

US EPA ARCHIVE DOCUMENT

# land revitalization

Region 5 Land Revitalization Technical Assistance Project

## GREEN BUILDING AND HISTORIC PRESERVATION CASE STUDIES FOR MOLINE MULTI-MODAL STATION PROJECT (1 OF 5)

EPA provided technical assistance support to the City of Moline, Illinois in the areas of green building and historic preservation for the Moline Multi-Modal Station Project. This assistance was intended to strengthen the HUD-DOT-EPA Partnership for Sustainable Communities by providing the City of Moline access to technical resources and expertise. EPA's technical assistance activities focused on the development of five case studies on the renovation of existing/historic structures to meet Leadership in Energy and Environmental Design (LEED) standards for multi-modal transportation projects, where possible. These five case studies were presented at the Moline Developer Workshop held on October 18, 2011. This is the first case study in the series.

### KING STREET STATION CASE STUDY SEATTLE, WASHINGTON

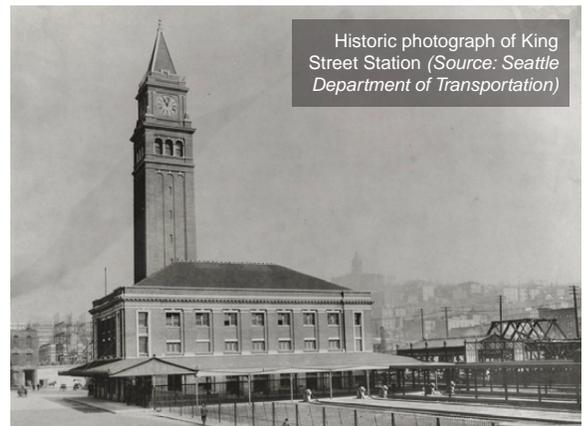
#### Project Summary

The City of Seattle purchased King Street Station, a brick and granite three-story building with a 12-story clock tower, from the Burlington Northern Santa Fe Railway Company in 2008. Under city ownership, King Street Station is undergoing a \$50 million phased renovation to achieve the following goals:

- Restore the building's historic character and grandeur;
- Upgrade station facilities to meet present and future needs of rail and bus users;
- Enhance passenger safety and security;
- Promote sustainable design with a Leadership in Energy and Environmental Design (LEED) Silver building certification; and
- Support efforts to transform the station into a modern transit hub.

#### Historic Features

Activities aimed at preserving the site's historic designation include rehabilitation of: the iconic 12-story clock tower, original 35-foot-high ornamental plaster ceilings and walls, terrazzo and mosaic tile floors, and operable windows. True to the building's original look, the white marble wainscoting, decorative sconces and glass globe chandeliers that were removed during modernization of the station in the 1950s will be replicated and/or replaced where possible.



Historic photograph of King Street Station (Source: Seattle Department of Transportation)

#### Project Description

**Elements:** Transit, Historic, Green

#### Size of Community Served:

- Seattle population = 608,660
- 2.7 million passengers in 2007: Served by Amtrak trains, Thruway Motorcoach, and Sounder commuter rail

**Current Owner:** City of Seattle

**Square Footage of New, Renovated, Adaptive Reuse:** 88,500 (building and clock tower)

**Original Construction Date:** 1906

**Historic Designation:** National Register of Historic Places (1973)

**Project Completion Date:** Spring 2013

**Construction and Project Costs:** \$50 million

**LEED or Other Green Certification:** Targeted LEED NC Silver – expected to achieve Platinum

A major part of the historic rehabilitation involves restoring the 105-year-old original Douglas-fir windows and returning them to an operable condition (many windows have been painted, nailed or caulked shut). The design team, together with an historic preservation consultant, took a detailed survey of the building's 26 different window types, defining characteristics and condition to determine whether to repair or replace the existing windows.

