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GREEN BUILDING RETROFITS IN A CORPORATE SETTING

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GREEN BUILDING RETROFITS IN A CORPORATE SETTING

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MAY 2016

A MASTER'S CAPSTONE

Submitted to the faculty of Clark University, Worcester, Massachusetts, in partial fulfillment of the requirements of the degree of Masters of Science in Environmental Science and Policy in the Department of International Development, Community, and Environment and in partial fulfillment of the requirements of the degree of Masters of Business Administration in Finance from the Graduate School of Management.

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ABSTRACT

GREEN BUILDING RETROFITS IN A CORPORATE SETTING

EDWARD MICHAEL SNOOK, JR.

Buildings influence human consumption levels and lifestyles, require resources for creation and operation, and occupy physical space in the environment. This study examines if energy efficient buildings provide sufficient benefits to overcome costs in a certified green building project and the ways that tenants and owners can work together to accomplish retrofit projects and LEED certification in existing buildings. The results of the LEED feasibility analysis demonstrated that the office building studied could achieve Silver or Gold certification with little or no infrastructure and process change cost. Additionally, benefits exist for both the building's owner and tenant, and costs can be divided through lease negotiation. Nevertheless, some common barriers to retrofitting and LEED certifying existing buildings, such as organizational support, financial benefits, costs, and collaboration, could impair potential completion.

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DEDICATION

To my family and Kate

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1.Introduction¹

Over the past century, humanity's impact on the earth has intensified. According to Goudie (2013), human population has increased from about 1.5 to over 7 billion; the world's economy has increased over 15-times. Global energy consumption has increased about 14-fold, while freshwater consumption and irrigated land has increased by 9-fold and 5-fold, respectively. Humans continue to manipulate the environment in a various ways, resulting in a human-dominated planet (Rockström et al., 2009, Steffen et al., 2011). Additionally, local impacts have become global problems. For example, industrially produced substances, such as DDT, lead, and sulfates, can be found far away in Antarctica (Rusiecki et al., 2008). Rapidly expanding populations and increases in per capita consumption have compounded environmental impacts (Myers and Kent, 2003). Finally, humans now play a major role in global biogeochemical cycles, such as the carbon and nitrogen cycle (Goudie, 2013).

For the last 10,000 years, buildings have been a necessity for human survival and life. Adverse climate conditions have forced humans inside (Goudie, 2013). These buildings influence human consumption levels and lifestyles, require resources for creation and operation, and occupy physical space in the environment. Currently, UNEP (2015) estimates that buildings use about 40% of global energy, 25% of global water, 40% of global resources, and emit approximately 33% of GHG emissions. Additionally, building construction accounts for about 40% of total material consumption, such as iron, aluminum, copper, clay, sand, gravel, limestone, and wood, and produces 40% of US's

¹ Names and identifiers have been altered or removed for confidentiality.

nonindustrial waste (Herczeg et al., 2014, USGBC, 2008). Additionally, building retrofit projects consume natural resources and energy, as well as produce noise and pollutants (Zuo and Zhao, 2014).

As the 20th century came to a close, buildings became a key focus of the environmental movement (Hoffman and Henn, 2008). In the US, LEED certification is a measure of a buildings sustainability and impact on the environment. A certified green building (CGB)² uses fewer resources and has a lower impact. Green buildings are an attempt to alleviate some of these problems by employing practices such as sustainably sourced materials and recycling (Barnett and Browning, 1995, Johnson, 2005).

Additionally, green buildings help to improve local biodiversity through the protection of local ecosystems and sustainable land use (Western North Carolina Green Building Council, n.d.). Compared to conventional buildings, green buildings are generally more efficient in terms of energy and water consumption and waste production (Zuo and Zhao, 2014).

In 2011, almost 50% of all new nonresidential construction projects were CGBs. However, in 2010, only 25-33% of all LEED projects were retrofit projects (McGraw-Hill Construction, 2011). New construction of CGBs is not only simpler than retrofitting, but is also more easily accomplished through government regulation, building codes, low-carbon technology, and cheaper green building components. Thus, retrofitting, a more efficient

² Certification-based building rating systems aiming to reduce resource consumption and environmental degradation, such as ENERGY STAR, The Home Energy Rating System (HERS) Building Research Establishment's Environmental Assessment Method (BREEAM), LEED, ect.

use of resources lags behind new construction CGBs. This lag may be due to some common barriers to retrofitting and LEED certification in existing buildings, such as organizational support, financial benefits, costs, collaboration, and split incentives between building owners and tenants.

1.a Objectives

Given the situation described above, this paper seeks to examine how a financial and nonfinancial case could be made for obtaining LEED certification for an existing large, commercial building already with a high level of energy performance. The specific questions examined are:

1. Can an energy efficient building provide sufficient benefits to offset costs in a CGB?
2. How can tenants and owners work together to accomplish retrofit projects and LEED certification in existing buildings?

This paper employs a case study and participatory research approach. This paper is based on a LEED feasibility study performed in a corporate setting as well as an assessment of owner-tenant split incentives in undertaking an existing building retrofit project. The data for this case was collected during the author's time at PS (Process Solutions, Inc.) through

conversations with facility personnel and investigations of the current building and company practices.

This paper is structured as follows. The background section incorporates insights from relevant literature to describe benefits of a CGB to the owner and tenant and the barriers to CGB certification. The results of this study will lay out some ways to solve the split incentives issues and address the costs associated with retrofitting and certifying the building as a CGB. These findings are based on research performed at the author's internship and experiences in the author's investigation of LEED building certification. This paper will also discuss the costs and barriers of the project. Finally, this study outlines recommendations aimed to resolve the split incentive issues and to complete the certification process for this corporation.

2. Background

Corporations and businesses (as both tenants and owners) have large real estate footprints and portfolios. The 2012 Commercial Buildings Energy Consumption Survey estimated that there are about 5.6 million commercial buildings (87 billion ft² of floor space) in the US, which represents a 14% increase in the number of buildings (21% increase in floor space) since 2003 (EIA, 2012).

CGBs provide corporations with an important avenue to reduce organizational impacts throughout their significant real estate holdings. These buildings also provide a number of benefits to both owners and tenants. However, currently, a small number of CGBs are present in the US. Currently, CGBs account for less than 1% of the total US commercial building stock (USGBC, 2013). The lack of adoption nationwide may be due to a number of factors inside of these organizations and businesses that utilize the commercial building stock; some factors are drivers of CGB adoption while others are barriers. Some factors serve as a driver and a barrier depending on the specific conditions of an organization. The factors can be separated into eight categories: executive and organizational support, financial benefits, other benefits, CGB education/knowledge, costs, collaboration, and incentives. These factors have been derived from a number of studies across various sectors, institutions, and organizations (Melaver and Mueller, 2008, Yudelson, 2012, Zuo and Zhao, 2014, Häkkinen and Belloni, 2011, Johnson, 2005).

2.a. Executive and Organizational Support

Executive support is critical in driving the successful completion of a CGB project, such as a retrofit project (Melaver and Mueller, 2008). Top executives establish the vision of an organization and drive the organization towards its goals. Because organizations have limited resources, only a finite number of projects can be chosen that will help the company achieve success (Johnson, 2005). If environmental stewardship or sustainability is one of the organization's goals, then CGB projects could be a mode for achieving that goal. However, if such is not the case, other projects may take precedence over CGB projects. A study by Deloitte discusses how corporate environmental commitment is an important driver of CGB projects (Deloitte, 2007). Moreover, that commitment can lead to patterns of thought and action that perpetuate that commitment (Brint and Karabel, 1991, DiMaggio and Powell, 1991, Hoffman and Henn, 2008). On the other hand, Richardson and Lynes identify a lack of internal leadership and sustainability targets as key barriers to successful green building projects (2007).

2.b. Financial Benefits

CGBs provide financial benefits for organizations that decide to undertake them. CGBs achieve superior energy performance and reduce operational costs through energy, water, and waste efficiency; these savings serve as a financial benefit and incentive for organizations to undertake CGB projects and can create a competitive advantage through

reduced costs (Johnson, 2005, Deloitte, 2007, Yudelson, 2012). Nevertheless, capital investment, payback and certainty vary across project and situation.

2.c. Other Benefits

CGBs can also provide other non-financial benefits that can serve as key drivers for CGB projects. These non-financial benefits include increased indoor air and environmental quality, higher workforce productivity, as well as attraction and retention of quality human resources (Deloitte, 2007, Yudelson, 2012).

2.d. CGB Education and Understanding

Misconceptions and lack of knowledge about green buildings and the certification process can mitigate CGB projects. A study by Johnson found that lack of experience with LEED certification and lack of project team knowledge are barriers to CGB projects (2005). Zuo and Zhao goes a step further, claiming that specific skills sets are required for managing green building projects (2014). Other studies discovered that terminology can hinder communication and can potentially lead to incomplete and unapproved projects (Hoffman and Henn, 2008, Häkkinen and Belloni, 2011). Therefore, education and existing expertise are imperative for the success of these projects.

