GLOTMAN | SIMPSON
60TH ANNIVERSARY

Sen’áḵw - Phase 1
EMBODIED CARBON STUDY

PREPARED BY
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PHOTO CREDIT: REVERY ARCHITECTURE

Project Overview

The Sen̓áḵw development is an Indigenous-led development at the south end of Burrard Bridge in central Vancouver.

- **Owner:** Nch'ḵay West
  (Nch'ḵay̓ Development Corporation and Westbank Projects Corp)
- **Architect:** Revery Architecture
- **Structural Engineer:** Glotman Simpson Consulting Engineers
- **General Contractor:** Peak Construction
- **Mechanical Engineer:** AME Consulting Group
- **Electrical Engineer:** Nemetz
- **LCA Consultant:** Glotman Simpson Consulting Engineers

A landmark Indigenous-led development by the Squamish Nation, Sen̓áḵw is located at the south end of Vancouver's Burrard Bridge. Delivering 6,000 rental units over 11 towers across four phases, it is one of Canada's largest urban Indigenous housing projects. Designed to be car-light and carbon-conscious, Sen̓áḵw emphasizes high-density housing, extensive cycling infrastructure, and a transit hub—making it a model for sustainable, self-determined development on Indigenous land.

We respectfully acknowledge that the Sen̓áḵw development is located on the unceded territory of the Skwxwú7mesh Úxwumixw (Squamish Nation), who lead this project with vision and sovereignty. We also recognize that our work is conducted on the traditional, ancestral, and unceded territories of the Skwxwú7mesh (Squamish), Səl̓ílwətaʔ/Selilwitulh (Tsleil-Waututh), and xʷməθkʷəy̓əm (Musqueam) Peoples. We are committed to ongoing learning, reconciliation, and partnership in all that we do.

