City and County of San Francisco
2030 Sewer System Master Plan

TASK 800
TECHNICAL MEMORANDUM NO. 801
LEED CERTIFICATION OF WWE FACILTIES

FINAL DRAFT
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CITY AND COUNTY OF SAN FRANCISCO
SEWER SYSTEM MASTER PLAN

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NO. 801
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LEED CERTIFICATION OF WASTEWATER FACILTIES

1.0 PURPOSE

The purpose of this memorandum is to provide a general overview of the Leadership in Energy and Environmental Design ™ (LEED) method, outline possible avenues of certification, and detail an approach for LEED certification of newly constructed and existing wastewater enterprise (WWE) buildings.

2.0 WHAT IS LEED?

According to the United States Green Building Council (USGBC), the term 'green building' refers to an interdisciplinary and holistic approach to design and construction that, "strives to balance environmental responsibility, resource efficiency, occupant comfort and well-being, and community sensitivity."[1] Sometimes called "high-performance building" or "sustainable design and construction," green building strives for built environment sustainability, which can be defined as meeting the needs of today without compromising the ability of future generations to meet their needs. Green building design requires that all players ranging from the design team (building owners, architects, engineers, and consultants), the construction team (materials manufacturers, contractors and waste haulers), maintenance staff, and building occupants, collaborate and coordinate individual efforts.

The LEED green building rating system was first drafted by the USGBC in 1994, in the model of other green building rating systems such as Britain's BREEAM (Building Research Establishment Environmental Assessment Method). The first LEED-rated buildings were certified as pilot projects in 2000. Initially consisting of a single rating system for new construction and major renovations of existing buildings (LEED-NC/EB), the USGBC has since tailored other forms of the LEED system to meet the needs of many other aspects of the built environment. Today, LEED applies to the operations and maintenance of existing buildings (LEED-EB), commercial interiors (LEED-CI), core and shell developments (LEED-CS), residences (LEED-Homes), neighborhood development (LEED-ND), schools (LEED-Schools), retail (LEED-Retail NC), and campuses or areas with multiple buildings (LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects). Currently in pilot phases are green rating systems for health care (LEED for Healthcare) and laboratory (LEED for Labs) settings.[2]

In general, the LEED rating system evaluates buildings using a point system, in which points are awarded in five categories:

[1] LEED Reference Guide for New Construction & Major Renovations, Version 2.1. May 2003.
[2] http://www.usgbc.org/ Accessed May 9, 2007.

- sustainable sites;
- water efficiency;
- energy & atmosphere;
- materials & resources; and
- indoor environmental quality.

Each category contains specific, quantitative requirements that if met, contribute between one and five points to the overall rating of the building. When sufficient points are accumulated, the building is awarded one of the following certifications: Certified, Silver, Gold, or Platinum. Specific requirements and thresholds for certification vary between LEED ratings systems is presented in Table 1.

Table 1 Summary of Points Required for Each Rating Level
2030 Sewer System Master Plan
City and County of San Francisco

Rating Level	LEED-NC/EB v2.2	LEED-EB v2.0	Five Evaluation Categories
Certified	26-32	32-39	• Sustainable Sites • Water Efficiency • Energy & Atmosphere • Materials & Resources • Indoor Environmental Quality
Silver	33-38	40-47	
Gold	39-51	48-63	
Platinum	52-69	64-85	

3.0 WHY SHOULD WE CARE ABOUT LEED AND GREEN BUILDING?

Buildings in the United States consume over 30 percent of the nation's total energy demand and 60 percent of its electricity. Five billion gallons per day of potable water are used to flush toilets, and a typical North American commercial construction project generates as much as 2.5 pounds of solid waste per square foot of building footprint. According to the US Department of Energy (DOE), buildings are responsible for 49 percent of acid-rain-causing sulfur dioxide emissions, 25 percent of nitrous oxide emissions, a greenhouse gas, and 10 percent of health-compromising particulate emissions. Buildings also produce 35 percent of the nation's carbon dioxide emissions. At least 38 million new buildings are estimated to be constructed in the next decade. Green-building practices can begin to minimize the environmental damage that results from these buildings. In addition, green building often reduces operating and material costs, increases market values, and has been shown to improve worker productivity and occupant health. It contributes to the

overall economic, environmental, and social sustainability of our cities and suburbs, and creates attractive environments for human and ecological communities alike. [3]

Application of LEED presents an opportunity to advance the benefits of green building and sustainability at the wastewater treatment level. Improving the sustainability of the Southeast and Oceanside treatment plants and their collection system presents a unique opportunity worthy of investigation. For the WWE's purposes, this memo will address the following questions:

- What are the paths toward LEED certification?
- Many of the wastewater treatment system's facilities consist of older buildings (e.g. SEP engineering building). What are some requirements for certifying an older building?
- What is the feasibility of just building to "LEED-equivalent" standards?
- What are requirements in LEED certification of laboratories?
- Is it possible to expand certification beyond the office and laboratory to the collection system's pump stations?

