ROYAL CITY SCIENCE CENTRE

ROYAL CITY SCIENCE

ZAS ARCHITECTS + INTERIORS

2024.08.28

A Message from our Founders

We launched Royal City Science in 2020 with one audacious goal: to build a new science centre for Southwestern Ontario. Four years later, we are thrilled to be sharing the results of an incredible visioning exercise, undertaken by our team in partnership with ZAS Architects. With funding from Wellington Waterloo Community Futures and the Ontario Ministry of Tourism, Culture & Sport we have focused on what is important to us – creating an incredible space to play, explore, engage, and be curious – while doing so in a sustainable and regenerative environment.

While exploring the countless possibilities, our team quickly focused on the idea of building on an existing or former gravel pit in Puslinch, close to the 401 – transforming the regeneration of the lands into a living laboratory to visit and discover. This report situates the facility on one specific site, Mill Creek pit owned by the University of Guelph, but the designs are site-agnostic and have been created for ease of translation to other possibilities in the region.

We are reaching for the stars – join us!

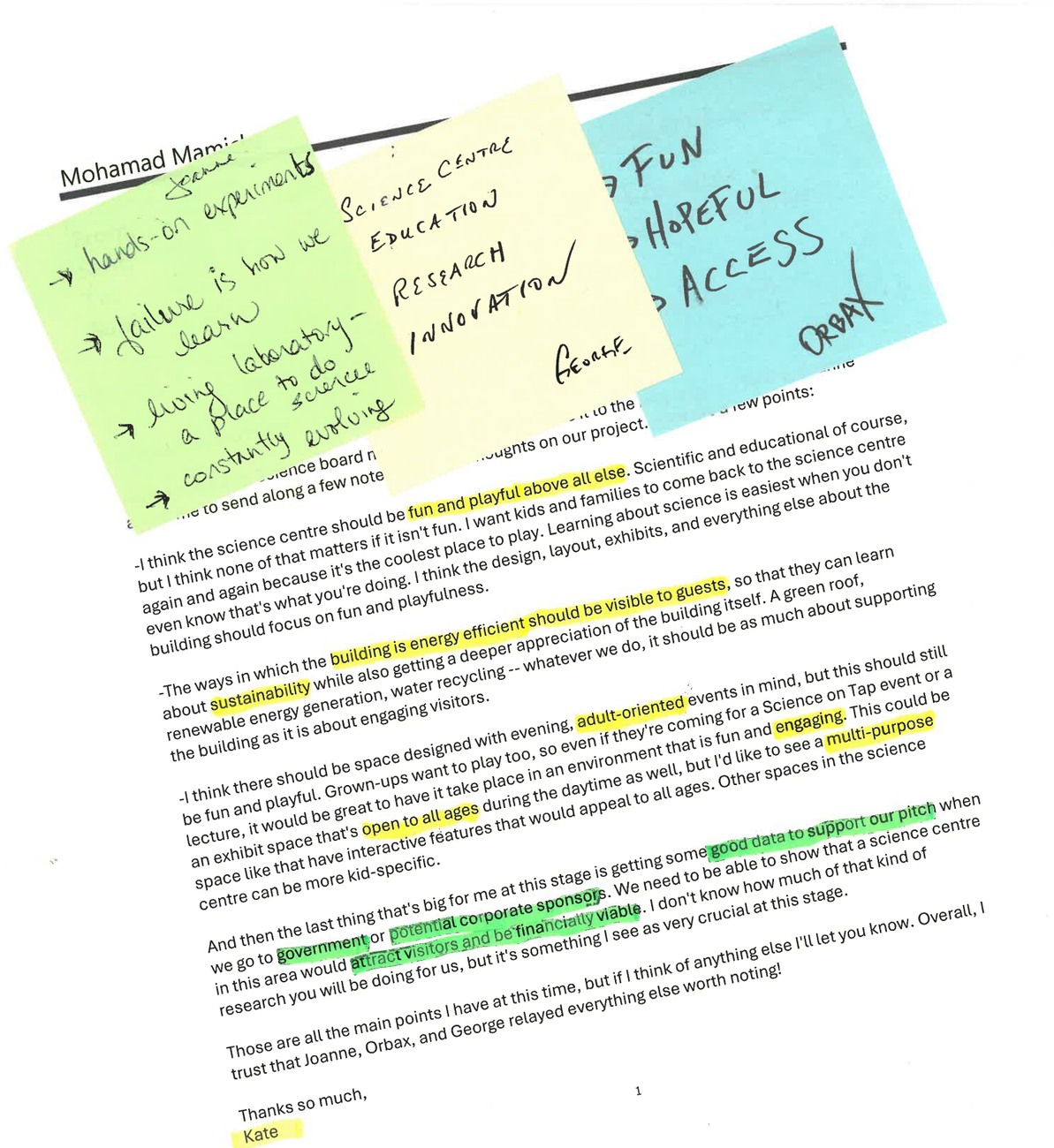
INTRODUCTION

RCSC Vision

Royal City Science Centre's mission is about exploration, experimentation, and fun, that enhances science accessibility to everyone. Both the site and this mission inspire the idea of a building that is itself part of the exploration and learning process. The team of science educators and enthusiasts at Royal City Science has recognized the transformative power of infusing fun into the learning process, reigniting that childlike sense of wonder and curiosity within us. Drawing upon decades of combined experience, the group at Royal City Science aim to ignite the curiosity of countless individuals. To accomplish their goals, they embarked on an ambitious journey to further engage the residents of Guelph, Puslinch Township, Wellington County and Southwestern Ontario by establishing a cutting-edge science center.

The RCSC center will cater to the armchair scientist, the budding scientist, and anyone with a curiosity for science, offering interactive exhibits, diverse learning opportunities, and access to knowledgeable educators committed to making science accessible and captivating for all. With a mission to creating a dedicated space that fosters critical thinking, scientific literacy, and inclusivity for everyone. The goal is to establish the pre-eminent destination in the region for celebrating curiosity, nurturing creativity, and forging connections to a science playground that will inspire generations to come. To serve as a hub for knowledge sharing, space for collaboration and learning, and develop curiosity in all. A building that showcases building science, natural science and the systems that make it sustainable and sensitive to people and the planet.

A building inspired by its natural surroundings and the transformation of the quarry site, reflecting both the disruption caused and the subsequent restoration. Central to the RCSC's vision are sustainability and energy efficiency, with a strong emphasis on creating an off-the- grid development. This building is designed not only to reduce its carbon footprint but also to provide a healthy environment for its occupants, integrating principles of biomimicry and serving as a space for educational exploration. It will stand as a showcase of building science, natural science, and sustainable systems, embracing the United Nations 17 Sustainable Development Goals. The RCSC offers a unique opportunity to educate the public on the interplay between buildings, their inhabitants, the environment, and society, serving as a living laboratory for sustainable development in harmony with nature.



to send along a few note

few points:

-I think the science centre should be fun and playful above all else. Scientific and educational of course, but I think none of that matters if it isn't fun. I want kids and families to come back to the science centre again and again because it's the coolest place to play. Learning about science is easiest when you don't even know that's what you're doing. I think the design, layout, exhibits, and everything else about the building should focus on fun and playfulness.

-The ways in which the building is energy efficient should be visible to guests, so that they can learn about sustainability while also getting a deeper appreciation of the building itself. A green roof, renewable energy generation, water recycling -- whatever we do, it should be as much about supporting the building as it is about engaging visitors.

-I think there should be space designed with evening, adult-oriented events in mind, but this should still be fun and playful. Grown-ups want to play too, so even if they're coming for a Science on Tap event or a lecture, it would be great to have it take place in an environment that is fun and engaging. This could be an exhibit space that's open to all ages during the daytime as well, but I'd like to see a multi-purpose space like that have interactive features that would appeal to all ages. Other spaces in the science centre can be more kid-specific.

And then the last thing that's big for me at this stage is getting some good data to support our pitch when we go to government or potential corporate sponsors. We need to be able to show that a science centre in this area would attract visitors and be financially viable. I don't know how much of that kind of research you will be doing for us, but it's something I see as very crucial at this stage.

Those are all the main points I have at this time, but if I think of anything else I'll let you know. Overall, I trust that Joanne, Orbax, and George relayed everything else worth noting!

Thanks so much,
Kate

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ZAS ARCHITECTS + INTERIORS

UNITED NATIONS 17 SUSTAINABILITY DEVELOPMENT GOALS / BASIS OF DESIGN

Applicable Strategies

In 2015, world leaders agreed to 17 goals for a better world by 2030. These goals have the power to end poverty, fight inequality and stop climate change. These goals aim to address various global challenges such as poverty, inequality, climate change, environmental degradation, peace, and justice. Each goal has specific targets to be achieved over the next decade and a half, with the overarching aim of ensuring a more sustainable future for all people and the planet. Architects are tasked with designing spaces that foster a more equitable society, buildings that enhance the wellbeing of their occupants, and address environmental challenges. Effective design is not only about function and aesthetics but is also accountable to its environment and society. The UN Sustainability Goal are comprehensive and directs ones attention to means to integrate sustainability goals and make buildings relevant in the current and future context.

NO POVERTY

Architecture can profoundly uplift people's standards by designing with sensitivity to cultural contexts and the wellbeing of inhabitants. The goal of alleviating poverty involves creating buildings with affordable public access, ensuring people from diverse backgrounds can equally use such spaces. Engaging stakeholders from local communities promotes participation in decision-making processes, enhancing public welfare and community improvement. Public buildings can provide opportunities for people to learn and develop low-cost skills. By harnessing site resources and aligning with topography, architects can revitalize spaces and create buildings that are minimal maintenance and energy efficient.

ZERO HUNGER

Building development plays a critical role in supporting land use for food production across various scales. Integrating urban farming initiatives, micro gardens, and cooperatives are effective methods to implement SDG 2. Designing landscapes to restore diversity of species native to the area and constructing buildings suitable for local climatic conditions are crucial steps. Promoting research in sustainable harvesting ensures harmony with the local ecosystem. Examples of implementing this SDG include incorporating vertical farms on building facades. Such projects foster community improvement and support the local economy.

GOOD HEALTH AND WELL-BEING

Architecture influences the built environment, impacting the health and wellbeing of its occupants either positively or negatively. Building design plays a crucial role in enhancing indoor climates concerning light, acoustics, indoor air quality, and off-gassing. Choosing materials with low VOC emissions, such as formaldehyde-free waterproofing sealants, can contribute to a healthier indoor environment. Ensuring safe and hygienic sanitation conditions further supports this goal. Incorporating biophilic design principles enhances sensory stimulation through visual connections to the outdoors. A community-centric approach to building design prioritizes architectural reflections of social and cultural values, thereby promoting the health and wellbeing of occupants.

QUALITY EDUCATION

The built environment offers opportunities for community training and research in sustainable initiatives applicable to buildings and everyday life. Establishing a productive, inclusive learning environment accessible to all involves addressing various learning styles and utilizing diverse technologies and materials to impart knowledge and equip individuals with sustainable, employable skills. Designing spaces for gathering storytelling, idea exchange, and knowledge expansion fosters community interaction. Promoting conservation programs, Indigenous cultural awareness, and appreciation of the natural environment further enriches these efforts.

GENDER EQUALITY

Empowering women through education, female leadership, and overall awareness of their rights and while creating more safer and inclusive space to encourage participation across diverse backgrounds. Allocating dedicated spaces which facilitate, focus on micro-enterprises led by women, offering training in entrepreneurship, creativity, innovation, and vocational skills, and promoting equal pay. Maximize women's engagement in the operations of the facility and foster strong relationships within the organization promoting representation in leadership positions. Ensure fairness and dignity in the workplace.

CLEAN WATER AND SANITATION

Buildings should incorporate provisions for accessible clean water for all occupants. Integrating rainwater harvesting into building design helps reduce strain on storm water management systems. Harvested rainwater can be utilized for landscaping irrigation, while measures such as permeable paving materials and green roofs facilitate rainwater percolation into groundwater, preventing mixing with wastewater. This approach mitigates flooding and alleviates pressure on infrastructure. Implementing naturalized storm water management systems transforms spaces into sustainable, forward-thinking infrastructure projects that are environmentally friendly, accessible to the public, blend well with surroundings, and support science education initiatives.

AFFORDABLE AND CLEAN ENERGY

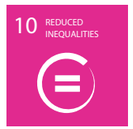
The building design reduces energy consumption through strategic orientation and access to on site natural resources. It features a strong envelope that minimizes heat loss and stabilizes indoor temperatures. Energy-efficient lighting with dimable fixtures is used throughout, and the building assembly includes features like building-integrated photo-voltaic panels to either store or generate energy. Green roof integration would not only aid in stormwater management, but also minimize heat island effect and increase roof assembly longevity. Use the on site access to lake water for geothermal heating. Use of mass timber for structural framework would reduce the carbon footprint of the building.

DECENT WORK AND ECONOMIC GROW

Buildings play a crucial role in driving economic growth through sustainable construction practices, leveraging technological advancements, and utilizing innovative materials. They contribute significantly by integrating publicly accessible facilities for education, entertainment, recreation, and community engagement. Emphasis is placed on enhancing connectivity to facilitate easier access to workplaces. Additionally, establishing collaborative workspaces within buildings fosters workplace up-liftment and enhances productivity.

INDUSTRY, INNOVATION AND INFRASTRUCTURE

Sustainability extends beyond architectural products and design to encompass the processes involved in producing construction materials. Implement practices aimed at reducing pollution, lowering energy consumption, minimizing waste, and upholding safe and healthy standards. Focus efforts on advancing sustainable product development and enhancing both physical and digital infrastructure to promote sustainable trade and coexistence. In regions with advanced industries, prioritize developing products that elevate current standards and promote higher levels of sustainability. This shift involves transitioning from a production-focused approach to a life cycle perspective that aims to minimize waste. Innovative construction methods such as modular construction, known for its adaptability and rapid installation,



REDUCED INEQUALITIES

Buildings should strive to reduce inequalities by ensuring universal access for all, including people with disabilities, through thoughtful design features such as ramps, universal washrooms, inclusive information systems, and adaptable visual and acoustic systems that cater to diverse capabilities. Designing spaces with consideration for minorities fosters inclusivity and accessibility. Emphasizing user comfort and integrating Eco-friendly solutions in building design minimizes ecological impact. Furthermore, providing universal access to research and resources can help mitigate economic disparities and foster stable job creation for all individuals.

SUSTAINABLE CITIES AND COMMUNITIES

Sustainable Cities and Communities The built environment constitutes a fundamental component of urban fabric, playing a pivotal role in shaping communities. It should strive to cultivate an inclusive, safe, healthy, resilient, and environmentally sustainable society through deliberate design and meticulous planning. This involves integrating closed-loop systems for waste and water management within buildings to minimize environmental impact. By implementing these measures, buildings can effectively reduce their ecological footprint and contribute positively to the surrounding environment.