### Green Features

A number of sustainable strategies and systems are envisioned to increase building performance including installing natural ventilation, replacing all mechanical systems with a ground-source heat pump, and using energy- and water-efficient lights and fixtures. Computer energy models predict that the building can perform 56.4% better than ASHRAE 2007, a common energy goal, and meet benchmarks of the Architecture 2030 Challenge, which sets targets to reduce energy consumption in new and existing buildings.

## Challenges and Solutions

### Seismic and Structural Upgrades

The rehabilitation includes significant seismic and structural updates to improve the building's safety, durability and longevity. All of these updates comply with the city's sustainable building standards and the Secretary of the Interior's Standards and Guidelines for Historic Preservation. The building was poorly maintained and allowed to deteriorate over the last century; the rehabilitation will bring King Street Station up to modern codes while retaining its historic character. The project is one of the first to comply with the City of Seattle's new code for Seismic Rehabilitation of Existing Buildings (ASCE 41), which allows for a project-specific, site-specific response to structural upgrades in lieu of standard, code-defined responses.

The planned design takes advantage of this code flexibility, coupled with the building's location in a liquefaction zone (i.e., an area where the strength and stiffness of soil is reduced by earthquake shaking or other rapid loading) and unreinforced masonry perimeter walls, to supplement rather than replace the station's existing structural system (which has performed remarkably well in several significant seismic events).

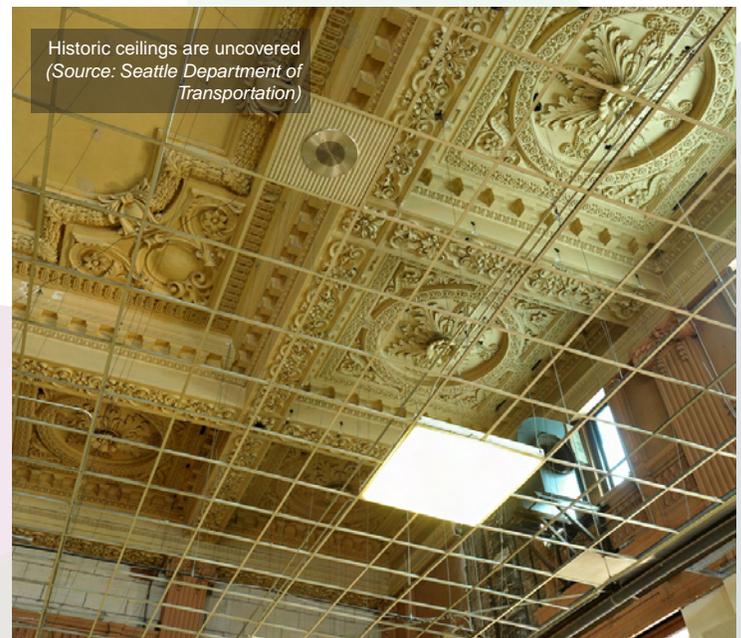
The vast majority of the added structural support elements required careful insertion behind existing historic finishes. With only three inches between the historic finishes and the wall to insert the system,

standard reinforcement approaches were not possible; a combination of anchors, wide flange sections, and horizontal steel plates were inserted into existing walls around the entire perimeter of the station's three main floors. Additionally, a combination of steel helical piles and grade beams were added along with a structural collar to the outside of the building to reinforce the foundation while preserving the historic terrazzo floors in the public areas.

### Improve Energy Performance

After determining that the antiquated equipment used to heat the station was extremely inefficient (cooling was nonexistent), the design team conducted a cost-benefit analysis to determine the most effective and minimally invasive mechanical system to meet both energy performance goals and the project budget.

A ground-source heat pump system was selected; however, initial funding only allowed for 37 geothermal wells (which would provide only enough for the building's public heating and cooling needs). The design team took advantage of the structural work on an adjacent area known as the Jackson Street Plaza to install these 37 wells under the building, in a system that allowed additional wells to be added when funding became available. Since then, the Seattle Department of Transportation (SDOT) received a grant from the Federal Transit Administration (FTA) for additional geothermal wells (a total of 68 have been installed) which are anticipated to meet all of the building's heating and cooling requirements. Space has also been allocated for a future boiler and fluid cooler, in the event that occupant loads greatly exceed those anticipated.



