

## **The George Brown College of Applied Arts and Technology Waterfront Campus**

The George Brown College of Applied Arts and Technology (GBC) is a highly urban, publicly funded post-secondary institution in Toronto Canada. GBC delivers 150 full-time and 1,600 continuing education programmes to a diverse 65,000-person student body from numerous locations spread across the downtown Toronto core. We anticipate continuing rapid change in our regional economy, in the workplace and in our students, socioeconomic change that will change the very nature of our city, ultimately shaping the College's approach to preparing students to be *graduates of choice*. We recognize that our students today will form the future leadership structure of our corporations and institutions, and in time they will manifest the economic engine of our society. In our support of the lifelong learning process, GBC has an important role to play in the economic destiny of Toronto.

The statistics are meaningful. By 2015, the GTA population will stand at 6.7 million people. Despite dramatic growth, Ontario will face a labour shortage of 364,000 skilled workers by 2025, especially in the healthcare fields – including health technologies, as well as the nursing and dental professions. Much of the skills shortage will befall the City of Toronto itself.

As the College has a strong reputation for industry-focused professional training, the institution embarked upon an innovative process, involving deep study and original primary and secondary research, to foresee the impacts of such rapid change – in our economy, in the workplace and in our students. For what's to come at George Brown College – for our students, their employers and the economic health of the city in which we live – represents a microcosm of the future workplace and will reflect the health of our society as a whole.

Seeing our role as critical not only to the employers and students we serve, but to the City of Toronto and its many communities drove GBC to a new level of understanding and commitment. As such, we have studied how the workplace will change over the course of the next decade, and how high technology students, both present and future, will learn and acquire necessary skills.

We have challenged ourselves to define and implement long-term sustainability across the broad spectrum of our influence – from city-wide urban economic thinking, seeking innovative urban planning solutions at the College-wide and campus building levels, and demanding ever greater levels of sustainability. This level of inquiry was sustained through the planning and design of a complex remediation and campus construction process, on through to the individual student experience in the classroom. Our submission highlights the realization of sustainability across this tremendous continuum of urban need and desire, both meeting present need and

laying the groundwork for future campus phases of increasingly enhanced and targeted sustainability.

In an effort to meet the increasing demands of Toronto and area employers for skilled professional workers, GBC had reached substantially beyond its enrolment capacity, by approximately 70 percent. Over the past several years, applications had grown by more than 50 per cent for GBC programs in the health sciences, business, and construction and engineering technologies. With the decision to embark upon a new urban campus in the heart of the city of Toronto, George Brown College took advantage of this unique moment in its history to implement a series of cascading long-term sustainability initiatives, each building upon the previous initiative and informing the next.

*Head-to-toe, cradle-to-grave sustainable thinking* helped to inspire a re-invention of GBC's relationship with its city, and drove the physical building design process in the short term. Importantly, the process ensured that holistic, innovative thinking at the ideological level would be manifested in the reality of day-to-day sustainable building operations in a future world of ever tightening environmental sustainability standards.

With tremendous growth pressure on GBC's health sciences faculty, and a system-wide healthcare curriculum transformation ongoing since 2004, the top priority was to consolidate GBC's four health sciences programmes (Schools of Nursing, Dental Health, Health and Wellness Promotion and Health Sciences Management), then physically scattered miles apart around the city. Critical for the future of the College, the expanding Applied Research i-Portal programme would locate to the Waterfront and share mission-critical advanced technology platforms, simulation suites, control rooms, viewing platforms and learning/testing laboratories.

What were the important attributes of this new environment that would reflect the future-forward goals and objectives of the College? While the urban and building-specific plans would be a response to regional economic need, a primary concern was to ensure that GBC would give students the right tools, environments of inspiration and collaboration, and clear applied learning opportunities to meet the future. In a co-operative and continuous stakeholder partnership process involving students, staff and faculty, the defined development objectives were to:

- Create New Links to GBC's Constituent Communities
- Design a Place of Transparency and Openness
- Provide a Flexible and Adaptive Platform for Change and Growth
- Enable Advanced Technologies
- Build an Environment Exemplifying Wellness and Health

- Define Sustainability at every Step in the Process

George Brown College chose Waterfront Toronto's East Bayfront District as the civic stage for the next step in its evolution. Achieved as a result of an innovative strategic financial partnership between GBC and Waterfront Toronto as well as an operational partnership with the City of Toronto, the proposed multi-phase campus development became the first institution to locate on the Central Waterfront Revitalization lands, one of the largest urban brownfield remediation initiatives in the world.