RESPONSIBLE CONSUMPTION AND PRODUCTION

Responsible Consumption and Production focuses on managing the life cycle of materials used in buildings. The goal of this Sustainable Development Goal (SDG) is to integrate materials that can be easily removed and either recycled or up-cycled. Architects play a crucial role by designing buildings with components that are easy to separate, thereby reducing waste. Using durable materials in construction minimizes the need for frequent maintenance and replacement, extending the lifespan of products and materials and reducing overall wastage.Buildings should be designed with inherent adaptability to ensure they remain functional and relevant for future uses, rather than becoming obsolete after their initial purpose. Emphasizing the use of local and renewable materials promotes responsible construction practices, where waste is minimized throughout the construction process. This approach not only supports sustainability but also contributes to creating a more resilient and environmentally conscious built environment.

CLIMATE ACTION

The built environment significantly influences climate change, and implementing affordable, sustainable solutions in system design, material specification, and resource use is crucial. Buildings should be designed with flexibility in mind, allowing for adaptive reuse over time. It's essential to address issues like desertification, halt and reverse land degradation, and prevent biodiversity loss simultaneously.To mitigate climate impact, buildings can be designed to minimize energy consumption by strategic orientation to reduce heat loss, mitigate internal glare, and incorporate a robust building envelope. These measures not only enhance energy efficiency but also contribute to creating healthier and more sustainable urban environments.

LIFE ON LAND

Life on Land. As cities rapidly expand, it becomes imperative to prioritize the development of Brownfield sites. This approach prevents encroachment on greenfield areas, minimizing disturbance to existing ecosystems and habitats crucial for local flora and fauna. Integrating green networks throughout developments allows plant life to thrive, contributing to enhanced biodiversity in the area. Strategies should prioritize ecological restoration through the reuse of abandoned sites, promoting sustainable land use practices. Efforts to reduce the carbon footprint of buildings can be advanced by incorporating mass timber in construction. This sustainable material not only sequesters carbon but also offers structural integrity and design flexibility, aligning with environmentally conscious building practices.

PEACE, JUSTICE AND STRONG INSTITUTIONS

Peace Justice and Strong Institutions Build public buildings that prioritize inclusivity, ensuring they are accessible to all individuals without limitation. The design of these buildings should incorporate features that facilitate universal access, providing assurance to everyone moving through them that they are safe, welcomed, and can navigate comfortably. This includes implementing ramps, elevators, wide doorways, and accessible restroom facilities to accommodate people of all abilities.
Beyond basic amenities, institutional buildings can provide vocational services to support skill development, educational resources for learning opportunities, and technological infrastructure for digital access and connectivity. Such facilities serve as hubs for community engagement, fostering social cohesion and empowerment among diverse populations.
In essence, by designing and equipping public buildings and community centers with inclusive features and comprehensive services, societies can create environments that promote equality, accessibility, and support for all members of the community. These spaces become catalysts for empowerment, education, and social integration, contributing to a more cohesive and resilient society overall.

PARTNERSHIP FOR THE GOALS

To achieve sustainable development goals through Partnerships for the Goals, it is essential to foster knowledge sharing and exchange resources that can mutually benefit all stakeholders involved. This requires active communal participation where ideas, expertise, and resources are shared to address common challenges effectively. Collaboration between the private and public sectors is crucial in leveraging their respective strengths to tackle social and economic issues such as housing and displaced populations. By working together, these sectors can implement inclusive and sustainable solutions that cater to community needs and promote equitable development.
condense: Platforms like the International Union of Architects exemplify the importance of global partnerships in reviewing and promoting sustainable and innovative initiatives worldwide. Such organizations provide a framework for exchanging best practices, setting standards, and advocating for responsible architecture and urban planning practices.
In essence, fostering partnerships across sectors and globally allows for collective action towards sustainable development, ensuring that initiatives are impactful, inclusive, and contribute to long-term social, economic, and environmental resilience.

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RCSC SUSTAINABILITY / ZERO CARBON / LCA'S

RCSC Sustainability

In creating a sustainability strategy for a science centre we believe that building and site should be an integral part of the learning experience. The building should also push the boundaries of conventional sustainable design. The goal of the building will not simply to be sustainable but to be regenerative in nature. It is not enough that the building is sustainable. Our goal is to create a net-positive building through integrated design – not through offsets.

Site

The site itself is an example of how industrial sites can evolve into regenerative environments. While the nature of quarrying stone creates a series of environmental risks and challenges, the science behind managing the impact of this process to ensure that there is no negative impact on natural water flows in surrounding areas is an exercise in water management. The re-naturalisation of the site is an ecological case study. While the natural environment surrounding the site is actually created as a by-product of the quarry process it creates a learning environment on the evolution of a quarry from original undisturbed land through the life-cycle of the quarry to the regeneration of the natural ecosystem.

The building will exist within this ecosystem by minimizing the development footprint through siting and design but also through the construction process with carefully coordinated site works and staging areas to minimize the impact to the evolving natural ecosystem. Site design will take the approach of landscape as natural infrastructure. A design that is part of a system for storm water management, reduction of heat island effect, and creates rather than disrupts habitat for species that inhabit the site. Hard surfaces will be permeable with various products and materials being reviewed and proposed as a means of testing and evaluating these products as part of the research of the centre itself. Species habitats will be integrated into the natural infrastructure to support ecological research.

Water

The site is inherently one which celebrates the balance between consumption and preservation with the disruption natural water systems being at the forefront of the quarrying process. The science behind how to extract the material and disrupt the water table while avoiding the impact on the surrounding watershed is to be celebrated. Sustainable design needs to be about more than a building – it needs to understand and manage the impact on the surrounding environment

including adjacent watersheds. Water will be a focus of our sustainable design approach from how the building impacts waterflows on site to how we use and re-use water within the building. The natural infrastructure design will allow maximum natural infiltration. Green roofs will be used as a means of managing stormwater through evapotranspiration while also creating habitat for species. Rainwater will be collected and used for irrigation where necessary and for offsetting potable water use for mechanical equipment and toilet flushing.

The design will look at treating all waste water naturally on site rather than relying on conventional septic beds. This will create an opportunity not only for managing waste but will make the water treatment part of the experience of the centre for staff, researchers and day-to-day users. Extracted solid waste can be utilized as fertilizer for agricultural areas within the site.

Energy and Carbon

Energy and Carbon are often incorrectly discussed synonymously. The carbon footprint of a building includes not only the carbon released through ongoing operations but more importantly the embodied or "up front" carbon that goes into manufacturing and shipping all of the construction materials. In modern low-energy buildings this up-front carbon can account for over 70% of the building's carbon footprint over its' lifecycle. For this reason reducing the up-front carbon is critical to creating a carbon neutral building.

The design process will include embodied carbon modelling as a design tool to help inform material selection throughout to create a balance between embodied carbon and energy performance. Energy use in buildings is directly impacted by the quality of the building envelope. The Passive House Standard has established the science of good building design: super-insulated, air-tight and thermal bridge free buildings. By building a better building we reduce the demand and thus the size of mechanical systems which reduces both cost and energy use.

Our design will highlight the building science of good envelopes to continue the theme of building as a teaching tool. To create a balance between energy requirements and our ability to offset these we will create an energy budget in collaboration with the Royal City team to understand in detail what the energy use expectations of the building will be rather than using default assumptions. This strategy allows us to then work to develop viable strategies to offset the energy requirements in the design.

Once our upfront carbon and energy use has been reduced and quantified we can look at how to generate and potentially store the energy required to operate the building and offset the overall carbon footprint. Water can again play a part in this discussion. Options being explored including using the existing lakes as heat exchangers for air conditioning and even looking to generate energy from the evaporation from the surface of by creating small "run-of-river" generating by creating slight elevational differences in the water level from front to back of building. Integrated vertical wind in the tower and Building Integrated photo-voltaic panels are other options to be integrated into the building to ensure that all material decisions serve multiple purposes in our goal to create a net-positive building.We will look at integrating Science Based Targets as a key metric in ensuring design decisions support emissions reductions that align with the IPCC target of maintaining a maximum global warming impact of 1.5 degrees.

Materials

The impact of material selections cannot be ignored from an impact to environment through extraction, recycling, health and carbon footprint. From decisions on upfront carbon, energy generating potential and impact to human and planetary health material selections will be mindful throughout the design process.

Health and Wellbeing

The science of human health and well-being is often overlooked in our quest for energy efficient, low-carbon buildings. From choosing materials with Health Product Declarations and a LCA analysis process a balance between energy performance and exposure to natural light and biophilic design human health will be a core driver in the design of the building.

SUSTAINABILITY

Standards and Accreditations

Building Standards

LEED Building Design and Construction LEED is the international standard for the design, construction and operation of high-performance structures. As the most holistic green building standard, LEED helps buildings to focus on efficiency and leadership to deliver the triple bottom line returns of people, planet and profit. The system addresses energy efficiency, water conservation, site selection, material selection, day lighting and waste reduction.
https://www.usgbc.org/leed

Living Building Challenge

The Living Building Challenge encourages projects to create living buildings that include regenerative design solutions to improve the local environments and encourage healthier communities. With a focus on place, water, energy, health and happiness, materials, equity, and beauty, the Living Building Challenge aims to create healthy and ecologically restorative spaces for the community at large.
https://living-future.org/lbc/

Passive House

Passive House (or Passivhaus) is a standard for energy efficiency that reduces a buildings ecological footprint. The standard includes design features such as superior windows, quality insulation, airtight construction, and improved mechanical ventilation to reduce a buildings ecological footprint. Passive infrastructure reduces fluctuations in temperature, improves indoor air quality, and dramatically reduces energy consumption reducing its overall environmental impact to create a healthier and more comfortable living space.
https://www.passivehousecanada.com/

Zero Carbon Building Standard

The Zero Carbon Building Standard provides pathways for new or existing buildings to achieve zero carbon. The key components include embodied carbon, refrigerants, and energy efficiency to reduce carbon emissions. The standard puts an emphasis on carbon reduction as the key indicator for building performance. Benefits of reducing carbon go beyond building performance, it also leads to creating healthy and sustainable communities.
https://www.cagbc.org/zerocarbon

WELL Building Standard

The WELL Building Standard (WELL) is a roadmap for creating and certifying spaces that advance human health and well-being. Unlike most green building standards WELL takes a people-first approach to buildings, organizations and communities with a focus on indoor air quality, water quality, material health, healthy food choices, physical and mental well-being. WELL was created by the International Well Building Institute based on a decade of research with leading research centres including the Mayo Clinic.
https://www.wellcertified.com/

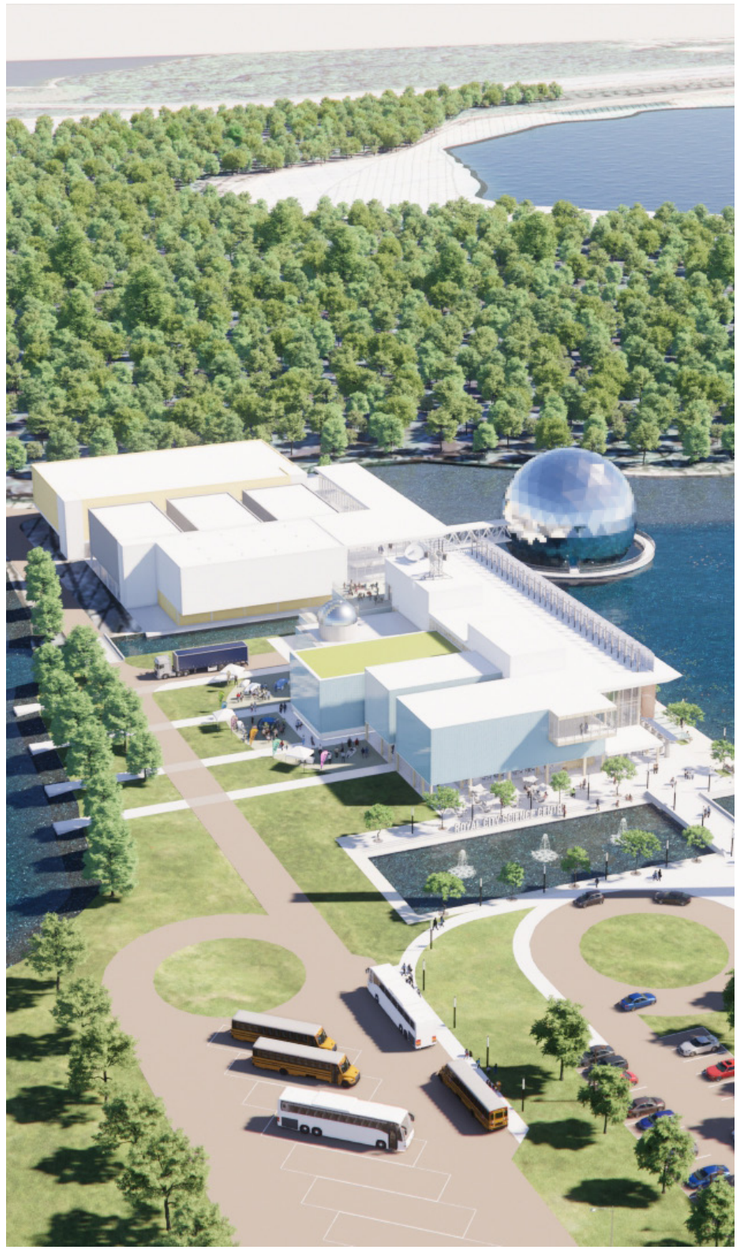
Fitwel

Like WELL, Fitwel focuses on human health and well-being. The system was developed by the Centre for Disease Control and the US General Services Administration. Fitwel is a checklist based rating system with a focus on air quality, physical well-being, healthy food choices, equity and community health. While similar in focus to WELL, Fitwel is a very prescriptive standard with a simpler certification process.
https://www.fitwel.org/

Alternate Community Based Standard:

One Planet Living

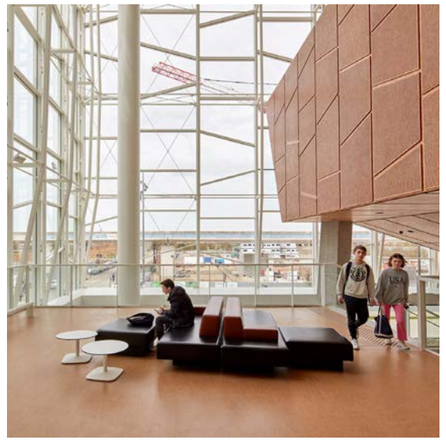
One Planet Living is a sustainability framework designed to support projects in how to create a 'One Planet Action Plan' towards a more sustainable future. The One Planet Living Framework recognizes the problem of overconsumption as being the root cause of unsustainable development. Two main ideas within the framework are how to move towards a circular economy and how to promote the sharing economy with the overall goal of reducing environmental impacts, enhancing wellbeing, and building better communities. While designed for community development the overlap with the UN SDG's and the fact that One Planet is a framework that allows flexibility to create your own approach to achieving the goals may provide opportunities for a project of this type.
https://www.bioregional.com/resources/one-planet-living-toolkit-for-community-groups