4.0 AVENUES OF CERTIFICATION

There are several avenues of certification available for the WWE facilities. These are discussed further below.

4.1 LEED Certification for Entire Sites

LEED-Campus applies to *new construction* and *major renovations* (LEED-NC/EB) projects in a campus or multi-building setting. It is intended for projects where several buildings are constructed at once, in phases, or a single building is constructed in a setting of existing buildings with common ownership or planning with the ability to share amenities or common design features. Guidelines for LEED-Campus are in conjunction with LEED-NC/EB. USGBC comments regarding the application of LEED on campus settings are found at the USGBC website.

LEED-Campus applies to the following situations[4]:

- Certification of a new building within a setting of existing buildings that are considered a campus, i.e. there is one owner or common property management and control.

[3] LEED Reference Guide for New Construction & Major Renovations, Version 2.1. May 2003.
[4] LEED-NC Application Guide for Multiple Buildings and On-Campus Building Projects. Oct 2005.

- Certification of a group of new buildings as a package where the entire building set will be rated as a package and only one rating received. These buildings may constitute the entire campus or be a subset of an existing campus.
- Certification of new buildings where each new building is constructed to a set of standards but will receive an independent rating based on achievement of credits beyond the standards specific to that building. These buildings may constitute the entire campus or be a subset of an existing campus.

LEED-Campus is a possible option for Southeast and Oceanside administration buildings, since plant amenities can be shared to accumulate credits; for example, Southeast utilizes greywater for plant processes including landscape irrigation. Several water efficiency credits can be attained because on-site buildings can take advantage of the plant's treatment facilities. Investigation of existing plant amenities is advised to uncover other credit opportunities.

4.2 LEED Existing Building Certification (LEED-NC/EB or LEED-EB)

There are two categories for certification of existing structures: (1) LEED-NC/EB, and (2) LEED-EB. The first category covers major renovations of existing structures, whereas the second category certifies buildings that are at least two years in operation and are not currently certified, or were previously certified under LEED-NC and recertification is sought after the initial two-year period.

Unlike certification for new construction, LEED-EB certification requires data of actual building performance. For initial certification, one-year's worth of operating data is required. A list of LEED-NC/EB and LEED-EB requirements are provided in Appendices A and B, respectively.

4.3 "Green" Laboratories (Labs21 EPC)

WWE laboratories, such as Millbrae, consume more energy and require stringent indoor environment quality standards than office environments. Chemical analysis equipment, the extra need for potable water, continuously running fume hoods to ensure adequate ventilation of toxic vapors – all are examples of the added demands that require a set of sustainable building guidelines tailored specifically for this environment.

The USGBC currently does not have a LEED type checklist for laboratory environments. However, a program sponsored by the DOE and the Environmental Protection Agency (EPA) has developed a certification checklist for such settings. The Laboratories for the 21st Century Environmental Performance Criteria (Labs21 EPC) builds upon the LEED rating system, extending it to conform to the laboratory setting. Labs21 pursues goals are similar to LEED[5]. These are:

[5] Labs21. Website: http://www.labs21century.gov/

- Adopt energy and performance goals
- Assess opportunities from a “Whole Building” approach
- Use lifecycle cost decision making
- Commission equipment and controls in new construction and retrofits
- Employ a broad range of sustainable energy and water efficiency strategies
- Measure energy and water consumption and track emission reductions
- Evaluate on-site power generation, combined heat and power technologies, and renewable power purchases
- Specify green construction materials
- Promote energy and water efficiency operation and training efforts
- Explore sustainable design opportunities beyond the building site

Unlike the LEED system, Labs21 EPC does not have a certification process. The USGBC is currently piloting a LEED system for laboratories using Labs21 EPC as a basis for this effort. However, Labs21 guidelines add to LEED certification prerequisites and credits, making laboratory certification possible under the established LEED process. A Labs21 guideline is listed in Appendix C.

5.0 LEED OR LEED-EQUIVALENT STANDARDS?

When considering applying for certification, several benefits and drawbacks of embarking on the LEED certification process should be carefully considered. First, in favor of LEED, it is a nationally and internationally recognized standard that is highly acclaimed as one of the first steps towards a more sustainable built environment. Because it is third-party certified by the USGBC, LEED is a trusted and quantitative assessment of sustainability that is less likely to be criticized as “greenwash” by citizens, watchdog groups, or even other government agencies. If all stakeholders in a design and construction project are on board with LEED from the beginning, LEED-certification is possible with minimal added time and funding.

On the other hand, many cities and large institutions have chosen to adopt “LEED-equivalent” internal rating systems to save on time and expense. In these contexts, either the LEED process is followed exactly, or various elements of LEED are adopted, amended, or eliminated based on applicability to the building project being assessed.

