Burke Mountain Community Centre

Sustainability Plan
100% Design Development

14 August 2025

Executive Summary

This Sustainability Plan is a flexible project framework for the Burke Mountain Community Centre (BMCC), in support of implementing sustainable design, climate mitigation, and climate resilience strategies that align with and support the city's existing and future policy framework. It reflects the analysis and performance status of the BMCC at the 100% Design Development project milestone.

Project sustainability and climate action objectives confirmed at predesign:

- Carbon neutral
- No fossil fuels
- Protect the downstream watershed from the impact of rainwater on the site.
- Design for future climate.
- Create traction for the project with strong storytelling and use the project to showcase leadership in sustainability and climate action.

Key project outcomes at 100% DD:

- Design strategies reflect future climate risk
- No fossil fuels
- Rainwater is managed to optimize the flow of rainwater into the tributaries on site.
- Future climate conditions and risks are anticipated by design including increased cooling capacity, onsite battery, air filtration, and indoor and outdoor water use reduction.
- Demonstrated 34% energy savings compared to code requirements.
- Low operational emissions at 5.4 kgCO2/m2.
- 12% reduction in embodied carbon emissions.
- The project will formally pursue Zero Carbon Building v4 – Design certification (ZCB) which will support strong storytelling and demonstrated leadership.
- Design complies with requirements of ZCB v4- Design.
- Successful pursuit of two grant and funding opportunities will support the project cost of building performance analysis and potentially lead to a significant capital incentive (TBC).

Recommended next steps:

- Register the BMCC with the CAGBC for the Zero Carbon Building Standard v4– Design.
- Coordinate and confirm occupancy numbers for each program area so the energy and water balance calculations can be adjusted accordingly.
- Confirm and coordinate ventilation rates and supply air rates so the energy model can be refined.
- Advance plant optimization opportunities to realize additional energy savings.
- Evaluate alternative cladding materials to reduce the impact of current selection on embodied carbon.
- Confirm expectations for tracking performance during construction for materials, construction waste and indoor air quality.

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1. Introduction

1.1 Purpose

This Sustainability Plan is a flexible project framework for the Burke Mountain Community Centre, in support of implementing sustainable design, climate mitigation, and climate resilience strategies that align with and support the city's existing and future policy framework.

From concept to operation, the plan describes the technical and financial feasibility of key design and operational strategies that support the city in meeting its climate goals.

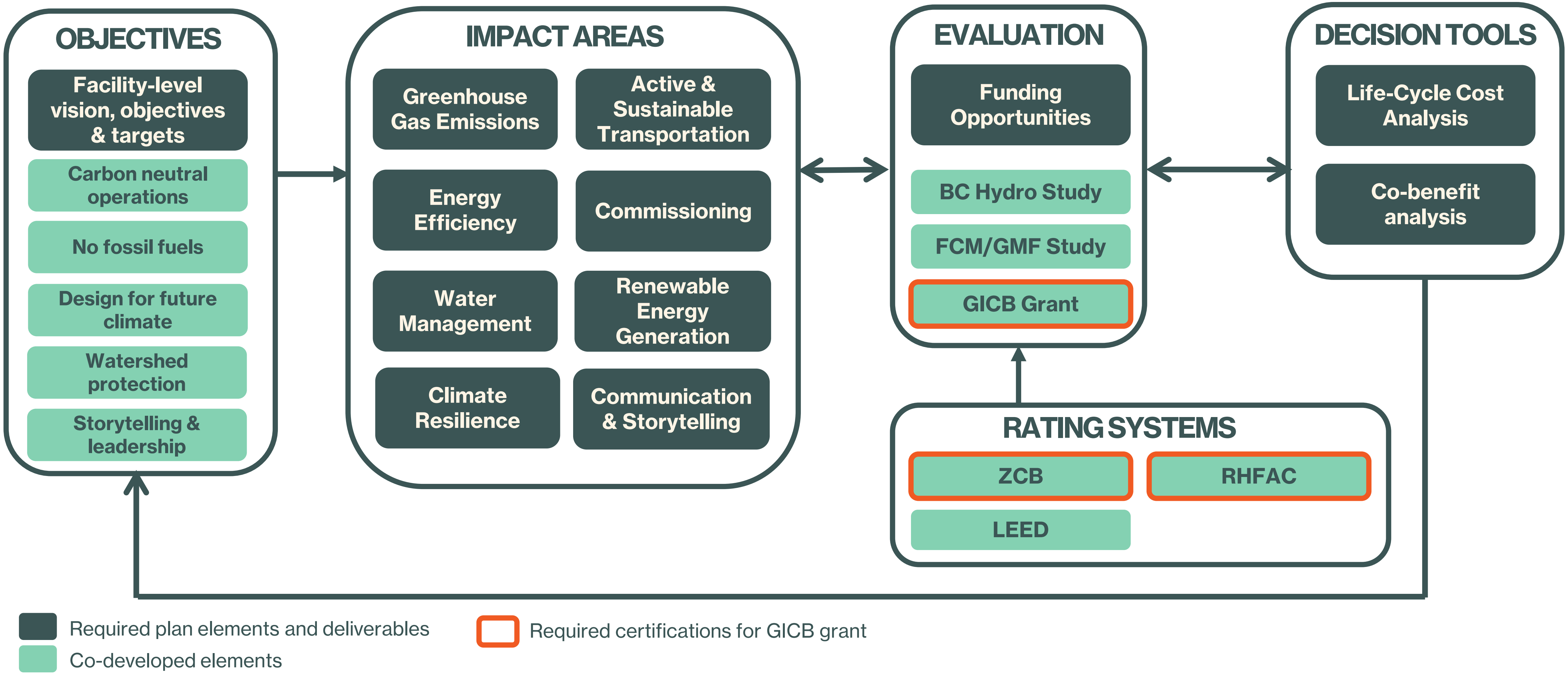
Coquitlam is committed to reducing greenhouse gas emissions from corporate operations by 45% by 2030 (from 2007 levels) and to being carbon neutral by 2050. To achieve these targets, and to showcase civic leadership in climate action, the Burke Mountain Community Centre (BMCC) must prioritize energy efficiency and aim to be net-zero carbon in operations.

This plan aligns with the scope of work as described by the City of Coquitlam for the design of Northeast Community Centre in the Request for Proposal's Appendix E (now known as the Burke Mountain Community Centre). The plan sets out objectives, identifies areas of performance to be evaluated, and sets targets for each performance area with associated metrics. The plan also contains decision making tools including a co-benefits analysis and life-cycle cost assessment. It is intended to help city staff and project team decision making and support grant and funding opportunities where applicable.

Finally, the plan informs what might be publicly communicated about this project in support of the city's commitment to sustainability and climate resilience.

1.2 Scope

The scope of work for the Sustainability Plan is clearly defined in the project Request for Proposal, and includes developing clear objectives, goals, and targets to align with relevant policy, evaluating design strategies to support various defined impact areas, relevant grant and funding opportunities, and supporting decision making with specific analysis. This diagram describes the relationship between the sustainability objectives, performance areas, evaluation and decision-making tools. It identifies required elements and deliverables of the plan as described by the scope of work and those co-developed with the project team.



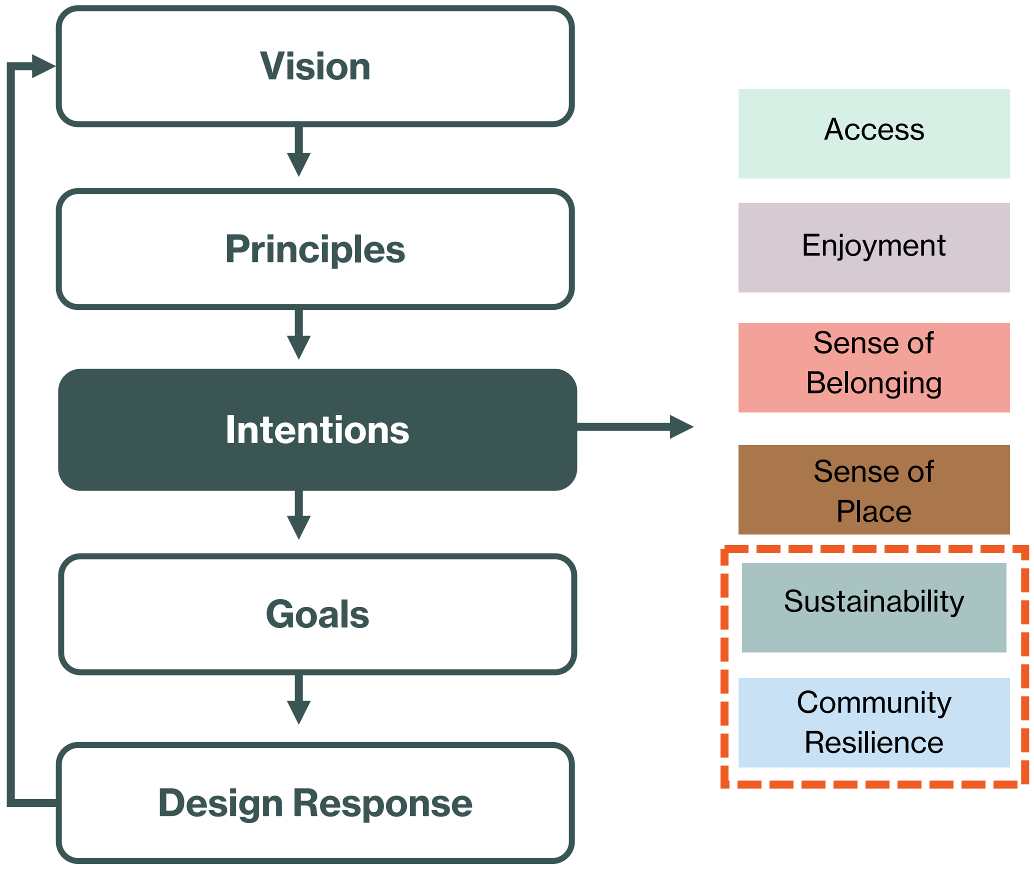
1.3 Project vision & intentions

Within the context of the project's broader design aspirations, this plan is the implementation of the Sustainability 'intention' and supports the environmental aspects of Community Resilience from the broader design aspirations.

The Northeast Community Centre is a catalyst for community, immersed into the landscape and the life of the village. It builds connections and enriches lives by providing a hub for socializing, life-long learning, health, creation and play.

The new centre will respond to the unique social, educational, physical, and economic well-being of the Burke Mountain community.

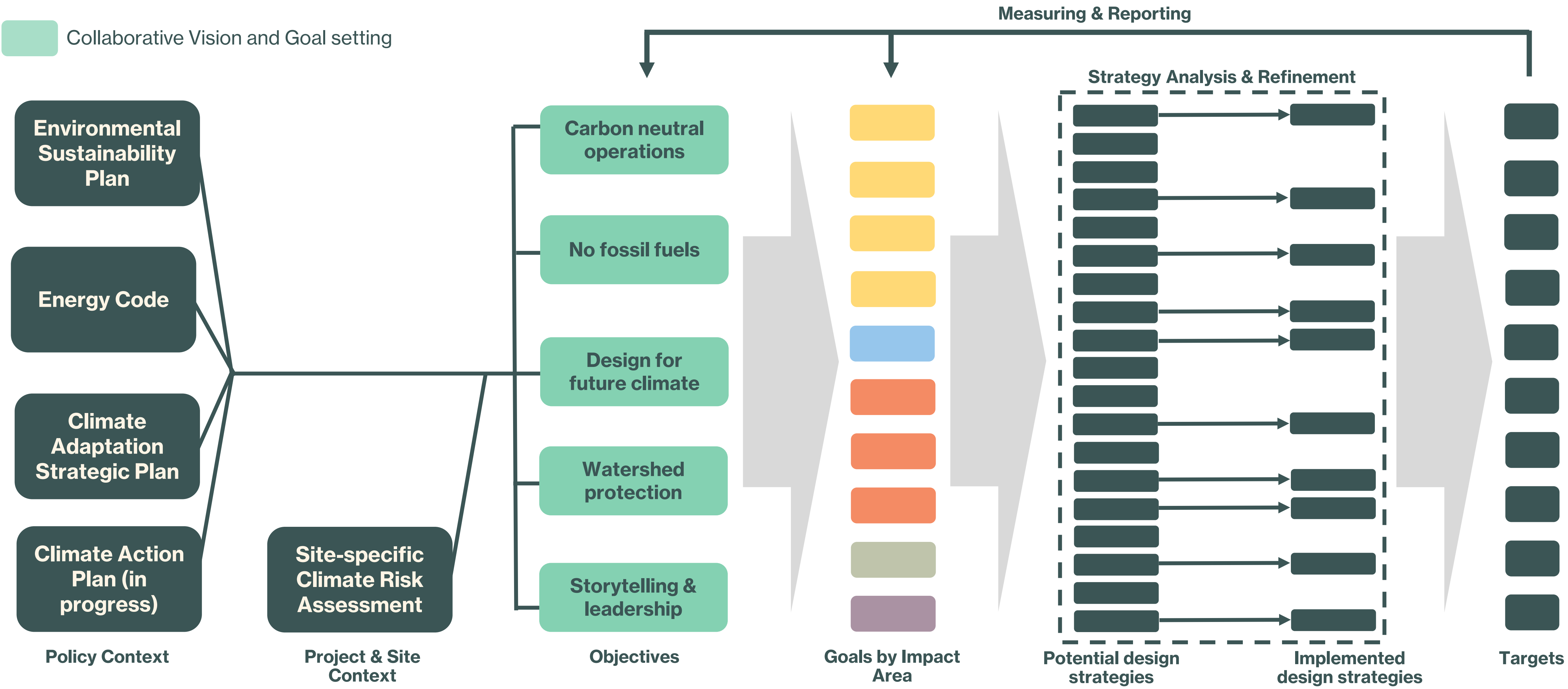
Project vision from Final Feasibility Study and Charrette Report (2021)



Project intentions from the overall facility & park design aspirations

1.3 Plan structure

This diagram aims to clarify the structure and hierarchy of the sustainability plan, connecting the City of Coquitlam policy to the project goals. Objectives, targets and specific design strategies were developed in response, along with relevant performance metrics.



2. Policy context

Policy and code context

Existing city policy, regulations, and codes relevant to the scope of the sustainability plan set the context, starting points, and guidelines for this work. The most pertinent are summarized in the following pages for reference:

- Applicable building and energy codes
- The City of Coquitlam Environmental Sustainability Plan (January 2022)
- The City of Coquitlam Climate Adaptation Strategic Plan (October 2020)

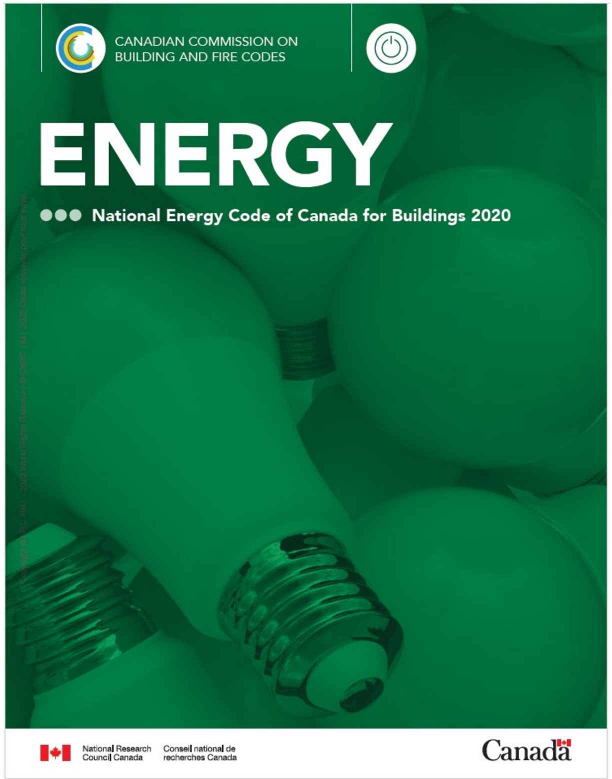
The City is also developing a Climate Action Plan which will provide a focused, strategic roadmap for reducing emissions and enhancing resilience in the community. While forthcoming, the BMCC Sustainability Plan is anticipated to largely align and support the approaches and strategies outlined in the Climate Action Plan.

Energy code

BC Energy Step Code
The current BC Building Code is 2024 and requires compliance with the BC Energy Step Code. The step code sets incremental, performance-based energy efficiency requirements for new construction. It's a pathway towards achieving net-zero energy-ready buildings by 2032. The code is organized into "steps," each representing a specific level of energy efficiency.

As of 2023, the BC Building code requires compliance with Step 2 for Part 3 buildings. For the recreation centre building typology, the Energy Step Code does not set absolute energy reduction target but rather requires compliance with the 2020 National Energy Code for Buildings (NECB 2020), along with air tightness testing.

BC Zero Carbon Step Code
Not applicable to recreation facilities (per BCBC 2024).



City of Coquitlam Environmental Sustainability Plan

The Environmental Sustainability Plan (ESP), the first of its kind for the City of Coquitlam, is a forward-looking plan to guide future decisions that support the long-term environmental resiliency and sustainability of the community.

Designed to align with and complement overarching City plans such as Coquitlam's Strategic Plan and Citywide Official Community Plan (CWOCP), the ESP provides a strategic and sustainable pathway for the City towards achieving the vision of a community that "sustains a high quality of life for current and future generations, where people choose to live, learn, work and play". The ESP links existing and future environmental actions together in a single plan with clear goals and targets coupled with specific actions for implementation.

The sustainability plan for the Burke Mountain Community Centre project is a direct result of action #49 from the ESP:

"49. Contemplate using the Northeast Community Centre project to pilot the development of a "sustainability plan", including a cost benefit analysis, for Council consideration."

https://www.coquitlam.ca/898/Environmental-Sustainability-Plan

The plan is organized into five key themes. Goals for each theme are presented alongside a detailed list of the strategies and actions required to achieve them as well as key performance indicators (KPIs) to continually monitor success and progress.

The BMCC Sustainability Plan takes a similar approach and establishes project objectives, aligned with the broader City of Coquitlam strategy, and sets performance targets which address all themes outlined in the Environmental Sustainability Plan.

Themes	Climate Action	Built Environment	Waste Management	Water Management	Natural Areas, Wildlife and Habitat
Goals	1. Reduce GHG emissions 2. Create a resilient City that can adapt and thrive in current and future climate conditions	1. Encourage sustainable modes of transportation 2. Develop complete, well-connected neighbourhoods that consider the protection of natural areas 3. Encourage sustainable development and building design	1. Minimize waste generation 2. Maximize reuse, recycling and material recovery 3. Ensure adequate disposal opportunities exist to discourage illegal dumping and littering	1. Conserve and protect drinking water 2. Use an integrated approach to stormwater management that provides flood protection while protecting ecological health 3. Protect the public and environment from exposure to sanitary sewage	1. Improve ecological conditions of natural areas for the community and wildlife 2. Provide a balanced, sustainable system of parks that provide equity of access to services and facilities across demographics and neighbourhoods 3. Profile and highlight the natural assets and features of Coquitlam and plan for expanded outdoor recreation and environmental initiatives

Strategies

↓

Actions

↓

Implementation and Monitoring (KPIs and Targets)

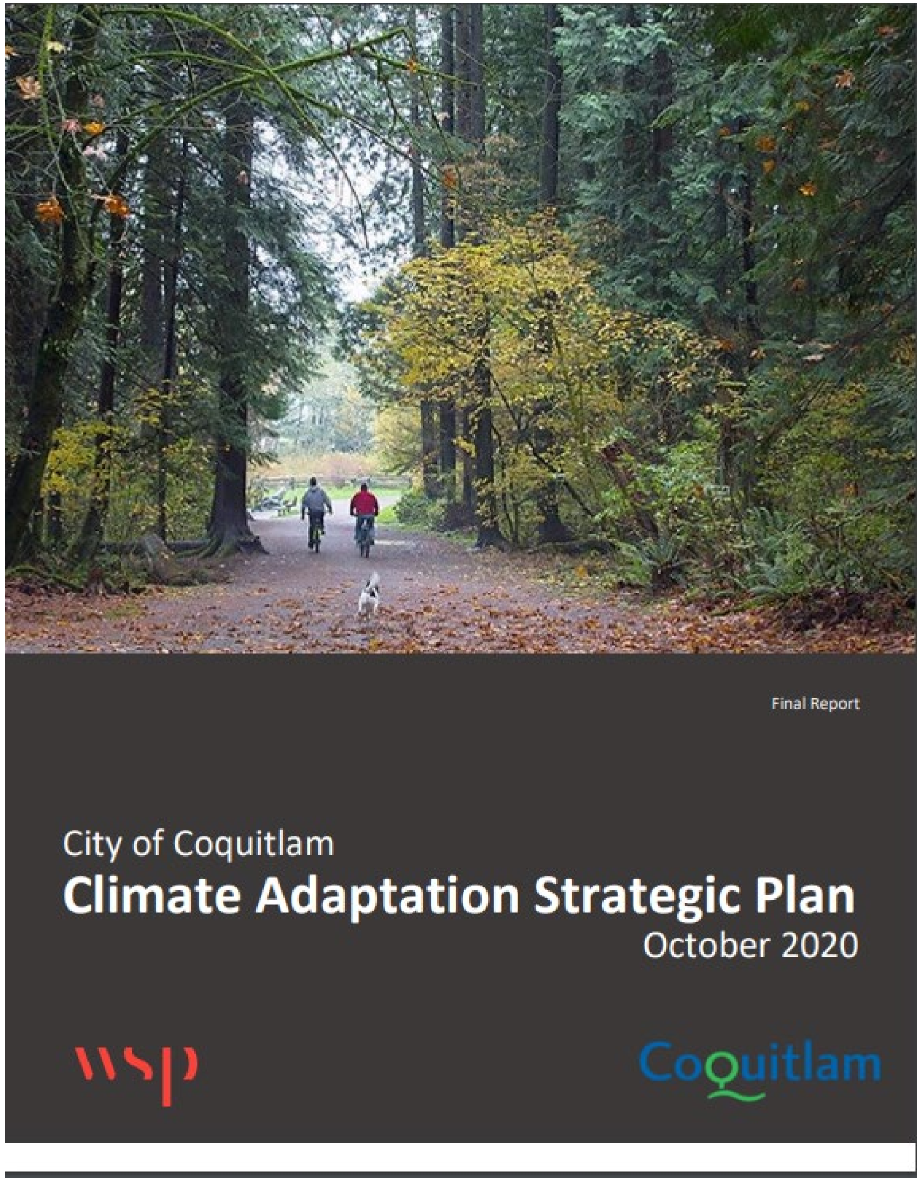
City of Coquitlam Climate Adaptation Strategic Plan

In 2020, the City of Coquitlam published the Climate Adaptation Strategic Plan. The plan was developed to better understand the impacts of climate change and extreme weather on infrastructure, services, and the community.

Using the latest available models and climate projections, the plan assessed the exposure of city assets to climate impacts, identifying seven main climate risk events:

- Drought
- Wildfires
- Heat Waves
- Seasonal Water Shortages
- Inland Flooding
- Coastal Flooding
- Storm Events

The BMCC Sustainability Plan responds to this plan by including a site-specific climate risk assessment, using the same methodology of identifying climate exposure, and determining risk as a product of likelihood and consequence. Refer to the Section 3.3 Climate Risk Assessment summarizes the results, and detailed analysis is included in Appendix 11.1.



https://www.coquitlam.ca/DocumentCenter/View/3209/Climate-Adaptation-Strategic-Plan-PDF

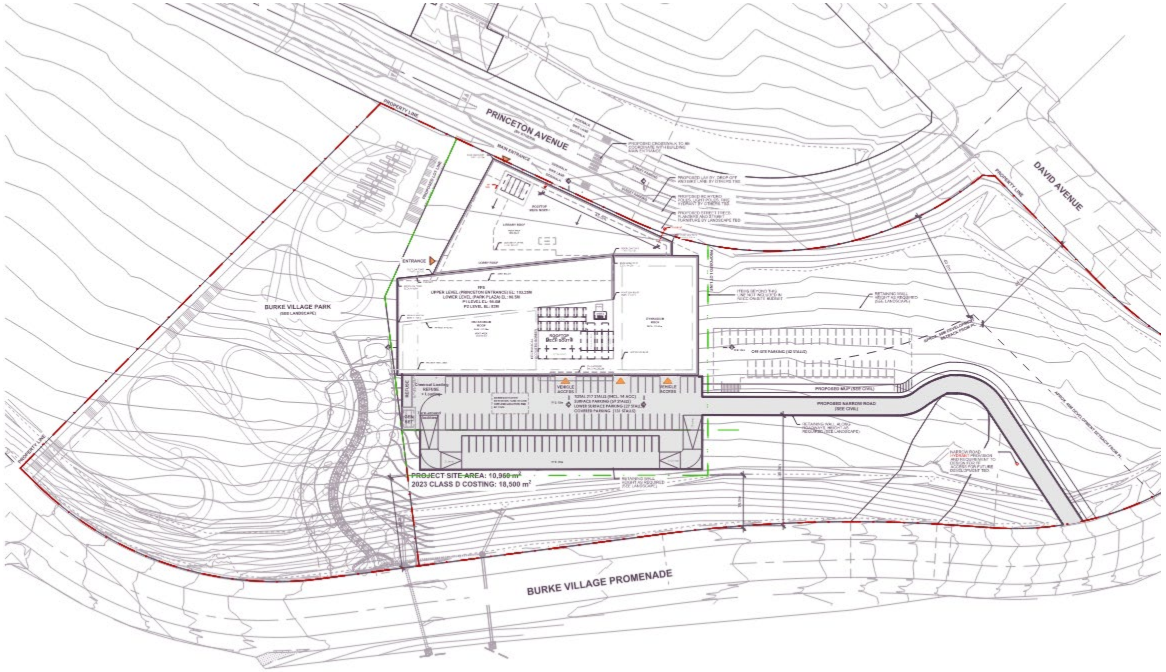
3. Project Context

3.1 Project summary

Land use planning on Burke Mountain has been ongoing for several decades. The guiding document for the Burke Mountain Community Centre (BMCC) is the Partington Creek Neighborhood Centre Master Plan (PCNCMP) completed in 2017. The PCNCMP envisions a vibrant main street at the heart of the Burke Mountain Village community, which is defined by higher density development, retail, and commercial opportunities as well as community center and destination park.

The Burke Mountain Community Centre is envisioned as a two-story community recreation hub, supported by two levels of covered parking. It will feature a wide range of amenities designed to serve the growing needs of the community, including a natatorium with a 6-lane 25m pool, leisure pool and a sauna and steam room, a double gymnasium, a fitness studio, multipurpose rooms, and a neighbourhood-scale library, along with significant public realm improvements and a seamless connection to the adjacent Burke Village Park (BVP).

Located on a sloped mountain site south of Princeton Avenue the shared site of the BVP and the BMCC has been informed by conceptual design work conducted by KWL and Space2Place. Their studies have shaped both the park and building siting strategy to ensure cohesive integration with the surrounding landscape.



3.2 Climate risk assessment

The scope of this plan includes climate mitigation, adaptation and resilience. In alignment with the city's climate adaptation goals, a site-specific climate risk assessment was conducted to determine the project's site-specific climate risks on each building system. From the risk assessment, appropriate design strategies were identified to mitigate and manage hazards determined as medium and high risk. The complete Climate Risk Assessment is included in Appendix 11.1. Refer to Section 7.6 for the status of climate resilience design strategies and Appendix 11.2 for the Resilient design response table.

Summary of site-specific climate risks		
Hazard	**Building system impacted**	**Risk**
Extreme Heat	Human Systems; Mechanical and Plumbing Systems	High
	Preparedness, Planning & Response; Landscape & Ecological Systems; Power & Electrical Systems.	Medium
Wildfire	Architectural Systems; Planning & Response; Human Systems	High
	Civil Engineering Systems; Landscape & Ecological Systems; Mechanical and Plumbing Systems; Power & Electrical Systems; Structural Systems.	Medium
Poor air quality (wildfire related)	Preparedness, Planning & Response; Human Systems, Mechanical and Plumbing Systems	Medium
Power Outage	Preparedness, Planning & Response; Human Systems; Mechanical and Plumbing Systems; Power & Electrical Systems.	Medium
Riverine flooding (including storm surges)	Architectural Systems; Civil Engineering Systems; Preparedness, Planning & Response; Landscape & Ecological Systems;	Medium
Decreased slope stability or landslide	Architectural Systems; Civil Engineering Systems; Preparedness, Planning & Response; Human Systems; Landscape & Ecological Systems; Mechanical and Plumbing Systems; Power & Electrical Systems; Structural Systems.	Medium
Drought/Water restrictions	Preparedness, Planning & Response; Human Systems; Landscape & Ecological Systems; Mechanical and Plumbing Systems	Medium
Warmer summer temperatures	Human Systems; Landscape & Ecological Systems; Mechanical and Plumbing Systems	Medium

4. Objectives & Targets

4.1 Objectives

During the project pre-design phase, the design team and client group established five sustainability objectives as part of the broader design intentions, aligned with and informed by the city's existing plans and policies to guide decision making.

Performance areas were established for evaluation that reflect the objectives, the required project deliverables, and any aligned requirements set out in the grants and funding opportunities pursued including the FCM Green Municipal Fund, BC Hydro New Construction Program, and the Green and Inclusive Communities Buildings grant.

The objectives are broken down into goals and targets to support to facilitate evaluation, implementation, and tracking. Refer to the diagram on the next page for goals and targets organized by impact area.

- Pursue Zero Carbon Building Standard v4 certification to demonstrate carbon neutrality.
- Reduce energy use intensity by 25% reduction compared to NECB 2020
- Design for 2080 climate projections
- Retain 80% of rainwater on site from regional rainfall events
- Reduce indoor water use by 20% compared to the US EPA baseline
- Reduce outdoor water use by 50% compared to LEED v4/v4.1 baseline.
- Reduce embodied carbon by a minimum 20% and comply with LEED v4/4.1 Building Lifecyle impact reduction, Option 4.
- Reduce construction waste by at least 75% per LEED v4/4.1.
- Comply with LEED v4/4.1 low emitting materials, enhanced indoor air quality, and IAQ testing credit requirements.
- Improve natural landcover conditions to better support the downstream watershed. Vegetate at least 25% of outdoor open space.
- Prioritize use of active and sustainable transportation to and from the facility and follow inclusive and accessible design principles.

BMCC Sustainability Objectives

1. Carbon neutral
2. No fossil fuels
3. Protect the downstream watershed
4. Design for future climate
5. Create traction for the project with strong storytelling and use the project to showcase leadership.

4.2 Goals and targets

Impact Areas	**Climate resilience**	**Energy & Operational GHG**			**Water**	**Materials & indoor environmental quality**			**Biodiversity & ecological function**	**Transportation, community, & experience**
		Energy use		Operational emissions		Embodied emissions	Waste & circularity	Wellbeing & IEQ		
Goals	Design for future climate Infiltrate rainwater on site Store energy onsite	Meet min energy requirement of ZCB v4 Airtight envelope	Improve thermal energy demand (TEDI)	Carbon neutral operations, no fossil fuels ZCB Design Certification	Infiltrate water on site Reduce potable water use	Reduce embodied carbon	Reduce construction waste	Improve indoor quality	Design to protect the downstream watershed Provide planted outdoor space	Design for active and sustainable transportation Accessibility and inclusive design principles
Targets	Design for 2080 climate	25% better than NECB 2020	Adjusted TEDI per ZCB	GHGI	20% Indoor water use reduction	Reduce embodied carbon 20%	Reduce const. waste by 75%	Comply with LEED v4 low emitting materials	Native plant palette in WSA	Meet LEED v4 for cycling facilities requirements
	Infiltrate 80% rainwater on site	Total energy use intensity (TEUI)		No gas connection	50% Outdoor water use	Comply with LEED v4 Building Life Cycle Impact reduction	Comply with LEED v4.1 BPDO credits	Comply with LEED v4 enhanced IAQ and IAQ testing	Provide at least 25% vegetated outdoor space	Provide EV car charging aligned with LEED v4
	Battery storage onsite	Air tightness per Step Code 2		ZCB Design certification	Reuse water where possible				Comply with LEED v4/4.1 Heat island	Provide micro mobility facilities and EV charging

5. Analysis

5.1 Approach to analysis

To connect design strategies to both broader city policy and project sustainability and climate objectives, a co-benefit analysis and life-cycle costing analysis were carried out.

The co-benefit assessment was conducted using two separate methods to assess synergies and co-benefits of the early, long list of sustainable design and climate action strategies developed.

Throughout the schematic and design development processes those strategies were refined based on costing, feasibility or limitations of implementation, risk, operations and maintenance requirements and more.

The life cycle-costing analysis was conducted on a refined list of strategies accordingly, in three phases as described herein.

5.2 Co-benefit assessment

Low carbon resiliency framework

The City of Coquitlam's Environmental Sustainability Plan and the forthcoming Climate Action Plan assesses co-benefits using Simon Fraser University's Adaptation to Climate Change team's Low Carbon Resiliency (LCR) framework, reinforcing consistency across city plans. The framework encourages integrated strategies and investments that consider future climate conditions while strengthening overall sustainability. It supports multiple considerations and trade-offs of a range of policy options, projects, and decisions we make today with their impacts on tomorrow.

The framework considers three key issues in support of decision making including: **climate risk[1] and vulnerability**, **emissions[2]**, and **co-benefits[3]**.

To align with this approach, the BMCC Sustainability Plan applies the LCR framework co-benefit table to assess the project's design strategy categories within the broader city context. The performance categories assessed are:

1. Operational GHG reductions
    - Energy reductions through passive strategies
    - Energy reductions through active strategies
    - Energy demand reduction strategies
2. Water conservation
    - Use of alternative water sources
    - Water demand reduction
3. Materials and indoor environmental quality
    - Embodied carbon reduction strategies
    - Waste reduction strategies
    - Material health and enhanced indoor air quality strategies
4. Biodiversity and Ecological Function
    - Stormwater retention strategies
    - Restoration through vegetated open space
5. Transportation, community & experience
    - Active and sustainable transportation
    - Universal accessibility

Economic Co-Benefits		
Supports green job creation	Diversifies local economy	Reduces costs/ increases savings
Fosters innovation and green, clean industries	Supports clean energy transition	Promotes a circular economy
Reduces risks to property values	Reduces waste/ optimizes resources	Avoids community damages and costs over time

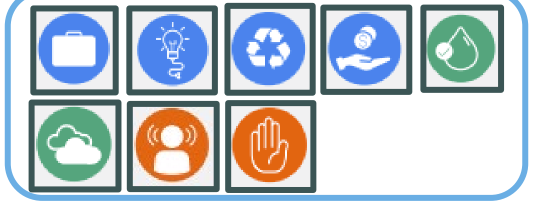
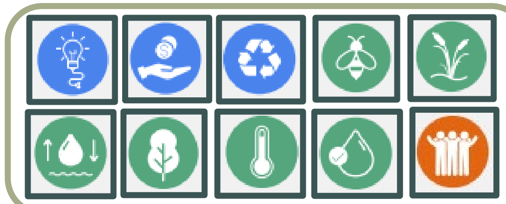
Environmental Co-Benefits		
Enhances biodiversity	Supports habitat creation	Improves water retention and absorption
Enhances pollutant capture	Improves air quality	Reduces extreme temperatures
Improves water quality	Increases carbon sequestration/storage	Promotes regional connectivity

Social Co-Benefits		
Enhances human health and well-being	Supports local food security	Limits tax increases
Improves climate awareness and access to data and information	Improves community livability and vitality	Enhances local autonomy
Advances equity and social inclusion	Reduces congestion	Improves public safety, disaster preparedness and response

https://www.sfu.ca/content/dam/sfu/act/reports/2021/LCR%20Advancing%20the%20Co-benefits%20of%20Climate%20Action.pdf

[1] **Climate Risk:** Does the investment or action minimize community vulnerability to projected climate impacts such as flooding, wildfire, heat, and other extreme events?
[2] **Emissions:** Does the investment or action measurably reduce corporate and/or community emissions and help advance carbon-reduction goals?
[3] **Co-benefits:** Does the investment or action advance community sustainability goals such as health, equity, biodiversity, and economic savings and development?

LCR Framework co-benefit assessment

Strategy Categories	LCR framework co-benefits	Co-benefit description
Operational GHG - Energy reductions through passive strategies - Energy reductions through active strategies - Energy demand reduction strategies		Implementing building systems and strategies that reduce GHG's builds capacity in local building trades and expands viability of implementation in other projects. Reduced energy demand reduces operational costs and supports the energy transition by reducing strain on the utility grid. Reduced emissions improve air quality and mitigate the greenhouse effect while improving community awareness and resilience.
Water - Alternative water sources - Reduction of water demand		Implementing water conservation and reuse systems builds capacity in local building trades and expands viability of implementation in other projects. Reducing both potable water demand and water reuse reduces waste, improves discharge water quality, and captures water pollutants. Demand reduction strategies build awareness and making water strategies visible increase community autonomy and resilience.
Materials & indoor environmental quality - Embodied carbon reduction strategies - Waste reduction strategies - Material health and enhanced IAQ strategies		Embodied carbon reduction strategies include sourcing materials locally, and reusing materials which promotes circularity and increases demand for local manufacture while reducing waste. Biogenic carbon is stored when using organic building materials like mass timber. Careful material selection enhances indoor environmental quality for occupant wellbeing.
Biodiversity & ecological function - Stormwater retention strategies - Restoration through vegetated open space		Native and adaptive habitat restoration reduces maintenance costs and water use while building capacity in related trades. The improved landcover conditions also creates habitat, enhances biodiversity, improves water retention and quality, and reduces the heat-island effect. Access to nature also drastically improves community livability and vitality.
Transportation, community, & experience - Active and sustainable transportation - Universal accessibility		Promoting and implementing a variety of electrified collective and individual transportation options fosters innovation and supports the energy transition through electrification. They also improve air quality while reducing congestion. Active modes of transport also promote community health, wellbeing and can reduce healthcare costs. Ensuring universal accessibility promotes community livability and advances social equity and inclusion.