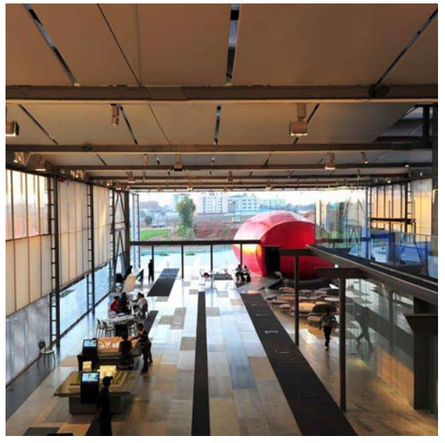
SW Aerial View

green reason

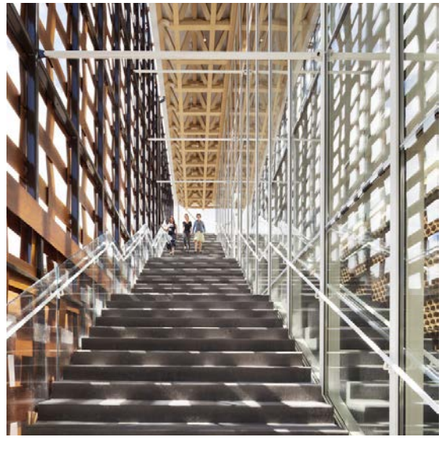
PRECEDENTS

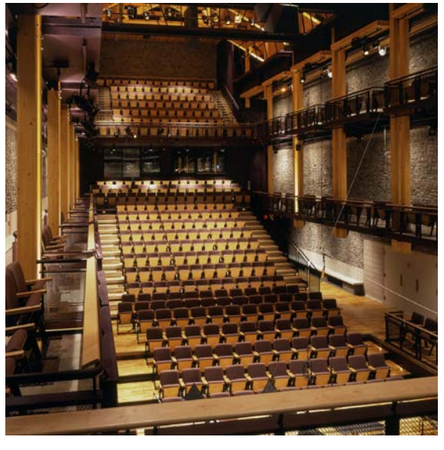


I Muzeiko Children's Science Center
II Domus Biotechnological Park
III
IV Bernard Tschumi Research Complex



I Bell Phillips Harwell Hide Pavilion
II Discovery Centre, India
III Tijbaou Cultural Center
IV Barnes Foundation





I Aspen Art Museum
II Toronto & Region Conservation Authority HQ
III C.W. Stockey Centre for the Perfoming Arts & Bobby Orr Hall of Fame
IV York University Bergeron Centre for Engineering Excellence

Senior RCSC representatives visited the TRCA project HQ to vizualize a ZAS project illustrating a similar context,size and sustainability/zero carbo aspiration.

ZAS ARCHITECTS + INTERIORS

MILL CREEK SITE

Situated within a view of Highway 401, the science center is poised to become a cornerstone attraction for the region, attracting tens of thousands of visitors annually. In 2016, the daily average traffic count on this bustling artery reached around 150,000 vehicles passing through our area. The proximity to this major thoroughfare will facilitate school excursions from neighboring regions, offering a significantly shorter and less congested journey compared to reaching the Ontario Science Centre in downtown Toronto.

Additionally, the strategic location of RCSC provides an ideal rest stop for families embarking on road trips through the area, and through collaboration with other stakeholders in the tourism sector such as restaurants and hotels, substantial contribution to the local economy is anticipated.

Research indicates that there are over 8 million Ontarians within a 90-minute drive of this location. Whether this site or another within the Township of Puslinch, close proximity to Highway 401 ensures direct access to millions in the region. In addition, site selection will focus on existing and former extraction sites such as the Mill Creek pit, owned by the University of Guelph. The rewilding/rehabilitation of such lands is a key component of our plans for the future.

This report situates our vision on the Mill Creek site, but the design process from the beginning was undertaken in such a way as to be readily transportable to other potential land opportunities in the region.

Mill Creek Aerial Proposed Site/Science Centre Concept Design


W View, Lake 1


N View


E View, Lake 2

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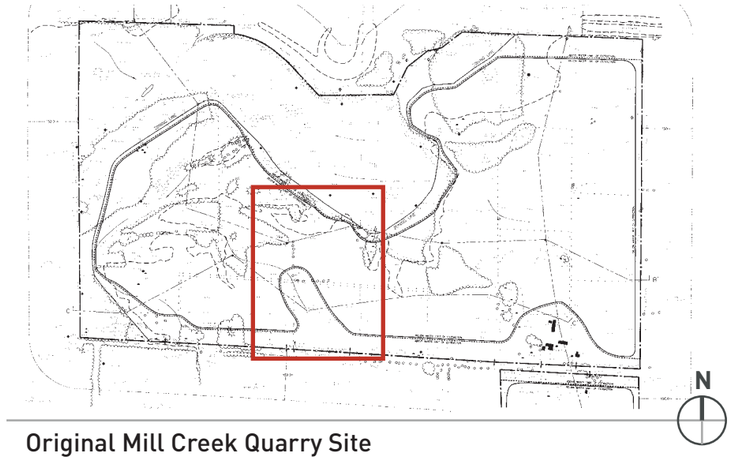
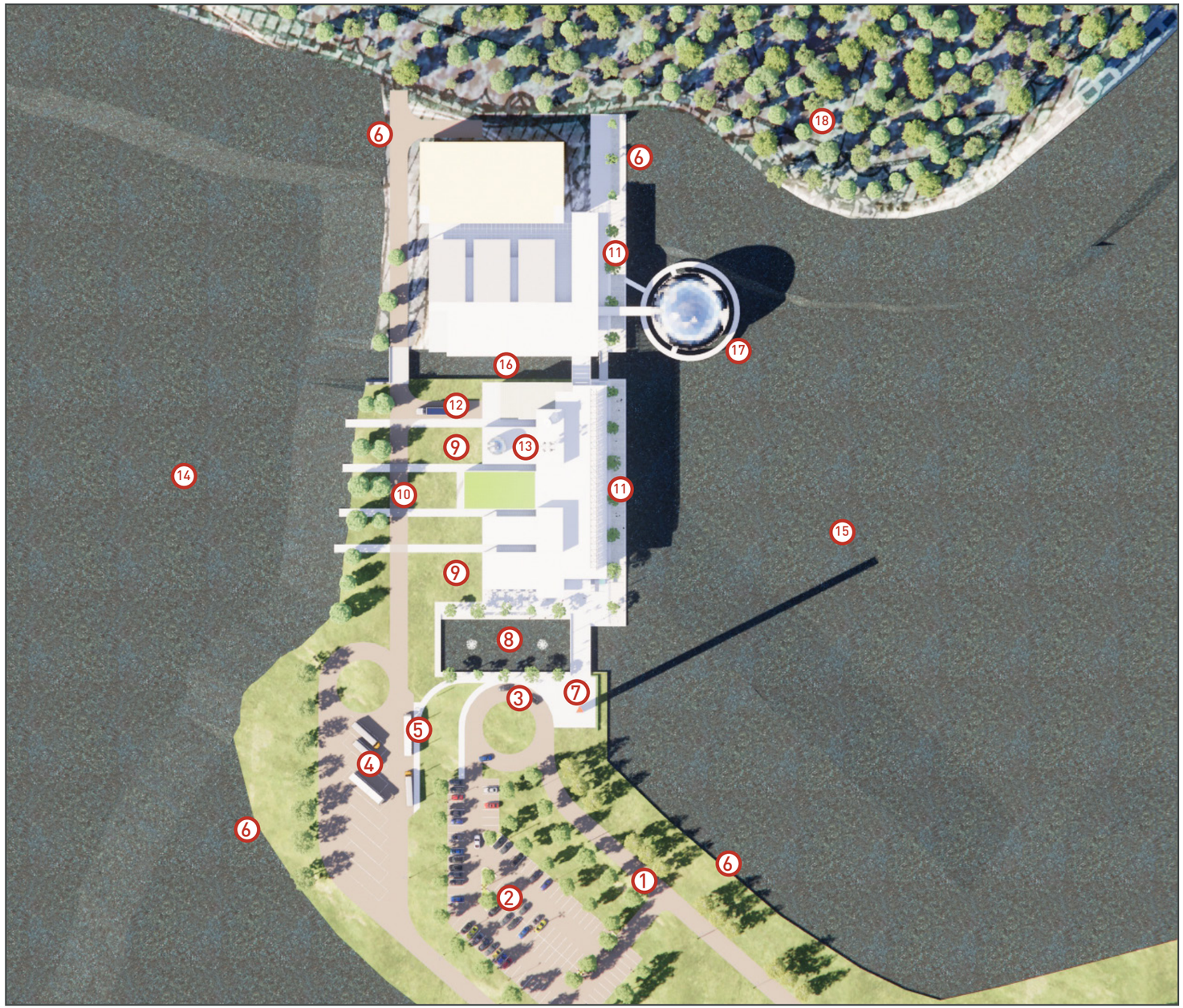
DEVELOPMENT OF REHABILITATED SITE



Original Mill Creek Quarry Site

1 DRIVEWAY
2 PARKING
3 PICKUP/DROPOFF ENTRY PLAZA
4 BUS PARKING
5 DROPOFF
6 REHABILITATED SHORELINE
7 LANDMARK
8 REFLECTIVE POOL/SKATING RINK
9 EXHIBITION COURTYARD/GARDENS
10 INFORMAL LAKE ACCESS /SERVICE
11 FORMAL LAKE ACCESS
12 DRIVE
13 OBSERVATORY/STARGAZING
14 REHABILITATED LAKE 1
15 FUTURE REHABILITATED LAKE 2
16 AQUATIC EXHIBITION
17 IMAX/PLANETARIUM
18 MATURE WOOD LOT



Proposed Detailed Site Layout

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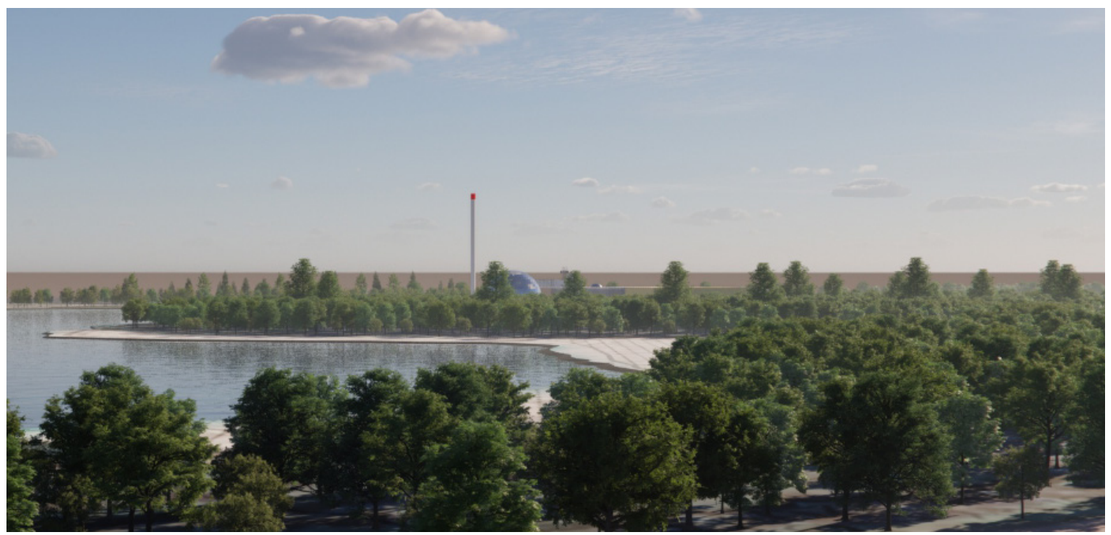
A LANDMARK



Landmark / 401 SW View

Landmark / SW View

Landmark / Concession W View

Landmark / Concession W Aerial View

ZAS ARCHITECTS + INTERIORS

CONCEPT PROGRAM PHASES I/II/III

PHASE I

GROUND FLOOR	M²	FT²
LOBBY/PROMENADE / CIRC	700	7535
WAREHOUSE	250	2691
THEATRE	280	3014
GIFT SHOP	160	1722
CAFÉ	190	2045
BOX OFFICE	40	431
WASHROOMS	100	1076
EXHIBITION HALL A	360	3875
COATS	30	323

SECOND FLOOR	M²	FT²
EXHIBITION HALL B	300	3229
EXHIBITION HALL C	280	3014
THEATER	120	1292
EDUCATIONAL	140	1507
BALCONY	270	2906

THIRD FLOOR	M²	FT²
OFFICES/WORKSHOP	350	3767
BRIDGE/CIRCULATION	190	2045

GFA	3760	40473
TOTAL AREA/PHASES I/II/III	**9300**	**100105**

PHASE II

GROUND FLOOR	M²	FT²
LOBBY	240	2583
EVENT SPACE	360	3875
EXHIBITION HALL PHII 1	450	4844
LINK PROMENADE PHII	90	969

SECOND FLOOR	M²	FT²
EXHIBITION HALL PHII 1	280	3014
EXHIBITION HALL PHII 2	280	3014
EXHIBITION HALL PHII 3	280	3014
OBSERVATION BALCONY/CIRC	270	2906
IMAX SPHERE	470	5056
BRIDGE	100	1076

GFA	2820	30354

PHASE III

GROUND FLOOR	M²	FT²
EXHIBITION HALL PHIII 1	320	3444
EXHIBITION HALL PHIII 2	320	3444
EXHIBITION HALL PHIII 3	260	2799
LOBBY BREAKOUT SPACE PHIII	360	3875
LINK PROMENADE PHIII	160	1722