UC Berkeley’s Building Energy and Reduction System (BEARS) and Minnesota’s Sustainable Building Guidelines (MSBG) are such examples of LEED-equivalent rating

systems. These systems suit the unique building needs for their respective organizations – an obvious advantage, as buildings ordinarily not covered by LEED can conform to a more appropriate or more demanding system than LEED. A disadvantage to consider is since the creator/administrator of the rating system is also the building owner; external critique can be lost, risking complacency and non-implementation of building goals. If this option is followed, the rating system's efficacy will need to rely on a strong marriage to overall sustainability goals.

An alternative to either the LEED or LEED-equivalent is to amend LEED to suit specific building types. Labs21 is a perfect example as it appends onto the LEED point system, making it applicable to the laboratory setting, while meeting LEED standards.

6.0 BUILDING "GREEN" IN THE WASTEWATER ENTERPRISE

Several examples of "green" building have already been implemented at wastewater treatment plants. These successful projects provide the WWE direction on how to implement "green" building at its facilities.

6.1 Green Buildings and the Wastewater Field

LEED building practices are becoming part of the wastewater field. Examples are presented in Table 2.

Table 2 Examples of LEED Practices in the Wastewater Field
2030 Sewer System Master Plan
City and County of San Francisco

Facility/Organization	Building Type	Location	LEED Rating
Triangle Wastewater Treatment Plant	Admin	Durham County Durham, NC	Certified
Water/Environmental Services Facility	Admin	Grand Rapids, MI	Certified
Tualatin Valley Water District (Clean Water Services)	Admin	Beaverton, OR	Silver
Durham Influent Pump Station (Clean Water Services)	Mechanical	Durham County, OR	In Certification Process

6.1.1 Triangle WWTP Administration Building (Durham County, North Carolina)

The Triangle WWTP administration building in Durham, North Carolina, was the first building of its type at a wastewater treatment plant to be certified. The administration building boasts many sustainable features including:

- The use of reclaimed water for the HVAC system and the toilets

- CFC reduction in HVAC equipment
- Digital lighting controls and occupancy sensors
- Tubular skylights for natural lighting
- Roof materials and color that lower solar energy absorption
- Reflective interior wall surfaces to allow more energy efficient lighting
- Use of recycled materials, such as concrete blocks, doors, windows, carpet, ceiling tiles, and vanity tops
- Low VOC paints, adhesives, and sealants
- Certified wood products from sustainable forests
- Storage and collection of recyclables
- The acquisition of regionally manufactured materials
- Diversion of 86% of the construction, demolition, and land clearing waste from the landfill

6.1.2 Durham Influent Pump Station (Durham County, Oregon)

LEED does not have rules specific to mechanical buildings. Nor is there an existing equivalent system in practice. However, LEED prescribes generalized approaches toward sustainable building practices that can be amended to suit buildings of any type. Although mechanical buildings, such as pump stations, have low occupancy and were designed primarily for mechanical systems rather than occupancy comfort, the LEED certification process can still be applied. For example, the public utility Clean Water Services of the Tualatin River Watershed in Oregon is in the process of LEED certifying it's newly constructed Durham Pump Station. A handful of the building's sustainability strategies include:

- Native plant landscaping (minimizes irrigation)
- Aggressive onsite stormwater management
- Low VOC interior finishes
- Reduced potable water use
- High recycled content of construction materials
- Regionally-sourced construction materials

- Incentives for alternative fuel vehicles
- Enhanced energy performance

6.2 Integrating LEED into WWE Buildings

The examples of Triangle WWTP and the Durham Pump Station demonstrate the applicability of LEED certification across a variety of buildings. The certification of existing WWE building infrastructure presents an interesting question – *Is it feasible to upgrade current WWE facilities to certification standards?*

The answer to this question can be complex. However, LEED prerequisites and credits provide a convenient starting point. Table 3 details a situation where a majority of credits are compiled by selecting efficient fixtures and sustainable materials, being active in construction waste management and recycling, mitigating storm water runoff, and taking advantage of San Francisco's existing policies and infrastructure. Thus, for new construction or any major renovation of existing WWE buildings, up to 18 of the requisite 26 credits needed for a LEED-*Certified* rating are either already achieved or could be achieved with minimal additional effort. This "Simple Green" approach demonstrates that being cognizant of green products and design practices results in a majority of credits for certification. Additional points may be possible with additional funding or minor construction renovations (e.g. purchasing green power, increasing day lighting by installing windows or skylights, etc).

7.0 CONCLUSIONS

The LEED certification approach detailed in this memo illustrates that a majority of the 18 of the 26 credits for accreditation are obtained through a selection of low-emitting building materials, being mindful of waste management, and recycling practices, and reduction of potable water usage. This "Simple Green" approach at the design stage nets credits without a dramatic increase in construction cost.

Sustainable building practices in the building industry have become widespread. Water and wastewater utilities such as Clean Water Services in Oregon have embraced green building as a tangible step towards sustainability in the built environment. For the WWE to embrace building green would not only include benefits of improved building efficiency and healthier working environments; but also demonstrate a commitment to sustainability practices and WWE's goals of mitigating negative impacts on the environment.

