



CUL-DE-SAC NOUVEAU

The typical North American suburb appears as a pattern of winding streets and cul-de-sacs, dotted with cookie cutter single-family houses. Over time, this pattern has spread far and wide, engulfing cities like Vancouver where 81% of residential land is strictly limited to single detached properties¹. However, our world is changing and with it, our needs. The new vision of residential utopia is a vibrant, walkable neighborhood connected to the city by bike paths and convenient public transportation.

By allowing layers of “missing middle” housing into residential neighborhoods and incentivizing practices like sustainable and participatory design, we can create **vibrant neighborhoods** with **diverse housing** types and tenures, space for local businesses and increased permeability to break away from car-dependency.

Diversity of Housing

Layering “missing middle” into neighborhoods can weave a tapestry of housing typologies into our urban fabric, ranging from single family to mid-rise apartments. Participatory design helps to ensure that diverse unit types meet the needs of current and future community members. Incentivizing a diversity of housing tenures, such as cooperative housing (co-ops), offers a middle ground between traditional rentals and home ownership while creating long-term affordable housing stock for Metro Vancouver.

The Cul-De-Sac

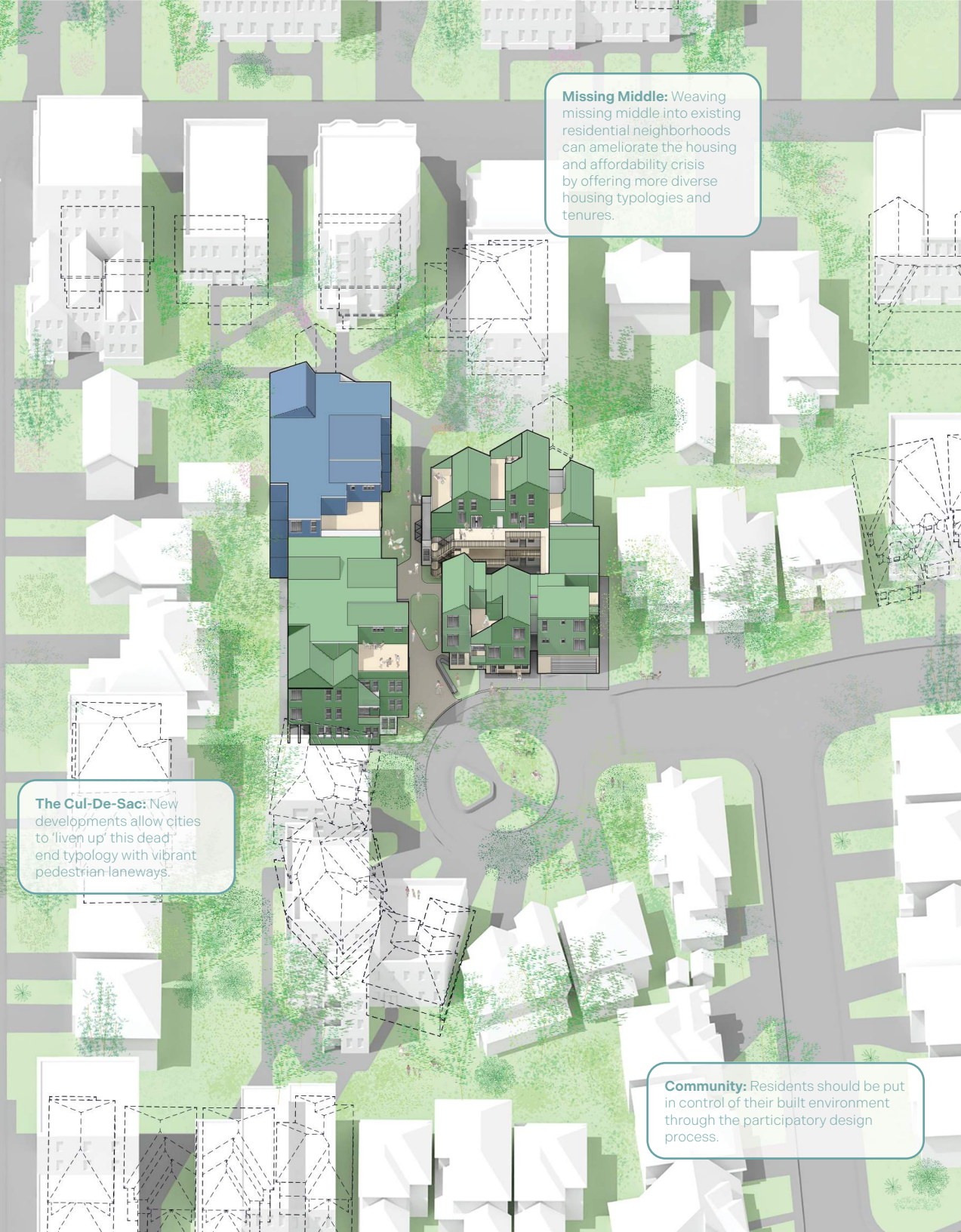
The cul-de-sac is the pinnacle of modern day suburbia. While it can be a safe haven for impromptu neighborhood events, it is too often an underutilized dead end. The cul-de-sac can be a very challenging urban design typology to mitigate once it has been laid down in a neighborhood. Through the integration of “missing middle” into the residential fabric, there is an opportunity to create permeability and connection by breaking through with pedestrian laneways to open up the otherwise car-centric cul-de-sac.