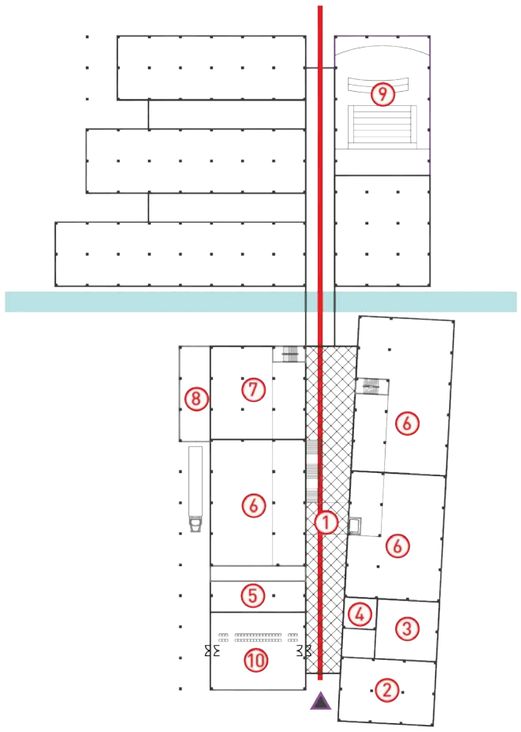
SECOND FLOOR	M²	FT²
GRAND EXHIBITION SPACE	1000	10764
BALCONY BREAKOUT PHIII	300	3229

GFA	2720	29278

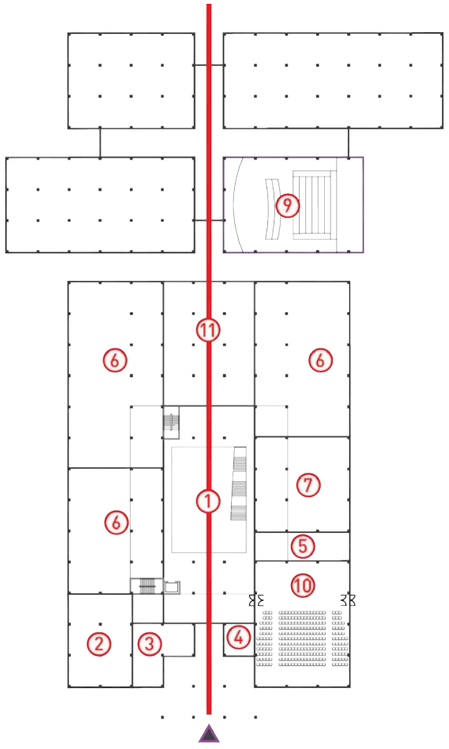
ZAS ARCHITECTS + INTERIORS

LAYOUT DIAGRAM OPTIONS/ CONCEPTS 1, 2, 3

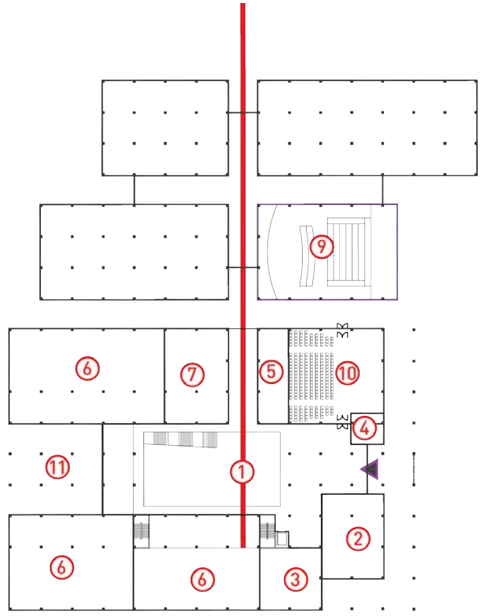
Concept 1
Lobby as path



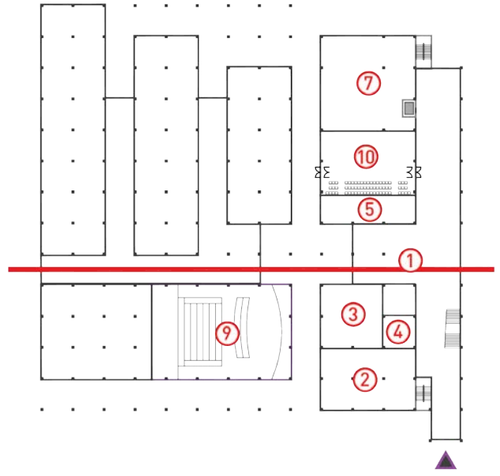
Concept 2
Lobby as place



Concept 2b
Lobby as path



Concept 3
Lobby as path



1 Lobby
2 Cafe
3 Gift shop
4 Box Office
5 Washroom/coat
6 Exhibition hall
7 Warehouse
8 Services
9 IMAX Theater
10 Theater
11 Outdoor Garden

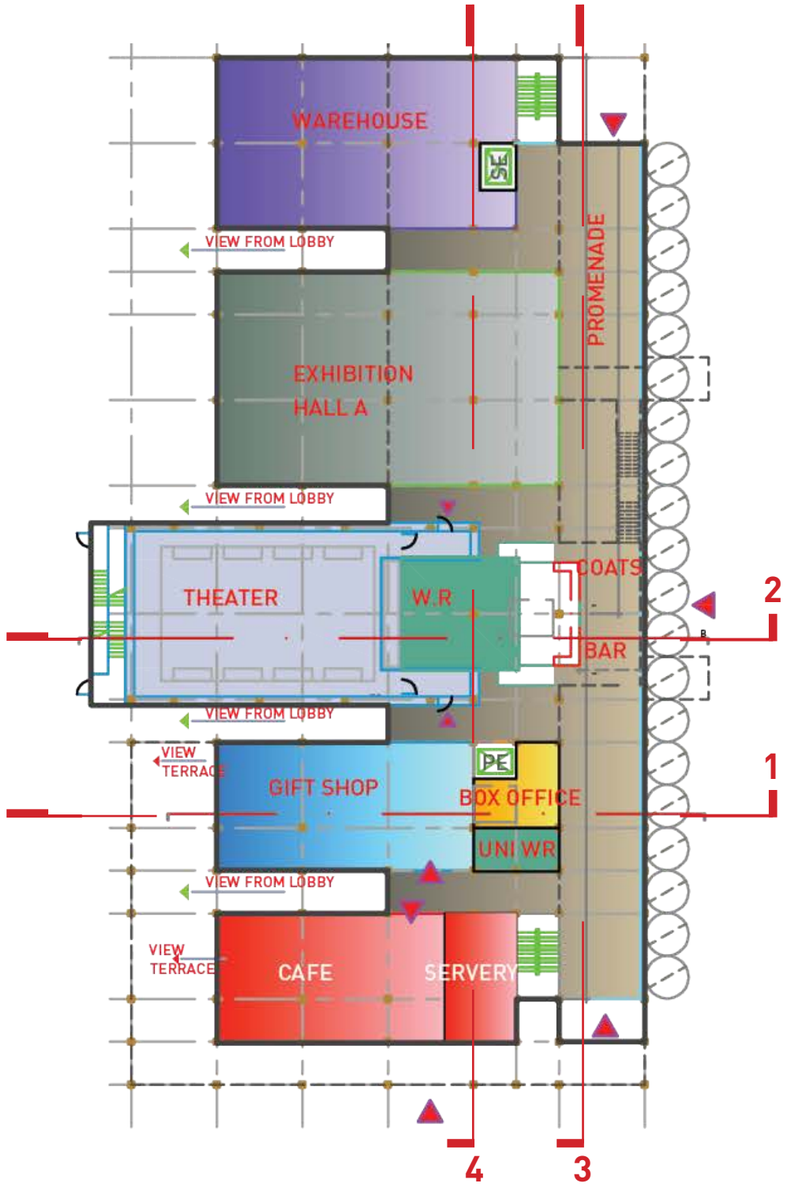
Ground floor support spaces include a 2,700 square foot warehouse, a 1,800 square foot gift shop, box office, coat check and washrooms.The second floor includes 2 main Exhibition Halls and Educational spaces which have views into the ground floor Exhibition Hall. The theater upper level can also be accessed from the second floor gallery. Through views to the 2 lakes are maintained on the second floor.

The second floor and third floor landings of the feature stair project out of the façade as a viewing post. A grand elevator ensures accessibility to all levels of the building and is conveniently located in close proximity to the warehouse space to allow for exhibition space set up and servicing. Offices and Workshops are located on the third floor and overlook Lake 2 through the promenade to the east and Lake 1 to the west.