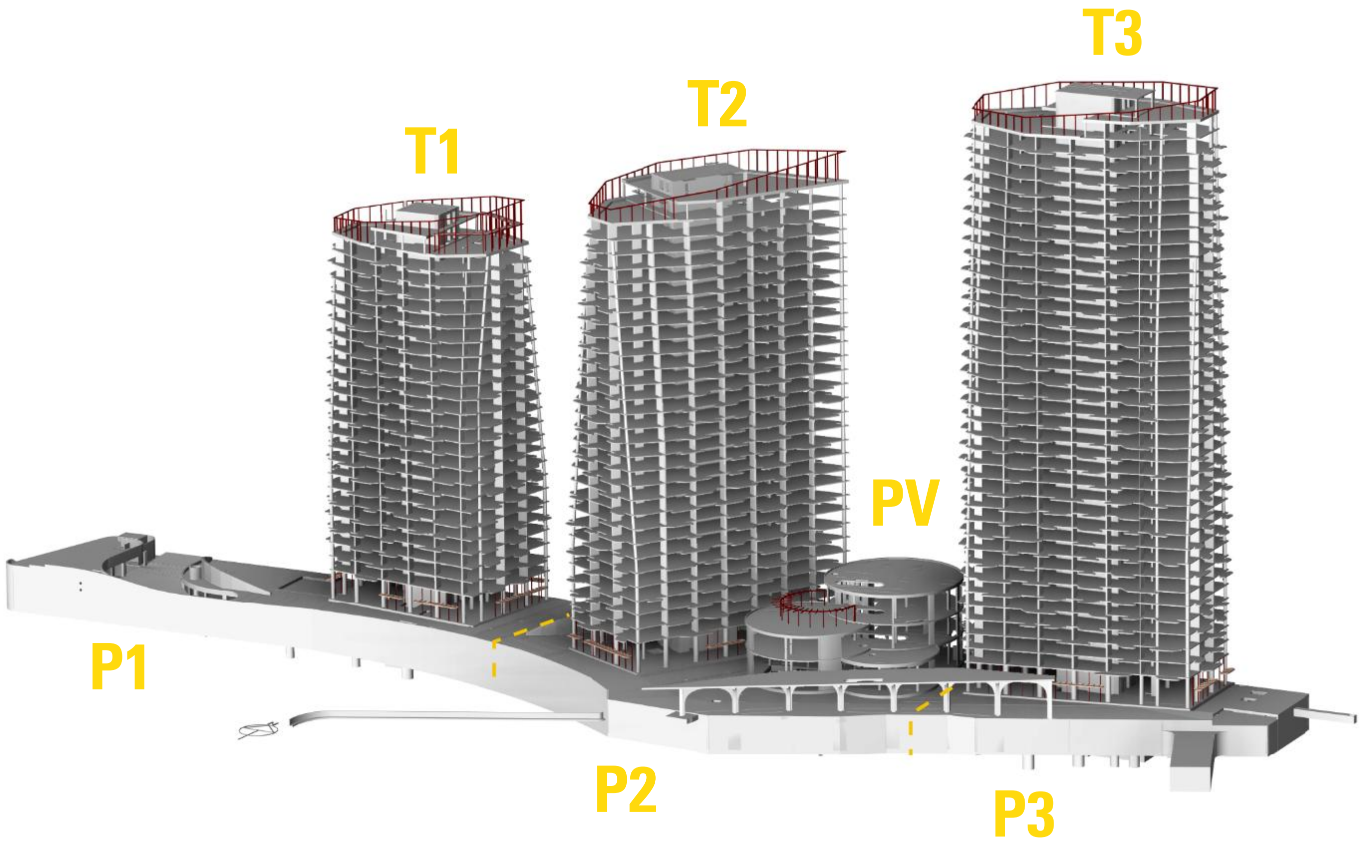

PHOTO CREDIT: BCIT

About Phase 1

Phase 1 of Sen̓áḵw begins the transformative project with three striking rental towers delivering 1,400 homes alongside new transit, cycling, and public spaces.

- **Building Type:** Residential
- **Location:** Vancouver, BC (Canada)
- **GFA:** 93,781 m^2 (1,009,450 SF)
- **Project Stage:** Under Construction – Estimated occupancy in 2026
- **LCA Method:** EC3
- **Assessment Scope:** Cradle to Grave (A-C) Substructure + Shell
- **Assessment Period:** 60 Years

Sustainability is at the heart of the development, which is designed to be carbon-neutral in operation. Including a transit hub, the focus on public transport and bicycle infrastructure has ensured that excessive below-grade parking construction is avoided.



Assessment Objective

Glotman Simpson conducted this embodied carbon study at the request of the City of Vancouver to provide technical insight and performance commentary on how the Sen̓áḵw development would fare under the embodied carbon requirements in the 2025 Vancouver Building By-law (VBBL) – with a reduction 'f' factor of 0.9, i.e. a 10% reduction.

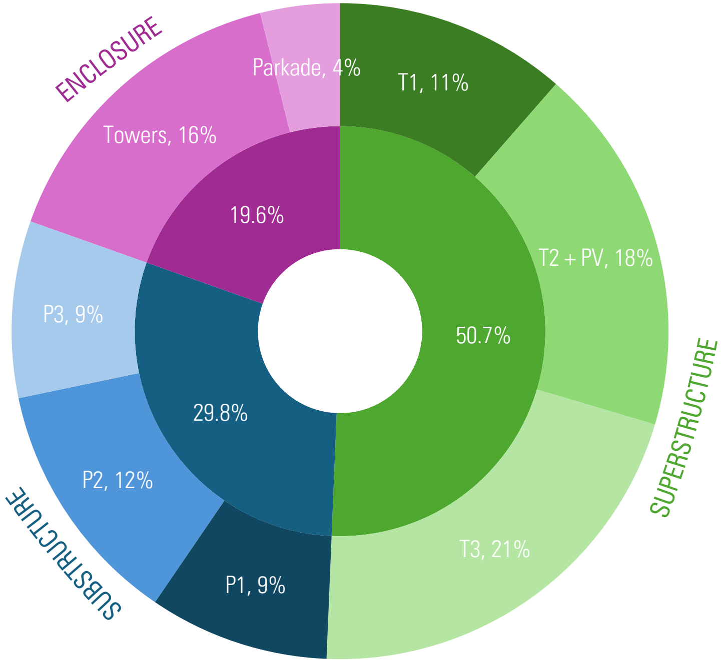
The study involved conducting multiple whole-building Life Cycle Assessments (LCAs) to evaluate compliance under both regulatory pathways — the intensity limit pathway and the baseline reduction pathway. These assessments were completed in accordance with the methodological standards and best practices outlined in the National Whole-Building Life Cycle Assessment Practitioner's Guide, published by the National Research Council (NRC), and City of Vancouver Addendum (v1.0).