8.0 RECOMMENDATIONS FOR FUTURE RESEARCH

Further research is recommended to evaluate integration of LEED into the WWE system. These include a case study of the Clean Water Services approach and the, developing existing building certification, and development of an indoor air quality management plan.

Table 3	**LEED-NC/EB v2.2 Potential Credits Achievable in PUC Buildings[(1)]** **2030 Sewer System Master Plan** **City and County of San Francisco**	
Sustainable Site (SS)		**Req/Credit**
Prerequisite 1	Erosion & Sedimentation Control	Required
SS Credit 4.1	Alternative Transportation: Public Transportation Access	1
SS Credit 4.3	Alt. Trans: Low Emitting & Fuel Efficient Vehicles	1
SS Credit 6.1	Storm Water Design: Quantity Control	1
SS Credit 7.2	Heat Island Reduction: Roof	1
Water Efficiency (WE)		
WE Credit 1.1	Water Efficient Landscaping – Reduce Potable Usage by 50%	1
WE Credit 1.2	Water Efficient Landscaping - No Potable Water Use or No Irrigation (1 pt in addt to WE Credit 1.1)	1
WE Credit 3.1	Water Use Reduction: 20% Reduction	1
WE Credit 3.2	Water Use Reduction: 30% Reduction (1 pt in addt to WE Credit 3.1)	1
Energy and Atmosphere (EA)		
Prerequisite 1	Fundamental Commissioning of the Building Energy Systems	REQ
Prerequisite 2	Minimum Energy Performance	REQ
Prerequisite 3	Fundamental Refrigerant Mgmt	REQ
EA Credit 3	Enhanced Commissioning	1
Materials and Resources (MR)		
Prerequisite 1	Storage & Collection of Recyclables	REQ
Credit 2.1	Construction Waste Mgmt: Divert 50% from Disposal	1
Credit 2.2	Construction Waste Mgmt: Divert 75% from Disposal (1 point in addition to MR Credit 2.1)	1
Credit 4.1	Recycled Content: 10% (post-consumer + 1/2 pre-consumer)	1
Credit 4.2	Recycled Content: 20% (post-consumer + 1/2 pre-consumer) (1 pt in addt. to MR Credit 4.1)	1
Indoor Environment Quality (IEQ)		
Prerequisite 1	Minimum IAQ Performance	REQ
Prerequisite 2	Env. Tobacco Smoke (ETS) Control	REQ
IEQ Credit 4.1	Low-Emitting Materials: Adhesives & Sealants	1
IEQ Credit 4.2	Low-Emitting Materials: Paints & Coatings	1
IEQ Credit 4.3	Low-Emitting Materials: Carpet Sys	1
IEQ Credit 4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	1
Innovative Design (ID)		
ID Credit 2	LEED Accredited Professional	1
	Total Points	***18***

Note:

(1) This example illustrates 18 of the 26 points required for a LEED-Certified rating. Additional points may be possible with additional funding or minor construction renovations (e.g. purchasing green power, increasing daylighting by installing windows or skylights, etc)

8.1 Clean Water Services (CWS) Approach

A case study of the CWS utility in Oregon is advised to gauge the possible costs of building green. The CWS is a major supporter of LEED sustainability practices, designing their administration/laboratory addition, field operations building, and wastewater influent pump station to eco-friendly standards. A link to the CWS website is listed in the Resources and Contact section.

8.2 Existing Building Certification

Much like the collection system's operational differences during dry-weather events versus wet-weather events, unique differences exist between buildings, requiring establishment of consumption/waste baselines before changes are initiated. This building snapshot, in comparison with efficiency and resource reduction goals, highlights areas for improvement. From this stage it can be determined if LEED design practices are feasible to pursue. In addition, if existing building certification is desired, such baselines will be needed. LEED existing buildings (LEED-EB) provides a list of required submittals for certification. In general, for existing building LEED certification, a year's worth of building performance data is required.

8.3 Indoor Air Quality Management Plan

From initial investigations, an Indoor Air Quality Management Plan (IAQMP) needs to be compiled. SF Environment provides a general workup of how to develop such a plan. The USGBC also provides general IAQMP guidelines. Links to their respective websites are listed in the Resources & Contact section.

9.0 RESOURCES AND CONTACT INFORMATION

Baum, Mara. Anshen+Allen, Architects. LEED-A.P.

- Primarily deals with healthcare facilities
- E-mail: marabaum@gmail.com

Clean Water Services (CWS). Public utility responsible for the Tualatin River Watershed in Oregon

- Example of water/wastewater agency pursuing LEED certification of its facilities
- Links to CWS's Eco-Friendly Facilities: http://www.cleanwaterservices.org/AboutUs/Wastewater/TreatmentFacilities/Eco-friendlyFacilities.aspx

Daniels, Jubilee. LEED-EB Consultant

- Phone No.: 925-518-1128
- E-mail: jubilee196@yahoo.com

Jencks, Rosey. SFPUC.

- Stormwater runoff mitigation expert
- E-mail: rjencks@sfwater.org

Labs21. Labs for the 21st Century.

