

**Collective Housing:  
Linking Ecological and Social Sustainability**

by

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Submitted in partial fulfilment of the requirements  
for the degree of Master of Architecture

at

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**DALHOUSIE UNIVERSITY**  
**SCHOOL OF ARCHITECTURE**

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## **ABSTRACT**

A constellation of challenges, including changing family types and shrinking household size, housing affordability, and ecological impact, can be addressed through a different approach to private dwelling. These are widespread challenges, but the challenges of affordability and changing demographics are acutely present in Victoria, British Columbia, Canada, making it a fertile site to explore these issues.

The thesis design addresses this constellation of challenges by adding layers of shared space to individual dwellings. The design draws from cohousing: common houses with shared facilities, parking at the periphery, massing the buildings around pedestrian circulation, and creating shared outdoor spaces. Cohousing is hybridized with a “big house” idea which puts dwellings for three to five families in a single building, where the main rooms are shared by all. Through these features the design encourages a sense of community, while taking advantage of shared facilities to improve affordability and reduce environmental impact.

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To Jasmine, and to my whole family for their love and support.

Thank you

## CHAPTER 1: INTRODUCTION

The history of household life isn't just a history of beds and sofas and kitchens and stoves ... But of scurvy and guano and the Eiffel Tower and bedbugs and body-snatching and just about everything else that has ever happened. Houses aren't refuges from history. They are where history ends up. (Bryson 2011, 8)

The changes in the human condition in recent history have been profound, and our ways of dwelling have changed right along with them. One of the most significant of these changes has been the move to cities. Cities themselves are not new; they have been important centers of economy, politics and culture, and in large part what goes on in them has described civilization for as long as it has existed. What is new in human history is that the majority of us are now living in urban settings, and in the industrialized world it is the overwhelming majority of us.

Louis Wirth argued powerfully in 1938 that key characteristics of cities lead to a distinct urban way of life. The most important of these characteristics are a large, dense population and social heterogeneity. Obviously there are good reasons for living in cities, but the picture Wirth painted of urbanism is not entirely desirable. Urbanites, while usually associated with a greater number of organized groups, meet each other in highly segmented roles, and their dependence on one another is

confined to a highly fractionalized aspect of the other's round of activity...[Hence] our acquaintances tend to stand in a relationship of utility to us...the role each one plays in our life is overwhelmingly regarded as a means for the achievement of our own ends (Wirth 1938, 99-100).

Frequent close physical contact, coupled with great social distance, accentuates the reserve of unattached individuals toward one another and, unless compensated for by other opportunities for response, gives rise to loneliness (Wirth 1938,101).

Ironically, living close to large numbers of people can create individualism and loneliness.

However, the instinctive response to living next to large numbers of people, many of whom are unlike us, is to seek more privacy. The architecture of typical higher density housing in cities is careful to separate dwellings and provide privacy. In the suburbs, the appeal of large yards has more to do with the desire for privacy than the desire to take care of a lawn.

Single family home ownership has long been a criterion for economic and social success in North America. The link between this type of home ownership and success has in large part been driven by government and industry policy, and is explicitly for the nuclear family (Hayden 2002, 19-33, and Hemmens, Hoch and Carp 1996, 1-7). At the time these policies were created, the nuclear family was the dominant household arrangement, but it has never been the only one. Changing family types, decreasing household sizes, and different social norms, have led to nuclear family oriented housing no longer meeting the needs of many people. This challenge alone might be enough to prompt a major rethinking of the housing types being developed.

As cities grow in numbers of people they also grow their appetite for resources. Happening at about the same time as human migration into cities has been an unprecedented transformation of the biosphere: a major loss of biodiversity. Not since the Cretaceous-Tertiary event of 65 million years ago has the planet seen a mass extinction, and there is speculation that the current mass extinction could be bigger than the Permian extinction event of 250 million year ago, an event sometimes called “the great dying.”



It is not the role of the architect to suggest how these two changes in human history and evolutionary history may be understood. Rather, architecture can seek potential strategies for how to respond to these distinct yet connected changes in our world.

Response to the ecological crisis in North America has been instinctively individual. In an insightful article called “Individualization: Plant a Tree, Buy a Bike, Save the World?” Maniates (2002) argues that how we understand the “environmental crisis” drives us towards an individualization of responsibility that reinforces existing patterns of consumption and production. According to Maniates it is very common for environmentalists to talk about serious global problems, and then suggest solutions clearly out of proportion to the scale of those problems: an individual scale; if all of us take it upon ourselves to plant a tree, and change our light bulbs, or ride bikes, all the world’s problems would be solved. In light of Wirth’s insights, this individualization of responsibility is the instinctive way for an urban society to respond.

But the monumental challenges posed by climate change, habitat destruction and species loss will require coordinated effort at societal and global scales. Robert Putnam’s influential article “Bowling Alone: America’s Declining Social Capital” (1995) laments the loss of social engagement and collective action in what is in many ways an updated version of Wirth’s essay, and an explanation for the individualization of environmental action that Maniates finds so frustrating.

This thesis will explore the potential of a collective approach to housing in order to address some of the negative effects the of urban condition has on our lives, specifically the individualiza-

tion that an urban way of life can breed. This individualization has been augmented since Wirth's time by changes in household types and decreasing household size. Cohousing has successfully created neighbourhood communities that combat some of the negative effects of urbanism identified by Wirth. The thesis design here adds to the cohousing model a "big house" idea that accommodates several families in a single building with shared facilities as an additional layer of community in the cohousing model. The intention of the "big house" is to create a new, contemporary extended household, somewhat analogous to a multi-generational family living in a single house.

This thesis links two notoriously overused and misused concepts: sustainability and community. Despite being watered down, these two concepts can still be powerful. Collective forms of housing offer a new way of tackling problems by fostering stronger social connections and offering another scale of social organization. This new level of social organization contributes to social sustainability by countering many of the characteristics of cities that Wirth identified as leading to individualization and anonymity.

A collective approach to housing also provides opportunities for enhancing economic and environmental sustainability. Things can be shared, reducing costs as well as material and energy use. Collective approaches to financing can also ensure access to affordable housing into the future, rather than leaving housing costs to the whims of the speculative market.

An architectural intervention, even when responding to global issues and broad cultural trends, must happen in a particular place. If that architectural intervention is to have a widespread impact on these global trends, it must embody ideas

that have widespread relevance. Thus the site must be in some ways typical. Also, in order for a new idea to bear fruit, it must be planted in fertile soil.

The City of Victoria is where the project is located. It is typical of North American cities in many ways, with development patterns and building types that are familiar to many places. It is also a vibrant and active place, with a strong community of people willing to tackle tough questions of sustainability and open to creative solutions. It is also one of the most unaffordable cities in the world when it comes to housing, creating even more willingness to diverge from typical real estate and development approaches to housing.

### **Thesis Question**

How can a collective approach to housing link the pursuit of biophysical and social sustainability?

## CHAPTER 2: SUSTAINABLE ARCHITECTURE

The purpose of this chapter is not to engage in debates around the meaning of sustainability and sustainable architecture. Instead it is intended to frame a design approach that takes the complexity of the concept seriously, and situate the focus of the design within the multitude of issues that are under the umbrella of sustainability.

### What is Sustainability?

The word “sustainability” has become widely used as a generic synonym for “good,” but among those that do take the concept seriously there is disagreement over its definition. As such, it is appropriate to elaborate on how the word is being used.

The most widely cited definition of sustainability comes from the United Nations *Report of the World Commission on Environment and Development: Our Common Future*, also known as the Brundtland Report (1987). It states that sustainable development is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (24).

In the Brundtland definition, the word “needs” is central. This word refers to human needs. The presence and/or definition of this word is the source of a lot of disagreement about sustainability’s definition. What is considered a need changes the vision of what a sustainable society might look like. That vision might be a better place to start.

The word “sustain” has many meanings: to uphold, prove or confirm (the judge sustained the objection), to help or encourage (her memories sustained her), to nourish or nurture (a sustaining

meal), continuous and ongoing (his sustained battle against addiction), or to endure or to suffer (she sustained head injuries). If we use the word “sustainability” to represent our aspirations, we must aim beyond meeting our needs in an ongoing, endurable way. We must focus instead on strengthening, supporting, and nourishing the systems that serve us, our descendants, and the other species we share the planet with.

There are at least three large interacting systems widely recognized to play a role in sustainability: biophysical (environmental), social and economic. This “triple bottom line” approach (a phrase coined by Elkington (1998), although the idea has been around for longer) has now become the principal approach to full cost accounting. The metaphor is that these three realms are three legs of the sustainability stool, and if any one leg is not strong enough, the stool tips over.

We live in a physical world and have physical needs. We depend on resources and services provided by biophysical processes (air, water, soil/food, materials for shelter, etc.). Biophysical sustainability ensures the prerequisites for human survival. Human activity depends on and is shaped by these resources and services. This is biophysical sustainability (from a human point of view). These are physical things and are empirically measurable. Biophysical sustainability nurtures the continued health of the biophysical systems that we depend on.

It is widely accepted that current human activity is degrading natural systems and they are now less able to provide ecological services. Soil is being depleted, fish stocks are falling, and forests, oceans and grasslands are sequestering less carbon than we are emitting. These systems are becoming less resilient because of species extinctions, fragmentation and climate change.

Because of damage already done, in order to be sustainable future development must increase the capacity and resilience of natural systems, not just avoid damaging them.

Social and economic sustainability are not quantifiable in such a straightforward way. Part of a definition of social sustainability is that future generations must inherit effective control over their means of survival, and to make meaningful choices when it comes to those resources. These are simultaneously social and economic questions.

Sustainability is not a steady state, but a dynamic state, as it continuously allows for choice. Choices are limited by the available infrastructure: the physical (built and natural) environment, as well as social, political and economic structures. Moving towards sustainable ways of living does not depend simply on individual actions or consumer choices. Since choice is limited by societal infrastructure, meaningful choice can only happen simultaneously at an individual and collective level.

But the way we live can not be reduced to what we build, what we produce, what we consume, and how we exchange. Our lives result from those things but are more than their sum. Sustainability can be seen as a property of complex systems. It emerges from a combination of material and cultural processes, and interactions of human and non-human systems. If our goal as a society is sustainability, what we strive for should not be limited to human survival, but aim for human flourishing.

At a broad level, who can disagree with human flourishing? It's when assertions are made about what a flourishing society actually looks like that disagreements arise. Since this question is about a society as a whole, an engagement with the question must happen collectively.

## What is Sustainable Architecture?

Guy and Farmer point out that debates about sustainable architecture often sidestep the contested nature of sustainability as a concept:

Either competing environmental strategies are grouped within a single, homogenous categorization of green design with little or no reference to their distinctiveness, or the existence of a multiplicity of design approaches is identified as a significant barrier to solving what are considered to be self-evident problems such as global warming. (Guy and Farmer 2001, 140)

When the multiplicity of design approaches are recognized, disagreements about the best way to achieve these “self-evident” goals are technical in nature, and discussions of the social questions implied in the practice of sustainable architecture tend to be ignored (Guy and Farmer 2001).

These technical discussions often focus on the consumption of resources, especially energy. If one wants to prove or disprove that a building is sustainable within this technical focus one tends to look at metrics of energy consumption, water consumption, and to how a building is connected into transportation networks. However, there are different indicators to measure besides energy and resource consumption of the building itself. There are also different ways of measuring the same things.<sup>1</sup> Shying away from the difference in approaches to green building is the same thing as shying away from the question of what it is green building is trying to achieve.

1. Staying with the example of energy use: it is often measured in W/m<sup>2</sup>, but if houses are getting bigger and the number of people per house is decreasing, a houses can be less efficient per person even if it is more efficient per floor area. A recent energy study found that despite buildings becoming more “efficient” through better insulation, improved mechanical systems, etc. Canadian houses are drawing more power due to more appliances, electronic devices, and fewer people in bigger houses. (National Research Council of Canada 2007)

Table 1 The six competing logics of sustainable architecture

Logic	Source of Environmental Knowledge				Idealized Concept of Place
	Image of Space	Building Image	Technologies		
Eco-technic	global context macrophysical	commercial modern future oriented	integrated energy efficient high-tech intelligent	Integration of global environmental concerns into conventional building design strategies. Urban vision of the compact and dense city.	
Eco-centric	fragile macrobiotic	polluter parasitic consumer	autonomous renewable recycled intermediate	Harmony with nature through decentralized, autonomous buildings with limited ecological footprints. Ensuring the stability, integrity, and "flourishing" of local and global biodiversity.	
Eco-aesthetic	alienating anthropocentric	iconic architectural New Age	pragmatic new nonlinear organic	Universally reconstructed in the light of new ecological knowledge and transforming our consciousness of nature.	
Eco-cultural	cultural context regional	authentic harmonious typological	local low-tech commonplace vernacular	Learning to "dwell" through buildings adapted to local and bioregional physical and cultural characteristics.	
Eco-medical	polluted hazardous	healthy living caring	passive nontoxic natural tactile	A natural and tactile environment which ensures the health, well-being, and quality of life for individuals.	
Eco-social	social context hierarchical	democratic home individual	flexible participatory appropriate locally managed	Reconciliation of individual and community in socially cohesive manner through decentralized "organic," nonhierarchical, and participatory communities.	

Guy and Farmer (2001: 141) illustrate the contested nature of the meaning of sustainable architecture.



The above way of thinking about sustainability can outline an approach to sustainable architecture. If sustainability is a property of complex systems, asking if a single building is sustainable is a meaningless question. Instead we can look at the effects development has on the systems it embedded in. This approach means the so called self-evident problems relating to biophysical sustainability are not simply technical questions. Earlier I defined sustainability as an integration of social, economic and biophysical goals. Assessing whether or not a building contributes to global warming, for example, is not simply a question about its energy consumption (although that is of great importance). It is also a question about the choices it offers to its occupants and neighbors, and its effects on the patterns of the city.

It would be extraordinarily difficult, if not impossible, for a building to achieve a positive effect without changing the habits and consumption patterns of its users in the context of wealthy societies like Canada. Architecture can make some choices easier and some choices less convenient. Architecture can also make the energy and resource use of its occupants more legible, which can have an effect on environmental behavior. Perhaps most powerfully, architecture can foster and support the social systems that encourage behavioral change.

While architects and architecture can be a part of achieving this goal, our profession must approach it with humility. Architecture alone has no hope of achieving widespread changes in how people live their lives, but architects can play a part in the transition towards sustainable ways of living by providing a built form that supports sustainable ways of life.



BP's Helios House Gas Station in Los Angeles; a LEED certified building with rainwater collection, solar panels, recycled building materials and LED lighting. Is it a step in the right direction? Image from Matter Network.

## **Scope of this Thesis**

Technical questions of energy use, the effects of materials extraction, manufacture, and disposal, etc. are of utmost importance to biophysical sustainability. However, the focus of this thesis is on linking biophysical and social sustainability. Our expectations about housing and the changing nature of the household are the social questions this thesis will focus on, which have direct impact on biophysical sustainability.

A collective approach to housing can provide a new, meaningful choice in housing type. The project offers an alternative to the trend toward fewer people living in bigger houses, which is a social intervention with direct effects on energy and material use. Collective dwelling can foster a new level of social organization and kinship between the levels of the family and the city which can encourage pro-environmental behavioral change and a collaborative approach to creating resilient futures. This process will be elaborated in Chapter 4, but before we get there it is helpful to introduce the location of the project: the city of Victoria.

