

## LEED Business Case Study for Hillcrest Curling Facility

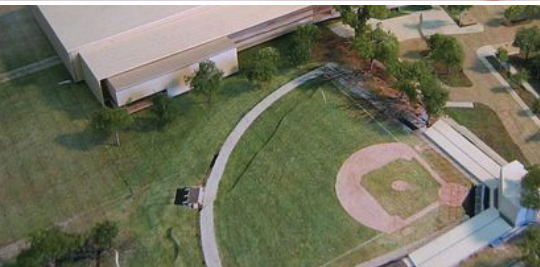
### *Prepared for:*

- Sustainability Office of Environment Canada (EC)
- Industry Canada (IC)
- The Vancouver Olympic Organizing Committee for the 2010 Olympic and Paralympic winter Games (VANOC)
- Canada Mortgage Housing Corporation (CMHC)

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## **1.0 | EXECUTIVE SUMMARY**

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Environmental sustainability has become an increasingly important consideration in building design, construction and maintenance in recent years. In addition to increasing concerns regarding energy over-consumption and indoor environmental quality, sustainable design must utilize a holistic perspective that includes: ecological impacts associated with site selection and maintenance; water usage; air and soil quality; and resource depletion. Implementing sustainable operation and maintenance practices requires a shift in thinking from conventional practices, procedures, and policies.

The Sustainability Office of Environment Canada (EC), Industry Canada (IC), the Vancouver Olympic Organizing Committee for the 2010 Olympic and Paralympic Winter Games (VANOC), and Canada Mortgage Housing Corporation (CMHC) (collectively referred to as the “Steering Committee”), commissioned this study in order to understand broad-scale implications associated with maximizing sustainability performance options at Olympic venues.

This study presents the business case for the Hillcrest Curling Facility, conducted in order to assist in enhancing the sustainability performance and reduce the overall ecological impact of the Hillcrest Facility; and in doing so, also provide a LEED Business Case for future venues.

This report outlines a sustainable building design methodology, summarizes the LEED®-Canada for New Construction Green Building Rating System (version 1.0), and proposes a wide range of sustainable measures that could be implemented in the Hillcrest Facility and Community Centre project design, as well as in other venues.

The budget and design goals for the Hillcrest Curling Facility have been established by the design team. However, some design strategies may still be in a state of flux, which allows the opportunity for the study team to provide input on the sustainability goals for the project. In order to achieve LEED-Gold, the Hillcrest Facility must achieve a minimum of three more points in addition to those targeted in May, 2006 (see Appendix A for the LEED scorecard for existing design). Energy modelling was based on design current at October 5<sup>th</sup>, 2006, since mechanical design had changed substantially since the LEED scorecard issued at May 31<sup>st</sup> (while other strategies had not).

Using the LEED-Canada rating system, the study team proposed 3 LEED certification Scenarios, using 20 sustainable design measures that would further conserve energy, reduce potable water consumption, instigate low impact maintenance and operations procedures, and enhance indoor work environments, over the project’s existing design (Baseline Design). These Scenarios are based on design team aims, venue owner goals and available cost data. These scenarios identified opportunities for Green House Gas (GHG) reductions, simple payback, and capital cost increases due to specific green design measures.

This data is further intended to provide baseline information and therefore a roadmap for improving the life-cycle and operational performance of current and future Olympic facilities.

The 20 proposed measures are prioritized according to four levels of implementation difficulty, based on initial capital cost investment; additional capital cost estimates were completed for each measure for the purpose of this study. However, these estimates should be viewed with some caution as the construction industry is currently experiencing volatile fluctuations in labour and material pricing.

In order to achieve LEED-Gold, the Hillcrest Facility must achieve a minimum of three more points in addition to those targeted in May, 2006 (see Appendix A for the LEED scorecard for existing design).

Examples of Easily implemented measures (Green) include use of Flyash in concrete for Recycled Content, Use of Low-Emitting Paints, and Use of Groundwater for Toilet Flushing. Moderate measures (Blue) include Rainwater Harvesting, Heat Recovery from Pool and Shower Water Heat, and using Sewer Water Heat. Finally, examples of Difficult (Black) measures include installing a Green Roof for Stormwater Management, Solar Water Heating, and Using Renewable Energy by installing a Biomass Plant.

**Scenario 1 (“Gold1”)** projects the achievement of an additional 10 points, yielding a LEED score of 46 points, at a cost premium of \$237,942. This gives an additional project cost premium of 0.03%, with the a simple payback on a relevant recommended strategy being 4 years (Use Groundwater for Toilet Flushing), and potential for GHG offsets, based on the measures that could be analyzed, starting at 395,000kg carbon equivalents (purchasing Green Power certificates).

The water-related measure (Use of Groundwater for Toilet Flushing) in Scenario 1 helps conserve potable water supply and is estimated to result in an additional 27% potable water savings over that achieved by the current design, giving a \$10,300 annual water cost savings with a 4 year simple payback.

**Scenario 2 (“Gold2”)** projects the achievement of a potential additional 13 points, yielding a LEED score of 49 points, at a cost premium of \$776,242. The project cost premium in this scenario amounts to 1.1% of the total project construction cost, with a minimum simple payback on relevant recommended measures of 4 years (for Geothermal Systems and Groundwater Heat Recovery). Potential for GHG offsets could amount to 963,000kg.

Savings in Scenario 2 amount to a total of \$5,400 in annual water cost savings or 14% over the existing design. Annual energy cost savings amount to \$68,000, with a simple payback ranging from 4-29years. The bulk of the capital costs for Scenario 2 resides in the Moderate to implement (Blue) measures. Architectural, landscaping, water, and energy measures are all represented in this scenario.

**Scenario 3 (Platinum)** projects the achievement of an additional 24 points in addition to the existing baseline design, for a LEED score of 60 points, at a cost premium of \$1,702,366, or 2.5%. The minimum simple payback for the relevant measures that were possible to calculate starts at 4 years (Groundwater for Toilet Flushing) towards 51 years (Rainwater Harvesting). Potential GHG offsets start at 721,000kg in carbon equivalents for the selected measures.

Annual water cost savings in Scenario 3 amount to \$4,000, while annual energy cost savings due to this combination of measures amounts to \$61,600, for using Sewer Heat Recovery and Solar Water Heating.

In selecting appropriate scenarios and/or individual measures for other venues, attainment of LEED-Canada Gold will first require the Steering Committee to determine which of its environmental priorities are most applicable within the context of any given site. Considerations will likely concern initial capital cost, payback, and the ability of the strategy to meet GHG offset programming. An energy simulation is highly recommended once measures are selected, which will help the Steering Committee prioritize the various measures according to simple payback and GHG offset strategies.

Based on the assessment conducted for this study, there are appropriate measures to incorporate into the design of the Hillcrest Facility that will not only bolster the current LEED-Gold target, but also achieve GHG offsets that may help to meet VANOC's climate-neutral goal.

Together, these initiatives can contribute significantly to a large-scale shift in environmental attitudes, becoming a catalyst for environmental improvement throughout the global effort of the Olympic and Paralympic Games.