Glotman Simpson extends its thanks to **AME Group** for their categorization and life cycle analysis of the enclosure assemblies.

Compliance Pathway 1 –Intensity Limit

This pathway requires the building to achieve an embodied carbon intensity under a cap of 360 $kgCO_2e/m^2$. Three key project characteristics result in this building archetype adding complexity in achieving this cap:

1. The fully glazed enclosure has a higher GWP intensity when compared to its insulated stud wall counterpart.
2. The building height requires significantly stronger gravity and lateral systems. This increases the volume and strength required for the columns, shear walls and footings relative to the number of units in the project. Hence, the embodied carbon is increased due to both the increase in material volume and the relative cement quantity.
3. The shared podium layout creates a valuable public realm space that is landscaped to provide the best possible user experience. However, this space does not increase the GFA in the project. Thus, the thick L1 slab adds 9% to the building's GWP intensity.



Embodied Carbon Distribution for Phase 1

TARGET

360 $kgCO_2e/m^2$

Embodied Carbon (tCO_2e)	
T1	15%
T2	24%
T3	27%
PARKADE	34%
TOTAL	**39,667**

GFA 1 (m^2)	
T1	20%
T2	34%
T3	39%
PARKADE	0%
TOTAL	**93,781**

RESULT

423 $kgCO_2e/m^2$

(↑ 17 %)

As a result of these challenges, the Phase 1 development exceeds the limit by 17%. This is expected for a project of this size and type, and we believe this is still a significant reduction against other similar buildings. The efficient structural design and optimized building layout ,including removing all transfers from the project and minimizing the parking count, result in a much lower project intensity than the functionally equivalent baseline building. As discussed in the second pathway.

Structural Material Cost: Approximately $40M

***Note:** The approximate cost attributed to the structural materials is $40 million. This does not include formwork, excavation, or other construction processes. Any cost savings attributed to the baseline path narrative relate to the Material supply and installation only.

Compliance Pathway 2 – The Baseline Path

CATEGORIZING THE FUNCTIONALLY EQUIVALENT BASELINE BUILDING:

Per the proposed VBBL requirements, it is assumed that 0.54 stalls per rental unit will be provided in the baseline building. This would result in an additional 760 parking stalls – an additional three levels of below-grade parking.

In addition to this, a typical car-focused parking structure would typically be optimized for three parking stalls between columns. This grid would not align with typical unit layouts, resulting in a transfer structure above the parkade. This would be a significant volume of concrete for towers of this height.

Outside these characteristics, it is assumed that the structural system is similar, and the same concrete strengths would be required. In the baseline categorization, it is also assumed that all concrete mixes are at 28-day strength per the CONCRETE BC industry average EPDs.