As master developer since 2001, WT is attempting to lift the project beyond real estate development with the goal of creating sustainable, LEED Gold ranked, liveable, and prosperous communities, while meeting key public policy objectives. A multiple phased waterfront campus was envisioned by GBC. Exemplifying an expressed drive toward transparency, openness, and strong links to its communities, the site is a short walk south from GBC's existing St. James Campus.

The East Bayfront site came with history and substantial sustainability challenges compounded by GBC's proposed institutional change of use from the existing commercial/industrial usage. Formerly known as the Queen Elizabeth Docks, Blocks 3 and 5 of the East Bayfront District were a definitive brownfield site, where environmental contamination in soil and groundwater was widespread. Historically, during the final implementation stages of the 1912 Toronto Harbour Commissioners' industrial park plan, the Lake Ontario marshlands of the East Bayfront were filled and used for industrial and marine transport-related purposes, increasing in port activity with the opening of the St. Lawrence Seaway.

From its landfill inception, the Toronto Harbour Commission used the site as a marine freight transfer facility. The site had airborne contaminants as well as spills and fuel leaks from cargo and vehicles adjacent to the loading docks. Considering the diverse sources of fill material and the industrial operations historically conducted at the site; and given that environmental considerations were not a significant concern during that era, various contaminants were also present within the soils and ground water, including metals, Poly Aromatic Hydrocarbons (PAHs), Volatile Organic Carbons (VOCs) and Petroleum Hydrocarbons (PHCs). The site was also found to be associated with elevated methane concentrations in soil gas, associated with the decay of organic carbon matter within native lake-bottom sediments.

In recent years, the evolution of downtown Toronto and changes in the goods movement industries rendered the industrial port redundant. For years, the 23 hectare (55 acre) East Bayfront site, which extends from Lower Jarvis Street east to Parliament Street and from Lake Shore Boulevard south to the water's edge, languished as a reminder of Toronto's industrial past. Following an extensive planning and public consultation by the master developer, the site

is slowly transforming, commencing with a series of complex infrastructure projects. The East Bayfront was the first new neighbourhood to launch within this Central Waterfront plan, and George Brown College the first institution to locate there on a .83 hectare cornerstone site.

Announced in 2008 as the future home to 3,500 full-time and 1,000 part-time/continuing education healthcare students commencing classes in the fall semester 2012, George Brown College was an ideal candidate for this pivotal site from a number of urban design perspectives. With transformative potential, preliminary campus planning expanded upon and enhanced the macro-level design principles defined by Waterfront Toronto's competition winning Central Waterfront Revitalization Master Plan. Enhancing public realm access, creating a ground floor dedicated to the public realm, dovetailing with the public promenade at the water's edge and park to the east, the GBC campus design team skilfully executed the broad stroke urban planning principles at the finer-grained campus level.

Fundamentally, the campus encouraged public access and use at all levels, encouraging public access from the water's edge north into the city, thereby reinforcing the existing grid street pattern by providing increased foot traffic on a year round basis. Community integration was further enhanced within the building itself through the provision of public clinics in a number of specialties including dental, hearing, and health promotion attracting over 10,000 patient visits per year to the water's edge facility.

A Risk Assessment was undertaken to evaluate baseline human health and ecological conditions and risks, and to recommend an appropriate Risk Management Plan. This process resulted in an innovative tripartite site sustainability solution: 1) risk management, 2) remediation and 3) restoration. The southern portion of the proposed GBC waterfront campus (approximately 11 m strip of land) lies in close proximity to Lake Ontario, and was classified as an 'environmentally sensitive' area. To meet the stringent environmental conditions required for the re-development, GBC was required to remediate a significant volume of impacted soil and groundwater present in this area.