1 - Jens von Bergmann, “SDH Zoning and Land Use: How Much Land Do Single Detached and Duplex Houses Consume?” Mountain Math (blog), June 17, 2016.

Missing Middle: Weaving missing middle into existing residential neighborhoods can ameliorate the housing and affordability crisis by offering more diverse housing typologies and tenures.

The Cul-De-Sac: New developments allow cities to “live up” this dead end typology with vibrant pedestrian laneways.

Community: Residents should be put in control of their built environment through the participatory design process.



POLICY FOR BUILDING THE MISSING MIDDLE

To enhance the suburb and alleviate the housing crisis, we propose expanding the zoning code regulations in residential zones. New residential zones will include a range of "missing middle" typologies, depending on the proximity to arterial roads or public amenities, with density bonuses awarded when pedestrian permeability is created through public easements on new developments.



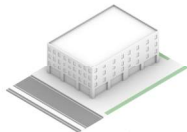
AD - Arterial Density: Mixed-use residential buildings up to 6 stories.

Site Location: Adjacent to arterial roads, regardless of block face.



MD - Moderate Density: Residential buildings with conditional non-residential, up to 4 stories.

Site Location: Adjacent to AD block, or within a five minute walk of a public park, school, or commercial area.



LD - Low Density: Residential building up to 3 stories and 8 units.

Site Location: Any residential zone not specified as AD or MD.



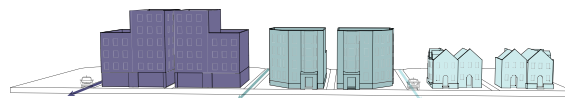
Density Bonus:

Density bonuses are available on site locations when the project introduces permeability through pedestrian laneways designated as public easements. Density bonuses allow a project to move from a lower density zone to a higher density zone (ie. LD to MD or MD to AD).