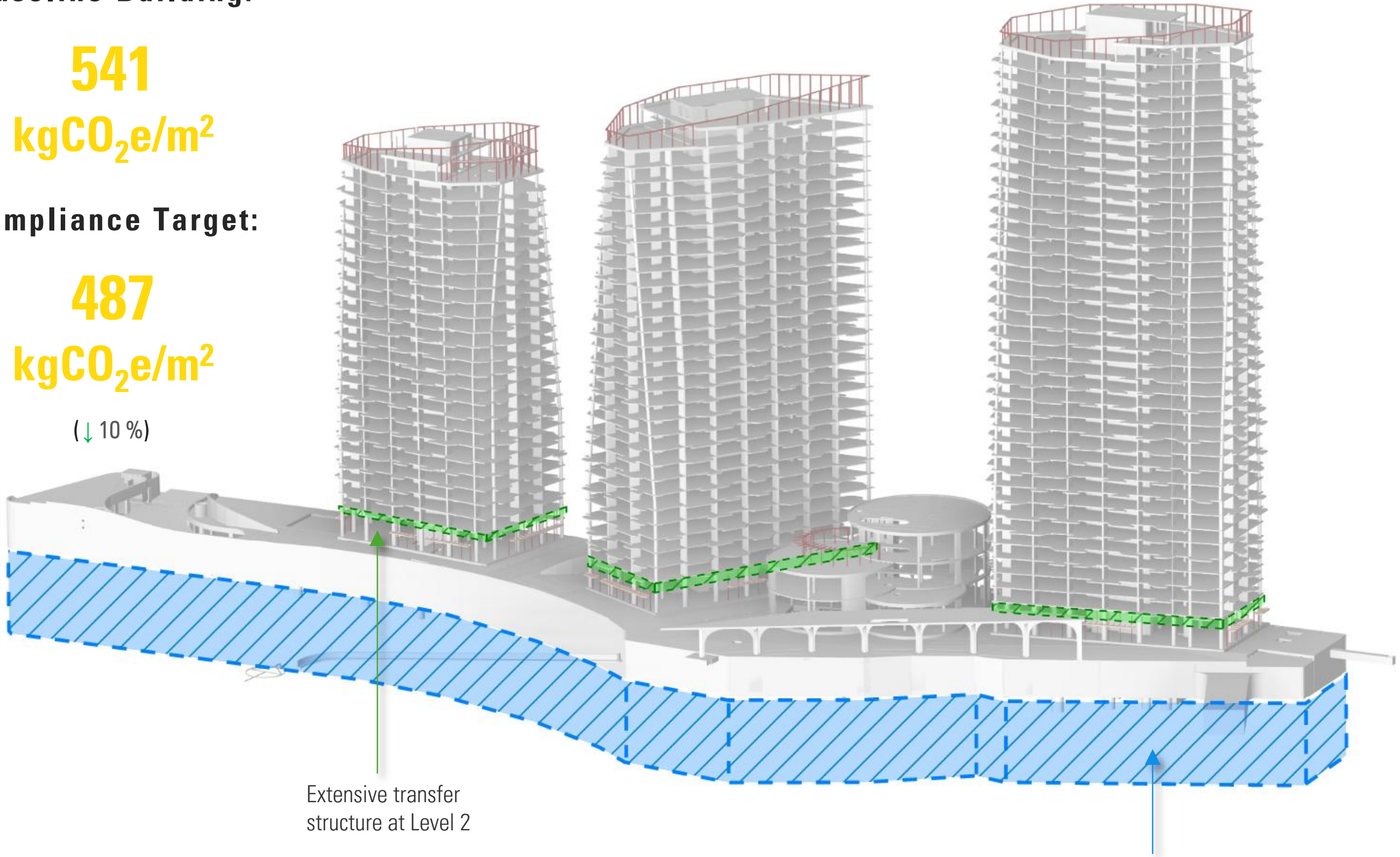
Baseline Building:

541
$kgCO_2e/m^2$

Compliance Target:

487
$kgCO_2e/m^2$

(↓ 10 %)



Compliance Pathway 2 – Reduction Strategies

REDUCTION STRATEGY # 1

REDUCE FLOOR AREA OF BELOW-GRADE CONSTRUCTION

This project's key strategy for reducing embodied carbon aligns with other environmental strategies, removing the focus on personal vehicle infrastructure. Providing only 106 vehicle stalls across the site removed three below-grade levels from the extensive site footprint. The project replaced the parking stalls with much more efficient bicycle storage and a transit hub adjacent to Burrard St.