The total projected energy savings associated with the mechanical and geothermal upgrade translates into a reduction of 206 metric tons of carbon dioxide (CO<sub>2</sub>) per year, an extraordinary improvement over pre-retrofit operation on a per square foot basis. The pre-retrofit active area (13,383 square feet) was using 118 KBTU/ square foot/year. When renovations are finished, the complete active area (totaling 64,334 square foot) will have an energy use intensity (EUI) of 38 KBTU/ square foot/year. This translates to a 68% reduction in energy use in a space more than four times its original size. Additionally, energy models predict the overall building to perform 56% better than ASHRAE 2007 and to meet the benchmarks of the Architecture 2030 Challenge.

### **Restore Natural Ventilation**

The interior environment of the station will feature restored and enhanced natural ventilation capabilities that provide high indoor air quality and comfortable temperatures. Because the station was originally designed to be naturally ventilated and restoration of the historic windows is part of the project scope, the design team explored local climate conditions to retain the use of natural ventilation (consistent with historical performance) where possible to improve energy efficiency and serve as a model for other buildings.

Onsite air quality testing was conducted around the station, particularly around selected waiting room windows, to monitor the collective effect of pollutants from trains, roads, loading docks and other vehicular traffic. These tests showed that the outside air quality meets ASHRAE Std. 62.1 requirements. This finding will allow the design team to pursue a naturally ventilated scheme that will create a comfortable and healthy indoor environment.

Local climate research and analysis conducted with local wind data, cloud cover data, and typical meteorological year (TMY3) data helped determine anticipated conditions. Thermal comfort levels were established for different areas of the building based on accepted temperature ranges, also taking into account outdoor temperatures and area functions to ensure occupant comfort. As waiting areas have a wider thermal acceptance range due to their function as “temporary” space, natural ventilation will be limited to these areas (representing 23% of the occupied portion of the building). Mechanical cooling will only be provided in these areas when the outside temperatures rise above 80°F.

To effectively implement this strategy, the historic window actuators in the public waiting areas will be restored and electronically controlled by an automated system to meet ventilation and cooling requirements monitored by CO<sub>2</sub> sensors and thermostats. Actuators are required due to the public nature of the spaces that limit personal control as well as the physical location of the windows, which are generally inaccessible due to height.

### **Phased and Long-Term Planning**

This project demonstrates that logical and prudent strategies for phased development projects can restore historic facilities while accommodating additions and improvements. Early collaboration among project team members—including the architect, contractor, green building consultant, historic consultant, engineers, owner, owner’s representative and building tenant—allowed the team to outline long-term goals and embed them in the scope of work from the project’s outset. This clear, early direction allows work to be phased in order to capitalize on funding as it becomes available, and accommodate future development, technologies and modes of transit.

The creation of a long-term “Urban Vision” to complement the station’s rehabilitation outlined additional, future enhancements to the facility, adjacent neighborhoods and open space to further benefit the community and inspire additional, area-wide improvements.

### **Partnerships and Funding Strategies**

Restoration of King Street Station is being funded by contributions from city, state and federal governments as well as nonprofit organizations. The voter-approved Bridging the Gap initiative—a nine-year, \$365 million levy for transportation maintenance and improvements—provides \$10 million to the project; an additional \$40 million comes from the FTA (including TIGGER II funding), Federal Railroad Administration, the Washington State Department of Transportation (WSDOT), the Washington State Historical Society, and two non-governmental organizations (South Downtown Foundation and 4Culture). In addition, WSDOT and Amtrak purchased new exterior awnings and restored the building’s entryway foyer and waiting area restrooms at a cost of \$4 million.