5.3 Detailed co-benefit assessment

The LCR framework is useful to assess co-benefits of strategies within the broader urban and policy context and their alignment with development goals. However, when evaluating building performance, it is valuable to identify co-benefits at the more granular scale.

A co-benefit matrix was developed to understand specific design strategies relative to the project objectives, impact areas, and to identify potential synergies (co-benefits) and trade-offs (optimizations) across building systems.

Each individual strategy is cross-referenced with the project impact areas and the corresponding cell is populated with a filled circle to represent a co-benefit, or open circle to identify an optimization. General alignment with the project objectives is also shown.

● = Co-benefit / Synergy

Identifies a benefit in a certain impact area, as a direct result from a strategy targeting another impact area.

For example: An airtight, high performing envelope maintains interior temperatures and reduces heating energy demand. A co-benefit of this is increased resilience to extreme temperatures and poor air-quality events, safeguarding occupant wellbeing.

○ = Trade-off / Optimization

Identifies a trade-off or need to balance impacts of a strategy on other impact areas. In other words, identifies a need to optimize the strategy across building systems.

For example: Increased envelope performance requires an increase in material use (insulation, glazing). It is necessary balance energy performance with embodied carbon impacts.

BMCC Sustainability Objectives

1. Carbon neutral
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5. Create traction for the project with strong storytelling to demonstrate city leadership

	Impact area	Impact area	Impact area	Objective Alignment
Design strategy	●	●	○	**1, 2**
Design strategy		●		**2**
Design strategy		●	○	**2, 3**

Co-benefit matrix

Strategy	Climate Resilience	Energy Use	Thermal Energy Demand	Operational Emissions	Water Use & Sources	Embodied Emissions	Waste & Circularity	Wellbeing & IEQ	Biodiversity & Ecological Function	Transport, Community, Experience	Objective Alignment
Air-tight, high-performing envelope	●	●	●	●		○		●			1, 2, 4
Thermal bridge analysis and thermal break detailing	●	●	●	●				●			1, 2, 4
Explore feasibility of a 35% Window to wall ratio	●	●	●	●				○			1, 2, 4
All-electric. ASHP + WWHP with electric boiler back-up	●	●		●							1, 2, 4
Use waste heat through ERV, active heat recovery (exhaust cooling coil), shower drains, and sewage (Sharc-Piranha)	●	●		●				●			1, 2, 4
Natural ventilation	●	●	●	●				●			1, 2, 4
Demand controlled ventilation and occupancy sensors in multi occupant spaces	●	●	●	●				●			1, 2, 4
Radiant slab (potential to reduce fan power load)	●	○	○	○		○		●			1, 2, 4
Explore Earth tube ventilation pre-heat	●	●	●	●				●			1, 2, 4
Hot pool thermal storage tank	●	●	●	●	●			●			1, 2, 4
Thermal energy storage integrated into hydronic system	●	●		●							1, 2, 4
Solar energy generation for power (PV)	●	●		●							1, 2, 4
Battery energy storage for peak shaving and back-up power	●	●		●							1, 2, 4
Daylight sensor controls		●		●							1, 2, 4

OBJECTIVES 1. Carbon neutral 2. No fossil fuels 3. Protect downstream watershed 4. Design for 2080 climate

Co-benefit matrix (continued)

Strategy	Climate Resilience	Energy Use	Thermal Energy Demand	Operational Emissions	Water Use & Sources	Embodied Emissions	Waste & Circularity	Wellbeing & IEQ	Biodiversity & Ecological Function	Transport, Community, Experience	Objective Alignment
Specify low-flow fixtures, showers, and toilets	●	●	●	●	●		●		●		3, 4
Backwash water use for toilet flushing	●				●		●		●		3, 4
Rainwater capture for reuse in building systems: toilet flushing, pool makeup, fire suppression or irrigation	●				●		●		●		3, 4
Consider use of efficient irrigation and irrigation retention methods such as drip irrigation and root watering	●	●		●	●		●		●	●	3, 4
Use of mass timber and other lighter structural materials to reduce concrete volumes in foundations						●	●	●			1
Specify low carbon concrete mixes						●					1
Specify low emission insulation types				○		●		●			1
Access furniture or equipment available for refurbishment or reuse within the organization						●	●		●	●	1, 5
Access salvaged materials, such as construction material to be remanufactured or repurposed				●		●	●		●		1, 5
Prioritize recycled content in product procurement using LEED v4/4.1 BDO credits to inform specifications						●	●		●		1
Divert at least 75% of construction waste using LEED v4/4.1 Construction Demolition and Waste Management credit						●	●		●		1, 3
Align with LEED v4/v4.1 Low emitting materials requirements and protect IAQ during construction						○		●	●		
Conduct an air quality test upon construction completion in accordance with LEED v4/v4.1 IAQ Testing	●							●			4
Restore onsite stream/watercourse and direct rainwater to improve volume and flow to downstream watershed	●				●				●	●	3, 4

OBJECTIVES 1. Carbon neutral 2. No fossil fuels 3. Protect downstream watershed 4. Design for 2080 climate

Co-benefit matrix (continued)

Strategy	Climate Resilience	Energy Use	Thermal Energy Demand	Operational Emissions	Water Use & Sources	Embodied Emissions	Waste & Circularity	Wellbeing & IEQ	Biodiversity & Ecological Function	Transport, Community, Experience	Objective Alignment
Restore onsite stream/watercourse and direct rainwater to improve volume and flow to downstream watershed	●				●				●	●	3, 4
Use bioswales and other low impact development strategies to slow and manage rainwater	●				●				●	●	3, 4
Use xeriscaping or native and adaptive plant species with low water demand for trees, shrubs and ground cover	●				●				●	●	3, 4
Consider the plant community make up and the exiting Burke Mountain ecosystem to increase diversity incorporating the core principle of right plant, right place	●				●				●	●	3, 4
Use trees around the building and around the site to provide shade and reduce heat islands	●	●	●	●	○			●	●	●	1, 3, 4
Consider material and colour selection with low heat absorption and SRI to reduce heat-island effect	●	●	●	●				●	●	●	1, 4
Place parking underground or undercover as a means of reducing the heat-island effect	●	●	●	●		○		●	●	●	4
Ensure all spaces are universally accessible and inclusive								●		●	3, 4
Provide short- and long-term bicycle storage facilities aligning with LEED v4/4.1 Bicycle facilities credit								●	●	●	3, 4
Provide EV charging infrastructure aligned with LEED v4.1 Electric vehicles credit		○		○					●	●	3, 4
Provide charging stations for personal mobility devices like wheelchairs, electric bicycles and scooters		○		○				●	●	●	3, 4
Maximize connectivity to bike networks and park systems								●	●	●	3, 4
Explore opportunities to promote rideshare and carpooling through priority parking or otherwise									●	●	3, 4

OBJECTIVES 1. Carbon neutral 2. No fossil fuels 3. Protect downstream watershed 4. Design for 2080 climate

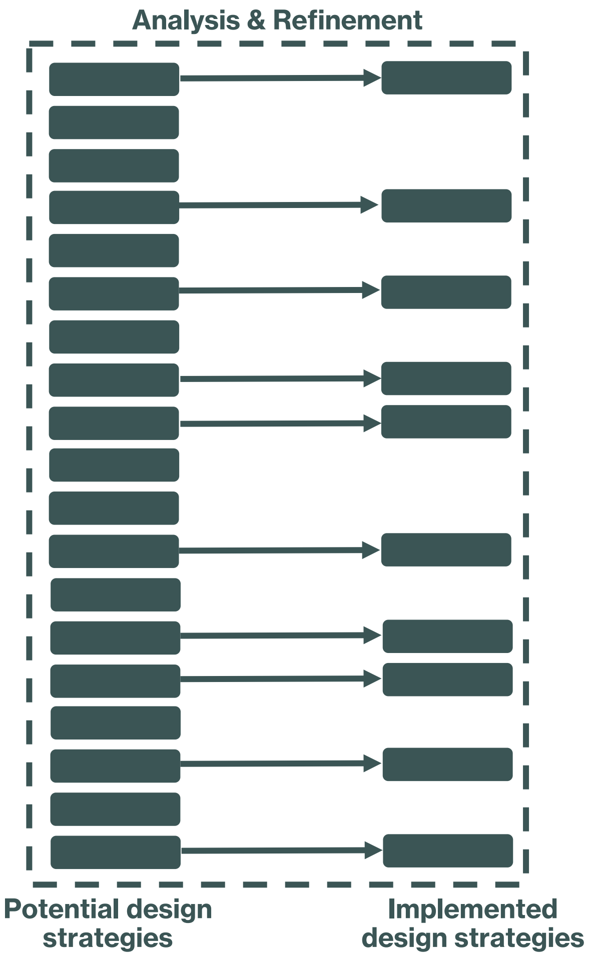
5.3 Life Cycle Cost Analysis (LCCA) Overview

The life-cycle costing was done in three phases to inform decision making on design strategy implementation. At each stage, the results helped evaluate whether the strategy was beneficial and cost effective, needed more detailed or different analysis, or should be abandoned.

1. **Life-cycle costing Phase 1:** The BC Hydro Commercial New Construction study was leveraged, along with the general costing process to assess the performance of a long list of measures. Where the resulting outputs were sufficient, strategies were either abandoned or adopted into the proposed design.

2. **Life-cycle costing Phase 2:** Select measures that fell outside the BC Hydro study scope or were better understood compared to the design case rather than the prescribed BC Hydro baseline, a separate evaluation was done to further refine implemented strategies.

3. **Life-cycle costing Phase 3:** Two remaining measures were selected for a more detailed lifecycle cost analysis, which, in addition to incremental capital cost, considers replacement and operational implications over the building's life in a 60-, and 80-year scenario.



5.4 Life Cycle Cost Analysis (LCCA) Methodology

PHASE 1

BC Hydro Commercial New construction Study:

- Seeking capital incentives for elements of our proposed system
- Consider additional measures and understand potential
- For most measures, yielded sufficient information for decisions by project team

PHASE 2

Optimization Study:

- Updated baseline model to reflect early DD for greater accuracy
- Measures selected where a more refined analysis was necessary

PHASE 3

Life Cycle Cost Analysis:

- Two measures selected where this level of detail could inform decisions
- Considers O&M and replacement costs
- Output total cost over 60- & 80-year scenarios

Compares (Phase 1):

Individual measures to **BC Hydro prescriptive baseline (better than code)**

Compares (Phases 2 and 3):

Individual measures to **Early DD proposed design**

LCCA
Phase 1 results: ECM's carried forward based on BC Hydro CNC study

Refer to the results of the BC Hydro Commercial New Construction study as part of the energy modelling report in Appendix 11.3 for the complete presentation of BC Hydro CNC results. This table summarizes the measures carried forward based on the BC Hydro CNC Study.

Measures Studied	Annual energy savings		Annual GHG savings		Annual energy savings		Incremental cost	Discounted payback (yrs)	Over Life of Measure		
	(kWh)	%	(tCO2e)	%	($)	%			NPV	IRR	Life expectancy (yrs)
Interior LPD reduction	25,991	0.5%	0.3	0.5%	$1,396	0.3%	- $215,790	-	$233,061	-	16
Exterior LPD reduction	17,371	0.3%	0.2	0.3%	$1,434	0.3%	-$10,790	-	$28,524	-	16
Lighting controls (OS)	10,709	0.2%	0.1	0.2%	$847	0.2%	$10,000	11	$473	5.6%	16
Proposed HVAC system (all-electric plant)	777,337	14.8%	8.6	14.8%	$94,424	17.4%	$1,296,300	22	$187,758	6.4%	22
Demand Controlled Ventilation	331,615	6.3%	3.6	6.3%	$28,339	5.2%	$214,500	7	$23,209	7.1%	10
Passive Drain HR	59,813	1.1%	0.7	1.1%	$7,126	1.3%	$21,200	3	$241,292	35.6%	30

Escalation Rate: 2%
Discount Rate: 5%

LCCA
Phase 1 results: Abandoned ECM's

Measures Studied	Annual energy savings		Annual GHG savings		Annual energy savings		Incremental cost	Discounted payback (yrs)	Over Life of Measure		
	(kWh)	%	(tCO2e)	%	($)	%			NPV	IRR	Life expectancy (yrs)
Thermal Storage	123,588	2.4%	1.4	2.4%	13,556	2.5%	$377,890	23	-$32,076	4.5%	50
Active Greywater HR	342,319	6.5%	3.8	6.5%	$23,168	4.3%	$1,118,375	34	-$846,062	-2.3%	15
Hot tub drain at night	132,982	2.5%	1.5	2.5%	$16,482	3.0%	$1,056,390	44	-$635,945	1.0%	50

Escalation Rate: 2%
Discount Rate: 5%

LCCA
Phase 1 findings: Warrants optimization study in phase 2

Measures Studied	Annual energy savings		Annual GHG savings		Annual energy savings		Incremental cost	Discounted payback (yrs)	Over Life of Measure		
	(kWh)	%	(tCO2e)	%	($)	%			NPV	IRR	Life expectancy (yrs)
Envelope (8" insulation)	23,319	0.4%	0.3	0.4%	$899	0.2%	$153,200	75	-$135,786	-7.1%	30
Glazing improvement	23,805	0.5%	0.3	0.5%	$492	0.1%	$448,200	151	-$439,748	-17.0%	25
Earth Tube	276,149	5.3%	3.0	5.3%	$43,620	8.0%	$703,600	14	$670,304	8.2%	100
90% Efficient ERV	534,071	10.2%	5.9	10.2%	$48,950	9.0%	$304,500	6	$270,853	15.6%	15
Solar PV	142,100	2.7%	1.6	2.7%	$42,241	7.8%	$450,560	10	$367,353	10.5%	30
Battery Storage	Ongoing coordination and evaluation with AES & BC Hydro										

Escalation Rate: 2%
Discount Rate: 5%

LCCA
Phase 2 results: Optimizations study compared to design baseline

Measures Studied	Annual energy savings		Annual GHG savings		Annual energy savings		Incremental cost	Discounted payback (yrs)	Over Life of Measure		
	(kWh)	%	(tCO2e)	%	($)	%			NPV	IRR	Life expectancy (yrs)
Exterior wall insulation from 8” to 6” (Rip-20 to Rip-17)	-1,199	0.0%	0.0	0.0%	-$95	0.0%	Will be assessed through Class B costing				
Double glazing in non-natatorium areas	-42,292	-1.1%	-0.5	0.5%	-$6,515	-1.6%	Will be assessed through Class B costing				
90% Efficient ERV	35,815	0.9%	0.4	0.9%	$2,192	0.6%	Will be assessed through Class B costing				
Earth Tube	145,718	3.7%	1.6	3.7%	$17,209	4.3%	Abandoned due to geotechnical risks requiring additional testing				

Phase 3: Life Cycle Cost Analysis

In Phase 3, two measures which aligned with project objectives and budget but fell outside the scope of the BC Hydro CNC and refinement process of Phase 2, were selected for a more detailed analysis, resulting a total cost over 60- and 80- year building life scenarios:

Solar PV Array
Pool backwash reuse for toilet flushing

Variables considered as part of the analysis include:

- Incremental cost
- Annual savings
- Life expectancy
- Annual component replacement costs
- Full system replacement cost
- O&M implications & cost

Decisions on both measures will be made early in CDs and as part of the Class B costing process.

Solar PV array results

Solar PV Array	Cost/Saving
Annual energy savings (kWh)	142,100
Annual energy savings ($)	$42,241
Annual GHG savings (tCO2e)	1.6
Incremental cost	-$450,560
Life expectancy (years)	Panels: 30 Inverters (x2): 15
Average annual component replacement cost	-$3,049
Total system replacement cost	-$182,960
Operational cost	$0
NPV	**$855,730**
IRR	**12%**
Payback (years)	**11**
Total saving over building life (60-year scenario)	**$855,730**
Total saving over building life (80-year scenario)	**$910,880**

Assumptions:

- 140.8 kW roof mounted PV array
- 30-year life expectancy for panels
- 15-year life expectancy for inverters (x2)
- Negligible maintenance implications
- Baseline: Early DD design with no PV
- Escalation Rate 2%
- Discount Rate 5%

Greywater reuse

Greywater reuse results

Water reuse	Cost/Saving
Annual water cost savings	$18,878
Annual energy cost ($)	-$12,000*
Annual GHG savings (tCO2e)	**
Incremental cost	-$410,000
Life expectancy (years)	Varies per ASHRAE Equipment Life Expectancy Chart
Average annual component replacement cost	-$4,042
Total system replacement cost	-$242,490
Operational cost	-$168,150
NPV	-$168,150
IRR	-
Payback (years)	-
Total saving over building life (60-year scenario)	**-$935,810**
Total saving over building life (80-year scenario)	**-$1,033.130**

*Not modelled, assumption provided by BTY for the purposes of this exercise
**Increased energy use increases emissions, additional modelling required

Assumptions:

- Pool backwash used for toilet flushing
- Includes filtration, UV disinfection, retention tank with aeration & pumps
- Requires periodic cleaning, filter replacement, UV maintenance, pump maintenance
- Estimated 1,293 L/day water savings
- BTY water cost analysis $0.40/m3
- Escalation Rate 2%
- Discount Rate 5%

6. Systems diagrams

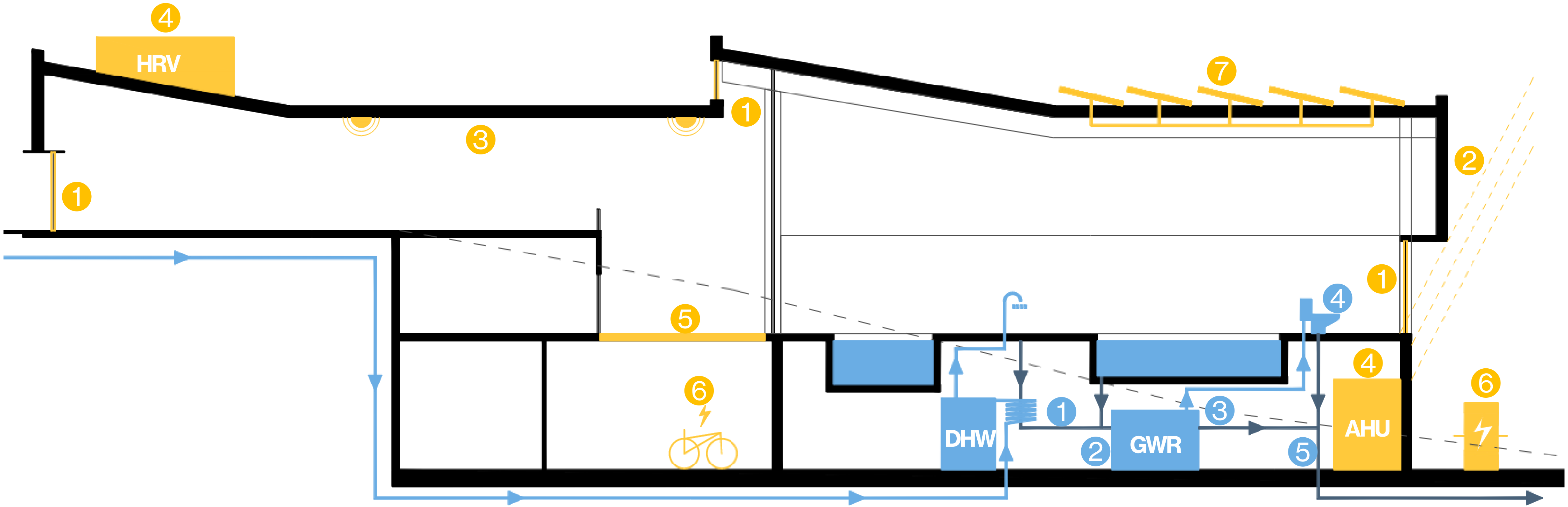
Energy and water systems

This diagram illustrates energy and water systems as currently reflected or under consideration at 100% Design Development.

Additional diagrams can be developed in layers as design is refined to reflect strategies by impact area, synergies between systems or other concepts as desired.

1. Passive heat recovery from drains for domestic hot water pre-heat
2. Pool backwash greywater collected
3. Greywater is treated for use
4. Greywater is used for toilet flushing
5. Overflow greywater is sent to sewer along with building sewage

1. High performing triple glazing
2. Overhang reduces solar heat gain
3. Daylight sensors help reduce interior lighting loads
4. The all electric mechanical system uses high-efficiency HRV to recover heat from natatorium dehumidification
5. Radiant slab in the lobby reduces fan loads
6. Charging infrastructure for EV's and personal devices
7. 140 kW PV array



7. Performance

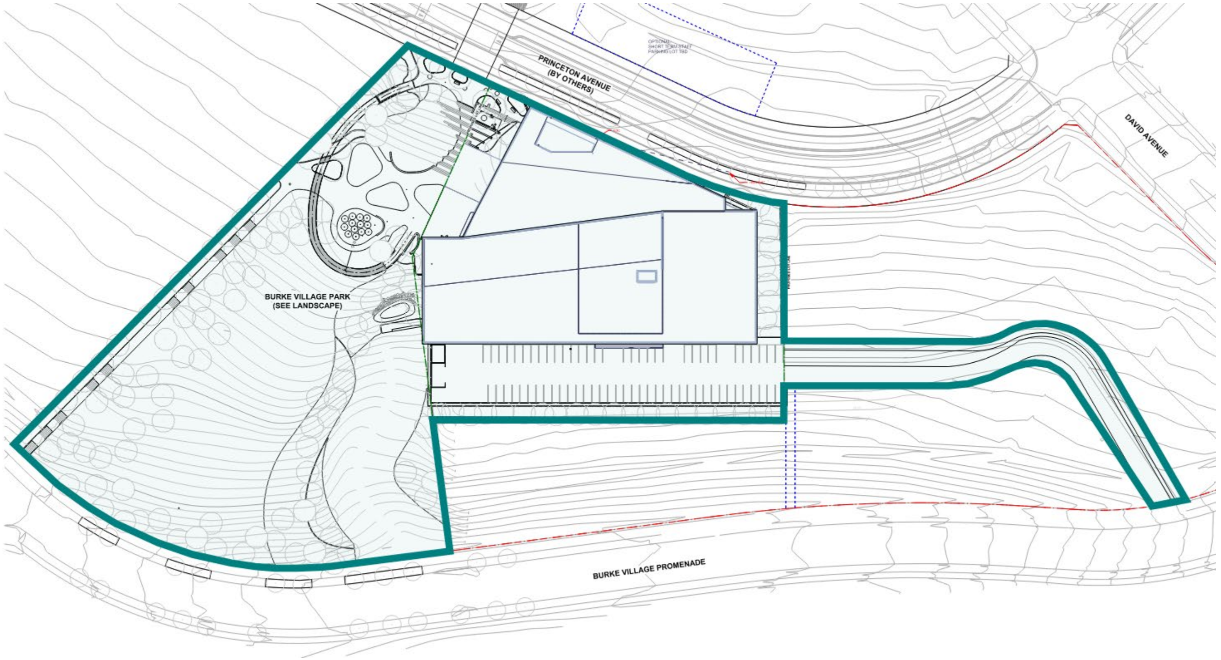
Site Assessment Boundary

It is important for the project to establish a site boundary to facilitate consistent evaluation of performance that both reflects the impact of the project and captures the extent of the strategies implemented.

An approximate 'limit of construction' approach was used, which includes all directly adjacent works being executed, excluding areas of the property which are set aside for future development.

The boundary includes the portion of Burke Village Park directly adjacent to the BMCC building, surface parking and street access, and a small vegetated buffer area on the east edge of the building. The intended development of the remaining areas is unknown and therefore excluded from the assessment boundary.

The boundary options are generally aligned with the rules of the LEED rating system. Targets and metrics to assess rainwater management, biodiversity and ecological function reference some LEED requirements, so we have aligned the boundary aligns accordingly.



7.1 Energy and emissions

Targets:

Targets:	25% better than NECB.	ZCB Adjusted TEDI target 214 kWh/m2*
Status:	**34%**	**175 kWh/m2**

*The project is exempt from meeting TEDI to comply with ZCB no fossil fuels are used for heating, but it is a helpful measure to evaluate performance.

Energy Efficiency

Energy modelling confirms the design is performing **34%** better than our baseline, NECB 2020, which meets the energy target set for the project and the ZCBv4 energy efficiency requirement if 25% better than baseline.

Operational Emissions

No natural gas or other fossil fuels are part of the building systems. Greenhouse gas emissions are about 20% lower than the baseline at 5.4 kgCO2/m2, which is considered very low owing to the fossil fuel free building systems, and low emission electrical grid.

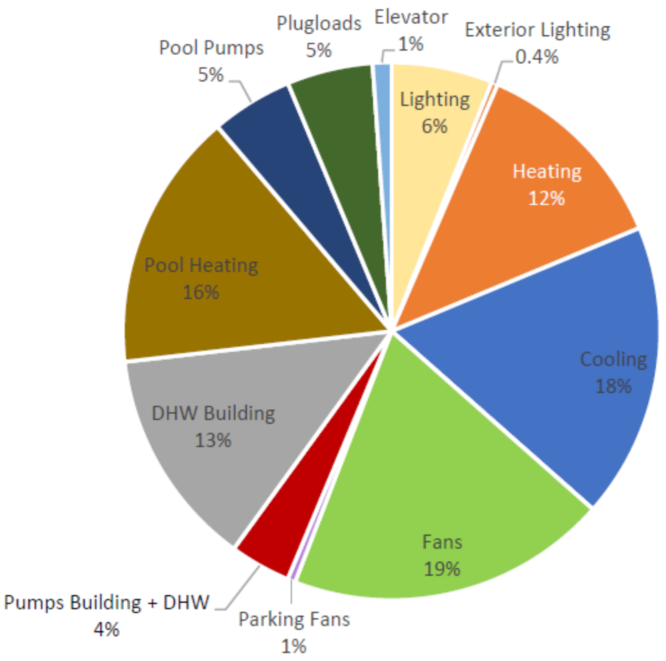
Refer to the energy modelling report in Appendix 11.3 for detailed results and methodology.

Notes and considerations:

- The adjusted TEDI target shows good performance when averaged between natatorium and all other program. When measured for the non natatorium areas only it measures high (target is 30, proposed is 36), which may be addressed by specifying the higher ERV efficiency of 90% that is currently being considered as an option as part of Class B costing.
- None of the pending design options are included in the 100% DD Energy Model Results, but all options studied in DD are referenced in the energy modelling report (Appendix 11.3).
- Further coordination is needed with the mechanical team as limited information was available on the air system details, and to evaluate opportunities for plant optimization.
- Better coordinating and estimating occupancy numbers will be key to refining the model.

	Total Energy Consumption (MWh)	Total Energy Use Intensity (kWh/m2)	Total Energy Demand Intensity (kWh/m2)	Annual Energy Cost ($)	Operational GHG emissions ($kgCO_2/m^2$)
Baseline	6,137	623.1	290	*not provided	6.9
Design	4,067	413.0	175	$398,650	4.5
Reduction	**34%**	**34%**	**40%**	***N/A**	**34%**

*The modeling rules applied to reflect the unique HVAC system for this typology generate an unrealistic cost baseline, accordingly we have excluded it here to avoid unrealistic comparison.



Proposed design energy consumption by end-use

7.3 Water

Targets:	20% indoor water use reduction	50% outdoor water use reduction	Retain 80th percentile rainfall onsite
Status:	21.08%	74%	TBC

Indoor water use

Indoor water use is measured using the LEED calculation methodology which includes water use generated by plumbing fixtures and fittings only. No process water associated with the pool is assessed as part of the efficiency calculation.

Water use is estimated to be 20.33% lower than the baseline with high efficiency plumbing fixtures alone, meeting the target of 20%. A water reuse system that collects grey water from the pool backwash to be reused for toilet flushing is still being evaluated. Water savings increases to 21.08% with both efficient fixtures and water reuse, which represents a significant absolute savings of 471,945 litres per year.

Occupancy and user assumptions for the pool require review and further coordination by the design team and client group in early CD. Revised use assumptions will impact water use calculations.

Indoor water use	Unit
Baseline water use	62,382,788.75 L/yr
Fixture efficiency	
Design case water use with efficient fixtures only	49,703,316.55 L/yr
Water use reduction (%)	**20.33%**
Fixture efficiency and grey water reuse for toilet flushing	
Estimated daily savings through greywater reuse (provided by AME):	1,293 L
Annual savings	47,1945 L/yr
Annual consumption with greywater reuse system	49,231,371.55 L/yr
Water use reduction with greywater reuse system (5%)	**21.08%**

*LEED v4 Indoor Water Use Reduction calculator applied

Outdoor water use

Indoor water use is measured using the LEED calculation methodology which evaluates potable water used for irrigation against a baseline.

Outdoor water use reduction is currently 74% lower than the baseline, exceeding the target of 50% reduction from the baseline. Landscape design currently includes a mix of drought tolerant planing with no irrigation provided beyond establishment and plants that require some irrigation. The irrigation system for the areas requiring it, is higher in efficiency where possible.

Outdoor water use	Unit
Landscape baseline water use (L/month)	1,542,650 (L/month)
Design case landscape water use (L/month)	401,386 (L/month)
Water use reduction (%)	**74%**

*LEED v4 Outdoor Water Use Reduction calculator applied

Water cont'd

Targets:

Retain 80th percentile rainfall onsite

Design not aligned.

Rainwater management

The stormwater management strategy is aligned with the Partington Creek Integrated Water Management Plan. Infiltration is not technically feasible on the site, so the project target of retaining 80 percent of rainfall on site is not being met. The strategy still aligns with the project objective to protect the downstream watershed, redirecting water to the tributaries, meeting retention requirements, and detaining remaining water for treatment and discharge.

- Capacities for the tributaries are estimated to be (to be confirmed in a forthcoming site visit):
    - 328 L/s – East Tributary
    - 260 L/s – West Tributary
- Post-development flows to the tributaries will be maintained at pre-disturbance levels up to the 100-year event, including primarily groundwater flows and a small portion of rainwater runoff from only roof and landscape areas.
- The exact amount of runoff directed to the tributaries is still being determined, but it will not be significant and diversion structures will be designed to ensure the correct flows are being discharged.
- The remaining overflow will be directed to the Burke Village Park trunk sewer up to the 100-year event.
- Additional retention requirements will be met using a minimum of 300 mm topsoil on all pervious surfaces and grading hardscape toward the pervious surfaces at a max ratio of 2:1 hardscape:landscape.

Treatment

- Water quality objectives will be met by through capture and treatment of 90% of the average annual runoff from impervious areas. Rain gardens will treat and detain runoff, and potentially other detention facilities to reduce peak flows from non-sediment laden impervious surfaces, such as roofs and sidewalks.
- All roadway and parking lot runoff will be treated via proprietary devices prior to discharging to the Burke Village Park trunk sewer system.

7.3 Materials and indoor environmental quality

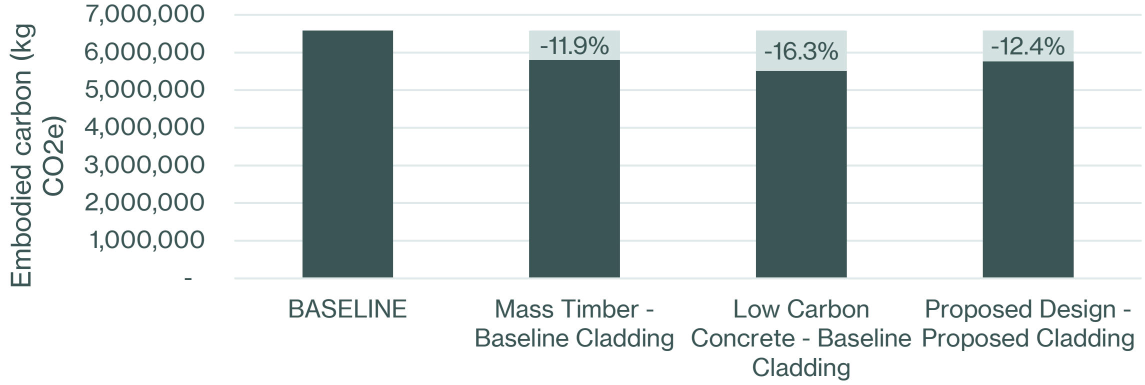
Targets:	20% embodied carbon reduction	Comply with LEED v4.1 Building Life Cycle Impact reduction	Divert minimum 75% const. waste from landfill	Comply with LEED v4.1 low emitting materials and IEQ requirements
Status:	12.4% reduction	Design partially aligned	Design aligned	Design aligned

Embodied carbon/LCA

A whole building Life Cycle Assessment (WBLCA) was conducted based on the 75% DD package, which confirms 12.4% embodied carbon reduction compared to the baseline. The minimum reduction of 10% is met, although the analysis presents some opportunities to optimize and improve the reduction. Refer to section 7.2 for a summary of the LCA results, and Appendix 11. 4 for the detailed results memo.

Life Cycle Analysis Results		
Design Option	Embodied carbon A1-C4 (tons CO_2e)	Embodied carbon A1-C4 (kg CO_2e/m^2)
Baseline	6,587	648
Proposed Design	5,769	568
reduction against baseline	12.4%	

Cumulative reductions from individual strategies



- The methodology of the assessment was in alignment with the National Research Council's National Guidelines for Whole-Building Life-Cycle Assessment, in compliance with ZCB Design Standard v4. Structural material takeoffs were provided by the structural consultant, and the 75% DD revit model was used for architectural takeoffs. OneClick LCA for LEED tool was used for the assessment.
- Figure 1 shows the cumulative reductions achieved. The use of Mass Timber resulted in a 11.9% reduction.
- Low carbon concrete resulted in a further 4.6% reduction.
- However, the proposed design includes cladding with a higher GWP than the baseline, which is resulted in a 3.9% increase in embodied carbon.

It is recommended that the following strategies are explored during the CD phase:

- Conduct a snow load study to reduce structural snow load factors used from code and reduce member sizes
- Optimize concrete mix design, confirming maximum savings/optimal performance, and include emissions limits for various concrete mixes in the specifications.
- Reduce the thickness of concrete slabs, by considering more reinforcing, concrete with higher compressive strength, rebar with higher tensile strength, post-tensioned slabs, etc.
- Replace more concrete or steel elements with mass timber products
- Specify North American steel
- Consider replacing the selected claddings with a lower embodied carbon alternative.

Special note:
The LEED v4.1 Building Life Cycle Impact Reduction credit encourages material impact assessment in six categories, only one of which is embodied carbon emissions. Current design does not demonstrate adequate reductions in the minimum number of impact categories. This may improve with material refinements as recommended above. Refer to the LCA memo included in Appendix 11.4 for details.

Materials and IEQ cont’d

Targets:	20% embodied carbon reduction	Comply with LEED v4.1 Building Life Cycle Impact reduction	Divert minimum 75% const. waste from landfill	Comply with LEED v4.1 low emitting materials and IEQ requirements
Status:	12.4% reduction	Design partially aligned	Design aligned	Design aligned

Materials

The project outline specification includes requirements to procure materials that align with attributes and thresholds of the Building Product Disclosure and Optimization credits of LEED v4.1:

- Use at least 20 products with Environmental Product Declarations (EPDs).
- Use at least 15% by cost products that include one of the following attributes: Extended producer responsibility; Bio-based materials; Wood products; Materials reuse; Recycled content.
- Use at least 20 different products from at least five different manufacturers that use any of the following programs to demonstrate the chemical inventory of the product to at least 0.1% (1000 ppm): ANSI/BIFMA e3 Furniture Sustainability Standard; Cradle to Cradle; Declare; Facts – NSF/ANSI 336; Health Product Declaration; Living Product Challenge; Manufacturer Inventory; Product Lens Certification.

Construction waste

The project outline specification includes requirements to divert at least 75% construction waste by complying with the LEED v4/v4.1 Construction Demolition and Waste Management credit including requiring a Construction and Demolition Waste Management Plan and tracking and reporting construction waste diversion.

Indoor Environmental Quality

The project outline specification includes requirements procure low emitting materials and protect indoor air quality during construction according to the requirements of LEED v4/v4.1 as follows:

- Specify low-emitting materials in compliance with maximum allowed emissions and VOC levels for paints, coatings, adhesives, sealants, flooring, ceilings, walls, acoustic and thermal insulation, composite wood and furniture.
- Comply with Enhanced IAQ strategies including implementing entryway systems, preventing ventilation cross-contamination, and MERV 13 filtration media.
- Conduct air quality testing upon construction completion.

7.4 Biodiversity and ecological function

Targets:	Improve conditions to support watershed	Vegetate 25% of outdoor open space	LEED v4/4.1 heat island requirement
Status:	Design is aligned	56.1 % vegetated open space	Design not aligned

Landscape planning summary

The planting and landscape design for the new park and community center employs a strategic, two-pronged approach tailored to the specific ecological and programmatic requirements of different zones across the site. This ensures robust ecological function while creating a beautiful and resilient public space.