2.e. Costs

As previously mentioned, resource and capital limitations can restrict an organization's ability to overcome the costs associated with investing in CGBs (Hoffman and Henn, 2008, Häkkinen and Belloni, 2011). Hakkinen and Belloni's research shows that the fear of unforeseen costs is one of the most common barriers to undertaking CGB projects (2011). In a study of LEED certificated projects, Johnson identifies the cost of documentation, registration, and certification as well as the costs of managing and employing green building practices as major barriers to completion (2005). Green building practices can cause changes in procumbent practices, which may result in increased operational cost. While these aforementioned costs should be considered in a feasibility analysis, they can be difficult to quantify and their unpredictable nature can deem the project too risky.

2.f. Collaboration

CGB projects involve multiple stakeholders. For organizations, this may include multiple internal teams, such as real estate, corporate social responsibility, facilities, and finance as well as external influencers, like property managers and vendors. Communication and collaboration are imperative for the success of these projects. Johnson points out that a lack of communication prevents dissemination of know-how and relevant knowledge. Communication deficiencies can also impede the collection of necessary documents by the project team and can delay the completion of the certification process

(2005). Hakkinen and Belloni emphasize the importance of collaboration; based on their research, budgeting time for collaboration is crucial before beginning a CGB project (2011). The models of cooperation and communication, the roles of different actors, the decision-making and management processes, and the scheduling of tasks should all be considered prior to beginning a CGB project. If these things are not taken into account, collaboration problems could transform from a driver to a barrier (Häkkinen and Belloni, 2011). According to Menassa and Baer, because sustainable retrofit projects involve complex processes that are typically unfamiliar to stakeholders, a concise decision-making framework is necessary to align and properly communicate with the stakeholders (2014; Klotz and Horman, 2009). Hoffman and Henn assert that organizational structure, which defines the organization's boundaries, rules of interaction, and division of responsibilities, determines the patterns through which information is passed between business units (2008). CGB projects rearrange these roles, relationships, and responsibility into a form that is outside the standard operating procedure (Hoffman and Henn, 2008). Without accounting for these changes, projects will not be successful. Finally, Richardson and Lynes found that communication between stakeholders, in this case, professional designers, facilities management, and faculty, was a key ingredient for successful green building projects at an educational institution (2007). While not the same as a corporation, this study illustrates the importance of communication and collaboration.

2.g. Incentives

Under most net leases, operating costs are paid directly by tenants. Thus, building owners are not motivated to invest in building efficiency and CGB projects. This split incentive could be considered a subset of the collaboration factor. This factor and solutions are explored later in this paper.

2.h. Benefits of LEED Certified Building to Owners of a Commercial Building

LEED-certified buildings help differentiate an owner's real estate from other buildings. They have lower operating costs and higher indoor environmental quality, making them more attractive to a growing group of corporate, public, and individual buyers and tenants. A survey by McGraw Hill Construction (MHC) found that 61% of corporate leaders believe that sustainability leads to market differentiation and improved financial performance (McGraw-Hill Construction, 2011).

Similarly, tenants want to differentiate their companies and their brands through LEED spaces, so these buildings are desirable to tenants. A study from the University of San Diego's Center for Real Estate illustrates that new green buildings typically have quicker lease-up rates, the time period for a newly available property to attract tenants and reach stabilized occupancy (Evans and Evans, 2007, Miller et al., 2008). Additionally, studies have found that LEED-certified buildings have up to 18% higher occupancy rates compared to comparable non-LEED buildings (Wiley et al., 2010). LEED-certified buildings prove to be positive investments for owners. MHC's Green Outlook reports that

green building projects have a 19.2% higher ROI compared to regular building projects (2011). Moreover, existing green building operating costs is 8.5% less than regular buildings, and existing green building value is 6.8% higher than regular buildings (McGraw-Hill Construction, 2011). Additional research uncovered even more robust results; a study of LEED-certified buildings revealed that sale prices for LEED-certified buildings was up to 10% higher than comparable buildings, and another study found a sale price premium of 35% for LEED-certified office buildings, like this site (Miller et al., 2008, Fuerst and McAllister, 2009, Janda et al., 2016).

In addition to higher resale value, rental rates, and occupancy rates, the USGBC states that certification can provide a measure of protection against future legal action through third-party verification of enhanced indoor air quality, beyond required code minimums (USGBC, 2015a). Regulatory risks are also emerging in countries and cities around the world. For example, the UK government is committed to introducing Minimum Energy Performance Standards for existing buildings, making the most energy inefficient buildings unable to be leased by 2018 (World Green Building Council, 2013). Regulatory risk is by no means confined to Europe, and some US cities, such as New York and San Francisco, have mandated the public disclosure of energy use data for certain buildings, with the intention of encouraging occupants to incorporate this information into their leasing and investment decision-making (World Green Building Council, 2013, Janda et al., 2016). With an increasing consensus that governments will implement regulations targeting sustainability factors more aggressively in the future, CGBs will play an important role in mitigating these risks (World Green Building Council, 2013).

2.i. Benefits of LEED Certified Building to Tenant of a Commercial Building

According to the EPA, people in the U.S. spend about 90% of their time indoors. Levels of indoor pollutants, such as cleaning chemicals and radon, can be between 2 to 5 times (and occasionally up to 100 times) higher than outdoor pollutants (EPA, 2013). LEED-certified buildings are designed to have healthier and cleaner indoor environments, which results in healthier occupants. Researchers have identified a link between lighting design and headache incidences, finding that improved lighting design can lead to a reduction in the number of employee headaches (Helland et al., 2008). In one case, this reduction accounted for an approximately \$70 reduction in each employee's annual health insurance costs (Geisel, 2011). For a company like PS with about 12,000 employees, this reduction could mean significant savings on annual health insurance costs. Researchers have also found that improved indoor environmental quality factors (i.e. humidity, temperature, ventilation, lighting, acoustics, ergonomics, and carbon dioxide concentrations) have led to reductions in employee absences due to asthma, respiratory allergies, depression, and stress (Erdmann et al., 2002). This study also found that the reduction in these afflictions improves worker productivity (Erdmann et al., 2002). Improved worker productivity leads to increases in a company's overall efficiency and effectiveness. While somewhat intangible, productivity increases certainly have a positive effect on businesses.

In addition to improved productivity and lower health insurance costs, LEED-certified buildings can also save tenants energy and water utility costs as well as waste disposal costs, depending on the lease terms. Saving on energy and other operational costs can allow capital to be used in other areas of the business and for more productive endeavors. On an organization-wide level, reducing operational expenses will increase profits. This result can have important implications for a company's stock, such as attracting investors, increasing valuation, and satisfying shareholders.

Many businesses also play a significant role in the communities in which they reside. LEED-certified buildings strive to have the least negative impact on surrounding communities through decreased air and water pollution, reduced water use, and local wildlife habitat protection. LEED-certified buildings provide a healthy and safe place for community members to work. Being a good community member and corporate citizen can improve public relations. Not only do tenants in LEED-certified buildings reap improved publicity, but LEED-certified buildings indicate the tenant's commitment to sustainability which can attract and retain customers and employees (USGBC, 2015a). Companies can leverage their certification to demonstrate their CSR commitments and improve their public image.

3. Methods

During the summer of 2015, the author worked for a multinational, public information technology solutions company, Process Solutions, Inc. (PS). PS has an emissions target of a 35% reduction in carbon dioxide equivalents by 2020 with a 2006 base year and was close to reaching its reduction target in 2015³. Working at a site in Massachusetts, the author analyzed PS's Framingham office building's ability to meet the LEED v4 certification under the Building Operations and Maintenance (O&M) rating system. O&M is used for existing buildings that are looking to operate in a low impact way. The author also analyzed the financial feasibility of this project and provided recommendations for PS.

During this time, the author worked with PS's facility personnel, facility service vendors, facility engineers, and corporate social responsibility team. Research was conducted on the facilities current infrastructure and technology, and the author estimated the costs of adding a new technology or updating the facility's processes. An attempt was made to investigate some of the potential issues in undertaking this project. The author researched and outlined some of the benefits of LEED certification to building owners and tenants, and indicated ways to overcome owner-tenant split incentive issues. Finally, the author presented a study to relevant internal and external stakeholders as a resource for the implementation of this LEED project.

³ Citation removed for anonymity

As this analysis took place in a corporate setting, the following will focus on the author's experiential learning that took place on-site rather than the drivers and barriers to the execution and success of similar projects. A summary of the findings from the PS report follows in the results section.

3.a. Data Collection

The information for the feasibility study was collected from various sources. Initially, all of the requirements dictating the building's ability to qualify for specific credits were found in the LEED Reference Guide for Building Operations and Maintenance (Version 4). The guide provides the information required to receive points for each credit. In order to ascertain whether or not the building fulfilled these requirements, the author consulted with the facilities service vendors, such as Orkin or ABM Cleaning Company, and the facility's chief engineer. These sources allowed for a determination of credit worthiness and for the projection of the number of points each credit could receive. Other information regarding the building was found on the company's intranet website.