### **Leveraging Private Investment**

Catalyzed through focused investment in the historic transit station, private development interests recognize the opportunity to build on the momentum created by the renovation effort. As a result, current and future investment adjacent to the station will create millions

of square feet of adaptive reuse and new commercial development. The King Street Station project highlights the potential for financing area-wide redevelopment through a combination of public and private resources.

**Leasable Tenant**

The renovation offers mixed-use leasable office space on the building’s second and third floors. Eventually, this space will be used by commercial tenants to create revenue and enhance the station’s appeal to commuters and the community. These tenant spaces will be upgraded to meet current code and prepared to a “core and shell” state, in order to accommodate specific tenant needs as spaces are leased. Tenants must share a commitment to preservation, stewardship of the natural environment, and a desire to promote dense, transit-oriented urban development. In accordance, the design team is helping to develop tenant guidelines outlining proper and environmentally responsible actions for office space lessees.



Rendering of finished Jackson Plaza  
(Source: Seattle Department of Transportation)

**Project Effect on Neighborhood**

The project makes environmentally and fiscally conscious improvements to increase and improve the use of King Street Station and create an active, vibrant commercial and transit hub.

Through this project, the following, planned improvements will enhance the urban fabric of the neighborhood:

- Re-establish historic development patterns to focus on pedestrian and transit friendly neighborhoods
- Repair, restore, clean or replace (as needed) the brick facade and terra cotta detail to improve the building’s face to the community
- Install new overhead canopies to provide weather protection and create inviting building entries
- Remove existing parking in front of the building to create a new pedestrian plaza space that accommodates outdoor community activities and events
- Install architectural lighting to highlight the building’s historic features
- Encourage future tenant use of the second floor to further activate the adjacent Jackson Street Plaza, a public meeting area
- Include a new passenger drop-off /pick-up location and turnaround on King Street to help manage vehicular traffic and improve pedestrian access
- Reopen the Jackson Plaza entrance and install a new elevator to improve station access and Americans with Disabilities Act compliance
- Widen and repave existing walkways, and reopen the grand staircase which connects the Jackson Plaza and the lower station entrance to enhance pedestrian access
- Install new lighting, furniture, natural landscaping and signage to welcome travelers and visitors
- Incorporate materials that acknowledge the historic nature of the station and surrounding neighborhood

Positioned at the nexus of two historic neighborhoods (Pioneer Square and the International District), and in proximity to two professional sports stadiums (Safeco Field and CenturyLink Field), the King Street Station project is seen as a catalyst for public and private redevelopment area-wide. Related projects include an envisioned, 500,000-square-foot mixed-use and residential community on the adjacent “North Lot”; as well as more than 3 million square feet of commercial

development using the air rights over the station's tracks (which are currently being explored by interested parties).

## Sources for Additional Information

For more information on this restoration project, please see the King Street Station website: <http://www.seattle.gov/transportation/kingstreet.htm>.

## Project Contact

For more information on the King Street Station restoration, please contact:

### Trevina Wang

King Street Station Program Manager  
Seattle Department of Transportation  
(206) 684-3072  
[trevina.wang@seattle.gov](mailto:trevina.wang@seattle.gov)