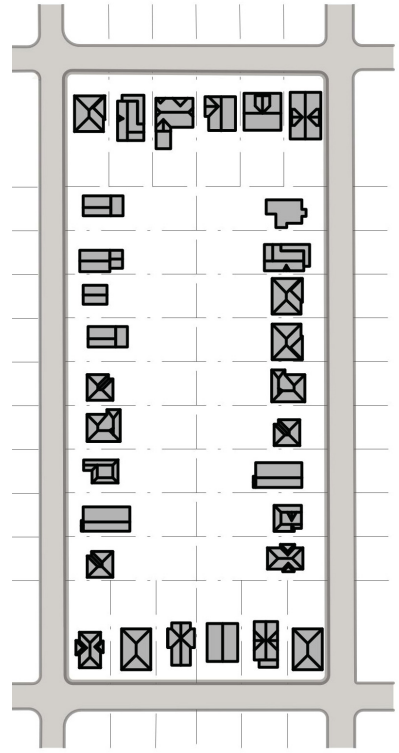
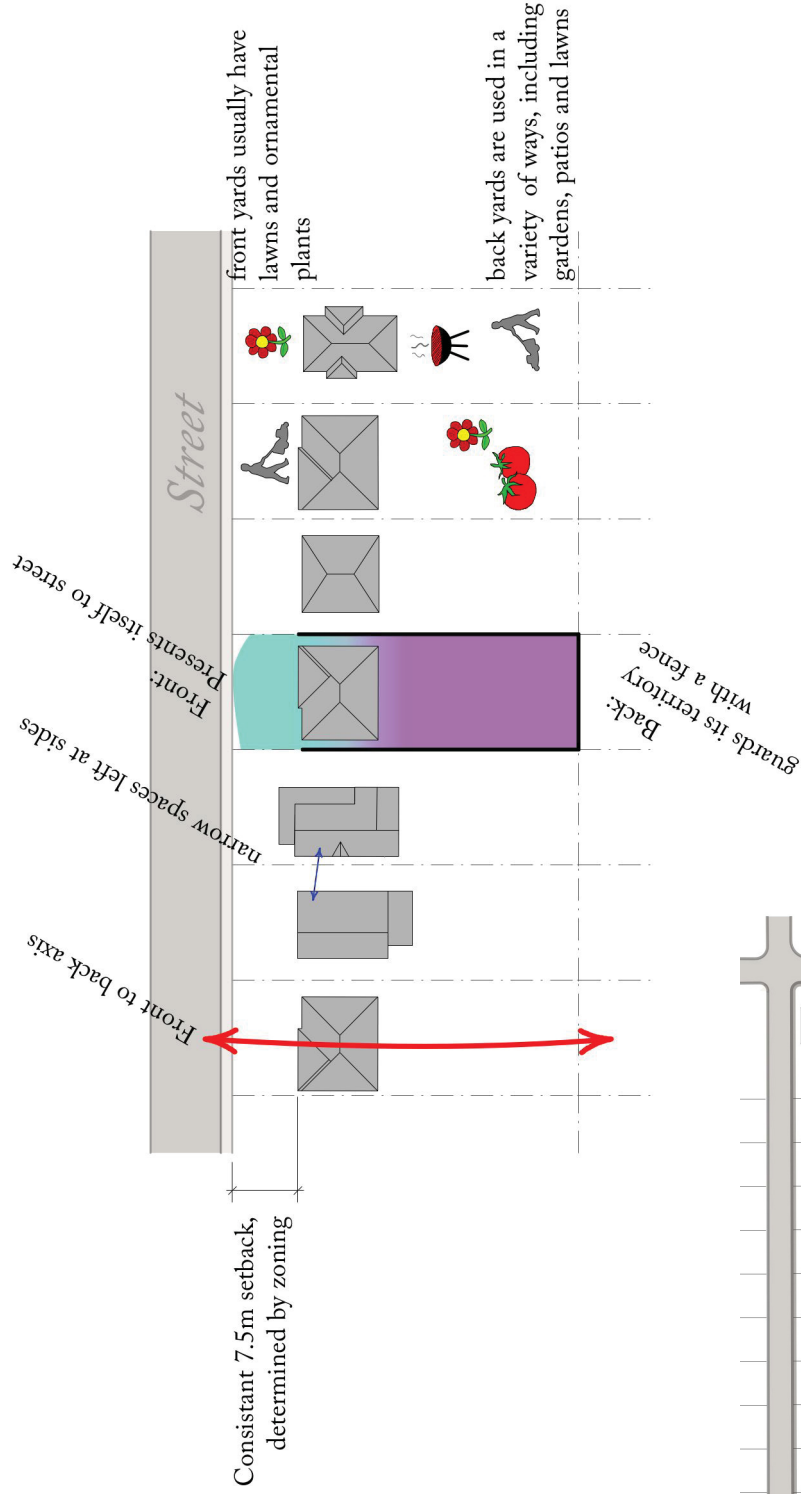
## CHAPTER 3: THE CITY OF VICTORIA

This thesis responds to global sustainability issues, but architecture is a physical intervention in a particular place, in this case in the Fernwood neighborhood in the city of Victoria. Trends common to cities across the wealthy world are also present in Victoria, but with some exaggerated. An in-depth discussion of site selection follows in Chapter 5. This chapter introduces the city as a place that is both typical and fertile. The design site must be typical in some ways so that the lessons learned in this project can be applicable elsewhere, and fertile to give this prototype the best possible chance of success.

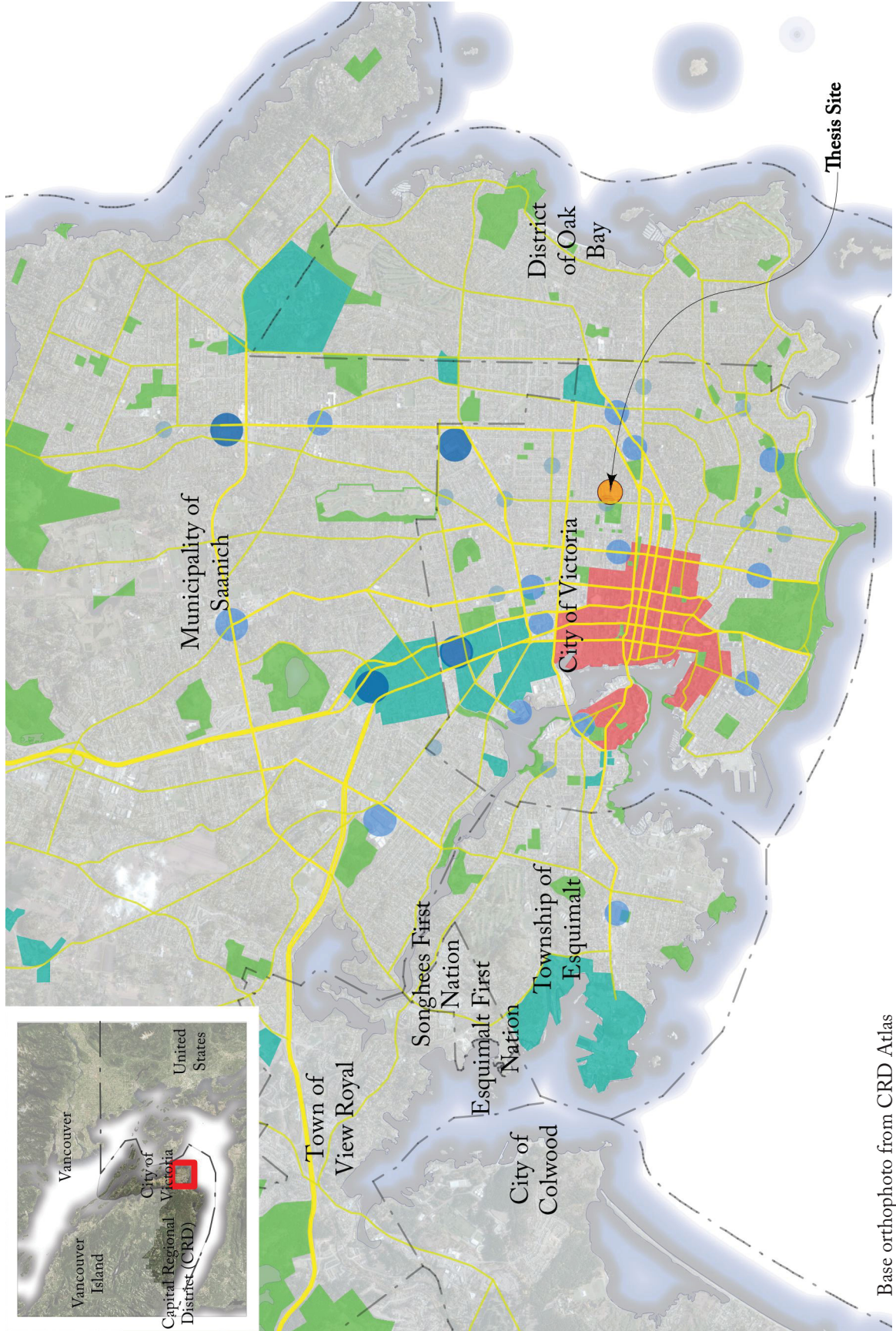
Greater Victoria is made up of several municipalities. The Capital Regional District (CRD) is the regional administrative body made up of thirteen municipalities and three rural electoral districts. The city core is made up of five municipalities with a combined population of approximately 230,000, roughly two thirds the population of the CRD (Statistics Canada 2006). The City of Victoria is the municipality at the center. It contains a significant proportion of the employment and economic activity of the region. It is also home to about 78,000 people, and an additional 40,300 people commute into Victoria from the surrounding municipalities to work (Statistics Canada 2006).

### **Housing in Victoria**

The residential fabric that makes up most of Victoria is a prototypical block of 30 lots, each 50 feet by 150 feet. Whether the long axis is east-west or north-south varies. Originally each lot would have contained a single family home with a 7.5 meter setback and a large back yard. Back alleys are uncommon.



Top: characteristics of a typical row of houses  
 Left: a typical block with 30 lots, all 50' by 150'



Base orthophoto from CRD Atlas

**Urban Core** (includes):  
business, historic,  
legislative/gov't, commercial,  
employment, and high density  
residential.



**Commercial and Service Areas**  
(includes): public services, retail  
centers, and areas of  
employment.



**Public Green Space** (includes):  
parks, sports fields, and  
playgrounds.



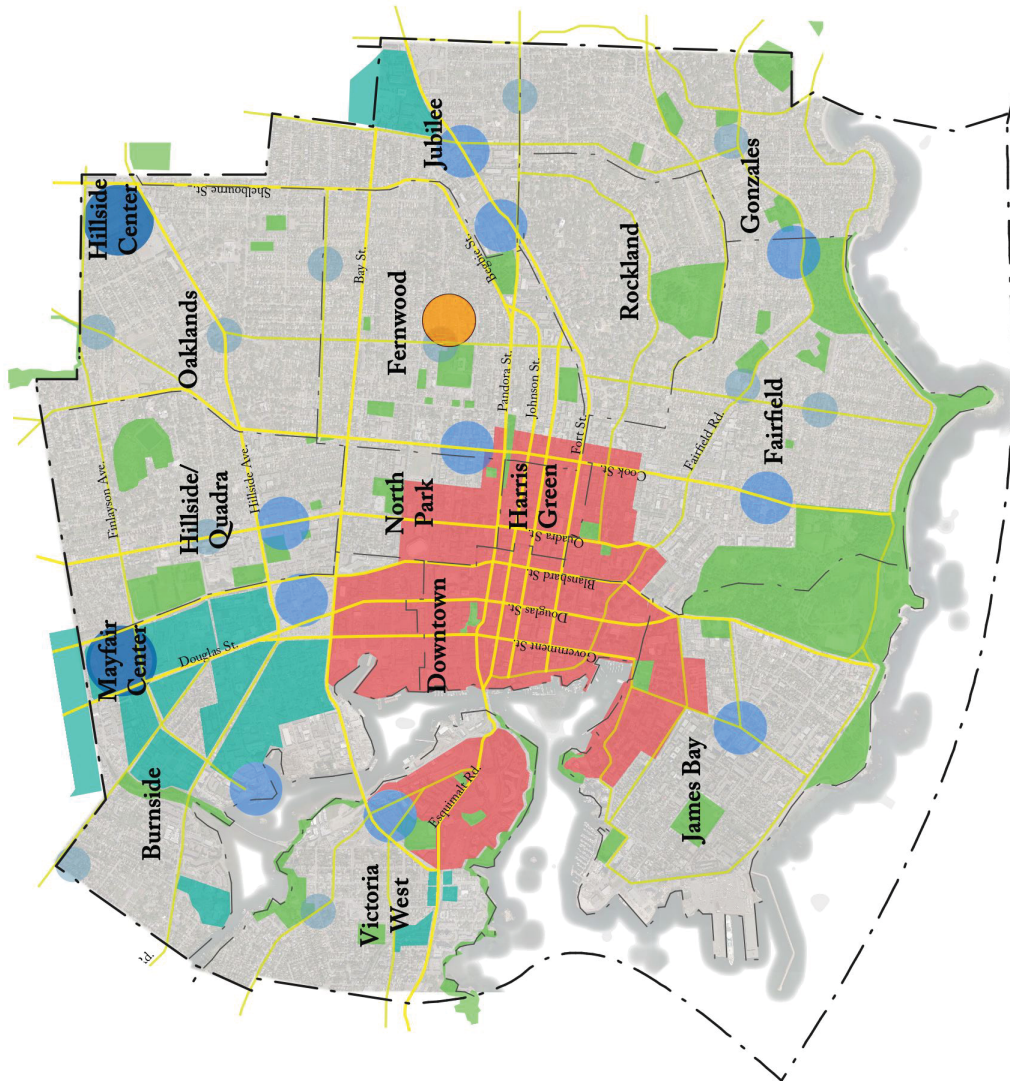
**Major Center:** Destination of  
importance for the whole city.  
Includes shopping,  
entertainment, business, etc.



**Large Urban Village:**  
Destination of importance for a  
large neighborhood.



**Small Urban Village:**  
Destination of importance for  
nearby residents.



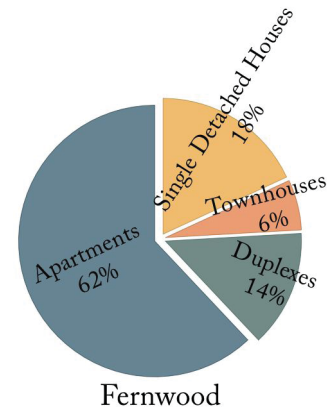
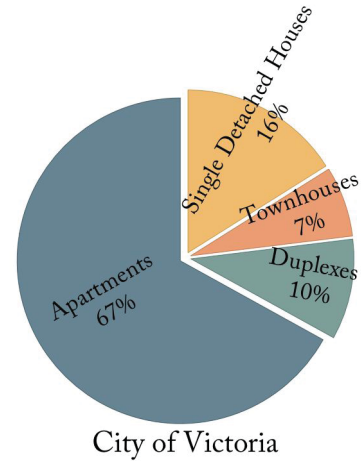
Shows planning areas, “urban centers” and “urban villages” and neighborhood boundaries as identified by the City of Victoria’s planning department. Base orthophoto from CRD Atlas.

Major exceptions to this pattern occur where the regular grid was disrupted by topography in the neighbourhoods of Rockland and Gonzales, leading to irregular and usually larger lots. The topography also provided views, and these neighbourhoods attracted more wealthy residents.

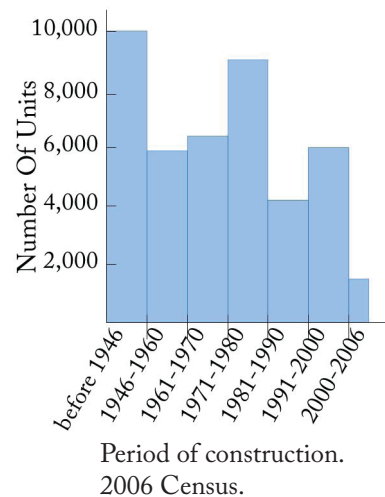
The original pattern remains in most neighbourhoods. High density residential occurs in the downtown area. Along or near arterial roads and “large urban villages” there are also apartment buildings and townhouse developments, but generally they do not extend far into the residential fabric. The only two neighbourhoods to significantly change have been James Bay and Victoria West, densifying with a significant amount of multi-unit residential development.

Statistically, apartments are the dominant housing type, despite the appearance of single family housing in most places. The census counts a house with a basement suite as two apartments, which accounts for the preponderance of “apartments” in apparently detached housing dominated neighborhoods. Many large houses have also been converted into several apartments, maintaining the appearance of the neighbourhood but adding even more to the apartment numbers.

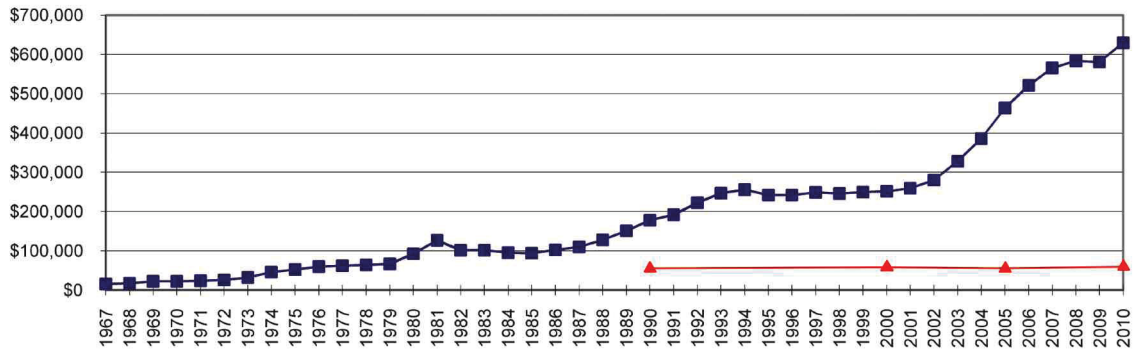
Home ownership in Greater Victoria is currently out of reach for many people. In most cities in Canada, home prices are increasing faster than people’s income. In Victoria, this trend is exaggerated. The 2011 Demographia International Housing Affordability Survey (2011), ranked Greater Victoria 309th for affordability of 325 cities surveyed, and 34th of 35 Canadian cities surveyed, behind only Vancouver. In other words, it is the second least affordable city in Canada and the 16th least affordable city in the world.



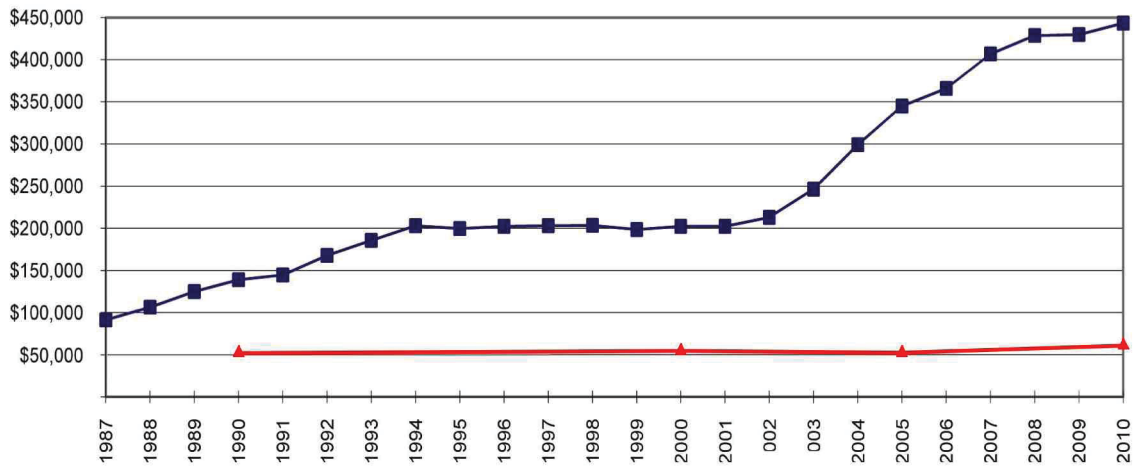
Mix of housing types. 2006 Census.