3.b. Case Background

The facility is over 155,000 ft² and was erected in 1992. The facility accommodates about 500 employees along with a 5th floor tenant. The facility received an ENERGY STAR rating of 97 in April 2015, indicating that the facility is more efficient than 97% of peer facilities, or other similar office buildings (US EPA, 2015). This facility is planning to

attempt LEED v4 certification under the Building Operations and Maintenance (O&M) rating system. O&M is used for existing buildings that are looking to operate in a low impact way beyond energy efficiency. As discussed above, LEED buildings have a number of other benefits. Furthermore, preexisting buildings do not require the energy, water, materials, and other resources associated with a new construction project. According to the United States Green Building Council (USGBC), it can take up to 80 years to offset the environmental impacts of demolishing an old building and constructing a new efficient one, making the retrofit strategy a highly efficient use of resources (2015a).

The LEED Green Building Rating System is the nationally accepted benchmark for the design, construction, and operation of high performance green buildings. The LEED rating system is managed through the USGBC, a non-profit group with the mission “to transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life” (USGBC, 2015b). LEED promotes a building-wide approach to sustainability by recognizing performance in these six key areas of human and environmental health: transportation, sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.

Previously, Jackie Armstrong from Facilities Consultants (FC) Inc. performed a LEED gap analysis to assess the feasibility of certification under LEED O&M v3 (version 3). However, LEED v3 will expire in September 2016, and all building certified after that date will have to be certified under LEED v4 (version 4). Due to the site’s lease expiration in less than 2 years, certification under v4 is most likely. This analysis aims to update the

previous v3 analysis and ascertain the potential for different certification levels. Difficulty assessment is indicated on a scale of 1 (easiest) to 5 (most difficult). Following that, this study presents an assessment of the building owner-tenant landscape and examines the potential actions required to fund and execute a successful LEED project.

4. Results

4.a. LEED v4 Existing Building O&M Feasibility Study

4.a.1. Current Status

LEED certification can be achieved at four different certification levels: Certified, Silver, Gold, and Platinum. Each requires the building to reach a certain point threshold: Certified (40+ points), Silver (50+ point), Gold (60+ points), and Platinum (80+ points). The following sections will examine where the building currently is in terms of the certification process and the credits required to achieve certain levels of certification. The following credits are representative of credits completed at the site or in compliance with the credit requirements. The site has completed 42 credit points, which is enough to receive LEED Certified level, the lowest level of certification. For more information and analysis of the credits see Appendix A.

Table 4.1: LEED Credits Completed at Framingham Office

Completed Credits	Est. Credit Points
Heat Island Reduction	1
Water Metering	2
Existing Building Commissioning—Implementation	2
Ongoing Commissioning	3
Optimize Energy Performance	20
Renewable Energy and Carbon Offsets	4
Enhanced Refrigerant Management	1
Indoor Air Quality Management Program	2
Enhanced Indoor Air Quality Strategies	1
Exemplary Perf.: EA Optimize Energy Performance	1
PC: Comm. Contaminant Prevention - Airborne Releases	1
LEED Accredited Professional	1
Regional Priority: EA Optimize Energy Performance	1
Total	42

4.a.2. No Cost Credits

In LEED, No Cost Credits are credits, which incur no capital or initial costs to achieve the credit. In some cases, more investigation or research will need to be done in order to confirm that the credit is attainable. For example, the Alternative Transportation Credit requires a survey to determine the number of occupants that are using alternative transportation methods (i.e. walking or biking, public transit, telecommuting, carpools, and green vehicles) during their daily round-trip commutes. Another example incorporates the Site Development – Protect or Restore Habitat Credit, in which 20% of the LEED site must contain natural or adapted vegetation. According to information provided by National

Development and the author's research and analysis, 20% of this site contains the necessary vegetation. However, in order to complete this credit and document it properly, a naturalist or biologist will need to assess the area and use GPS and GIS software (like TerrSet or ArcGIS) to determine compliance.

In addition to some of No Cost Credits mentioned above, there are some types of credits that have no initial cost but may have undetermined ongoing, operational costs. For example, the Purchasing – Ongoing Credit may require that some future purchasing decisions, such as those for paper, toner cartridges, binders, batteries, and desk accessories, be changed. These changes may cost the purchaser more (or less) than they would normally spend on those goods. Nonetheless, these incremental increases should be further investigated over the long term. A similar situation may exist for vendor-driven credits, like Green Cleaning – Products and Materials and Integrated Pest Management. In those cases, vendors have the capacity to alter agreements with PS to fulfill credits. However, changes in these contracts may lead to changes (or increases) in fees. See Appendix A for information and analysis of the credits listed below.

The combination of No Cost Credits and Completed Credits equals 63 credit points, enough for the LEED Gold certification level. Nevertheless, USGBC recommends that projects aim to receive 5 to 8 points higher than the nearest certification (i.e. Gold at 60 points), in case some of the credits cannot be achieved during the certification process. Therefore, the site should look to achieve 2 to 5 more points in order to ensure they reach Gold Certification without issue.

Table 4.2: Potential LEED Credits with No Capital Costs at Framingham Office

No Cost Credits	Est. Credit Points
Alternative Transportation	4
Site Development – Protect or Restore Habitat	2
Outdoor Water Use Reduction	2
Indoor Water Use Reduction	3
Cooling Tower Water Use	2
Purchasing - Ongoing	1
Thermal Comfort	1
Green Cleaning- Products and Materials	1
Integrated Pest Management	2
Occupant Comfort Survey	1
Pilot Credit: Ergonomics Strategy	1
PC: Enhanced Acoustical Perf. - Exterior Noise Control	1
Total	21

4.a.3. Low Cost Credits

If the site aims for Gold Certification, it should identify 2 to 5 more points from the Low Cost LEED Credit tier for completion, in order to ensure they reach the desired level. Occasionally during the certification process, sites do not achieve all of the credits that they had planned on achieving. These 2 to 5 more credits will act as a buffer. The chart below lays out some low cost credit options. This study recommends that the site undertake the Rainwater Management Credit (3 points). This credit is a Regional Priority Credit, meaning that if the facility achieves above a certain threshold for that credit (3 points in this case), then the facility will be rewarded 1 additional point. Regional Priority Credits were introduced in the LEED v3 rating systems to incentivize the achievement of

credits that address geographically specific environmental priorities (USGBC, 2015b).

Thus, the Rainwater Management Credit + Regional Priority will achieve 4 points for the project for only \$6,000 and help ensure a LEED Gold Certification. For more information on specific credit costs and feasibility, see Appendix A.

Table 4.3: Low Cost LEED Credits at Framingham Office

Low Cost Credits	Est. Credit Points	Total Cost per Credit	Cost per Point
Rainwater Management + Regional Priority	4	\$ 6,000	\$ 1,500
Site Management	1	\$ 3,000	\$ 3,000
Green Cleaning- Custodial Effectiveness Assmt.	1	\$ 3,000	\$ 3,000
Pilot Credit: Local Food Production	1	\$ 3,000	\$ 3,000
Indoor Water Use Reduction + Regional Priority	3	\$ 10,000	\$ 3,333
Total	10	\$ 25,000	\$ 2,500

4.a.4. Medium to High Cost Credits

It is not recommended that PS pursue these credits as they have high costs and will not provide any benefits in terms of certification level. These credits will not benefit the LEED certification level because after reaching Gold Certification at 60 points, the next level is Platinum at 80 points. These credits will not get the building to 80 points and will come at a significant cost. Additionally, these credits would have no tangible financial benefit to PS. For more information about specific credits, see Appendix A.

Table 4.4: Medium to High Cost LEED Credits at Framingham Office

Medium - High Cost Credits	Est. Credit Points	Total Cost per Credit	Cost per Point
Heat Island Reduction	1	\$ 10,000	\$ 10,000
Light Pollution Reduction	1	\$ 8,000	\$ 8,000
Renewable Energy and Carbon Offsets	1	\$ 10,000+	\$ 10,000+
Purchasing- Lamps	1	\$ 8,125	\$ 8,125
Enhanced Indoor Air Quality Strategies	1	\$ 7,600	\$ 7,600
Total	5	\$ 43,725	\$ 43,725

4.a.5. Not Feasible/Not Attempted Credits

These credits are considered too complex or costly to be attempted and will be forgone. Some credits may be termed “not feasible” because the systems in the building are not applicable to the credits. In other cases, more research or an outside consulting firm would be necessary to ascertain the ability to complete these credits. Hiring a firm would incur costs for the credit before knowing if it is feasible. Finally, some of these credits would disrupt the processes and workflow of the organization and the company may become more inefficient. This is not a desirable outcome. See Appendix A for more information on specific credits.