RESULT

3 parking levels removed

18,000 yd^3 of concrete saved

2,100t reinforcing bar saved

↓ 7,800 tCO_2e

↓ $9.5 million

REDUCTION STRATEGY # 2

DESIGN STRUCTURE FOR MATERIAL EFFICIENCY

Early choices to slope the columns and align them to the below-grade structure enabled GS to design the building without transfers. A typical baseline building would have required an extensive transfer at L2 to suit the parking layout below. These transfer structures would have been 52", 72", and 84" deep, respectively, across the three towers. This simple change resulted in 4% savings in embodied carbon across the project, when only contributing 1.5% of the building slab area.

RESULT

L2 transfer slabs 95% removed

4,000 yd^3 of concrete saved

570t reinforcing bar saved

↓ 1,800 tCO_2e

↓ $2.5 million

Compliance Pathway 2 – Reduction Strategies

REDUCTION STRATEGY # 3

SELECT LOWER-CARBON STRUCTURAL AND ENCLOSURE MATERIALS AND ASSEMBLIES

Vertical building elements do not see full design loads until months after they are constructed. We specified 56 or 91-day strengths for this reason, allowing lower overall cement paste, while also encouraging higher SCM usage. The carbon intensity of these mixes can be approximated by the GUL 40SCM mix GWP intensities provided by CONCRETE BC and has no cost premium due to the lower overall cement content.

The concrete BC baseline mix GWP intensities, set in 2018, are no longer representative of typical supply in Metro Vancouver. The concrete supplier confirmed that the carbon intensities attributed to the GUL 15SCM mixes are appropriate for the current material supply, again at no cost premium.