Instead of the traditional "dig-and-dump approach", the team utilized site-specific modeling strategies, and was able to mitigate soil vapour intrusion from the underlying soil and groundwater contaminants using innovative engineering controls, including a vapour barrier system consisting of a soil-gas collection system. This environmentally sustainable approach also allowed for the re-use of material on site when possible; and thus, substantially reduced negative impacts that are produced from traditional remedial approaches.

Leaving impacted soils and groundwater in place and employing the risk assessment approach has reduced noise and dust emissions, truck traffic increases, road degradation and tracking of impacted soils to neighbourhood lands, all critical LEED initiatives. The risk assessment

approach also ensured that leaving soil and groundwater in place prevented sedimentation and degradation of the natural Lake Ontario aquatic habitat, saving land-fill space, greenhouse gas releases, and negative local economic impacts. Building design drove support structure through this zone, but avoided human activity in the area of soil directly impacted. Complementing the RA/RM process on the southernmost end of the site, the remaining soil on the north end of the site was completely removed to bedrock, thereby ensuring that the contaminants were completely cleared. The risk assessment included a Public Consultation process whereby the Ministry of the Environment consulted on the proposed risk management plans with various stakeholders from the public and municipal sectors.

Critically, both from an environmental as well as a schedule perspective, the contaminated soil and groundwater was also found to be trapped within the tie-backs holding the adjacent Lake Ontario quay wall in place - an essential element of public infrastructure at the waterfront. The sixty-year old wooden tie-back system supporting the quay wall extended onto the 11 m portion of the development and required remediation and restoration as well. A typical dig-and-dump approach could have placed the tie-back system in structural failure, threatening the stability of the Lake Ontario quay wall.

The risk-based approach adopted for the site included both a progressive remediation approach to the contamination as well as an innovative structural design for the replacement of the tie-back structure while maintaining full quay wall loading in situ. This would prevent a catastrophic collapse of the quay wall under load. Special low-vibration drilling rigs were an additional innovation, brought forward by the general contractor, in order that the ancient wooden tie backs, acting in both compression and tension forces, were not disturbed in the construction process until their loads could be relieved with the new system.

While initiated by GBC, this solution was implemented by Waterfront Toronto in close co-operation and co-ordination with GBC's design and construction forces on public land. Thus, a once heavily impacted landfill site was remediated for a change-of-use scenario - and to suit a high-level sensitive institutional occupancy. Substantial time, cost and development effort was saved with this triple pronged approach to the remediation challenges of the site, promoting long term sustainability and infrastructure stability on a district-wide basis.

A Sustainability Framework was developed by Waterfront Toronto in 2005 and included the sustainability initiatives defined by the City of Toronto and the Canada Green Building Council. This comprehensive framework was tested, implemented and enhanced by George Brown College in an institutional interpretation of these guidelines with the commencement of the GBC campus development project in earnest in 2009. Final sustainability metrics include: LEED NC 1.0 (registered and targeting Gold certification), Waterfront Toronto Mandatory Green Building Requirements (MGBR), and Toronto Green Standards (TGS). The purpose of the

development sustainability roadmap was to identify a district-wide vision for sustainability, allowing GBC to determine the specific steps that would be taken to achieve that vision in a way that would enhance the investment of the College over time. It was critical at this juncture, given the dramatic and sudden turn of events in the global economy, to provide much needed economic momentum to the East Bayfront development as a whole and reassurance to GBC in particular that the sustainable development could proceed toward the stated goals.

When examined as a district-wide sustainability initiative, George Brown College campus and other East Bayfront projects, such as Sherbourne Common, Sugar Beach, and the Corus Entertainment Building, have each contributed in their unique way to the revitalization of the precinct and the development of a complete neighbourhood. As such, these projects have provided solutions to overcoming redevelopment barriers by increasing the land value and attractiveness of the site, creating the impetus for a transit extension, and successfully transitioning this former underutilized and vacant area to a space where people want to live, work, play, and importantly, to learn.

At the neighbourhood scale, George Brown College met and indeed exceeded the targets outlined in the 2005 Sustainability Framework including the following highlights: developing a vibrant street life active with student flow to and from classes, the Library Learning Commons, evening continuing education courses, and fitness and wellness programmes on a 24/7 basis, attracting people to the waterfront year-round, improving water quality in the lake, minimizing risk from contaminated sites, and stimulating creativity and innovation. The entire ground floor is devoted to the public realm, fully open and including a bookstore, coffee and (healthy, sustainable) food choices and an indoor/outdoor patio overlooking the lake, exhibition space, and a ground floor atrium seating several hundred people for seminars and events, both interior as well as exterior, stretching into the adjacent park.