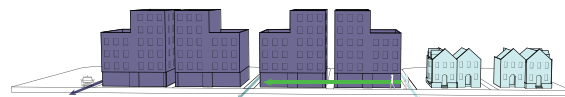
Site locations eligible for a Density Bonus:

- A cul-de-sac where the creation of a pedestrian laneway would improve pedestrian permeability.
- A LD or MD block being opened up to a AD block

Default : Arterial, Moderate, and Low Density

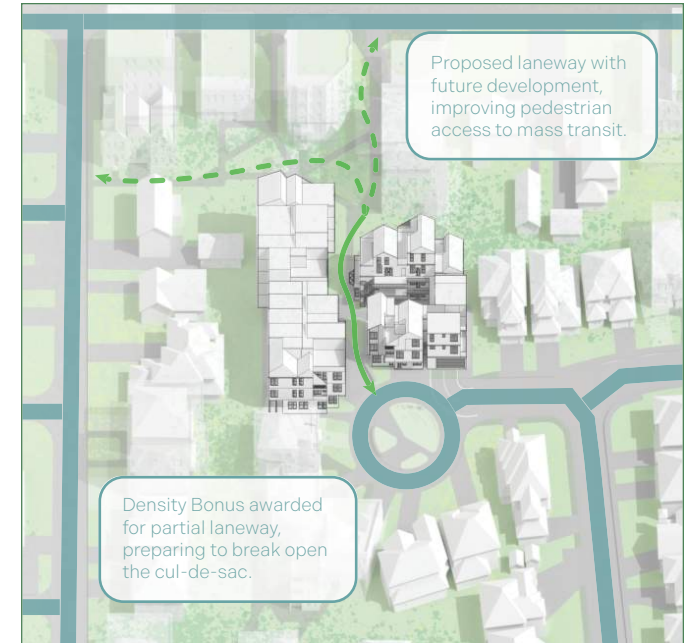


Upgraded Laneway: Arterial, Upgraded Moderate, and Low Density



The Cul-De-Sac Condition

Opening the cul-de-sac is accomplished by creating permeable public easements along new developments. On sites where a development cannot ensure permeability, they may lay the groundwork for a laneway, which can be completed by future developments.



Building Code Suggestions

With the influx of modern safety technology, portions of the building code can be re-evaluated to ensure our safety while enabling creative design. Recommendations include:

Egress Stairs:

For up to 6 stories in residential buildings, allow:

- (1) pressurized stair up to 4 units per floor
- (1) pressurized stair with (1) external stair for up to 6 units per floor

Timber Construction:

Allow +5 story mid-rise construction with light frame timber.

Ensuring Neighborhood Character

To aid in the creation of a vibrant and unique community, cities can:

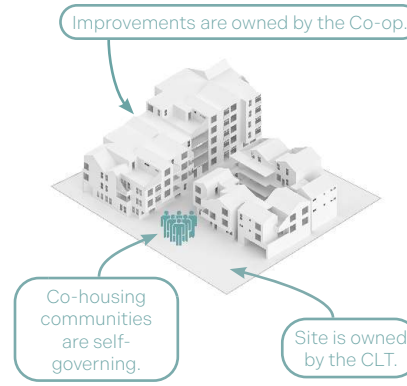
- Incentivize projects that undergo the participatory design process.
- Use performance-based guidance to ensure respectful setbacks.