The plant palette for the **Water Sustainability Act (WSA) Permit Area** is composed exclusively of species native to Coquitlam and the broader Burke Mountain ecosystem. The primary goal in this zone is to seamlessly integrate the park back into the surrounding forest on Burke Mountain.

The planting lists for the other developed zones (e.g., plazas, parking lots) feature a thoughtful blend of native plants and carefully selected non-native, climate-adapted cultivars. This hybrid approach is designed to meet the unique challenges and goals of high-use, programmed spaces. The entire planting plan is designed to function as a cohesive ecosystem that integrates with and supports the wildlife of Burke Mountain. The strategy is not simply "native vs. non-native," but rather creating a resilient, multi-functional landscape.

Currently a total of 56.1% of outdoor open space is vegetated with two or more species and the landscape plan in the WSA Permit area supports restoration of the downstream watershed.

Vegetated open space	Area
Area total (assessment boundary)	26,252 m2
Area vegetated open space provided	8,314 m2
% vegetated open space	**56.1%**

LEED v4.1 Open Space calculation methodology applied.

Biodiversity and ecological function cont'd

Targets:	Improve conditions to support watershed	Vegetate 25% of outdoor open space	LEED v4/4.1 heat island requirement
Status:	Design is aligned	56.1 % vegetated open space	Design not aligned

Heat island reduction

Reducing the impact of heat islands on the microclimates improves the quality of the outdoor space for ecological systems, human experience and building system performance. LEED v4/v4.1 offers an accepted method of calculating heat island and acceptable benchmarks for improvement.

LEED projects may demonstrate compliance by applying one of two methods of compliance. Option 1 encourages application of highly reflective surfaces (roof or paved area) and planted or permeable areas. Option 2 requires placing at least 75% of parking under cover.

Currently the BMCC has 65% of parking under cover, just short of meeting the requirements for option 2. Surface materials have not yet been selected so compliance with Option 1 cannot be confirmed. We recommend aligning surface material selection with the minimum reflectance requirements.

Heat island calculation

LEED Option 1 – Standard Nonroof + Roof calculation
Design case area totals for reference only*

Heat Island Reduction Nonroof + Roof Area summary	Area (m2)
Area of nonroof measure (Vegetated areas shaded with trees)	5,990 m2
Area of high-reflectance roof (Assuming whole roof is high-reflectance or has PV)	6,077 m2
Total Site Paving + Total Roof (Threshold for compliance)	13,487 m2
Total Nonroof + roof measure calculation	7,553 m2

*The weighted nonroof or roof calculation can be assessed when on surface materials selection is confirmed.

LEED Option 2 – 75% of parking under cover

Heat island reduction parking	Spaces
Total parking	197
Parking under cover	129
% parking under cover	**65.5%**

7.5 Transportation, community, and experience

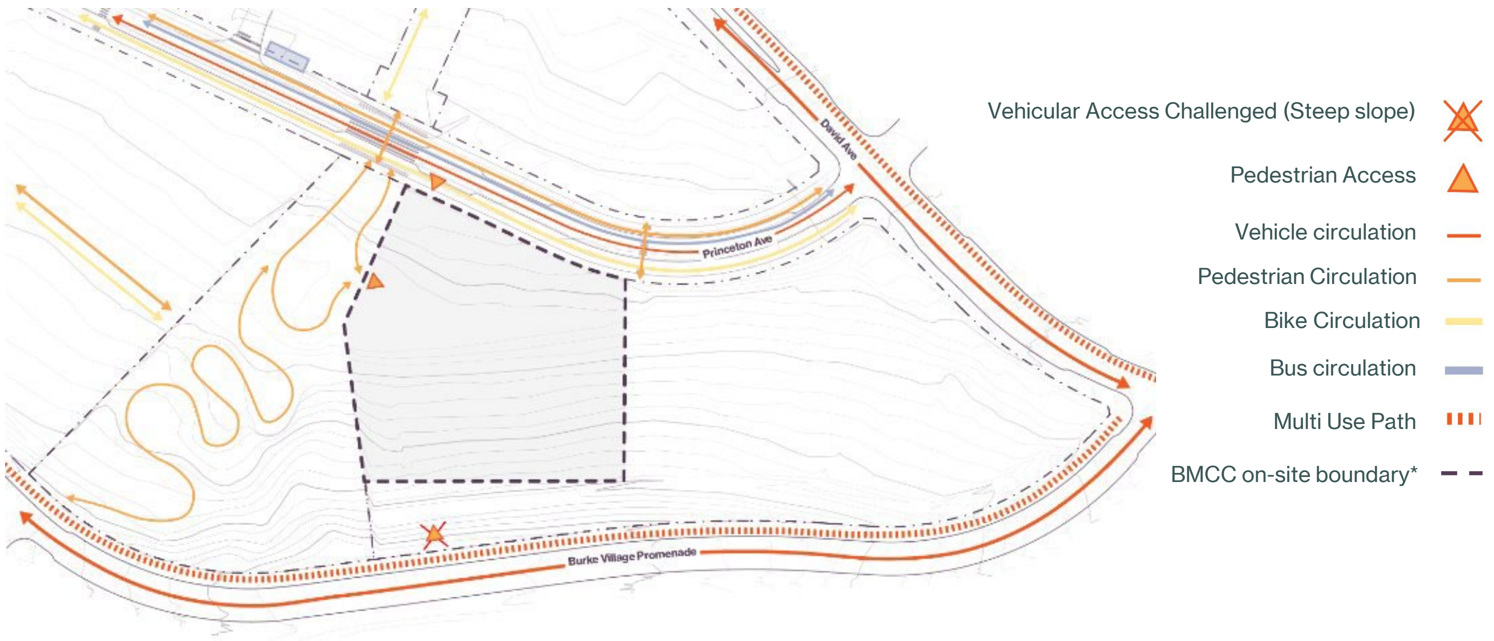
Targets:	Align cycling and EV charging requirements of LEED v4/4.1	Provide short term storage and charging for micro-mobility devices
	Design aligned	Design aligned

Bicycle storage and EV charging metrics are shown below and are compliant with the respective LEED credit requirements. The project also complies with the LEED requirement to be connected to a bicycle network, being adjacent to a bicycle and multi use path network which connects to another employment or school within 4800m (Coast Salish Elementary).

Bike storage	No. Spaces
Required short term bicycle storage per LEED	27
Required long term bicycle storage per LEED	5
Short term storage provided	**42**
Long term storage provided	**11**
Stalls with bicycle and micro mobility charging	**10**

Electric Vehicle (EV) car charging	No. Spaces
Parking stalls provided	197
EV charging required per LEED (5%)	10
EV charging stalls provided	**62**

Cycling network diagram



7.6 Climate resilient design

Targets: Design for 2080 climate

Status: Design aligned

Climate resilience is a central design principle. The climate risk assessment conducted at pre-design identified site specific risks and hazards by building system including extreme heat, wildfire poor air quality, power outage, riverine flooding, decrease slope stability, drought, and warmer summer temperatures. Refer to Appendix 11.1 for the detailed risk assessment, and Appendix 11.2 for detailed design responses by building system in the design tracker.

A short summary of current design strategies reflected in progress to date:

Extreme heat:

- Mechanical system is sized to align with 2080 temperature range for hydronic piping. Ventilation shafts and ducts are sized for 2050 temperature range, understanding that minor renovation could accommodate larger sizes as required in the future.
- HRV/AHU equipment is sized for 2050 temperature range. Space is provided for larger equipment needed to accommodate 2080 range when replaced at end of life.

Poor air quality:

- MERV-13 filters are provided on all AHUs.

Warmer summer temperatures:

- Natural ventilation proposed for the gymnasium, overhangs and screens protect from the interior space from solar heat gain.

Power Outage:

- Battery storage is being evaluated in collaboration with BC Hydro.

Drought:

- Efficient plumbing fixtures specified to reduce indoor water use
- Grey water (pool backwash) reuse for toilet flushing
- Eliminating permanent irrigation in some landscape areas and higher efficiency irrigation in others for 74% reduction in outdoor water use.

7.7 Rating systems

BMCC is working with two systems to help set targets and establish metrics for assessing building performance, support funding and grant applications, and to demonstrate market leadership in sustainability.

Rating systems and assessment frameworks provide exceptional value as benchmarks for performance across a range of impact areas - they use established and consistent methods of measurement, metrics, and tools to evaluate design strategies, construction process, and operational outcomes, and rating systems with third party verification (certification programs) also offer validation and verification of outcomes which is critical to communicating performance with credibility to organizational or public audiences.

BMCC is pursuing **Design** certification under the **Zero Carbon Building Standard (ZCB) v4.** Key benefits of the rating system:

- Requires improved energy efficiency and reductions in embodied and operational emissions
- Aligns with BCBC Energy Step Code 2 (Rec Centers) with an energy efficiency requirement of 25% improvement over NECB 2020 (excluding renewables)
- Aligns with requirements of GICB Grant application.
- Opportunity to pursue ZCB Performance certification post-occupancy to demonstrate net-zero carbon in operation.

ZCB Design v4 requires projects to demonstrate compliance with three performance criteria:

1. Minimum energy efficiency of 25% better than NECB 2020.
2. Minimum 10% reduction in embodied carbon as measured against a baseline
3. Implement at least two Impact and Innovation strategies, one of which must be from the ZCB list of pre-approved options.

ZCB Status at Design Development

- **Energy performance**
  Energy modelling confirms 34% reduction compared NECB. Refer to Appendix 11.3 for the Energy Modelling Report.

- **Embodied carbon/LCA**
  A whole building Life Cycle Assessment (WBLCA) was conducted based on the 75% DD package. Analysis confirms a reduction of 12.4% embodied carbon compared to the baseline. The minimum reduction of 10% is met, although the analysis presents some opportunities to optimize and improve the reduction. Refer to section 7.2 for a summary of the LCA results, and **Appendix 11.** for the detailed results memo.

- **Impact and Innovation strategies**
  Two pre-approved Impact and Innovation strategies are currently met based on 100% DD package:
  1. 100% of space heating using non-combustion-based technologies.
  2. Design service hot water systems to operate without combustion.

We recommend registering the project with CAGBC as soon as possible to avoid any changes to the rating system that might become applicable.

LEED Building Design + Construction v4/4.1 Referenced for assessment only

Key benefits of referencing the LEED the rating system:

- Aligns with CoC Environmental Sustainability Policy and ZCB v4
- FCM Green Municipal Fund feasibility study for new construction of community buildings references LEED metrics as part the study requirements.
- Supports storytelling with measured data industry standard methodologies.
- LEED performance thresholds and compliance paths are helpful benchmarks.

LEED Status at DD: The project will not pursue formal LEED certification however some LEED performance metrics are being applied to support benchmarking and evaluation and the FCM Green Municipal Fund grant requirements. To get a general sense of where the project stands against the LEED BC+D scorecard, a conservative evaluation is included on the following page, showing a likely minimum of 45 points, with another 22 points identified as “maybe” or possible. The current score is a strong indicator that the project is in the range of earning a Silver rating (min 50 points).

LEED requirements have not been evaluated in detail except where referenced by the FCM grant requirements. The score reflects our understanding of how the project would score based on our experience and knowledge of the design, budget and goals confirmed to date and how projects of similar scale and type perform.

LEED V4 PROJECT SCORECARD

PROJECT NAME: Northeast Coquitlam Community Centre
DATE: 11-Aug-25
CERTIFICATION LEVEL: Certified

Y	?	N			
1			Credit	Integrative Process	1

Y	?	N		Location and Transportation	16
2	1	12		Location and Transportation	16
			LTc1	LEED for Neighborhood Development Location	16
		1	LTc2	Sensitive Land Protection	1
		2	LTc3	High Priority Site	2
		4	LTc4	Surrounding Density and Diverse Uses	5
	1	4	LTc5	Access to Quality Transit	5
1			LTc6	Bicycle Facilities	1
		1	LTc7	Reduced Parking Footprint	1
1			LTc8	Green Vehicles	1

Y	?	N		Sustainable Sites	10
3	3	3		Sustainable Sites	10
Y			SSp1	Construction Activity Pollution Prevention	Required
1			SSc1	Site Assessment	1
1			SSc2	Site Development - Protect or Restore Habitat	2
	1		SSc3	Open Space	1
		3	SSc4	Rainwater Management	3
	2		SSc5	Heat Island Reduction	2
1			SSc6	Light Pollution Reduction	1

Y	?	N		Water Efficiency	11
1	1	9		Water Efficiency	11
Y			WEp1	Outdoor Water Use Reduction	Required
Y			WEp2	Indoor Water Use Reduction	Required
Y			WEp3	Building-Level Water Metering	Required
1		1	WEc1	Outdoor Water Use Reduction	2
		6	WEc2	Indoor Water Use Reduction	6
		2	WEc3	Cooling Tower Water Use	2
	1		WEc4	Water Metering	1

Y	?	N		Energy and Atmosphere	33
16	10	3		Energy and Atmosphere	33
Y			EAp1	Fundamental Commissioning and Verification	Required
Y			EAp2	Minimum Energy Performance	Required
Y			EAp3	Building-Level Energy Metering	Required
Y			EAp4	Fundamental Refrigerant Management	Required
3		3	EAc1	Enhanced Commissioning	6
12	6		EAc2	Optimize Energy Performance	18
	1		EAc3	Advanced Energy Metering	1
	1		EAc4	Demand Response	2
1			EAc5	Renewable Energy Production	3
	1		EAc6	Enhanced Refrigerant Management	1
	1		EAc7	Green Power and Carbon Offsets	2

Y	?	N		Materials and Resources	13
8	3			Materials and Resources	13
Y			MRp1	Storage and Collection of Recyclables	Required
Y			MRp2	Construction and Demolition Waste Management Planning	Required
1	3		MRc1	Building Life-Cycle Impact Reduction	5
2			MRc2	Building Product Disclosure - Environmental Product Declarations	2
1			MRc3	Building Product Disclosure - Sourcing of Raw Materials	2
2			MRc4	Building Product Disclosure - Material Ingredients	2
2			MRc5	Construction and Demolition Waste Management	2

Y	?	N		Indoor Environmental Quality	16
7	4	2		Indoor Environmental Quality	16
Y			EQp1	Minimum Indoor Air Quality Performance	Required
Y			EQp2	Environmental Tobacco Smoke Control	Required
2			EQc1	Enhanced Indoor Air Quality Strategies	2
3			EQc2	Low-Emitting Materials	3
1			EQc3	Construction Indoor Air Quality Management Plan	1
1			EQc4	Indoor Air Quality Assessment	2
	1		EQc5	Thermal Comfort	1
	1		EQc6	Interior Lighting	2
	1	1	EQc7	Daylight	3
	1		EQc8	Quality Views	1
		1	EQc9	Acoustic Performance	1

Y	?	N		Innovation and Design	6
6				Innovation and Design	6
1			Credit	Education Program	1
1			Credit	Social equity within the project team	1
1			Credit	Innovation Credit Placeholder	1
1			Credit	Innovation Credit Placeholder	1
1			Credit	Innovation Credit Placeholder	1
1			Credit	LEED Accredited Professional	1

Y	?	N		Regional Priority	4
1		3		Regional Priority	4
1			Credit	Optmize Energy 10 pts	1
		1	Credit	Enhanced Cx 5 pts	1
		1	Credit	Outdoor water use 2 pts	1
		1	Credit	Rainwater management 2 pts	1

Y	?	N			
45	22	32	TOTAL SCORE	Possible Points:	110

Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110

8. Communications + Storytelling

Communication + storytelling

Purpose
Showcasing city leadership in sustainable design and climate action through BMCC's building performance is paramount for the City of Coquitlam. The city wishes to use this opportunity to both educate, develop sustainable design and climate action literacy, and inform audiences about how the building performs accordingly.

Audience
Internal city staff and stakeholders and the public/facility users are the target audience. Educating and informing with relevant and compelling content is a priority.

Approach
A strong building performance story starts with good methods of evaluation at design, construction and operation, so we can communicate outcomes against best practice and leading performance targets. It is important that work is transparent and uses accepted industry methods to both measure and verify our work so that the story we tell is credible and authentic.

Accordingly, this plan aligns with this approach with clear performance objectives set at the start of the project, supported by measurable targets and established indicators to measure the impact as we progress. In addition, the project is pursuing formal Design certification under the Zero Carbon Building Standard to validate project energy and emissions impact and establish a platform from which the city may choose to verify performance in operation (ZCB Performance) following occupancy.

While strong storytelling more broadly benefits from specific expertise to develop a structure, framework, language/visual style, and more, this section focuses on two aspects to support a more comprehensive story and narrative development:

- **What stories are emerging?**
  Emerging themes or performance elements that are commendable and valuable to communicate. Both strategies and outcomes along with process/lessons learned could be relevant to communicate depending on the audience.

- **How might we communicate the stories?**
  Suggested methods or materials that can be developed to communicate including precedents and examples provided for reference.

The suggestions included here are based on current design progress and may not be suitable for communication should design changes impact performance. Similarly other aspects may emerge that warrant including as the project develops. We recommend evaluating all emerging themes with the city team to align the stories with organization priorities.

9.1 What stories are emerging?

The big picture

Communicate the big picture in alignment with organizational goals

- Provide context to the audience by connecting the project and how it performs with the city's commitment to sustainability and climate action. This could help make technical strategies and solutions more relatable and help to contextualize design decisions and explain trade-offs.

Process and lessons learned

Communicate the methods that led to success

- Transfer knowledge about lessons learned and successful strategies within the organization can help advance subsequent projects, inspire others, improve transparency, and build trust in new ways of working and unfamiliar technology.

Embedding performance requirements and climate resilience into the scope of work

- How might future projects expect to do things differently when sustainable design and climate resilience are a desired outcome?

Design Strategies

Energy efficiency and operational greenhouse gas reduction

- Why a low energy building matters even in context of a clean grid.
- Contextualize the unique energy demands of indoor pools and the importance of efficient mechanical systems.
- Describe passive design strategies, such as orientation, glazing, shading strategies, and envelope performance, and active strategies including mechanical and electrical design and equipment.
- Communicate modelled and/or measured outcomes. Provide comparable and contextualized data tailored for various audiences.

Electrification as a method of GHG reduction and future proofing

- Rationale for electrification as a strategy not only to reduce greenhouse gases but as the most efficient method to heat and cool buildings.
- Electrification as climate resilience strategy in extreme heat conditions – most efficient way to deliver adequate cooling.

Climate resilient design

- Communicate design strategies in response to climate risks and hazards including cooling capacity for future temperatures, anticipating extreme heat and precipitation conditions, filtering air for wildfire smoke, managing solar heat gain with passive measure like overhangs.
- Community space to support people in extreme conditions such as heat events, wildfire smoke events, flood impacts.
- Significant 74% outdoor water use reduction to address drought.
- Grey water reuse: pool backwash reused for toilet flushing

Design Strategies cont’d

Transportation

- Anticipating the current and growing use of electric vehicles and prioritizing cycling and other micro mobility devices in site access and design

Biodiversity and ecological function

- Protection of the downstream watershed by managing and redirecting water to the tributaries.
- Planting plan designed to function as a cohesive ecosystem that integrates with and supports the wildlife of Burke Mountain; a strategy to support a resilient, multi-functional landscape.
- High quality vegetated outdoor space and reflective paving and roof materials to reduce the impact of heat islands.

9.2 How might we tell the stories?

The city may wish to consider a coordinated campaign that is designed to align with the organization's communications approach, branding, graphic language and preferred materials. Included here are suggestions relevant to communicating building performance and sustainability concepts specific to the BMCC and suggested materials and methods for consideration, with examples from other projects for reference.

It may be worthwhile to consider developing specific strategies for internal and external communication. For example, material developed for public education purposes may not contain the level of technical detail relevant for staff or other internal stakeholders. Consider both active and passive methods of communication for all audiences.

Signage in and around the building

- Signage is effective at both raising awareness to a broad audience and demonstrating applied concepts.
- Generally considered a passive strategy, signage can engage audiences by prompting actions such as scanning QR codes for more information.
- Successful signage is branded and part of a broader campaign that is kept current.
- Signage can become stale and dated in a relatively short period, depending on the content. Technology, design solutions, and strategies tend to evolve quickly, and what is considered leading or strong performance now may not be in the future. To manage this challenge, consider material that could accommodate updated content, is easily demountable or semi-permanent, and digital signage where appropriate.
- Refer the **Storytelling Example Material** provided as a separate file for two signage program examples.

Viewing windows to increase visibility of key building systems

- Most effective where new technology or equipment is not well understood.
- Excellent method to expose technical building systems to more people that wouldn't otherwise have an opportunity to see "behind the scenes" , both members of the public and staff.
- Heat pump technology is a key application for the BMCC and could be considered for a viewing window if location and access can be accommodated.
- Refer the Signage example material #2 in the **Storytelling Example Material** provided as a separate file for an example viewing window.

Printed material

- While digital information is preferred to avoid the cost an impact of printed material, printed information can be effective in targeted and specific circumstances.
- Consider small scale materials like post cards with compelling visuals, graphics, quick facts with reference more detail accessible online.
- Refer the **Storytelling Example Material** provided as a separate file for an example printed postcard.

Green building tours

- Consider both self-guided and hosted tours.
- An active strategy that can be tailored for various audiences.
- Generally inexpensive capital cost to implement, but active tours rely on available hosts.
- Hosted tours could be offered for a limited period (first year/two years).
- Self-guided tours can be combined with signage and/or printed and digital material.
- Consider a self guided tour development service: https://greenbuildingaudiotours.com/

How might we tell the stories cont'd

Project case study

- Case studies can reflect a range of depth but are effective tools to communicate technical information and details in written and graphic formats.
- Consider designing for both print and digital formats and for multiple audiences.
- Static case studies in print or PDF download online are effective at capturing a moment in time or documenting process, decision making, predicted outcomes, rationale, and relevance to current policy and organization commitments. Content can inform website or other dynamic digital material.
- Case studies can be a good place to capture a range of design and/or construction information, data, metrics, models, and graphics that can be referred to or used to develop other materials.
- Refer the **Storytelling Example Material** provided as a separate file for case study examples.

Website material

- Project performance information on the organization's website to inform and educate is a simple, effective, and inexpensive way to communicate to the broadest audience. Consider pages within existing organizational site or developing a microsite for the project.
- Static website content could draw on other assets developed like case studies or drawings and design materials, construction photographs or video.
- Dynamic website content might communicate real time building performance by integrating it with the metered data from the building management system or regularly updated content reflecting new and current information.
- Website material could be designed to support self-guided building tours, hosting pages accessed via QR codes or other.
- Consider animated graphics or video content to actively engage the audience.
- Refer the **Storytelling Example Material** provided as a separate file for website references.

Building performance data monitoring and display

- Display or access to view performance data either in real-time or immediate historical trends, can be an effective engagement and education strategy.
- Requires careful integration of metering and building management systems, and a system interface for display.
- If considered for public display in the facility, it should be accompanied by clear contextual information to make it relevant to a broad, non-technical audience.
- Web only data display are good tools to engage internally, they support transparency and could be designed for cross-institutional or external sharing where appropriate. A proprietary app or interface is likely required. Refer to UBC's Building Energy and Water Data initiative for an example: https://facilities.ubc.ca/infrastructure-and-systems/utilities-metrics-and-data/building-energy-and-water-data/
- Consider displaying data from the immediate past such as energy use, contribution of renewable energy systems to the overall energy use, water reuse or other data as relevant. This strategy would rely submetering a range of end uses and preparing a display template for update monthly/quarterly/regularly.

How might we tell the stories cont’d

Collaborative or coordinated education programs

- Consider developing material or strategies in collaboration with other local institutions such as the school district or other city departments, or other local governments where a shared interest and benefit exists.
- Include the project in a broader green building tour program in collaboration with other local governments.
- Design tours or engagement material appropriate for k-12 students.
- Offer the building as a teaching tool to the school district or other community groups.

Thought leadership

- Developing thought leadership material and engagement strategy can create traction for the project in the technical community and position the city as a leader in a range of spaces.
- Internal thought leadership might communicate successful strategies and processes resulting desired outcomes to support new projects with high performance goals. Include lessons learned and focus on sharing constructive and authentic do’s and don’ts.
- Collaborate with the design team to tap into the industry’s network to share successes via speaking engagements and industry events and support project staff to attend and present. Examples might include:
  BC Recreation and Parks Association annual conference
  Canada Green Building Council annual conference
- Access local government networks to share lessons learned for example ICLEI Canada https://icleicanada.org/

9. Operations

9.1 Commissioning and Measurement + Verification

Commissioning
A commissioning authority (CxA) is a valuable role in support of building owners. The CxA ensures the project is designed, constructed, and operated per the specific needs and expectations of the organization. The CxA should be independent of the design and construction team and be involved from early design phases to post-occupancy, supporting optimal performance and function over the first year of operation.

Commissionign scope is accounted for in the project budget but the CxA role has not yet been engaged. While there is no fixed deadline for hiring the CxA in this case, we recommend engaging the role as soon as possible to provide time for comment on the DD package as the project advances in early CD. This timeframe will provide best value to the owner organization.

activities and measurement and verification protocols are recommended to support design for efficient operation and ongoing optimization. Metering to support M+V will be incorporated into design as it progresses, and we recommend engaging a third-party Commissioning Authority (CxA) as soon as possible.

Measurement + Verification
A comprehensive measurement and verification plan is essential to understand how the building is performing against design assumptions, and for ongoing optimal operation.

An M+V plan has not been developed although an allowance for a building DDC control system is included in the Class C costing including energy metering and digital metering on electrical systems. Water metering equipment is not clearly identified.

We recommend advancing a measurement and verification plan early in CD so that a metering strategy can be integrated and costed for as part of Class B. The strategy should be coordinated with the Cx scope and facilities operations team.

10. Funding Opportunities

9.1 Grants and funding

Together with the City of Coquitlam team, the design team is supporting three funding/grant opportunities to support the NECC with funds to cover the cost of studies or feasibility evaluation, and capital incentives. This table summarizes each funding effort, the funding amounts, and where the funding programs are aligned with or require compliance with rating systems/certifications programs. In all cases, the effort required to conduct the studies to pursue the funding is already in the project scope. Successful grant applications will allow the city to recover consulting costs and/or access capital funding for the project.

Grant and incentive programs				
Program	**Value**	**Requirements**	**Rating system alignment**	**Status at DD**
Green and Inclusive Community Buildings (GICB)	Up to 16M	• Climate risk assessment • ZCB v4 (register and certify) • CSA Tech Standard for Accessibility in the Built Environment	ZCBv4 Design RHFAC	Application submitted October 2025, outcome pending.
FCM Green Municipal Fund New Capital project Feasibility Study (GMF)	Up to $200,000	• Climate risk assessment – PIEVC or climate lens GHG reduction – align with net zero – ZCB/LEED Water conservation – LEED metric • Sustainable materials management – LEED metric • Biodiversity and ecological benefits – LEED metric	ZCBv4 Design LEED	Application submitted December 2025. **Approved** for $194,000 July 22, 2025.
BC Hydro Commercial New Construction Offer	Feasibility study: $65,000 Capital incentive: Up to $500,000	• Offer potential annual electrical energy savings of at least 25,000 kWh per year • Evaluate energy conservation measures and create a business case for the best options, accounting for life cycle costs (ongoing energy and maintenance costs), energy savings, and payback period.	ZCBv4 Design LEED	• Application submitted November 2025 with revisions requested. Feasibility study **Approved** March 2025. • Feasibility study complete and submitted to BC Hydro June 2025. • Capital incentive amount and approval pending.

11. Appendices

11.1 Climate risk assessment report
11.2 Resilient design response table
11.3 Energy model report
11.4 Whole-Building Lifecycle Assessment Memo
11.5 Design strategy evaluation tracker

11.1 Climate risk assessment report

Climate Risk Assessment
Northeast Community Center

Prepared for City of Coquitlam

Prepared by **hcma**
400 – 675 West Hastings Street
Vancouver, BC
V6B 1N2

Date 03 October 2024

TABLE OF CONTENTS

1.0 Introduction

The new Northeast Community Center (NECC) is being developed as part of the City of Coquitlam capital plan to serve the newest growth area in the city. The project is guided by the Partington Creek Neighbourhood Center Master Plan (2017) and will serve the Burke Mountain Village community. The community centre program includes an aquatic center, a library, a gymnasium, a fitness studio, and multipurpose rooms, with an estimated gross floor area of 7,900 m2.

Image 1: Site location

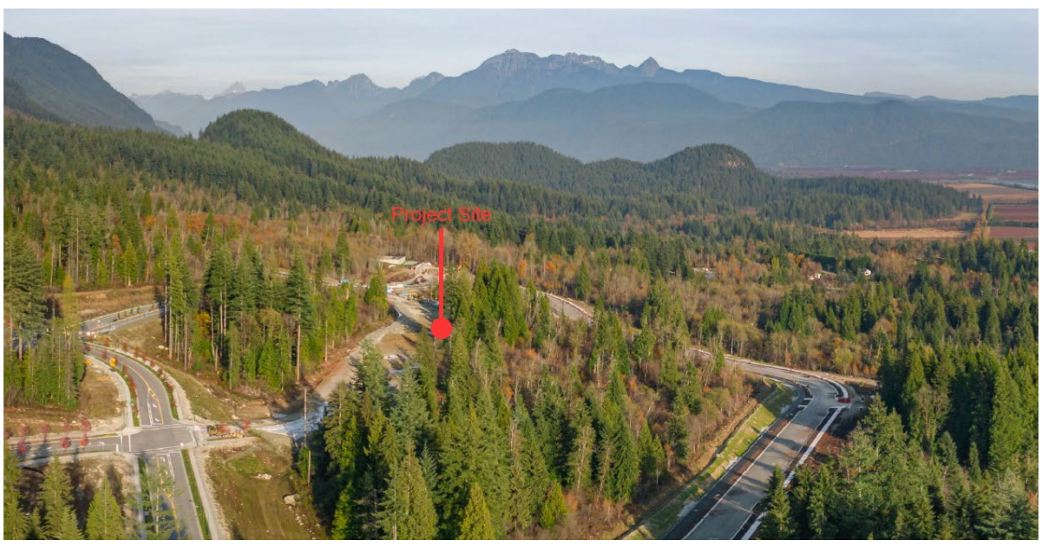


Image 2: Aerial site view

The main access to project will be from the newly extended Princeton Avenue, at the highest point of the lot. The significant slope of the site is a major design consideration.

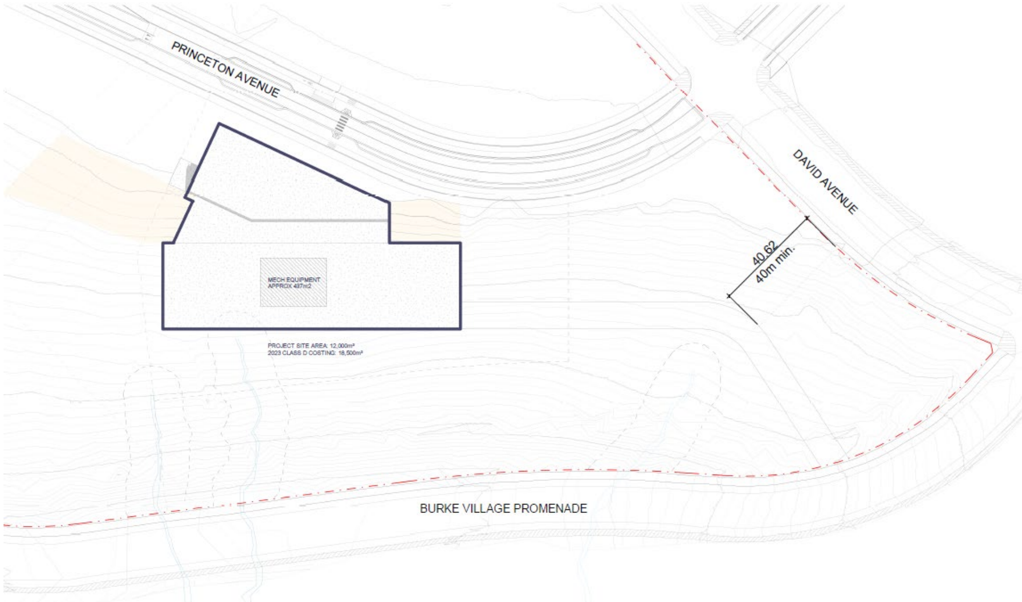


Image 3: Preliminary site plan

1.1 Community Context

Northeast Coquitlam, also known as Burke Mountain, is a unique mountainside area within the city covering an area of 6,096 hectares. It is located east of Hockaday / Nestor and Westwood Plateau communities and north of the City of Port Coquitlam. It is the farthest northeastern neighbourhood in the City of Coquitlam.

According to 2016 Census data, Coquitlam and Northeast Coquitlam residents are part of a community with diverse backgrounds, with 32% of residents speaking a language other than English at home.[1]

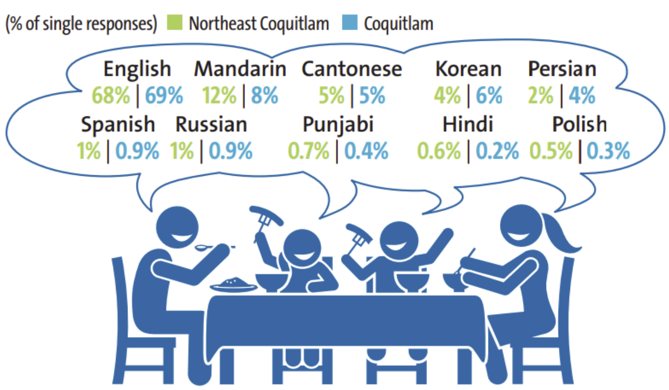


Image 4: Top 10 languages spoken most often at home. Source: Northeast Coquitlam Community Profile

According to Census Canada population counts from 1981 to 2016.The community is made up of a rapidly growing population.

[1] Northeast Coquitlam Community Profile 2019. URL: https://www.coquitlam.ca/DocumentCenter/View/212/2019-Northeast-Coquitlam-PDF Accessed: September 2024

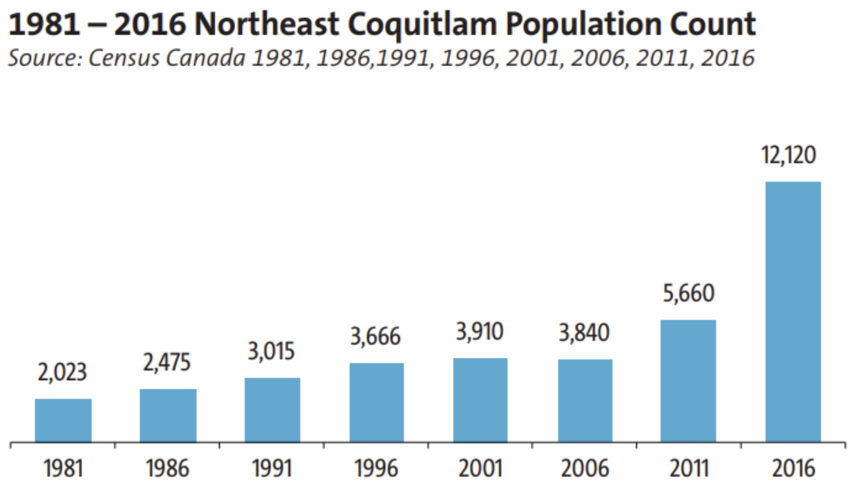


Image 5: Northeast Coquitlam population growth 1981-2016 Source: Northeast Coquitlam Community Profile

Young families are growing in this area of the city; population distribution by age shown in Image 5, shows residents aged 0-9 years made up 17% of the population in 2016, compared to 11% when looking at Coquitlam's general population.

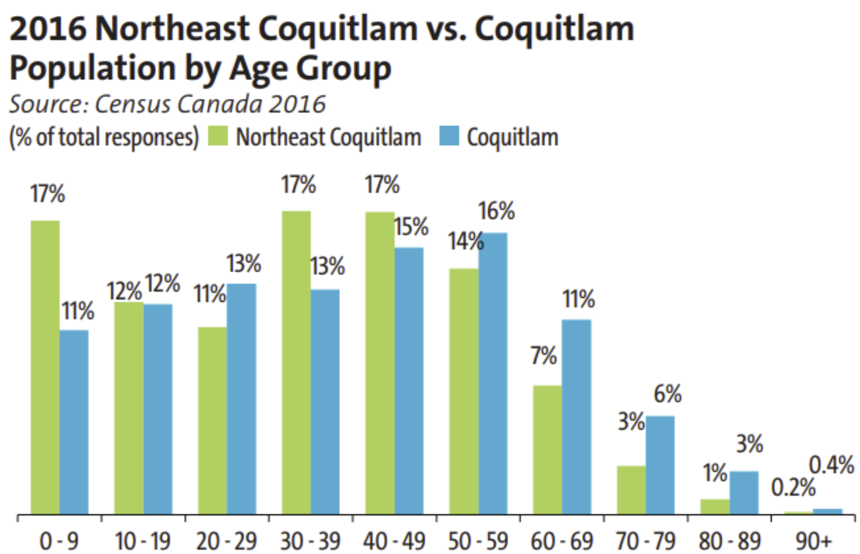


Image 6: Northeast Coquitlam population by age group Source: Northeast Coquitlam Community Profile

1.2 Scope

The scope of this climate risk assessment includes the full project site and new community centre building. The assessment is a desktop study that uses the most current and relevant future climate data and other resilience and adaptation planning resources to identify the projected changes in climate and their direct and indirect impacts on the site and project, including impacts during construction which is expected to take place before 2029. The study ranks each risk and recommends design and operational strategies to address those risks ranked as medium and high.