GBC's campus siting within the East Bayfront community fronting east on the 3.75 acre Sherbourne Common park has proven to be a wonderful animation opportunity. This new park space for the city encourages social interaction through skating, fountains and passive recreation while fostering a sense of community and social well-being. Sherbourne Common is a unique and innovative space providing recreation, landscape, art, and infrastructure. The park is the first in Canada to integrate into its design an ultraviolet (UV) facility for neighbourhood-wide stormwater treatment.

Collected stormwater is treated in the UV facility beneath the skating pavilion, thereby removing bacteriological pathogens, and is subsequently released from three dramatic art features into a 240-metre long water channel – or urban river – and out to Lake Ontario. GBC's student WiFi extends into the park and the lakefront public promenade to the south to facilitate group study and learning in a green waterside environment. The park and promenade

draw students out to utilize and animate space in the public realm. Co-operative security planning has occurred among the other tenants of the district, the Port Authority, the City of Toronto Parks and Recreation and Waterfront Toronto.

With respect to the long term sustainability both of the public realm and the GBC site, extensive design and long term durability studies were conducted in support of the competition-winning Central Waterfront urban design standards. These are innovative, custom designed elements of street furniture and finishes. As an example, in order to ensure that landscaping and specifically planted trees mature and thrive in the public realm, Waterfront Toronto installed a tiered web of rigid boxes known as silva cells. These reinforced cells provide support for the soil to prevent compaction under the weight of the pavement above and further allow tree roots to spread and thrive.

This technology will enhance the public realm of East Bayfront by creating a healthy tree canopy while, in turn, providing shade to GBC sidewalks and improving terrestrial habitat. GBC extended this idea to the on-grade public realm and green roof, which includes native grasses and plant species also living in discrete cell-type environments facilitating growth under extreme cold and wind environmental conditions.

While George Brown College targets LEED Gold certification for the Campus, Gold level certification under LEED for Neighbourhood Development (LEED ND) rating system (Stage 1) for the East Bayfront community has been achieved. LEED ND was developed to provide a comprehensive multi-use neighbourhood-wide perspective on sustainability performance. As such, issues such as development density, smart location, transit, proximity to local needs, walkable streets, affordability, and community involvement are addressed within the rating system.

As anchor institution, GBC will grow with East Bayfront as a notable sustainable community development and an appropriate future-oriented community. The stage has been set to facilitate a second phase of GBC's development immediately to the north of the first phase of Waterfront Campus building which was completed for occupancy in September 2012. GBC is prepared for an ever-increasing commitment to sustainability at the neighbourhood, campus and building level in keeping with these guidelines.

At the individual building scale, the broad planning principles utilized across the East Bayfront district and the campus as a whole were again re-interpreted at a much finer, granular level, always emphasizing project objectives:

1. Create a vertical campus by stretching public realm animation beyond the ground plane up through the building via a series of connected 'learning landscapes';

2. Emphasize the ideas of transparency and accessibility to the community with glass curtainwall providing stunning lake views, and a connection with the environment;
3. Anchor the building with a porch/patio and appealing public uses at the south end of the building, opening to the lake and the park;
4. Humanize building scale and improve access to natural light by redistributing the allowable zoned volume – creating a taller west ‘loft’ building opposite Corus Quay, thereby allowing a stepped-down massing toward the lake and park;
5. Set up view corridors and termini, always connecting and orienting the building inhabitants to the lake and the park.

As one of the first buildings in Canada to promote inter-professional applied learning in healthcare, the four healthcare programmes were consolidated and planned in detail via a continuous, democratic user buy-in process composed of faculty, staff and student stakeholders. Extensive research and development focused on the simulated practice areas utilizing high fidelity mannequins, applied learning laboratories, and control suites connecting and integrating all areas. Secondly, innovative multi-media learning studio environments were applied across all classrooms, meeting rooms, and student gathering areas. Health and wellness promotion informed decisions regarding everything from patient planning through to healthy food choices in food service areas. A future-forward technology communication platform anticipates high speed distance learning, live lecture capture and on-line learning.