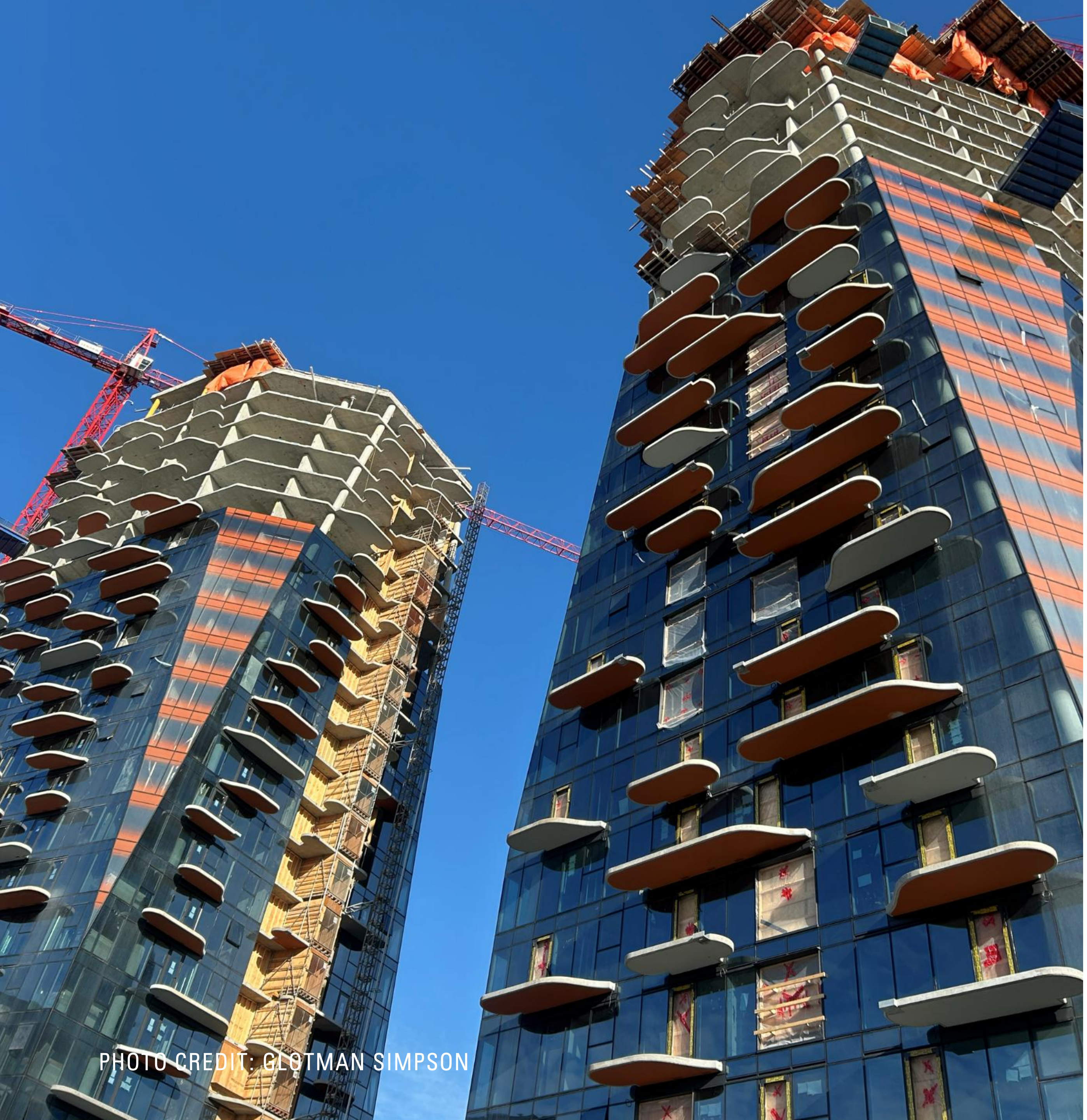
It is important to never mandate a specific SCM percentage in concrete mixes, as this can often result in cost premiums. It is best to simply specify the total concrete carbon budget for the project. This will allow the supplier the most flexibility to meet the project goals via the multitude of mix design options. Smart and appropriate specifications will not result in cost premiums and ensure the project schedule is not affected.

RESULT

Delayed strength in vertical structure
↓ 1,000 tCO_2e

Use of GUL cement
↓ 440 tCO_2e

Overall savings
↓ 1,440 tCO_2e
= No cost premium/ potential cost savings



Compliance Pathway 2

OVERALL RESULTS

TARGET	RESULT
487 $kgCO_2e/m^2$ (↓ 10 %)	423 $kgCO_2e/m^2$ (↓ 22 %)