Table 4.5: Not Feasible and Not Attempted LEED Credits at Framingham Office

Not Feasible/Not Attempted Credits	Est. Credit Points
Cooling Tower Water Use	1
Site Improvement Plan	1
Demand Response	3
Purchasing- Facility Management and Renovation	2
Solid Waste Management- Ongoing	2
Advanced Energy Metering	2
Green Cleaning- Equipment	1
Solid Waste Management- Facility Management & Renovation	2
Interior Lighting	2
Daylight and Quality Views	4
Totals	20

4.b. LEED Project Owner-Tenant Split Incentive Assessment

As PS and building owner move closer to the renegotiation and renewal of a lease agreement, it is important to consider some of the benefits that can be achieved for both parties as a result of LEED certification. Understanding the financial and non-financial benefits of LEED buildings is important in order to set the stage for lease negotiation. While many of the energy-specific benefits have already been realized, others do exist and are outlined below. Furthermore, other obstacles exist in the forthcoming negotiations and agreement, including expense responsibilities and contractual obligations. Some insights are provided below into potential strategies for dividing LEED costs and creating a fair lease agreement.

4.b.1. Financing Options for LEED Certification

Currently, the site's lease expires in April 2017. LEED certification and its associated cost will likely be a part of the lease renewal negotiation. Because LEED certification goes beyond energy efficiency and this facility has already accomplished ENERGY STAR rating of 97, a green lease (or similar mechanism) will be important in dividing and sharing the costs and benefits from green building operation between landlord and tenant. On the most basic level, a green lease can be described as a lease which contains sustainability or environmental provisions as part of a landlord-tenant agreement (Janda et al., 2016). A LEED certification and its associated credits would included in such an agreement, but additional language will be required to address division of costs. Below are three suggestions for division of responsibilities. While not all credits below are recommended, they are used here to demonstrate options. Other options exist and may be uncovered through lease negotiation (relating to rents rate, type of lease, and lease length).

4.b.1.i. Benefiter Pays

One way to divide the LEED certification capital costs would be to have a credit's benefiter pay for the credit's costs. This option however can become complicated, as benefits are not always financial and may be ambiguous. For example, the Local Food Production Credit seems to benefit the employees in terms of nutritional value and freshness of the food they will enjoy, but an onsite garden producing food would also increase property value and attractiveness to future tenants, benefitting the building owner. Sharing the costs could be another solution in these situations. However, this author has

assigned Local Food Production to the tenant. The below table displays a breakdown of the “benefiter pays” principle.

Table 4.6: Example of “Benefiter Pays” in Capital Cost Division between Two Parties

Benefiter Pays	
Tenant	
Indoor Water Use Reduction (Prerequisite)	\$ 4,000
Indoor Water Use Reduction (Credit)	\$ 10,000
Ongoing Purchasing and Waste Policy	\$ 4,500
Environmental Tobacco Smoke Control	\$ 1,000
Green Cleaning- Custodial Effectiveness Assessment	\$ 3,000
Pilot Credit: Local Food Production	\$ 3,000
<i>Tenant Total</i>	<i>\$ 25,500</i>
Owner	
Rainwater Management	\$ 6,000
Site Management	\$ 3,000
<i>Owner Total</i>	<i>\$ 9,000</i>

4.b.1.ii. Physical Site Division – Inside and Outside of the Building

The current owner-tenant agreement requires the tenant to pay for improvements and maintenance inside of the facility, while the owner is responsible for outside of the building. This division of capital provides a clear delineation of responsibility. Below lays out a table of the capital cost responsibility.

Table 4.7: Example of the Status Quo in Capital Cost Division between Two Parties

Inside/Outside - Status Quo	
Tenant	
Indoor Water Use Reduction (Prerequisite)	\$ 4,000
Indoor Water Use Reduction (Credit)	\$ 10,000
Ongoing Purchasing and Waste Policy	\$ 4,500
Green Cleaning- Custodial Effectiveness Assessment	\$ 3,000
<i>Tenant Total</i>	<i>\$ 21,500</i>
Owner	
Rainwater Management	\$ 6,000
Site Management	\$ 3,000
Environmental Tobacco Smoke Control	\$ 1,000
Pilot Credit: Local Food Production	\$ 3,000
<i>Owner Total</i>	<i>\$ 13,000</i>

4.b.1.iii. Operational Control

Another option for dividing the responsibilities is assigning cost responsibilities to the entity with most control of a given credit. For example, the Indoor Water Use Reduction credit and prerequisite both deal with the fixtures, fittings, and physical infrastructure of the water system, and is less dependent on human utilization or behavior. Therefore, the building owner would be the responsible party for the credit. Similarly, costs for establishing the Ongoing Purchasing and Waste Policy fall under the purview of the tenant, since they control selection of goods purchased for the office and the operation of the recycling and waste program.

Table 4.8: Example of “Operational Control” principle in Capital Cost Division between

Two Parties

Operational Control	
Tenant	
Ongoing Purchasing and Waste Policy	\$ 4,500
Environmental Tobacco Smoke Control	\$ 1,000
Pilot Credit: Local Food Production	\$ 3,000
Green Cleaning- Custodial Effectiveness Assessment	\$ 3,000
<i>Tenant Total</i>	<i>\$ 11,500</i>
Owner	
Rainwater Management	\$ 6,000
Indoor Water Use Reduction (Prerequisite)	\$ 4,000
Indoor Water Use Reduction (Credit)	\$ 10,000
Site Management	\$ 3,000
<i>Owner Total</i>	<i>\$ 23,000</i>

5. Discussion

5.a LEED Feasibility Study

The above results have identified the credits that the building currently qualifies for under LEED v4 Existing Building Operations and Maintenance and the credits that can be easily and inexpensively obtained through minor modifications. All credits require proper documentation before review by the GBCI (Green Building Certification Institute). GBCI was established to provide third-party project certification under the USGBC's LEED Green Building Rating System. Concurrent with the findings, this project would be best served by attempting LEED Gold Certification through a combination of Completed Credits, No Cost Credits, and one Low Cost Credit: the Rainwater Management Credit. This combination would yield 67 points for an initial investment of \$6,000. Additional Low Cost Credits, besides the Rainwater Management Credit, could be pursued but will increase costs. As corporations generally work to minimize costs, no additional Low Cost Credits need to be explored at this time.

In addition to the \$6,000 initial investment for the Rainwater Management credit, USGBC certification fees (potentially \$10,000-\$12,000) will also be required to achieve official certification upon submittal of all documentation (see Appendix A for more information). Costs may increase if a consultant or facilitator needs to be hired to undertake and complete the project. This could drive the costs of this LEED project to about \$70,000 with almost no tangible financial benefits. These costs will increase the overall commitment needed by the corporation, but are unavoidable in any LEED project.

5.b. Split Incentive Issues

The most critical factor in determining the outcome of this project will be overcoming the split incentive issues. As described above, benefits exist both for the tenant and owner. Thus, both parties should contribute to project expenses. The lease renewal provides an opportunity to negotiate these expenses and divide them in a manner that will be beneficial to both parties. However, if this project is not planned for and considered during lease negotiation, the probability of project completion will decrease considerably. The owner will be less likely to take on increased expenses, especially if it is a long-term (10+ year) lease. Because LEED certification must be renewed every five years, the building may no longer be LEED certified when PS's lease ends. This will void many of the owner's benefits and will drive down the likelihood of a negotiation after the lease is renewed.

Tenant-owner split incentive issues can be a barrier to completion of LEED and other CGB projects. The following recommendations discuss strategies for adding green lease language to the upcoming lease negotiation. Both owner and tenant should share the economic responsibility. This responsibility can be divided in ways other than those suggested above. If costs cannot be negotiated during the lease renewal process, cost division discussions will be less probable, and could ultimately result in the abandonment of this LEED project. As described earlier, the split incentive issues are likely the most critical hurdle for this LEED project.

5.c. Executive and Organizational Support

When the author arrived at PS, the organization had recently hired a new CEO. According to PS employees' conversations and the new CEO's public and internal communication, the new CEO is focused on redirecting the organization's strategy and driving growth. PS is currently in the process of changing its core business offerings. Unlike with the former CEO, environmental issues, corporate social responsibility (CSR), and sustainability are not top priorities for the new CEO. Although the author did not witness any direct objections to the LEED project or other CSR projects, there were no promotional directives or initiatives from executive management. This lack of support will neither drive project completion nor prevent it. It will most likely have no impact on the project.

Additionally, a Deloitte study found that corporate environmental commitments are an important driver of CGB projects (2007). As mentioned above, PS has an emissions target of a 35% reduction in carbon dioxide equivalents by 2020 with a 2006 base year and had nearly reached its reduction target as of 2015⁴. Considering the fact that this specific LEED project will do little to achieve the emissions target, this project may be overlooked in favor of other projects that will contribute more to this desired outcome.

⁴ Citation removed for anonymity

5.d. Financial Benefits

As previously stated, this LEED project has no tangible financial benefits. While some studies have suggested positive correlation with these projects and worker productivity, which could be monetized, it would be difficult, and potentially misleading, to do so in this situation. The lack of financial benefit will not act as an incentive for this organization to undertake this LEED project, and may ultimately prevent the project's completion. Since companies and departments have limited budgets and resources, other projects offering higher returns could take precedence over this LEED Project. Because LEED buildings address areas of sustainability beyond energy efficiency, financial return on investment may not always be an accurate evaluation of this type of project. However, if corporations continue to evaluate projects in this way, green buildings may not realize their positive potential.