## Project Team

**Architects** – ZGF Architects, LLP

**GCCM** – Sellen Construction

**Owner's Representative** – Shiels Oblatz Johnsen, Inc.

**SMEP Engineer** – ARUP

**Historic Consultant** – Artifacts, Inc.

**LEED Certification** – Green Building Services, Inc.

**Cost Estimating** – Davis Langdon

**Geotechnical Engineer** – Hart Crowers, Inc.

**Civil Engineer** – KPFF Consulting Engineers, Inc.

**Acoustic** – Sparling

**Commissioning Agent** – Keithly Barber Associates

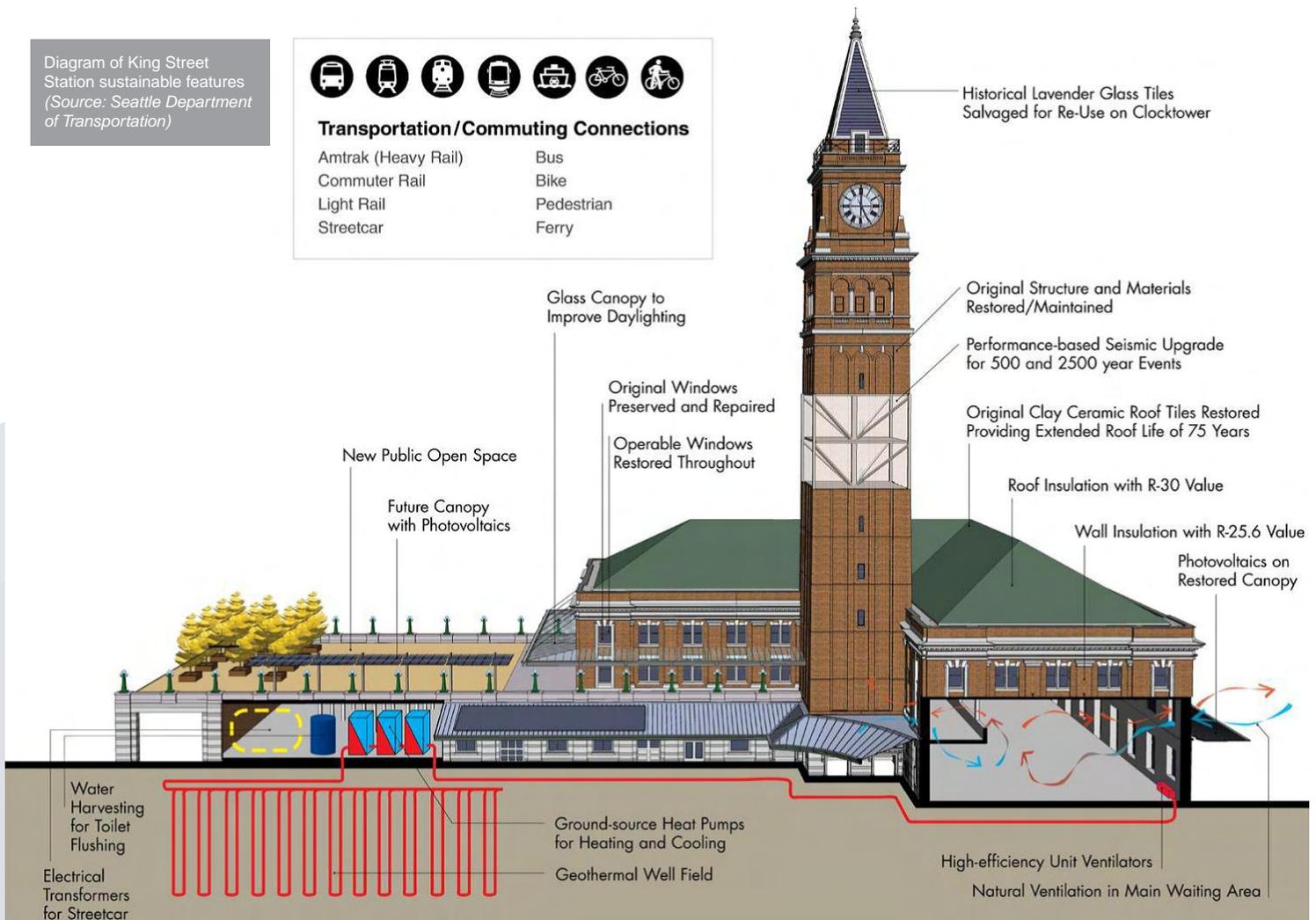
Diagram of King Street Station sustainable features  
(Source: Seattle Department of Transportation)