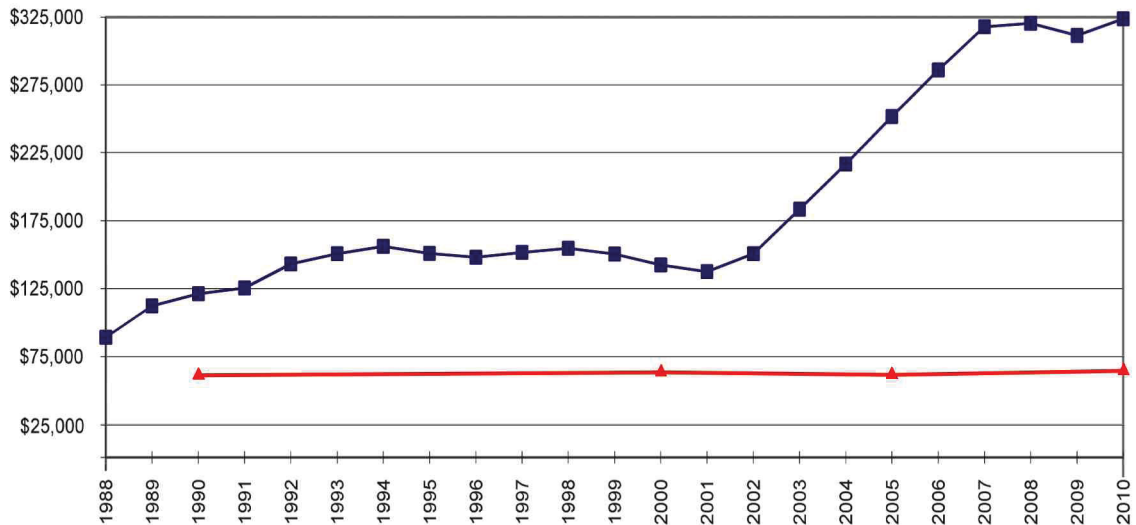
### Single Family Homes (Greater Victoria)



### Townhomes (Greater Victoria)



### Condominiums (Greater Victoria)



Average Sale Price
  Median Household Income

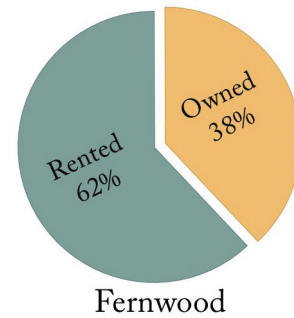
Historic average prices by housing type from the Victoria Real Estate Board multiple listings service (2011), with added income information from Statistics Canada (2006).



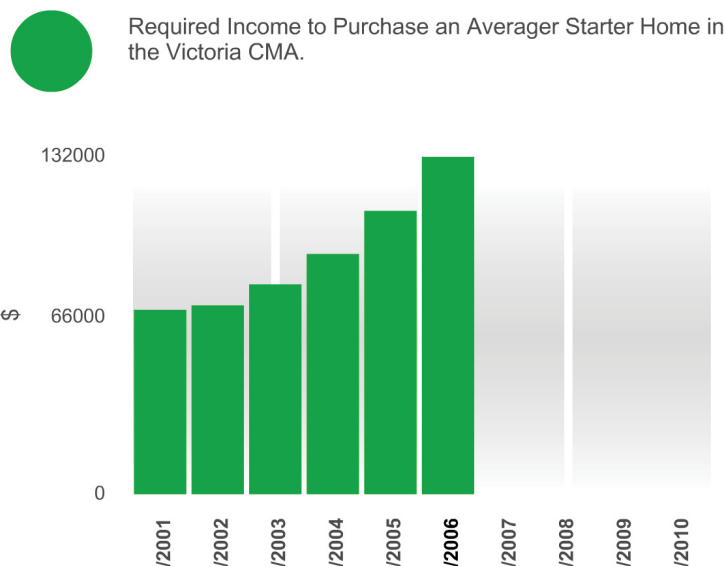
According to the 2006 Census, 40% of households in the CRD are renters, and 60% of households in the City of Victoria are renters, compared to the B.C. total of 30%, and the Canadian total of 31%. It is more difficult to purchase a home in Victoria than most places in Canada.

The number of renting households spending more than 30% of their income on shelter is 43% in the CRD and 46% in the City of Victoria (Statistics Canada 2006). This compares to 21% in the CRD and 27% in the City of Victoria among households who own their dwelling. Since vacancy rates have been below 1% in six of the past ten years (CRD Sustainability Monitoring Program 2011), renters do not have much choice.

There are some things particular to the housing market in Victoria that are driving prices up. These include retirees migrating here for the mild climate, and its proximity to Vancouver, whose housing prices are driven up in large part by wealthy immigrants from China.



Tenure type. 2006 Census.



Income required for an “average starter home.” From CRD Regional Sustainability Monitoring Program.

It is a common trend in Canada for housing prices to be increasing faster than income, although that trend is exaggerated in Victoria. One trend making housing costs increase is the increasing expectations people have for space and amenities. Take toilets. Fifty years ago, it was common for a family of six or seven to share a single bathroom. It was also common for several hotel rooms to have a shared bathroom, but now that would be unheard of. Toilets are one example, but the same can be said of fridges, TVs, or any number of things. Dwellings are becoming more and more individualized, getting closer to having one of everything for each person.

Another demographic trend common to the industrialized world and definitely present in Victoria is decreasing household size. According to the 2006 Census, in the CRD the average household size was 2.2 people, and in Victoria proper it was only 1.8 people.

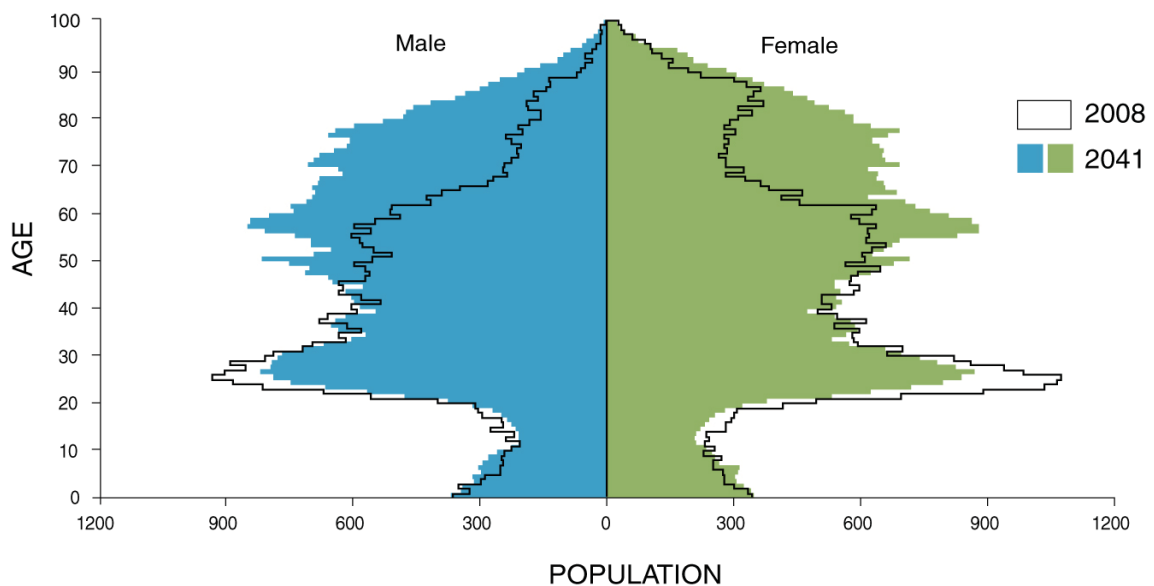
My own unscientific observations of the effects of the affordability of housing is that it is hardest for younger adults, causing many in their late twenties or early thirties to move away. Of those that do stay, some continue to live with roommates, in similar situations as students, well into their careers. Young adults often have student loans to pay off, are starting families, are starting to save for retirement, or simply are looking at their cash flow and find housing just takes up too much of it. Young adults who are not in college or university seem to be moving out of Victoria in substantial numbers, despite a desire to stay. The cost of housing seems to be an important reason. A phrase often used to describe the city is “home of the newly wed and nearly dead.”

The city's planning department recognizes that these demographic and economic challenges will have an effect on housing. The proportion of Victorians over the age of 65 is increasing dramatically, expected to reach 29% in 30 years. According to the draft Official Community Plan:

The demographic shift in Victoria presents a dual challenge: meeting the shifting service, housing and mobility needs of an older population, while enhancing the housing, facilities and affordability needed to retain a younger workforce and their families. (City of Victoria 2011, 20)

This statement implies a recognition that affordability in Victoria is playing a role in the demographic shift.

One way many households in Victoria are able to afford a mortgage is by dividing a house into suites, with rent from the secondary suite covering a portion of the mortgage. The majority of land in Victoria looks like neighbourhoods with single detached houses only, but in 2006, 67% of dwellings were apartments and only 16% were single detached houses in Victoria.



Population by age and sex, 2008 and 2041. City of Victoria 2011: 20.



House with garage converted into secondary suite. This building counts as 2 apartment dwellings in census data.

When a house is divided into suites, the number of stoves, fridges, toilets, and microwaves multiplies, increasing the energy use and environmental impact of the building. This would not necessarily be a problem if household sizes were not also decreasing. Whereas one household, for example a couple with three children, would have lived in a single family home in the 1980s, today that same house could be occupied by a two person household renting a suite to a single person. In this scenario, the number of people living in the house has declined by two, but the house likely has twice as many fixtures and appliances. This affects both affordability and ecological impact.

If the above scenario is repeated for a whole block of typical residential fabric, two paradoxical things are happening: the density of households are increasing while population is decreasing. (As a whole the city of Victoria's population is increasing, due to multi-unit development close to downtown or along major streets.) The decreasing number of people in residential neigh-

**In the 1950's**

representative lot:

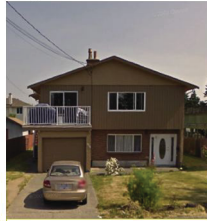


2 adults  
5 children  
1 bathroom  
3 bedrooms

**Whole Block:**  
30 households  
153 people  
38 bathrooms

**In the 1980's**

representative lot:



2 adults  
3 children  
2 bathroom  
4 bedrooms

**Whole Block:**  
36 households  
128 people  
64 bathrooms

**In the 2000's**

representative lot:



2 adults  
(empty nest couple, owners)  
1 bathroom

1 adult  
1 bathroom  
(renting secondary suite)

**Whole Block:**  
53 households  
98 people  
77 bathrooms

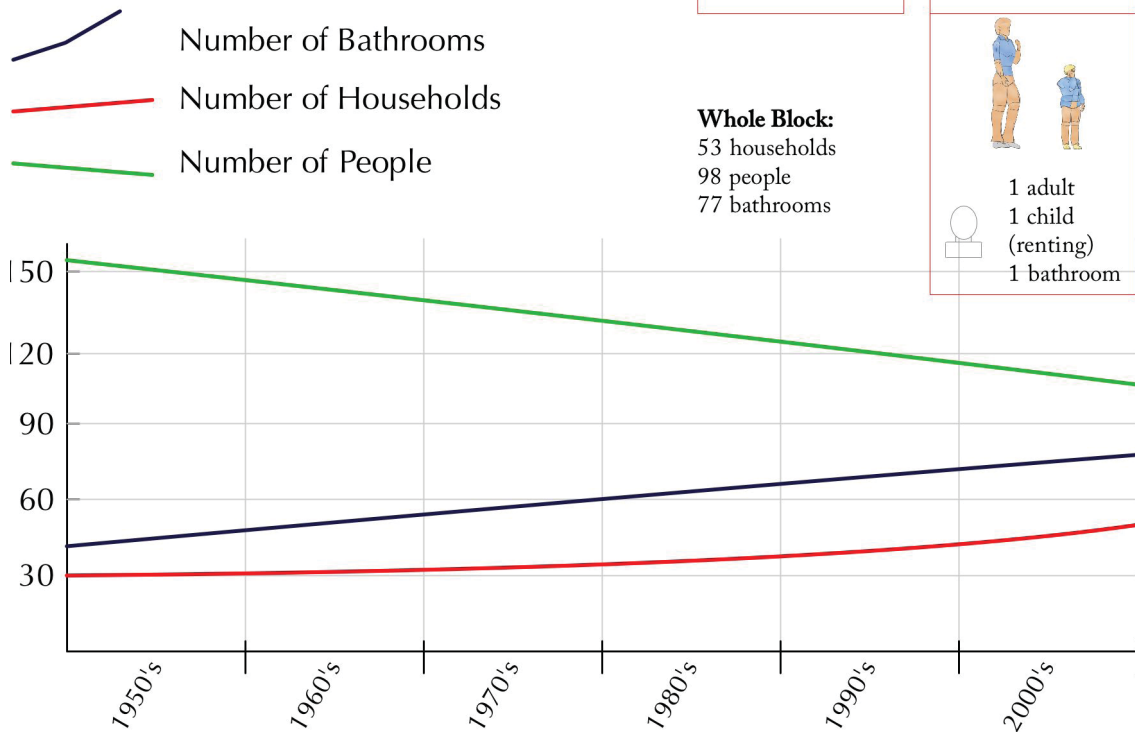
representative lot:



1 adults  
(renting)  
1 bathroom

3 adults  
(unrelated, renting)  
2 bathroom

1 adult  
1 child  
(renting)  
1 bathroom



Changing characteristics of "single family" houses by individual building and by block.

bourhoods could eventually pose a problem for transportation planning and is already posing a problem for some small local businesses.

Victoria has development patterns and housing types similar to many North American cities, and the trends of decreasing household size and increasing expectations about housing amenities are also similar. Whether or not it is a bubble that will eventually burst, the high housing prices can encourage people to think about the economics of housing differently, and critically examine current trends, and perhaps act to counteract those trends sooner than in other places.

### **Victoria's Active Community**

People seeking creative solutions to problems of sustainability are everywhere, but they are not all evenly distributed. Victoria is on the "Left Coast" of the continent, with many people actively engaged in social justice and environmental issues. Despite being a relatively small city, Victoria saw the biggest environmental demonstrations in Canadian history in the early 1990's. It was an important staging ground for protests against logging in old growth coastal forests in the region, including in Clayoquot Sound, which in 1992 was the location of the largest mass arrests in Canadian history until the G8/G20 meetings in Toronto in 2010.

Organized groups working on issues including environment, social justice, and peace continue to be numerous and active in the city. Diverse organizations focus on issues at different scales. Most of these groups are not relevant to the thesis, besides the fact that their presence indicates a willingness to tackle tough sustainability problems. The Fernwood neighbourhood, where this project is situated, is particularly fertile ground for linking

community and ecological initiatives, as shown by a multitude of local projects bringing people together to create neighbourhood resilience.

One of these groups is Transition Fernwood, part of the Transition Network, a grassroots movement supporting community-led initiatives to reduce oil dependence and build local community resilience and ecological sustainability in anticipation of a low-carbon future. It emphasizes the creation of a local skills networks and the development of local resources. Transition Victoria decided that a city wide response was not local enough, so different neighbourhood groups were created, including Transition Fernwood. This community does a diversity of things, including skill sharing, and creating a local barter economy. (Transition Victoria 2011)

Spring Ridge Commons, another Fernwood neighbourhood initiative, is a public permaculture garden. It is a “multi-layered food forest,” with over 100 species of plants, and anybody is free to harvest from them (Fernwood Community Association 2011). It is also home to birds and insects and a gathering place for people. It was transformed from a hard-packed gravel school bus lot in 1999. It is maintained with monthly work parties and has been supported by many local organizations since its creation. It has been such a success that other permaculture food forests have been created in the city. (Fernwood Community Association 2011)

The Fernwood Neighbourhood Resources Group (Fernwood NRG) operates several social enterprise businesses and services around the neighbourhood, including child care, affordable housing, a neighbourhood newspaper, and a cafe. Since 2006, the group has built ten three bedroom market based

affordable housing units, giving preference to families with children. Another one of their businesses is the Cornerstone Café, which is run as a social enterprise with all profits being reinvested in the community. The café is working towards eliminating solid waste completely from its operations. (Fernwood Neighbourhood Resources Group 2011)

Like most neighbourhoods, Fernwood has a community association. The Fernwood Community Association does all of the usual neighbourhood association things, but on top of that they jointly operate a community allotment garden (with the Greater Victoria Compost Education Center), and run a heritage building in Fernwood Square, which is home to a good food box program, a theatre group, an arts collective, and a youth center, and is a venue for the occasional all ages concert. (Fernwood Community Association 2011)

These initiatives are not in any way an exhaustive list. However, they do illustrate that the active and vibrant neighbourhood makes this fertile for a design which aims to link social and ecological sustainability through a collective approach to housing. There are already people actively organizing on a social scale between the family and the city.



## CHAPTER 4: OPPORTUNITIES IN COLLECTIVE FORMS OF HOUSING

Housing is not just about floors, walls and roofs. Housing is about how we inhabit space, and who we inhabit it with; it is about how we live our lives. As social structures and economies change, housing forms must adapt. Conventional forms of housing and development have been criticized for their effects on livability (Jacobs 1961), gender equality, (Hayden 2002), and sustainability (Greene 2004), to name only a few. Suburbs are criticized for being socially homogenous and physically isolating, yet many people choose suburbs over dense city centers that are seen as crowded, dirty and potentially dangerous.

Setting the question of density aside for a moment, there is a pervasive design criteria that exists in both urban and suburban housing design. Whether it's large setbacks from the street in the suburbs, or the solid doors facing double loaded corridors in a downtown condo, care is taken to maximize privacy. Hemmens, Hoch and Carp strongly argue that although single family dwelling ownership has been the signal of social and economic success in North America for the past fifty years, "it is a myth that housing designed for the nuclear family offers the ideal home for everyone" (1996, 1-2).

Instead of presenting yet another critique, this thesis aims to explore an alternative. Rather than having a clear dividing line between public life and private life, a collective approach to housing would create a meaningful new choice of housing type in Victoria that offers a level of social organization in between the household and the city.