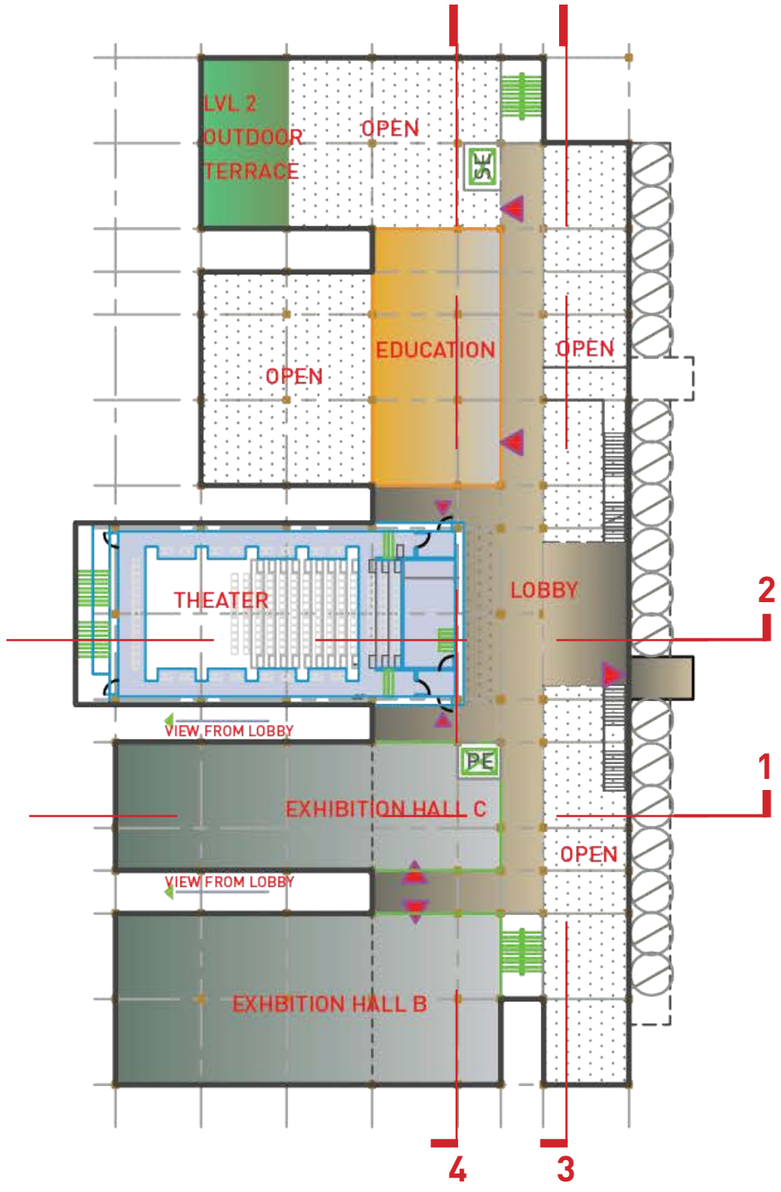
ZAS ARCHITECTS + INTERIORS

DETAIL PLAN PHASE 1

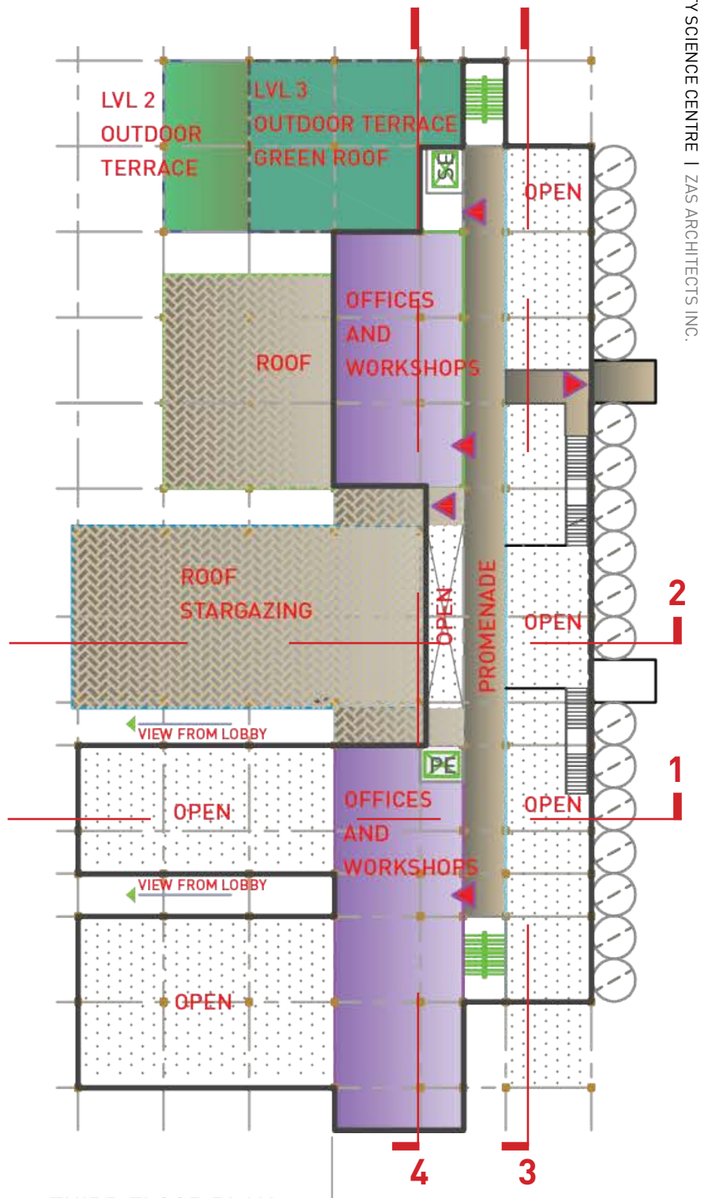
Concept 4 Lobby as Path



GROUND FLOOR PLAN



SECOND FLOOR PLAN

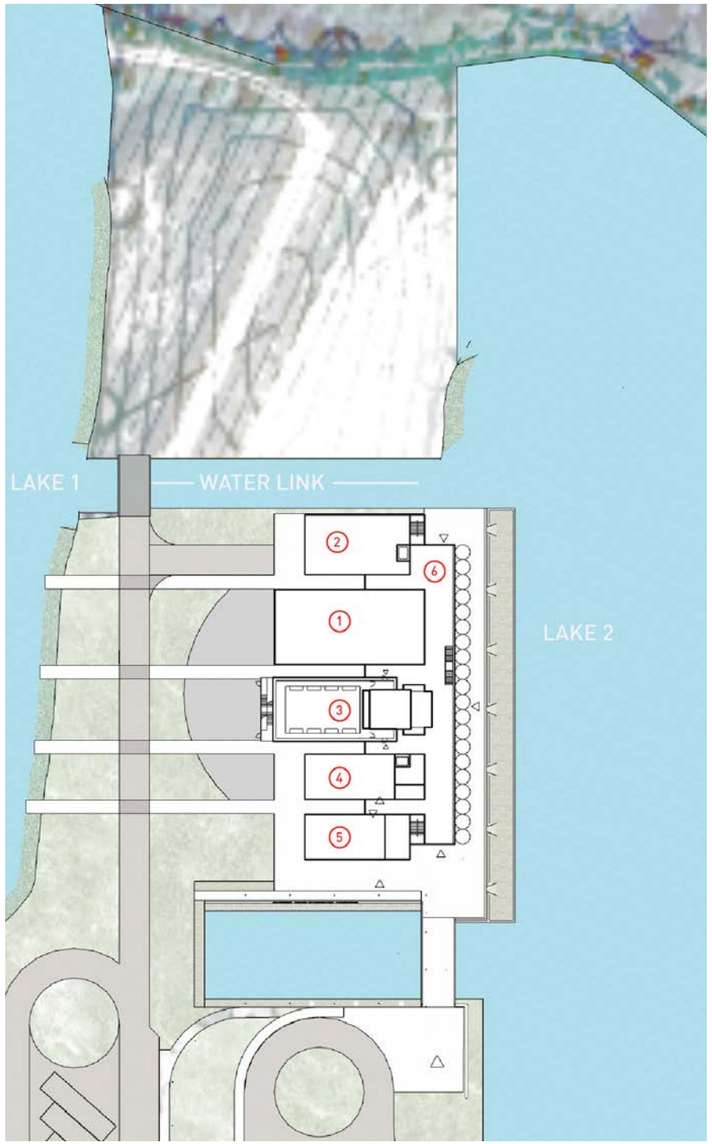


THIRD FLOOR PLAN

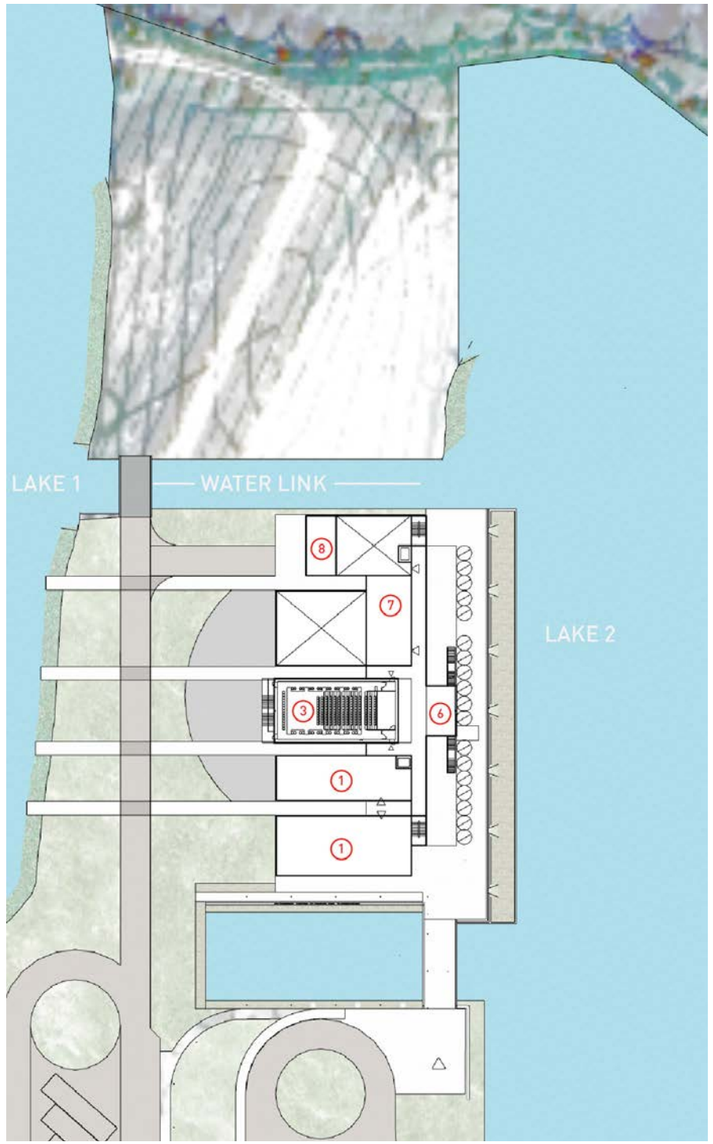
ZAS ARCHITECTS + INTERIORS

PLANS PHASE I

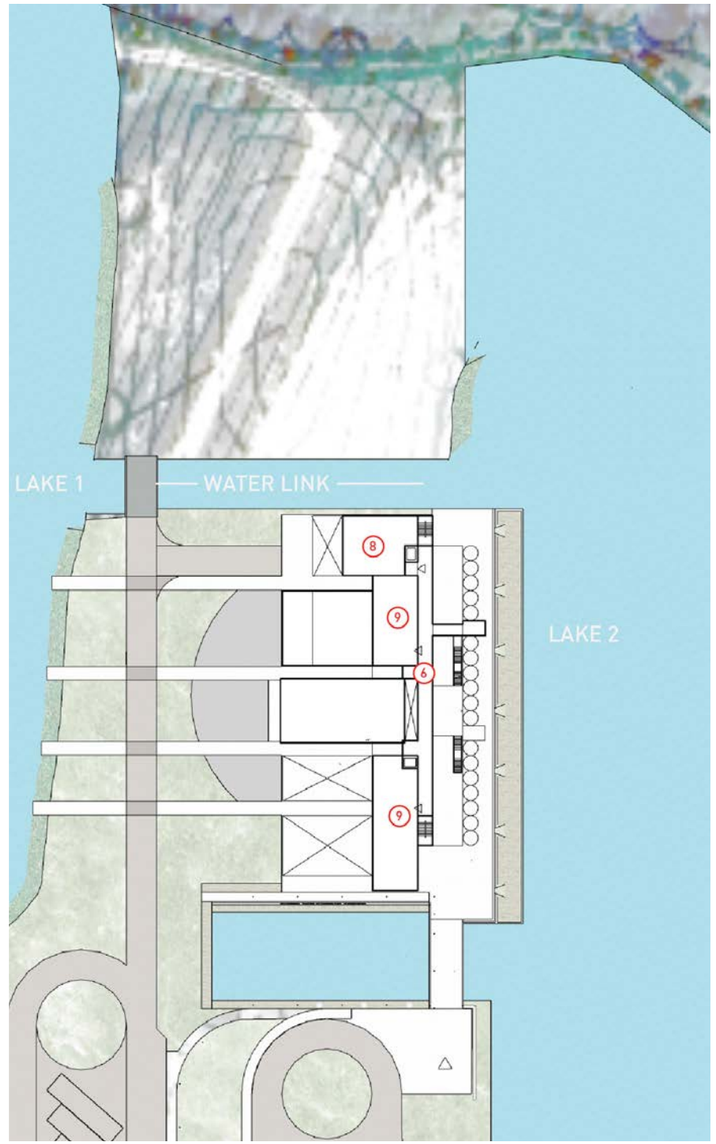
GROUND FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



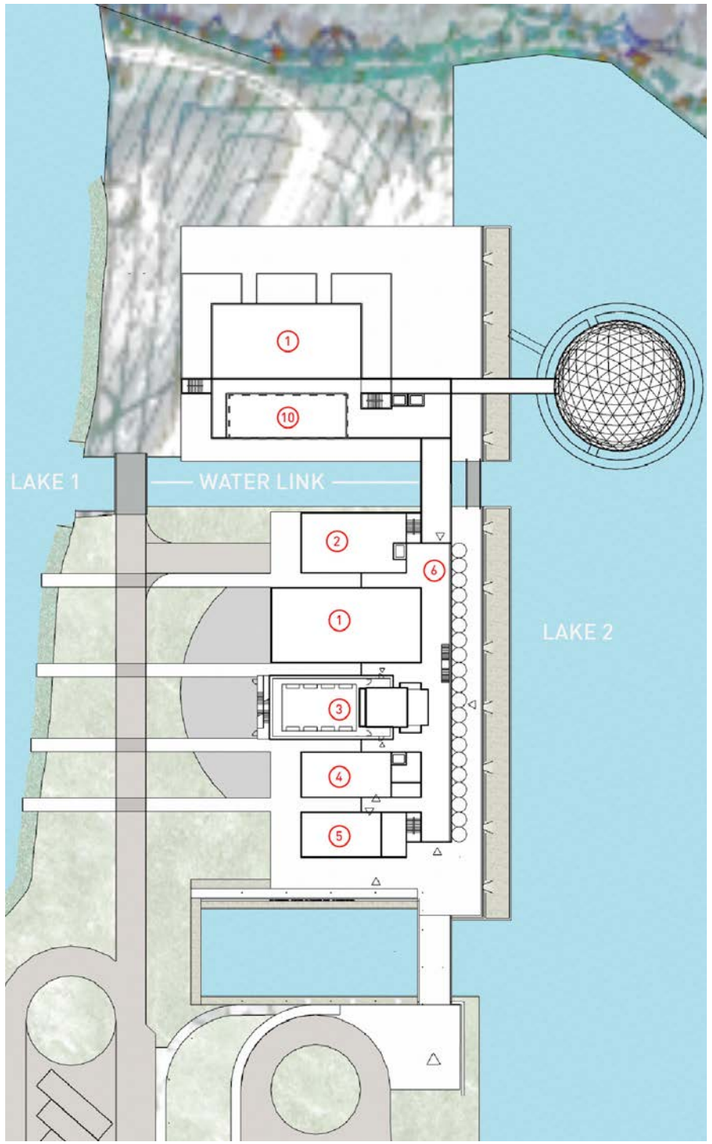
1 Exhibition Halls
2 Warehouse
3 Theater
4 Gift Shop
5 Cafe
6 Circulation
7 Education
8 Terrace
9 Offices/Workshops
10 Event space
11 Bridge
12 IMAX
13 Lobby
14 Exhibition Grand Hall
15 Balcony

Phase 1 of the RCSC project is a complete functioning facility, subsequent phases would add new features and activities and provide additional exhibition and support spaces for an increasing educational and research demand. The growth of the facility is controlled through the extension of the promenade thus keeping the original idea of the design.

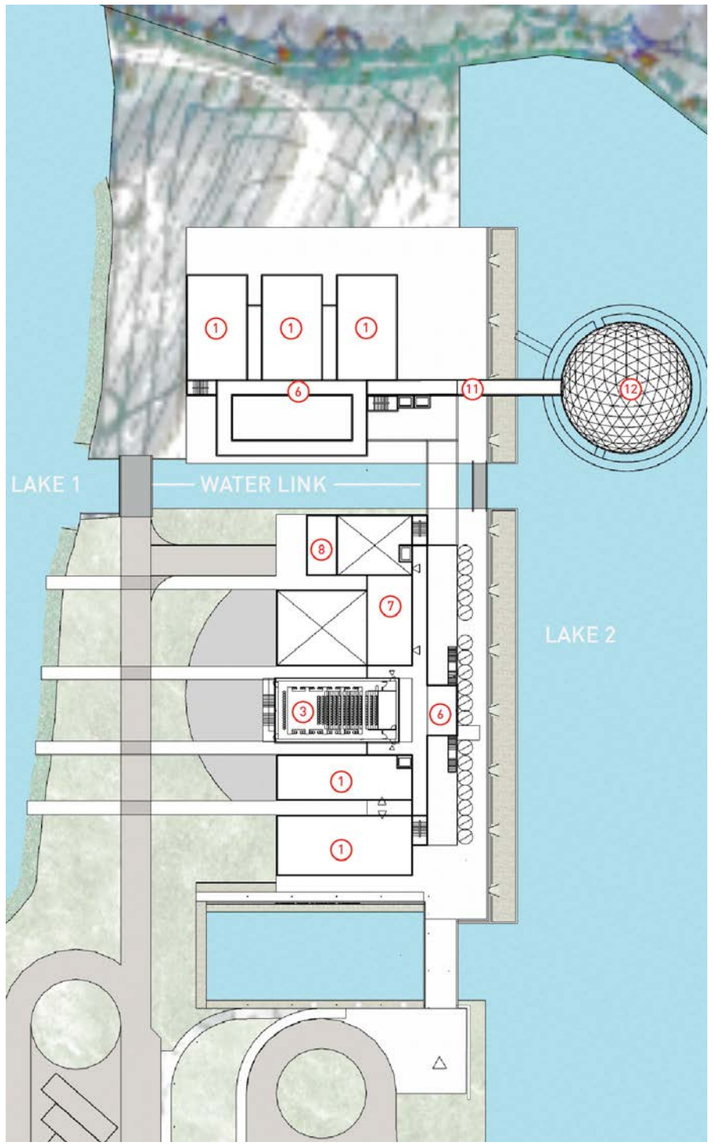
ZAS ARCHITECTS + INTERIORS

PLANS PHASE II

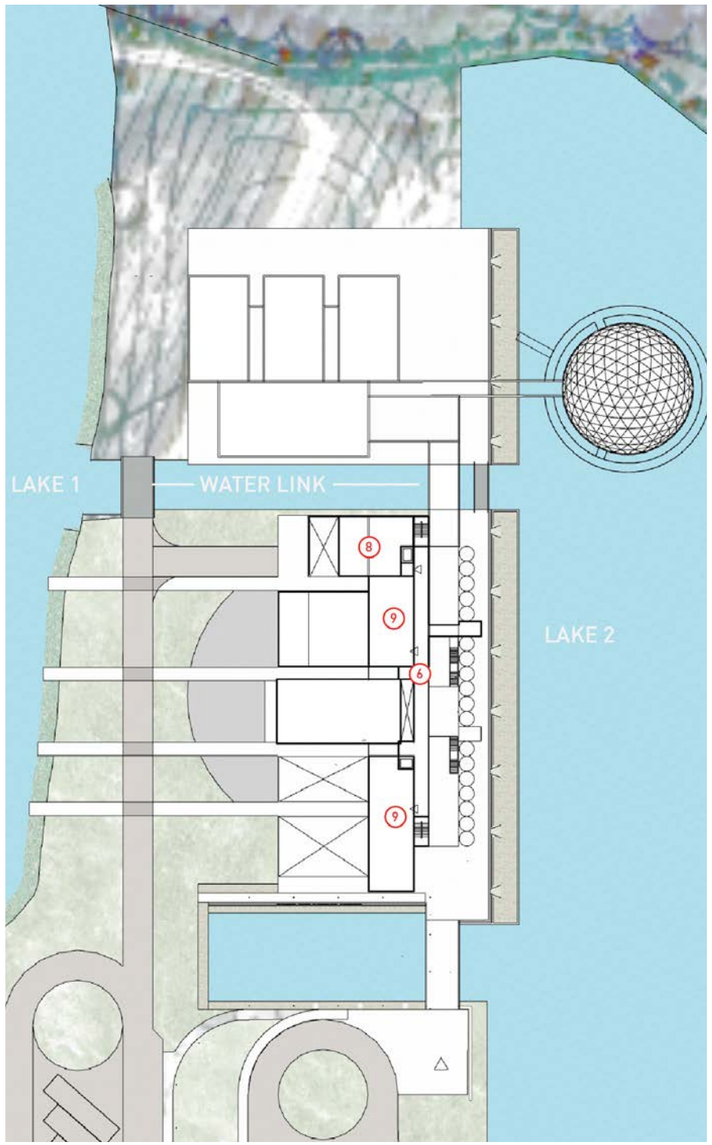
GROUND FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