### Transportation/Commuting Connections

Amtrak (Heavy Rail)  
Commuter Rail  
Light Rail  
Streetcar

Bus  
Bike  
Pedestrian  
Ferry



# King Street Station

## LEED 2009 for Core and Shell Scorecard

9/14/2011

Available	Yes	Maybe	No			Primary Responsible Party	Status	
<b>SUSTAINABLE SITES</b>								
0	Y			SSp1	C	Construction Activity Pollution Prevention	KPFF Open	
1	1			SSc1	D	Site Selection	GBS Anticipated	
5	5			SSc2	D	Development Density and Community Connectivity	GBS Anticipated	
1	1			SSc3	D	Brownfield Redevelopment	GBS Anticipated	
6	6			SSc4.1	D	Alternative Transportation - Public Transportation Access	GBS Anticipated	
2			2	SSc4.2	D	Alternative Transportation - Bicycle Storage and Changing Rooms	GBS Anticipated	
3	3			SSc4.3	D	Alternative Transportation - Low-E and Fuel-E Vehicles	GBS Open	
2	2			SSc4.4	D	Alternative Transportation - Parking Capacity	GBS Anticipated	
1			1	SSc5.1	C	Site Development - Protect or Restore Habitat	- Closed	
1			1	SSc5.2	D	Site Development - Maximize Open Space	- Closed	
1			1	SSc6.1	D	Stormwater Design - Quantity Control	- Closed	
1			1	SSc6.2	D	Stormwater Design - Quality Control	- Closed	
1	1			SSc7.1	C	Heat Island Effect - Nonroof	GBS Documented	
1			1	SSc7.2	D	Heat Island Effect - Roof	- Closed	
1			1	SSc8	D	Light Pollution Reduction	- Closed	
1	1			SSc9	D		GBS Anticipated	
28	20		8	Total Points for Sustainable Sites				

<b>WATER EFFICIENCY</b>								
0	Y			WEp1	D	Water Use Reduction	GBS Anticipated	
2			2	WEc1.1	D	Water-Efficient Landscaping, 50% Reduction	- Closed	
2			2	WEc1.2	D	Water-Efficient Landscaping, No Potable Water Use or Irrigation	- Closed	
2			2	WEc2	D	Innovative Wastewater Technologies	- Closed	
2	2			WEc3.1	D	Water Use Reduction, 30% Reduction	GBS Anticipated	
1	1			WEc3.2	D	Water Use Reduction, 35% Reduction	GBS Anticipated	
1			1	WEc3.3	D	Water Use Reduction, 40% Reduction	- Closed	
10	3	3	4	Total Points for Water Efficiency				

<b>ENERGY &amp; ATMOSPHERE</b>								
0	Y			EAp1	C	Fundamental Commissioning of Building Energy Systems	KBA Open	
0	Y			EAp2	D	Minimum Energy Performance	ARUP Pending	
0	Y			EAp3	D	Fundamental Refrigerant Management	GBS Anticipated	
21	21			EAc1.1	D	Optimize Energy Performance, 8% (3 points) - 44% (21 points)	ARUP Pending	
4	4			EAc2	D	On-Site Renewable Energy, 1%	ZGF Open	
2	2			EAc3	C	Enhanced Commissioning	KBA Open	
2	2			EAc4	D	Enhanced Refrigerant Management	ARUP Anticipated	
3	3			EAc5.1	C	Measurement and Verification - Base Building	ARUP Anticipated	
3			3	EAc5.2	C	Measurement and Verification - Tenant Submetering	GBS Open	
2	2			EAc6	C	Green Power	GBS Open	
37	34		3	Total Points for Energy & Atmosphere				