DEVELOPING LASTING AFFORDABILITY

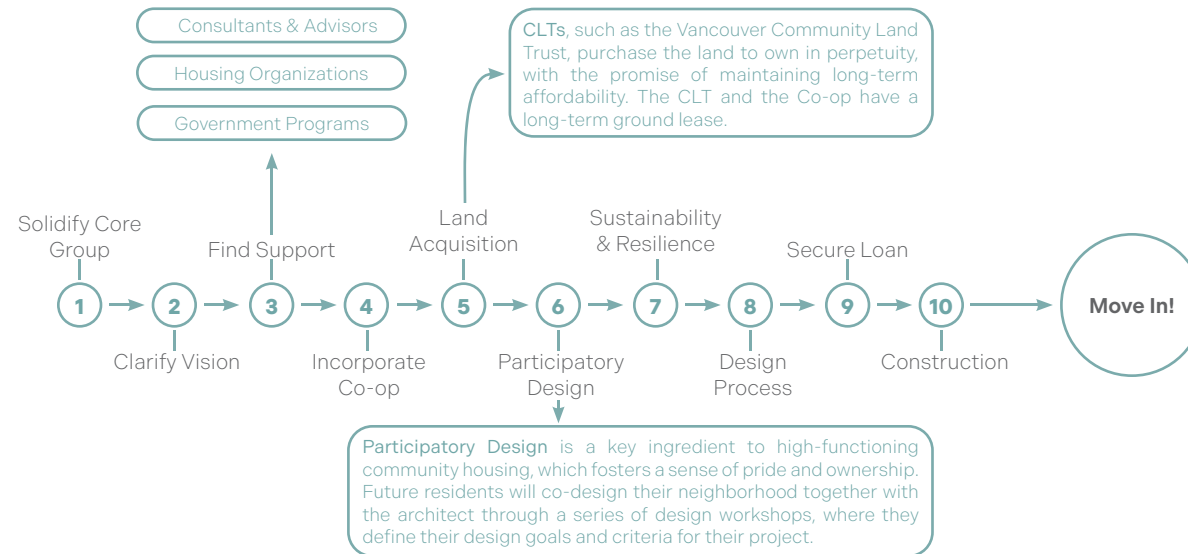
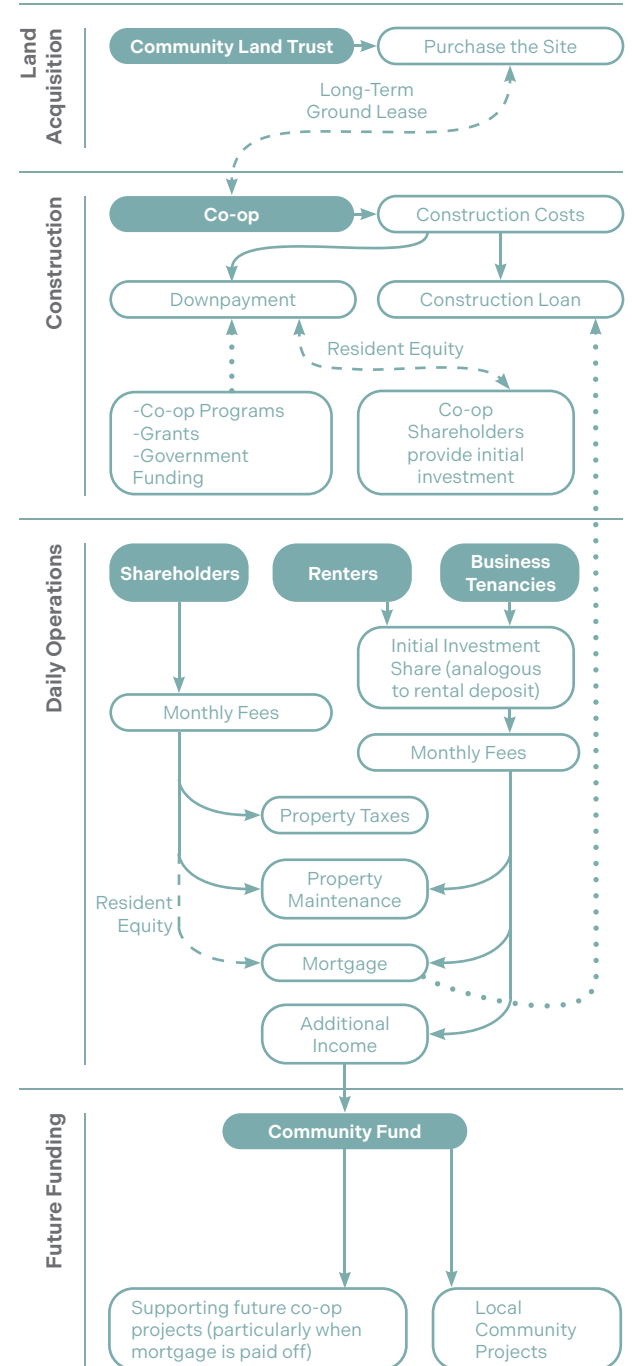
Housing has become a dilemma - rentership or homeownership; a lack of wealth accumulation or an insurmountable barrier to entry. Alternative tenures, like limited equity co-ops, offer a middle ground - striking a balance between building personal equity and affordability. In this scheme, the development of the building can be coordinated by a community land trust (CLT) and a co-op, comprising of the future co-housing community members and residents.