Government and industry policy has deliberately made single family home ownership “economically affordable, socially attractive, and politically desirable” since WWII. These policies have always been prejudiced against the poor, the elderly, the single-parent family, the disabled, and anyone else who is not part of a nuclear family. As demographics change and fewer and fewer people are part of a prototypical nuclear family, this problem increases. (Hemmens, Hoch and Carp 1996, 1-4)

Economic conditions have changed since the creation of those policies too, pushing home ownership out of reach and “forcing moderate and middle income households to remain in a rental market that has little government support and usually receives general public contempt” (Hemmens, Hoch and Carp, 1996, 1-4). As demand for rental housing increased, so too did rent (Apgar 1990 cited in Hemmens, Hoch and Carp 1996, 2) increasing financial hardship for those who already do not have enough for home ownership.

However, shared housing in some form or another is common, but is not necessarily recognized as sharing. There are obvious forms of shared housing, like group homes for people with disabilities, halfway houses and old age homes. However, the most common type of shared housing is probably condominium type ownership, which is a formalized legal and financial structure for sharing. There are also single family dwellings disguised as independent home ownership, but part of a planned development with a homeowners association, also a form of shared housing. The type of legal sharing arrangement in these cases, however, are mainly economic in nature and is designed to treat the dwelling as a financial asset, rather than as a home.

Treating the dwelling as a home that accommodates social interaction and encourages a sense of community requires a change in architectural form more than formalized legal or financial sharing.

Residential structures can be designed to accommodate sharing for members of different social classes, whether transitional housing for the homeless or co-housing for the middle-class. Sharing itself does not impose the stigma of dependency or low status, at least not if undertaken free of moral and legal sanction from outside. Many households and community organizations currently modify the structure and use of the physical housing stock to meet a diverse assortment of social needs. (Hemmens, Hoch and Carp, 1996. 1)

It is time for a change in thinking towards one that accepts shared forms of housing as legitimate for people from a variety of social and economic backgrounds. While many forms of shared housing arose as a response to perceived economic or social problems, they can be part of a response to ecological problems as well.

Physically, a collective approach to housing offers more opportunities to be ecologically responsible. A greater range of site planning options are available, and higher densities are more readily accepted. Access to shared facilities can be traded for smaller individual dwellings. A greater range of building technologies are available/affordable when resources are pooled. All of these things are important technical issues, but the focus here is on the connections between the social and the ecological.

## **Linking Ecological and Social Sustainability**

In the western world, consistently a large majority of people list the environment among their top concerns. Despite this concern, even relatively easy behaviors like recycling are not always done. A significant number of committed, intelligent,

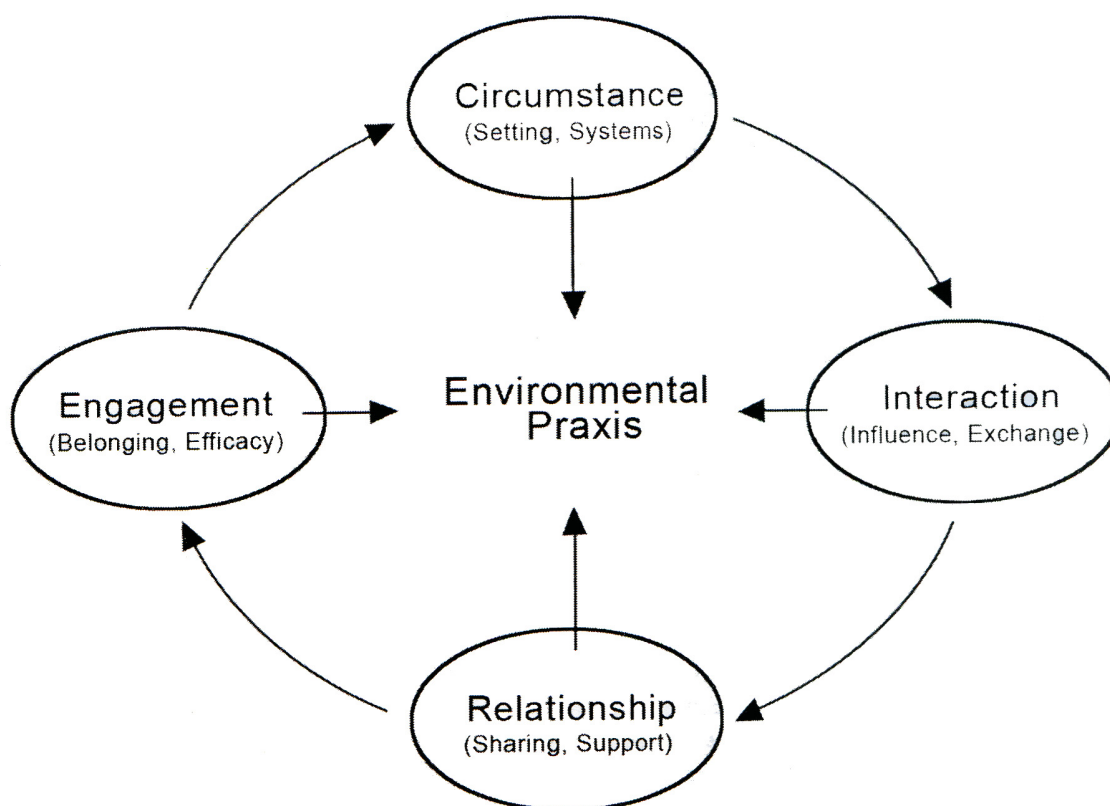
informed people are active participants in the environmental movement, but even they lapse into ecologically unfriendly behavior. A common criticism of these people is that they “talk the talk, but don’t walk the walk.”

There are probably many different reasons that contribute to this disconnection between values and actions, but how can it be overcome? Behavior is closely connected with culture, and cultural change is only possible when acting collectively. It is worth exploring, then, how housing can support quality social relationships and a meaningful new scale of social organization.<sup>1</sup>

A community as a whole can encourage pro-environmental behavior to help reduce the gap between intention and action. This is not an authoritative influence, but a supportive one. The habits of neighbours, friends and relatives have a significant impact on our own habits. In this way, incrementally positive changes in behavior can have a significant effect over time. Meltzer (2005) has documented change over time in pro-environmental behavior, quantifying reductions in car use, dwelling size, use of toxic products, and in water conservation, energy conservation and waste reduction in individuals before and after moving into a cohousing community. His conclusion is that as a community’s social cohesion strengthens, pro-environmental behavioral change tends to follow.

1. By scale of social organization I mean a defined group that one shares a sense of identity with and feels a kinship for. The family is the quintessential example on the small end of the scale, a nation is an example on a bigger scale. While places often have a sense of neighborhood and voluntary organizations directed at any number of goals or interests, they do not necessarily create a lasting sense of identity or kinship. In fact, Wirth (1938) argues that these associations can be described as substituting primary contacts for secondary ones, actually weakening the bonds of kinship in the process (103).

Meltzer's diagram (on the next page) is a summary of how social connections and relationships within cohousing communities has led to pro-environmental empowerment. Four key domains are at work. *Circumstance* can “set obstacles and offer conveniences” that strongly influence behavior (Meltzer 2005, 154). *Interaction* is important in “raising environmental consciousness and spreading awareness about how to apply one's environmental values in practice” (Meltzer 2005, 155). The sharing and support that are part of high quality social *relationships* “enhance the environmental praxis of cohousing residents” (Meltzer 2005, 155). The fourth domain is *engagement*, “a sense of belonging and high levels of real and perceived efficacy enable cohousing residents to successfully manage their own affairs”



Model of community empowerment in Cohousing. Meltzer 2005: 155.

(Meltzer 2005, 155). Through engagement, they are empowered to make changes to their circumstances, creating a beneficial spiraling effect. The communities Meltzer studied effectively reversed the worst individualizing effects of urbanism identified by Wirth.

### **The Role of Architecture**

The role of architecture is clear when it comes to physical infrastructure, but it is perhaps less clear when it comes to the social and organizational benefits of a collective approach to housing.

Positive social interaction and a strong sense of community can arise despite unsupportive architecture, and vice versa, so architects must act with some humility about their role. However, a built environment that fits with the goals and values of a community can only make that community stronger.

Fostering a sense of community and providing space for meaningful social interaction is a goal of architecture in many building types, but in housing the primary goal more often is privacy. Housing is capable of “inhibit[ing], support[ing] or passively contain[ing] various forms of sharing” (Ahrentzen 1996, 51). The goal of collective housing design must be to support beneficial sharing and positive social interaction. We can look to precedents from intentional communities, and in particular cohousing, for examples of how this can be done.

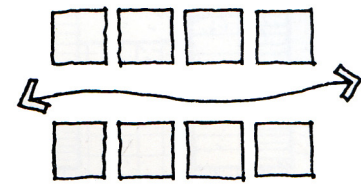
### **Learning from Cohousing**

The intentional communities movement has explicitly made the connection between sustainability values, social relationships, and built form that contains them.

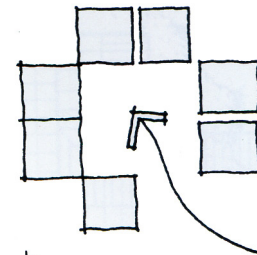
Intentional communities are planned residential communities with specific membership, organized around a shared idea. It is a broad category that can include everything from Kibbutzes and Hutterite villages to hippie communes and ecovillages. While these examples may seem outlandish for a majority of people, intentional communities also includes groups that are much less distant from the mainstream, like cohousing. This thesis looks to the cohousing model because it is a contemporary movement which is growing, it is well studied from an architectural point of view, and has produced some vibrant and exciting results.

Cohousing takes inspiration from many of the advantages of traditional villages: knowing and trusting your neighbours, a safe environment for children, and a socially rich, supportive and interconnected community. Consciously avoiding nostalgia, it seeks to reestablish those advantages within the context of contemporary urban and suburban life. It does not by definition imply any political or environmental values, but those attracted to the idea are often on the progressive end of the spectrum.

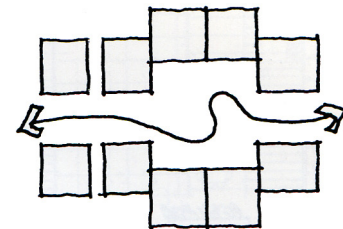
Cohousing is characterized by 1) intentional neighborhood design, 2) self-contained private homes supplemented by extensive common facilities, 3) participatory processes, and 4) complete resident management. Shared meals are the cornerstone of most cohousing communities, and so the shared kitchen and dining room are usually the most important of the shared facilities. The private homes tend to be smaller than typical market homes, but this is compensated for by the shared space. (McCamant and Durrett 1988, 35-41)



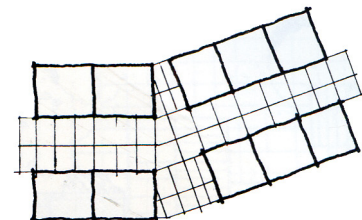
a



b



c



d

Generic cohousing site plans: a) the pedestrian street, b) the courtyard, c) the courtyard/street hybrid, and d) the atrium or interior street. McCamant and Durrett 1988: 173.

The first communities built with the ideals that led to cohousing started planning in 1964 in Denmark, spearheaded by Bodil Graae and the architect Jan Gudmand-Hoyer, along with a large group of families. These efforts eventually led to communities completed in 1973: Saettedammen and Skraplanet, located in the towns of Jonstrup and Hillerod, near Copenhagen. These communities were explorations of a new kind of neighbourhood, but were not yet cohousing.

The process and thinking that went into these communities led to the first really cohesive manifestation of cohousing ideas: a community called Tinggården, completed in 1976 and designed by the architecture firm Vandkunsten. Tinggården's design was the result of a competition whose brief was to explore alternative dwelling types. Cohousing took off quickly in Denmark, with 22 communities by 1982 and 120 by 1989 (McCamant and Durrett 1988, 10), with many more created since.

The cohousing movement was brought to North America by two architects, Kathryn McCamant and Charles Durrett, and their 1988 book: *Cohousing: A Contemporary Approach to Housing Ourselves*. The idea has taken hold in North America, although not as dramatically as it did in Scandinavia. There are currently 9 completed communities in Canada, with 8 more in some stage of development (Canadian Cohousing Network) and 104 completed communities in the United States, with 134 more in some stage of development (Cohousing Association of the United States).

There are certain proven design principles that have been learned from successful cohousing communities: 1) purposeful separation from the car, 2) pedestrian pathways connecting the



dwelling, 3) the least private spaces of the private dwellings facing the pedestrian pathways, and 4) common house is centrally located (Scotthanson and Scotthanson 2004).

Another insight that has developed about cohousing is that of the optimal community size. Between 12 and 36 households is the size that seems to work best (Scotthanson and Scotthanson 2004, 125). Communities smaller than 12 households have fewer resources for shared facilities, and can feel too intimate or might become too dependent on particular individuals. It becomes more important to like everybody in the community when the community is smaller. There are small cohousing communities that do work, however, and they tend to be in urban areas where there is a greater likelihood of non-residents participating in community meals and other activities, and where there are more social opportunities outside the community but still nearby.

When a community is larger than about 36 to 40 households, it becomes more difficult to know everybody, or might become administratively complex. Larger communities tend to work better in rural or suburban areas, where there are fewer opportunities for socializing and activities nearby (Scotthanson and Scotthanson 2004, 125).

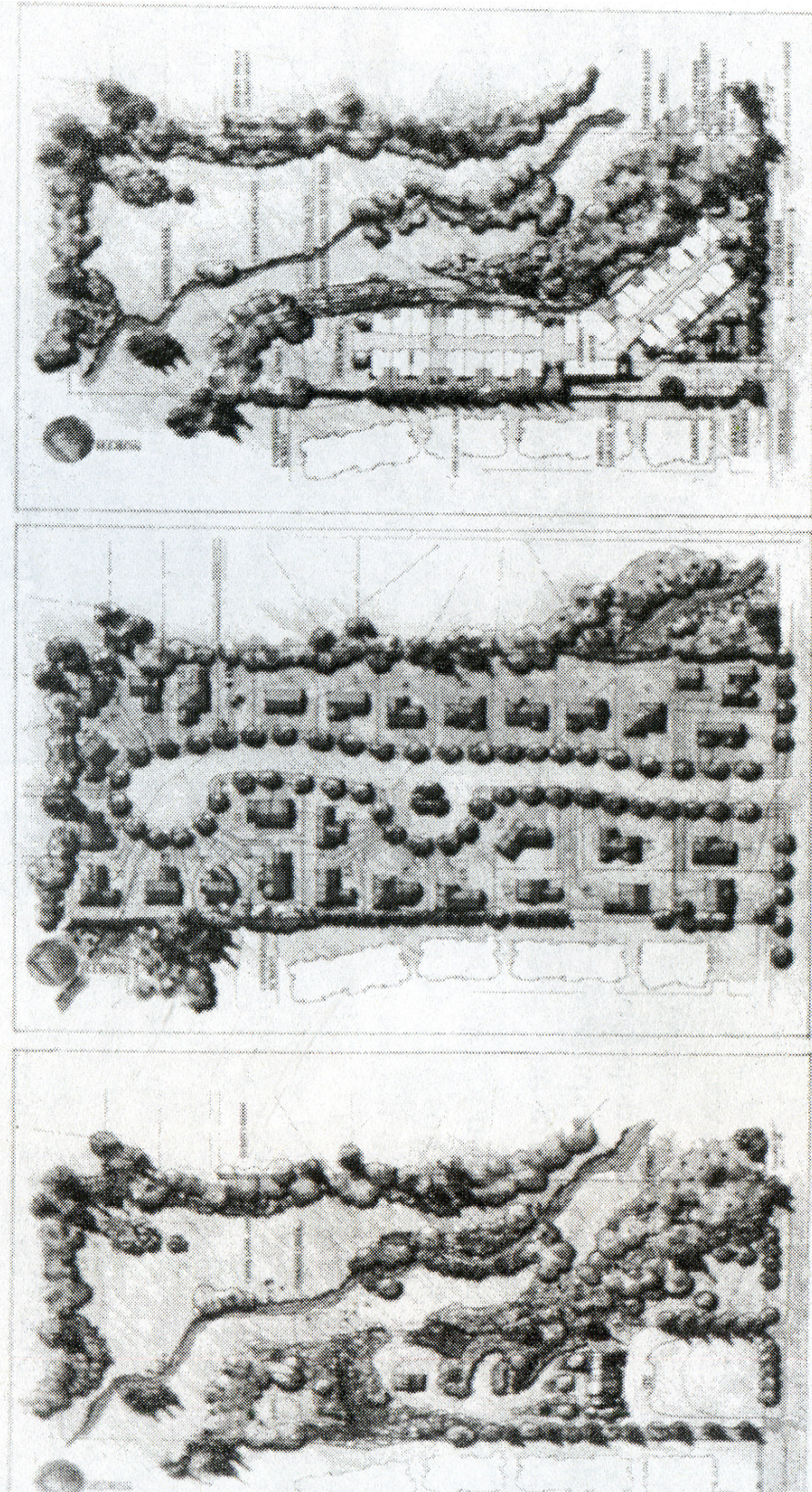
Cohousing design has changed over time, and Scotthanson and Scotthanson (2004) have identified four distinct generations. In the first generation there was still uncertainty about the concept, and so private dwellings tended to be close to average market size (about 1,500 square feet) and relatively separated, and shared facilities were modest (about 1,500 square feet on average). Second generation cohousing was more confident about the idea of sharing common facilities, and traded smaller

private dwelling size for a larger common house (about 1,000 square feet and 5,000 square feet on average), although the dwellings still tended to be fairly separate. Third generation cohousing continued the trend toward smaller apartments and larger common facilities (750 square feet and 10,000 square feet on average), and apartments were brought into a closer physical relationship, often in a single building, or connected by a glass covered street. Fourth generation cohousing consists of clusters of second and third generation cohousing communities, forming a larger village.