5.e. Other Benefits

Like financial benefits, other non-financial benefits (or intangible benefits) can be key in driving CGB projects. These benefits, stated in the Background section, explore the potential benefits that could offset the financial costs. This LEED project has a number of strong non-financial benefits. However, the strength of the benefits is relative to associated barriers and drivers. If management prioritizes other barriers and drivers over this project, then this project's impact will be dampened.

5.f. Costs

Resource and capital limitations can restrict an organization's ability to invest in CGBs (Hoffman and Henn, 2008). This LEED project includes one-off capital investments to the building and its systems and the potential for process changes, such as purchasing or waste management, that will likely increase recurring process costs. Many of these process change costs are unknown and beyond the scope of this study. Research demonstrates that the fear of unforeseen costs is one of the most common barriers to undertaking CGB projects and that the certification cost as well as new process costs are a major barriers to project completion (Johnson, 2005, Häkkinen and Belloni, 2011). These costs, sometimes difficult to value, can deem the project risks too great for finance department personnel. The benefits of this LEED project must overcome the costs and uncertainty in order to commence. To overcome this barrier, a more in-depth assessment must be done in order to more accurately estimate the change to recurring costs.

Considering the limited financial benefits described above, it is no wonder that overall costs of this project seem to carry little to no returns. In a corporate setting, the business ultimately has a responsibility to concentrate on turning a profit and returning money to their shareholders. Projects with high costs and risk are not as appealing to businesses. Again, cost alone can prevent corporate investments in green buildings, which denies green buildings the opportunity to reduce human's environmental impact.

6. Recommendations

Ultimately, the author would recommend that PS move forward with the LEED certification for two specific reasons. First, the author believes that the total capital costs between \$16,000 and \$18,000 are relatively inexpensive compared to the potential benefits, and relatively insignificant in light of the company's 2014 profits of over \$900 million. Additionally, for a company looking to increase sales and improve product and service offerings, a CGB could have a positive impact on employees' productivity, health, and efficiency. Improving a workforce only adds to a company's value. Secondly, the downside risks are relatively small. Many of the previous building improvements qualify for LEED credits, and with No Cost Credits, no additional investment in the building is required to reach the minimum LEED certification level. Thus, this site would be a perfect test site, or pilot, for LEED certification at other PS properties. This pilot would allow PS to assess the validity and impact of the benefits presented above. The following recommendations are made with the aim of facilitating a successful LEED certification process.

6.a. Recommendations for Split Incentive Issues

As lease renegotiation approaches, an interdepartmental team should be created to address LEED certification issues. Internally, PS must outline a strategy for negotiation and communicate that strategy to relevant stakeholders. Thus, once negotiations begin, PS will be able to engage effectively with the building owner and properly incorporate the

LEED certification process into the lease, which will prevent certification from being put aside or deferred. Both owner and tenant should share the economic responsibility of the LEED certification, as both will derive benefits. The total cost of the certification will depend on the certification level. However, the total amount can also be divided in other ways than those outlined in the results.

6.a.1. Provisions for a LEED-Certification Lease and Negotiation⁵

Placing language in the lease to ensure the building stays green after certification is critical to ensuring the green benefits over time. Obligations to properly maintain green building systems, practices, and monitoring should be addressed in the lease agreement. Additionally, a long-term lease (at least 10 years) is suggested since a long-term agreement may motivate the landlord and tenant to make building improvements and implement green practices that have longer payback periods. The current lease ends in April 2017.

Lease structure and type are crucial because they distribute operational expenses and capital costs. For example, a lease can allow building owners to amortize and recover capital costs associated with LEED improvements to building systems. Moreover, lease language could allow the building owners to pass through smaller LEED project costs (i.e. building controls, water conservation measures, and installation of sub-meters) as operating expenses and charge to the tenant.

⁵ Bases on recommendations from the Retail Industry Leaders Association and Institute for Market Transitions' "Retail Green Lease Primer" and USGBC's "Green Office Guide: Integrating LEED into Your Leasing Process".

The most important aspect of negotiating a lease with LEED provisions is the cooperation of all stakeholders (i.e. occupants, management, ownership, building service vendors, PS's real estate team, brokers, and attorneys). PS and the owner should consider hiring consultants if they do not have LEED experience. Communication between stakeholders is key and education may be needed for all parties to understand tangible and intangible benefits for LEED certification. For example, USGBC asserts that changing operations and maintenance practices may increase costs to tenants, but can be offset by increased morale and productivity of the workforce.

One of the recommendations from the above study urges PS to use FC's LEED certification management service. This service would establish consistency from leveraging the same group to perform all of the stages of the certification, eliminating discrepancies and facilitating a smooth and timely certification process. This strategy could be employed to overcome any lack of knowledge or experience during the project.

6.b. Recommendations for Undertaking LEED Project

After identifying the credits that should be attempted, stakeholders must assign roles and responsibilities for the LEED project. USGBC recommends that one stakeholder takes primary leadership responsibility for the LEED application and documentation process. For each specific credit, primary and supporting roles should be assigned to appropriate stakeholders.

FC provides LEED certification management services, including credit documentation, assistance for the building engineers, management, contractors, and vendors with creating and installing procedures, facilitating communication for stakeholders, and administering construction, landscape, and engineering service agreements. Leveraging FC services will allow for the consistency of the same group performing all of the responsibilities for the certification, eliminating discrepancies and allowing for a smooth and timely certification process. However, the use of FC will increase total cost of the LEED certification. FC's project management fees are \$50,000.

Following the division of labor, the stakeholders will have to determine the performance period, when sustainable operations are being measured. Many prerequisites and credits require that operating data and other documentation be submitted for the performance period. It must be at least three months but no more than 24 months, except as noted in the credit requirements. Certification is awarded based on current building performance data, and applications must be submitted for review within 60 days of the end of the performance period. Determining the performance period will help to build the certification timeline and help stakeholders plan for improvements and alterations to the building.

Once a timeline has been established, responsibilities divided, and operational and maintenance changes implemented, the stakeholders must collect documentation and create a presentation for review by GBCI. USGBC recommends performing a quality assurance review prior to submitting for certification. A quality control review can improve the

presentation of the project and avoid errors that would be time-consuming and expensive to correct later in the certification process.

7. Conclusion

The results of the LEED feasibility analysis demonstrated that the office building studied could achieve Silver or Gold certification with little or no cost. However, these costs only represent the investments in infrastructure and technologies; this observation does not account for other costs such as certification costs (see Appendix B), which could reach \$10,000 or more, and the cost associated with hiring a third party to oversee the project, such as FC. Thus, the costs of this LEED project could total about \$70,000 with almost no tangible financial benefits. Other intangible benefits do exist and could translate into financial benefits down the road.

Additionally, benefits exist for both the building's owner and tenant. Specifically for the owner, a LEED certification differentiates this building from other commercial buildings, while also delivering lower operating costs and higher indoor environmental quality, which makes it more attractive to buyers and tenants. Additionally, green buildings typically have quicker lease-up rates and higher occupancy rates compared to non-LEED buildings. Certification can also provide a measure of protection against regulatory risks that have begun to emerge in cities, such as New York and San Francisco.

For tenants, LEED-certified buildings are designed to have healthier and cleaner indoor environments, meaning healthier occupants and reductions in employee absences and improvements in worker productivity. Improved worker productivity will increase a company's overall efficiency and effectiveness. Moreover, LEED-certified buildings can also save tenants money in energy and water utility costs as well as waste disposal costs.

Finally, LEED-certified buildings demonstrate a commitment to the surrounding communities as well as the local and global environment.

Nevertheless, issues arise when owners and tenants decide how to pay for these benefits and accomplish a LEED project. Both owner and tenant should share the economic responsibility of the LEED certification as both derive benefits from the certification. The total amount can also be divided in a number of ways and the responsibility for these costs should be negotiated during the lease renewal process.

Since CGB projects serve to resolve the impacts humans have on their environment, adoption and completion of such projects is an important factor in driving a sustainable society across the globe. The lack of adaption of CGB can be attributed to a number of issues. CGB projects have a number of barriers and drivers that can in combination impact a project's undertaking. From a business and economic perspective, the LEED certification project examined in this study appears to be an investment without much tangible return. The project is further complicated by collaboration and owner-tenant split incentives. For this project, recommendations have been provided in the form of strategies for overcoming some of the barriers faced at PS. However, in some cases overcoming barriers may not be enough. Drivers can also be important contributing factors for project initiations. Many crucial drivers present in other projects are lacking at PS, and for this project in particular. This lack of significant drivers could ultimately impair the project.

APPENDICES

Appendix A: Credit Category Analysis: Overview⁶

Note on Prerequisites: Each section has prerequisites that must be completed before credits can be awarded. Some prerequisites will require investigation and documentation similar to the credits, but credits are not awarded for completion of the prerequisites.

Note on difficulty rating: Each credit is assigned a difficulty rating on a scale of 1 (easies) to 5 (hardest) with an accompanying term. Completed credits can be expected to be received without further action other than documenting current conditions. Easy credits are generally achievable with little time and expense, while more difficult ones are only achievable with moderate to significant expenditure and time requirements. Some very difficult or complex credits are considered not realistically feasible and will not be pursued.