US EPA ARCHIVE DOCUMENT

# King Street Station

## LEED 2009 for Core and Shell Scorecard

9/14/2011

Available	Yes	Maybe	No	Primary Responsible Party	Status			
<b>MATERIALS &amp; RESOURCES</b>								
0	Y			MRp1	D Storage and Collection of Recyclables	GBS	Anticipated	
1	1			MRc1.1	C Building Reuse - Maintain Existing W, F, R 25%	GBS	Documented	
1	1			MRc1.2	C Building Reuse - Maintain Existing W, F, R 33%	GBS	Documented	
1	1			MRc1.3	C Building Reuse - Maintain Existing W, F, R 42%	GBS	Documented	
1	1			MRc1.4	C Building Reuse - Maintain Existing W, F, R 50%	GBS	Documented	
1	1			MRc1.5	C Building Reuse - Maintain Existing W, F, R 75%	GBS	Documented	
1	1			MRc2.1	C Construction Waste Management, 50%	Sellen	Open	
1	1			MRc2.2	C Construction Waste Management, 75%	Sellen	Open	
1			1	MRc3	C Materials Reuse, 5%	-	Closed	
1	1			MRc4.1	C Recycled Content, 10%	Sellen	Open	
1	1			MRc4.2	C Recycled Content, 20%	Sellen	Open	
1	1			MRc5.1	C Regional Materials, 10%	Sellen	Open	
1	1			MRc5.2	C Regional Materials, 20%	Sellen	Open	
1	1			MRc6	C Certified Wood			
13	12		1	Total Points for Materials & Resources			Sellen	Open

<b>INDOOR ENVIRONMENTAL QUALITY</b>							
0	Y			IEQp1	D Minimum Indoor Air Quality Performance	ARUP	Anticipated
0	Y			IEQp2	D Environmental Tobacco Smoke (ETS) Control	GBS	Anticipated
1	1			IEQc1	D Outdoor Air Delivery Monitoring	ARUP	Anticipated
1			1	IEQc2	D Increased Ventilation	-	Closed
1	1			IEQc3	C Construction Indoor Air Quality Management Plan - During Construction	Sellen	Open
1	1			IEQc4.1	C Low Emitting Materials - Adhesives and Sealants	Sellen	Open
1	1			IEQc4.2	C Low Emitting Materials - Paints and Coatings	Sellen	Open
1	1			IEQc4.3	C Low Emitting Materials - Flooring Systems	Sellen	Open
1	1			IEQc4.4	C Low Emitting Materials - Comp Wood and Agrifiber Products	Sellen	Open
1			1	IEQc5	D Indoor Chemical and Pollutant Source Control	-	Closed
1			1	IEQc6	D Controllability of Systems - Thermal Comfort	-	Closed
1			1	IEQc7	D Thermal Comfort - Design	ARUP	Closed
1			1	IEQc8.1	D Daylight and Views - Daylight	-	Closed
1	1			IEQc8.2	D Daylight and Views - Views	GBS	Documented
12	7		5	Total Points for Indoor Environmental Quality			

<b>INNOVATION IN DESIGN</b>							
1	1			IDc1.1	D Green Housekeeping	SDOT	Open
1	1			IDc1.2	D Green Building Education	SDOT	Open
1	1			IDc1.3	Exemplary Performance SSc4.1	GBS	Anticipated
1	1			IDc1.4	Exterior Building and Hardscape Management Plan	GBS	Anticipated
1	1			IDc1.5	Exemplary Performance MRc2 or Green Power (70%)	GBS	Open
1	1			IDc2	C LEED® Accredited Professional	GBS	Open
6	6			Total Points for Innovation & Design			

<b>REGIONAL PRIORITY</b>							
1	1			RPc1.1	SSc3	-	Anticipated
1	1			RPc1.2	SSc4.2	-	Anticipated
1	1			RPc1.3	SSc4.4	-	Anticipated
1	1			RPc1.4	EAc1 (44%)	-	Anticipated
4	4			Total Points for Regional Priority			

**110 86 6 18** **Total Points Attempting** **Platinum**  
 Total Points Possible  
 Certified: 40-49, Silver: 50-59, Gold: 60-79, Platinum: 80+

**Credit Status**

- Open** Credit is under analysis or integration of requirements is still in process.
- Closed** Credit is determined to be not applicable, not feasible, or is otherwise not being considered.
- Documented** Completed LEED Submittal Templates and supporting documentation have been uploaded to LEED Online.
- Anticipated** GBCI has reviewed credit documentation and approved it.