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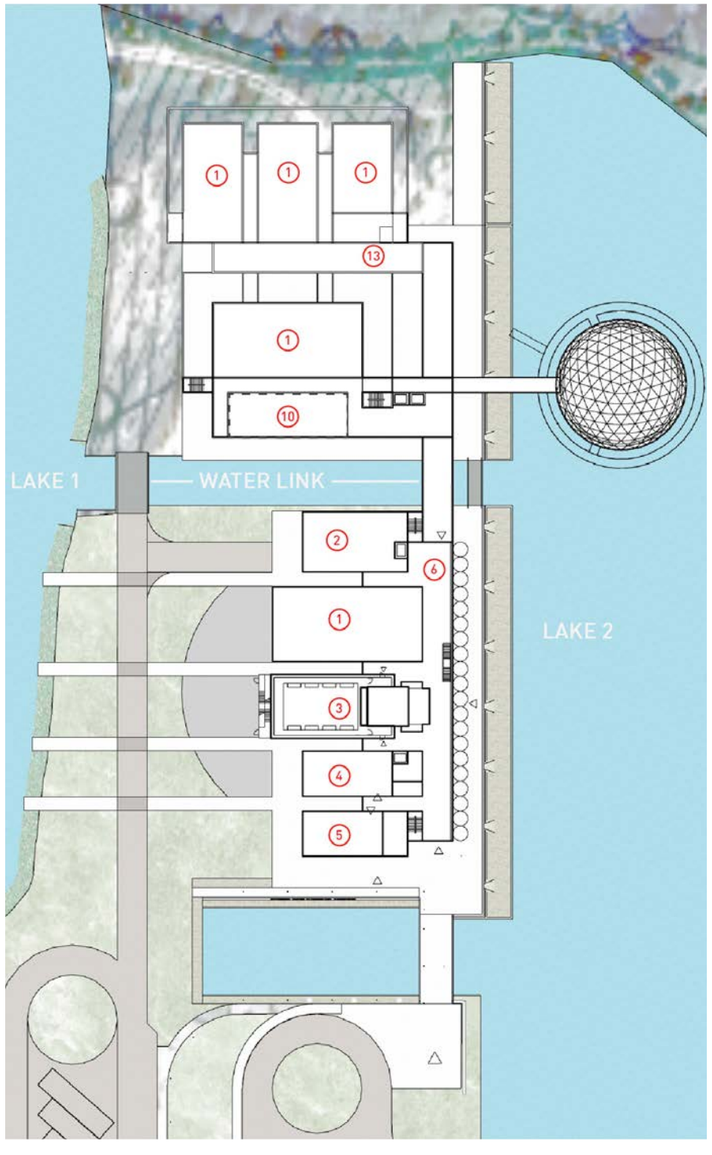
Phase 2 is intended to invite more participation, enrich the experience and draw more masses to the RCSC. It would include the addition of an IMAX sphere, clad in PV panels with the ability to project onto an IMAX screen as well as on the curved surface for planetarium features. It also would include 3 interconnected exhibition halls, educational and research workshops and a multi-purpose main event space with a perimeter viewing gallery that may be offered for private parties and special community events.

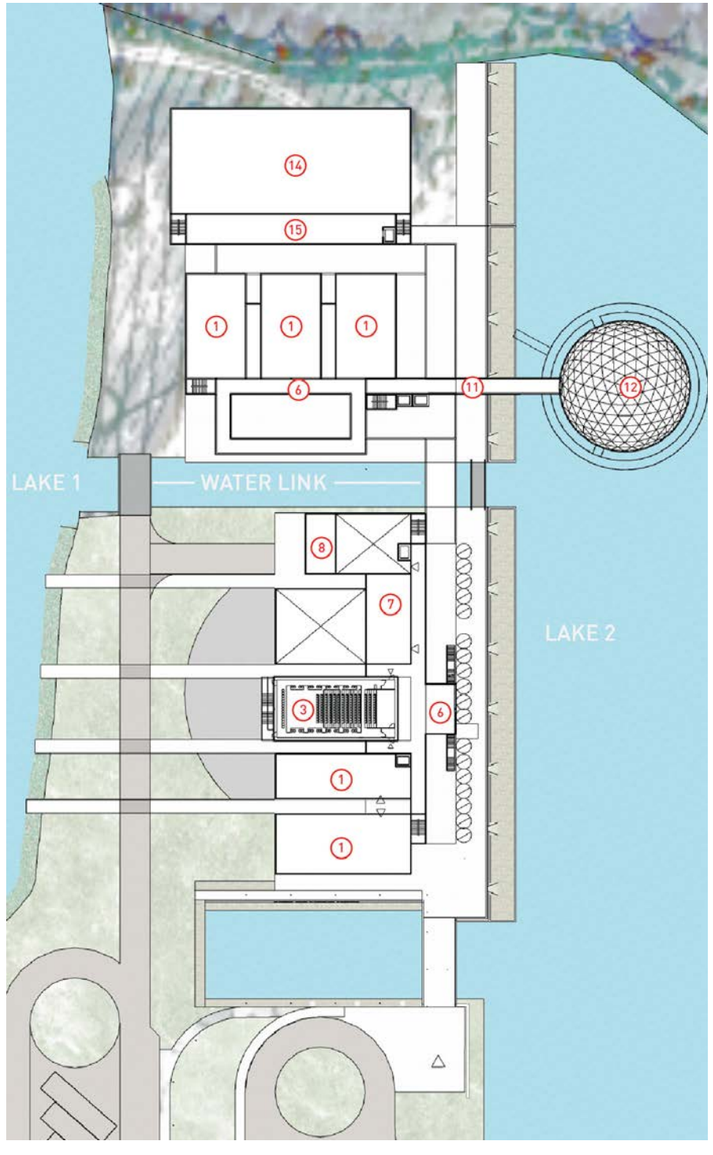
ZAS ARCHITECTS + INTERIORS

PLANS PHASE III

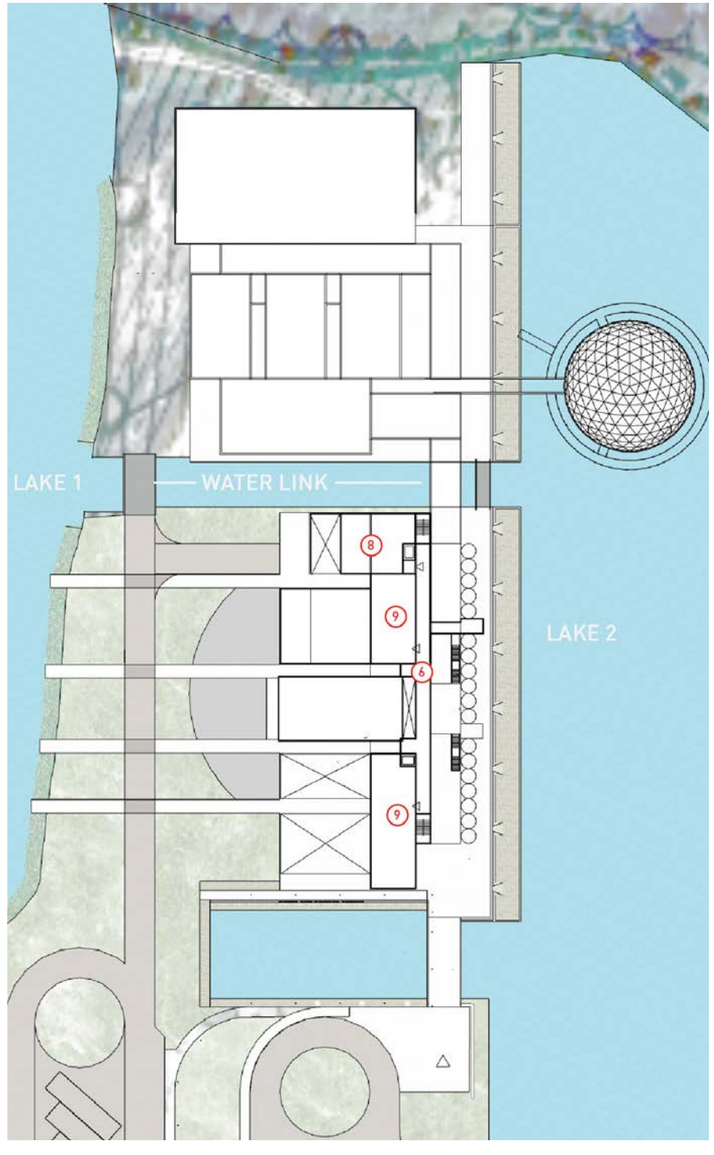
GROUND FLOOR PLAN



SECOND FLOOR PLAN



THIRD FLOOR PLAN



1 Exhibition Halls
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Phase 3 similarly includes the addition of 3 interconnected exhibition halls, educational and research workshops and features a second story multi-purpose grand exhibition hall at 10,000 square feet which may have movable partitions to be subdivided into smaller spaces as required.

ZAS ARCHITECTS + INTERIORS

CONCEPT DESCRIPTION

PROGRAMMING

Phase 1 of the proposed science centre development entails the construction of 40,000 square feet for indoor programming. Situated amidst over 200 acres of former quarry lands, predominantly water-covered, the indoor facility will be complemented by outdoor activities including nature walks, Indigenous knowledge walks, dark sky events, and citizen-science projects such as long-term biodiversity monitoring programs, groundwater testing and tracking, and bird migrations. Collaborating with Dufferin Aggregate has provided valuable insight pertaining to the potent reuse of the rehabilitated brownfield site. The northwest protected corner, adjacent to Mill Creek, will remain untouched, serving as a pristine living laboratory for visitors to engage with the natural ecosystem.

The workshops, warehouse, and assembly space constitute vital elements as they present opportunities for additional sources of revenue, as the RSC group ventures into the exhibit manufacturing and rental sectors. The warehouse areas flanking the rear of the center will be easily adaptable for expanded exhibit space. Additionally, these warehouse spaces will serve as transitional zones from the Phase 1 structure to the Phase 2 and Phase 3 expansion areas as funding becomes available.

Phases 2 and 3 each are projected to have respective areas of 30,000 square feet. Phase 2 involves the addition of a convertible IMAX Theatre / Planetarium and its supporting infrastructure, which can function independently and become a unique attraction to draw more people when the center is closed. Phase 3 focuses on establishing a Nature and Ecology Centre, further enriching the outdoor programming offerings.

PRE-DESIGN CONCEPT

The proposed Science Centre building is located on a 200-acre site which includes two lakes, located south of the 401 highway, as part of the Mill Creek Aggregate quarry. The concept design illustrates the potential for redevelopment and reuse of this unique partially rehabilitated brownfield site. A landmark tower monument located adjacent to the building provides a direction al beacon that can be recognized from afar. Approaching from the concession road, one experiences a preview of the building, and its reflection in and fronting Lake 2. The building is developed along a formalized north south axis structuring the primary program components of the building which include guest services, exhibition halls, warehouse/ exhibit fabrication, a convertible multi-use "box" theatre, education/ workshops and administration.

Separated site access provisions and parking rooms are divided between service, commercial (E-bus) vehicles and private (E) patron vehicles to organize traffic on-site circulation and to mitigate pedestrian congestion to the main entrance, plaza and the building drop-off / pickup areas. A naturalized service lane is provided along the west side of the building which connects the parking lots to the service drop off, adjacent to the warehouse.

The building location and configuration is established to harness the optimized potential for site positioning, orientation, program functioning, climate action, and enhanced interaction with the other outdoor activities. Phase 1 with an area of 40,000 sq ft is located along the east edge of the buildable land precinct, separating the adjacent two lakes. The primary design concept is based on 'lobby as a path', oriented along the north south structural axis, with visual connection to the undisturbed north mature wood lot. The continuous building lobby / promenade links the north and south entrances, hosting lounge areas, reception/ box office, concessions, while facilitating views of and formal access to Lake 2 and pre-function access at all levels to the various programmed spaces within the complex. The lobby / promenade serves as a flexible and adaptable space to congregate, view informal exhibitions and space that can be rented for private/ special functions.

The 280 capacity, convertible, multi-use "box" theatre is prominently centered within the building and draw the patrons into the lobby, which could be utilized independently, when the formal exhibition hall spaces are closed. A central open staircase takes the visitors up to the second floor bridge level, which serves as the pre-function space during formalized theatre activities and provides an elevated platform to view ground level exhibits and suspended science elements located with-in the lobby / promenade. The bridge level also continues the central open stair providing access to the third level and to exterior balconies along the east façade, overlooking Lake 2.

Building massing is juxtaposed in such a manner that each science centre function maintains a distinct external identity and position within the overall building design. At the ground level naturalized informal access to Lake 1 and secured exterior courtyards and gardens create visual transverse continuity between the east and west building facades and facilitating connecting views of both lakes from various vantage points along the lobby / promenade. The café, gift shop, washrooms and box office are all visible and accessible to the main entrance. The adjoining canopied and exterior protected outdoor seating space, provide patrons sheltered location during the arrival and departure sequences, winter skating and to overlook to the outdoor reception plaza from the building premises.
Offices and workshops are located on the third level and overlook Lake 2 through the promenade to the east and Lake 1 to the west. Vegetated green roofs with potential future greenhouses are accessed from the workshops. Solar panels are planned for reflective white non-green roof surfaces. The accessible roof over the Theatre will provide public night sky star-gazing.

Future Phasing / Growth
Phase 1 of the RCSC project is a complete functioning facility, with subsequent phases adding new features, activities and additional exhibition and support spaces for an increasing educational and research demand. The growth of the facility is controlled through the extension of the promenade thus maintaining the design continuity of the original concept.
Phase 2 is intended to invite more participation, enrich the experience and draw more patrons to the RCSC. It is envisioned to include the addition of a convertible IMAX sphere, clad in PV panels with the convertible ability to project onto an IMAX screen, or to the curved surface for planetarium feature. It also would include 3 interconnected exhibition halls, educational and research workshops and a multi-purpose main event space with a perimeter viewing gallery that would support larger private functions and special community events.
Phase 3 similarly includes the addition of 3 interconnected exhibition halls, educational and research workshops and a second storey multi-purpose grand exhibition hall of 10,000 square feet which with inclusion of relocatable partitions, be subdivided into smaller exhibition spaces as required.