Location and Transportation

Credit: Alternative Transport | Potential Points: 15 | Estimated Points: 4 | Difficulty: Easy
(2)

Analysis: This credit awards point for employees' and staffs' alternative use of transportation. While some of CA's employees may carpool or use hybrid or electric vehicles, the most prominent form of alternative transportation is telecommuting. Based on observations, it appears as though s significant number of employees telecommute a few days per week (especially on Fridays). This credit required a survey to determine the exact number. However, 4 points are reward for only 15% telecommuting per week, calculated by dividing the number trips avoided by telecommuting/alternative transportation divided by a total of 10 trips per employee per week. This number is an observational estimate and intended to provide a general idea of where the Framingham 121 facility may fall. See O&M Reference Guide for more information about documentation and survey approach.

⁶ Analysis of credit and prerequisite feasibility based on observations and assessment by JLL, facilities, applicable vendors, and the author. Credit information based on USGBC's LEED Reference Guide for Building Operations and Maintenance, 2013 Ed.

Cost: Only labor hours to conduct and analyze survey, unless CA wants to implement additional alternative transportation strategies.

Sustainable Sites

Prerequisite: Site Management Policy | Potential Points: N/A | Difficulty: Easy (1)

Analysis: This prerequisite aims to establish a site management policy that employs practices to reduce harmful chemical use, energy waste, water waste, air pollution, solid waste, and/or chemical runoff. The expectations for this policy are laid out in the O&M Reference Guide and are a combination of two previous (v3) credits – Building Exterior and Hardscape Management Plan and Integrated Pest Management, Erosion Control, and Landscape Management Plan. This prerequisite only involves creating the policy. Templates are available.

Cost: Only labor hours to fill out templates.

Credit: Site Development – Protect and Restore Habitat | Potential Points: 2 | Estimated Points: 2 | Difficulty: Easy (1)

Analysis: Bases on documentation from National Development, JLL, and the City of Framingham as well as analysis on Google Maps, the property is 11 acres. If the parking garage is not included in the LEED certification process, the property is only 10 acres. According to the credit, 20% of the area (or 2 acres) must be reserved native or adapted vegetation. According to the above sources, the current landscaping outlay and vegetation meets the 2 acres requirement.

Cost: N/A

Credit: Rainwater Management | Potential Points: 3 | Estimated Points: 3 | Difficulty: Medium (3)

Analysis: Adapted from the v3 credit, Stormwater Quality Control, this credit will require some alterations to the current practices and infrastructure to capture and treat rainwater. This credit's baseline to determine severity of rain event that must be taken into

consideration and appears to be lower than the v3 credit (Stormwater Quality Management). Stormwater Quality Management uses the 2-year, 24-hour design storm (3 inches of rain) versus the Rainwater Management baseline that uses the EPA National Stormwater Calculator tool (1.61 inches of rain).

Cost: Based on JLL's previous gap analysis and assessment, these measures and alterations would cost about \$6,000. The cost may be less since this credit requires planning for a less severe storm.

Credit: Heat Island Reduction | Potential Points: 2 | Estimated Points: 1 | Difficulty: Complete and Difficult (4)

Analysis: This credit has two components: one point for nonroof and one point for roof. This v4 credit is a combination of two separate v3 credits. According to USGBC, the two v3 credits (Heat Island Reduction – Nonroof and Heat Island Reduction – Roof) are applicable to this v4 credit as well. According to JLL's analysis and assessment, the nonroof portion has already been completed due to underground parking and shaded parking medians that meet current credit compliance. However, JLL estimates the roof portion would cost approximately \$10,000. Additionally, the roof has a significant amount of hardware on it, which may make completion of the roof portion more difficult. For more information see O&M Reference Guide.

Cost: Roof portion - \$10,000

Credit: Light Pollution Reduction | Potential Points: 1 | Estimated Points: 0 | Difficulty: Difficult (4)

Analysis: According to USGBC, the v3 version of this credit is applicable to this v4 credit as well. According to JLL's analysis and assessment, this credit will be difficult to complete and have a high cost.

Cost: JLL estimates that it will cost \$8,000 fulfill this credit.

Credit: Site Management | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (2)

Analysis: This credit involves the implementation and performance of the Prerequisite Site Management Plan. Some infrastructure and management practices will most likely need to be changed or altered, resulting in costs. See O&M Reference Guide for more information.

Cost: JLL estimates total costs of about \$3,000 fulfill this credit.

Credit: Site Improvement Plan | Potential Points: 1 | Estimated Points: 0 | Difficulty: Difficult (5)

Analysis: This credit involves establishing and develop a five-year site improvement plan, addressing hydrology, vegetation, and soils. In order to reduce complications and costs over the years following certification, this credit will not be attempted.

Cost: N/A

Water Efficiency

Prerequisite: Indoor Water Use Reduction | Potential Points: N/A | Difficulty: Easy (2)

Analysis: This prerequisite aims to establish a baseline for water use and may involve installing new water fixtures. According to the USGBC, the actions required to fulfill v3 prerequisite Minimum Indoor Plumbing Fixture and Fitting Efficiency can also be used for this prerequisite in v4. JLL estimates that this prerequisite is easily achievable, but will include costs.

Cost: JLL recommends upgrades to all lavatory faucets and break room faucets as well as showers heads to maximize water efficiency. JLL estimates that fixture updates will bring costs to about \$4,000.

Prerequisite: Building-Level Water Metering | Potential Points: N/A | Difficulty: Completed

Analysis: To fulfill this prerequisite, the facility must have permanently installed water meters that measure the total potable water use for the building and associated grounds. The Framingham 121 facility has this in place.

Cost: N/A

Credit: Outdoor Water Use Reduction | Potential Points: 2 | Estimated Points: 2 | Difficulty: Completed

Analysis: This credit requires that an irrigation meter be installed in order to ascertain the amount of water being used for those purposes. Framingham 121 has installed an irrigation meter. Based on water bill data provided by National Development and Framingham Water Department and the extrapolation calculations, Framingham 121 has reduced irrigation water usage by over 40%. See O&M Reference Guide for more information.

Cost: Costs already paid or paid by National Development.

Credit: Indoor Water Use Reduction | Potential Points: 5 | Estimated Points: 5 | Difficulty: Difficult (5)

Analysis: Points in the credit are awarded for using less water than the baseline calculated in Prerequisite Indoor Water Use Reduction. Point are based on the degree to which Framingham 121 can reduce its water consumption. JLL has estimated that 3 points are easily achievable through low-cost or no-cost measure. However, the final 2 point will come at cost for replacing inefficient fixtures and adding other efficient water practices and infrastructure. See O&M Reference Guide for more information.

Cost: See Prerequisite Indoor Water Use Reduction's costs for more information. Additional measures for toilets and urinals may be needed. JLL has estimated that in order to achieve the final 2 point of this credit and thus receive all 5 points will cost \$10,000.

Credit: Cooling Tower Use | Potential Points: 3 | Estimated Points: 2 | Difficulty: Easy (1)

Analysis: This credit's points are awarded for two separate establishments. This credit intent is to conserve water used for cooling tower makeup while controlling microbes, corrosion, and scale in the condenser water system. Points are awarded for performing a baseline analysis of the chemical level in the water and calculating the number of cooling tower cycles. Currently, Framingham 121 has a chemical vendor whose responsibility it is to check the chemical levels in the cooling towers. Thus, in order to reactive 2 of the 3

points, the vendor will have to test for the required chemicals and the cycles calculated. In order to receive the third point, the facilities system could have to implement efficiency or recycling measures to increase the number of cooling tower cycles. However, this will most likely involve some major renovations or infrastructure changes and associated costs.

Cost: Only the labor hours required to calculate the cooling tower cycles are required. Chemical tests can be taken during chemical vendor's routine visits.

Credit: Water Metering | Potential Points: 2 | Estimated Points: 1 | Difficulty: Completed

Analysis: This credit can be fulfilled for 1 point by metering two water subsystems or 2 points for four or more water subsystems. Subsystems include irrigation, indoor plumbing fixtures and fittings, cooling towers, domestic hot water, and reclaimed water. At Framingham 121, irrigation, cooling towers, and domestic hot water are already submetered. Thus, one point is already achieved.

Cost: N/A

Energy and Atmosphere

Prerequisite: Energy Efficiency Best Management Practices | Potential Points: N/A | Difficulty: Completed

Analysis: This prerequisite requires an energy audit that meets both the requirements of the ASHRAE preliminary energy use analysis and an ASHRAE Level 1 walk-through assessment identified in the ASHRAE Procedures for Commercial Building Energy Audits. This has been performed and completed by ESI.

Cost: Costs were associated with this evaluation, but because they are sunk costs, they will not be included here.

Prerequisite: Minimum Energy Performance | Potential Points: N/A | Difficulty: Completed

Analysis: This prerequisite requires the facility to have received an ENERGY STAR rating of at least 75. Framingham 121 has an ENERGY STAR rating of 97.