- Labs21 provides guidelines for designing sustainable, high-performance, and low-energy laboratories
- Website: http://www.labs21century.gov/
- Tool kit link: http://www.labs21century.gov/toolkit/index.htm

LEED Website.

- Provides description of LEED certification requirements and supporting documents
- http://www.usgbc.org/DisplayPage.aspx?CategoryID=19

Lewis, Scott. Brightworks Founder and Principal. LEED A.P.

- Brightworks provides sustainability consulting services to large institutions
- Currently working on Durham Influent Pump Station certification
- Brightworks website: http://www.brightworks.net/index.php
- E-mail: scott@brightworks.net

Palmer, Mark. SF Environment. Municipal Green Building Coordinator. LEED A.P.

- Phone No.: 415-355-3710
- E-mail: mark.palmer@sfgov.org

SF Environment.

- Provides guidance for SF green builders – LEED documentation, suggested building materials and fixture lists, etc.
- Website: http://www.sfenvironment.org/index.html

- SF Municipal Green Bldg Guide

  http://www.sfenvironment.com/aboutus/innovative/greenbldg/gb_compliance_guide.pdf

- Green Building Material Resource Guide: http://www2.sfenvironment.org/aboutus/innovative/greenbldg/resource_guide/

State of Minnesota Sustainable Building Guidelines (MSBG) Version 2.0

- Example of a municipal LEED-Equivalent guideline

- Documents Downloads: http://www.msbg.umn.edu/download2.html
  - Guidelines: http://www.msbg.umn.edu/downloads_v2_0/guidelines.pdf
  - Workbook:
    * Assigns party responsibilities and details efficiency/reduction baselines
    * Website: http://www.msbg.umn.edu/downloads_v2_0/B3-MSBG_Workbook.xls

Triangle WWTP. Durham County Government Minutes. 12 Dec 2005. Accessed: 16 Jun 2007.

- Design features of the LEED certified administration building

- Website:

  http://www.durhamcountync.gov/departments/bocc/Agendas/Archives/2005/12-12-05.html

- Renovation Project Engineers:
  - Whisler, Glen. PE, County Engineer, 919-560-0738
    * gwhisler@co.durham.nc.us
  - Hill, Chuck. PE, Utility Division Manager, 919-560-7992
    * chill@co.durham.nc.us

APPENDIX A - LEED-NC/EB V2.2

APPENDIX A - LEED-NC/EB V2.2

LEED-NC/EB Version 2.2		
Sustainable Site (SS)		
Prerequisite 1	Erosion & Sedimentation Control	Required
SS Credit 1	Site Selection	1
SS Credit 2	Development Density & Community Connectivity	1
SS Credit 3	Brownfield Redevelopment	1
SS Credit 4.1	Alternative Transportation: Public Transportation Access	1
SS Credit 4.2	Alternative Transportation: Bicycle Storage & Changing Rooms	1
SS Credit 4.3	Alt. Trans: Low Emitting & Fuel Efficient Vehicle	1
SS Credit 4.4	Alt. Trans: Parking Capacity	1
SS Credit 5.1	Site Development -- Protect or Restore Habitat	1
SS Credit 5.2	Site Development: Maximize Open Space	1
SS Credit 6.1	Stormwater Design: Quantity Ctrl	1
SS Credit 6.2	Stormwater Design: Quality Ctrl	1
SS Credit 7.1	Heat Island Reduction: Non-Roof	1
SS Credit 7.2	Heat Island Reduction: Roof	1
SS Credit 8	Light Pollution Reduction	1
Water Efficiency (WE)		
WE Credit 1.1	Water Efficient Landscaping - Reduce By 50%	1
WE Credit 1.2	Water Efficient Landscaping - No Potable Water Use or No Irrigation (1 pt in addt to WE Credit 1.1)	1
WE Credit 2	Innovative WW Technologies	1
WE Credit 3.1	Water Use Reduction: 20% Reduction	1
WE Credit 3.2	Water Use Reduction: 30% Reduction (1 pt in addt to WE Credit 3.1)	1
Energy and Atmosphere (EA)		
Prerequisite 1	Fundamental Commissioning of the Building Energy Systems	REQ
Prerequisite 2	Minimum Ene Performance	REQ
Prerequisite 3	Fundamental Refrigerant Mgmt	REQ
EA Credit 1	Optimize Energy Performance	1-10
EA Credit 2	On-Site Ene	1-3
EA Credit 3	Enh. Commissioning	1
EA Credit 4	Eng. Refrigerant Mgmt	1
EA Credit 5	Measurement & Verification	1
EA Credit 6	Green Power	1
Materials and Resources (MR)		
Prerequisite 1	Storage & Collection of Recyclables	REQ
Credit 1.1	Building Reuse: Maintain 75% of Existing Walls, Floors & Roof	1
Credit 1.2	Building Reuse: Maintain 95% of Existing Walls, Floors & Roof (1 pt in addt to MR Credit 1.1)	1
Credit 1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements	1
Credit 2.1	Const. Waste Mgmt: Divert 50% from Disposal	1