2.0 Methodology

This study applies findings from the City of Coquitlam Climate Adaptation Strategy which includes a climate risk assessment conducted in accordance with the ISO 31000 standard by a qualified P.Eng with WSP. Site specific information gathered from applicable data and professional expertise/contributions from project consultants (civil, landscape, mechanical, energy, arch) were used to inform analysis of climate risks to the building and its systems.

The structure of the assessment is aligned with the City of Vancouver Resilient Buildings Planning Worksheet[2] tool, which is modeled on the PIEVC High-Level Screening Guide[3] and the Climate Resilience Framework & Standards for Public Sector Buildings[4]. Using the City of Coquitlam risk assessment as well as the worksheet, the following steps were followed to assess and address project climate risks:

1. Exposure screening
2. Identifying impacts
3. Identifying likelihood & risk
4. Identifying resilience strategies

Other data sources were consulted in addition to the Coquitlam Climate Risk Assessment to support site specific assessment. These include:

- WUI Risk Class Map[5]
- Climate Data for a Resilient Canada[6]
- City of Vancouver Climate Adaptation Strategy 2024-25 update [7]
- Climate Atlas of Canada[8]

This methodology was applied to assess risks to the building over the course of its lifetime in a future climate (RCP 8.5) scenario. In parallel, a high-level assessment was carried out to identify risks and mitigation strategies during the construction phase of the project, using near-term climate conditions.

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[2] Resilient Buildings Planning Worksheet Primer (2023) URL: https://vancouver.ca/files/cov/primer-on-resilient-buildings-planning-worksheet.pdf Accessed: September 2024
[3] PIEVC High Level Screening Guide URL: https://pievc.ca/pievc-high-level-screening-guide/ Accessed: September 2024
[4] Climate Resilience Guidelines for BC Health Facility Planning & Design (2020) URL: https://bcgreencare.ca/wp-content/uploads/2021/09/ClimateResilienceGuidelinesForBCHealthFacilityPlanningAnd-Design_v1-1.pdf Accessed: September 2024
[5] BC Wildland Urban Interface Risk Class Maps (2023) URL: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/wui-risk-class-maps/wui-downloads Accessed: September 2024
[6] Climate Data for a Resilient Canada (n.d.). URL: https://climatedata.ca/ Accessed: September 2024
[7] City of Vancouver Climate Adaptation Strategy 2024-25 update. URL: https://vancouver.ca/files/cov/vancouver-climate-change-adaptation-strategy-2024-25.pdf Accessed September 2024
[8] Climate Atlas of Canada (n.d.). URL: https://climateatlas.ca/ Accessed: September 2024

3.0 Climate Analysis and Risk Assessment

3.1 Exposure Screen

The first step of the climate risks assessment is to identify the hazards that the project will be exposed to throughout the course of its expected service life. In this case, hazard identification was mainly informed by the existing Climate Risk Assessment for the City of Coquitlam, coupled with the project consultant team's expertise and knowledge of the site. Given the climate projections referenced are based on current trends already impacting the region, a conservative approach was taken for the present-day scenario, assuming all the identified hazards for future climate also apply to the construction phase. This initial screening identified the following hazards:

Table 1: NECC identified climate hazards

Hazard	Rationale
Extreme Heat	Heat waves are identified as a climate risk event in the CoC Climate Risk Assessment
Poor air quality (wildfire related)	Air quality concerns due to wildfires is identified high risk in CoC Climate Risk Assessment
Power Outage	An increase in duration and frequency of power outages is identified high risk in the CoC Climate Risk Assessment
Riverine flooding (including storm surges)	Property flooding from higher rainfall runoff is identified as a high risk in the CoC Climate Risk Assessment. The project's proximity to natural drainages means it could be exposed to this hazard
Decreased slope stability or landslide	An increased risk of landslides is identified as a medium risk in the CoC Climate Risk Assessment
Drought/Water restrictions	Droughts are identified as a climate risk event in the CoC Climate Risk Assessment
Warmer summer temperatures	Future climate projections for the region show an overall increase in temperatures
Warmer winter temperatures	Future climate projections for the region show an overall increase in temperatures
Wildfire	Wildfires are identified as a climate risk event in the CoC Climate Risk Assessment

3.2 Impacts and consequence rating

Step 2 of the assessment considers the potential future impacts of each hazard to each building system and the current potential impacts during construction. Informed by input from the project consultant team, the existing City of Coquitlam Climate Risk Assessment, and relevant climate data, the impacts of each hazard are described and assessed in a matrix. A consequence rating was assigned to hazards affecting each building system. A separate matrix was generated to assign consequence ratings for hazards during the construction phase. The rating was adapted from the PIEVC High Level Screening Guide and follows the scale:

- 1 – Very low
- 2 – Low
- 3 – Moderate
- 4 – High
- 5 – Very high

The impact descriptions and assigned consequence ratings are shown in the following Tables 2a and 2b:

Table 2a: Impacts and consequence ratings of future climate hazards by building system																
Hazards	**Architectural Systems**	**Consequence Rating**	**Civil Engineering Systems**	**Consequence Rating**	**Preparedness, Planning and Response**	**Consequence Rating**	**Human Systems**	**Consequence Rating**	**Landscape & Ecological Systems**	**Consequence Rating**	**Mechanical & Plumbing Systems**	**Consequence Rating**	**Power & Electrical Systems**	**Consequence Rating**	**Structural Systems**	**Consequence Rating**
Extreme Heat	Extreme heat would have little or no impact on exterior architectural systems	1	Extreme heat alone has little or no impact on civil engineering systems	1	The community center could become a place of refuge for nearby residents	3	The building will serve a large number of occupants, many of which may be vulnerable (youth and senior)	4	Vegetation and biodiversity can suffer	3	Cooling and ventilation loads would increase significantly, with the potential of failure	4	Increased energy requirements for cooling	3	Extreme heat alone has little or no impact on building structural systems	1
Poor air quality (wildfire related)	Poor air quality has little or no impact on building architectural systems	1	Poor air quality has little or no impact on civil engineering systems	1	The community center could become a place of refuge for nearby residents	3	The building will serve a large number of occupants, many of which may be vulnerable (youth and senior)	4	Minor direct impacts from air quality to vegetation and biodiversity	1	Air filters will need more frequent replacements	3	Poor air quality has little or no impact on building power and electrical systems	1	Poor air quality has little or no impact on building structural systems	1
Power Outage	A power outage has little or no impact on building architectural systems	1	Any stormwater management or irrigation systems requiring pumps would be affected	3	Continued use of the building both for normal operation and potential place of refuge would be severely impacted	4	Continued use of the building would be severely impacted with occupants potentially vulnerable to other hazards	4	Irrigation systems would be impacted	2	Without back-up power, mechanical and plumbing systems would cease operation during a power outage	5	Without back-up power, power & electrical systems would cease operation during a power outage	5	Power outages have little or no impact on building structural systems	1

Riverine flooding (including storm surges)	Given the topography of the site, and vicinity of natural drainages, some exterior architectural elements such as cladding or entryways could be affected	3	Given the topography of the site, and vicinity of natural drainages, stormwater systems could be impacted. Access and use of below-grade structures and spaces like parking and mechanical rooms may be impacted.	4	Entrances and exits could be compromised limiting possible evacuation paths	3	Below-grade storage spaces could be impacted, and use of exterior amenity spaces may be reduced	2	Some habitat loss and ecosystem degradation from higher runoff and stream flows	3	Systems below flood construction level could be affected	2	Below-grade electrical systems around the building could be impacted by storm surges, including free-standing exterior lighting.	2	Erosion cause by runoff could impact foundations and/or retaining wall loads and waterproofing	2
Decreased slope stability or landslide	Some exterior architectural elements such as paving or entryways could be affected	3	Site grading could also be affected by erosion and runoff.	3	Entrances and exits could as well as exterior walkways could be compromised limiting possible evacuation paths	4	Use of exterior amenity spaces could be impacted. Landslides could cause injuries	3	Landslides could eliminate vegetation and cause habitat and biodiversity loss	3	Major utility connections and below-grade systems around the building could be severely damaged in the case of a landslide	3	Below-grade electrical systems around the building could be severely damaged, affecting building operation	4	A landslide could cause significant damage to both the substructure and superstructure of the building	4
Drought/Water restrictions	Drought and water restrictions have little or no impact on building architectural systems	1	Operation of irrigation systems would be limited	2	Use of aquatic facilities may be limited, and the community center could become a place of refuge or point of water access for nearby residents	4	Depending on the extent of water restrictions, the continued use of the center could be severely impacted	4	Extended droughts can cause significant habitat loss and ecosystem degradation around the building	4	Systems serving the aquatic facility and other non-essential uses could be impacted by water restrictions and limit normal operation of the building	3	Drought or water restrictions have little or no impact on power & electrical systems	1	Drought or water restrictions have little or no impact on structural systems	1

Warmer summer temperatures	Warmer summer temperatures would have little or no impact on exterior architectural systems	1	Warmer summer temperatures would have little or no impact on exterior architectural systems	1	Warmer summer temperatures likely would not impact the building's emergency preparedness	1	Warmer summer temperatures likely would not impact the building occupants, though some populations may be more sensitive and vulnerable	2	Over time, warmer summer temperatures could contribute to ecosystem degradation and biodiversity loss	2	Though cooling energy demand would increase, warmer summer temperatures likely would not impact the building's mechanical and plumbing systems significantly	2	Warmer summer temperatures would not significantly impact the building's power & electrical systems	1	Warmer summer temperatures would not impact the building's structural systems	1
Warmer winter temperatures	Warmer winter temperatures would have little or no impact on exterior architectural systems	1	Warmer winter temperatures would have little or no impact on exterior architectural systems	1	Warmer summer temperatures likely would not impact the building's emergency preparedness	1	Warmer winter temperatures likely would not impact the building occupants	1	Over time, warmer winter temperatures could contribute to ecosystem degradation and biodiversity loss	2	Warmer winter temperatures likely would not impact the building's mechanical and plumbing systems	1	Warmer winter temperatures would not significantly impact the building's power & electrical systems	1	Warmer winter temperatures would not impact the building's structural systems	1
Wildfire	Direct wildfire contact could have devastating consequences to architectural systems, including the complete destruction of the building	5	Direct wildfire contact could have significant consequences for civil engineering systems, though these may be less vulnerable than the building itself	4	Direct wildfire contact could eliminate the building's capacity to be used as a place of refuge, and block accesses and evacuation paths, potentially resulting in loss of life	5	Direct wildfire contact would impact human health and wellbeing severely, with consequences ranging from loss of life directly related to fire, to respiratory issues related to smoke	5	Wildfire can result in significant destruction of habitat and loss of biodiversity	4	Wildfire contact could cause significant destruction of mechanical and plumbing systems	4	Wildfire contact could cause significant destruction of power & electrical systems	4	Depending on the main structural system used, damage could be major	4

Table 1b: Consequence rating of current climate hazards during the construction phase						
Hazards	**Human Systems, Preparedness, Planning and Response**	**Consequence Rating**	**Landscape and Civil Works**	**Consequence Rating**	**Architectural and other building systems under construction**	**Consequence Rating**
Extreme Heat	Heat waves can create hazardous health conditions for workers performing manual labour. Construction works can also generate sparks, which, considering the site location, can be a significant wildfire hazard if conditions are hot and dry.	5	Extreme heat alone has little or no impact on civil engineering systems during construction, though work could be delayed if conditions are too dangerous for workers. Vegetation and biodiversity can suffer.	3	Extreme heat alone has little or no impact on building systems during construction, though work could be delayed if conditions are too dangerous for workers.	2
Poor air quality (wildfire related)	Severe smoke events pose health risks to workers performing outdoor manual labour.	3	Negligible direct impacts from air quality to vegetation and biodiversity. Work could be paused, and construction delayed if conditions are not acceptable for outdoor manual labour.	2	Poor air quality has little or no impact on building systems themselves when under construction	1
Power Outage	Provided the site has alternate power sources, a grid power outage during the construction phase would have little or no impact on human systems and preparedness	1	Since construction site equipment and machinery operate mostly on power sources which are independent from the grid, works would be mostly unaffected with some potential interruptions.	2	Since construction site equipment and machinery operate mostly on power sources which are independent from the grid, works would be mostly unaffected with some potential interruptions.	2
Riverine flooding (including storm surges)	Entrances and exits could be compromised limiting possible evacuation paths.	3	Site flooding could set back landscaping and civil works significantly. Exposed excavations could become flooded and unfinished grading works can wash out.	4	Exposed foundation work could be flooded. Any materials or equipment stored below the flood level could be damaged and require replacement.	4
Decreased slope stability or landslide	Though the construction site is unlikely to be operating during a storm event with the potential for landslides, unfinished excavations or grading work could be vulnerable given the slope of the site. The road downhill of the site could be blocked and prevent emergency vehicle access	3	Unfinished excavations or grading work could be vulnerable given the slope of the site. This could represent a significant setback in works.	3	Unfinished excavations or grading work could be vulnerable given the slope of the site. A landslide could damage other structures on site and represent a significant setback in works.	3
Drought/Water restrictions	Water restrictions would not impact workers water supply or emergency systems	1	Water restrictions could impact the progress of site work which requires water.	3	Water restrictions could impact the progress of site work which requires water.	3

Warmer summer temperatures	Warmer summer temperatures likely would not impact construction workers, other than some potential discomfort. Some populations may be more sensitive and vulnerable.	2	Warmer temperatures would have negligible impacts on civil works. Landscape work may require more water than usual.	2	Warmer summer temperatures have little or no impact on building systems during construction.	2
Warmer winter temperatures	Warmer summer temperatures likely would not impact construction workers.	1	Warmer winter temperatures would likely not impact civil works.	1	Warmer winter temperatures have little or no impact on building systems during construction.	1
Wildfire	Direct wildfire contact would impact human health and wellbeing severely, with consequences ranging from loss of life directly related to fire, to respiratory issues related to smoke. Accesses and evacuation paths may be compromised, potentially resulting in loss of life	5	Wildfire can result in total destruction of habitat and loss of biodiversity, including ongoing landscaping works. Some excavation or grading works could be unaffected by fire.	4	Unfinished structures, exposed systems, stored materials and equipment may be especially vulnerable to wildfire contact and could be destroyed completely.	5

3.3 Likelihood & risk

In alignment with PIEVC methodology, step 3 of the assessment assigns a likelihood rating to each hazard once the consequence ratings have been established by hazard and impact. This assessment draws from the existing City of Coquitlam (CoC) Climate Risk Assessment, relevant climate data, and the professional judgement of the project consultant team to assign a rating based on the following scale:

Table 3: Hazard likelihood scale and rationale

Likelihood Score (L)	Middle Baseline Approach - Establish Base	Method	Suggested Rational
1		Likely to occur less frequently than current climate	50 – 100% reduction in frequency or intensity with reference to Baseline Mean
2			10 – 50% reduction in frequency or intensity with reference to Baseline Mean
3	Establish Current Climate Baseline Per Parameter	Likely to occur as frequently as current climate	Baseline Mean Conditions or a change in frequency or intensity of ±10% with reference to the Baseline Mean
4			10 – 50% increase in frequency or intensity with reference to Baseline Mean
5		Likely to occur more frequently than current climate	50 – 100%+ increase in frequency or intensity with reference to Baseline Mean

Source: PIEVC High-Level Screening Guide

In the case of construction phase hazards, present-day climate is considered, and a likelihood of 3 is assigned to all hazards per the PIEVC likelihood scale referenced above. The likelihood assigned to each of the future climate hazards are shown in the following table:

Table 4: Likelihood of Northeast Community Center Climate Hazards		
Hazard	**Likelihood rating**	**Rationale**
Extreme Heat	5	CoC Climate Adaptation Strategy identifies health risks due to heat waves as a high risk. According to Climate Data for a Resilient Canada, the yearly median number of days with a Humidex >30 for the period between 1981-2010, was 17 days. Using the RCP 8.5 scenario for the period of 2051-2080, the projected yearly median is 60 days.
Poor air quality (wildfire related)	4	CoC Climate Adaptation Strategy projects a doubling of forest fires in the region by 2080 and consequently identifies poor air quality as a high risk. This is supported by the City of Vancouver Climate Adaptation Strategy 2024-25 update, adding that the likelihood of the risk is high.
Power Outage	3	It is difficult to project the future likelihood of this hazard but given that power outages are mainly caused by storms, however this hazard can be correlated with projected heavy precipitation days (>20mm). CoC Climate Risk Assessment has labeled the increase in duration and frequency of power outages due to windstorms to have a moderate likelihood. The same document cites an increase of +5 days of heavy precipitation days per year from present day to the 2080's. This is a modest increase, which would likely not result in more than 10% increase in power outages. Future development of infrastructure near the site will mitigate the likelihood further.
Riverine flooding (including storm surges)	4	CoC Climate Adaptation Strategy has labeled property flooding from higher rainfall runoff as a high risk. The likelihood of flooding on public property due to lack of storm sewer capacity or dam breach is also labeled as high. The site could be exposed to rainfall creek surges, as there are natural drainages in the vicinity. Once again, the document correlates this hazard to heavy precipitation days, which have a projected increase of 14% in the 2080s. A likelihood rating of 4 is assigned.

Decreased slope stability or landslide	4	The project site is located on a relatively steep slope. COC Climate Risk Assessment labeled the likelihood of landslide risks as high.
Drought/Water restrictions	4	CoC Climate Rick Assessment has labeled the likelihood of seasonal water shortage and reduction of snowpack as high. The document cites a projected increase of consecutive days with less than 1mm of precipitation from 21 days presently to 29 days by the 2080s. This is a 33% increase and is therefore assigned a likelihood rating of 4 per the PIEVC likelihood rating scale.
Warmer summer temperatures	5	In order to assign a likelihood rating for this hazard, the number of summer days (days where the daytime high temperature is >25C) is used as a metric. According to Climate Data for a Resilient Canada, these are projected to increase from 28 days in the 1981-2010 period, to 66 days in the 2051-2080 period. An increase of more than 100% is assigned a likelihood rating of 5 per the PIEVC likelihood rating scale.
Warmer winter temperatures	4	The metric used for evaluating the likelihood of this hazard is the number of mild winter days (<-5C). Climate Atlas data projects a decrease from 40.2 days in the 1976-2005 period to 13.2 days in the 2051-2080 period. This represents a 67% change, and so a likelihood rating of 4 is applied.
Wildfire	4	The CoC Climate Risk Assessment describes a decrease in reported large forest fires over the past decades and assigns a medium risk level to 'properties more exposed to forest interface wildfires'. The current Wildland Urban Interface Risk Class rating map for the region also shows the site within a moderate risk (4/10) area. However, the COC risk assessment also brings attention to a projected doubling of forest fires in the region by 2080 with the newly developed North-East of the City at particular risk and assigns a high likelihood to interactions between wildfires and urban infrastructure in this area. The likelihood rating assigned for this project is elevated to 4.

As defined by the PIEVC protocol, the risk of any given hazard is the product of likelihood and consequence. The consequence rating and likelihood are multiplied to produce a risk rating, which then falls into one of the following ranges:

- 0-9: Low Risk
- 10-16: Medium Risk
- 17-25: High Risk

Table 5a shows the resulting risk rating for each hazard by building system. Table 5b shows the resulting risk ratings for present-day hazards during the construction phase. Risks rated medium or high will be addressed through design strategies.

Table 5a: Final risk ratings by building system (2030-2080)

Hazards	Architectural Systems	Civil Engineering Systems	Preparedness, Planning and Response	Human Systems	Landscape & Ecological Systems	Mechanical & Plumbing Systems	Power & Electrical Systems	Structural Systems
Extreme Heat	5	5	15	20	15	20	15	5
Poor air quality (wildfire related)	4	4	12	16	4	12	4	4
Power Outage	3	6	12	12	6	15	15	3
Riverine flooding (including storm surges)	12	16	12	8	12	8	8	8
Decreased slope stability or landslide	12	12	16	12	12	12	16	16
Drought/Water restrictions	4	8	16	16	16	12	4	4
Warmer summer temperatures	5	5	5	10	10	10	5	5
Warmer winter temperatures	4	4	4	4	8	4	4	4
Wildfire	20	16	20	20	16	16	16	16

Table 5B: Final risk ratings by hazard during construction (2024-2030)			
Hazards	**Human Systems, Preparedness, Planning and Response**	**Landscape and Civil Works**	**Architectural and other building systems under construction**
Extreme Heat	15	9	6
Poor air quality (wildfire related)	9	6	3
Power Outage	3	6	6
Riverine flooding (including storm surges)	9	12	12
Decreased slope stability or landslide	9	9	9
Drought/Water restrictions	3	9	9
Warmer summer temperatures	6	6	6
Warmer winter temperatures	3	3	3
Wildfire	15	12	15

3.4 Resilience strategies

A total of 39 risks were identified as medium or high. Resilience strategies were identified for these risks, appropriate to the early design stage of the project. Table 6a lists these hazards along with their resulting risk level and proposed mitigation strategy.

Table 6a: Resilience strategies				
Risk	**Hazard**	**Impact Category**	**Risk Level**	**Potential Resilience strategy to reduce risk**
1	Extreme heat	Emergency Preparedness, Planning and Response	Medium Risk	Opportunities will be explored for the facility to be used as a cooling centre and/or community resilience hub
2	Extreme heat	Human Systems	High Risk	Passive cooling strategies will be prioritized, and mechanical cooling systems will be sized for future climate to ensure thermal comfort for occupants
3	Extreme heat	Landscape & Ecological Systems	Medium Risk	Heat and drought-tolerant planting will be used, as well as low pollen trees to optimize shading across the site. Heat absorbing exterior surfaces will be minimized.
4	Extreme heat	Mechanical and Plumbing Systems	High Risk	Mechanical equipment will be sized for future climate and extra space for future equipment and ductwork will be considered. Thermal storage opportunities will be explored through a heat exchanger using tanks, earth, or groundwater.
5	Extreme heat	Power & Electrical Systems	Medium Risk	Efficiency of mechanical equipment will be optimized to mitigate increased cooling energy demand. Renewable energy opportunities will also be explored
6	Poor air quality (wildfire related)	Emergency Preparedness, Planning and Response	Medium Risk	Opportunities to allocate space for storage and stockpiles of enhanced filters (e.g. carbon, MERV 13, HEPA) will be considered, as well as the possible use of the facility as a place of refuge for the community during extreme smoke events
7	Poor air quality (wildfire related)	Human Systems	Medium Risk	The project would include MERV 13 filtration at a minimum to ensure adequate air quality for all occupants.
8	Poor air quality (wildfire related)	Mechanical and Plumbing Systems	Medium Risk	The project would include MERV 13 filtration at a minimum to ensure adequate air quality for all occupants. Enhanced sealing for filters and bypass systems will be considered to maximize effectiveness.
9	Power outage	Emergency Preparedness, Planning and Response	Medium Risk	The building will include back-up power for essential systems. Options for both thermal and electrical energy storage are being considered.
10	Power outage	Human Systems	Medium Risk	The building will include back-up power for essential systems. Options for both thermal and electrical energy storage are being considered.
11	Power outage	Mechanical and Plumbing Systems	Medium Risk	The building will include back-up power for essential systems. Options for both thermal and electrical energy storage are being considered.

12	Power outage	Power & Electrical Systems	Medium Risk	The building will include back-up power for essential systems. Options for both thermal and electrical energy storage are being considered.
13	Coastal or riverine flooding (including storm surges)	Architectural Systems	Medium Risk	A holistic approach to waterproofing systems will be used to protect below-grade exterior foundation walls. High performance water-resistant building materials will be selected to reduce damage to building structure, envelope, and finishes.
14	Coastal or riverine flooding (including storm surges)	Civil Engineering Systems	Medium Risk	A topological site survey and grading review will be conducted to understand stormwater flows in and around the site and design stormwater systems accordingly.
15	Coastal or riverine flooding (including storm surges)	Emergency Preparedness, Planning and Response	Medium Risk	Space for storage of temporary storm barriers will be considered if there are areas of concern during design
16	Coastal or riverine flooding (including storm surges)	Landscape & Ecological Systems	Medium Risk	Landscape features and green infrastructure such as bioswales, raingardens, and constructed wetlands will be considered to maximize water retention and infiltration on site
17	Decreased slope stability or landslide	Architectural Systems	Medium Risk	Slope stability of the site will be considered during structural design and potential risk points will be flagged for reinforcement
18	Decreased slope stability or landslide	Civil Engineering Systems	Medium Risk	Slope stability of the site will be considered during structural design and potential risk points will be flagged for reinforcement
19	Decreased slope stability or landslide	Emergency Preparedness, Planning and Response	Medium Risk	Evacuation plans shall consider stable, low-risk areas for egress.
20	Decreased slope stability or landslide	Human Systems	Medium Risk	Slope stability of the site will be considered during structural design and potential risk points will be flagged for reinforcement
21	Decreased slope stability or landslide	Landscape & Ecological Systems	Medium Risk	Landscaping will be designed to reinforce and stabilize slopes
22	Decreased slope stability or landslide	Mechanical and Plumbing Systems	Medium Risk	Slope stability of the site will be considered during plumbing design and potential risk points will be flagged for reinforcement or redirecting piping
23	Decreased slope stability or landslide	Power & Electrical Systems	Medium Risk	Slope stability of the site will be considered during electrical design and potential risk points will be flagged for alternatives
24	Decreased slope stability or landslide	Structural Systems	Medium Risk	Slope stability of the site will be considered during structural design and potential risk points will be flagged for reinforcement
25	Drought/Water Restrictions	Emergency Preparedness, Planning and Response	Medium Risk	Opportunities for rainwater capture to reduce grid water dependency will be explored
26	Drought/Water Restrictions	Human Systems	Medium Risk	Opportunities for rainwater capture to reduce grid water dependency will be explored
27	Drought/Water Restrictions	Landscape & Ecological Systems	Medium Risk	Landscape design will consider native species that are low-maintenance and minimize irrigation demand
28	Drought/Water Restrictions	Mechanical and Plumbing Systems	Medium Risk	Opportunities for rainwater capture to reduce grid water dependency will be explored
29	Warmer summer temperatures	Human Systems	Medium Risk	Passive cooling strategies will be prioritized, and mechanical cooling systems will be sized for future climate to ensure thermal comfort for occupants
30	Warmer summer temperatures	Landscape & Ecological Systems	Medium Risk	Heat and drought-tolerant planting will be used, as well as low pollen trees to optimize shading across the site. Heat absorbing exterior surfaces will be minimized.
31	Warmer summer temperatures	Mechanical and Plumbing Systems	Medium Risk	Mechanical equipment will be sized for future climate and extra space for future equipment and ductwork could be considered. Thermal storage opportunities will be explored through a heat exchanger using tanks, earth, or groundwater.
32	Wildfire	Architectural Systems	High Risk	Use of non-combustible envelope materials will be prioritized
33	Wildfire	Civil Engineering Systems	Medium Risk	Civil systems will be designed to minimize wildfire transmittance

34	Wildfire	Emergency Preparedness, Planning and Response	High Risk	Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary
35	Wildfire	Human Systems	High Risk	Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary
36	Wildfire	Landscape & Ecological Systems	Medium Risk	Landscaping design will conform to the FireSmart BC Landscaping design guidelines[9]
37	Wildfire	Mechanical and Plumbing Systems	Medium Risk	Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary
38	Wildfire	Power & Electrical Systems	Medium Risk	Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary
39	Wildfire	Structural Systems	Medium Risk	Fire-resistance of structural systems will be designed to code and exceed this where possible and deemed necessary

In the case of near-term climate hazards during the construction phase, the assessment found that three of eight hazards need to be addressed, resulting in six medium risks. Table 6b lists these hazards along with their resulting risk level and proposed mitigation strategy:

Table 6b: Resilience strategies for the construction phase

Risk	Hazard	Impact Category	Risk Level	Resilience strategy to reduce risk
1	Extreme heat	Human Systems, Preparedness, Planning and Response	Medium Risk	The site supervisor shall implement procedures to assess the worksite and keep workers safe, as per WorkSafe BC regulations[10]. These include but are not limited to assessing the risk of heat stress when the temperature is above 23C, training staff about heat exposure, monitoring worksite conditions throughout the shift, and implementing mitigations strategies based on daily and current conditions.
2	Flooding (including storm surges)	Landscape and Civil Works	Medium Risk	If possible, excavation, landscape and civil works will be timed during the summer, when weather conditions are more favourable. Store and install critical equipment and materials in elevated locations. Flood barriers can be kept on site for water management in an emergency.
3	Flooding (including storm surges)	Architectural and other building systems under construction	Medium Risk	If possible, excavation, landscape and civil works will be timed during the summer, when weather conditions are more favourable. Store and install critical equipment and materials in elevated locations. Flood barriers can be kept on site for water management in an emergency.
4	Wildfire	Human Systems, Preparedness, Planning and Response	Medium Risk	Per the Wildfire Act (section 6)[11], the site supervisor will assess the Fire Danger Class, if any high-risk activities are being conducted. In the case of a construction site, these include disk trenching, using fire- or spark-producing tools, including cutting tools, mechanical land clearing, welding, etc... Depending on the Fire Danger Class, restrictions will be implemented per Wildfire Regulation.
5	Wildfire	Power & Electrical Systems	Medium Risk	Per the Wildfire Act (section 6), the site supervisor will assess the Fire Danger Class, if any high-risk activities are being conducted. In the case of a construction site, these include disk trenching, using fire- or spark-producing tools, including cutting tools, mechanical land clearing, welding, etc... Depending on the Fire Danger Class, restrictions will be implemented per Wildfire Regulation.
6	Wildfire	Architectural and other building systems under construction	Medium Risk	Per the Wildfire Act (section 6), the site supervisor will assess the Fire Danger Class, if any high-risk activities are being conducted. In the case of a construction site, these include disk trenching, using fire- or spark-producing tools, including cutting tools, mechanical land clearing, welding, etc... Depending on the Fire Danger Class, restrictions will be implemented per Wildfire Regulation.

Though the risk of transmitting airborne diseases is not generally considered climate-related, it is a separate project priority that will be addressed by some of the same design strategies. MERV 13 and 15 filtration will be installed for all air filtration with the option to use HEPA filtration units.

[9] FireSmart BC Landscaping Guide. FireSmart BC. URL: https://firesmartbc.ca/wp-content/uploads/2021/04/FireSmartBC_LandscapingGuide_Web_v2.pdf Accessed September 2024
[10] Working outside during heat events. WorkSafe BC. URL: https://www2.gov.bc.ca/assets/gov/careers/managers-supervisors/managing-occupational-health-safety/working_outside_during_heat_events.pdf Accessed October 2024
[11] High-risk activities. Government of British Columbia URL: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/for-industry-commercial-operators/high-risk-activities Accessed October 2024

4.0 Limitations

This analysis focused solely on climate change related risk and associated resilience measures and did not include potential environmental risks outside of those not currently linked to climate change, e.g. seismic events. It is based on a desktop study of existing, current climate change data sets and relevant climate adaptation resources. It acknowledges that climate science and data is changing quickly, and that other planning scenarios may be used to assess risk and result in different rankings or outcomes. The intent of this assessment is to inform design strategies only.

Consolidated Design Responses and Consultant Comment

Risk	Hazard	Building System Category	Risk Level	Potential Resilience strategy to reduce risk	50% SD Consultant input
1	Extreme heat	Emergency Preparedness Planning and Response	Medium Risk	The facility will be used as a cooling centre and/or community resilience hub	**Architecture (HCMA):** While the building is not being built to 'post-disaster', it is currently being designed to have backup power for essential services and provide a place of refuge for the public in the case of extreme weather conditions or air quality events
2	Extreme heat	Human Systems	High Risk	Passive cooling strategies will be prioritized, and mechanical cooling systems will be sized for future climate to ensure thermal comfort for occupants. Earth tubes will be considered for preconditioning of outdoor air.	**Architecture (HCMA):** Will be exploring shading devices based on orientation needs. During Design Development, there's opportunity to study natural ventilation strategy (particularly in lobby, gynasium, reception and washroom, which are areas identified by client as place for refuge). **Mechanical (AME):** Passive cooling strategies, such as shading, thermal mass, and natural ventilation, should be integrated to reduce reliance on mechanical cooling. Mechanical cooling systems will be sized using future climate projections to maintain occupant thermal comfort under extreme heat conditions. The feasibility of earth tubes depends on soil conditions, installation complexity, and maintenance considerations, but they can help precondition outdoor air. A natural ventilation study could be valuable to assess opportunities for reducing mechanical cooling loads, but effectiveness will depend on building layout, occupancy patterns, and external air quality (extreme heat tends to be also the time where outdoor air quality is at it's worst)
3	Extreme heat	Landscape & Ecological Systems	Medium Risk	Heat and drought-tolerant planting will be used, as well as low pollen trees to optimize shading across the site. Heat absorbing exterior surfaces will be minimized.	**Landscape (S2P):** Confirms strategy
4	Extreme heat	Mechanical and Plumbing Systems	High Risk	Mechanical equipment will be sized for future climate and extra space for future equipment and ductwork will be considered. Thermal storage opportunities will be explored through a heat exchanger using tanks, earth, or groundwater.	**Architecture (HCMA):** Currently the building is sized as required to meet program brief requirement. Design team to review current proposed mechnical cooling system capacity to see if we could include sizing consideration for future climate need. There may also be opportunity to review if parkade levels have any capacity to repurpose for future equipment and ductwork. **Mechanical (AME):** Allowing extra space provides flexibility for future uncertainties – whether that's changes in climate modeling, building use, or cooling demand. Assuming the current design will be sufficient without contingency could limit future adaptability. Thermal storage is typically more useful for load management rather than directly mitigating extreme heat, but if designed properly, there may be an opportunity to reject excess heat into a thermal bank. That said, thermal storage alone won't replace the need for a well-sized, resilient mechanical cooling system. Allowing for larger hydronic distribution piping – since increasing pipe sizes retroactively is often difficult – can also help future-proof the system by enabling higher cooling capacities if needed. **Energy Modelling (reLoad):** Climate data for the 2050s and 2080s, obtained from PCIC, will be utilized to simulate the building's energy performance. We will coordinate with AME to ensure alignment on the project design temperature, supporting HVAC system sizing for climate adaptation planning. Thermal storage will be analyzed as an Energy Conservation Measure (ECM) to evaluate the additional cooling capacity it may provide throughout the year. However, it will not be a substitute for allocating sufficient space to accommodate additional cooling equipment necessary to address rising summer temperatures in the future.
5	Extreme heat	Power & Electrical Systems	Medium Risk	Lighting load reduction strategies will be implemented to mitigate increased cooling demand. Solar PV potential is being explored as well.	**Electrical (AES):** Lighting in all spaces are being controlled via dimming control and occupancy sensor. Spaces with significant daylighting available will be controlled via daylight sensor. When space is vacant or when daylighting is available, lights will be dimmed or turned off accordingly.
6	Poor air quality (wildfire related)	Emergency Preparedness Planning and Response, Human Systems, Mechanical and Plumbing Systems	Medium Risk	The project will include MERV 13 filtration at a minimum to ensure adequate air quality for all occupants.Opportunities to allocate space for storage and stockpiles of enhanced filters (e.g. carbon, MERV 13, HEPA) will be considered, as well as the possible use of the facility as a place of refuge for the community during extreme smoke events	**Architecture (HCMA):** Can be coordinated and reviewed further with Mechanical. Currently vestibules are proposed on both upper and lower level lobbies to help improve indoor air quality by limiting the infiltration of paritculates into the building. Preliminary Basic Climate Analysis by RWDI did note consideration to incorporate a "wildfire mode" into the HVAC system design to preserve indoor air quality. **Mechanical (AME):** Having a full set of filters on hand for emergency use is generally a good practice, especially for larger systems like the natatorium, gym, and HRVs. For future flexibility, allowing space for the installation of carbon and HEPA filters as needed during smoke events – rather than maintaining them year-round – can reduce operational costs. However, adding these enhanced filters will create back pressure on the fans, which may require fan capacity upgrades to maintain adequate airflow. It's improtant that regular maintenance and filter checks are conducted to ensure optimal performance. Size of filters will vary based on the air handling unit but they typical come in banks with smaller filters creating one large one - usually around 24"x24"
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9	Coastal or riverine flooding (including storm surges)	Civil Engineering Systems, Emergency Preparedness Planning and Response, Landscape & Ecological Systems	Medium Risk	A topological site survey and grading review will be conducted to understand stormwater flows in and around the site and design stormwater systems accordingly. Space for storage of temporary storm barriers will be considered if there are areas of concern during design. Landscape features and green infrastructure such as bioswales, raingardens, and constructed wetlands will be considered to maximize water retention and infiltration on site.	**Architecture (HCMA):** Pending Civil input, to be reviewed further in Design Development **Landscape (S2P):** Confirms strategy **Civil (KWL):** During construction, erosion and sediment control measures would be sized to manage up to the 5-year design storm event. The City's ESC permitting requires a full site inspection prior to a forecasted significant rain event (25mm in 24hours) to ensure facilities are functioning prior to rainfall. Post construction, the site would be designed to convey the minor design storm event (5-year). Green infrastructure will be sized to manage the average annual rainfall event (approx. 90% average annual volume) on site. Major flows (100year +) will be accomodated in safe overland flow pathways.
10	Decreased slope stability or landslide	Structural Systems, Architectural Systems, Civil Engineering Systems, Mechanical and Plumbing Systems, Power & Electrical Systems	Medium Risk	Slope stability of the site will be assessed and potential risk points will be flagged for reinforcement. Landscaping will be designed to reinforce and stabilize slopes. Main utility connections and equipment locations will be designed to avoid potentially unstable areas.	**Architecture (HCMA):** Main utility connection and equipment locations are proposed to tie in with proposed utility lines from new Princeton Avenue. See Structural and Geotechnical for shoring wall considerations. **Structural (RJC):** A permanent geotechnical shoring wall is proposed. This provides a more robust reinforcing of the slope than reliance on the building structure, and minimizes risk of damage to the building in extreme events. **Geotech (Thurber):** Decreased slope stability will be caused by increased rainfall and the saturation of slopes. The site should be design to allow surface water to flow to collection points and not to be allowed to pool on sites. Surfaces and slopes should be designed to be at low risk of erosion. All retaining walls, slopes etc. should be designed with drainage, and the drainage should be upsized to accomodate increased water flow. Finally, a sensitivity analysis of the impact on an increased groundwater level to slope stability should be completed. Where practical, the slope design could incorporate a higher than observed groundwater level. However, if the slope proves very sensitive to groundwater level, the extent of mitigation measures necessary should be discussed with the City. Regarding hazard from offsite/upslope landslides, does the City have a past geohazards study completed for the Burke Mountain area? And does that document consider the effects of climate change? **Civil (KWL):** Civil will incorporate geotech / structural recommendations into design (including road base, infiltration locations,etc.) and any additional considerations required
11	Decreased slope stability or landslide	Emergency Preparedness Planning and Response, Human Systems	Medium Risk	Evacuation plans shall consider stable, low-risk areas for egress and congregation.	**Architecture (HCMA):** Noted for future coordination. Currently due to nature of topography and building arrangement, egress are proposed based on code requirements and access to congregation.
12	Drought/Water Restrictions	Emergency Preparedness Planning and Response, Human Systems, Mechanical and Plumbing Systems	Medium Risk	Opportunities for water reuse including irrigation, toilet flushing, pool filter backwash, process water, showers, sinks, pool and rainwater capture to reduce grid water dependency will be explored.	**Mechanical (AME):** Reuse of water can help during times of water restrictions and drought. We typically find that rainwater capture and reuse is limited duirng times of drought/water restircitions - but certain amount can be stored on site. Any type of water reuse will require a filtration system and generally, pumps, to carry the water to the rest of the building. **Civil (KWL):** Rainwater management plan can account for reuse systems accordingly if the desire is to implement. No additional comments.
13	Drought/Water Restrictions	Landscape & Ecological Systems	Medium Risk	Landscape design will rely on native species that are low-maintenance and minimize irrigation demand.	**Landscape (S2P)**: This approach has been communicated by S2P to the City of Coquitlam (CoC) as the ideal scenario, as it aligns with Indigenous values. Confirmation is required from the CoC and maintenance staff on whether they are comfortable proceeding with this strategy, and whether S2P has approval to implement this approach for the project.
14	Wildfire	Architectural Systems	High Risk	Use of non-combustible envelope materials will be prioritized	**Architecture (HCMA):** Design team will continue to prioritize use of non-combustible envelop materials
15	Wildfire	Civil Engineering Systems	Medium Risk	Potential for exterior fire suppression systems will be explored, including the use of rainwater as a source.	**Envelope (Evoke):** The use of metal or cementitious cladding with exterior mineral wool is recommended. FR rated SBS roofing membranes, PVC or potentially ballasted assemblies could be utilized at flat roof areas and metal at any slope roof areas. **Civil (KWL):** Rainwater from the building can be directed to a retention tank for fire suppression.
16	Wildfire	Emergency Preparedness, Planning and Response, Human Systems, Mechanical and Plumbing Systems	High Risk	Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary.	**Mechanical (AME):** AME is available to be the fire supression system consultant for this project. Rainwater can be a source and a rentention tank on site sized for the storm load can be constructed. Any makeup water will be provided via the domestic water system - a fire pump for this will be required **Civil (KWL):** Additional hydrants can be provided if desired. There is also potential to explore access options from the laneway.
17	Wildfire	Landscape & Ecological Systems	Medium Risk	Landscape design will conform to the FireSmart BC Landscaping design guidelines[1]	**Mechanical (AME):** Discussion around what part of the building (exterior/interion) that need to meet above and beyond code will help navigate this discussion. **Landscape (S2P):** We will design the landscape considering the FireSmart BC Landscaping guidelines. Additionally, the entire site is irrigated, which is a significant factor in reducing wildfire risk.
18	Wildfire	Power & Electrical Systems	Medium Risk	Electrical systems will de designed to meet code fire hazard requirements and exceed this where possible and necessary. Fire suppression and emergency systems will be designed to meet code requirements and exceed this where possible and deemed necessary	**Electrical (AES):** Further discussion on requirements for fire hazard protection for interior/exterior that exceeds code requirement is needed.
19	Wildfire	Structural Systems	Medium Risk	Fire-resistance of structural systems will be designed to code and exceed this where possible and deemed necessary	**Structural (RJC):** The majority of the buildng is reinforced concrete, which by its nature often exceeds code minimums for fire ratings. Roof structures do not typically require a fire rating, but mass timber structures as a combustible material can be designed for some fire resistance thorugh charring. We will work with the code consultant to identify appropriate design criteria.

