendix: Applicable profitability metrics vary by project-specific revenue profile

- Project type (for-sale vs. lease) results in very different cash flows

- Project list includes diverse mix of revenue profiles:
  - Lease revenue (office, retail, apartments)
  - Sales revenue (for-sale residential – condominiums and townhomes)
  - Blended revenue (for-sale residential w/retail)

- Certain profitability metrics are more/less applicable depending on the revenue profile
Appendix: definition of selected profitability metrics

- **Yield on cost (YOC)**
  - AKA return on cost (ROC)
  - AKA rate of return (ROR) on total capital
  - Straightforward metric for projects generating *lease revenue only*
  - YOC = stabilized net operating income (NOI) divided by total project costs (YOC = NOI / Total Cost)
  - Developers typically seek YOC ~200bp higher than current cap rates

- **Internal rate of return (IRR)**
  - Measures % return of total cash flows over time (upfront capital investment and ongoing net revenue from sales and/or leases)
  - Target IRR contingent upon various factors including perceived project risk, land use, debt structure (unleveraged vs. leveraged IRR), etc.
  - Unleveraged IRR calculated for each project
    - eliminates speculative debt structure assumptions
    - but does require disposition assumptions for lease revenue projects (e.g. sale year, sale price/cap rate, etc.)
    - Leveraged IRR higher than unleveraged

- **Return on investment (ROI)**
  - best/simplest for for-sale projects, but only one project had revenue exclusively from sales
  - ROI equals total project revenue divided by total development costs (or investment) (ROI = total revenue / total cost)
## Appendix: Pro forma quantitative data inputs gathered and analyzed in previous work

<table>
<thead>
<tr>
<th>Category</th>
<th>Data Inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Revenue assumptions</strong></td>
<td>- <strong>Rental properties</strong>: submarket-level lease trends and property-specific lease data from CoStar to estimate project-specific annual gross revenue</td>
</tr>
<tr>
<td></td>
<td>- <strong>For-sale properties</strong>: Publicly available transaction or list price data for for-sale residential</td>
</tr>
<tr>
<td><strong>Construction costs</strong></td>
<td>- 2018 RSMeans Square Foot Costs – industry standard resource for all commercial and residential formats with ability to tailor by location, scale, finish levels, and several other criteria</td>
</tr>
<tr>
<td><strong>Operating costs</strong></td>
<td>- Operating costs by land use / format (not including for-sale residential):</td>
</tr>
<tr>
<td></td>
<td>- <strong>Apartments</strong>: National Association of Apartment (NAA) 2017 Income &amp; Expense Survey for properties in DC region</td>
</tr>
<tr>
<td></td>
<td>- <strong>Commercial</strong>: Building Owners and Managers Association (BOMA) 2017 Experience Exchange Report (EER) for DC region properties</td>
</tr>
<tr>
<td><strong>Land acquisition costs</strong></td>
<td>- Actual transaction data from Alexandria assessor’s office</td>
</tr>
</tbody>
</table>
Research on typical operating costs shows that the lifecycle cost benefits of green building differ by land use.

Utility costs (energy / water) are higher for commercial vs. multifamily uses (where costs are typically passed on to tenants).

APPENDIX: OPERATING COSTS

Share of Commercial Operating Costs by Category, Northern Virginia, 2017

Share of Apartment Operating Costs by Category, Washington, DC Region, 2017

Source: BOMA

Source: National Apartment Association
PROJECT OVERVIEW

Green Building Cost Analysis

Pro forma analysis

Preliminary Cost Analysis

Final Cost Analysis

Response to Review

Final Report

12-18: Preliminary Report Draft 1
1-16-19: Preliminary Report Draft 2
1-30-19 Presentation of Findings
TASK FORCE BACKGROUND

– In 2009, Green Building Policy

– FY2019 update to the Green Building Policy

– Task Force to provide guidance to staff

– The Department of Planning and Zoning requested cost analysis to evaluate implementation cost of each strategy
METHODOLOGY:
GREEN BUILDING STRATEGY

- New Private Development
  - Office (OFF)
  - Multifamily (MF)
  - Small Buildings (SML)

- Existing Private Development
  - Commercial (COM)
  - Multifamily (MF)
  - Single-family residential (SF)

- New Public Buildings
  - Schools (SCH)
  - Fire/Police (FIRE)

- Existing Public Buildings
  - Schools (SCH)
  - Fire/Police (FIRE)
# METHODOLOGY: GREEN BUILDING STRATEGY

## CERTIFICATIONS
- LEED v4 Certified
- LEED v4 Silver
- LEED v4 Gold
- LEED v4 Platinum
- Net-Zero Energy

## ENERGY/GHG
- Improved Building Envelope
- Efficient Building Systems
- Integrated Building Controls
- Commissioning (Fundamental & Enhanced)
- Ongoing Performance/M&V
- Energy Use Intensity (EUI)

## WATER
- Outdoor Water Savings
- Indoor Water Savings
- Process Water Savings
- Commissioning
- Ongoing Performance / M&V
- Water Metering & Performance
- Water Use Intensity (WUI)

## STORMWATER
- Green Infrastructure (ground)
- Green Infrastructure (roof)
- Rainwater Collection