### **Cohousing and Sustainability**

Contrasting to the ecovillage movement, cohousing is primarily a socially motivated idea. Despite its social focus, the connection between community and ecological sustainability is strong. These communities are aware of the connection between their built environment and way of life, and the community's organization allows for the sharing of resources with many potential benefits.

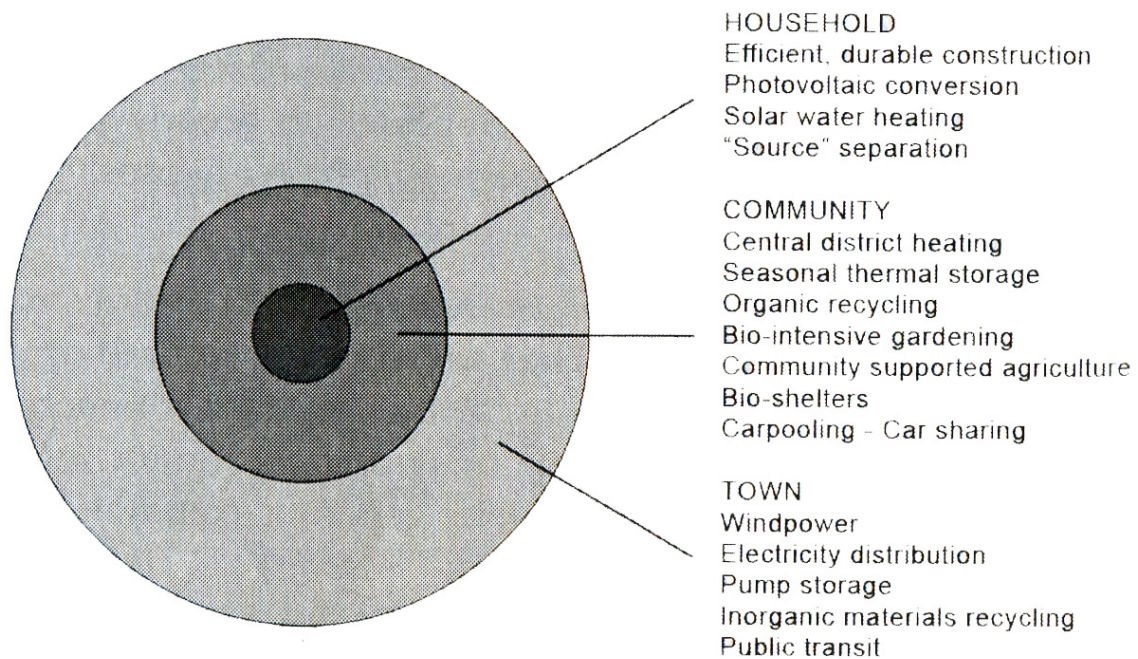
Increased density and decreased dwelling size are perhaps the most obvious ways that collective forms of housing can reduce their impact relative to conventional housing. Access to shared space changes the prevailing norms and expectations around private space, making smaller dwellings feel comfortable. Collective housing forms allow the possibility of unconventional site planning and massing, which has potential for improving the environmental impact of the building. Smaller dwellings on less land decrease the resources needed to construct housing, the energy needed to heat and cool it, and the amount of land impacted.



Left: site of Windsong Cohousing when the community acquired the land. Center: a typical suburban development pattern for the site. Right final site plan for Windsong. The final design has the same number of housing units as the suburban pattern, but leaves a large part of the site in its natural state. Meltzer 2005: 30.

The average density of suburban developments in Australia and North America is 30 people per hectare (12 per acer). Meltzer (2005) compared this number to the people per hectare of suburban cohousing developments in these regions, and found them to be between 50 and 117 people per hectare (20 to 47 people per acer). Meltzer did a similar analysis of dwelling size. In America, a typical single family house built in 1993 had an area of 202 m<sup>2</sup>, and that number has since increased. The average cohousing dwelling built in the early 1990's was half the size, at 100 m<sup>2</sup> (Meltzer 2005, 119-121).

Meltzer also documented a decrease in car ownership and car usage after moving into cohousing. This is perhaps surprising since the majority of cohousing residents he interviewed moved to areas of lower density. Meltzer attributed this to the fact that



Scales of technological efficiency. Diagram by Coldham, in Meltzer 2005: 122.

when choosing where to locate, suburban cohousing communities often have access to transit as one of, if not the, most important criterion for site selection, and that carsharing, either formal or informal, is common (Meltzer 2005, 115-117).

Sharing resources can decrease an individual's material needs without decreasing quality of life. A carshare is a wonderful example of this, but it can also apply to washing machines and smaller items like tools, etc. Meltzer documented a net decrease per household of freezers, washers, dryers, and mowers when people move into cohousing. (115-128)

Technologies apply to some scales better than others, which makes some things available to neighbourhoods working together that would not be available or affordable to individual households. Geothermal heating combined with seasonal heat storage would be prohibitively expensive for most households, but feasible for a neighbourhood, for example.

## CHAPTER 5: DESIGN

### Design Goals

The main design goal is to create a sustainable community housing development. The discussion on what sustainability is has shown that this is not such a straightforward thing to do.

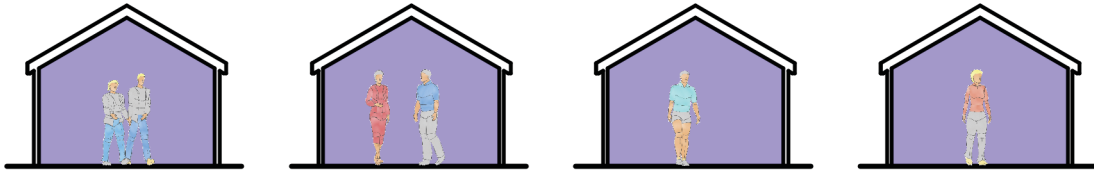
The project is located on the block bounded by Fernwood Rd, Gladstone Ave, Vining St, and Stanley Ave. The target density is to double the number of people living on the block to at least 180 people. The reasons for choosing this location and this density are elaborated below.

The program takes its inspiration from the cohousing model, but adds another layer to it. Cohousing is a response to many of the undesirable social consequences of urbanism that Wirth (1938) identified by creating a strong sense of community within the context of a city. Cohousing does not, however, directly take into account the changing nature of the household.

The program for this project includes the “common house” facilities of cohousing communities, shared by all of the residents. Because of the size there are two common houses, and residents are associated with one or the other, making it a “fourth generation” cohousing type (see page 36). The important difference in this project is to treat the household differently. In cohousing, each household has a unit complete with kitchens, bathrooms, and everything else conventional housing would have, even if they are on average smaller units than is typical.

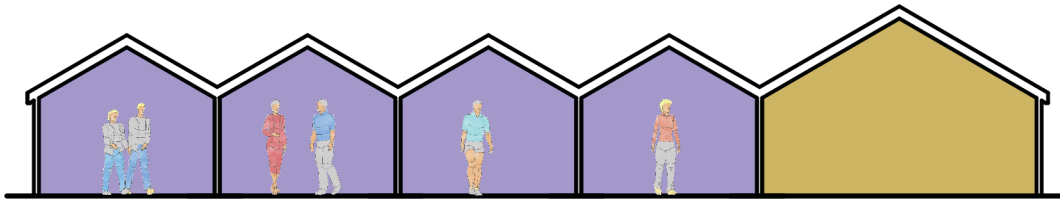
Since it is more and more common that a household is only one or two people, a level in between the household and a community of 180 to 200 people is introduced. This project creates residential buildings that cluster private rooms around shared

## Typical households in Victoria



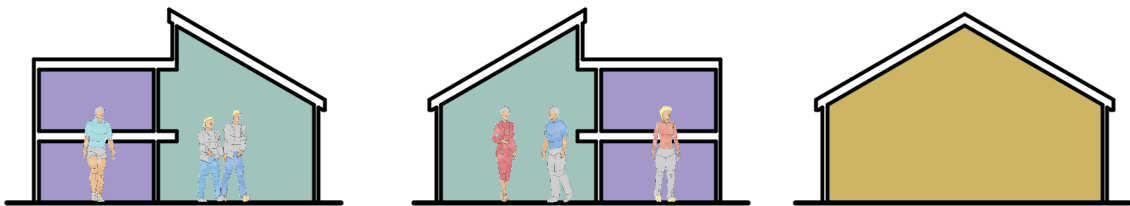
Home is private space within the city

## Cohousing Model



Home is individual space in a neighbourhood community

## Modified Cohousing Proposal



Home is individual and shared space in a neighbourhood community

facilities, creating a sort of “big house.” These buildings can accommodate a mix of individuals and small or large families, but the separation between what is typically considered a household will be blurred. The hope is that as people settle into the building, these “big houses” will end up with the feel of one big household of 8 to 12 people.

That is the program, now for the architecture. The main architectural objective is to support the program by creating spaces that foster a strong sense of community. This is accomplished by designing shared space that is generous and inviting, while providing individual space on an intimate scale. The thresholds between individual and shared space within the big houses, and between the big houses and the outdoor spaces are treated with care and designed as places of encounter rather than of separation. The architecture also makes physically legible the different layers of shared and individual space.

The secondary architectural objectives are:

1. to respect the character of the neighbourhood, despite doubling the number of people living there, by conforming to setbacks, floor area ratios, height restrictions, and ground coverage stipulated by the current zoning (although it will be non-compliant with zoning in other ways)
2. to encourage connections between the new community and the wider neighbourhood
3. to take advantage of the opportunities for physically improving the environmental impact of the buildings and to make these legible
4. to make the design affordable in the long term to residents who make their livings in Victoria.



## **Affordability**

Affordability is a relative term. The more money a household has, the more housing options are “affordable.” Housing in Victoria might be affordable now to people at the height of their careers or who already have substantial equity in a house. For most people early in their career with no equity, housing in Victoria is clearly not affordable. Since Victoria is a desirable city to retire to, there is no reason to believe that housing prices will correct to allow young Victorians into the market any time soon.

If affordability is the goal, it is a challenging one in Victoria. Do the experiences of cohousing communities offer solutions? While cohousing developments are not always more affordable, they have the potential to be. Scotthanson and Scotthanson note that within certain practical limits, a unit in cohousing can cost almost anything (2004, 8). However, because cohousing is generally created by those who can already afford to buy their own home, in North America all cohousing communities that were not externally subsidized were built at normal market cost (Scotthanson and Scotthanson 2004, 180). If an aim of this thesis design is a community affordable for people with roots in Victoria, then the potential of cohousing to be more affordable than market housing must be taken advantage of.

So, what are the potential ways collective housing can be more affordable than market housing? Fixed costs can be distributed across more units. Also, the size of each individual unit can be much smaller than market housing while still being comfortable, because of the common facilities. Clustering and stacking units can save money.

The cost of land is higher the closer you get to the core of the city, so it might seem that the more affordable option is to build in the suburbs, and most cohousing developments do. But when living far from work and amenities necessitates a private vehicle, it makes sense to include this cost into the calculations for the cost of housing. Since cohousing can make increased densities attractive, the higher cost of land close to the center can be distributed among more households, and each household can benefit from lower transportation costs. The collective nature of cohousing can also facilitate things like a car share, eliminating the need for private vehicles for each household.

Transportation costs are treated here as part of housing costs. A house far from the city center may seem cheaper, but if you can live happily without a vehicle closer to downtown, that cost is saved. A now outdated study found that the average American household can save \$8,883 annually by taking public transit instead of driving (Calthorpe 1993, cited in Hester 2006, 204). That cost has probably increased since. Distance to employment, amenities, and public transit were important considerations in choosing the site in Fernwood for this thesis.

The specifics of the design affect the short term affordability, but if treated as typical real estate it is likely to be influenced by the ups and downs of Victoria's housing market, and if the ups continue, it might be affordable for only a short time. A collective legal/financial structure could ensure longer term affordability.

A community land trust or limited equity co-op model can effectively take this housing out of the ups and downs of the speculative market while maintaining secure community control. This also encourages a relationship to the physical dwelling to

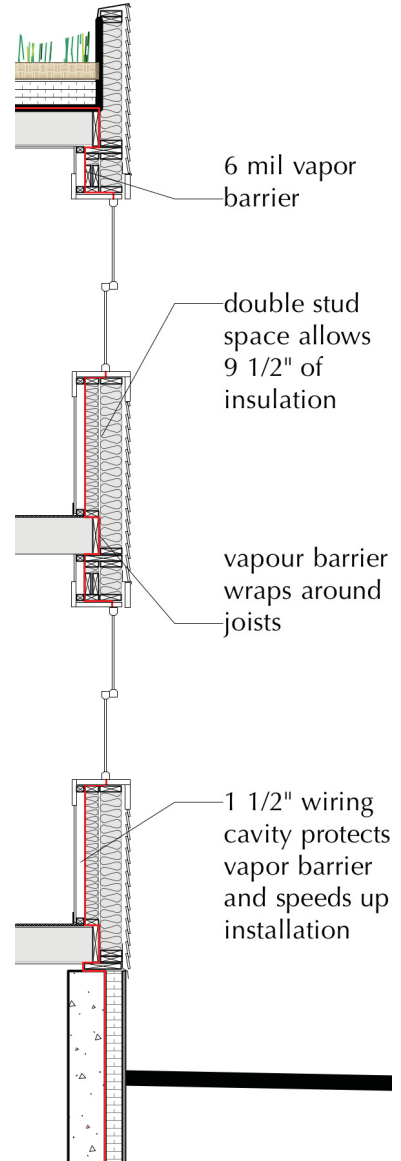
be primarily a home, rather than a financial asset. But whether the legal entity of the community is a land trust, a co-op, or something else, is not an architectural question. However, the architectural implication is that the legal and financial structures of this project are collective ones, and the architecture can reflect and support that collectivity.

The physical design affects both long term and short term affordability. Short term affordability is considered by keeping building forms simple and building techniques and materials to what is familiar to local builders. The floor area per person and envelope area per person are to be well below normal market averages, taking advantage of the shared spaces to offset smaller individual spaces. The operating costs of the building will be kept low by designing tight envelopes with high insulation value.

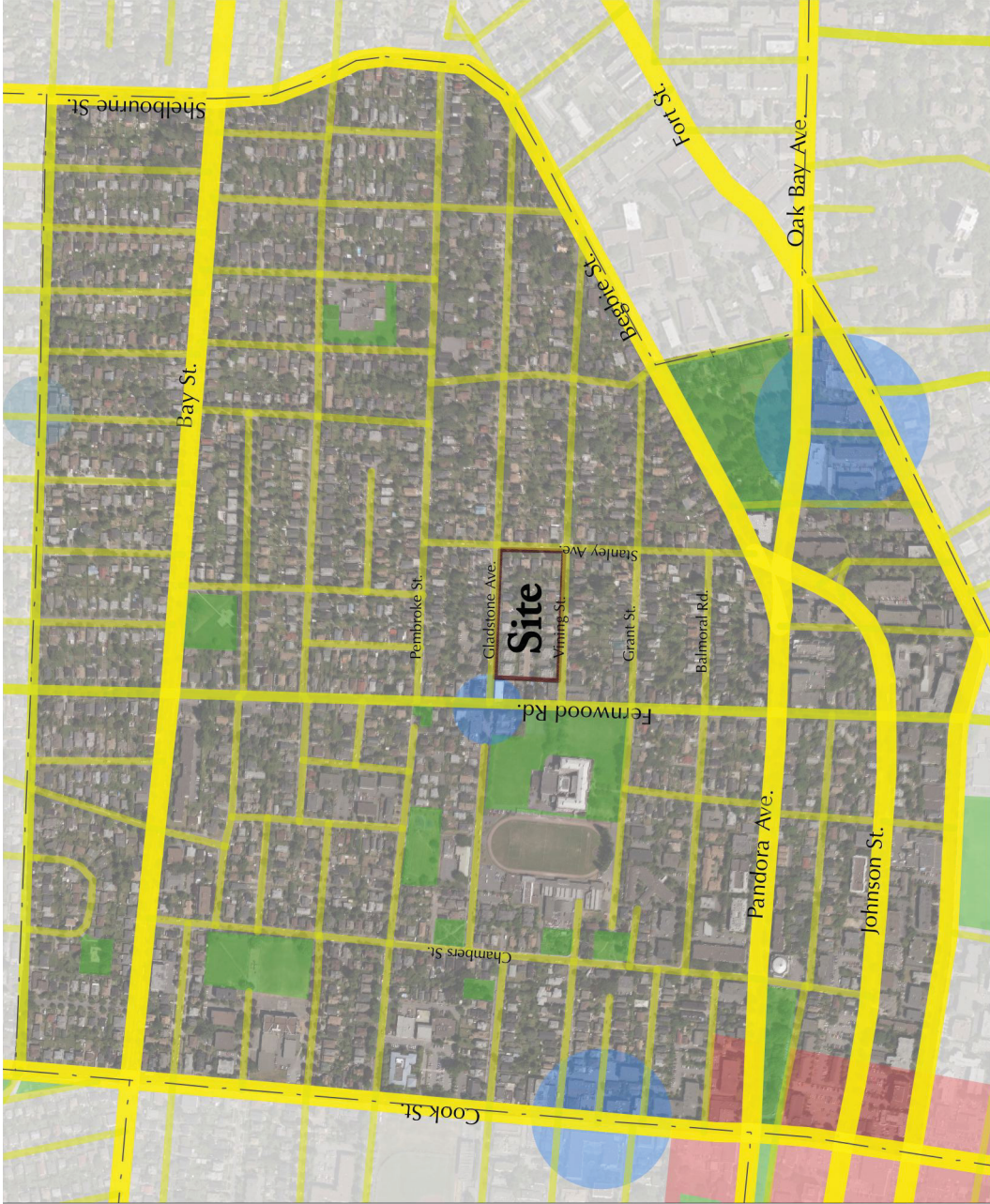
### Site Selection

The site chosen is in the middle of the Fernwood neighborhood. When the city was young the area was known as Spring Ridge, and supplied the drinking water for the city. As Victoria's population grew, a suburb for working and middle class families grew in the area between 1880 and 1930. Many buildings remain from that era, including some houses, Victoria High School (1914) and the Emmanuel Baptist Church (1890) which later became the Belfry Theater. The neighborhood was serviced by the Fernwood Line Streetcar, which ended at what is now Fernwood Square.