11.2 Resilient design response table

Climate Resilience Design Responses and Consultant Comment

Risk	Hazard	Building System Category	Risk Level	Potential Resilience strategy to reduce risk	50% SD Consultant input
1	Extreme heat	Emergency Preparedness Planning and Response	Medium Risk	The facility will be used as a cooling centre and/or community resilience hub	**Architecture (HCMA):** While the building is not being built to 'post-disaster', it is currently being designed to have backup power for essential services and provide a place of refuge for the public in the case of extreme weather conditions or air quality events
2	Extreme heat	Human Systems	High Risk	Passive cooling strategies will be prioritized, and mechanical cooling systems will be sized for future climate to ensure thermal comfort for occupants. Earth tubes will be considered for preconditioning of outdoor air.	**Architecture (HCMA):** Will be exploring shading devices based on orientation needs. During Design Development, there's opportunity to study natural ventilation strategy (particularly in lobby, gynasium, reception and washroom, which are areas identified by client as place for refuge). **Mechanical (AME):** Passive cooling strategies, such as shading, thermal mass, and natural ventilation, should be integrated to reduce reliance on mechanical cooling. Mechanical cooling systems will be sized using future climate projections to maintain occupant thermal comfort under extreme heat conditions. The feasibility of earth tubes depends on soil conditions, installation complexity, and maintenance considerations, but they can help precondition outdoor air. A natural ventilation study could be valuable to assess opportunities for reducing mechanical cooling loads, but effectiveness will depend on building layout, occupancy patterns, and external air quality (extreme heat tends to be also the time where outdoor air quality is at it's worst)
3	Extreme heat	Landscape & Ecological Systems	Medium Risk	Heat and drought-tolerant planting will be used, as well as low pollen trees to optimize shading across the site. Heat absorbing exterior surfaces will be minimized.	**Landscape (S2P):** Confirms strategy
4	Extreme heat	Mechanical and Plumbing Systems	High Risk	Mechanical equipment will be sized for future climate and extra space for future equipment and ductwork will be considered. Thermal storage opportunities will be explored through a heat exchanger using tanks, earth, or groundwater.	**Architecture (HCMA):** Currently the building is sized as required to meet program brief requirement. Design team to review current proposed mechnical cooling system capacity to see if we could include sizing consideration for future climate need. There may also be opportunity to review if parkade levels have any capacity to repurpose for future equipment and ductwork. **Mechanical (AME):** Allowing extra space provides flexibility for future uncertainties – whether that's changes in climate modeling, building use, or cooling demand. Assuming the current design will be sufficient without contingency could limit future adaptability. Thermal storage is typically more useful for load management rather than directly mitigating extreme heat, but if designed properly, there may be an opportunity to reject excess heat into a thermal bank. That said, thermal storage alone won't replace the need for a well-sized, resilient mechanical cooling system. Allowing for larger hydronic distribution piping – since increasing pipe sizes retroactively is often difficult – can also help future-proof the system by enabling higher cooling capacities if needed. **Energy Modelling (reLoad):** Climate data for the 2050s and 2080s, obtained from PCIC, will be utilized to simulate the building's energy performance. We will coordinate with AME to ensure alignment on the project design temperature, supporting HVAC system sizing for climate adaptation planning. Thermal storage will be analyzed as an Energy Conservation Measure (ECM) to evaluate the additional cooling capacity it may provide throughout the year. However, it will not be a substitute for allocating sufficient space to accommodate additional cooling equipment necessary to address rising summer temperatures in the future.
5	Extreme heat	Power & Electrical Systems	Medium Risk	Lighting load reduction strategies will be implemented to mitigate increased cooling demand. Solar PV potential is being explored as well.	**Electrical (AES):** Lighting in all spaces are being controlled via dimming control and occupancy sensor. Spaces with significant daylighting available will be controlled via daylight sensor. When space is vacant or when daylighting is available, lights will be dimmed or turned off accordingly.
6	Poor air quality (wildfire related)	Emergency Preparedness Planning and Response, Human Systems, Mechanical and Plumbing Systems	Medium Risk	The project will include MERV 13 filtration at a minimum to ensure adequate air quality for all occupants.Opportunities to allocate space for storage and stockpiles of enhanced filters (e.g. carbon, MERV 13, HEPA) will be considered, as well as the possible use of the facility as a place of refuge for the community during extreme smoke events	**Architecture (HCMA):** Can be coordinated and reviewed further with Mechanical. Currently vestibules are proposed on both upper and lower level lobbies to help improve indoor air quality by limiting the infiltration of paritculates into the building. Preliminary Basic Climate Analysis by RWDI did note consideration to incorporate a "wildfire mode" into the HVAC system design to preserve indoor air quality. **Mechanical (AME):** Having a full set of filters on hand for emergency use is generally a good practice, especially for larger systems like the natatorium, gym, and HRVs. For future flexibility, allowing space for the installation of carbon and HEPA filters as needed during smoke events – rather than maintaining them year-round – can reduce operational costs. However, adding these enhanced filters will create back pressure on the fans, which may require fan capacity upgrades to maintain adequate airflow. It's improtant that regular maintenance and filter checks are conducted to ensure optimal performance. Size of filters will vary based on the air handling unit but they typical come in banks with smaller filters creating one large one - usually around 24"x24"
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11.3 Energy model report

reLoad
Sustainable Design Inc.

Burke Mountain Community Centre (BMCC)

City of Coquitlam

Design Development Energy Model Report

August 8, 2025

PREPARED BY:

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TABLE OF CONTENTS

1 INTRODUCTION

reLoad Sustainable Design Inc. has been contracted by HCMA to complete energy advisory and energy modeling services for the new Burke Mountain Community Centre (BMCC), previously known as Northeast Community Center (NECC), in Coquitlam, BC.

This report summarizes the energy compliance requirements and energy targets that apply to the project, along with preliminary project energy and operational carbon emissions performance reflecting project Design Development (DD) information. Further, it summarizes design options that were investigated during DD stage for reference.

1.1 Project Description

The Burke Mountain Community Centre (BMCC) is a new facility to be built on Burke Mountain in Coquitlam. The centre will have a total gross floor area of approximately 15,000 m² including parking and will offer a variety of services. These services include a natatorium with lane, leisure, and hot pools, as well as gymnasium, fitness areas, a library, and community spaces spread across two levels. The project also includes two levels of underground parking, along with mechanical and electrical rooms and other essential back-of-house services.

1.2 Reference Documents

- BC Building Code
- The National Energy Code for Buildings (NECB)
- ASHRAE 62.1-2016 (BCBC minimum ventilation)
- ASHRAE 90.1-2019
- Zero Carbon Building Design Standard V4, CAGBC
- Zero Carbon Building Design Standard Energy Modelling Guide, CAGBC
- City of Vancouver Energy Modelling Guideline v 2.0 (BC Energy Step Code)
- Building Envelope Thermal Bridging Guide (BETBG)

1.3 Report and Energy Model Revisions Log

This report provides a building performance summary based on Design Development drawings and memos received in July and August 2025.

Table 1: Progress Update Log

Progress	Issue Date
NECC SD Energy Model Report	April 28th 2025
BMCC DD Energy Model Report	**August 8th 2025**

2 PROJECT ENERGY TARGETS & COMPLIANCE REQUIREMENTS

There are two overarching energy performance targets that applies to the project:

1) Meet **BC Building Code** Energy Efficiency requirements in Part 10
2) Meet the **CAGBC ZCB-Design v4** standard for certification

- To comply with the BC Building Code (BCBC), the project must meet Step 2 of the BC Energy Step Code, which corresponds to Tier 1 of the 2020 National Energy Code for Buildings (NECB). This requires the building's modelled annual energy consumption (in MWh/year) to be less than that of a reference building modeled under NECB 2020. BCBC does not mandate a specific Thermal Energy Demand Intensity (TEDI) target for this project occupancy classification.

- The building aims to achieve the CAGBC ZCB-Design v4 Standard, which mandates an energy use intensity (EUI) 25% better than Tier 1 of NECB 2020, excluding renewable energy. As the building will utilize a fully electric mechanical system for space heating and domestic hot water heating, it is not required to meet a TEDI target per ZCB-Design standard.

Table 2: Summary of BMCC Energy and Carbon Targets

Building Performance Metric	BCBC Part 10	CAGBC Zero Carbon Building - Design
Envelope and ventilation heating load (TEDI)	No target	No TEDI if all electric system
Total energy consumed by the building (TEUI)	< NECB 2020	25% reduction Tier 1 of NECB 2020

TEDI = Thermal Energy Demand Intensity (kWh/m^2)
TEUI = Total Energy Utilization Intensity (kWh/m^2)

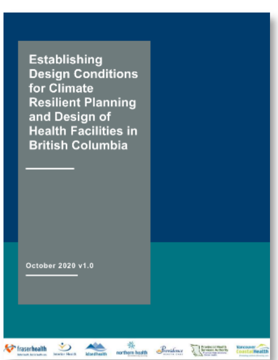
3 CLIMATE INFORMATION

It is imperative to consider climate change and the warming climate in retrofits and new construction projects today, to avoid large retrofit costs in the future.

The following section summarizes key climate data considerations that will impact building energy performance, including minimum and maximum temperatures, as well as the duration of hot spells. The summary includes a suggested methodology for how to work with future adjusted climate data as part of the design process to create a climate-adaptive design that is '2050 ready'.

3.1 Design Conditions for Climate Adaptation Planning

Coquitlam falls within Climate Zone 4 and has a heating degree day (HDD) value of 2800, as determined by NECB Table C-2 for New Westminster, the nearest reference location. Climate data from Pitt Meadows, the closest weather station, has been used for energy modeling, utilizing 30-year normalized data.



The predicted annual peak temperatures from the weather files are not appropriate to use for design day temperature for mechanical system sizing. A methodology was developed by the health authorities (VCH/FH/PHSA) in collaboration with PCIC and reLoad, to establish cooling design temperatures to use for system sizing and financial planning. The methodology uses the current BCBC design temperatures for any location, adjusted with the 2050s highest range of temperature change (referred to as 90th percentile) for sizing of cooling systems. This approach has recently been adopted by other local guidelines such as the Health Authorities in BC and the UBC Technical Guidelines.

Using the same method for Coquitlam location, would result in the following cooling design temperatures to be considered for climate change planning, based on an adjusted 2.5% Dry-bulb (°C) and 2.5% Wet-bulb (°C) PCIC data.

Table 3: Proposed Design Temperature for Climate Change Planning

Data Reference	Heating Dry-Bulb °C	Cooling Dry-Bulb °C	Cooling Wet-Bulb °C
BCBC 2024 Design Temperature	-10	29	19
2050s (Average range of change -cooling)	-10	32 (29+3)	21.9 (19+2.9)
2050s (High range of change -cooling)	-10	33.6 (29+4.6)	23.3 (19+4.3)

It is recommended that this information be reviewed by the design team and discussed further. This discussion is essential to establish appropriate climate adaptation strategies to be integrated into the planning and design of the BMCC today, to meet the needs of the 2050s and the 2080s.

3.2 Climate Change Data

The Pacific Climate Impacts Consortium (PCIC) has produced several climate indicators for weather stations in BC, for the 2020s, 2050s and 2080s[1], based on CWEC 2016 weather files. As part of the early planning stage, reLoad reviewed and summarized the predicted climate change implications for Pitt Meadow to understand expected peak monthly temperatures and predicted duration of hot spells for the project location.

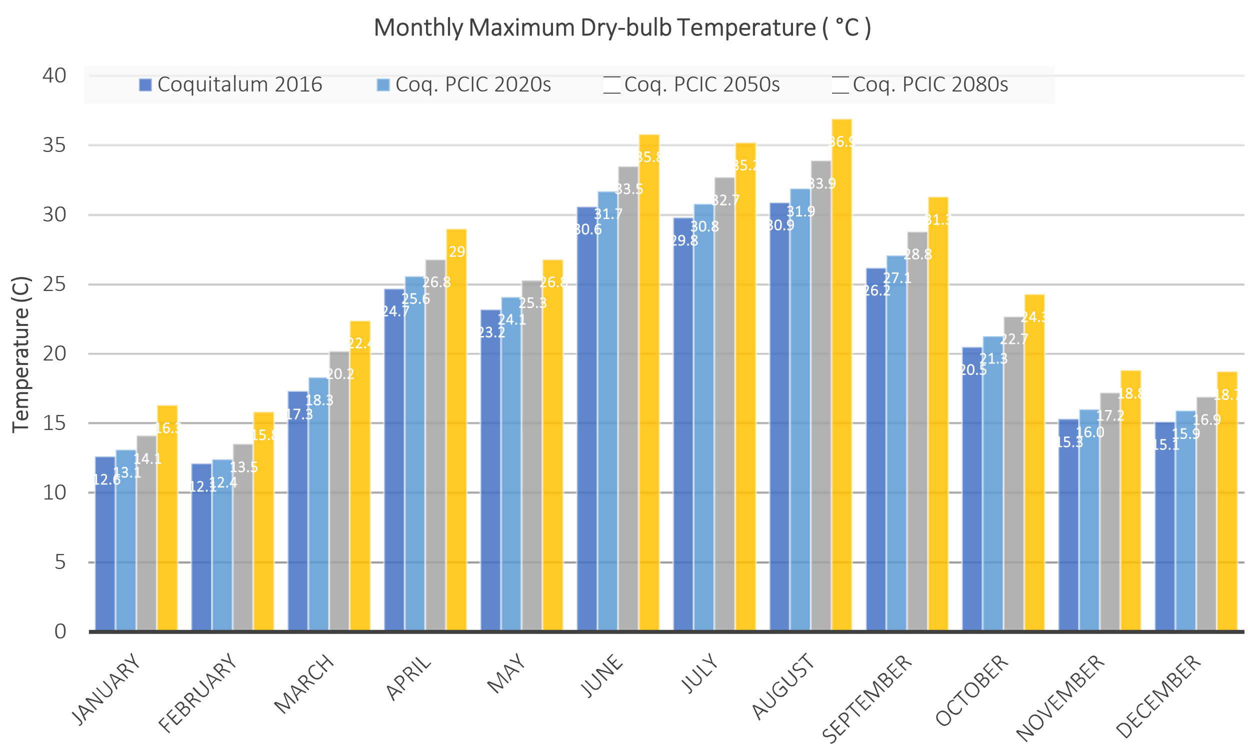


Figure 1: Monthly Maximum Dry-Bulb Temperature Comparison

[1] The 2020s, 2050s and 2080s refer to 30-year time periods for which PCICs climate models are distilled: 2020s (2011-2040), 2050s (2041-2070), 2080s (2071-2100).

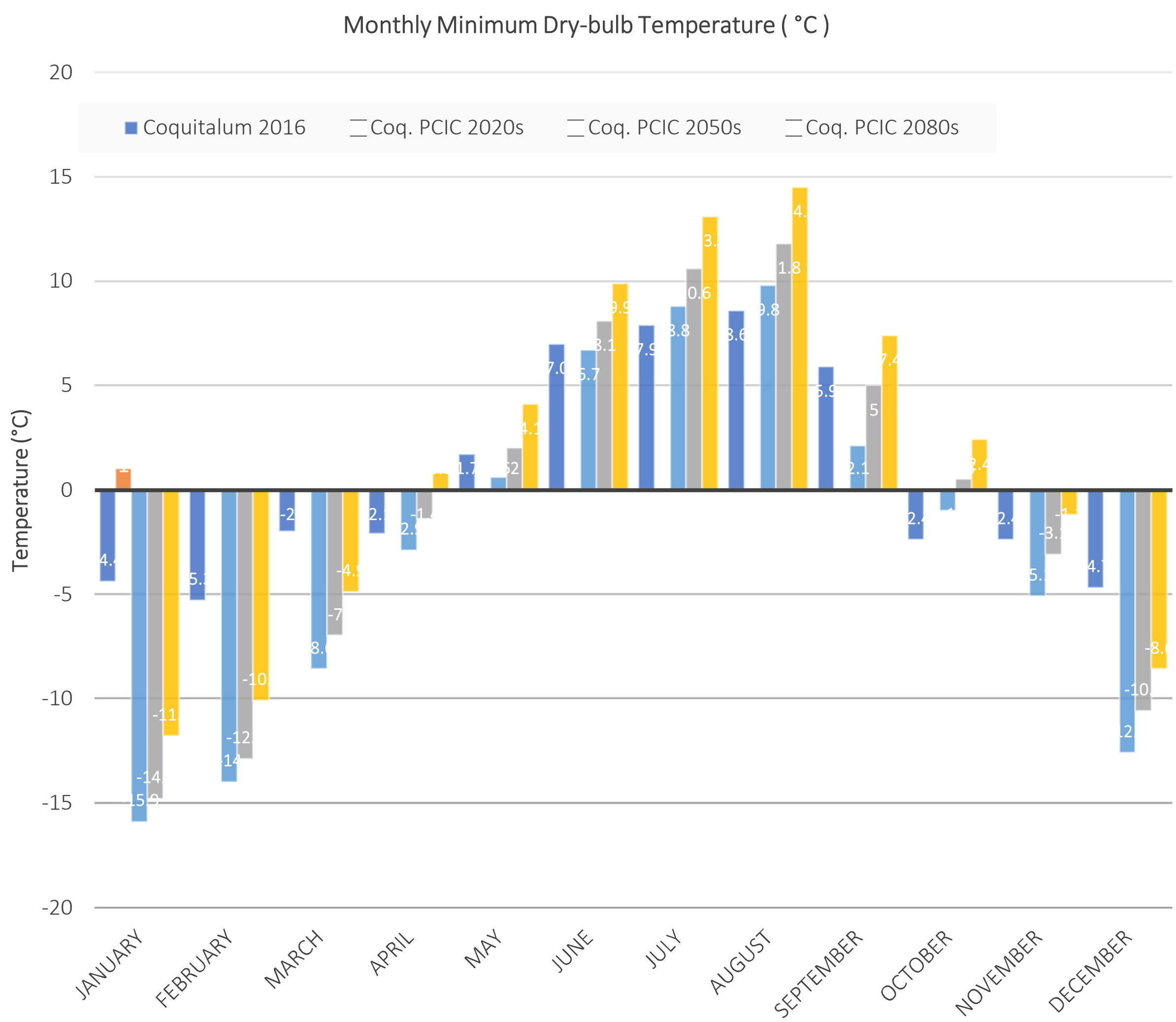


Figure 2: Monthly Minimum Dry-Bulb Temperature Comparison

3.3 Annual Temperature Distribution

The frequency of peaks and duration of hot spells is important to understand as well. Figure *3* depicts the hourly outdoor dry-bulb temperature over the course of a year for the *PCIC 2050s* predicted climate data. As shown, a large portion of the outdoor air temperature falls within the passive cooling range during the summer months, with relatively infrequent spikes exceeding the 26°C-30°C threshold.

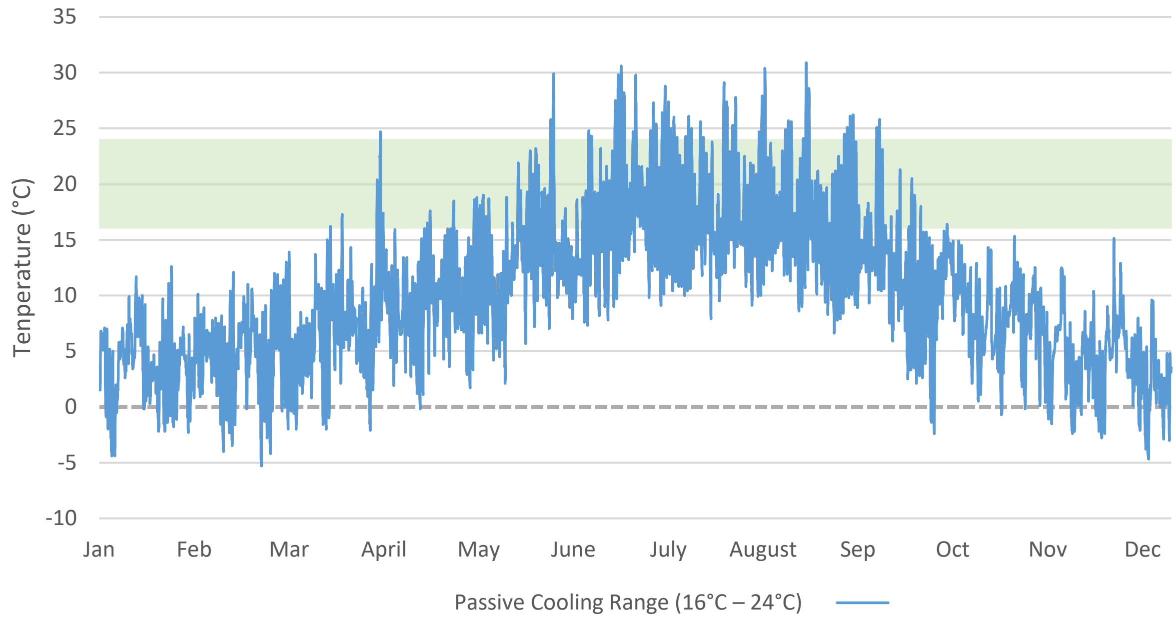


Figure 3: Annual Plot of Hourly Outdoor Dry-Bulb Temperature for Pitt Meadow PCIC 2050 Climate Data

In the next design phase, we are exploring opportunities to incorporate natural ventilation in the gym, lobby, and MPR areas. This approach aims to reduce annual cooling energy use and enhance the building's passive resilience during power outages.

3.4 Duration of Warmer Temperatures

For passive cooling and mixed-mode ventilation approach, it is important to understand how often and when the high degree of temperatures occur and how the temperature range is predicted to shift in future.

Figure 4 is a synopsis of the outdoor dry-bulb temperature throughout the entire year, categorised by the number of hours within certain temperature thresholds. As expected, the number of hours where potential overheating may occur (24°C – 32°C, >32°C) increases in conjunction with the later decades. However, there is also increased potential for passive cooling as the duration of shoulder season gets longer. Using passive measures, such as operable windows, stack effect and skylights, are most effective for cooling when outdoor air temperature is between 16°C – 24°C.

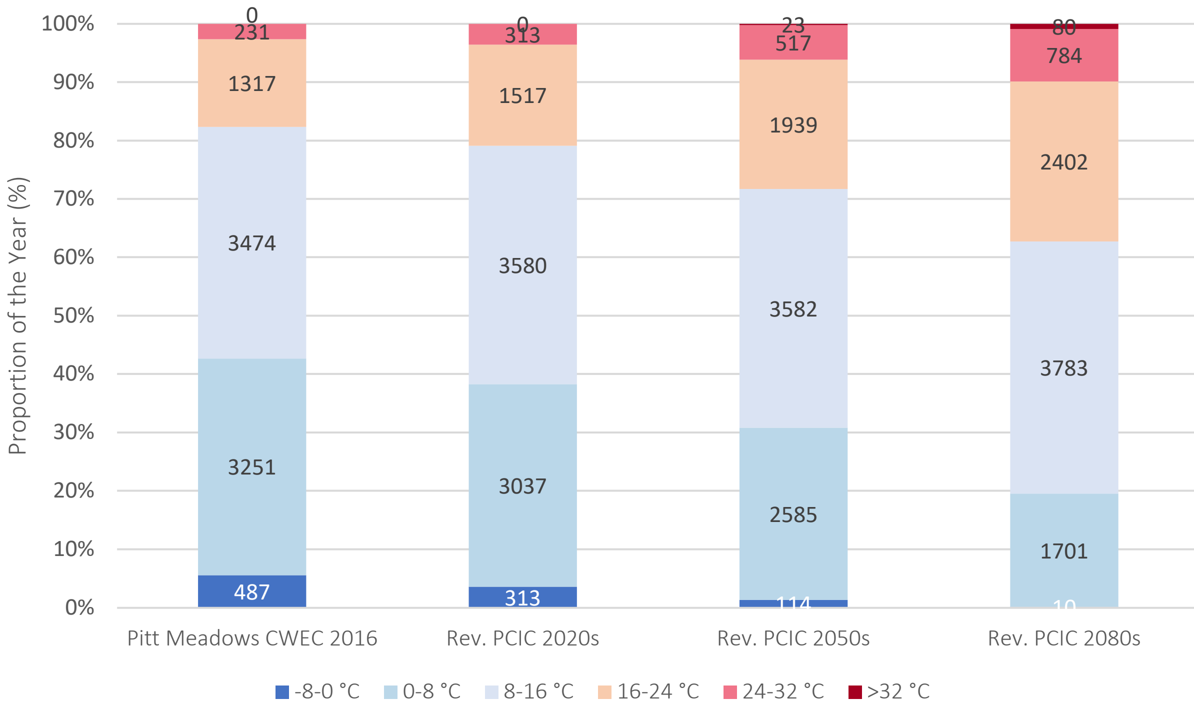


Figure 4: Synopsis of Annual Outdoor Temperature Hours as Climate Warms

3.5 Summary

It is recommended that the design team review and discuss the above data to reach a consensus on the level of climate change to account for in both design strategies and financial planning for infrastructure investments. An initial discussion with the mechanical engineer indicates that the 2050 weather file will be used for sizing the cooling equipment, and provisions will be made for future capacity expansion to accommodate projected climate conditions.

4 BC HYDRO ENERGY STUDY

The project is pursuing capital funding from BC Hydro as part of their BC Hydro Commercial New Construction (CNC) Program. The energy study was initiated during schematic design with several energy conservation measures coordinated and studied by reLoad and the design team. ECMs that were studied can be referenced in Table 10. The measures were compared to a BC Hydro specific baseline with objective of realizing capital funding for implementation.

The BC Hydro study Energy Conservation Measure (ECM) results were presented to the team on June 10, 2025, and submitted for BC Hydro review on July 2, 2025, and is currently pending BC Hydro review prior to next steps. The submitted energy performance results are included in Appendix A for reference, for full energy study submission refer to July 2nd submission package.

Table 10: Energy Conservation Measures (ECM)

Energy Conservation Measures (ECMs)	Description
ECM-1	Roof Improvement
ECM-2	Wall Improvement
ECM-3	Glazing Improvement
ECM-4	Interior Lighting Power Density (LPD) Reduction
ECM-5	Exterior Lighting Power Density (LPD) Reduction
ECM-6	Lighting Controls (Occupancy Sensors Parkade)
ECM-7	Earth Tube
ECM-8	All-electric Proposed HVAC (Air side + plant)
ECM-9	Demand Control Ventilation
ECM-10	High Efficiency Energy Recovery Ventilators
ECM-11	Thermal Storage
ECM-12	Passive Drain Heat Recovery
ECM-13	Active Grey Water Heat Recovery (Sharc/Piranha)
ECM-14	Hot Tub Drain at Night
ECM-15	Solar PV
ECM-16	Battery Storage

As of 100% DD, this is the status of the measures based on feedback from client and project team:

- ECMs carried forward into proposed:
  - ECM-4: Interior LPD reduction
  - ECM-5: Exterior LPD reduction
  - ECM-6: Occupancy sensors in parkade (beyond NECB 2020)
  - ECM-8: All-electric Proposed HVAC system
  - ECM-9: Demand controlled ventilation
  - ECM-12: Passive drain heat recovery

- ECMs abandoned:
  - ECM-2: Wall Improvement
  - ECM-3: Glazing Improvement
  - ECM-11: Thermal storage
  - ECM-13: Active greywater heat recovery from pool backwash
  - ECM-14: Hot tub drain at night
  - ECM-7: Earth tubes

- ECMs pending decision:
  - ECM-10: High Efficiency Energy Recovery Ventilators
  - ECM-15: Solar PV
  - ECM-16: Battery Storage

5 DESIGN OPTIONS STUDY

Following the BC Hydro Study, several design options were tested further to evaluate energy performance and impact relative to the proposed design as baseline, with the objective of informing design decisions based on cost-benefit. The options were developed in collaboration with the project team in an energy workshop following the BC Hydro presentation on June 10th 2025.

The following options were studied, performance results are included in Appendix B for reference.

- Studied design optimizations vs Proposed Design (DD)
  - Option 1: Reduce to double pane glazing in all non-natatorium areas, Uip-0.35, SHGC-0.30
  - Option 2: Reduce exterior wall insulation from 8" to 6" (From Rip-20 to Rip-17)
  - Option 3: Improve ERV efficiency from 80% to 90% (sensible)
  - Option 4: Include Earth Tube (ET) supplying natatorium, gym and changerooms
  - Future climate study: Proposed Design vs Earth Tube (ET) in 2050 climate

Decisions are still pending on Option 1,2 and 3, and they have not been included in the 100% DD energy model. As noted in previous section, the earth tube option was abandoned based on coordination and feedback from project team.

6 DESIGN DEVELOPMENT ENERGY MODEL INPUTS

The energy model is based on Design Development architectural coordination drawings and Rhino model dated July 18th, 2025, as well as input from the design team on envelope, lighting, and mechanical system approach.

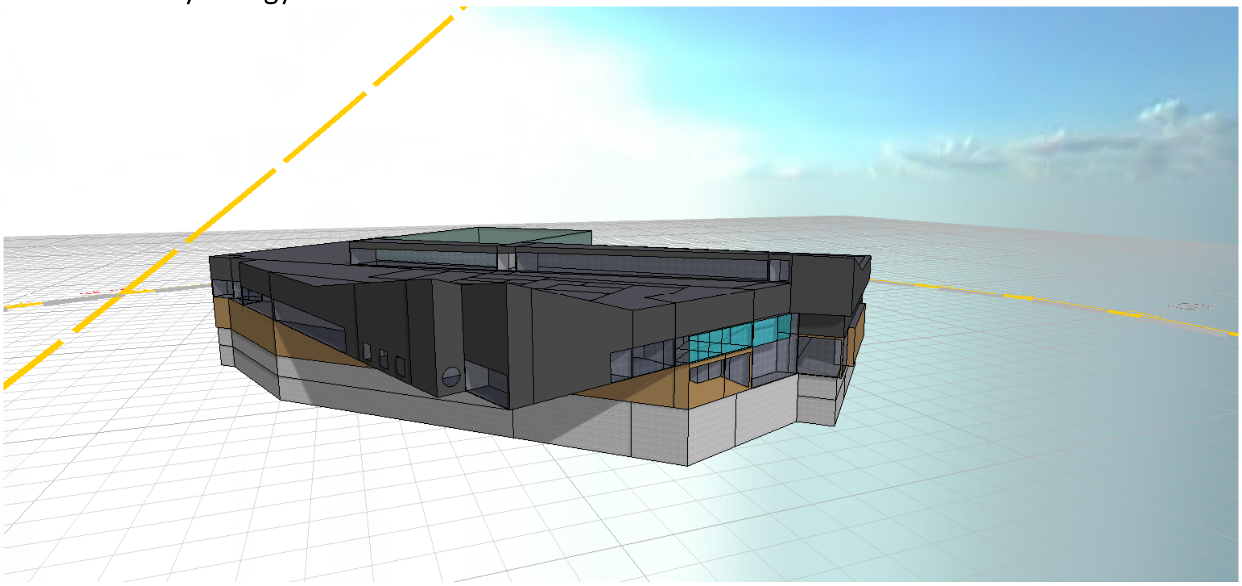
The following sections summarizes the detailed data forming part of the 100% DD Energy Model.

6.1 Base Model Data

Design Progress Date:	August 2025 (Design Development)
Software:	IES Virtual Environment, v2024.1.0.0 and Hysopt
Climate Zone:	4 BCBC, HDD-2800
Weather file:	CAN_BC_Pitt.Meadows.Rgnl.AP.717750_CWEC2016.epw
Total Model Area:	15,527 m^2 (total gross building floor area)
MFA[2]:	9,885 m^2 (for TEUI and TEDI calculations)

[2] MFA=Modeled Floor Area as per CoV Energy Model Guideline; excluding parking areas, including all other conditioned, unconditioned or semi-conditioned floor areas. MFA used for TEUI, TEDI and GHGI calculation.