Credit 2.2	Const. Waste Mgmt: Divert 75% from Disposal (1 pt in addt to MR Credit 2.1)	1
Credit 3.1	Materials Reuse: 5%	1
Credit 3.2	Materials Reuse: 10% (1 pt in addition to MR Credit 3.1)	1
Credit 4.1	Recycled Content: 10%(post-consumer + 1/2 pre-consumer)	1
Credit 4.2	Recycled Content: 20%(post-consumer + 1/2 pre-consumer) (1 pt in addt to MR Credit 4.1)	1
Credit 5.1	Regional Materials: 10% Extracted, Processed & Manuf Regionally	1
Credit 5.2	Regional Materials: 20% Extracted, Processed & Manuf Regionally (1 pt in addt to MR Credit 5.1)	1
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1
Indoor Environment Quality		
Prerequisite 1	Minimum IAQ Performance	REQ
Prerequisite 2	Env Tobacco Smoke (ETS) Control	REQ
IEQ Credit 1	Outdoor Air Delivery Monitoring	1
IEQ Credit 2	Increased Ventilation	1
IEQ Credit 3.1	Construction IAQ Mgmt Plan: During Construction	1
IEQ Credit 3.2	Construction IAQ Mgmt Plan: Before Occupancy	1
IEQ Credit 4.1	Low-Emitting Materials: Adhesives & Sealants	1
IEQ Credit 4.2	Low-Emitting Materials: Paints & Coatings	1
IEQ Credit 4.3	Low-Emitting Materials: Carpet Sys	1
IEQ Credit 4.4	Low-Emitting Materials: Composite Wood & Agrifiber Products	1
IEQ Credit 5	Indoor Chem & Pollutant Source Ctrl	1
IEQ Credit 6.1	Controllability of Systems: Lighting	1
IEQ Credit 6.2	Controllability of Systems: Thermal Comfort	1
IEQ Credit 7.1	Thermal Comfort: Design	1
IEQ Credit 7.2	Thermal Comfort: Verification	2
IEQ Credit 8.1	Daylight and Views: Daylight 75% of Spaces	1
IEQ Credit 8.2	Daylight and Views: Daylight 95% of Spaces	1
Innovative Design		
Credit 1.1-1.4	Innovation in Design	1-4
Credit 2	LEED Accredited Professional	1

APPENDIX B – LEED-EB V2

APPENDIX B – LEED-EB V2

LEED Existing Building	Version 2	
Sustainable Site		
Prerequisite 1	Erosion & Sedimentation Control	Required
Prerequisite 2	Age of Building	Required
SS Credit 1.1 & 1.2	Plan for Green Site and Building Exterior Management	1-2
SS Credit 2	High Development Density Building and Area	1
SS Credit 3.1	Alternative Transportation: Public Transportation Access	1
SS Credit 3.2	Alternative Transportation: Bicycle Storage & Changing Rooms	1
SS Credit 3.3	Alt. Trans: Alt. Fuel Vehicles	1
SS Credit 4.1 & 4.2	Reduced Site Disturbance -- Protect or Restore Open Space	1-2
SS Credit 5.1 & 5.2	Stormwater Mgmt: Rate and Quantity Reduction	1-2
SS Credit 6.1	Heat Island Reduction: Non-Roof	1
SS Credit 6.2	Heat Island Reduction: Roof	1
SS Credit 7	Light Pollution Reduction	1
Water Efficiency		
Prerequisite 1	Minimum Water Efficiency	REQ
Prerequisite 2	Discharge Water Compliance	REQ
WE Credit 1.1 & 1.2	Water Efficient Landscaping - Reduce Water Use	1-2
WE Credit 2	Innovative Wastewater Tech	1
WE Credit 3.1 & 3.2	Water Use Reduction	1-2
Energy & Atmosphere		
Prerequisite 1	Existing Building Commissioning	REQ
Prerequisite 2	Minimum Ene Performance	REQ
Prerequisite 3	Ozone Protection	REQ
EA Credit 1	Optimize Energy Performance	1-10
EA Credit 2.1 - 2.4	On-Site & Off-Site Renewable Ene	1-4
EA Credit 3.1	Bldg. O&M: Staff Edu	1
EA Credit 3.2	Bldg. O&M: Bldg Sys Maint	1
EA Credit 3.3	Bldg. O&M: Bldg Sys Monitoring	1
EA Credit 4	Addt Ozone Protection	1
EA Credit 5.1 - 5.3	Performance Measurement: Ene Metering	1-3
EA Credit 5.4	Performance Measurement: Emission Reduction Rpt	1
EA Credit 6	Documenting Sustainable Building Cost Impacts	1
Materials & Resource		
Prerequisite 1.1	Source Reduction and Waste Mgmt: Waste Mgmt Policy and Waste Stream Audit	REQ
Prerequisite 1.2	Source Reduction and Waste Mgmt: Storage & Collection of Recyclables	REQ
Prerequisite 2	Toxic Material Source Reduction: Reduced Hg in Light Bulbs	REQ