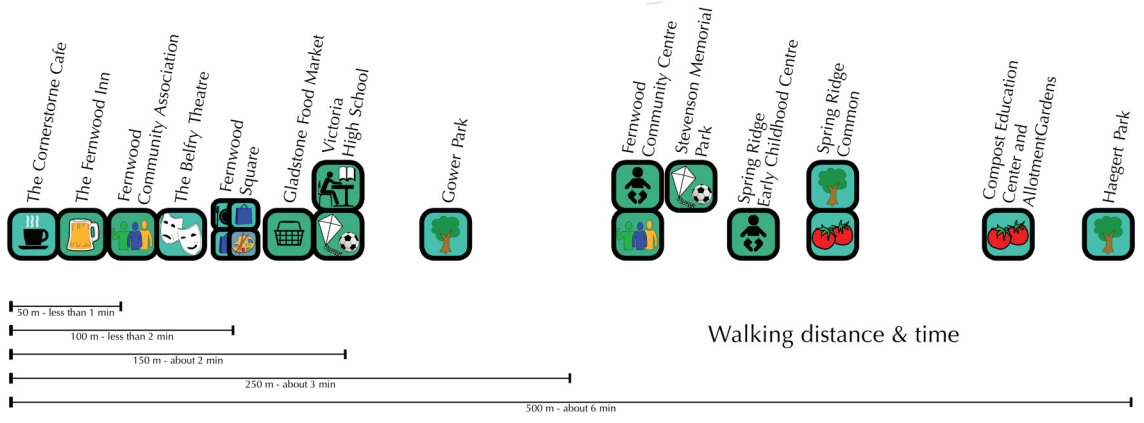
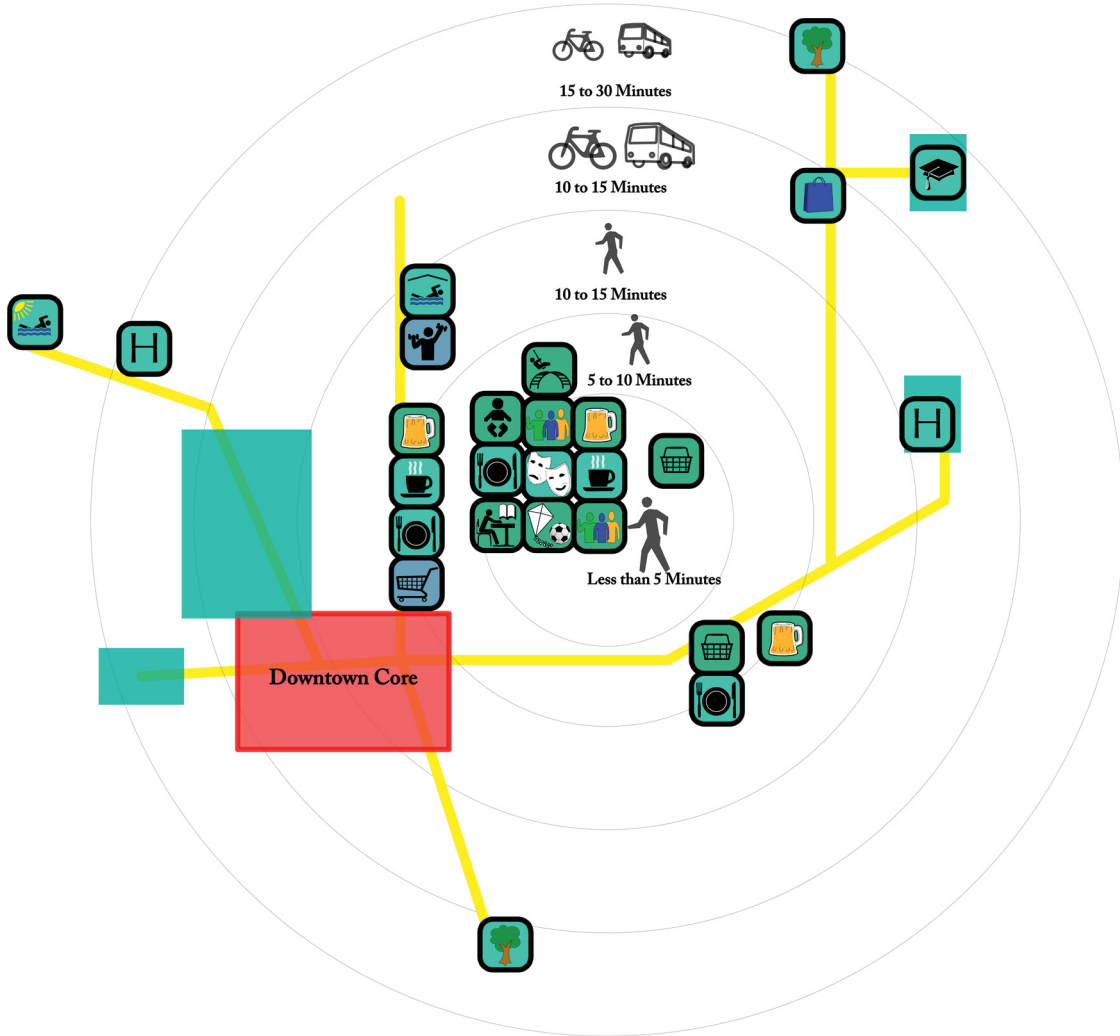
Fernwood has arterial streets along the perimeter, with Victoria High School and Fernwood Square in the center. (Even though it is a former streetcar line, Fernwood Road is no longer an arterial route.) This pattern follows some of the principles of Clarence Perry's (1929) "neighborhood unit," a pattern which



Double stud wall construction uses familiar materials and techniques to achieve high insulation value, minimal thermal bridging, and tight construction.



Map of Fernwood. Base orthophoto from CRD Atlas.



Network of amenities near the chosen design site

provides a clear sense of boundary and center, but implies that the center is for neighborhood residents alone.

Since Fernwood Square is not located along major routes, but roughly equidistant from several, the businesses there rely on a combination of local residents and people who go there specifically; businesses located here do not get casual walk-ins from outside the neighborhood.

Local residents frequent the Cornerstone Café and the Fernwood Inn Pub, and participate in activities at the Fernwood Community Center (which was introduced in Chapter 3). One big draw for people outside Fernwood is the Belfry Theater, a professional theater company that puts on up to 12 new productions a year, many of which are premieres. A popular night out is to combine going out to a play with dinner at Stages Wine Bar and Restaurant, also located in Fernwood Square.

The City of Victoria is in the process of updating its Official Community Plan (OCP), in the draft stage at the time of writing. The draft OCP calls for key local services at Fernwood Square, and envisions all services in the neighborhood to primarily serve neighborhood residents (City of Victoria 2011, 37, 135). In order for businesses providing those services to be viable, there must be enough locals. Fernwood Square itself is mostly surrounded by single family dwellings, or formerly single family homes converted to two or more suites in the process described in Chapter 3.<sup>1</sup> These densities are not enough to support

1. There is some medium density residential along Cook St. and medium to high density residential south of Pandora Ave, which is inside the municipality's boundaries for the Fernwood neighbourhood. However, frequent public transit routes, wide roads and more active streetscapes orient these places towards downtown rather than the center of Fernwood. People who live in these areas might not identify themselves as residents of Fernwood; they are more likely to say "I live Downtown," or "I live on Upper Cook Street."

many local businesses, and indeed many start-ups in Fernwood Square have failed over recent years.

As Hester (2006, 222-223) notes, creating neighborhood centers is a chicken and egg problem; residential density nearby is needed to support the shops, schools and community services of a neighborhood center, but often a center is needed to attract more density. Despite not having local density, the attractions of the Belfry Theater, the uniqueness of the buildings at Fernwood Square, and the activities of the community result in people from other neighborhoods coming here. This fertile situation sidesteps the chicken and egg problem.

Fernwood is a fertile site because there are local amenities to support more density and more density would be good for the local amenities.

The existing amenities in the neighborhood provide some of the things that a cohousing community would often contain: for example, a large field for children to run and play, which could happen at Vic High or at Stevenson Park, or a place for adults to casually gather and socialize, which can happen at the community center, the café or the pub. These places not only offer amenities to residents of the development, but also one interface between the people living in the new community and the wider neighbourhood. Since people are already congregating in places next door, the design includes new places that attract people from the neighbourhood, providing yet another layer of interaction. In the design process the spaces included in the design evolve based on what can be provided by the neighborhood and what might enhance the neighbourhood.

The street grid, lot size and existing housing stock in Fernwood are similar to many neighborhoods in Victoria, and similar to patterns that exist in many other North American cities. A successful intervention here is applicable elsewhere because of similar starting conditions.

The draft OCP would like to see the neighborhood provide “a transition between the Urban Core and primarily ground-oriented Traditional Residential” to the north and east (City of Victoria 2011, 135). The “Urban Core” is defined as you would think, and “Traditional Residential” describes lot sizes, setbacks, ground coverage, building heights and floor area ratios that are typical of suburbs (City of Victoria 2011, 32, 36). What exactly the transition looks like is not well defined in the draft plan. This ambiguity provides an opportunity for innovative proposals.

One current proposal is very relevant to this thesis: a co-housing development called the Fernwood Urban Village is in the late stages of planning and hoping to build in early 2012. It has not yet been given a permit by the city, but the group has had plenty of dialogue with neighbours and city planners, and has gotten a positive response overall. This is further evidence that the community will welcome new approaches to housing.

The specific site chosen includes seven amalgamated lots containing five four-plex buildings, which is evidence of an openness to increasing density here, although this intervention increases the density less than is proposed by the thesis design. (A full discussion of density will follow in the next section.) Their design and landscaping also makes them seem to hide from the street, doing the opposite of encouraging community.

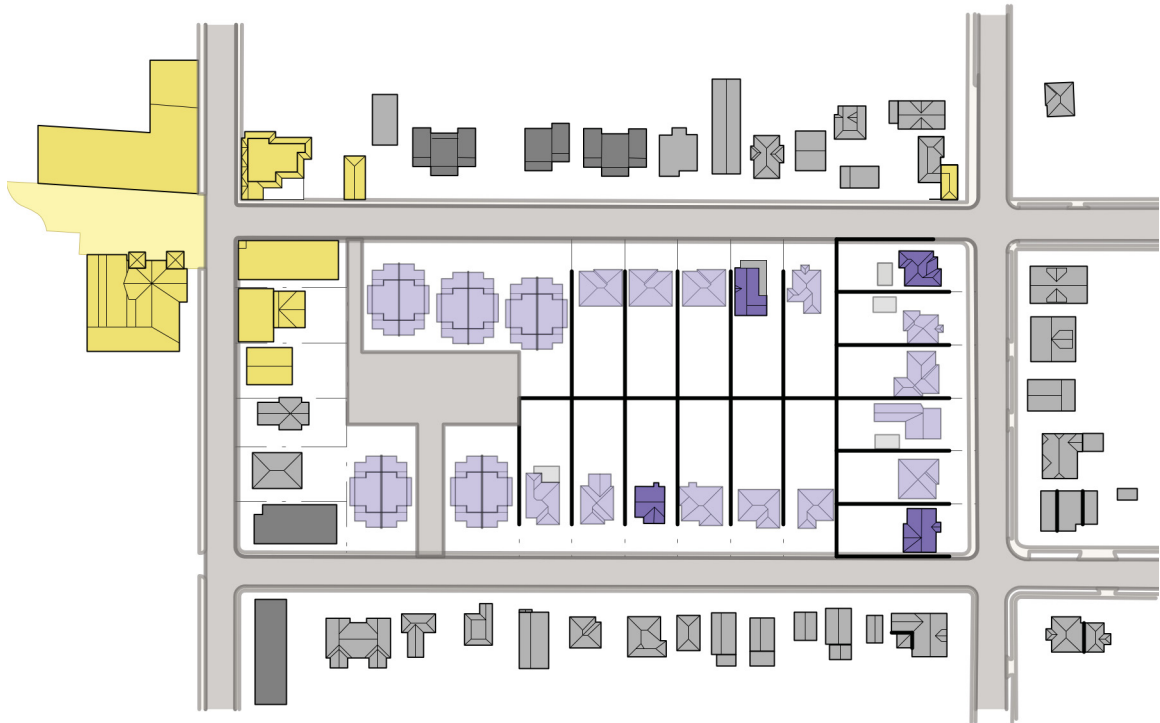




Three houses facing Gladstone Ave. These will be replaced.



House facing Gladstone Ave. This house will be incorporated into the proposal.



The design site showing the existing buildings. The buildings shown darker will be kept and incorporated into the new proposal.



Four-plex development on the western side of the site. These buildings will be replaced.

Of the twenty-two existing buildings on the site (excluding back yard sheds), four are kept and incorporated into the thesis design proposal. The houses that are kept are renovated to function like the new big houses. Incorporating some of the existing housing stock into the proposal helps the development be less jarring to the neighbourhood character. The selected houses to keep is chosen based on considerations of their robustness and state of maintenance, their suitability for use as a “Big House,” and how well they could be integrated into the new site plan. 1345 Gladstone (the blue one pictured on p. 51) is also a registered heritage house, adding incentive to keep it. The four-plex development on the western part of the site has a form that emphasizes privacy rather than community, so it will not be kept.

Location in the vibrant and active community in Fernwood, together with proximity to Fernwood Square and to downtown make this site fertile for the intervention this thesis proposes. The site is made up of lot sizes and existing dwellings typical of the fabrics found in older suburbs. That fabric is not supporting the community as much as it could, and it is not responding well to demographic, social, economic and environmental challenges. This makes the lessons here applicable in many places. But the neighborhood is also unique, and this proposition has an excellent chance for success here. Once it is an established success, other neighborhoods will look to it as a precedent.

## **Density**

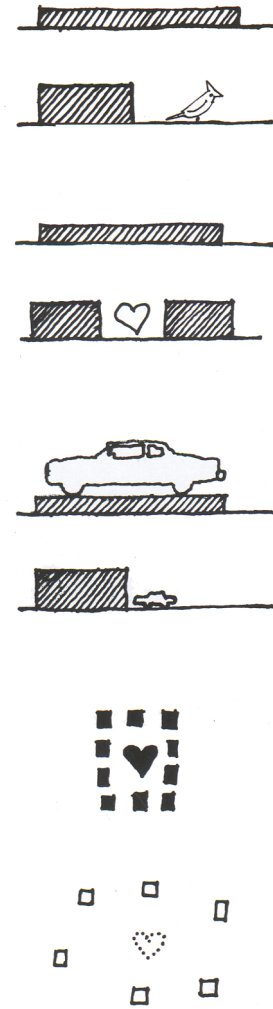
Supporting Fernwood square as a neighbourhood center, transitioning between high density downtown and ground oriented residential neighborhoods, and making public transit frequent economical and effective can all be supported by one thing: increasing density.

Concentrated dwelling forms, if done well, can create vibrant and resilient development patterns; it can create centeredness and take development pressure off greenfield sites. In low density neighborhoods only 12% of trips are by foot or public transit, but this number jumps to 45% in moderate-density neighborhoods (Schlesinger 1993, in Hester 2006, 204) therefore reduce transportation's costs and adverse effects. Increasing density can be part of achieving social and biophysical sustainability goals.

This design takes advantage of the amenities at Fernwood square, and also to supports it as a local center. Clarence Perry's influential 1929 paper found that local businesses fail with densities less than 13.8 residential units per acre. Perry's inventory of several cities found that neighborhoods of 5,000 people loyal to local businesses could support a grocery store, a drug store, a furniture store, restaurants, specialty meat market, fruit and vegetable markets, bakeries, plumbers and auto repair. 7,000 people were required to make laundry, hardware, clothing and florist businesses viable. (Perry 1929)

Even though the details of this study are out of date, the underlying principles still hold true (Hester 2006, 203). Hester observes that the Urban Land Institute's *Shopping Center Development Handbook* still calls for the same principles, despite the fact that fewer people are faithful to their local neighborhood center (Hester 2006, 203).

The design site chosen is 16,200 square meters, or 4 acres. Based on a combination of census data and physical observation, the current occupation of the site is estimated at 42 dwelling units in 22 buildings, with 91 people living in them. This is a net density of 10.5 units per acre and 22.8 people per acre, which

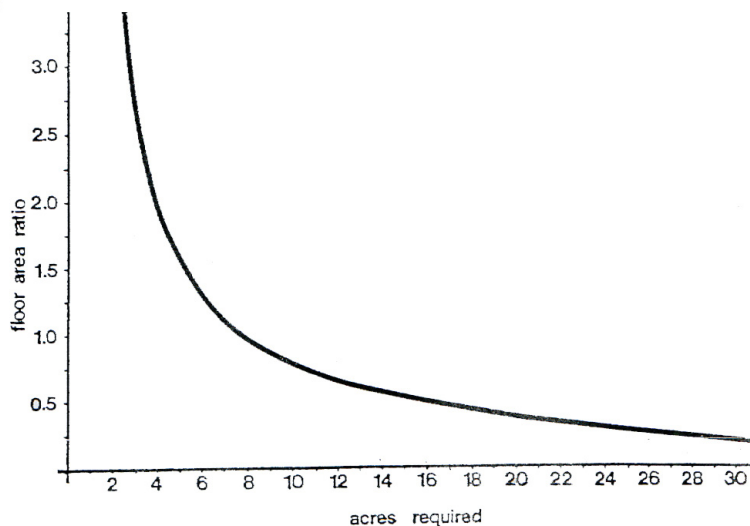


Density trade offs. Hester, 2006: 202.

is below Perry's threshold for successful local businesses. As discussed in the previous section, Fernwood square does attract people from other neighborhoods, but despite this, many small businesses have failed in Fernwood square.