6.2 Geometry Energy Model



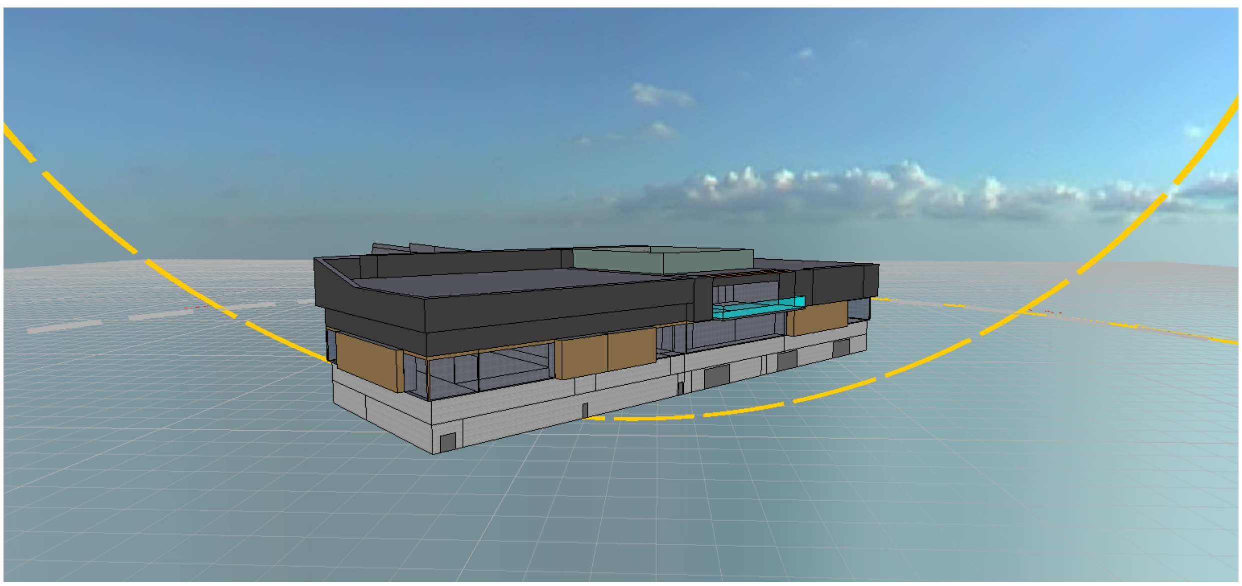


Figure 5: IES VE Energy Model Perspectives –West View (top) South View (bottom)

6.3 Utility Rates and Emissions

The following utility rates and emission factors are used in all energy models for this project. Rates for electricity is from BC Hydro Rate Schedule for Large general service as of April 2025.

Table 4: Utility cost and Emission Rates

Fuel Source	Energy Cost Rate	Unit
Electricity Demand Charge	13.75	$/kW
Electricity Consumption Charge	0.0675	$/kWh
Fuel Source	Carbon Emission Rate	Unit

Electricity	11.0 (BCBC 2024)	t/GWh

6.4 Envelope Performance

The proposed envelope performance includes design targets confirmed using architectural drawings dated July 31, 2025, and correspondence with building envelope consultants on August 1, 2025. The envelope performance is listed and compared to NECB 2020 code minimum performance.

Table 5: Summary of Envelope Performance

Rsi – Thermal resistance, standard international units [m²K/W]
Usi – Thermal transmittance, standard international units [W/m²K]
Rip – Thermal resistance, imperial units [hr·ft² °F/BTU]
Uip – Thermal transmittance, imperial units [BTU/hr·ft² °F]

Envelope	Baseline NECB 2020		Description	Proposed Design		Description
Description	Envelope data from NECB 2020 Section 3			Design Development		
Climate Zone	Climate Zone - New Westminster (closest CWEC file location to Coquitlam) 2800 HDD per Table C-1 Design Temperature BCBC: -10°C winter, 29°Cdb/19°Cwb summer 2050 Adjusted: -10°C winter, 32°Cdb/22°Cwb summer					
Conventional Roof - CLT	Rsi (eff.)	6.05	per Table 3.2.2.2	Rsi (cle.)	5.55	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 Clearfield: Rip-35.2 (Usi - 0.161) 8" poly iso insulation (R4/in) with slope package above. R1-CLT & R2-Steel per HCMA assemblies table dated 20250731 Thermal bridging derating: 10%
	Usi (eff.)	0.165		Usi (eff.)	0.180	
	Rip (eff.)	34.9		Rip (eff.)	32.0	
	Uip (eff.)	0.029		Uip (eff.)	0.031	
Conventional Roof - Metal	Rsi (eff.)	6.05	per Table 3.2.2.2	Rsi (cle.)	5.55	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 Clearfield: Rip-35.2 (Usi - 0.161) 8" poly iso insulation (R4/in) with slope package above. R1-CLT & R2-Steel per HCMA assemblies table dated 20250731 Thermal bridging derating: 10%
	Usi (eff.)	0.165		Usi (eff.)	0.180	
	Rip (eff.)	34.9		Rip (eff.)	32.0	
	Uip (eff.)	0.029		Uip (eff.)	0.031	
Below Grade Exterior Walls	Rsi (cle.)	1.73		Rsi (cle.)	1.73	Per coordination with building envelope design

Envelope	Baseline NECB 2020		Description	Proposed Design		Description
	Usi (eff.)	0.577		Usi (eff.)	0.577	development correspondence by Evoke 2025-08-01 2" extruded insulation at R5/in exterior of foundation wall
	Rip (eff.)	10.0		Rip (eff.)	10.0	
	Uip (eff.)	0.100		Uip (eff.)	0.100	
Above Grade Exterior Walls	Rsi (eff.)	3.45	per Table 3.2.2.2	Rsi (eff.)	3.52	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 Clearfield: Rip-27 (Usi - 0.210) Steel stud wall with 8" exterior mineral wool insulation Effective: Rip - 20
	Usi (eff.)	0.290		Usi (eff.)	0.284	
	Rip (eff.)	19.6		Rip (eff.)	20.0	
	Uip (eff.)	0.051		Uip (eff.)	0.050	
Slab on Grade (conditioned areas)	Rsi (eff.)	1.32	For 1.2 meter	Rsi (eff.)	1.76	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 2" external perimeter insulation (R5/in) for 1.2m
	Usi (eff.)	0.757		Usi (eff.)	0.568	
	Rip (eff.)	7.5		Rip (eff.)	10.0	
	Uip (eff.)	0.133		Uip (eff.)	0.100	
Exposed Floors - Soffit at P1 Level	Rsi (eff.)	5.18	per Table 3.2.2.2	Rsi (eff.)	3.17	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 Clearfield: Rip-19.8 (Usi - 0.287) 5" spray chopped glass (R4/in) Thermal bridging derating: 10%
	Usi (eff.)	0.193		Usi (eff.)	0.315	
	Rip (eff.)	29.4		Rip (eff.)	18.0	
	Uip (eff.)	0.034		Uip (eff.)	0.056	
Exposed Floors - Soffit	Rsi (eff.)	5.18	per Table 3.2.2.2	Rsi (eff.)	3.52	Assumed same performance as exterior wall, 8" insulation per assembly S2
	Usi (eff.)	0.193		Usi (eff.)	0.284	
	Rip (eff.)	29.4		Rip (eff.)	20.0	
	Uip (eff.)	0.034		Uip (eff.)	0.050	

Envelope	Baseline NECB 2020		Description	Proposed Design		Description
Doors - Opaque (ESF/EDF)	Usi (eff.)	2.1	per Table 3.2.2.3	Usi (eff.)	1.80	Per coordination with building envelope design development correspondence by Evoke 2025-08-01
	Rip (eff.)	2.7		Rip (eff.)	3.2	
	Uip (eff.)	0.373		Uip (eff.)	0.317	
Glazing	Usi (eff.)	1.9	per Table 3.2.2.3	Usi (eff.)	1.20	Per coordination with building envelope design development correspondence by Evoke 2025-08-01 Triple pane, low-e coating and argon filled IGUs. Area-weighted average of aluminium curtain wall (fixed, operable and doors) Kawneer 1600 UT
	Uip (eff.)	0.335		Uip (eff.)	0.211	
	SHGC	0.30		SHGC	0.30	
Glazing WWR %	Same as proposed (per CAGBC ZCB Modelling Rules)		per Section 3.2.1.4	OVERALL: 20% NORTH: 13% EAST: 13% SOUTH: 23% WEST: 32%		BCBC NECB 2020 comparison has Max 40% FDWR, not modelled in DD as we are comparing to ZCB-NECB 2020 baseline.
Exterior Shading	No exterior shading		per Section 8.4.4.3.(4)	Perforated metal panel cladding on back-up wall		Per HCMA 75% DD drawings under CL1b tag dated 20250718
Infiltration	Same as proposed Modeled rate 0.45 L/s/m2 for above grade walls Note, per ZCB, infiltration is 0.25 L/s/m^2 for above grade walls		NECB 2020 section 8.4.2.9 (ZCB is modelled as 0.25 L/s/m^2)	Assumed normalized air leakage rate 1.0 L/s/m^2 @ 75Pa per Section 8.4.3.3 Equal to Modeled rate 0.45 L/s/m2 for above grade walls.		Note, per ZCB, infiltration is 0.25 L/s/m^2 for above grade walls. Using converted rate from tested target in models for DD as more conservative.

6.5 Lighting Performance

Lighting performance targets are based on inputs from the electrical consultant dated July 30th, 2025. The NECB 2020 Baseline performance is also listed for reference. The DD energy model has updated its lighting control strategies since schematic design phase which now includes daylight sensors in addition to occupancy sensors in various spaces, per Table 6.

Table 6: Summary of Lighting Performance

OS=Occupancy Sensor
DS=Daylight Sensor

Lighting	NECB 2020 Baseline			Proposed Design			Baseline & Proposed	
Space Type	Load W/m²	Occupancy Sensor	Daylight Sensor	Load W/m²	Occupancy Sensor	Daylight Sensor	OS Diversity Factor*	Schedule
Lobby < 20ft Height	9.0		x	3.4		x	1	NECB C
Lobby <eq 20ft to >eq40ft Height	9.0		x	4.4		x	1	NECB C
Lobby >40ft Height	9.0		x	5.5		x	1	NECB C
Elevator Lobby	7.0			3.5			1	24 hrs/day
Office–Enclosed	8.0	x	x	6.0	x	x	0.63	NECB A
Office–Open	8.0	x	x	4.0	x	x	0.63	NECB A
Library	10.3	x	x	10.9	x	x	0.81	NECB C
Multipurpose room	10.5	x	x	8.0	x	x	1	NECB C
Natatorium	9.3	x	x	7.0	x	x	0.90	NECB C
Sauna Steam	7.0			7.0			1	NECB C
Stairwell	5.3	x	x	4.5	x		0.25	24 hrs/day
Changing Room	5.6	x		4.8	x		0.75	NECB C
Gymnasium	9.6	x	x	7.0	x		0.56	NECB C
Fitness Centre	9.6	x	x	7.0	x	x	0.65	NECB C
Food Preparation Area	11.7			11.4			0.70	NECB C
Washrooms	6.8	x		5.5	x		0.55	NECB C
Corridors	4.4	x	x	3.6	x		0.75	24 hrs/day
Storage	4.1	x		3.0	x		0.44	NECB C
Mechanical Rm	4.6			3.9			1	NECB C
Electrical Rm	4.6			3.9			1	NECB C
Parkade	1.5			1.5	x		1	24 hrs/day

Lighting	NECB 2020 Baseline			Proposed Design			Baseline & Proposed	
Pool Lighting	7.0			7.0			-	24 hrs/day
Exterior Lighting	6kW			3kW			-	Photocell

*Diversity factor per NECB 2020 section 4

6.6 Occupancy

Occupancy rates and schedules of operation are based on NECB defaults for the building typology in the DD energy model. We recommend updating this with design information of occupancy rate and planned hours of operation in subsequent models for better accuracy of energy consumption and cost predictions.

Table 7: Summary of Occupancy Loads

All sensible and latent gains derived from CIBSE 2015 Environmental Design Guide.

Occupancy Loads	NECB 2020 Baseline & Proposed Design				
Space Type	m^2/Person	Sensible Heat Gain W/Person	Latent Heat Gain W/Person	Schedule	Notes
Lobby	10	88	53	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Elevator Lobby	10	88	53	NECB C	CIBSE for standing, light working, walking in 22C
Office	20	84	46	NECB A	As per NECB 2020 Table A-8.4.3.2. (2)-A
Library	20	84	46	NECB C	CIBSE for standing, light working, walking in 22C
Multipurpose room	20	84	46	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Natatorium	5	168	357	NECB C	CIBSE for office type work in 22C"
Sauna Steam	5	168	357	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Stairwell	200	88	53	NECB C	CIBSE for office type work in 22C"
Changing Room	10	66	75	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Gymnasium	5	117	132	NECB C	CIBSE for office type work in 22C"
Fitness Centre	5	117	132	NECB C	per eQUEST pool modelling guide and ASHRAE Fundamentals adjusted for 27C
Food Preparation Area	20	102	107	NECB C	TBC
Washrooms	30	84	46	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Corridors	100	88	53	NECB C	CIBSE for standing, light working, walking in 22C
Storage	100	88	53	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Mechanical Rm	200	88	53	NECB C	CIBSE for standing, light working, walking in 26C
Electrical Rm	200	88	53	NECB C	As per NECB 2020 Table A-8.4.3.2. (2)-A
Parkade	1000	84	46	NECB H	CIBSE for working out in 20C

6.7 Plug Loads & Process Loads

Table 8: Summary of Receptacle Loads

Plug Loads/Process Loads	NECB 2020 Baseline & Proposed Design		
Space Type	Load W/m²	Schedule	Notes
Lobby	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Elevator Lobby	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Office	7.5	NECB A	As per NECB 2020 Table A-8.4.3.2.(2)-A
Library	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Multipurpose room	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Natatorium	1.5	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Sauna	9kW	NECB C	TBC assumed 12hrs/use
Stairwell	0	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Changing Rooms	2.5	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Gymnasium	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Fitness Centre / Active Studio	7.5/1	NECB C	Assumed for fitness room equipment / Per NECB
Food Preparation Area	10	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Washrooms	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Corridors	0	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Storage	0	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Mechanical Rm	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Electrical Rm	1	NECB C	As per NECB 2020 Table A-8.4.3.2.(2)-A
Parkade	0	NECB H	As per NECB 2020 Table A-8.4.3.2.(2)-A
Elevator	10kW / elevator	-	Assumed (TBC), total of 3 elevators serving BMCC

6.8 Pool Design Information

The pools are modeled directly within the IES VE and Hysopt software based on supporting calculations and the following approach and assumptions:

- Pool temperature setpoints per mechanical SD report:
  - Lane Pool: 30°C
  - Leisure Pool 35°C
  - Hot Pool 40°C
- Pool turnover rates per mechanical SD report:
  - Lane Pool: 4
  - Leisure Pool: 2
  - Hot Pool: 0.25
- Pool backwash flow rates are preliminary at this stage:
  - Lane Pool: 6000 gallons, Leisure and Hot Pool: 3000 gallons each
  - 1 time per week assumed

  - Duration 10 minutes assumed
- Pool evaporation rates are calculated per ASHRAE 2019 Handbook HVAC Applications, based on an activity factor of 1.0. Occupied and unoccupied rates are used in the energy model with an hourly schedule.
- Pool makeup water rate is calculated and used with an hourly schedule for appropriate HW load and dT per pool separating occupied, unoccupied and backwash make-up loads.
- Each pool HX is modeled directly to be connected to the building hot water loop.
- An assumed total pool lighting load of 5.15 kW is included in the model.
- The thermal mass of the pool tank and water is accounted for in the energy model.
- Pool conduction gains through tank walls and radiant losses are included.

6.9 Mechanical Systems

Mechanical system approach and modeled parameters are included in Table 9. The HVAC systems are listed in comparison to NECB 2020 Part 8 reference model systems. This is the baseline that has been modeled during DD to evaluate performance relative to the 25% reduction target over NECB 2020 for ZCB. The HVAC system for NECB 2020 will be similar.

Table 9: Mechanical System Design Inputs

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
GENERAL INFORMATION			
Climate	Climate Zone - New Westminster (closest CWEC file location to Coquitlam) 2800 HDD per Table C-1 Design Temperature BCBC: -10°C winter, 29°Cdb/19°Cwb summer 2050 Adjusted: -10°C winter, 32°Cdb/22°Cwb summer		CWEC 2016 Pitt Meadows weather files is used for models. 2050 adjusted design temps with PCIC data for Pitt Meadows.
System Description	Per 8.4.4.13 Packaged Unitary ASHP with electric furnace heating and electric BBrds	<u>System 1: AHU with Heat Recovery Wheel</u> Ventilation, Heating and Cooling are provided by AHU. complete with a sensible heat recovery wheel, cooling coil, heating coil, and an exhaust air heat recovery coil (cooling coil). System 1 applies to **Natatorium** (AHU1)	per Mechanical Memo-001 - Costing and Design Considerations R1 2025-03-06 and DD coordination. Limited updates provided for DD model on airside details.
	Per 8.4.4.13 Packaged Unitary ASHP with electric furnace heating and electric BBrds	**System 2: HRV + Terminal Fan coil units** System 2 applies to Aquatic Office (HRV1a), Changing room (HRV1b), **Lower Level MPR, Studio, Commercial Kitchen and Corridor ventilation** (HRV2), **Library** (HRV 3); **Fitness Spaces** and **Large MPR** (HRV4); , **Outdoor Washroom** (HRV5) and **Pool Mechanical Room** (HRV6) Ventilation is provided by HRV to be complete with VAV's and reheat coils at roof level. Heating and cooling are provided by	

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
		individual fan coils with separate controls for user adjustments	
	Per 8.4.4.13 Packaged Unitary ASHP with electric furnace heating and electric BBrds	System 3: AHU with Heat Recovery Wheel System 3 applies to Gymnasium (AHU2) Ventilation, Heating and Cooling are provided by AHU complete with a heat recovery wheel and an exhaust air heat recovery coil (cooling coil)	
	Per 8.4.4.13 Packaged Unitary ASHP with electric furnace heating and electric BBrds	<u>Other Systems:</u> **Lobby**: Heating is provided by radiant floors **Vestibule**: Hydronic forced flow heaters **Stairs and below grade parkade vestibule**: Stair pressurize fans (300 L/s) with hydronic heating coils (SF-1) **Parkade**: One exhaust fan at 13,000 L/s and eight transfer fans at 400 L/s (SF-2) **Chemical Storage Room**: Exhaust Fans (EF-1)	
Hours of Operation	NECB Schedule C assumed until confirmed M-F: 7am - 9pm Sat: 7am - 9pm Sun: 7am-6pm AHU Natatorium, HRV changeroom/ corridor fan hours, MUA mechanical hours: 24/7 RTU-01 min OA occupied hours only, cycle on off unoccupied periods		Preliminary assumption until confirmed.
Set Points	Natatorium: 28°C-30°C and RH 50-60% (winter) Change rooms: 22°C - 26°C and 50% RH Library/MPR/Studio: 22°C (winter), 24°C (summer) Gymnasium/Fitness Spaces: 18°C (winter), 18°C (summer) Kitchen: 16°C (winter), 24°C (summer) Stairs/Lobby/Vestibule: 16°C (winter) Electrical Rooms: 10°C (winter) / 26°C (summer) Parkade / Mechanical Rooms: 10°C (winter)		Setbacks not modelled, confirmed with client group
AIR SIDE SYSTEMS			
OA Flowrates	<u>Level 1</u> Gym: 3000 L/s Natatorium: 15,000 L/s Multipurpose Store: 500 L/s x Qty (2) Activity Studio: 3000 L/s Admin Office (Total): 525 L/s Lower Lobby: 700 L/s <u>Level 2</u> Library and supporting space: 1850 L/s Library Multipurpose: 400 L/s Upper Lobby: 215 L/s Multipurpose: 1500 L/s		Min OA rates per mech SD coordination or assumed per BCBC 62.1-2016

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
ERV/AHUs/MUA Specs	Natatorium: RTU-ASHP Economizer 100% OA Min OA 15,000 L/s Energy Recovery: 40% eff sensible Capacity = 30,000 L/s (sized to meet RH) EER-10 COP-3.2@8.3C and 2.05@-8.3 DX Cooling = kW (autosized) HP Heating = kW (autosized) SF: 640Pa combined fan/motor eff 40%, no RF	Natatorium: 1 x AHU1: Economizer 100% OA Min OA = 15,000 L/s Capacity total SA= 30,000 L/s CHW Cooling = kW (IES Autosizing) HW Coil Heating = kW (IES Autosizing) SF: 3.5"sp (850 pa), 75% eff fan, 90% eff motor RF: 2.8"sp (700 Pa), 75% eff fan, 90% eff motor Heat wheel 80% sensible and heat recovery coil in exhaust	Assumed Pa, 75% Fan and 90% motor, TBC
	Gymnasium: RTU-ASHP Energy Recovery: not required Min OA: 3,000 L/s Capacity = 8,100 L/s EER-10 COP-3.2@8.3C and 2.25@-8.3 DX Cooling = kW (autosized) HP Heating = kW (autosized) SF: 640 Pa combined fan/motor eff 40%, no RF	Gymnasium: 1 x AHU2: Economizer 100% OA Min OA = 3000 L/s Capacity total SA= 6,000 L/s CHW Cooling = kW (IES Autosizing) HW Coil Heating = kW (IES Autosizing SF: 3.0"sp (750 pa), 75% eff fan, 90% eff motor RF: 2.0"sp (500 Pa), 75% eff fan, 90% eff motor Heat wheel 80% sensible heat recovery coil in exhaust	Fan power assumed, modelled with VSD, TBC
	RTU-ASHP Energy Recovery: not required Min OA: 10,996 L/s Capacity = 14,450 L/s EER-11 COP-3.3@8.3C and 2.25@-8.3 DX Cooling = kW (autosized) HP Heating = kW (autosized) SF: 640 Pa combined fan/motor eff 40%, no RF	100% OA system, VSD HRV1 Aquatic Office and Changing Room Capacity = 1064 L/s and Reheat coil = 12 kW (IES Autosizing) HRV2 MPR and Studio Capacity = 3300 L/s and Reheat coil = 10 kW (IES Autosizing) HRV3 Library and Office Capacity = 2650 L/s and Reheat coil = 30 kW (IES Autosizing) HRV4 Fitness and Large MPR Capacity = 4000 L/s and Reheat coil = 45 kW (IES Autosizing) HRV5 Pool Mechanical Room Capacity = 200 L/s HRV6 Ex Washroom Capacity = 100 L/s SF: 3.4"sp, 75% eff fan, 90% eff motor RF: 2.5"sp, 75% eff fan, 90% eff motor HRV: 80% sensible	Fan power assumed, modelled with VSD. Size assumed based on ASHRAE min OA calculations. TBC with mechanical
Dehumidification	Natatorium Max 50-60% RH cooling dehumidification in AHU CHW coil		

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
Fan Control	Constant Volume OA schedule same as proposed	AHU1 Natatorium: CV, OA off at night AHU2 Gym: Demand control ventilation, OA off at night HRV1,2,3 and 4: Demand control ventilation, off at night HRV1b, 5 and 6: CV, assumed on 24/7	
Supply Air Temperature	per 8.4.4.18 11°C dT for cooling, 21°C dT for heating, with reset	AHUs: 13-32°C with reset HRVs: based on heat recovery 80%	
Heat Recovery	Natatorium per 5.2.10.2 40% sensible heat recovery from exhaust air All other areas that are exempt from heat recovery per NECB.	Natatorium AHUs: Heat wheel 80% sensible and heat recovery coil in exhaust (active heat recovery w HR chiller) Other: 80% sensible efficiency	
Exhausts	Same as proposed	EF-1: Garbage Room Exhaust: 264 L/s, 1 W/(L/s) EF-2: Chemical Storage Exhaust: 1000L/s, 1W/(L/s) EF-3: Gas Chlorine Exhaust Fan ((Trichloramine exhaust): 1000 L/s (1W/(L/s)	Fan power assumed, TBC with mechanical
Terminal Units Heating	All areas heated by RTUs, except: Stairs: Electric BBrds	Library, Fitness, MPR and Admin Offices: Fan coil units and reheat coils Vestibule: FFHs (assumed electric) Entrance Vestibule and Stairs: Unit Heaters Electric Storage/Misc: BBrds electric	
Terminal Units Cooling	All areas cooled by ASHP RTUs, except: Electrical Room System 1- AC cooling: COP-2.2 Comms Room System 1- AC cooling: COP-2.2	Electrical Room FCU (CHW) cooling: 15kW	Preliminary assumed 24/7 loads, 0.7 diversity
PLANT SIDE SYSTEM (Space conditioning)			
Central Heating System	n/a	1st stage: 2 WWHPs (Heating Capacity 790 kW each) 2nd stage: 2 x 2-pipe AWHPs (Heating Capacity 308 kW each) 3rd stage: 4 booster WSHPs (Heating Capacity 165 kW each) 4th stage: 3 x 300 kW back-up electric boilers AWHPs shut-off temp: None (confirmed by mech. consultant on August 1st, 2025) Seasonal Heating COP (from annual simulation results): AWHPs: 2.4 and 2.5	WWHPs and AWHPs types and models provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025. Efficiency rating and partload performances obtained form manufacturer selection software (Aermec) and

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
		Booster WWHPs: 4.5 Total proposed heating capacity: 3,756 kW AWHPs + WWHP: Total rated heating capacity 2,856 kW Electric Boilers: Total heating capacity: 3 x 300 kW (900 kW)	technical data sheet (Daikin) WWHPs - Daikin WMC036DDSNA AWHPs - Aermec NYG 1800XH Booster WWHPs - Aermec WWBG0700XHL
Hot Water Loop	n/a	ASHP HW loop: HWS = 46.1°C HWR = 42.2°C WWHPs and building heating HW loop HWS = 43.3°C HWR =35°C Booster WWHPs HWS = 65.5°C HWR = 54.4°C OA reset with OA temp but always > hot pool supply temp	Provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025.
Hot Water Loop Pumps	n/a	P-1/P-2: HW distribution, VSD, 30HP 571 gpm P-7/P-8: WSHP HW circulation pumps, VSD, 10HP 506 gpm P-13/P-14/P-15: Boiler circulation pumps, 10HP each 237gpm	
Central Cooling	n/a	1st stage: 2 WWHPs (Cooling Capacity 632 kW each) 2nd stage: 2 x 2-pipe AWHPs (Cooling Capacity 458 kW each) Seasonal Cooling COP (from annual simulation results): WWHPs: 4.1 AWHPs: 3.2 and 6 Total proposed cooling capacity: 2,180 kW	WWHPs and AWHPs types and models provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025. Efficiency rating and partload performances obtained form manufacturer selection software (Aermec) and technical data sheet (Daikin) WWHPs - Daikin WMC036DDSNA AWHPs - Aermec NYG 1800XH

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
Chilled Water Loop	n/a	ASHP CW loop: 5.6°C supply 11.1°C return Building Hydronic CW loop: 7.2°C supply 12.8°C return	Provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025.
CHW loop pumps	n/a	P-3/P-4: CW distribution, VSD, 40HP 554 gpm P-5/P-6: WSHP CW circulation pumps, VSD, 10HP 836 gpm	
Heat Rejection	n/a	1st WSHP (fan power counted in total equipment COP rating) 2nd heat rejection simultaneous heat/cool operation in ASHP	
Condenser Water Loop	n/a	n/a	
Condenser loop pumps	n/a	n/a	
DOMESTIC HOT WATER SYSTEMS			
DHW Load	Same as proposed	NECB C DHW schedule=EFLH 7.45 Showers: 12,305 L/h General use: 306 L/h	5 min showers @ 7.6 LPM assumed 4600 total visitors and respective uses requires client verification: - Library 1200 ppl 0% shower - Gym/Fitness 1900 ppl 25% shower - Pool 1500 ppl 2 shower per person Total average shower per visitors 1.02, plus diversity 0.8 Lavatory faucets Lpm per BCBC max
DHW heating source	AWHP with Electric Boiler. AWHP shutoff temp -10C per NECB 2020. COP-2.33@8°Cdb/6°Cwb and @LWT 60	Central heat pump plant pre-heat: 4.4°C to 37.8°C Electric boilers final heat: 37.8°C to 60°C Heat exchangers for both DHW loops: central heat pump plant for pre-heat	Provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025.

HVAC SYSTEMS	Baseline NECB 2020	Proposed Design	Description
		HX and high temperature boilers loop for final-heat HX Water Volume: Pre-heat: 2 @ 500-gallon tanks Final-heat: 2 @ 500-gallon tanks Total: 2,000 gallons (7,572 L)	
DHW Loop	Same power as proposed, CV	Final Heat P-17 and preheat P-16 15HP each	From mechanical design coordination drawings DD.
POOL MECHANICAL SYSTEMS			
Pool Heating setpoints	Same as Proposed	Lap pool: 30°C Tot pool: 35°C Hot tub: 40°C	From mechanical design coordination drawings DD.
Pool Heating source	AWHP with Electric Boiler. AWHP shutoff temp -10C per NECB 2020. COP-2.72@8°Cdb/6°C wb and @LWT 50°C Same HX baseline as proposed	HX for each pool Lap Pool: primary 43/33 °C; secondary 35/28 °C (HW Loop) Leisure Pool: primary 43/35 °C; secondary 40/33 °C (HW Loop) Hot Pool: primary 65/45 °C ; secondary 48/40 °C (High temp loop)	Provided by mechanical consultant in 100% DD Progress Set (dated July 30th, 2025) and updated central plant schematic on August 1st, 2025.
Heating Pumps	Same power as proposed per NECB, CV	Pool HXs Heating Loop 250 gpm, 7 HP	From mechanical design coordination drawings DD.
Filtration Pumps	Same power as proposed per NECB, CV	Filtration centrifugal pumps, VFD Lap pool filtration, 600 gpm, 45ft, 80% eff (TBD) Leisure pool filtration, 600 gpm, 45 ft, 80% eff (TBD) Hot pool filtration, 400 gpm, 45ft, 80% eff (TBD) Additional chem by-pass, CL2 injection pumps	Pump efficiency assumed, TBC
Backwash flow	Same power as proposed per NECB, CV	Total flow assumed 12,000 gpm (TBD), once per week, makeup assumed during nighttime.	Assumptions, TBC as design progresses

6.10 Energy Model Application

Results from the energy modeling simulations are most appropriate for determining compliance with the, NECB following Part 8- Performance Path methodology. Energy modeling methods follow a combination of BCBC Energy Step Code requirements, NECB, ASHRAE and best practices. Actual energy consumption can differ from these calculations due to several variables including but not limited to variations in occupancy and building operations schedules; plug-loads or equipment installed by tenants outside of energy model allowances; differences between actual weather and the typical meteorological year represented in the climate data file.

7 DESIGN DEVELOPMENT BUILDING ENERGY PERFORMANCE

The following section reports updated energy model performance based on the 100% Design Development stage and status of currently confirmed design strategies as noted above.

7.1 Proposed Design Performance

The proposed design energy model shows a total energy consumption of 4,067 MWh, GHGI of 4.5 kgCO2e/m^2 and estimated annual energy cost $398,650 per year. 31% of the estimated energy cost is from demand charges ($/kW) which shows the importance of focusing design on load reduction strategies.

Total Energy: 4,067 MWh
Total TEUI: 413 kWh/m^2
Total GHGI: 4.5 kgCO_2e/m^2
Energy Cost: $398,650 per year

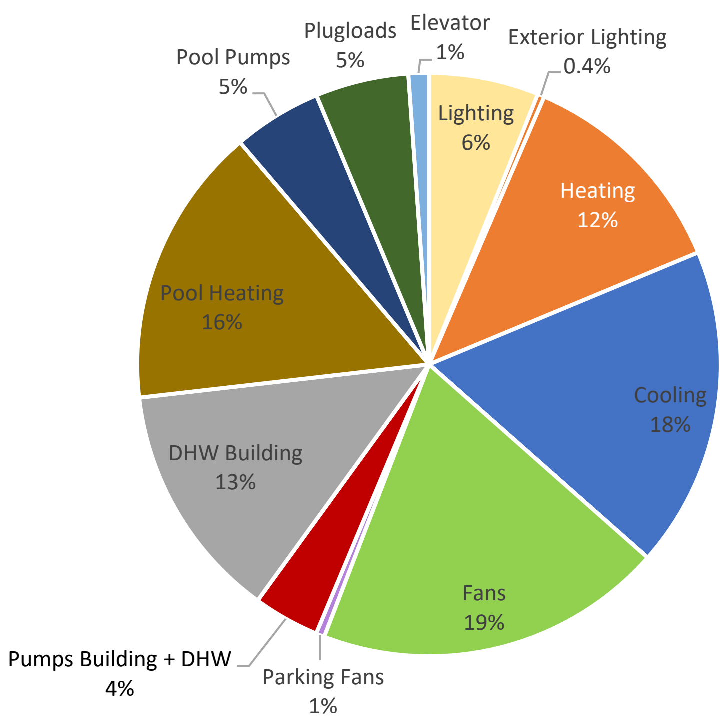


Figure 6: Proposed Base Design Development Energy by End-Use

7.2 Design Development vs NECB 2020

Project energy performance in comparison to the ZCB NECB 2020 baseline is summarized below. This comparison was made as the ZCB energy target of 25% reduction over NECB 2020 is more stringent than the BC Energy Step Code target of NECB 2020.

The preliminary energy models show the BMCC design approach per DD information reduces energy consumption to the NECB 2020 reference building by 34% as shown in Figure 7 and Table 11.

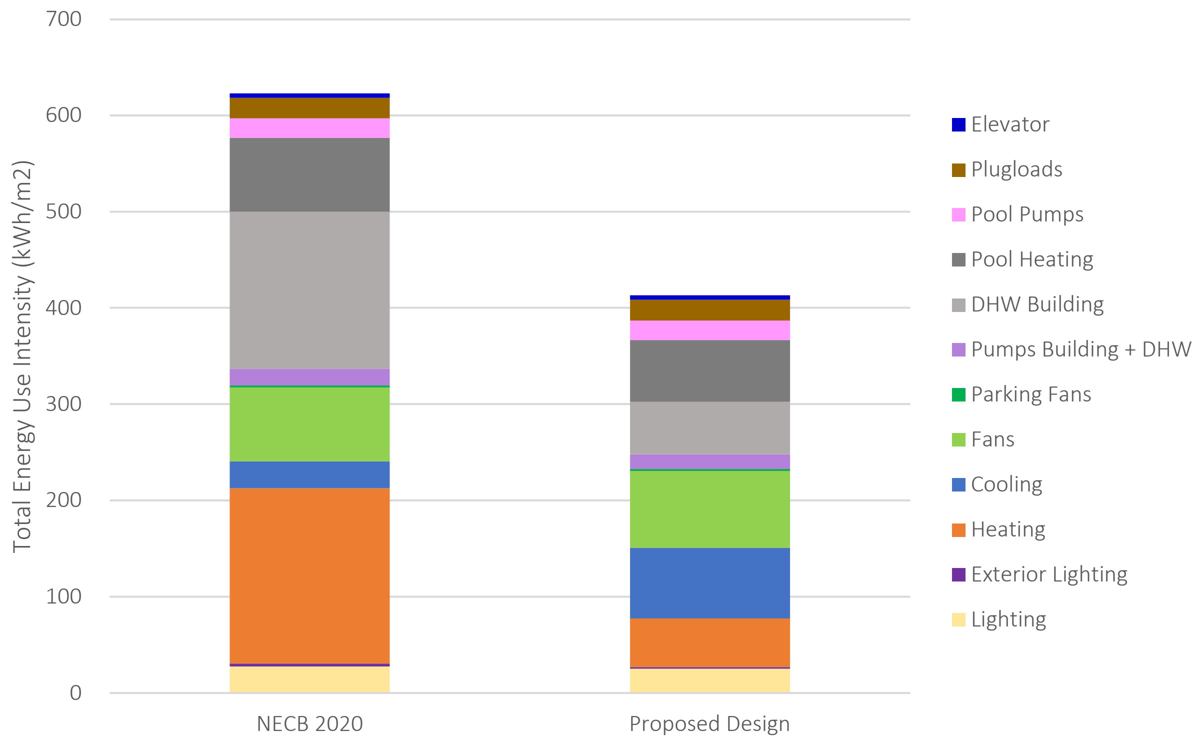


Figure 7: NECB 2020 vs Proposed Base Design Development Total Energy Use Intensity by End-Use

Table 11: Detailed Energy Use Breakdown NECB 2020 vs Proposed Design

ENERGY SUMMARY		Baseline NECB 2020		Proposed DD Design		% Savings
Per End-Use	Fuel Source	kWh	kWh/m²	kWh	kWh/m²	%
Interior Lighting	Electricity	270,755	27	247,877	25	8%
Exterior Lighting	Electricity	30,655	3	15,328	2	50%
Heating	Electricity	1,793,228	182	498,286	51	72%
Cooling	Electricity	273,634	28	723,897	73	-165%
Heat Rejection	Electricity	0	0	0	0	0%
Fans	Electricity	758,828	77	786,178	80	-4%
Parking Fans	Electricity	19,421	2	19,421	2	0%
Pumps	Electricity	168,160	17	149,345	15	11%
DHW Building	Electricity	1,608,495	163	536,790	55	67%
Pool Heating	Electricity	757,127	77	633,875	64	16%
Pool Pumps	Electricity	200,009	20	200,009	20	0%
Plug Loads	Electricity	210,483	21	210,483	21	0%
Elevator	Electricity	45,812	5	45,812	5	0%
TOTAL ENERGY CONSUMPTION		**6,136,607**	**623.1**	**4,067,301**	**413.0**	**34%**
Total Electricity		6,136,607	623.1	4,067,301	413.0	34%
Total Natural Gas		0	0	0	0	0
TEDI	kWh/m²	290		175		40%
OPERATIONAL GHG EMISSIONS		kgCO2e/m²		kgCO2e/m²		-
Total GHG Emissions		**6.9**		**4.5**		34%
Total Electricity		6.9		4.5		34%
Total Natural Gas		0		0		0%

The largest energy uses in the proposed design are domestic hot water, pool heating, pumps, building heating, cooling/dehumidification, and fans. It should be noted that the large cooling energy in proposed design is due to the active heat recovery coil in the pool AHUs imposing a cooling load on the WSHP for use in building heating. The proposed design pump energy is larger than the NECB reference building due to the hydronic heating and cooling systems serving the proposed building.