Long-term affordability is ensured through the nature of the co-op. Shareholder's selling price is capped by a yearly percentage, typically following inflation. Rental and business tenancy unit prices are tied to the local median equity. Subsidized rental units offer low-income housing. As the cost of construction loan is paid back in full, capital generated from rental units can be applied to development loans for other similar communities, ensuring additional communities to develop over time.

Non-profit alternative housing tenures are more reliant on government support to be financially feasible. Cities in Metro Vancouver should continue and expand initiatives to reinstate programs supporting co-op and other alternative tenure development.



How the Money Flows

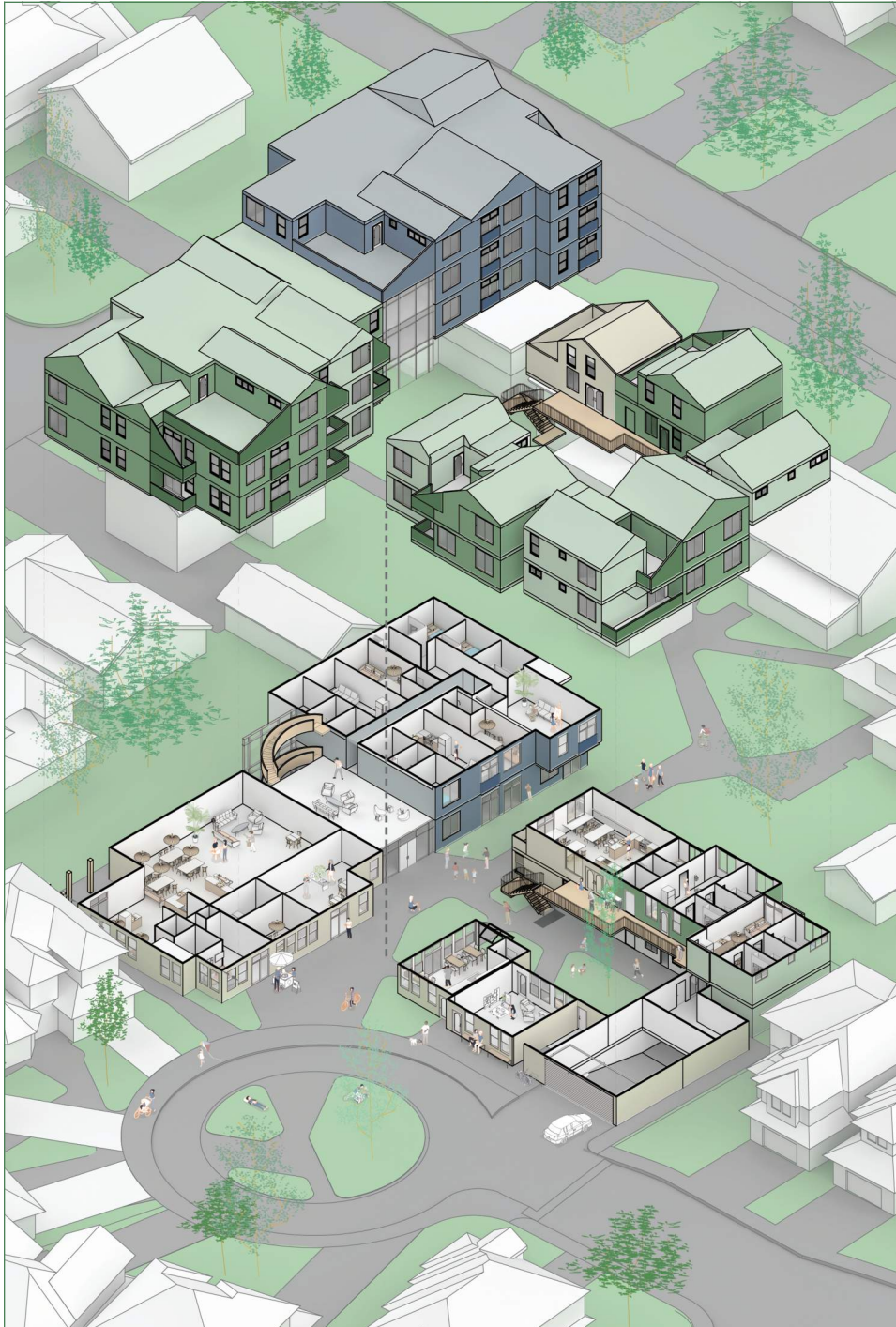


Building Operations - Cohousing Community

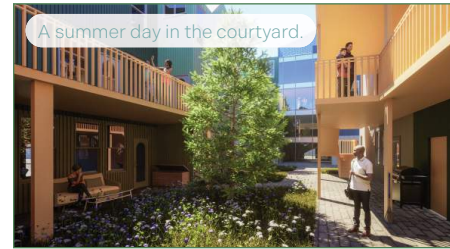
Co-housing communities are the social entities which govern the daily operations of the community. Decisions are carried out by consensus of the whole group during common meetings.



A PROTOTYPE FOR ARTERIAL DENSITY



Front elevation of Cul-De-Sac Nouveau



A summer day in the courtyard.



A view down the laneway.