REDUCTIONS vs BASELINE

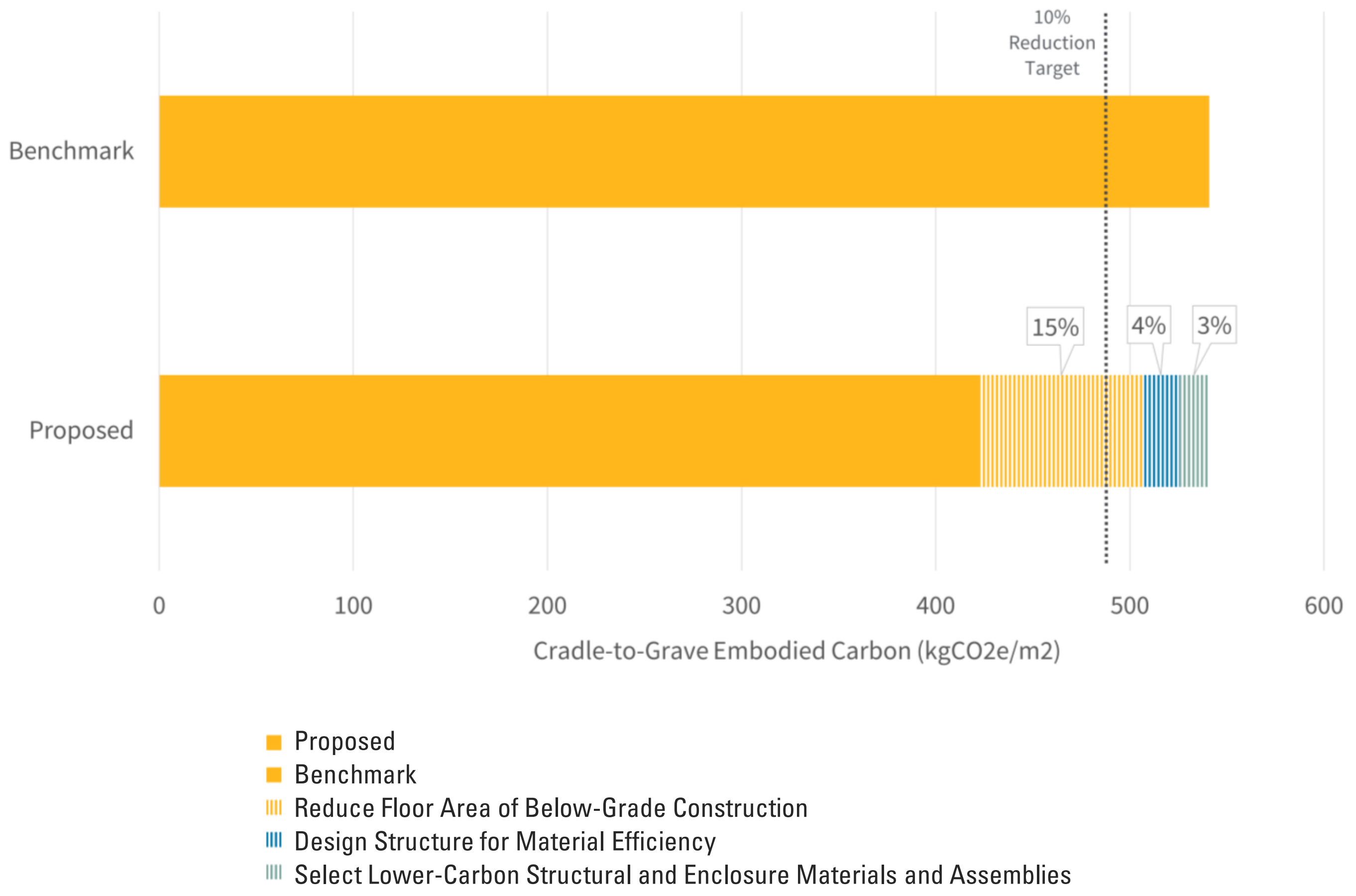
↓ 22,000 yd^3
CONCRETE

↓ 2,670 t
REINFORCING

$12.0M
COSTS SAVED

11,040 tCO2e
CARBON SAVED

Summary of Embodied Carbon Reductions Against a Functionally Equivalent Baseline Building



Conclusion

Although this project does not meet the Intensity Limit path, this project shows considerable cost (↓30%) and carbon (↓22%) savings when compared to a baseline building. This is the key result of driving carbon savings through early structural efficiency savings as opposed to late-stage material optimizations, which come at a premium.

We believe the 10% reduction proposed by the City of Vancouver, associated with a reduction factor ‘f’ of 0.9, is achievable. Targeting building efficiencies early in the design timeline, in combination with lower-carbon materials where appropriate, will enable overall material reductions and cost savings across developments within Vancouver.

Glotman Simpson is proud to have contributed to the sustainable principles of the Sen̓áḵw project and looks forward to continuing these across the remaining project phases.

Together, we can contribute to a more sustainable built environment. If you are interested in sustainability and would like to discuss any of the topics in this report, please get in touch with us at info@glotmansimpson.com.