The heat recovery from simultaneous heating and cooling loads reduces the overall building heating and hot water loads in proposed design. It is recommended the use of heat wheel and active heat recovery be further reviewed with the design team in next design phase to find the best energy balance based on loads and control setpoints. It is further recommended the control sequence of the heating plant equipment be reviewed against the energy balance to optimize the use of the heat pumps over electric boiler.

8 SUMMARY & NEXT STEPS

An updated energy model has been completed to reflect design development approach for the BMCC project. The model demonstrates a 34% reduction in energy consumption relative to the NECB 2020 ZCB baseline.

Several energy conservation measures were studied as part of the BC Hydro Study and further evaluated relative the proposed design intent during DD. Several energy efficiency measures were identified to be integrated, and several are pending decision by the project team. Next steps include final Capital Incentive amount verification by BC Hydro as well as continued coordination with the design team to assess the feasibility of system optimizations as the project advances into Construction Document (CD) phase.

End of Report

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APPENDIX A – BC HYDRO ENERGY CONSERVATION MEASURE STUDY RESULTS

reLoad Sustainable Design Inc.

Escalation Rate	**2%**
Discount Rate	**5%**

NECC

BC Hydro Study - ECM Modelling Results

Date: 20250612

		Energy Performance Metrics				Annual Savings							Payback	Over Life of Measure		
Energy Conservation Measures (ECMs)		MWh	kW	$/Year	tCO2e	kWh		tCO2e		$		Incremental Cost *	Discounted (yrs)	NPV	IRR	Life Expectancy (years)
BC Hydro Baseline	**BC Hydro Baseline**	**5,243**	**1,404**	**$543,559**	**58**	-		-								
ECM-1 & 2	Opaque Envelope	5,219	1,394	$542,660	57	23,319	0.4%	0.3	0.4%	$899	0.2%	$ (153,200)	75	-$135,786	-7.1%	30
ECM-3	Glazing Improvement	5,219	1,444	$543,068	57	23,805	0.5%	0.3	0.5%	$492	0.1%	$ (448,200)	151	-$439,748	-17.0%	25
ECM-4	Interior LPD reduction	5,217	1,436	$542,163	57	25,991	0.5%	0.3	0.5%	$1,396	0.3%	$ 215,790	-	$233,061	-	16
ECM-5	Exterior LPD reduction	5,225	1,401	$542,126	57	17,371	0.3%	0.2	0.3%	$1,434	0.3%	$ 10,790	-	$28,524	-	16
ECM-6	Lighting Controls (OS)	5,232	1,404	$542,713	58	10,709	0.2%	0.1	0.2%	$847	0.2%	$ (10,000)	11	$473	5.6%	16
ECM-7	EarthTube	4,966	1,202	$499,939	55	276,149	5.3%	3.0	5.3%	$43,620	8.0%	$ (703,600)	14	$670,304	8.2%	100
ECM-8 Updated	HVAC Proposed	4,465	1,089	$449,135	49	777,337	14.8%	8.6	14.8%	$94,424	17.4%	$ (1,296,300)	22	$187,758	6.4%	22
ECM-9	DCV	4,911	1,305	$515,221	54	331,615	6.3%	3.6	6.3%	$28,339	5.2%	$ (214,500)	7	$23,209	7.1%	10
ECM-10	High eff ERV	4,709	1,326	$494,609	52	534,071	10.2%	5.9	10.2%	$48,950	9.0%	$ (304,500)	6	$270,853	15.6%	15
ECM-11	Thermal Storage	5,119	1,356	$530,003	56	123,588	2.4%	1.4	2.4%	$13,556	2.5%	$ (377,890)	23	-$32,076	4.5%	50
ECM-12	Passive Drain HR	5,183	1,401	$536,434	57	59,813	1.1%	0.7	1.1%	$7,126	1.3%	$ (21,200)	3	$241,292	35.6%	30
ECM-13	Active Grey Water HR	4,900	1,438	$520,391	54	342,319	6.5%	3.8	6.5%	$23,168	4.3%	$ (1,118,375)	34	-$846,062	-2.3%	15
ECM-14	Hot tub Drain at night	5,110	1,434	$527,078	56	132,982	2.5%	1.5	2.5%	$16,482	3.0%	$ (1,056,390)	44	-$635,945	1.0%	50
ECM-15	Solar PV	5,100	1,404	$501,319	56	142,100	2.7%	1.6	2.7%	$42,241	7.8%	$ (450,560)	10	$367,353	10.5%	30
ECM-16	Battery Storage	TBD	TBD	TBD	TBD	TBD		TBD		0		$ -				12
Proposed Bundle	TBD	TBD	TBD	TBD	TBD	TBD		TBD		TBD		TBD				

** Positive value indicates an incremental cost benefit of the proposed ECM compared to the baseline, while a negative value represents an incremental cost premium.*

APPENDIX B – DESIGN OPTIONS STUDY DD

Northeast Community Centre – NECC

Preliminary Results from DD Design Options Study

July 11, 2025

DD Results Options to be Evaluated with Costing

- **Studied design optimizations vs Proposed Design (DD)**
- Option 1: *Reduce* to double pane glazing in all non-natatorium areas, Uip-0.35, SHGC-0.30
- Option 2: *Reduce* exterior wall insulation from 8” to 6” (From Rip-20 to Rip-17)
- Option 3: *Improve* ERV efficiency from 80% to 90% (sensible)
- Option 4: *Include* Earth Tube (ET) supplying natatorium, gym and changerooms
- Option 5: Plant optimization (TBD - with AME next week)

		Energy Performance Metrics				Annual Savings					
Energy Conservation Measures (ECMs)		MWh	kW	$/Year	tCO2e	kWh		tCO2e		$	
Proposed Design	**Early DD**	**3929**	**892**	**$398,221**	**43**	**-**		**-**			
Option 1	Double Glazing	3971	912	$404,736	44	(42,292)	-1.1%	(0.5)	-1.1%	-$6,515	-1.6%
Option 2	Exterior wall 6" insul.	3930	892	$398,316	43	(1,199)	0.0%	(0.0)	0.0%	-$95	0.0%
Option 3	ERV 90% eff.	3893	878	$396,028	43	35,815	0.9%	0.4	0.9%	$2,192	0.6%
Option 4	Earth Tube	3783	784	$381,012	42	145,718	3.7%	1.6	3.7%	$17,209	4.3%
Option 5	Plant optimizations	Next week									

Future Climate Study & Earth Tube Impact

- **Current Climate Scenario vs Future Climate (+2.5C scenario) 2050s**

Key Metric Comparison	Unit	DD Proposed (current)	DD Proposed in 2050s		DD Proposed + Earth tube in 2050s	
Heating energy	MWh	332	308	7%	268	19%
Cooling energy	MWh	254	312	-23%	255	-0.5%
Pump energy	MWh	136	153	-12%	114	16%
Total Energy	**MWh**	**3929**	**3999**	**-2%**	**3845**	**2%**
Electricity annual Peak	**kW**	**892**	**977**	**-10%**	**854**	**4%**
Annual Energy Cost	**$/ Year**	**$398,221**	**$400,140**	**-0.5%**	**$393,161**	**1%**

- **Proposed design cooling energy will increase by 23% by 2050s**
  - With ETs, there is negligible cooling energy increase by 2050s

- **Proposed design annual electricity peak will increase from current predicted 892kW to 977kW by 2050s**
  - With ETs, there is an overall annual electricity peak reduction from current 892kW to 854kW by 2050s

- **Proposed design annual predicted net energy consumption will increase by 2%**
  - With ETs, there is an annual energy consumption reduction by 4%
  - Essentially ETs are offsetting the energy impact of climate change as a passive strategy

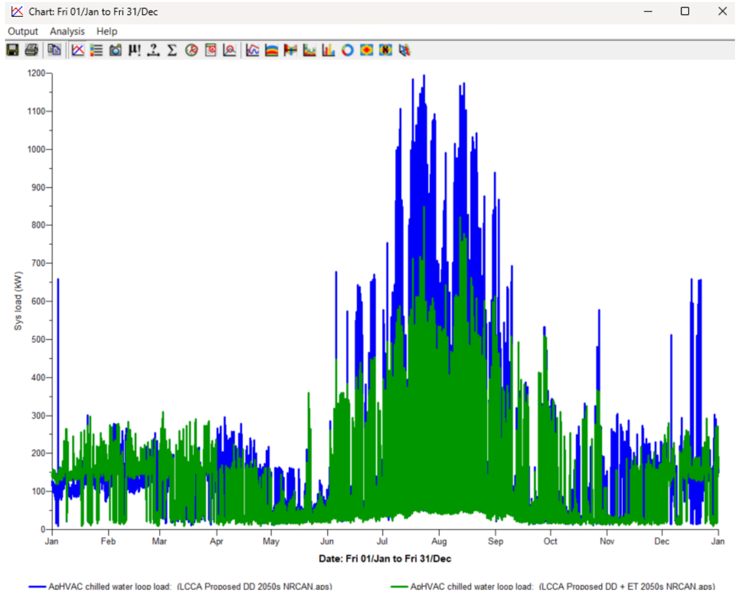
**Note: there results are reported modelled values and not design peak values*

Future Climate Study & **Earth Tube Impact on Peak Cooling Loads**

- Modelled Proposed Design with and without Earthtube in 2050s (+2.5C climate scenario)
- Overall building peak cooling load reductions 29% with earth tube

Peak Annual Cooling Loads (modelled):

2050s no Earthtube:	1,194 kW
2050s with Earthtube:	894 kW
Reduction:	345 kW (29%)



Annual cooling loads with (green) and without (blue) ET. Note include heat recovery coil cooling loads in wintertime and peaks occur in winter due to economizer shut off setting on very cold times (per preliminary controls strategy from AME).

11.4 Whole-building life cycle analysis memo

Memo

To	City of Coquitlam	**CC**	
From	Juan Rivera, hcma Architecture + Design	**Date**	August 4, 2025

Project Burke Mountain Community Center
Subject Design Development – Life Cycle Assessment Results

Details This memo summarizes the results of the Life Cycle Assessment (LCA) conducted for the Burke Mountain Community Center and provides recommendations to achieve further reductions in embodied carbon.

1.0 Introduction

Embodied carbon impacts represent greenhouse gases associated with material extraction, manufacture, and transportation, which are emitted to the atmosphere in the short term before the building becomes operational. Given the urgency to address climate change and the need to reduce carbon emissions quickly, reducing the embodied carbon of buildings is imperative.

A whole-building Life Cycle Assessment (LCA) was conducted for the Burke Mountain Community Center project in August 2025, based on the Design Development documents. The purpose of the study was to quantify the embodied carbon of the proposed design, identify the relative embodied carbon savings compared to conventional construction, and demonstrate alignment with the embodied carbon requirements of the Zero Carbon Building (ZCB) v4- Design standard.

To comply with ZCB Design v4, projects must demonstrate an embodied carbon saving of minimum 10% compared to baseline. Achieving an embodied carbon reduction of 20 or 40% would also count as one or two innovation strategies respectively.

Building information

Project Name	Burke Mountain Community Center
Location	Princeton Ave., Burke Mountain Village, Coquitlam, BC
Gross Floor Area	10,157 m^2, Excluded: Parking and other areas per the National Guidelines for wbLCA
Building Height	4 storeys
Building Description	The four-storey building contains an aquatic center, gymnasium, library, multi-purpose rooms, fitness center and some administrative areas The building also includes two below-grade parking levels

LCA parameters

Compliance	ZCB Design Standard v4
Software	OneClick LCA
Scope	Structure and Enclosure, Excludes: site development, interior partitions, finishes, furnishing and building services
LCA Stages	Cradle-to-grave A1-A5, B1-B5, C1-C4, Excluded: Module D, Excluded: Embodied carbon impact associated with biogenic carbon
Service Life	60 years

Guidelines	National Research Council (NRC) – National Whole-Building Life Cycle Assessment Practitioner's Guide: Guidance for Compliance Reporting of Embodied Carbon in Canadian Building Construction, National Research Council (NRC) - National Guidelines for Whole-Building Life Cycle Assessment

Methodology

The whole-building life cycle assessment was conducted using One Click LCA software. Environmental Product Declarations (EPD) are assigned to each material or assembly in the building. Environmental impacts of individual components are then scaled based on each material quantity and summed up to create a life cycle impact profile for the whole building. Material assignments were made using the extensive database of construction materials in One Click LCA. In certain cases, comparable materials were used to account for materials unavailable in the database. The architectural drawing sets (dated 18/July/2025), and the architectural Autodesk Revit model (dated 29/July/2025) were used to perform area and volume takeoffs. Structural takeoffs were provided by the structural consultant based on the 50% DD design. In accordance with ZCB requirements, the assessment has been conducted using the methodology from the National Research Council (NRC) – National Whole-Building Life Cycle Assessment Practitioner's Guide: Guidance for Compliance Reporting of Embodied Carbon in Canadian Building Construction (hereafter referred to as the National wbLCA Practitioner's Guide). This document complements the National Guidelines for Whole-Building Life Cycle Assessment previously noted.

Summary of assumptions

Table 1 summarizes structural and envelope systems assumptions for the proposed design and the baseline. Table 2 confirms embodied carbon assumptions for the concrete mixes used in both scenarios. The Bill of Materials is included at the end of this memo.

Table 1 Structure and envelope systems description

	PROPOSED DESIGN	**BASELINE**
STRUCTURE		
Substructure	Reinforced concrete slab-on-grade, pad and strip footings, below-grade walls	
Superstructure	Lower & Upper levels: reinforced cast-in-place concrete columns, transfer beams and suspended slabs.	
	Roof, Library: 76mm steel deck, supported by steel beams and columns	
	Roof, Natatorium and Gymnasium: CLT panels supported by glulam columns and beams	Roof, Natatorium and Gymnasium: 76mm steel deck, supported by steel beams and columns
Shear walls	Reinforced cast-in-place concrete	
Stairs	Reinforced cast-in-place concrete	
Concrete mixes	Low carbon concrete mixes. Refer to Table 2	Baseline concrete mixes per BC Concrete EPD. Refer to Table 2
BUILDING ENVELOPE		
Above-grade Exterior walls	Back up assembly type 1: - 16 mm interior drywall type X - 152 mm steed studs at 400 o.c. - 16mm exterior drywall sheathing Back up assembly type 2: - 190 mm CMU including mortar and reinforcement Cladding assembly: - Self-adhered air/vapour barrier	

<table>
<tr><td></td><td colspan="2">- 203mm semi-rigid mineral wool insulation
- 25 mm z-girts (at ACM, fiber cement and Steel sheet cladding types)
- Miscellaneous structural steel supports (at brick veneer and precast cladding types)</td></tr>
<tr><td></td><td>Cladding finish:
- type 1: 4mm ACM panels,
- type 2: 8mm fiber cement panels
- type 3: Prefinished standing seam steel sheet cladding
- type 4: 90mm Clay brick veneer
- type 5: Reinforced precast concrete panels</td><td>Cladding finish:
- Pre-finished steel sheet cladding</td></tr>
<tr><td>Below-grade walls</td><td colspan="2">- Waterproofing membrane
- XPS insulation
- Drainage mat, filter fabric</td></tr>
<tr><td>Slab-on-grade (SOG)</td><td colspan="2">- 15mil polyethylene air/vapour barrier
- 50mm XPS insulation in limited area</td></tr>
<tr><td>Slab over unconditioned parkade</td><td colspan="2">- 127mm glass fiber spray insulation</td></tr>
<tr><td>Soffits</td><td colspan="2">- 152 mm steed studs at 400 o.c.
- 16mm exterior drywall sheathing
- Self-adhered air/vapour barrier
- 203mm semi-rigid mineral wool insulation
- Z-girt & finish (excluded per modeling guidelines)

Steel stud and drywall sheathing omitted in assemblies over concrete slab substrate</td></tr>
<tr><td>Parapets</td><td colspan="2">- Cladding (as noted above)
- 25mm z-girts
- 203mm semi-rigid mineral wool insulation
- Self-adhered air/vapour barrier
- 16mm exterior drywall sheathing
- 152 mm steed studs at 400 o.c.
- 152 mm mineral wool batt insulation in stud cavity
- 13mm roof sheathing
- Roof air/vapour barrier
- 50mm polyisocyanurate insulation
- 6 mm protection board
- 2 ply SBS roofing membrane</td></tr>
<tr><td rowspan="2">Roofs</td><td>R1 (over CLT deck)
- 2 ply SBS roofing membrane,
- 6 mm protection board,
- Tapered polyisocyanurate insulation
- 125 mm polyisocyanurate insulation with tapered package,
- Air/vapour barrier</td><td>R1 (over steel deck)
- 2 ply SBS roofing membrane,
- 6 mm protection board,
- Tapered polyisocyanurate insulation
- 150 mm polyisocyanurate insulation,
- Air/vapour barrier membrane
13 mm exterior drywall (thermal barrier)</td></tr>
<tr><td colspan="2">R2 (over steel deck)</td></tr>
</table>

	- 2 ply SBS roofing membrane, - 6 mm protection board, - Tapered polyisocyanurate insulation - 150 mm polyisocyanurate insulation, - Air/vapour barrier membrane - 13 mm exterior drywall (thermal barrier)
Windows & Doors	- Triple glazed aluminum curtain wall - Triple glazed aluminum doors - Insulated hollow metal doors

Table 2 Embodied carbon assumptions for concrete mixes

Element Type	GWP (kg CO2e/m3) Baseline	GWP (kg CO2e/m3) Proposed Design	Savings against baseline
Pad & Strip Footings	310.51	239.21	23%
Shear Wall Footings	344.04	264.6	23%
Foundation Walls	310.51	276.84	11%
Columns	310.51	276.84	11%
Shear Walls	379.6	305.46	20%
Transfer Beams	320.02	320.02	0%
Slab-on-grade	310.51	239.21	23%
Suspended slab (non-pool areas)	320.02	320.02	0%
Suspended slab (pool areas)	338.09	338.09	0%
Stairs	320.02	320.02	0%

3.1 Results – Embodied carbon

Results of the analysis, summarized in Table 3, show that the proposed design has an embodied carbon intensity of 557 kg CO_2e per square meter (excluding parkade), demonstrating a 14.1% embodied carbon reduction compared to the baseline with an embodied carbon intensity of 648 kg CO_2e per square meter.

Table 3 Embodied carbon results

Design Option	Embodied carbon A1-C4 (tons CO_2e)	Embodied carbon A1-C4 (kg CO_2e/m^2)	Reduction against baseline
Baseline	6,587	648	N/A
Proposed Design	5,661	557	14.1%

Figure 1 provides the cumulative embodied carbon reductions associated with the various strategies implemented in the proposed design, compared to the baseline design. The proposed Mass Timber structure achieves an 11.9% reduction, and the low carbon concrete extends that reduction to 16.3%. However, the proposed design includes cladding selections which have a higher GWP than the steel sheet cladding baseline, resulting in the proposed design ultimately achieving a 14.1% embodied reduction compared to the baseline.

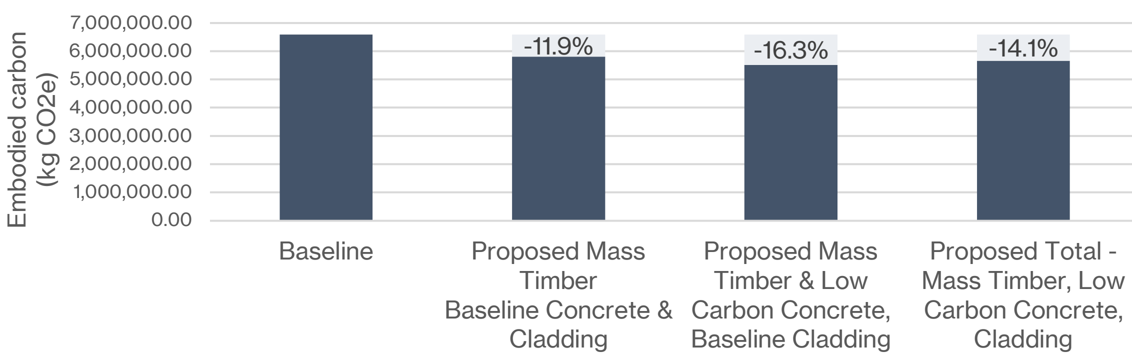


Figure 1 *Embodied carbon reduction strategies*

Figure 2 shows the breakdown of embodied carbon by building elements. As summarized in the table, in the baseline case, 49% of the embodied carbon is associated with superstructure (including columns, beams, shear walls, floor slabs, roof deck, and stairs), compared to 43% in the proposed case. Reduction is attributed to the low carbon concrete and select mass timber elements in the proposed design. The substructure (including foundations, below grade walls and slab-on-grade) accounts for 24% in both the baseline and proposed cases. In the proposed above grade envelope assemblies (including exterior walls, fenestration and roofing), Global warming potential increases to 33% compared to 27% in the baseline due to high embodied carbon impact of the proposed cladding materials.

Building Element	Baseline	Proposed
substructure	24%	24%
superstructure	49%	43%
above-grade enclosure	27%	33%

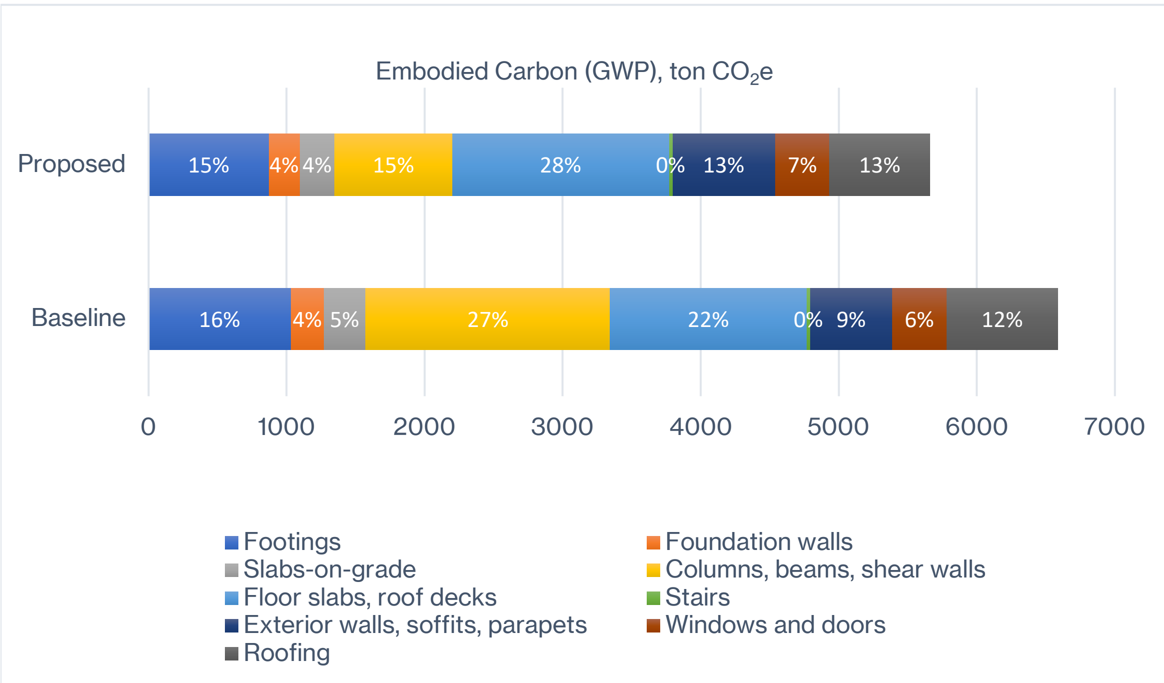


Figure 2 *Embodied carbon by building element*

Figure 3 demonstrates contribution of various material types to the overall embodied carbon. The reinforced concrete has the largest contribution in both proposed and baseline designs. Apart from other materials, which are similar in both designs, the next most contributing material in the baseline is steel, which is significantly offset by mass timber in the proposed design.

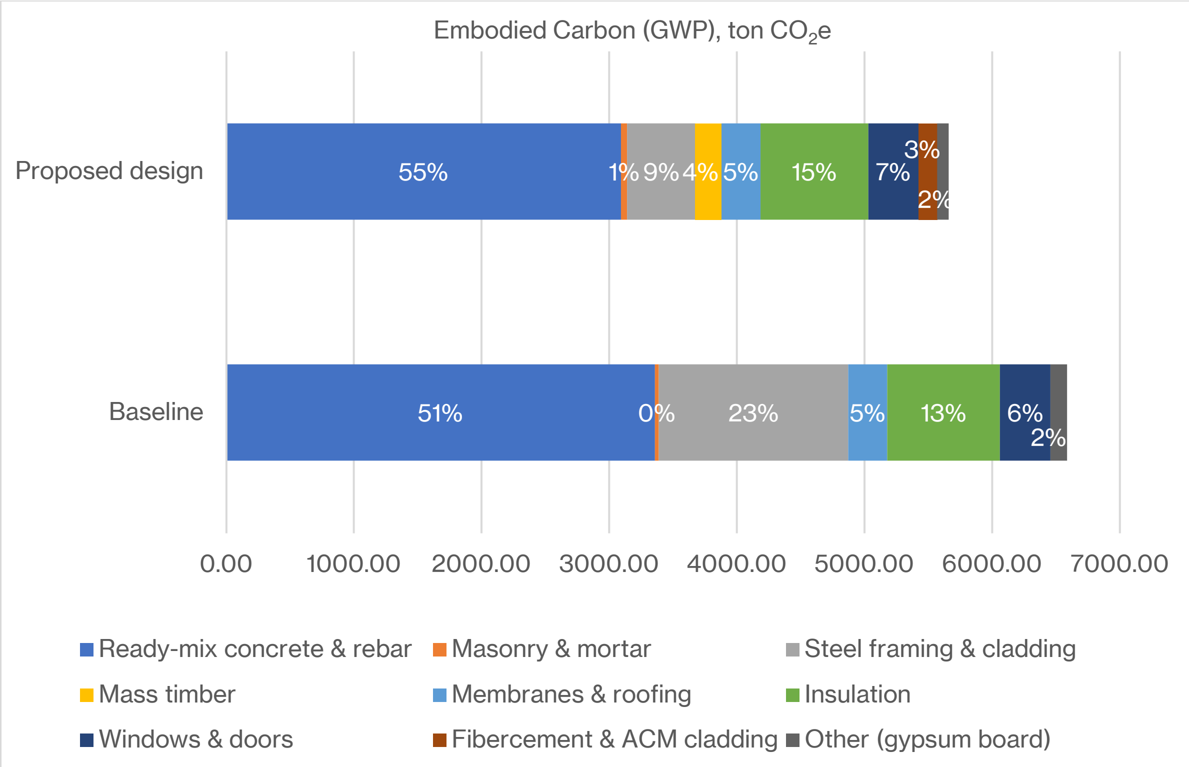


Figure 3 *Embodied carbon by material type*

3.2 Results – All Environmental Impacts

Table 4 summarizes all cradle-to-grave life cycle impacts for each environmental category. The highest reductions of over 14% and 10% are achieved in Global warming potential (embodied carbon) and Depletion of non-renewable energy resources respectively. A small reduction is seen in Acidification potential of nearly 3%. In other categories - Ozone depletion potential, Eutrophication potential and Formation of tropospheric ozone – the project demonstrated a small (less than 1%) increase in comparison to the baseline.

Table 4 Whole-building LCA Results - All Environmental Impacts

Environmental Impact Category	Baseline	Proposed Design	Reduction against Baseline
Global warming potential (kg CO_2e)	6,586,758.28	5,661,138.56	14.1%
Ozone depletion potential (kg CFC-11e)	30,828.97	30,829.07	-0.0003%
Acidification potential (kg SO_2e)	33,673.07	32,683.15	2.9%
Eutrophication potential (kg Ne)	3,862.36	3,893.87	-0.8%
Formation of Tropospheric ozone (kg O_3e)	388,160.87	388,350.71	-0.05%
Depletion of non-renewable energy resources (MJ)	64,715,839.54	58,148,368.93	10.1%

4.0 Summary and recommendations

The proposed design demonstrates a 14.1% reduction in embodied carbon compared to the baseline design exceeding the ZCB target of 10% minimum. This is however shy of the internal project embodied carbon target of 20%.

Several conservative assumptions were necessary to develop the LCA at the design development stage, especially around concrete. A more refined EPD selection of concrete mixes could yield additional reductions. However, it is also possible that some assumed mixes will not be feasible in construction procurement.

The following strategies are recommended to be explored in the Construction Documents phase to further reduce embodied carbon of the project.

- Review with structural engineer opportunities to:
  - Conduct a snow load study to refine structural snow load factors based on building code and optimize structural member sizes.
  - Optimize concrete mix design, confirming maximum savings/optimal performance, and include emissions limits for various concrete mixes in the specifications.
  - Reduce thickness of concrete slabs by considering more reinforcing, concrete with higher compressive strength, rebar with higher tensile strength, post-tensioned slabs, etc.
  - Replace additional steel elements with mass timber products.
  - Specify North American steel.
- Explore using wood products in building assemblies.
- Consider replacing selected cladding materials with a lower embodied carbon alternatives. Prioritize lighter weight cladding options to minimize reliance on structural steel for cladding support.

The final whole-building LCA will be conducted for the building permit submission and ZCB certification.

5.0 Attachments

Bill of materials.

Project: Burke Mountain Community Center

Date of take off: Aug-25

Gross Floor Area (m2)	10157

CLASS	IFCMATERIAL	QUANTITY	QTY_TYPE	THICKNESS (mm)	CONVERSION FACTOR	UNITS	COMMENT / Revit Denominations / Source	BASELINE REPLACEMENTS		
								Qty	Units	Comment
	Foundation									
	Pad Footings							**Baseline: Change to industry average concrete**		
FOUNDATION	Cast-in-place concrete GUL cement 35MPa 50% SCM (F-1)	680.00	M3					680.00	M3	BC industry average
FOUNDATION	Reinforcement	40800.00	KG		60.00	kg/m3				
	Strip Footings							**Baseline: Change to industry average concrete**		
FOUNDATION	Cast-in-place concrete GUL cement 35MPa 50% SCM (F-1)	45.00	M3					45.00	M3	BC industry average
FOUNDATION	Reinforcement	2700.00	KG		60.00	kg/m3				
	Shear Wall Footings							**Baseline: Change to industry average concrete**		
FOUNDATION	Cast-in-place concrete GUL cement 40MPa 50% SCM (C-1)	1350.00	M3					1350.00	M3	BC industry average
FOUNDATION	Reinforcement	182250.00	KG		135.00	kg/m3				
	Foundation Walls							**Baseline: Change to industry average concrete**		
WALL	Cast-in-place concrete GUL cement 35MPa 30% SCM (C-1)	460.00	M3					460.00	M3	BC industry average
WALL	Reinforcement	55200.00	KG		120.00	kg/m3				
	TOTAL CIP Concrete GUL cement 35MPa 50% SCM (F-1)	**725.00**	**M3**				Highest SCM content EPD in OneClick is 40	**725.00**	**M3**	35 Mpa (F-1) BC Industry Average
	TOTAL CIP Concrete GUL cement 40MPa 50% SCM (C-1)	**1350.00**	**M3**				Highest SCM content EPD in OneClick is 40	**1350.00**	**M3**	40 Mpa (C-1) BC Industry Average
	TOTAL CIP Concrete GUL cement 35MPa 30% SCM (C-1)	**460.00**	**M3**				Struct. Spec notes C-1 exposure class 30 SCM. Closest available EPD is F-2 with 25 SCM	**460.00**	**M3**	35 Mpa (F-2) BC Industry Average
	TOTAL Rebar	**280950.00**	**KG**							
	Concrete Columns							**Baseline: Change to industry average concrete**		
COLUMN	Cast-in-place concrete GUL cement 35MPa 30% SCM	170.00	M3					170.00	M3	BC industry average
COLUMN	Reinforcement	32300.00	KG		190.00	kg/m3				
	Steel Columns	**13500.00**	**KG**							
COLUMN	HSS	2025.00	KG				Advised by structural to estimate at 15% of total steel for DD			
COLUMN	Hot-rolled structural steel profiles	11475.00	KG				Other structural steel			
	Structural steel - beams, braces, misc angles, plates, connections	**66500.00**	KG				**Struct: approx 45 kg/m2 total steel average weight (includng cols)**			
BEAM	HSS	9975.00	KG				Advised by structural to estimate HSS at 15% of total steel for DD			
BEAM	Hot-rolled structural steel profiles	56525.00	KG				Other structural steel			
	Glulam Columns							**Baseline: Change to steel columns**		
COLUMN	Glulam	85.00	M3					60000.00	**KG**	
								9000.00	**KG**	HSS-Advised by structural to estimate HSS at 15% of total steel for DD
								51000.00	**KG**	Other structural steel
	Concrete Transfer Beams									
BEAM	Cast-in-place concrete GUL cement 35MPa 10% SCM	185.00	M3					185.00	M3	BC industry average
BEAM	Reinforcement	32375.00	KG		175.00	kg/m3				
	Interior and Exterior Concrete Walls									
	Shear Walls							**Baseline: Change to industry average concrete**		
WALL	Cast-in-place concrete GUL cement 50MPa 50% SCM	810.00	M3					810.00	M3	BC industry average
WALL	Reinforcement	141750.00	KG		175.00	kg/m3				
	TOTAL Columns CIP Concrete GUL cement 35MPa 30% SCM (C-1)	**170.00**	**M3**				Struct. Spec notes C-1 exposure class 30 SCM. Closest available EPD is F-2 with 25 SCM	**170.00**	**M3**	35 Mpa (F-2) BC Industry Average
	TOTAL Transfer Beams CIP Concrete GUL cement 35MPa 10% SCM (N)	**185.00**	**M3**				EPD with lowest SCM is 15%. Conservative approach, assumed no SCM			Structural requirements restricts SCM content below baseline of 20 SCM. No change from proposed due to structural requirement
	TOTAL Shear Walls CIP Concrete GUL cement 50MPa 50% SCM (C-3)	**810.00**	**M3**				Struct. Spec notes C-3 exposure class 50 SCM. Closest available EPD is C-1 with 40 SCM	**810.00**	**M3**	50 Mpa (C-1) BC Industry Average
	TOTAL Rebar columns & shear walls	**174050.00**	**KG**							
	TOTAL Rebar transfer beams	**32375.00**	**KG**							
	Total Glulam Columns	**85.00**	**M3**					**Baseline: Change to Steel (see above for quantities)**		
	Total HSS Columns	**2025.00**	**KG**							
	Total HSS Beams	**9975.00**	**KG**							
	Total Hot rolled steel columns	**11475.00**	**KG**							
	Total Hot rolled steel beams	**56525.00**	**KG**							
	Exterior CMU Walls									
	CMU 190mm (EW2)	**577.81**								
INTERNAL WALL	CMU 190mm	577.81	M2	190						
INTERNAL WALL	Reinforcement	577.81	M2				1.1kg/m2 default assumption From hcma tab			
INTERNAL WALL	Mortar GU cement 20MPa	577.81	M2							
	Total CMU Ext Walls	**144452.50**	**KG**		**250.00**	**kg/m2**	NM: weight per Basalite CMU 200x200x400 data sheet			
	Total Rebar CMU Ext Walls	**635.59**	**KG**		**1.10**	**kg/m2**	From hcma tab			
	Total Mortar CMU Ext Walls	**20223.35**	**KG**		**35.00**	**kg/m2**	From hcma tab for 190 CMU			
	Below Grade Wall Assemblies (Arch Revit)									
	FW1 - Below grade waterproofing on conventionally formed wall	**546.45**	M2							
FOUNDATION	Drainage mat	546.45	M2							
FOUNDATION	Waterproofing membrane	546.45	M2							
	FW2 - Below grade waterproofing + insulation on conventionally formed wall	**1176.07**	M2							
FOUNDATION	Drainage mat	1176.07	M2							
FOUNDATION	75mm XPS Rigid Insulation	1176.07	M2	75						
FOUNDATION	Waterproof membrane system	1176.07	M2							
	FW3 - Below grade waterproofing on conventionally formed wall	**46.01**	M2							
FOUNDATION	Drainage mat	46.01	M2							
FOUNDATION	Waterproof membrane system	46.01	M2							
	FW3a - Below grade waterproofing + insulation on conventionally formed wall	**150.75**	M2							
FOUNDATION	Drainage mat	150.75	M2							
FOUNDATION	75mm XPS Rigid Insulation	150.75	M2	75						
FOUNDATION	Waterproof membrane system	150.75	M2							
	Total Drainage Mat	**1919.28**	**M2**							
	Total XPS Insulation	**99.51**	**M3**				Assumed Owens Corning Foamular NGX until confirming we can spec Soprema Sopra XPS			
	Total Waterproofing	**6717.48**	**KG**		3.50	kg/m2	3.5 kg/m2 per Colphene BSW-V Plus Data Sheet			
	Exterior cladding wall assemblies									
	CL1 - ACM Panel Cladding							**Baseline: Change to steel cladding. Assuming Vic West PR 16 24 ga**		
EXTERNAL WALL	50mm ACM Cladding c/w concealed fastener system	2066.81	M2				Approx. 1800 between seams	2066.81	M2	Assuming Vic West PR 16 24 ga.
EXTERNAL WALL	25mm horizontal z-girts	3375.10	KG	25	1.63	kg/m2	Assuming 25mm 18ga z-girts horizontal @400mm o.c. 2.5 linear m length per 1m2 of wall, weight 0.653 kg/m length or 1.633 kg/m2 of wall			
EXTERNAL WALL	200mm semi-rigid insulation c/w thermal clip system	2066.81	M2	200						
EXTERNAL WALL	Self adhered air/vapour barrier membrane	2066.81	M2							
	CL1b - Perforated ACM Panel Cladding (Mechanical well above entrance)	**72.16**						**Baseline: Change to steel cladding. Assuming Vic West PR 16 24 ga**		
EXTERNAL WALL	Perforated 50mm ACM Cladding c/w concealed fastener system	72.16	M2				Approx. 1800 between seams	72.16	M2	Assuming Vic West PR 16 24 ga.
EXTERNAL WALL	200mm semi-rigid insulation c/w thermal clip system	23.43	M2	200						Portion of this wall enclosing conditioned space
EXTERNAL WALL	200mm vertical z-girts	72.16	M2	200	11.83	kg/m2	CANAM 16ga 203mm Z Profiles @400mm. Profiles have a sectional area of 603 mm2 = 0.000603 m3/lm of profile. 3 x 1m profiles in 1.2m2 of wall = 0.001809m3 = 0.0015075m3/m2 of wall * 7,850 kg/m3 = 11.834kg/m2 of wall			
EXTERNAL WALL	UV resistant barrier - Polyester fabric with acrylic coating	72.16	M2				B.O.D Delta Fassade S			
EXTERNAL WALL	Self adhered air/vapour barrier membrane	72.16	M2							
	CL2 - Masonry Veneer	**517.57**	M2					**Baseline: Change to steel cladding. Assuming Vic West PR 16 24 ga**		
EXTERNAL WALL	90mm Clay brick masonry, stack bond.	72702.56	KG		4.35	kg/brick	Per Glen Gery Utility size brick data sheet: Weight - 9.6 lb/brick=4.35kg/brick, Usage - 1 brick/linear ft, 3 bricks/sq ft https://www.glengery.com/brick-sizes	517.57	M2	Assuming Vic West PR 16 24 ga.
EXTERNAL WALL	Mortar, 10mm joint size	517.57	M2					845.19	kg	Remove mortar and assume 25mm horizontal z-girt like CL4. 1.633 kg/m2 of wall
EXTERNAL WALL	200mm Semi-rigid mineral wool insulation	517.57	M2	200						
EXTERNAL WALL	Self adhered air/vapour barrier membrane	517.57	M2							
	CL3 - Architectural precast concrete wall panel	**369.10**	M2					**Baseline: Change to steel cladding. Assuming Vic West PR 16 24 ga**		
EXTERNAL WALL	90 mm precast concrete panel	33.22	M3		0.09	m3/m2	90mm thick panel = 0.09 m3 of concrete/m2 of wall. Check with team, doesn't need to be so thick. Try to get product with SCM	369.10	M2	Assuming Vic West PR 16 24 ga.
EXTERNAL WALL	steel substructure, HSS	0.01	M3		0.00	m3/m2 of wall	NM: calculated per NWACC shop drawing per sample of wall, see Precast cladding Steel Substructure tab			
EXTERNAL WALL	steel substructure, L & PL shapes	1.48	M3		0.00	m3/m2 of wall	NM: calculated per NWACC shop drawing per sample of wall, see Precast cladding Steel Substructure tab	602.74	KG	Assuming 25mm 18ga z-girts horizontal @400mm o.c. 2.5 linear m length per 1m2 of wall, weight 0.653 kg/m length or 1.633 kg/m2 of wall
EXTERNAL WALL	steel substructure, fasteners	170.89	KG		0.46	kg/m2 of wall	NM: calculated per NWACC shop drawing per sample of wall, see Precast cladding Steel Substructure tab			
EXTERNAL WALL	50mm XPS insulation	18.46	M3	50						
EXTERNAL WALL	Self adhered air / vapour barrier	369.10	M2							
	CL4 - Typical flat metal panel system	**174.97**								
EXTERNAL WALL	38mm Standing seam steel cladding	174.97	M2				Assuming Vic West PR 16 24 ga.			
EXTERNAL WALL	25mm Horizontal Z girts	285.73	KG	25	1.63	kg/m2	Assuming 25mm 18ga z-girts horizontal @400mm o.c. 2.5 linear m length per 1m2 of wall, weight 0.653 kg/m length or 1.633 kg/m2 of wall			
EXTERNAL WALL	200mm semi-rigid insulation c/w thermal clip system	174.97	M2	200						
EXTERNAL WALL	Self adhered air/vapour barrier membrane	174.97	M2							
	CL5 - Cementitious wall panel	**470.03**	M2					**Baseline: Change to steel cladding. Assuming Vic West PR 16 24 ga**		
EXTERNAL WALL	8mm wall panel	470.03	M2	8			Assume Equitone Natura, confirmed by arch.	470.03	M2	Assuming Vic West PR 16 24 ga.