The building is among the first in Canada to be purpose-built for an integrated approach to health care education, where students from different professions learn and work together. GBC will be contributing to East Bayfront community development through a series of clinics called WAVE [Wellness, Applied Research and Visionary Education], where members of the public receive low-cost health services from supervised students-in-training, ranging from a 94-chair public dental and denturism clinic and hearing assessments to fitness testing and training.

Substantial public outreach programmes in the area of health promotion and preventative care provide a valuable public service. For example, a four-kitchen teaching laboratory overlooking the water’s edge will provide a healthy home environment setting for geriatric, stroke recovery and practical at-home re-teaching of motor, movement and life skills. Future planning for a second building phase anticipates a recreation facility in partnership with the City of Toronto, enhancing community access and fitness and wellness programming potential for both institutions.

A substantial applied research platform has been built for the first time at GBC. Sharing laboratory and simulation spaces with the healthcare faculty, the research team will leverage

available space for applied research and development purposes, supporting industrial manufacturing, technology, and product development in the private sector.

In a unique financial partnership with Waterfront Toronto, GBC provides three levels of below-grade parking for students and staff, Corus Entertainment staff residing next door to GBC, and members of the public in a facility owned and operated by the partnership.

At the building level, LEED Gold sustainability metrics which were met or exceeded include over 90% of construction waste diverted from landfill, over 50% reduction in irrigation demands, grey water re-use, reductions exceeding 30% in energy consumption, over 50% green roof area with native species, and reductions exceeding 50% in water consumption. The building achieves a durability LEED credit with the use of long-lifespan robust materials such as wood, basalt stone, exposed concrete and local/recycled building materials.

At the facility management level, a number of changes in policy and practice were implemented as a result of the new building platform. A LEED-compliant green housekeeping policy was developed and implemented. A carpool management plan was designed and implemented, including a free energy policy for alternative fuel electric vehicle charging. Enhanced green measures were implemented in food service, including locally-sourced menu options. A college-wide green team is consistently driving the campus toward ever-increasing thresholds of green operations.

Facilitating live energy management and the ultimate in user environmental control, GBC's campus has one of the first totally converged ethernet IP networks in Canada. GBC and constructor EllisDon ICT created a unique partnership, mandating a high level of general contractor management interface, in a successful bid to avoid the traditional silos inherent in the mechanical, electrical, IT, and controls disciplines. At the macro building-wide reporting level, a custom-designed web-based dashboard rolls up IP live data from mechanical and electrical automation systems, security, user preferences, and utilities management. All building systems communicate with each other. At the user level, the custom designed Content Management System software is triggered via classroom occupancy sensors or at the desk phone interface to achieve responsive controls for human comfort in the area of light/sun/temperature. As a result, new and industry-leading integration benchmarks for user control and energy management have been set for the first time by leveraging simple technology in a new way.

Building upon and extending the reach of our innovative integration platform, the Waterfront Campus will act as "living laboratory" complete with an exterior and interior sensor system conveying live building performance R+D data for GBC Construction Technology R+D students. This represents a new level of cross-platform reporting and access in user interface and control

systems. This promotes long-term energy management, efficiency, and flexibility – sustaining core objectives of the project. In addition, the system enhances individual user-level comfort, and long-term utility cost savings, resulting in an intuitive building that adapts to the needs of the College and its users.

By accomplishing these urban sustainability goals, George Brown College reinforced the sustainable community approach as well as further enabled Toronto to compete aggressively with other top tier global cities for investment, jobs, and people. Specifically, the newly consolidated Waterfront Campus is further enhancing the College's stature in the healthcare community and, thus attracting international-calibre faculty and students to Toronto. In this direct way, reinvestment in post-secondary applied education at Toronto's waterfront can be seen as an engine for student development, a destination for applied research, and high-technology focused economic growth at the College. It is also a place to find community and health care by those who most need these services.

While the regional economic and community impacts will be viewed as considerable, George Brown College has no doubt that an equal and enduring legacy will be experienced in the education, social and sustainability benefits of the Waterfront Campus development.