Cul-De-Sac Nouveau is home to two interconnected co-housing communities. Built on the ideal of a walkable city, the two buildings form a lush pathway that is primed to become a permeable laneway when joined with a future development.

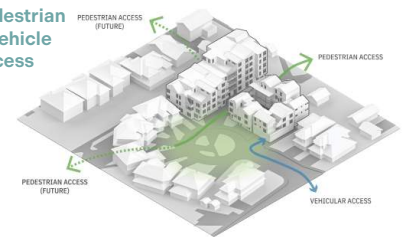
The project prioritizes the pedestrian, interweaving with the indoor and outdoor social spaces, encouraging spontaneous interaction between residents and fostering a sense of community.

Built as a home to a diverse group of people, the design and circulation promote the close proximity and chance encounters that allow for long-lasting relationships.

Building Statistics

FSR:	2.05
Lot Size:	25,530 SF
Gross Building Size:	52,401 SF
Number of Residential Units:	54
Number of Beds:	100
Shared Social Spaces:	12,276 SF
Commercial Retail Spaces:	545 SF

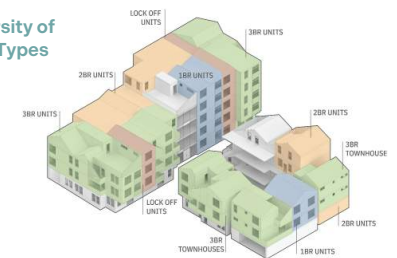
Pedestrian & Vehicle Access



Locations of Common Spaces



Diversity of Unit Types



PEOPLE AND SPACES



Ground Floor Plan

- 1. Common Lobby
- 2. Common Kitchen
- 3. Common Dining
- 4. Sitting Room
- 5. Play Room
- 6. Childcare
- 7. Coffee Shop
- 8. 3-Bedroom Unit
- 9. 2-Bedroom Unit
- 10. 1-Bedroom+ Unit
- 11. 1-Bedroom Unit
- 12. Lock-Off Unit
- 13. Bike Storage
- 14. Parking Entrance
- 15. Townhouse