Cost: N/A

Prerequisite: Building-Level Energy Metering | Potential Points: N/A | Difficulty: Completed

Analysis: This prerequisite requires building-level energy meters that can be aggregated to provide data representing total building energy consumption. Framingham 121 meters its electric and natural gas usage for the entire building.

Cost: N/A

Prerequisite: Fundamental Refrigerant Management| Potential Points: N/A | Difficulty: Completed

Analysis: This facility does not use chlorofluorocarbon (CFC)-based refrigerants in heating, ventilating, air-conditioning, and refrigeration systems.

Cost: N/A

Credit: Existing Building Commissioning - Analysis| Potential Points: 2 | Estimated Points: 2 | Difficulty: Completed

Analysis: The v3 credit Existing Building Commissioning- Investigation & Analysis, can be substituted for the v4 credit Existing Building Commissioning— Analysis. ESI has completed an assessment and report that inventories and evaluates specific opportunities at Framingham 121. JLL has deemed this report sufficient to fulfill this credit.

Cost: N/A – completed

Credit: Existing Building Commissioning - Implementation| Potential Points: 2 | Estimated Points: 2 | Difficulty: Completed

Analysis: This credit can be fulfilled by meeting the requirements of Existing Building Commissioning—Analysis. Many of the no- or low-cost operational improvements have been implemented during Framingham 121’s energy efficiency retrofit. This facility also has a tracking and verification system that ensures building is operating as planned. JLL has deemed previous actions are sufficient to fulfill this credit.

Cost: N/A – completed

Credit: Ongoing Commissioning | Potential Points: 3 | Estimated Points: 3 | Difficulty: Completed

Analysis: ESI has produced applicable engineering paperwork need to pursue this credit, establishing an ongoing commissioning process that includes planning, monitoring, testing, performance verification, ongoing measurement, and documentation. ESI along with mechanical contractor can perform post-certification services to fulfill this credit.

Cost: N/A – completed or post-certification

Credit: Optimize Energy Performance | Potential Points: 20 | Estimated Points: 20 | Difficulty: Completed

Analysis: This credit awards point based on a buildings ENERGY STAR rating. The scale assigns points for every rating level above 75, starting at 3 credit points. Framingham has and ENERGY STAR rating of 97, which is equivocal to 20 points.

Cost: This ENERGY STAR rating was achieved in April 2015. Thus, no current costs exists.

Credit: Advanced Energy Meter | Potential Points: 2 | Estimated Points: 0 | Difficulty: Difficult (4)

Analysis: This credit awards point for installing advanced energy metering for major end uses that represent 20% or more of the total annual consumption of the building. These end uses may include chillers, chilled water pumps, cooling tower, condenser water pumps,

boilers, hot water pumps, air supply fan, air return fan, and damper motors. According to JLL, only the chillers and dry cooler (winter) are measured and adding meters to other systems may not be worth the investment. This credit will not be pursued.

Cost: N/A

Credit: Demand Response | Potential Points: 3 | Estimated Points: 0 | Difficulty: Difficult (5)

Analysis: Demand response programs exist in Massachusetts; however, this facility does not have in place a system with the capability for real-time, fully automated demand response. In order to keep complexity and cost low, this credit will not be attempted.

Cost: N/A – not attempted

Credit: Renewable Energy and Carbon Offsets | Potential Points: 5 | Estimated Points: 4 | Difficulty: Completed

Analysis: This credit awards points for onsite renewable energy or purchased energy from renewable sources. Currently, Framingham 121 purchases all of its energy from renewable energy sources. According to the new calculation in this credit (see the O&M Reference Guide), 4 points can be achieved for 100% purchasing of renewable energy. In order to receive the other point, Framingham 121 has to add onsite renewable energy that accounts for about 1.5% of total building energy use.

Cost: N/A – completed

Credit: Enhanced Refrigerant Management | Potential Points: 1 | Estimated Points: 1 | Difficulty: Completed

Analysis: This facility does not use chlorofluorocarbon (CFC)-based refrigerants in heating, ventilating, air-conditioning, and refrigeration systems.

Cost: N/A – completed

Materials and Resources

Prerequisite: Ongoing Purchasing and Waste Policy | Potential Points: N/A | Difficulty: Medium (3)

Analysis: This credit requires this facility to write policies for environmentally preferable purchasing and solid waste management. Templates are available from JLL or LEEDuser. Environmentally preferable purchases apply to: paper, toner cartridges, binders, batteries, desk accessories, lamps, office equipment, appliances, and audiovisual equipment. Writing this policy will not be difficult, but the solid waste management portion of the policy will require a waste stream audit to set a baseline.

Cost: Creating policy will only require labor hours to write policy. JLL estimates the cost of the waste stream audit at \$4,500.

Prerequisite: Facility Maintenance and Renovations Policy | Potential Points: N/A | Difficulty: Easy (1)

Analysis: This credit required this facility to have in place a facility maintenance and renovation policy must address purchasing, waste management and indoor air quality. The policy applies to building elements permanently or semi- permanently as well as furniture and furnishings. Templates are available from JLL and LEEDuser. Prerequisite only requires the creation of the policy and not the execution.

Cost: Creating policy will only require labor hours to write policy.

Credit: Purchasing – Ongoing | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (2)

Analysis: In order to fulfill this credit, the Framingham 121 facility must purchase at least 60% (by cost) of total ongoing consumables that are environmentally preferable purchases. This credit fulfills the prerequisite Ongoing Purchasing and Waste Policy. According to JLL, this facility has already established the furniture and furnishing portion of this credit. However, the other ongoing purchases may require changes to current purchasing.

Cost: No capital or initial cost exist. However, purchasing environmentally preferable products may have higher costs than other products. Purchases will occur as current stock of goods are exhausted. Thus, small incremental increases in cost over standard products or goods are not included here.

Credit: Purchasing – Lamps | Potential Points: 1 | Estimated Points: 0 | Difficulty: Medium (3)

Analysis: In order to fulfill this credit, the Framingham 121 facility must implement the lighting purchasing plan that specifies an overall building average of 70 picograms of mercury per lumen-hour or less. Based on calculation of popular energy-efficient U-bent T8 lamps, Framingham 121 most likely is close (if not under) to the 70-picogram overall building average. Because LEED certification may not occur for 2-3 years, replacing noncompliant lamps with lamps with over 70 picograms of mercury per lumen-hour at end of life may be an easy way to fulfill this credit before the performance period. Nevertheless, costs may be a deterrent.⁷

Cost: JLL estimates replacing current lamps would cost about \$16,000 plus any installation or labor expenses.

Credit: Purchasing – Facility Maintenance and Renovation | Potential Points: 1 | Estimated Points: 0 | Difficulty: Not attempting

Analysis: Because Maintenance and Revocation can have complex owner-tenant issues and major cost implications, the prerequisite policy will be written, but the implementation will be forgone.

Cost: N/A

Credit: Solid Waste Management — Ongoing | Potential Points: 2 | Estimated Points: 0 | Difficulty: Not Attempting

⁷ Estimate based on ESI study: ~2000 fixtures; \$8/fixture * 2000 fixtures = \$ 16,000

Analysis: Because waste makes up a small portion of this facilities environmental impacts and some of the implementation of this is reliant on human actions and behaviors, the prerequisite policy will be written, but the implementation will be forgone.

Cost: N/A

Credit: Solid Waste Management — Facility Maintenance and Renovation | Potential Points: 2 | Estimated Points: 0 | Difficulty: Not Attempting

Analysis: This credit requires that this facility divert at least 70% of the waste (by weight or volume) generated by facility maintenance and renovation activities from disposal in landfills and incinerators. Because maintenance and renovations can have complex owner-tenant issues and major cost implications, the prerequisite policy will be written, but the implementation will be forgone.

Cost: N/A

Indoor Environmental Quality

Prerequisite: Minimum Air Quality Performance | Potential Points: N/A | Difficulty: Complete

Analysis: This credit requires that HVAC systems meet the minimum requirements of ASHRAE Standard 62.1–2010. According to ESI’s “100 Staples Drive/CA Technologies – ASHRAE 62.1 Calculations and Compliance” report, the current system and its configuration can provide sufficient ventilation airflow to the building which complies with ASHRAE 62.1.

Cost: None

Prerequisite: Environmental Tobacco Smoke Control | Potential Points: N/A | Difficulty: Easy (1)

Analysis: This credit prohibits smoking in the building and outside the building except in designated smoking areas. Framingham 121 does not allow smoking in the building and

does have an acceptable designated smoking areas. Signage will need to be purchased to fulfill requirements for the prerequisite.

Cost: JLL estimates the cost of signage to be about \$1,000.

Prerequisite: Green Cleaning Policy | Potential Points: N/A | Difficulty: Easy (1)

Analysis: The prerequisite requires this facility to have in place a green cleaning policy, addressing the requirements of the Green Cleaning—Purchase of Cleaning Products credit and Materials and the Green Cleaning—Cleaning Equipment credit. Products and materials must be certified by third party, including Green Seal, EcoLogo, and EPA. Framingham 121 has a contract with ABM Cleaning Co. for building cleaning services. ABM does use green cleaning products (Green Seal). JLL has templates for this policy.

Cost: Creating the policy will only require the labor hours need to write the policy.