Multiple planning configurations were developed through visioning, assessed, and analyzed through presentations, discussions, and collaboration between ZAS and RSC representatives. Following thorough evaluation of the advantages and disadvantages of the various layout options one hybrid design concept, option 4 was preferred, further detailed and refined to facilitate the commercial parameters of this report.

ELEVATIONS

PH I PH II PH III

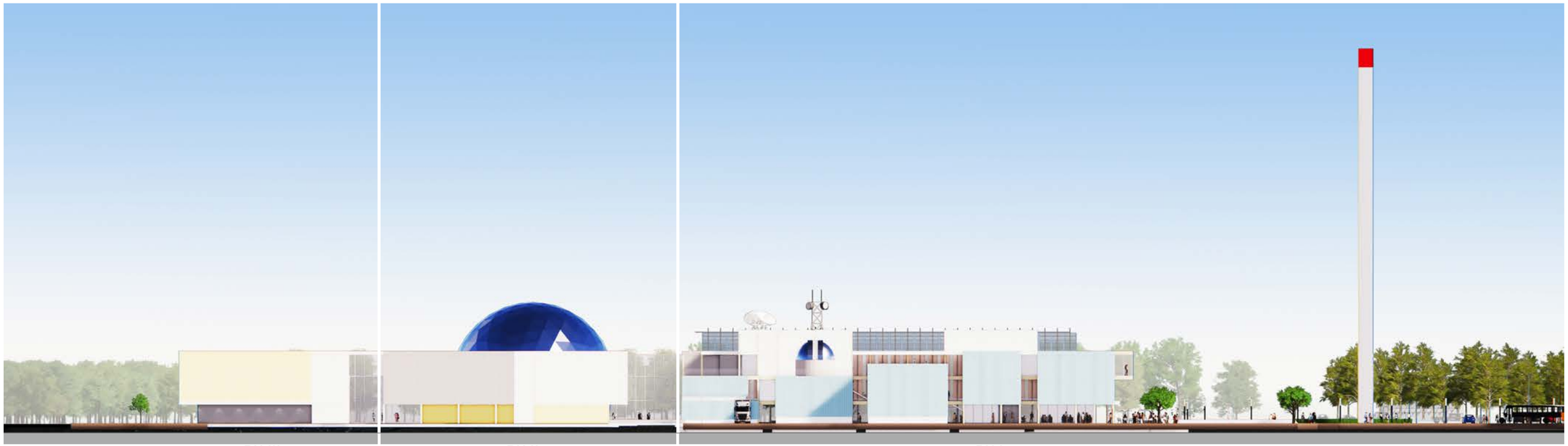
East Elevation

PH I PH II

South Elevation

ZAS ARCHITECTS + INTERIORS

ELEVATIONS

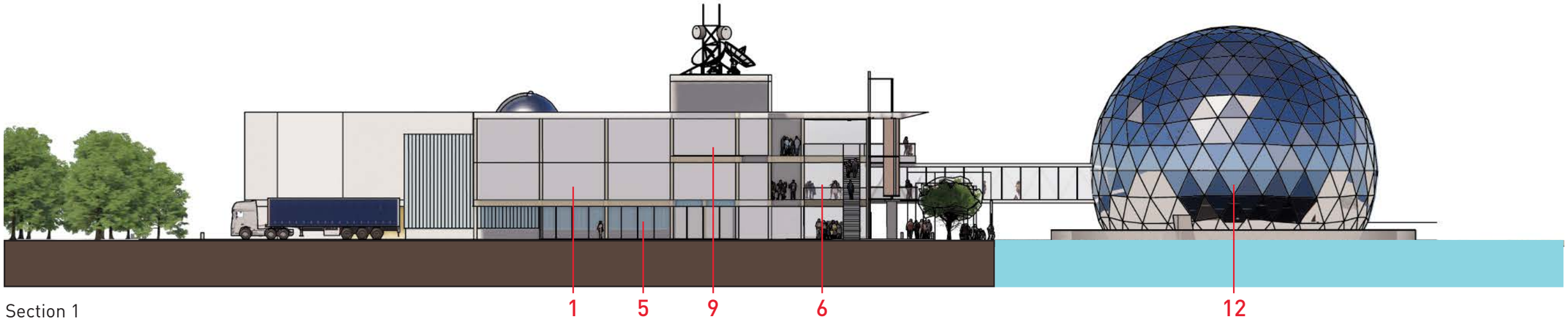


West Elevation

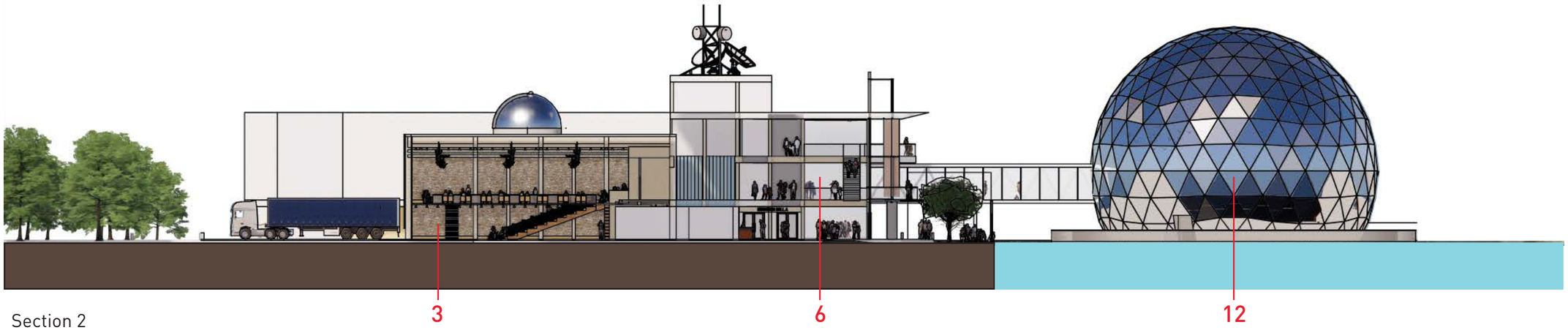
North Elevation

ZAS ARCHITECTS + INTERIORS

SECTIONS



Section 1



Section 2

1 Exhibition Halls
2 Warehouse
3 Theater
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5 Cafe
6 Circulation
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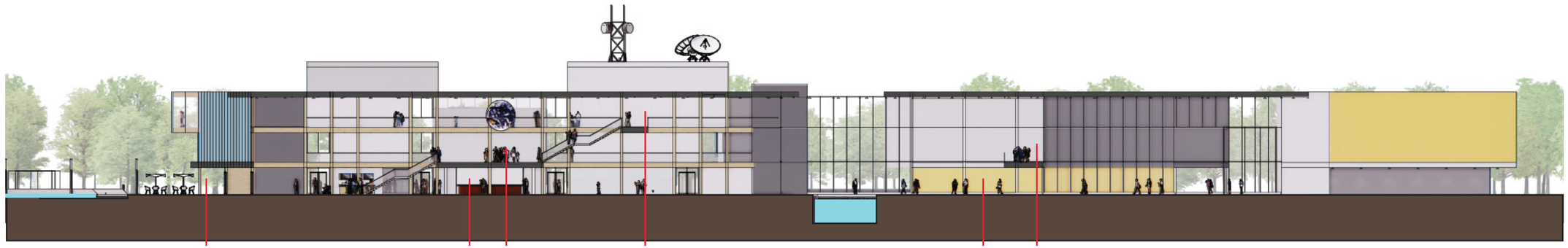
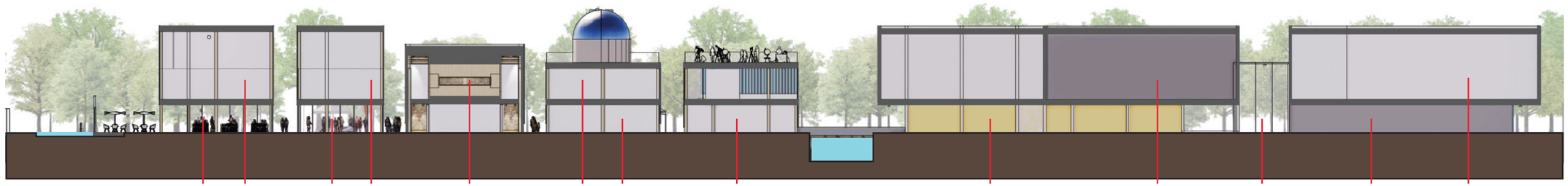
8 Terrace
9 Offices/Workshops
10 Event space
11 Bridge
12 IMAX
13 Lobby
14 Exhibition Grand Hall
15 Balcony

ZAS ARCHITECTS + INTERIORS

SECTIONS



Section 3



Section 4

1 Exhibition Halls
2 Warehouse
3 Theater
4 Gift Shop
5 Cafe
6 Circulation
7 Education
8 Terrace
9 Offices/Workshops
10 Event space
11 Bridge
12 IMAX
13 Lobby / Promenade
14 Exhibition Grand Hall
15 Balcony

ZAS ARCHITECTS + INTERIORS

VISUALIZATIONS

INTERIOR PERSPECTIVES

South Lobby / Main Stair N View

South Lobby / Ph1 + Ph 2 Lobby N View

South Lobby / Main Stair S View

ZAS ARCHITECTS + INTERIORS

VISUALIZATIONS

EXTERIOR PERSPECTIVES

Aerial Perspectives Ph 1 + Ph 2 + Ph 3 SE View

East Promenade / Lake 2 N View

East Promenade / Lake 2 N View - Night View

ZAS ARCHITECTS + INTERIORS

DEVELOPMENT METHODOLOGY/WORKPLAN/SCHEDULE

DEVELOPMENT METHODOLOGY/WORKPLAN/SCHEDULE
7034 CONCESSION 2, TOWNSHIP OF PUSLINCH, ONTARIO

Project #: 2023-024
REVISION 1 26 AUGUST 2024

STAGE	0	1	2	3	4	5	6	7
WORK PLAN STAGE	Feasibility Study	Preplanning	Pre-Design/Facility/ Programme/Vision/Concept Design	Schematic Design	Design Development	Tender/Construction Documents	Contract Administration/Site Review/ Commissioning	Post-Commissioning
COST MANAGEMENT - QTY SURVEYOR	▲ CLASS ORDER OF MAGNITUDE			100% ▲ CLASS D	100% ▲ CLASS C	50%,25% ▲ CLASS A	▲ FAIR VALUE CCN	
CONSULTANT TEAM RESOURCES ALLOCATION		MANAGEMENT/DESIGN TEAM			PRODUCTION TEAM		CONTRACT ADMINISTRATION TEAM	

TASKS

- PRO.#: 2023-024 RETAIN CONSULTANT — 5 MARCH 2024
- VISIONING/TONE — 18 APRIL 2024
- G COC — 30 APRIL 2024
- 2ND MEETING AT U OF GUELPH — 15 MAY 2024
- 3RD MEETING AT U OF GUELPH — 19 JUNE 2024
- 4TH MEETING AT ZAS — 30 JULY 2024
- TELECOM/FED FUNDING — 23 AUG 2024
- FINAL REPORT — 27 AUG 2024

- DETAIL & WORKPLAN APPROVAL
- DETAIL CRITICAL PATH SCHEDULE -EVENTS -MILESTONES -MEETINGS -PRESENTATIONS
- DATA COLLECTION
- ONBOARD CURRENT CONCEPT 3D MODEL OF RCSC
- THOROUGH REVIEW OF EXISTING SITE CONDITIONS
- REVIEW & VALIDATE EXISTING CONDITIONS WITH WITH 3D MODEL
- REVIEW & VALIDATE SITE EVALUATION & FEASIBILITY STUDY
- REVIEW & COMMENT ON BUDGET
- VALIDATE/OBTAIN BASELINE DATA, LEGAL
- MEET WITH AUTHORITIES HAVING JURISDICTION -PLANNING -BUILDING -ENGINEERING -CONSERVATION AUTHORITY
- ESTABLISH FTP PROJECT SECURE WEBSITE
- DEVELOP OPPORTUNITIES & CONSTRAINTS OVERVIEW

- COMPLETE COMMUNITY LISTENING STRATEGY -TOWNHALL MEETINGS -STAKEHOLDER MEETINGS -QUESTIONNAIRE
- PARTNERING SESSION VALIDATE INPUT/NEEDS REQUIREMENTS **A**RCSC, MANAGERS, CONSULTANTS **B**STAFF/USERS **C**STAKEHOLDERS **D**INDIGENIOUS **E**XHIBIT DESIGN **G**PARTNERS
- VALIDATE STATEMENT OF REQUIREMENTS -OBJECTIVES -NEEDS -GOALS
- VALIDATE PROJECT FUNCTIONAL PROGRAM -VISION -SPACE PROGRAM -SPACE DATA SHEETS -RELATIONSHIP DIAGRAMS -TECHNOLOGY REQUIREMENTS -REVIT MODEL INTEGRATION
- VALIDATE PROJECT PLAN/BIM AND SCHEDULE
- BLOCK/STACKING PLAN(S)

- VALIDATE COSTING PARAMETERS PROJECT BUDGET
- ESTABLISH DESIGN & CONSTRUCTION CRITERIA
- ESTABLISH OPERATIONAL CRITERIA
- ESTABLISH ZERO CARBON & ENERGY CONSERVATION INCENTIVES OPTIONS
- ESTABLISH/ DETAIL SCHEDULE REQUIREMENTS
- ESTABLISH PERMIT REQUIREMETNS
- REVIEW AND COORDINATE EXISTING SERVICES
- REVIEW NEW SERVICES
- DEFINE PROJECT COMPONENT PHASING
- GOALS & OBJECTIVES REQUIREMENTS STATEMENT
- PREPARE CONCEPT DESIGN FOR 3 PHASES

- DEVELOP APPROVED SCHEMATIC DESIGN OPTIONS
- 17 UN SUSTAINABILITY GOALS
- SCHEMATIC FLOOR PLANS, ELEVATIONS SECTIONS
- VALIDATE FUNCTIONAL PROGRAMMING
- DIAGRAM ENGINEERING SERVICES SYSTEMS/COSTS
- TEST COST ESTIMATE "DESIGN TO BUDGET" FOR EACH DESIGN ALTERNATIVE
- TEST JURISDICTION REQUIREMENTS -PLANNING -BLDG
- BARRIER FREE AODA ACCESSIBILITY COMPLIANCE
- TEST ENVIRONMENTAL AND SWM/ NATURALIZATION COMPLIANCE
- TEST CPTED PRINCIPLES
- PREPARE 3D COMPUTER MODEL
- DEFINE INDEPENDENT INSPECTION & TESTING