2nd Floor Plan

- 1. Ad Hoc Social Space
- 2. Co-Working Space
- 3. Common Dining
- 4. 3-Bedroom Flat
- 5. 3-Bedroom
- 6. 1-Bedroom+ Unit
- 7. 1-Bedroom Unit
- 8. Lock-Off Unit

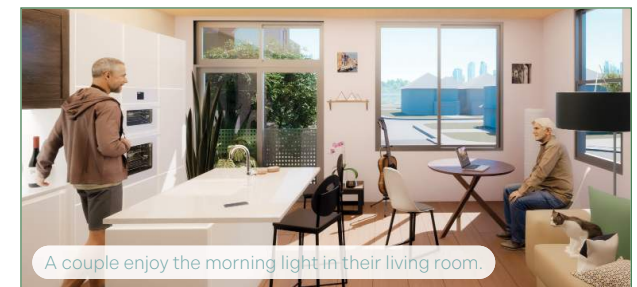


3rd Floor Plan

- 1. Ad Hoc Social Space
- 2. Rooftop Garden
- 3. Celebration Space
- 4. 3-Bedroom
- 5. 3-Bedroom
- 6. 1-Bedroom+ Unit
- 7. 1-Bedroom Unit
- 8. Lock-Off Unit



A view of the courtyard from the West Common Space.

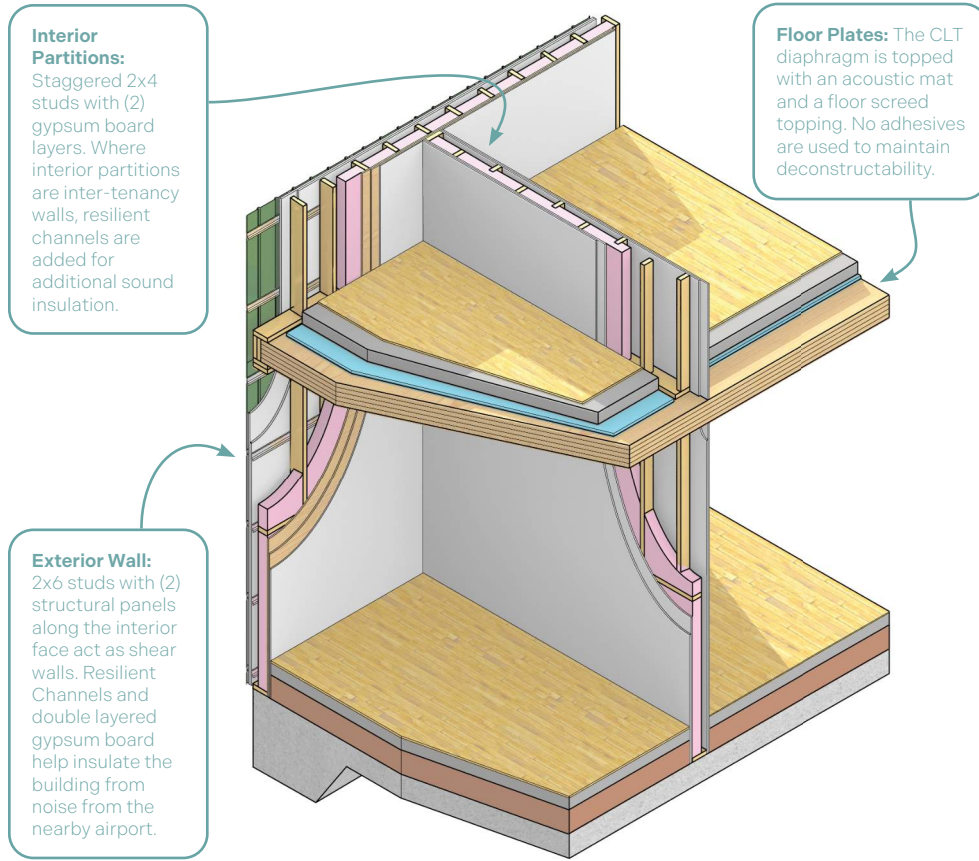


A couple enjoy the morning light in their living room.