Credit 1.1 & 1.2	Const, Demo, & Renovation Waste Mgmt	1-2
Credit 2.2 - 2.5	Optimize Use of Alt Materials	1-5
Credit 3.1 - 3.2	Optimize Use of IAQ Compliant Products	2
Credit 4.1 - 4.3	Sustainable Cleaning Products and Materials	1-3
Credit 5.1 - 5.3	Occupant Recycling	1-3
Credit 6	Addt Toxic Material Reduction: Reduced Hg in Light Bulbs	1
Indoor Environment Quality		
Prerequisite 1	Outside Air Introduction and Exhaust Systems	REQ
Prerequisite 2	Env Tobacco Smoke (ETS) Control	REQ
Prerequisite 3	Asbestos Removal or Encapsulation	REQ
Prerequisite 4	PCB Removal	REQ
IEQ Credit 1	Outdoor Air Delivery Monitoring	1
IEQ Credit 2	Increased Ventilation	1
IEQ Credit 3	Construction IAQ Mgmt Plan	1
IEQ Credit 4.1	Documenting Prod Impacts: Absenteeism & Health Care Cost Impacts	1
IEQ Credit 4.2	Documenting Prod Impacts:Other Productivity Impacts	1
IEQ Credit 5.1	Indoor Chem & Pollutant Source Ctrl: Non-Cleaning Sys - Reduce Particulates in Air Distribution	1
IEQ Credit 5.2	Indoor Chem & Pollutant Source Ctrl: Non-Cleaning Sys - Isolation of High-Volume Copying/Print Rm/Fax Stations	1
IEQ Credit 6.1	Controllability of Systems: Lighting	1
IEQ Credit 6.2	Controllability of Systems: Temp & Ventilation	1
IEQ Credit 7.1	Thermal Comfort: Compliance	1
IEQ Credit 7.2	Thermal Comfort: Perm Monitoring Sys	1
IEQ Credit 8.1 & 8.2	Daylight and Views: Daylight	2
IEQ Credit 8.3 & 8.4	Daylight and Views: Views	2
IEQ Credit 9	Contemporary IAQ Practice	1
IEQ Credit 10.1	Green Cleaning: Entryway Systems	1
IEQ Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	1
IEQ Credit 10.3	Green Cleaning: Low Env. Impact Cleaning Policy	1
IEQ Credit 10.4 & 10.5	Green Cleaning: Low Env. Impact Pest Mgmt Policy	2
IEQ Credit 10.6	Green Cleaning: Low Env. Impact Cleaning Eqpmt Policy	1
Innovation in Upgrades, Operation and Maintenance		
IUOM Credit 1	Innovation in Upgrades, O&M	1-4
IUOM Credit 2	LEED Accredited Professional	1

APPENDIX C – LABS21 EPC

APPENDIX C – LABS21 EPC

NOTE: Labs21 EPC is an addendum to LEED v2.1. Labs21 does *not* have a certification process. Labs21 EPC additions are highlighted yellow and *italicized*. Hyperlinks lead to online descriptions/strategies.

Sustainable Sites		16
Prerequisite 1	Erosion & Sedimentation Control	Required
Credit 1	Site Selection	1
Credit 2	Urban Redevelopment	1
Credit 3	Brownfield Redevelopment	1
Credit 4.1	Alternative Transportation, Public Transportation Access	1
Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
Credit 4.3	Alternative Transportation, Alternative Fuel Refueling Stations	1
Credit 4.4	Alternative Transportation, Parking Capacity	1
Credit 5.1	Reduced Site Disturbance, Protect or Restore Open Space	1
Credit 5.2	Reduced Site Disturbance, Development Footprint	1
Credit 6.1	Stormwater Management, Rate or Quantity	1
Credit 6.2	Stormwater Management, Treatment	1
Credit 7.1	Landscape & Exterior Design to Reduce Heat Islands, Non-Roof	1
Credit 7.2	Landscape & Exterior Design to Reduce Heat Islands, Roof	1
Credit 8	Light Pollution Reduction	1
Credit 9.1	*Safety and Risk Management, Air Effluent*	*1*
Credit 9.2	*Safety and Risk Management, Water Effluent*	*1*
Water Efficiency		7
Prerequisite 1	*Laboratory Equipment Water Use*	*Required*
Credit 1.1	Water Efficient Landscaping, Reduce by 50%	1
Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	1
Credit 2	Innovative Wastewater Technologies	1
Credit 3.1	Water Use Reduction, 20% Reduction	1
Credit 3.2	Water Use Reduction, 30% Reduction	1
Credit 4.1	*Process Water Efficiency, Document Baseline*	*1*
Credit 4.2	*Process Water Efficiency, 20% Reduction*	*1*
	25	
Prerequisite 1	Fundamental Building Systems Commissioning	Required
Prerequisite 2	*Minimum Energy Performance*	*Required*
Prerequisite 3	CFC Reduction in HVAC&R Equipment	Required
Prerequisite 4	*Assess Minimum Ventilation Requirements*	*Required*
Credit 1.1	*Optimize Energy Performance, 5%*	*1*