- REFINE PROGRAM ELEMENTS "FUNCTION & FIT"
- EVALUATION CRITERIA SELECT PREFERRED SCHEMATIC DESIGN
- "EFFICIENCY" IMPLEMENTATION COST/SCHEDULE SUSTAINABILITY FLEXIBILITY ACCESSIBILITY OPERATIONAL ANALYSIS
- CONSENSUS ENDORSEMENT
- TECHNICAL/ STEERING COMMITTEES
- RCSC PRESENTATION 1
- PUBLIC COMMUNITY INFORMATION FORUM
- **RCSC APPROVAL**

- DEVELOP SCHEMATIC DETAIL DESIGN
- INTEGRATE ENGINEERING BLDG SYSTEMS
- DESIGN ENGINEERING BLDG SYSTEMS
- DESIGN IT, AV, PA, VOICE DATA, CCTV, WIFI, BAS
- DEVELOP SUSTAINABLE INITIATIVES
- ROOM DETAIL LAYOUT(S) FITMENTS
- PREPARE MATERIALS, ELEVATIONS, INTERIOR FINISHES, FURNITURE
- OUTLINE SPECIFICATION
- VALIDATE COMPLIANCE TO CODES, BYLAWS
- PREPARE COST ESTIMATE & CONFIRM COMPLIANCE W/ ESTABLISHED BUDGET, SCHEDULE
- REVIEW & RECOMMEND CONSTRUCTION OPTIONS
- PREPARE VISUALIZATION MODEL
- ATTEND RECORD DESIGN MEETINGS
- PUBLIC COMMUNITY FORUM 2

- CONSTRUCTION DRAWINGS, SPECIFICATION PREPARED
- DESIGN SIGNAGE & WAYFINDING
- INSPECT/TESTING REQUIREMENTS
- 3RD PARTY COMMISSIONING PLAN
- COST CHECKS A/S/M/E/L
- COMPLY/EXCEED ASHRAE 90.1
- BUILDING/ PERMIT/ SPA/ REGULATORY APPROVALS
- PROCURE LONG LEAD ITEMS
- PREQUALIFY/ RECOMMEND BIDDERS, GC, M/E
- VALUE REVIEW ENGINEERING
- MIGRATION OCCUPANCY PLAN

- ISSUE TENDER/ ADDENDA/GC PRESUBMISSION SITE MTG
- BIDS ANALYSIS/ RECOMMEND
- RCSC PRESENTATION 2
- AWARD/PREPARE CONTRACT
- ASSIST FF+E SPEC TENDERS
- ISSUE IFC DWGS/ SPECS
- MAINTAIN SECURE DOCUMENT WEBSITE
- PUBLIC COMMUNITY FORUM 3
- **RCSC APPROVAL**

- OCCUPATIONAL HEALTH & SAFETY COMPLIANCE
- PRE-CONSTRUCTION MEETING
- BI-WEEKLY SITE MEETINGS
- FIELD REVIEW COMPLIANCE TO DOCUMENTS
- WRITTEN PROGRESS SCHEDULE/ STATUS REPORTS
- INSPECTIONS & APPROVALS REPORT VERIFICATION
- SHOP DRAWING REVIEW/E-LOG
- ISSUE SUPPLEMENTAL INSTRUCTIONS/ RFI ASSIST REVIEW QUOTES/ RECOMMEND
- REVIEW BILLING APPLICATIONS & CERTIFY PAYMENTS
- PREPARE FIRE SAFETY PLAN
- DEFICIENCY REPORTS E-LOG
- CERTIFY SUBSTANTIAL COMPLETION

SUBSTANTIAL COMPLETION

- EQUIPMENT/ EXHIBIT/ FURNITURE MOVE/ SETUP
- TEST COMMISSION - ALL SYSTEMS BLDG ENVELOPE
- MAINTENANCE OPERATIONS TRAINING
- PROJECT CLOSEOUT -AS BUILT DWGS -MANUALS -DOCUMENTS -WARRANTIES
- PREPARE BIM RECORD DWGS
- DEFICIENCIES CORRECTED
- STAFF/PATRON OCCUPANCY
- HOLDBACK RELEASE
- APPROVALS OBTAINED/ CONTRACT COMPLETION RELEASE
- CERTIFY TOTAL COMPLETION

- 1 YEAR WARRANTY INSPECTION
- WARRANTY MANAGEMENT ITEMS RECTIFIED
- PREPARE & TRANSFER ALL PROJECT FILES IN ELECTRONIC FORMAT
- BUILDING POST OPERATIONAL REVIEW

LEGEND

- ▲ MILESTONE COST CHECK - "DESIGN TO BUDGET" - COST REPORT. CONSULTANT TEAM VALUE ENGINEERING REVISIONS AS REQUIRED TO MAINTAIN BUDGET
- ● MILESTONE RCSC APPROVAL/SIGNOFF PRIOR TO PROCEEDING TO THE NEXT STAGE (1 WK REVIEW PERIOD)

PURPOSE	Methodology & Select Consultant Team	Mobilization & Organization	Public Consultation, Validate Program, Concept Design	Schematic Design	Approve Schematic Design	Design Realization/SPA	Prepare Tender Documents, Permits	Tender Contract 2025	Administer Site Meetings	Commission/Occupy Building/ Site	Warranty
RCSC			Community Listening Strategy/Detail Programme Approval		Schematic Design/Independent Cost Review	Final Design/Budget Approvals	50%, 95% Dwgs & Spec Review	Award Contract 2025	Administer Contract	Staff Receive Building Systems Instructions/Commissioned	
DELIVERABLES	Feasibility Study/Pre budget	FTP Project Website	Definition of Project Requirements Report, Facility(s) Programme (Specifications)	Schematic Options, Design Brief	Drawings - Design/Cost Report	Exterior, Interior Dwgs, Finishes Binders, Technical Brief, Public Info. 1	Drawings, Specifications, Contract Docs, Signage Report		Shop Drawings, Details, Site Reports	AutoCAD/BIM Record Dwgs, Finishes, Specs, Operating Manuals, Comm. Report	Warranty Items Rectified
SCHEDULE/DURATION		1 MONTH	2 MONTHS	2 MONTHS	1 MONTH	2 MONTHS	3 MONTHS	2 MONTHS	24 MONTHS	2 MONTHS	12 MONTHS

PHASE I

PHASE II

PHASE III

ZAS ARCHITECTS + INTERIORS

PROBABLE BUDGET

Order of Magnitude Estimate

An Order of Magnitude estimate is an initial estimate that is often undertaken before a project is started. Such an estimate has an accuracy of -25% to +75%. It identifies a project's level of effort and cost and is used for estimating a project budget that does not have a lot of detail. ZAS has directed GGGI to undertake a preliminary Order of Magnitude estimate for the proposed RCSC facility as described in the Project Description portion of this Study.

The GGGI estimate should be reviewed against the assumptions used in values carried in the Setting the Stage- part of the ZAS email dated July 26, 2024, identified within this report.

Funding Requirements for Building		
	Low	High
Anticipated Square Footage	40,000	40,000
Cost per square Foot	$895/sq.ft	$1025/sq.ft
Estimate Costs	$35,804.251	$40,995,608

Using the information provided in the Project Description GGGI estimates that the anticipated cost per square foot is greater than the values identified above.

A review of forecasted cost escalations for 2024 of 6%, and the following three (3) years 2025 to 2027 of 4% is recommended to be added to the values identified in the table below.

Forecasted Costs per Square Foot for the RCSC Phase 1 Facility		
Anticipated Square Footage	40,000	
Cost per Square Foot	$1,300/sq ft	2024-6%
Estimated Costs	$52,000,000	Increase 4% per anum after 2024

This Order of Magnitude Estimate is intended to identify the hard and soft costs based on the level of design information provided. This estimate reflects our opinion as to the fair market value for the cost of this project.The accuracy of the estimate is based on the documentation provided and is intended to be +/- 20%.

Contingencies are included to offset the accuracy risk, to the extent that the estimated amount represents the current opinion of the likely fair market value at the time of tender.

Taxes, (HST) are excluded from our estimate.

Variance Considerations

In the potentially turbulent times ahead, a project's success is relevant to informed budgets, and proactive risk management, to provide informed information necessary to make appropriate decisions promptly. ZAS preliminary design documents are reflective of RCSC goals, a net carbon zero facility with a timber structure. This design criteria, the purpose of the space, will require an efficient heating, and cooling system with both humidity and temperature controls, redundant systems, and fire prevention measures that will impact the costs.

Changing legislation is a further variance consideration. For example, in 2025 Mechanical Roof Top Units (RTU) will require more environmentally friendly refrigerants which will have an adverse cost impact.

The location of the facility will need to evaluate and consider methodologies to mitigate additional risks associated with utility and access costs such as power, underground storm, sewer, lighting, earthworks, curbs and asphalt roadways not included in the Order of Magnitude estimate.

A further consideration is to what standard the current Pit Operator will decommission the facility, concerning soil conditions, excessive groundwater, or environmental contamination.Cost escalations forecasted between 2024 to 2027 have been identified in the previous section of this study.

Considerations

The non-residential construction outlook in Ontario for 2024 is less positive than in 2023. However, several large infrastructure projects/programmes are forecasted to be scheduled for the GTA in 2024 and the near future.

Risk considerations include but are not limited to:
1Identifying known risks associated with the project's location and design;
2.The growing skilled trades shortage within the construction industry. More tradespeople are leaving the construction workplace than those joining it. This will further negatively impact construction costs. This is particularly evident in trades that require a higher level of education and training;
3.Forecasted higher interest rates, material costs, and high taxes;
4.Labour shortage and a weak/declining/uncertain economy;
5.Government policy and regulation;
6.Tight money and the lack of financing availability.

The first project risk item is the identification of project risks. This is quantified by the cost of a risk occurring during the project and multiplied by the percentage (100-0%) likelihood that it will occur. Once all these risks are identified, and quantified, the sum of the 'known risks' is included in the project budget under the line item called '**Contingency**.' Risk monitoring occurs throughout the project's life cycle and may change, so risk monitoring is an ongoing process throughout the project. Once the design is finalized the contingency sum is fixed, and is used to deal with project risks should they occur.

The last item, financing availability GGGI considers a primary risk that should be addressed to allow the project to move forward. Creating a **Cash Curve**, a tool to estimate the planned monies required (every month) to maintain the project's progress most efficiently should be considered to identify when monies are needed so as not to negatively impact the development and implementation of the project.

PROBABLE BUDGET FEE

"Shovel Ready"/ Order of Magnitude Budget Fee

Reference
RAIC / Appropriate Fees for the Services of the Consultant Team

Building Category 6 /
Museum, Planetarium, Science Building, Theatre uses

Building Gross Floor Area / 40,000 sf or 3,760 sm
Construction Order of Magnitude Budget / $52M (Q4 / 2024)
Building Complexity/ Complex Factor, fee @ 115%
Percentage Fee / @ 8.0% / $4,160,000
Shovel Ready includes SD/DD/CD Phases, plus submissions to authorities for SPA/ Building Permit

BIM/ Fee	Phase %	
Schematic Design	12%	$ 499,200
Design Development	20%	$ 832,000
Construction Documents	35%	$1,456,000
	67%	$2,787,200 x 115% = **$3,205,280**
Bidding/ Negotiation	3%	$124,800
Construction (Contract Administration)	29%	$1,206,400
Post Construction	1%	$ 41,600
	33%	$1,372,800 x 115% = **$1,578,720**
		$4,784,000

Anticipated Consultants
Architect/ Structural/ Mechanical/ Electrical/ Civil/ Interior Design/ Landscape Architect/ Quantity Surveyor/ Indigenous Specialist/ Environmental/ Sustainability, Energy Modelling/ Acoustic/ AV, Intelligent Building/ Fire Life Safety, Code/ Transportation/ Elevator/ Security/ ICAT/ Building Envelope

Reflecting Pool N View - Entrance

ZAS ARCHITECTS + INTERIORS

ACKNOWLEDGEMENT

RCSC Reflection

The Royal Science Centre is comprised of a group of science enthusiasts who have a vision to build a physical space for interactive, engaging, hands on science learning for all ages. They believe that the Royal Science Centre will not only be an incredible asset for Wellington County, but it will be a must-visit tourism destination for the whole southwestern Ontario region, as Science North is in Sudbury.

The Board of Directors are:

- **Joanne O'Meara** - University of Guelph
- **Orbax** - University of Guelph
- **George Staikos** - Innovation Guelph

An additional 17 people serve on the advisory council, including faculty & staff from the University of Guelph, local high school teachers, business leaders, science communicators, and community members. RCS is fully volunteer-led and run.

Royal City Science has brought together an outstanding team of passionate scientists and dedicated educators, whose combined decades of experience have successfully engaged community members in scientific endeavors. Each team member has individually inspired countless aspiring scientists. Now united, their goal is to further enrich the connection with the residents of Guelph and to extend their outreach beyond. Their vision is ambitious: to establish a cutting-edge science center that will serve as a hub for innovation, discovery, and education in their community and beyond. Through this initiative, they aim to foster a deeper appreciation for science and inspire the next generation of innovators.

It will not be limited to the sciences alone! There are research prospects available across various fields where a distinctive chance to establish a science center that actively supports cutting-edge research, education, "scientist in residence", all features uncommon among most science centres.

Consultancy Reflection (ZASA+I, GreenReason, GGI)

Royal City Science Centre's mission is about exploration, experimentation, and fun, that enhances science accessibility to everyone. Both the site and this mission inspire the idea of a building that is itself part of the exploration and learning process.

A science centre located within a reclaimed brownfield site that together support the RCSC vision to cultivate an environment in which wounder and awe are embraced, and where lifelong curiosity is valued and demonstrated.

A science centre that is inspired by its surroundings, by nature, by the disruption that has been caused by the prior quarry operations and the restorative rehabilitation of the commercialized site.

A science centre that not only minimize its carbon footprint through design, but one that creates a healthy environment for people, with opportunities for biomimicry incorporated into the design and utilized as educational moments in the exploration.

A science centre that showcases the building science, the natural science and the systems that make it sustainable and sensitive to people and the planet.

A developed building and site that exemplifies the United Nations 17 Sustainability Development Goals to varying degrees, making this an opportunity to educate the public about the impact of buildings on its occupants, the planet and society as a whole – a true living laboratory/ incubator for sustainable development in harmony with nature.

Embrace the collective vision and resultant design process that has been driven by strategic thinking and the passion to execute this transformational Royal City Science Centre project for location in south-western Ontario.

RCSC CONCEPT VIDEO:
https://youtu.be/MG1AiEuYr1c?si=YIclbleTrstGLvmr

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