EXTERNAL WALL	25mm horizontal z-girts	767.56	KG	25	1.63	kg/m2	Assuming 25mm 18ga z-girts horizontal @400mm o.c. 2.5 linear m length per 1m2 of wall, weight 0.653 kg/m length or 1.633 kg/m2 of wall			
EXTERNAL WALL	200mm semi-rigid mineral wool insulation	470.03	M2	200						
EXTERNAL WALL	Self adhered air/vapour barrier membrane	470.03	M2							
	Steel Ledger Angle at brick cladding (overhanging)							**Baseline omits this item, not needed for steel cladding**		
EXTERNAL WALL	L-bracket assumed 8" x 6" and 200mm long @1200 spacing	12.40	M				Quantified from 75% DD set facade elevations			
EXTERNAL WALL	8"x6" Ledger L-angle	55.91	M				Quantified from 75% DD set facade elevations			
	Steel Ledger Angle at brick cladding (at grade)							**Baseline omits this item, not needed for steel cladding**		
EXTERNAL WALL	HSS stub 3"x3" and 200m long @1200 spacing	13.00	M				Quantified from 75% DD set facade elevations. 18.1kg/m			
EXTERNAL WALL	4"x3" Ledger L-angle	62.07	M				Quantified from 75% DD set facade elevations			
	Total ACM Panel Cladding	2138.97	M2				Includes perforated and non-perforated			
	90mm Clay brick masonry, stack bond.	72702.56	KG					**25098.91**	**KG**	Assuming Vic West PR 16 24 ga. 1.47lbs/sf = 7.18kg/m2.
	Total 90 mm precast concrete panel	33.22	M3							
	Total 8mm cementitious wall panel	470.03	M2				Assuming Equitone fibre cement natura			
	Total 38mm Standing seam steel cladding	1256.28	KG		7.18	kg/m2	Assuming Vic-West Prestige PR16 24 GA. 1.47lbs/sf = 7.18kg/m2.			
	Total 25mm Horizontal z-girts	4428.39	KG							
	Total 200mm Vertical z-girts	853.94	KG							
	Total semi-rigid mineral wool insulation	5331.88	M3							
	Total XPS insulation	18.46	M3							
	Total Self adhered air/vapour barrier membrane	3670.64	M2							
	Total UV resistant barrier	72.16	M2							
	Mortar, 10mm joint size	16174.06	KG		31.25	kg/m2	From hcma tab			
	Total precast substructure HSS (steel)	0.01	M3							
	Total precast substructure L, PL (steel)	1.48	M3					602.74	KG	Assuming 25mm 18ga z-girts horizontal @400mm o.c. 2.5 linear m length per 1m2 of wall, weight 0.653
	Total precast substructure, fasteners (steel)	170.89	KG							
	Total support ledger 8"x6" L angles	2336.20	KG		34.20	kg/m		**Baseline omits this item, not needed for steel cladding**		
	Total support ledger 4"x3" L angles	341.39	KG		5.50	kg/m		**Baseline omits this item, not needed for steel cladding**		
	Total support ledger HSS	235.30	KG		18.10	kg/m		**Baseline omits this item, not needed for steel cladding**		
	Exterior steel stud back up walls									
	EW1	**2172.17**	M2							
EXTERNAL WALL	16mm exterior grade gyspsum sheathing	2172.17	M2	16						
EXTERNAL WALL	152mm steel studs @ 400mm o.c.	2172.17	M2	152						
EXTERNAL WALL	16mm Type X drywall	2172.17	M2	16						
	PW1 - Parapet	**380.91**	M2							
EXTERNAL WALL	16mm exterior grade gyspsum sheathing	380.91	M2	16						
EXTERNAL WALL	152mm steel studs @ 400mm o.c.	380.91	M2	152						
EXTERNAL WALL	Semi-rigid mineral wool batt insulation	380.91	M2	152						
EXTERNAL WALL	13mm Roof decking board roofside sheathing	380.91	M2	13						
EXTERNAL WALL	50mm Polyiso rigid insulation	380.91	M2	50						
EXTERNAL WALL	6mm Protection board	380.91	M2	6						
EXTERNAL WALL	2 ply SBS roofing membrane	380.91	M2							
	Total Exterior gypsum sheathing	**40.85**	**M3**							
	Total Type X drywall	**34.75**	**M3**							
	Total 152mm steel studs @ 400 o.c.	**2553.08**	**M2**							
	Total Semi-rigid mineral wool batt insulation	**57.90**	**M3**							
	13mm Roof decking board roofside sheathing	**380.91**	**M2**							
	Total 50mm Polyiso rigid insulation	**19.05**	**M3**							
	Total 6mm Protection board	**380.91**	**M2**							
	Total 2 ply SBS roofing membrane	**380.91**	**M2**							
	Floors and Roofs structure (Struct. Revit)									
	Slab on grade							**Baseline: Change to industry average concrete**		
SLAB	Cast-in-place concrete GUL cement 35MPa 50% SCM (C-1)	700.00	M3					700.00	M3	BC industry average
SLAB	Reinforcement	28000.00	KG		40.00	kg/m3				
	Slabs & Beams (non-pool areas)							**Baseline: Change to industry average concrete**		
SLAB	Cast-in-place concrete GUL cement 35MPa 10% SCM (N)	1200.00	M3					1200.00	M3	BC industry average
SLAB	Reinforcement	162000.00	KG		135.00	kg/m3				
	Slabs & Beams (pool areas)							**Baseline: Change to industry average concrete**		
SLAB	Cast-in-place concrete GUL cement 35MPa 10% SCM Exp. (C-3)	1200.00	M3					1200.00	M3	BC industry average
SLAB	Reinforcement	180000.00	KG		150.00	kg/m3				
	CLT Roof							**Baseline: Replace with Steel Deck**		
SLAB	5 PLY CLT Panels	780.00	M3					2111.42	m2	Steel Deck - 76mm x 0.91 (20 ga). Areas adjusted slightly from structural takeoff to match architectural
								2111.42	m2	Steel Deck - 76mm x 1.21 (18 ga). Areas adjusted slightly from structural takeoff to match architectural
SLAB	Micellaneous steel at wood roof	125000.00	KG				Struct: Approx 30 kg/m2 for crank plates and drag struts	Omit in baseline, all steel for steel deck accounted for		
	Glulam Beams and trusses							**Baseline: Change to structural steel - beams, braces, misc angles, plates, connections**		
BEAM	Glulam	535.00	M3					**551000.00**	**KG**	Total - approx 145 kg/m2 total steel average weight (including cols)
								82650.00	KG	HSS-Advised by structural to estimate HSS at 15% of total steel for DD
								468350.00	KG	Other structural steel
	Library Roof									
SLAB	Steel Deck - 76mm x 0.91 (20 ga)	924.65	M2				Areas adjusted slightly from structural takeoff to match architectural			
SLAB	Steel Deck - 76mm x 1.21 (18 ga)	924.65	M2				Areas adjusted slightly from structural takeoff to match architectural			
	Total CIP concrete GUL cement 35MPa SOG 50% SCM (C-1)	**700.00**	**M3**				Closest EPD available is 40 SCM (F-2)	**700.00**	**M3**	BC industry average
	Total rebar SOG	**28000.00**	**KG**							
	Total (non pool) CIP concrete GUL cement 35MPa Suspended slab 10% SCM (N)	**1200.00**	**M3**				EPD with lowest SCM is 15%. Conservative approach, assumed no SCM	**1200.00**	**M3**	Structural requirements restricts SCM content below baseline of 20 SCM. No change from proposed due to structural requirement
	Total rebar non pool Suspended slab	**162000.00**	**KG**							
	Total (pool areas) CIP concrete GUL cement 35MPa Suspended slab 10% SCM (C-3)	**1200.00**	**M3**				EPD with lowest SCM is 15%. Conservative approach, assumed no SCM. This EPD was F-2 instead of C-3	**1200.00**	**M3**	Structural requirements restricts SCM content below baseline of 20 SCM. No change from proposed due to structural requirement
	Total rebar pool Suspended slab	**180000.00**	**KG**							
	Total 5-PLY CLT Panels	**780.00**	**M3**					**29644.34**	**KG**	Steel Deck - 76mm x 0.91 (20 ga). Areas adjusted slightly from structural takeoff to match architectural
								38702.33	**m2**	Steel Deck - 76mm x 1.21 (18 ga). Areas adjusted slightly from structural takeoff to match architectural
	Total Glulam Beams	**535.00**	**M3**					**82650.00**	**KG**	HSS-Advised by structural to estimate HSS at 15% of total steel for DD
								398097.50	**KG**	Other structural steel
	Total Micellaneous steel at wood roof	**125000.00**	**KG**					**Omit in baseline, all steel for steel deck accounted for**		
	Total Steel Deck - 76mm x 0.91 (20 ga)	**12982.02**	**KG**		14.04	kg/m2	per canam P2404 data sheet, 76mm deck 20ga is 14.04 kg/m2			
	Total Steel Deck - 76mm x 1.21 (18 ga)	**16948.74**	**KG**		18.33	kg/m2	per canam P2404 data sheet, 76mm deck 18ga is 18.33 kg/m2			
	Roofing Assemblies									
	R1 (CLT Roof)	4222.84	M2					**Baseline: Increase insulation by 1" and add decking membrane**		
ROOF	2 ply SBS roofing membrane	4222.84	M2							
ROOF	6 mm Protection Board	4222.84	M2	6						
ROOF	polyiso tapered insulation sloped to drains	4222.84	M2	75			Assembly sheet notes EPS, envelope consultant advises polysio			
ROOF	High-density polyiso insulation	4222.84	M2	125			Assuming average height	4222.84	M2	Increased insulation to 175mm to match the proposed assembly R-value due to replacement of CLT with steel deck.
ROOF	Roof AVB membrane	4222.84	M2							
								4222.84	M2	16mm decking board added for steel deck replacement
	R2 (Steel Deck)	1849.29	M2							
ROOF	2 ply SBS roofing membrane	1849.29	M2							
ROOF	6 mm Protection Board	1849.29	M2	6						
ROOF	polyiso tapered insulation sloped to drains	1849.29	M2	75			Assuming average height			
ROOF	High-density polyiso insulation	1849.29	M2	150			Assembly sheet notes EPS, envelope consultant advises polysio			
ROOF	Roof AVB membrane	1849.29	M2							
ROOF	13mm Roof decking board	1849.29	M2	13						
	Total 2 ply SBS roofing membrane	**6072.13**	**M2**							
	Total Protection Board	**6072.13**	**M2**	6						
	Total polyiso tapered insulation sloped to drains	**455.41**	**M3**							
	Total High-density polyiso insulation	**805.25**	**M3**					**105.57**	**M3**	Polyiso insulation added to match CLT r-value
	Total Roof AVB membrane	**6072.13**	**M2**							
	Total 13mm Roof decking board	**1849.29**	**M2**					**4222.84**	**M2**	Roof decking board added replacing CLT
	Flooring Assemblies									
	F1 - Concrete slab on grade	**5404.74**	**M2**							
SLAB	15 mil vapour barrier	5404.74	M2	0.381						
	F2 - Concrete slab on grade - insulated	**82.97**	**M2**							
SLAB	15 mil vapour barrier	82.97	M2	0.381						
SLAB	XPS Insulation	82.97	M2	50			Assuming Owens Corning Foamular NGX			
	Total HDPE Air / vapour barrier	**5487.71**	**M2**	0.381						
	Total XPS insulation	**4.15**	**M3**				Assumed Owens Corning Foamular NGX XPS until confirming we can spec Soprema			
	Soffits									
	S1 - ACM Soffit	341.82	M2							
SLAB	152mm steel studs @ 400mm o.c.	341.82	M2	152			Framing to match EW1 (ACM cladding backup)			
SLAB	16mm exterior grade gyspsum sheathing	341.82	M2	16						
SLAB	Self adhered air/vapour barrier membrane	341.82	M2							
SLAB	200mm Semi-rigid mineral wool insulation	341.82	M2	200						

	S2 Exterior wood soffit	226.16	M2							
SLAB	152mm steel studs @ 400mm o.c.	226.16	M2	152			Framing to match EW1 (ACM cladding backup)			
SLAB	16mm exterior grade gyspsum sheathing	226.16	M2	16						
SLAB	Self adhered air/vapour barrier membrane	226.16	M2							
SLAB	200mm Semi-rigid mineral wool insulation	226.16	M2	200						
	S3 Spray applied thermal insulation	2824.63	M2							
SLAB	127mm Glass fibre/polymer spray applied insulation (R20)	2824.63	M2	127						
	Total 152mm steel studs @ 400mm o.c.	**567.98**	**M2**							
	16mm exterior grade gyspsum sheathing	**9.09**	**M3**							
	Total Self adhered air/vapour barrier membrane	**567.98**	**M2**							
	Total Semi-rigid mineral wool insulation	**113.60**	**M3**							
	Total 127mm Glass fibre/polymer spray applied insulation (R20)	**358.73**	**M3**				Recycled natural fiber thermal and acoustical insulation, spray-applied, RSI = 1 m2K/W, 38.4 mm, 2.1502 kg/m2, K-13, K-13 High-R System (International Cellulose Corporation)			
	Exterior Windows & Doors									
	Curtain Wall									
WINDOW	Exterior aluminum curtain wall, triple glazed	1119.42	M2				Revit wall schedule (CW-1) + (CW-2) - (CW door areas). Includes clerestory			
	Punch Window (Circle @ Library)									
WINDOW	Punch Window	2.54	M2				Manual area takeoff from 75%DD arch set pdf			
	Exterior doors									
DOOR	Curtain Wall aluminium / glass doors	46.01	M2				Revit Exterior door area schedule, CW doors			
DOOR	Hollow metal doors	54.99	M2		1.95	m2/unit	Revit Exterior door area schedule, PSF single and double door. Per product EPD, doors are 915 x 2135 = 1.954 m2/door			
	Total Hollow metal doors	**28.14**	**UNIT**							
	Concrete Stairs	**52.47**	**M3**					**Baseline: Change to industry average concrete**		
STAIRS	Cast-in-place concrete GUL cement 35MPa 10% SCM (N)	52.47	M3				EPD with lowest SCM is 15%. Conservative approach, assumed no SCM			Structural requirements restricts SCM content below baseline of 20 SCM. No change from proposed due to structural requirement
STAIRS	Reinforcement	7083.45	KG		135.00	kg/m3				

11.5 Design strategy evaluation tracker

Design Strategy Evaluation Tracker

Last update: 2025-08-08

Impact Category	Targets	System Category	Design Strategies/Studies/Assumptions	Discipline	Status / Comments
Operational GHG Reductions	TEUI - 25% Reduction over NECB ZCB - Design TEDI target (to compare and assess only, no requirement for ZCB Flexible approach Path 1 - No combustion) - 30 kWh/m2/yr TEDI equal to or better than NECB baseline Carbon neutral operations Design for 2080 climate	Envelope	Walls above grade- R-20 - cladding + 25mm z girts in air space + 200mm of Rockwool Cavity Rock mineral wool insulation with EJOT (or equivalent) thermal clips + 16mm ext. GWB sheathing + 152mm uninsulated steel studs + 16mm int. GWB Walls below grade R-10: 75mm of XPS insulation Roofs - R-35: 2-ply SBS, 6mm cover board, 150mm of polyiso + EPS slope package + AVB membrane on structural deck Slab on grade - R-7.5 for 1.2m perimeter (50mm XPS under full extent of slab)	Architecture, Envelope, Energy modelling	Included in Class D costing memo - Architectural **31.07.25:** Envelope performance being assessed and optimized through energy modelling and lifecycle costing **08.08.25:** Carried forward into CD. Potential optimization of wall insulation and glazing based on LCCA modelling results results
		Thermal bridging	Membrane through wall flashing (not metal) Fiberglass angle to support curtain wall Thermal breaks (Schock) at major structural connections through the envelope	Architecture, Envelope, Energy modelling	Included in Class D costing memo - Architectural **31.07.25:** Envelope detailing to be completed in CD to match
		Glazing	Explore feasibility of a 35% Window to wall ratio	Architecture, Energy modelling	Included in Class D costing memo - Architectural **08.08.25:** Design is within this limit
			Triple glazing (low e Sunguard SN68 on #2 and 5)	Architecture, Envelope, Energy modelling	Included in Class D costing memo - Architectural **08.08.25:** Carried forward into CD. Potential optimization of wall insulation and glazing based on LCCA modelling results results
			Curtain wall Kawneer 1600UT system 2	Architecture, Envelope, Energy modelling	Included in Class D costing memo - Architectural **08.08.25:** Carried forward into CD. Potential optimization of wall insulation and glazing based on LCCA modelling results results
		Shading devices	Consider 800mm fixed overhangs above South windows Consider 500mm deep vertical shading fins on East and West windows	Architecture, Energy modelling	Included in Class D costing memo - Architectural **08.08.25:** Design includes overhangs and screens
		Air tightness	Enhanced quality assurance during construction + mid and final airtightness testing	Architecture, General Contractor	Included in Class D costing memo - Architectural **08.08.25:** To be included in specifications in CD
		Program	~~Physical separation of natatorium~~	Architecture, Mechanical, Energy modelling	Not viable due to architectural programming and distribution
		Plant	All-electric. ASHP + WWHP with electric boiler back-up	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Included and carried forward to CD
		Ventilation	High efficiency ventilation heat recovery (ERV)	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Included and carried forward to CD. Higher efficiency to be explored based on LCCA results
			Natural ventilation in perimeter areas for thermal comfort and fan power reductions	Architecture, Mechanical	Not mentioned in costing memos. Method of assessment unclear **04.04.25** Per reLoad & AME discussion,Gym and MPR potential candidates for natural ventilation. Also consider lower temperature setpoint for gym and fitness (18°C) **15.04.25** Natural ventilation will continue to be explored for gymnasium and MPR. Team agrees to lower heating setpoint in gym and fitness to 18°C. Ceiling fans will also be considered **08.08.25:** Included and carried forward to CD for gymnasium and MPR
			Demand controlled ventilation and occupancy sensors in multi occupant spaces	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Included and carried forward to CD
			Explore radiant slab (potential to reduce fan power load)	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Included and carried forward to CD
			~~Explore Solarwall ventilation pre-heat~~	Mechanical, Energy modelling	Not mentioned in costing memos. Is this still an ECM? **04.04.25** Per reLoad & AME discussion, strategy not being considered. Narrative to follow
			~~Explore Earth tube ventilation pre-heat~~	Mechanical, Energy modelling	Not mentioned in costing memos but included as ECM for Hydro study **04.04.25** Per reLoad & AME discussion, strategy could be viable for change rooms. Currently cooling is not provided to change rooms. reLoad recommends considering cooling, in which case earthtubes could help loads. **04.04.25** Assess payback period if cooling is provided to changerooms. **15.04.25** Earth tube air tempering will be modeled and impact assessed **08.08.25:** Strategy assessed through LCCA. Deemed not viable due to geotechnical risk
		Heat recovery	~~Active heat recovery strategies (exhaust cooling coil)~~	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Strategy assessed through LCCA. Deemed not viable due to unfavourable results in LCCA
			Passive drain heat recovery from showers (Renewability)	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Included and carried forward to CD
			~~Drain hot tubs at night to reduce dehumidification demand~~	Mechanical, Energy modelling	Not mentioned in costing memos but is included in ECM list **04.04.25** Per reLoad & AME discussion, strategy could be viable for change rooms. Currently cooling is not provided to change rooms. reLoad recommends considering cooling, in which case earthtubes could help loads. **04.04.25** Per discussion with Arch. team, client group may not be interested. Assess payback period if model demonstrates significant savings. **08.04.25** AME provided parameters for modelling of thermal storage tank for hot pools. **15.04.25** AME confirms tank woul be underneath hot pool in mechanical room **08.08.25:** Strategy deemed unviable due to unfavourable results in LCCA
			~~Active sewage heat recovery (Sharc-Piranha)~~	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Strategy deemed unviable due to unfavourable results in LCCA
			~~Evaluate Active Sewage Heat recovery: from pool filter back wash~~	Mechanical, Energy modelling	To be assessed in energy model, information provided by mechanical **08.08.25:** Strategy deemed unviable due to unfavourable results in LCCA
		Pool systems	~~Evaluate drum filtration. In Blue?~~	Mechanical, Energy modelling	Sand filtration chosen through CBA framework. Mechanical memo refers to appendix but was not included in memo.
			~~Evaluate sand filtration as polishing filters~~	Mechanical, Energy modelling	Sand filtration chosen through CBA framework. Mechanical memo refers to appendix but was not included in memo.
			Consider pool covers – physical	Mechanical, Energy modelling	Not mentioned in costing memos **30.04.25** Not mentioned in SD report for costing **14.05.25** Peter Fox from Leisure Quest mentions this will be discussed during June 5 aquatics team discussions but storage would be an issue for physical covers and notes little success with chemical blanket treatment
			Evaluate pool covers – chemical	Mechanical, Energy modelling	Not mentioned in costing memos **30.04.25** Not mentioned in SD report for costing **14.05.25** Peter Fox from Leisure Quest mentions this will be discussed during June 5 aquatics team discussions but storage would be an issue for physical covers and notes little success with chemical blanket treatment
		Renewable energy	Solar energy generation for power (PV)	Electrical, Energy modelling	Included in Hydro ECM list, check electrical. Currently not in costing. **01.04.25** Sent follow up to electrical to provide information for modelling **15.04.25** Preliminary sizing provided, AES to provide adjusted size and annual generation **08.08.25:** Included and carried forward to CD as an option for costing.

			~~Hot-Pool Thermal Storage Tank~~	Mechanical, Energy modelling	Do not see this in Class D costing electrical or mechanical memos **04.04.25** Per discussion with Arch. team, client group may not be interested. Assess payback period if model demonstrates significant savings. **09.04.25** AME provided assumptions for modelling of thermal storage tank specific for hot pools. **08.08.25:** Strategy deemed unviable due to unfavourable results in LCCA
			~~Thermal energy storage~~	Mechanical, Energy modelling	**24.04.25** AME provided assumptions for modelling of thermal storage in both heating and cooling systems **08.08.25:** Strategy deemed unviable due to unfavourable results in LCCA
			Battery energy storage	Electrical, Mechanical, Energy modelling	Do not see this in Class D costing electrical or mechanical memos **01.04.25** Sent follow up to electrical to provide information for modelling **15.04.25** Ryan from CoC confirms there is a possibility to use a battery from BC Hydro. Follow up to request information to consider this. **21.04.25** Andy (AES) confirms BESS is part of the BC Hydro study, and being considered for peak shaving only. However, it does have potential use as back-up power as well. In any case, energy model results are required to advance assessment **08.08.25:** Strategy requiring further coordination in CD
		Lighting	Daylight sensor controls	Electrical, Energy modelling	Not part of FCM studies but will be assessed **01.04.25** Sent follow up to electrical to provide information for modelling **15.04.25** AES to provide approximate location of daylight sensors for modelling **08.08.25:** Included and carried forward to CD
Water Conservation	20% indoor water use reduction - US EPA baseline 50% outdoor water use reduction compared to LEED v4/4.1 baseline Process water target TBD	Fixtures	Specify water sense labeled and low flow showers Specify water sense labeled and low flow faucets and toilets.	Mechanical	To be assessed through water balance. Include in specifications. **08.08.25**: Low-flow included as recommended by AME
		Reuse & Capture	Evaluate use of backwash water for toilet flushing	Mechanical	To be assessed through water balance and mechanical input. Mentioned in mech. costing memo **08.08.25:** Unfavourable in LCCA but will continue to be explored due to potential water savings
			~~Evaluate grey-water treatment for re-use~~	Mechanical	To be assessed through water balance and mechanical input **08.08.25**: Only backwash for toilet flushing deemed viable due to cost and filtration requirements
			~~Evaluate drained pool water for irrigation or fire suppression~~	Mechanical	**To be assessed through water balance and mechanical input** **08.08.25:** Only backwash for toilet flushing deemed viable due to cost and filtration requirements
			~~Evaluate rainwater capture for reuse in building systems for toilet flushing, pool makeup, fire suppression or irrigation~~	Mechanical, Civil, Landscape	To be assessed through water balance and mechanical, civil, landscape input **08.08.25:** Only backwash for toilet flushing deemed viable due to cost and filtration requirements
		Irrigation	~~Consider use of efficient irrigation and irrigation retention methods such as drip irrigation and root watering~~	Mechanical, Landscape	Mechanical memo mentions greywater reuse system including captured rainwater but not potential irrigation use. To be assessed through water balance. **08.08.25:** Only backwash for toilet flushing deemed viable due to cost and filtration requirements
		Process water	~~Evaluate process water reduction opportunities & establish target based on proposed mechanical system~~	Mechanical	To be assessed through water balance and mechanical input **08.08.25:** Only backwash for toilet flushing deemed viable due to cost and filtration requirements
Materials and IEQ	20% Embodied carbon reduction compared to functionally equivalent baseline Comply with LEED v4/v4.1 Construction and Demolition Waste Management - Option , Path 2. Divert 75% & 4 material streams Comply with LEED v4/v4.1 low emitting materials Comply with LEED v4/v4.1 enhanced indoor air Comply with LEED v4/v4.1 IAQ testing	Structure	Evaluate lighter structural materials including wood to reduce volume of concrete foundations	Structural	To be assessed through structural design and LCA, included in costing memo **08.08.25:** Refer to embodied carbon memo
			Specify low carbon concrete mixes.	Structural	To be assessed through structural design and LCA, included in costing memo **08.08.25:** Refer to embodied carbon memo
			Review design for possible structural efficiencies	Structural	To be assessed through structural design and LCA, included in costing memo **08.08.25:** Refer to embodied carbon memo
		Insulation	Evaluate insulation impact, optimize insulation, use low emission insulation types	Architecture, Envelope	Low carbon assemblies to be proposed by architecture & envelope **08.08.25:** Refer to embodied carbon memo
		Material procurement and reuse	Consider end of life of all details and materials to be used in the design, and potentially design elements for disassembly and re-use.	Architecture, Structural	Not mentioned in costing memos. Consider potential and assessment method **08.08.25:** To be addressed in CD through specifications
			Evaluate opportunities to access materials available for repair, refurbishment, repurposing or reuse within the organization (furniture, equipment).	Architecture, Structural	Consultants to comment. No mention in costing memo **08.08.25:** To be addressed in CD through specifications
			Evaluate opportunities to access salvaged materials, such as construction material to be remanufactured or repurposed.	Architecture, Structural, General Contractor	Consultants to comment. No mention in costing memo **08.08.25:** To be addressed in CD through specifications
			Prioritize recycled content in new product procurement. Utilize LEED v4/v4.1 Building Product Disclosure and Optimization credits to inform specifications, procurement and tracking.	Architecture	To be addressed during architectural specifications **08.08.25:** To be addressed in CD through specifications
		Waste	Evaluate reduction of construction waste by at least 75% using LEED v4/v4.1 Construction Demolition and Waste Management credit to inform contract documents and tracking.	General Contractor	Tracker to be set up during contractor onboarding. **08.08.25:** To be addressed in CD through specifications
		Material health and indoor quality	Specify low emitting materials and protect indoor air quality during construction. Align with LEED v4/v4.1 Low emitting materials requirements for paints, coatings, adhesives, sealants, flooring, ceilings, walls, acoustic and thermal insulation, composite wood and furniture.	Architecture	To be addressed during architectural specifications
			Comply with LEED v4/v4.1 Enhanced IAQ strategies including implementing entryway systems, preventing ventilation cross-contamination, and MERV 13 filtration media.	Architecture, Mechanical	MERV 13 not mentioned in mechanical costing memo, but assumed to be included. CO2 sensors included. Mechanical to reference LEED enhanced IAQ strategies for guidance. **08.08.25:** MERV 13 at a minimum included in mechanical design
			Conduct an air quality test upon construction completion in accordance with LEED v4/v4.1 IAQ Testing.	General Contractor	To be included in OPR. Coordination during construction **08.08.25:** To be addressed in CD through specifications
Biodiversity & Ecological Functions	Improve natural landcover conditions to better support the downstream watershed Retain 80% of regional rainfall events Restore 25% of the disturbed site area (including building footprint) with vegetated area and restored soils (as defined in LEED v4.1) Vegetate >25% of open space	Rainwater	Explore restoration of onsite stream/watercourse and direct rainwater to improve volume and flow to downstream watershed.	Civil, Landscape	Consultants to comment on stormwater management strategy and impacts to the downstream watershed. **08.08.25:** Refer to narrative in Sustainability Plan
			Explore the use of bioswales and other low impact development strategies to slow and manage rainwater.	Civil, Landscape	Final site boundary for assessment TBD. Landscape Zone 2 includes detention pond. **08.08.25:** Refer to narrative in Sustainability Plan
		Landscape & Biodiversity	Evaluate use of native and adaptive plant species with low water demand for trees, shrubs and ground cover	Landscape	final site boundary for assessment TBD. Landscape memo mentions 'disturbed areas to be revegetated with native plants' **08.08.25**: Refer to narrative in Sustainability Plan
			Consider the use of xeriscape landscape principles and low-maintenance planting with potentially non-irrigated areas.	Landscape	Xeriscaping or (landscaped areas without irrigation) currently not mentioned explicitly in memo **08.08.25:** Refer to narrative in Sustainability Plan
			Consider the plant community make up and neighbouring ecotones to increase species richness and diversity as well as to facilitate species movement	Landscape	Final site boundary for assessment TBD. Landscape memo mentions 'disturbed areas to be revegetated with native plants' **08.08.25:** Refer to narrative in Sustainability Plan
			Consider the existing ecosystem in Burke Mountain while selecting plants and plant communities, incorporating the core principle of right plant, right place.	Landscape	Final site boundary for assessment TBD. Landscape memo mentions 'disturbed areas to be revegetated with native plants' **08.08.25:** Refer to narrative in Sustainability Plan
		Heat island reduction	Use trees around the building and around the site to provide shade and reduce heat islands.	Landscape	Final site boundary for assessment TBD. Performance to be assessed by impact team using LEED heat island calculation method. **Assess with and without south forested area** **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Consider material and colour selection with low heat absorption and SRI to reduce heat island effect.	Architecture, Envelope, Landscape	Final site boundary for assessment TBD. Prioritize high SRI value materials **with testing** for roofing and paving. Impact can support product selection. Performance to be assessed by impact team using LEED heat island calculation method. **08.08.25:** To be addressed in CD through specifications
			Place parking underground or undercover	Architecture, Envelope, Landscape	Currently 132/199 = 66.3% underground parking. Consider canopy or PV over surface parking. LEED Heat Island credit requires 75% under cover for reference. **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Design open space to be vegetated, shaded, and cool.	Landscape	Final site boundary for assessment TBD. Performance to be assessed by impact team using LEED heat island calculation method. **08.08.25:** Refer to metrics and narrative in Sustainability Plan
		Accessibility		Architecture	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan

Transportation, community and experience	Active and sustainable transportation Universal accessibility	Active & Sustainable Transportation	Provide short- and long-term bicycle storage facilities aligning with LEED v4/4.1 Bicycle facilities credit	Architecture	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Provide E-V charging infrastructure aligned with LEED v4.1 electric vehicles credit	Architecture, Electrical	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Provide charging stations for personal mobility devices like wheelchairs, electric bicycles and scooters	Architecture, Electrical	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Maximize connectivity to bike networks and park systems	Architecture, Landscape, Civil	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan
			Explore opportunities to promote rideshare and carpooling through priority parking or otherwise	Architecture	To be addressed in DD **08.08.25:** Refer to metrics and narrative in Sustainability Plan