Credit 1.2	*Optimize Energy Performance, 10%*	*1*
Credit 1.3	*Optimize Energy Performance, 15%*	*1*
Credit 1.4	*Optimize Energy Performance, 20%*	*1*
Credit 1.5	*Optimize Energy Performance, 25%*	*1*
Credit 1.6	*Optimize Energy Performance, 30%*	*1*
Credit 1.7	*Optimize Energy Performance, 35%*	*1*
Credit 1.8	*Optimize Energy Performance, 40%*	*1*
Credit 1.9	*Optimize Energy Performance, 45%*	*1*
Credit 1.10	*Optimize Energy Performance, 50%*	*1*
Credit 2.1	*Renewable Energy, 2% Contribution*	*1*
Credit 2.2	*Renewable Energy, 5% Contribution*	*1*
Credit 2.3	*Renewable Energy, 10% Contribution*	*1*
Credit 3	Additional Commissioning	1
Credit 4	Ozone Depletion	1
Credit 5	Measurement & Verification	1
Credit 6	Green Power	1
Credit 7.1	*Energy Supply Efficiency, 10%*	*1*
Credit 7.2	*Energy Supply Efficiency, 20%*	*1*
Credit 7.3	*Energy Supply Efficiency, 30%*	*1*
Credit 7.4	*Energy Supply Efficiency, 40%*	*1*
Credit 7.5	*Energy Supply Efficiency, 50%*	*1*
Credit 8	*Improve Laboratory Equipment Efficiency*	*1*
Credit 9.1	*Right-size Laboratory Equipment Load: Measure Comparable Lab*	*1*
Credit 9.2	*Right-size Laboratory Equipment Load: Metering Provision*	*1*
	14	
Prerequisite 1	Storage & Collection of Recyclables	Required
Prerequisite 2	*Hazardous Material Handling*	*Required*
Credit 1.1	Building Reuse, Maintain 75% of Existing Shell	1
Credit 1.2	Building Reuse, Maintain 100% of Shell	1
Credit 1.3	Building Reuse, Maintain 100% Shell & 50% Non-Shell	1
Credit 2.1	Construction Waste Management, Divert 50%	1
Credit 2.2	Construction Waste Management, Divert 75%	1
Credit 3.1	Resource Reuse, Specify 5%	1
Credit 3.2	Resource Reuse, Specify 10%	1
Credit 4.1	Recycled Content, Specify 25%	1
Credit 4.2	Recycled Content, Specify 50%	1
Credit 5.1	Local/Regional Materials, 20% Manufactured Locally	1
Credit 5.2	Local/Regional Materials, of 20% Above, 50% Harvested Locally	1
Credit 6	Rapidly Renewable Materials	1
Credit 7	Certified Wood	1

Credit 8	*Chemical Resource Management*	*1*
Indoor Environmental Quality		18
Prerequisite 1	Minimum IAQ Performance	Required
Prerequisite 2	Environmental Tobacco Smoke (ETS) Control	Required
Prerequisite 3	*Laboratory Ventilation*	*Required*
Prerequisite 4	*Exterior Door Notification System*	*Required*
Credit 1	Carbon Dioxide (CO2) Monitoring	1
Credit 2	Increase Ventilation Effectiveness	1
Credit 3.1	Construction IAQ Management Plan, During Construction	1
Credit 3.2	Construction IAQ Management Plan, Before Occupancy	1
Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	1
Credit 4.2	Low-Emitting Materials, Paints	1
Credit 4.3	Low-Emitting Materials, Carpet	1
Credit 4.4	Low-Emitting Materials, Composite Wood	1
Credit 5	Indoor Chemical & Pollutant Source Control	1
Credit 6.1	*Controllability of Systems, Perimeter*	*1*
Credit 6.2	Controllability of Systems, Non-Perimeter	1
Credit 7.1	Thermal Comfort, Comply with ASHRAE 55-1992	1
Credit 7.2	Thermal Comfort, Permanent Monitoring System	1
Credit 8.1	Daylight & Views, Daylight 75% of Spaces	1
Credit 8.2	Daylight & Views, Views for 90% of Spaces	1
Credit 9.1	*Indoor Environmental Safety, Airflow Modeling*	*1*
Credit 9.2	*Indoor Environmental Safety, Fumehood Commissioning*	*1*
Credit 9.3	*Indoor Environmental Safety, Alarm Systems*	*1*
Innovation & Design Process		5
Credit 1.1	Innovation in Design: Specific Title	1
Credit 1.2	Innovation in Design: Specific Title	1
Credit 1.3	Innovation in Design: Specific Title	1
Credit 1.4	Innovation in Design: Specific Title	1
Credit 2	LEED™ Accredited Professional	1