Credit: Indoor Air Quality Management Program | Potential Points: 2 | Estimated Points: 2 | Difficulty: Completed

Analysis: This credit is very similar to the v3 Indoor Air Quality Best Management Practices – Indoor Air Quality credit. Both require this facility to develop and implement an indoor air quality (IAQ) management program based on the EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM). According to JLL’s gap analysis, Framingham 121 has already completed this credit.

Cost: N/A

Credit: Enhanced Indoor Air Quality Strategies | Potential Points: 2 | Estimated Points: 1 | Difficulty: Completed and Difficult (4)

Analysis: In order to fulfill this credit, one point is awarded for having permanent entryway systems (least 10 feet long) to capture dirt and particulates entering the building at regularly used exterior entrances. This facility has rollout mats which count for this credit and the one point. For the other point, ventilation system that supply outdoor air to occupied spaces must have filters or cleaning device that meet one of the following

filtration media requirements minimum efficiency reporting value (MERV) of 13 or higher. Currently, this facility used MERV 8 air filters. Replacing air filters is a relatively simple process, however cost constraints exist.

Cost: MERV 13 air filters would have to be replaced twice as often as MERV 8 air filters because they will clog more quickly. Therefore, the annual difference in price to replace the MERV 8 filters with MERV 13 filters would be about \$7600. This is a large cost, which would be capital and recurring and is the major reason for the difficulty rating. Costs based on FC estimation.

Credit: Thermal Comfort | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (1)

Analysis: This credit requires that this facility has in place a system for continuous tracking and optimization of systems that regulate indoor comfort and conditions, in accordance with ASHRAE Standard 55–2010. This facility has a building management system in place that can monitor, track, and adjust air temperature, radiant temperature, humidity, and air speed.

Cost: None

Credit: Interior Lighting | Potential Points: 2 | Estimated Points: 0 | Difficulty: Difficult (5)

Analysis: This credit and its associated point are split into two distinct requirements. The first (for one point) requires that at least 50% of individual occupant spaces have lighting controls enabling occupants to adjust the lighting to suit their individual preferences. A majority of the lighting in this facility is automated for efficiency purposes and not under individual user controls. The second requirement (for one point) required this facility to meet certain criteria pertaining to luminance, CRI, rated life, reflectance, and illuminance. According to JLL, some groups (i.e. engineers) prefer to have low light settings. JLL estimates that these end user preferences will make it very difficult to fulfill these requirements and estimates that this facility is not currently fulfilling this credit.

Cost: Costs have not been calculated for this credit. Projects to fulfill this credit will be extremely costly and complex. The changes in infrastructure and human behavior may make this credit very difficult to attempt.

Credit: Daylight and Quality Views | Potential Points: 4 | Estimated Points: 0 | Difficulty: Difficult (5)

Analysis: This credit is split and gives 2 points for daylighting and 2 points for quality views. Based on observational survey, daylighting will not meet 3,000 lux requirement. The second part of this credit requires that this facility achieves a direct line of sight to the outdoors for 50% of all regularly occupied floor area. A majority of desks or cubicles are facing away from the exterior windows and do not have outdoor views.

Cost: Changing the level of daylight or the quality views could require a major renovation. Costs have not been calculated because this facility will most likely not attempt to achieve this credit based on the major costs and alteration that would be involved.

Credit: Green Cleaning- Custodial Effectiveness Assessment | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (2)

Analysis: In order to fulfill this credit, an assessment must verify that the strategies laid out in the Green Cleaning Policy have been implemented, and an annual audit must be conducted in accordance with APPA Leadership in Educational Facilities' Custodial Staffing Guidelines. Assessment and audit are relatively simple to conduct.

Cost: JLL estimates that this audit will cost \$3,000 to perform and achieve this credit.

Credit: Green Cleaning- Products and Materials | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (1)

Analysis: This credit requires this facility to purchase at least 75%, by cost, of the total annual green cleaning material and product purchases (i.e. floor finishes, strippers, disposable janitorial paper products, and trash bags) in accordance with the Green Cleaning Policy prerequisite. ABM Cleaning Co. has the contract for Framingham 121 and uses Green Seal products. At most, only small alterations to purchasing will need to be made to fulfill this credit.

Cost: Insignificant as green cleaning products are already in use.

Credit: Green Cleaning – Equipment | Potential Points: 1 | Estimated Points: 0 | Difficulty: Not Attempted

Analysis: Unable to attain information from vendor. No points assumed as probability of completion is unknown.

Cost: N/A

Credit: Integrated Pest Management | Potential Points: 2 | Estimated Points: 2 | Difficulty: Easy (1)

Analysis: This facility uses vendor Orkin for pest management. This credit is able to be achieved if the Integrated Pest Management service is provided by a certified member of GreenPro, EcoWise, or GreenShield. Orkin has a third-party certification, National Pest Management Association’s GreenPro certification.

Cost: Because Orkin is already contracted by this facility, changes to that contract should not be difficult. Initial costs are assumed to be negligible. JLL can provide template for policy.

Credit: Occupant Comfort Survey | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (2)

Analysis: This credit requires the administration of an occupant comfort survey to collect anonymous responses regarding acoustics, building cleanliness, indoor air quality, lighting, and thermal comfort. Incorporating this survey into the Employee Opinion Survey (EOS) and the Pulse Survey would fulfill the requirements of this credit, such as achieving at least a 30% response rate, documentation, and completing survey at least every 2 years. Development and implementation of corrective action plan to address issues in which more than 20% of occupants are dissatisfied can be integrated into other Indoor Environmental Quality credits.

Cost: No costs associated with adding questions to EOS and analyzing the results as these activities are already apart of internal processes.

Innovation

Credit: Exemplary Performance – Optimize Energy Performance | Potential Points: 1 | Estimated Points: 1 | Difficulty: Completed

Analysis: One point awarded for receiving at ENERGY STAR rating of 97 or above. Framingham 121 has an ENERGY STAR rating of 97.

Cost: N/A

Credit: Pilot Credit – Ergonomics Strategy | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (1)

Analysis: CA had an informal ergonomics policy and has employees dedicated to ergonomic needs and issues as well as providing access to ergonomic equipment. Creating and implementing this strategy would include the writing of the policy and a continuing assessment through EOS. Ergonomics education can be added to new hire orientation.

Cost: Only the labor hours needed to write policy and create educational and survey portions

Credit: Pilot Credit – Local Food Production | Potential Points: 1 | Estimated Points: 1 | Difficulty: Medium (3)

Analysis: This facility does not currently have a local food production, and in order to fulfill this credit, this facility would have to have an onsite garden added to the property. According to credit specifications, this would be an about 450 square foot space. Garden must include vegetable, nut, and/or fruit-bearing plants.

Cost: Estimated cost for installation is \$3,000.⁸

⁸ Estimation based on HomeAdvisor.com

Credit: Pilot Credit – Community contaminant prevention (airborne releases) | Potential Points: 1 | Estimated Points: 1 | Difficulty: Completed

Analysis: According to JLL’s assessment, this credit is currently being achieved. Framingham 121 has a 1.7 million BTU boilers that emit about 10 ppm of NO2 per joule of heat output, about half of this this credits requirement.

Cost: N/A – Completed

Credit: Pilot Credit – Enhanced Acoustical Performance (Exterior Noise Control) | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (1)

Analysis: This credit requires this facility to conduct a site noise assessment that measures site noise in at least one location for 24-hours. Noise level must not exceed 60 dBA. Based on observations and contextual comparisons, exterior noise currently under this threshold.

Cost: Only costs associated with verification and documentation.

Credit: LEED Accredited Professional | Potential Points: 1 | Estimated Points: 1 | Difficulty: Required

Analysis: This credit requires a LEED AP on the project. JLL has LEED AP accredited employees on staff.

Cost: None.

Regional Priority

Credit: Regional Priority – Optimize Energy Performance | Potential Points: 1 | Estimated Points: 1 | Difficulty: Completed

Analysis: 15-point required threshold. Optimize Energy Performance credit will receive 20 points.

Cost: None.

Credit: Regional Priority – Rainwater Management | Potential Points: 1 | Estimated Points: 1 | Difficulty: Easy (1)

Analysis: 2-point required threshold. Rainwater Management credit will receive 3 points.

Cost: None.

Credit: Regional Priority – Indoor Water Use Reduction | Potential Points: 1 | Estimated Points: 1 | Difficulty: Difficult (4)

Analysis: 5-point required threshold. Indoor Water Use Reduction credit will receive 5 points.

Cost: None.

Appendix B: LEED Certification Fees

Certification Fees			
Type	Costs/unit	Units	Total Cost
Registration Fee	N/A	N/A	\$ 1,200
Intial Review (\$/sf * building sf)	\$ 0.04	154,596	\$ 6,184
Credit Appeals: Complex (\$/credit)	\$ 800	3 (Est.)	\$ 2,400
Others(\$/credit)	\$ 500	3 (Est.)	\$ 1,500
Formal Inquiries (\$/credit)	\$ 220	4 (Est.)	\$ 880
Total			\$ 12,164

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