THE NITTY GRITTY

Building Structure:

Cul-De-Sac Nouveau is a mid-rise timber building. Lateral force resisting systems are made up of cross-laminated timber (CLT) panels as diaphragms and traditionally framed stud walls as shear walls.



Sustainable and Resilient Design:

Sustainability is broadly recognized as a sign of responsible construction. However, the “how” of sustainability is often misperceived as too complicated, out-of-budget, or an afterthought. While the obstacle of the climate crisis can be overwhelming for a single designer, each step forward brings us closer to decreasing our impact on the environment. In a coordinated effort, all of our disciplines must strive to experiment, share knowledge and move our industry closer to our climate goals with each new project. Sustainable design should become a critical consideration, given the same importance as the safety of our designs and the constructability of our dreams.

Climate Change Resilience:

As the climate changes, we must adapt. Metro Vancouver is expected to experience at least 5 types of extreme climate events and our building must be designed to this new normal. Techniques employed by *Cul-De-Sac Nouveau* include:



Extreme Heat: Large trees and outdoor shading devices protect human health mitigate Heat Island effect.



Poor Air Quality: Air filtration systems meet MERV-13 or better.



Drought and Extreme Rainfall: Capture rainwater from the building roofs and suspended slab courtyard into cisterns stored in the underground level. Reuse this rainwater for the gray water systems.

Maximize landscaped permeable surfaces, including rain gardens, and use permeable pavements.
Limit the extent of the underground parking by encouraging car-sharing amongst the co-housing community, reducing the required parking spaces.



Sea Level Rise: Place the mechanical and electrical equipment on an elevated slab on the ground floor.

Mitigation of Future Emissions:

To meet the international 2 degree climate target, we must keep working to limit our embodied and operational emissions. A few unique approaches used by the *Cul-De-Sac Nouveau* include:



BC Energy Step Code: Achieve minimum Step 3 energy performance objectives.



District Energy Utility: Connect to the nearby Alexandra DEU. If a connection is unavailable, design mechanical rooms that can be readily upgraded once the DEU's reach expands.



Timber Construction: Maximize the benefits of timber construction by ensuring locally sourced materials and sustainable forestry practices.



Post Occupancy Analysis: Utilize building monitoring to ensure the efficiency of MEP systems and to better understand building usage.

Building Life-Cycle:

A holistic understanding of a project's life-cycle can dramatically decrease the environmental impact of new construction. Design for program flexibility increases a building's lifespan, and design for disassembly creates a less wasteful end of life. *Cul-De-Sac Nouveau* uses the following strategies:

1 Construction:

- Wall and floor assemblies can be pre-fabricated off site or pre-assembled on site, allowing the use of heavy machinery to be completed in a tighter window.

2 Maintenance and Change of Use:

- Reduce interactions between different systems such as separating MEP from structural elements.
- Design for possible future uses. The layout of structural and non-structural walls considers the addition of commercial spaces along the ground floor, allowing future flexibility.

3 Deconstruction:

- Keep detailing standardized and repetitious to ease deconstruction.
- Where possible, minimize adhesives, and welds. Replace with mechanical connections, such as bolts and screws.

Building Cost:

Construction Costs:

Concrete - \$340 per SF:	\$602,480
Timber - \$275 per SF:	\$15,076,050
Elevator - \$40,000 per stop:	\$360,000
Parking - \$90,000 per stall - 2-level underground parking based on 0.7 stalls per unit:	\$3,402,000
STEP Code 3:	-12%
Construction Subtotal:	\$19,440,530
Compare to base project:	\$19,803,750

Land Costs:

Land Value:	\$275 per SF
Assembly premium:	20%
Land Cost Subtotal:	\$8,424,900
Compare to base project:	\$7,425,000
Total:	\$27,865,430
Compare to Base:	\$27,228,750
Note: soft costs not included	