This density is also low with respect to convenient and economically viable public transit. Ten dwellings per acre is the minimum for viable transit in a neighborhood, which the site barely has, but transit does not pay its way until fifteen units per acre. (Hester 2006, 204). The residential densities that currently exist on the site do not support the urban services one would expect so close to the city center. Densifying the site is a good idea, but by how much?

Density can be measured with respect to numbers of households or individual people. It can also be measured with respect to buildings, usually built floor area. A common way to measure building density is with Floor Area Ratio (FAR), the ratio of the area of the lot compared to the floor area of the buildings on the lot. Building density and people density are related, but as we



Graph showing the number of acres required for the built area at different floor area ratios. Diamond 1976.

density has an effect on social and economic interactions, and transportation planning. Physical land use efficiency is more a question of built form density.

Jack Diamond (1976) show that land use efficiency in terms of building density is subject to diminishing returns. His graph shows the number of acres required for a consistent floor area at different FARs. The graph shows that moving from floor area ratios typical of single family housing (about 0.25) to row housing (about 0.5), land use efficiency increases dramatically: 30,000 square meters of built floor area takes about 30 acres at an FAR of 1: 0.25, the same floor area takes about 15 acres of land at an FAR of 1 : 0.5. Doubling the FAR again to densities typical of stacked row housing (about 1 : 1.0) land use efficiencies continue to increase but less dramatically, to about 7.5 acres for our 30,000 square meters. He argues that floor area ratios in the middle range of .75 to 1.5 is optimum from a land use efficiency point of view, and going above 1.5 provides little advantage.

What is “optimum” is not so simple to figure out as Diamond’s analysis would suggest. The International Living Building Institute (ILBI) has the insight that an appropriate FAR is determined by context, with no particular one being “optimum.” Instead, different FARs are associated with a different set of environmental obligations (ILBI 2011). For example, the Living Building Challenge requires that all buildings have space devoted to food production, but in a dense urban core that area requirement is quite a bit smaller than at suburban densities.

In the context of this site, the existing fabric was established around the turn of the 20th century as a suburb, but as the city has grown the neighbourhood has become quite central.

Maintaining the historical character of the neighbourhood is something the residents of Fernwood and city planners consider important. This goal is at odds with the development pressure that will be put on it in the coming decades due to its proximity to downtown.

In terms of neighbourhood character, the perceived density is much more important than the actual density. Tall buildings, tight spaces, parked cars, lights, signs, and noise all incorrectly increase the perception of density. Variation and detail, open space, and turning strangers into familiar faces decreases the perception of density. (Hester 2006, 208-9)

Based on census data and physical observation, currently on the site there are about 90 people in 42 households in 22 buildings. The target for this project is to at least double the number of people living on the site (180 people), which will bring the site into the range of densities that can support local centers and convenient and economical public transit. The design achieves this while respecting the street setbacks and restrictions on height, ground coverage, and floor area ratio allowed by single family dwelling zoning in Victoria, zone R1-B (although it will be non-compliant with zoning in several other ways). The front yard setback is 7.5 meters (but allows for a porch in front). The maximum ground coverage is 40% and the maximum FAR is 1:0.8.

## Massing, Site Planning, and Landscape

With that density target as a starting point, there are several ways of planning the site. The norm in housing in Victoria is to make the relationship to the street primary. Just as chairs in a row all facing the same direction does not encourage people to interact, houses in a row facing the street are not the best way to encourage neighbourliness.

Again, looking to existing cohousing examples is helpful. McCamant and Durrett (1988, 173) identify four generic cohousing site plans: the pedestrian 'street,' the courtyard, the street-courtyard hybrid, and the single building with a central atrium (see page 32 in chapter 4). These types explicitly create a relationship between the dwelling units and space for social interaction. The following page shows build examples.

Cohousing site planning is usually most concerned with the internal relationships within the cohousing development; cohousing designs often turn their back on the surrounding streets. One of the design goals is to connect the layers of the individual,



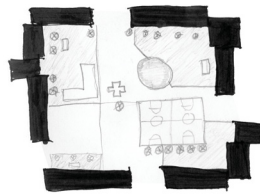
original designer's concept



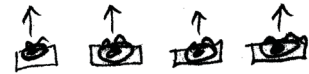
resident's friendship patterns



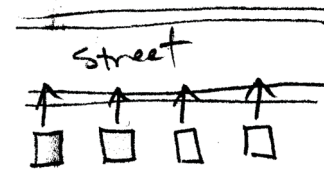
resident's concept



courtyard redesign



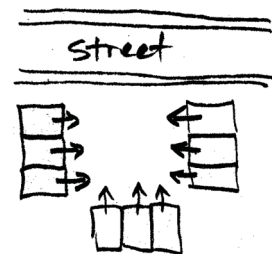
Benches or chairs in a row, facing the same direction: private space.



Houses in a row facing the street: private homes.



Chairs in a circle: social space.



Houses relating to each other: neighborly homes.

Designer's intentions for outdoor space do not always match with resident's perceptions and patterns of use. (Hester 2006: 34).



Trudslund  
Denmark  
"L" street



Mejdal II  
Denmark  
single courtyard



Justrup Savvaerk  
Denmark  
"L" street



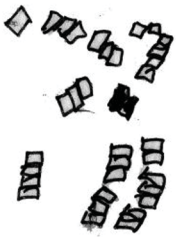
Mejdal I  
Denmark  
2 courtyards



Drejerbanken  
Denmark  
2 courtyards



Satterdammen  
Denmark  
2 courtyards



Winslow  
USA  
scattered  
configuration

A sampling of cohousing site plans. The dark building is the common house.

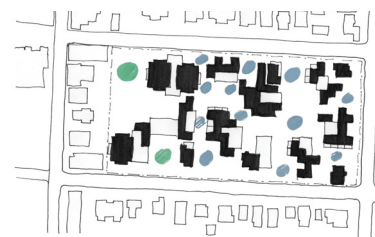


the “big house” the block as a whole, and the wider neighbourhood. Therefore the site planning treats the existing city streets with as much care as a new internal street or courtyard.

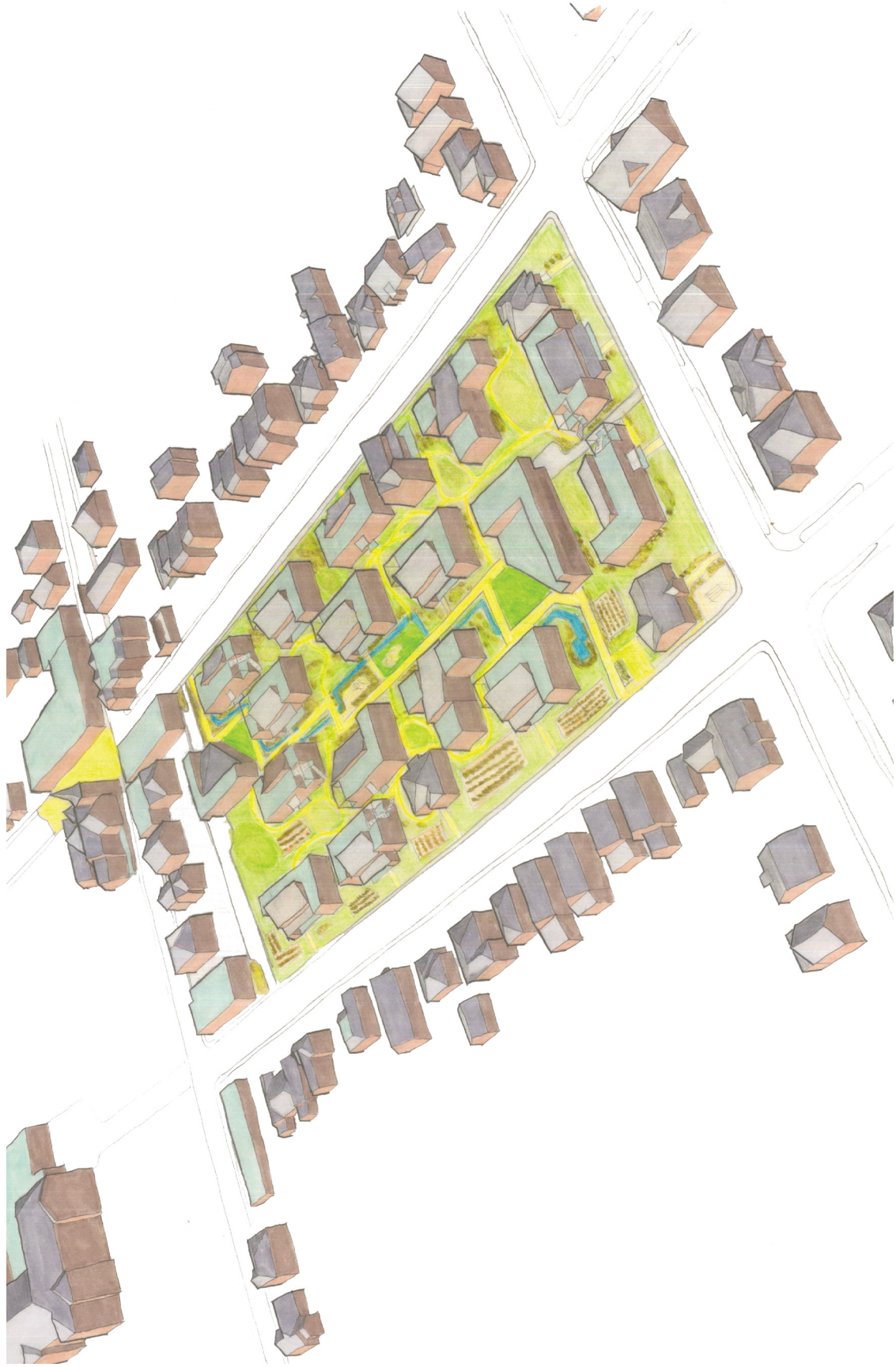
In the section on site selection I introduced the idea that the design draws on the amenities nearby. A typical part of site planning in a variety of projects from cohousing to market mid-density family housing developments is the provision of open space for children play soccer and run around. With the fields at Vic High and Stevenson Park close by that type of outdoor space is already available. With the target number of people being at least 180, the question of who would maintain or occupy a large courtyard or open space becomes a question on a scale closer to a public neighbourhood park than shared back yard. The conclusion is that there is no need for one large courtyard, or even several medium sized ones. The goal is not to create a great place to play soccer, but a great place to play hide-and seek.

This design is a variation on the pedestrian street type site plan. This new street allows the big houses in the middle of the block to have a front and back relationship, despite being far from the existing city streets. The fronts relate to either the existing city streets or the new pedestrian street, and the backs share a space that widens and narrows in various places, creating yards shared by two or three big houses.

The new pedestrian street is anchored near either end by the two common houses. As the street zigzags, it gets compressed between buildings in some spots, and opens up to shared spaces in others. The northwest end of the pedestrian street begins next to the Cornerstone building, one of the more distinctive and socially important buildings of Fernwood Square. An additional



An early concept sketch showing a desire for a larger number of smaller, more varied outdoor spaces.



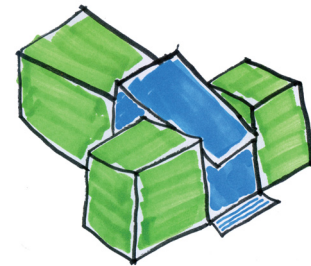
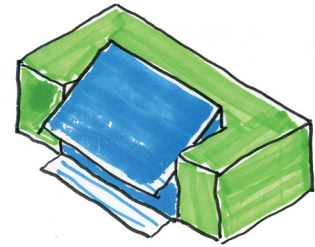
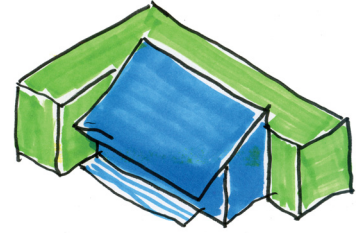
Aerial view of the proposed massing, showing the new pedestrian street and variety in the back yard spaces.

benefit of this route for the new pedestrian street is that the topography will support a stormwater management stream running roughly parallel to it, starting in the northwest and heading to the southeast. This stormwater management stream can support two design goals: 1) to make legible some environmental features of the design, and 2) as it weaves through the site it can be used to define spaces and mark thresholds.

The space around the pedestrian street itself is narrow in places, with a close relationship to the front porches. The space around the street widens in other places, creating a play area and a patio.

The pedestrian street is fully public, open for strangers to walk through. As a gesture to the wider neighborhood, hard-scaped public patios are located at each end of the pedestrian street, encouraging people to spend time there and interact with passers-by. If the design were to progress beyond this schematic phase, these spaces would be enhanced by site furniture and shade or rain protection structures, etc. to enhance them as public spaces.

The shape of the buildings must be considered when planning the site. Simple, rectilinear shapes are preferred for ease of construction to keep costs down. Purely rectangular buildings spread out over a four acre site, however, risks being monotonous and offers few opportunities for distinguishing individual space from shared space, and to create variety in the outdoor spaces. Three basic shapes are used for the big houses: a “C” shape, an “L” shape, and a “T” shape. These shapes are rectilinear and relatively simple, allowing for ease of construction. The shapes can be flipped and rotated to create relationships to each other and to outdoor space with more variation than purely



“L” type, “C” type, and “T” type configurations for big houses.



Space planing concept for “C” type big house. Green shows individual space, blue shared space, and yellow circulation.

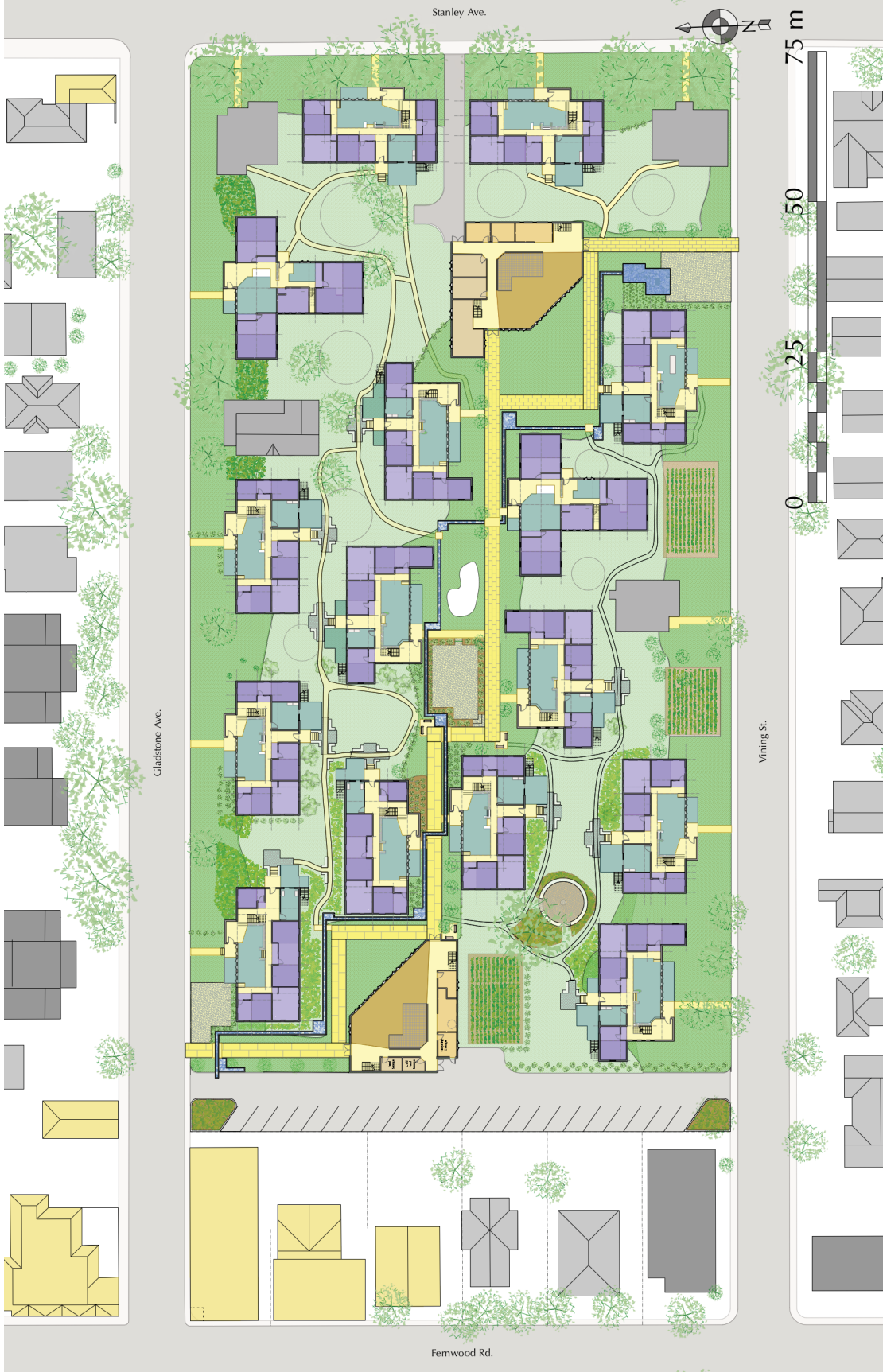
rectangular shapes.

In the case of the “C” and “L” configurations, the shared space is covered by a sloping roof and is wrapped by the individual space with a flat roof. In the case of the “T” shape, the individual space branches off of the shared space.

According to established cohousing design principles, the less private areas of a dwelling, in this case the main shared room under the sloping roof, should face the pedestrian street. For the big houses on the existing city streets, the same relationship will apply.

The area at the backs of the houses also widens and narrows. The narrow spots have paths and plantings. Where it widens it creates a back yard type space. The relationship to back porches, changes in level, and landscape walls show that particular yard spaces relate primarily to two or three big houses surrounding them, despite that paths run throughout. The paths are intended to be open to everyone living in the development. They are distinguished from the main pedestrian path by being narrower, curving, and treated with a less formal landscaping language. Where the back paths meet the main path that give the cue that this is a different kind of path. This threshold varies, sometimes it is a bridge over the water, in others it goes through plantings or past a seating area.

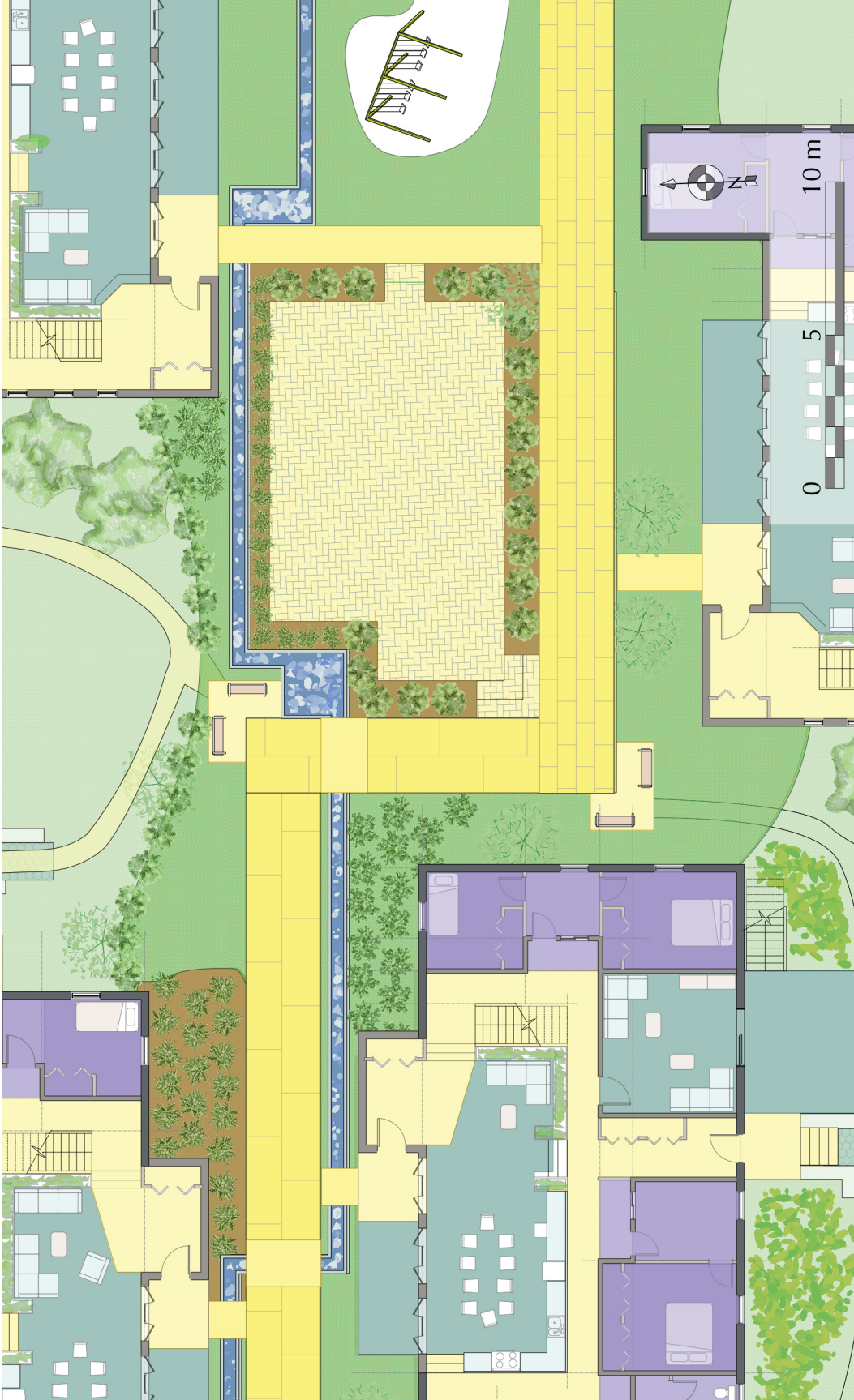
Respecting the setbacks and ground coverage norms in the area leaves a significant amount of outdoor space in this project. The sunnier spots are used for vegetable gardens, and the shadier spots that are not actively used by residents, such as the narrower spaces in the back yards, can be used for native plants that provide habitat for birds and insects. This supports the goal of ecological sustainability.



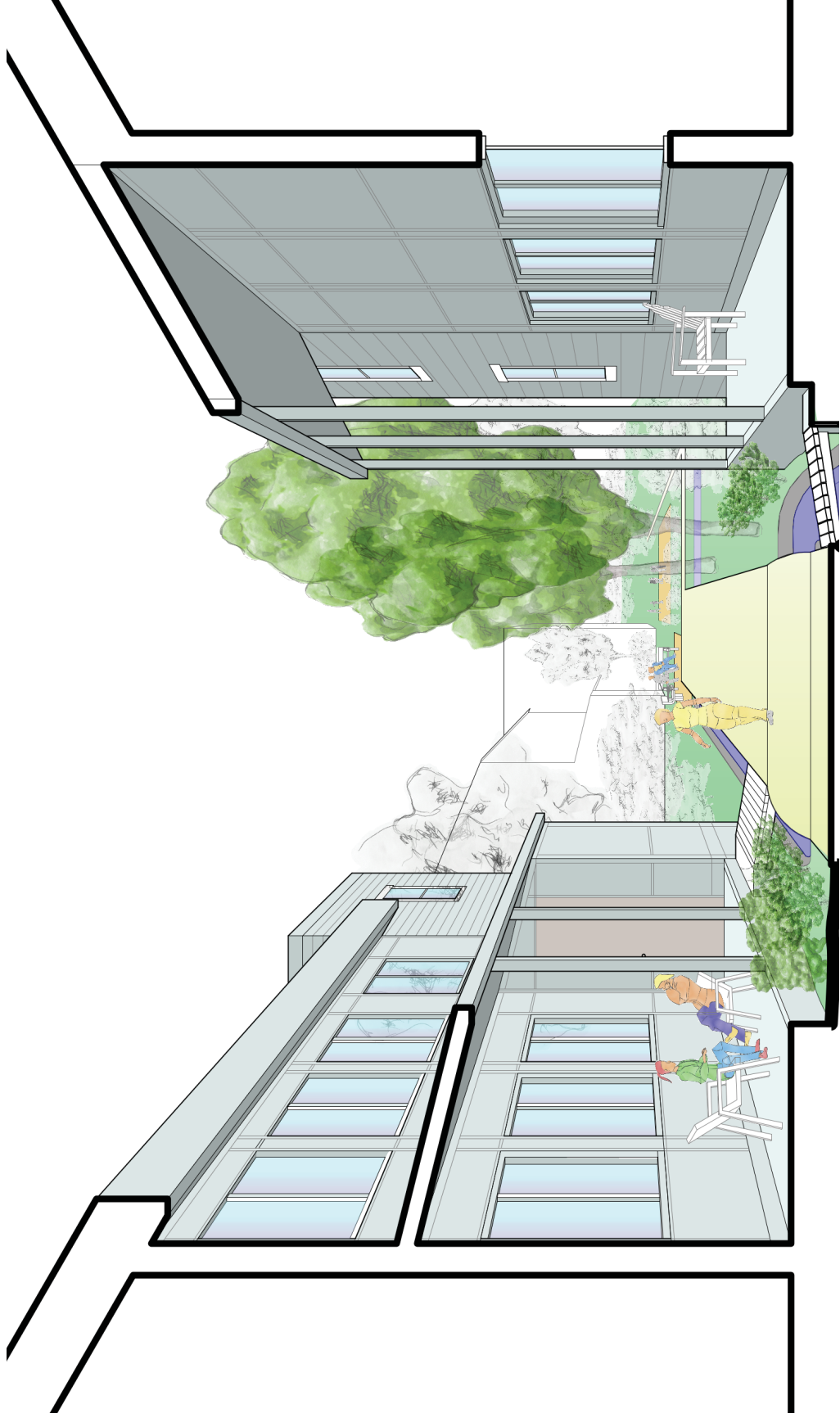
Sit plan at 1:1,000.



Section/perspective of Gladstone Ave facing East. Design respects the setbacks, heights, and front yard treatments of the neighbourhood.

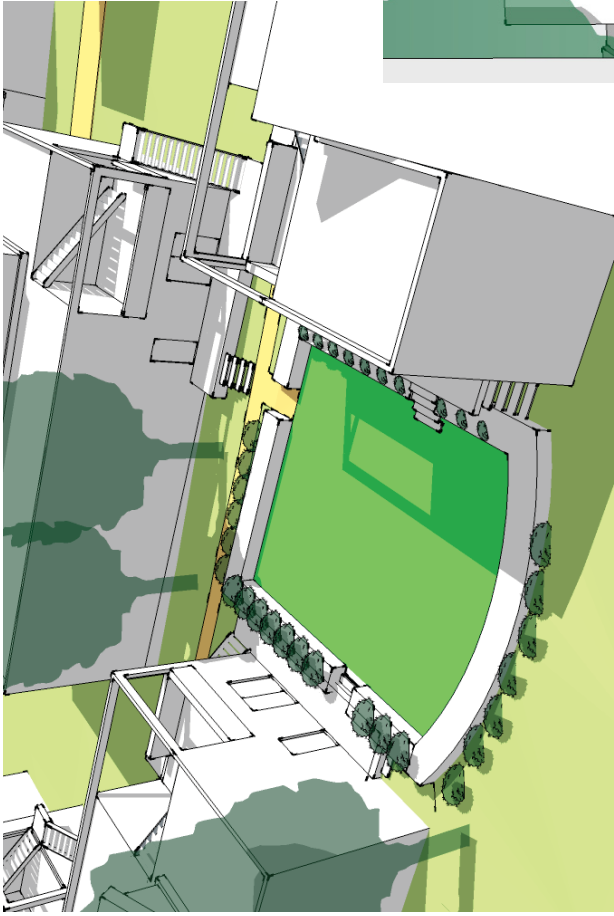


1:200 plan of a portion of the pedestrian street. The street goes through a narrow spot in the western part of this image. The space between the houses widens in the center and east of this image, where there is a public patio and play area.



Section/perspective showing the interior pedestrian street, and the relation of the big house fronts to it. Eye level for someone sitting on the porch is approximately eye level with someone walking by, encouraging interaction. Distance between the porch and the street is close enough for conversation. The water, bridge and plantings give the cue that one needs an invitation to enter the porch, making the closeness comfortable for those living in the big house.





Two perspectives of a sketch model showing a back yard space shared by three big houses. The orientation of the back porches and doors, landscape walls, and plantings allow the surrounding big houses to “claim” the yard. Here the space is drawn as a lawn, but the intention is for the residents to make it their own through plantings, patio pavers, outdoor furniture, etc. The model also shows the decks and roof terraces, which are the outdoor spaces exclusive to a single big house.



1:200 plan showing a developed design for two back yard spaces, the one to the north related to one big house, the one to the east shared by two other big houses. The back door and living room lead to a deck a few steps higher than grade. The stairs to the deck are off a patio. These features plus short landscape walls relate each big house to a back yard.



1:200 plan showing a different backyard area. A section/perspective of this space is shown on the next page.



Section/perspective showing a back yard shared by two big houses.

## Big Houses

The big houses are home to between ten and twelve people. The people living there are drawn from four or five conventionally defined households, but the intention is that they come together to function as a kind of extended household. Individual suites provide private spaces, but are not “complete” with their own kitchen and bathroom facilities.

People living in the big house share bathroom and kitchen facilities, a large main room that includes the kitchen and dining area and a living room area, and a family room connected to a back deck. Twelve people sharing a single kitchen in most situations would be difficult, but, as per cohousing norms, most dinners will be taken in the common houses, leaving the big house kitchens primarily for breakfast and lunch.

The “incompleteness” of the suites allows flexibility for family size. If a family has another child, they can take over another room without moving, or if a child moves out, the room they occupied could be used by someone else. A teenager might want more distance from parents than when they were younger, and could relocate to a different room within the big house.

The basic organizing principle of the big houses is to wrap spaces for individuals around the shared space. The collective space in the middle has a generous and open feel, while the individual spaces are more intimate in scale. This main shared space is on the front side of the building and is identified with a sloped roof, while the individual space has a flat roof.

## "C" Type Big House

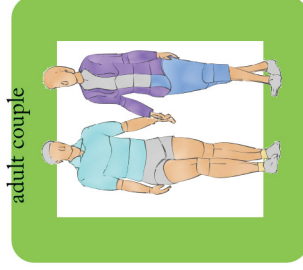
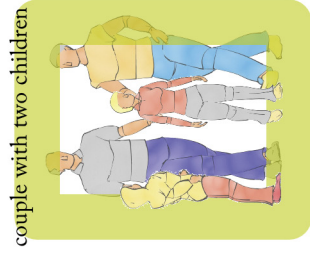
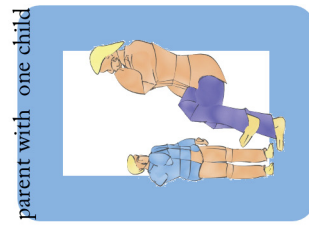
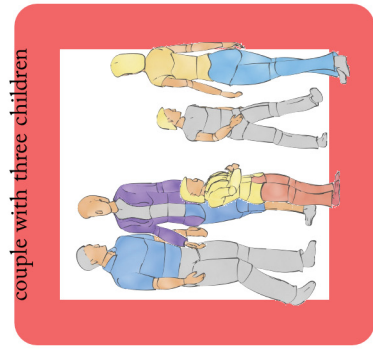
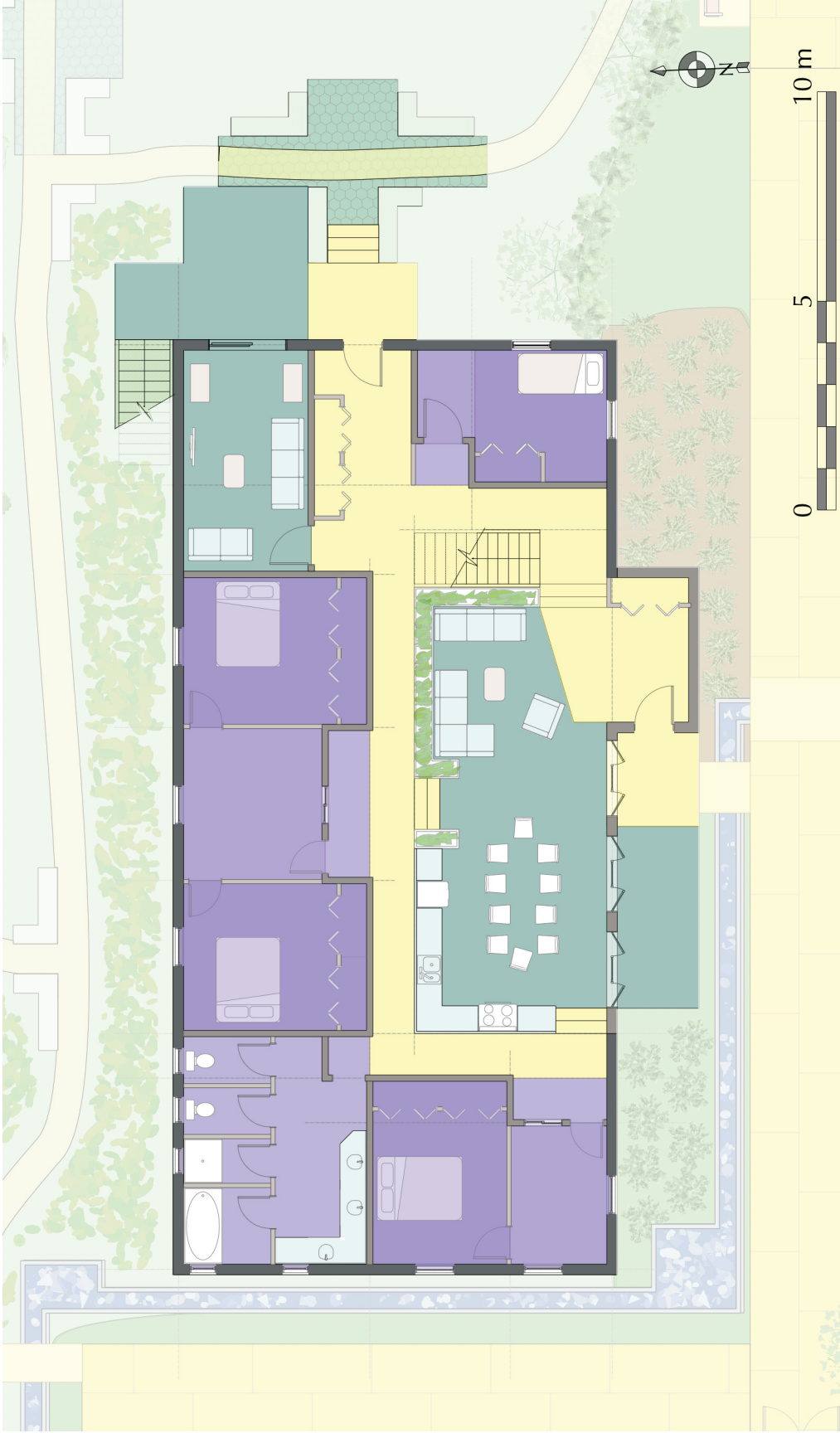


Diagram showing "C" type big house plans and the people living in it.



1:150 plan of the ground floor of a "C" type big house. Green indicates the shared spaces of the house, most importantly the large room under the sloping roof with a kitchen/dining area and living room area, and the family room connecting to the back porch. Yellow indicates circulation. Purple areas are the individual spaces in the house. The individual space begins before the door into the rooms in a vestibule, which allows the opportunity for the residents to decorate and personalize a space that is both unambiguously their own but also has a presence in the shared areas of the big house.

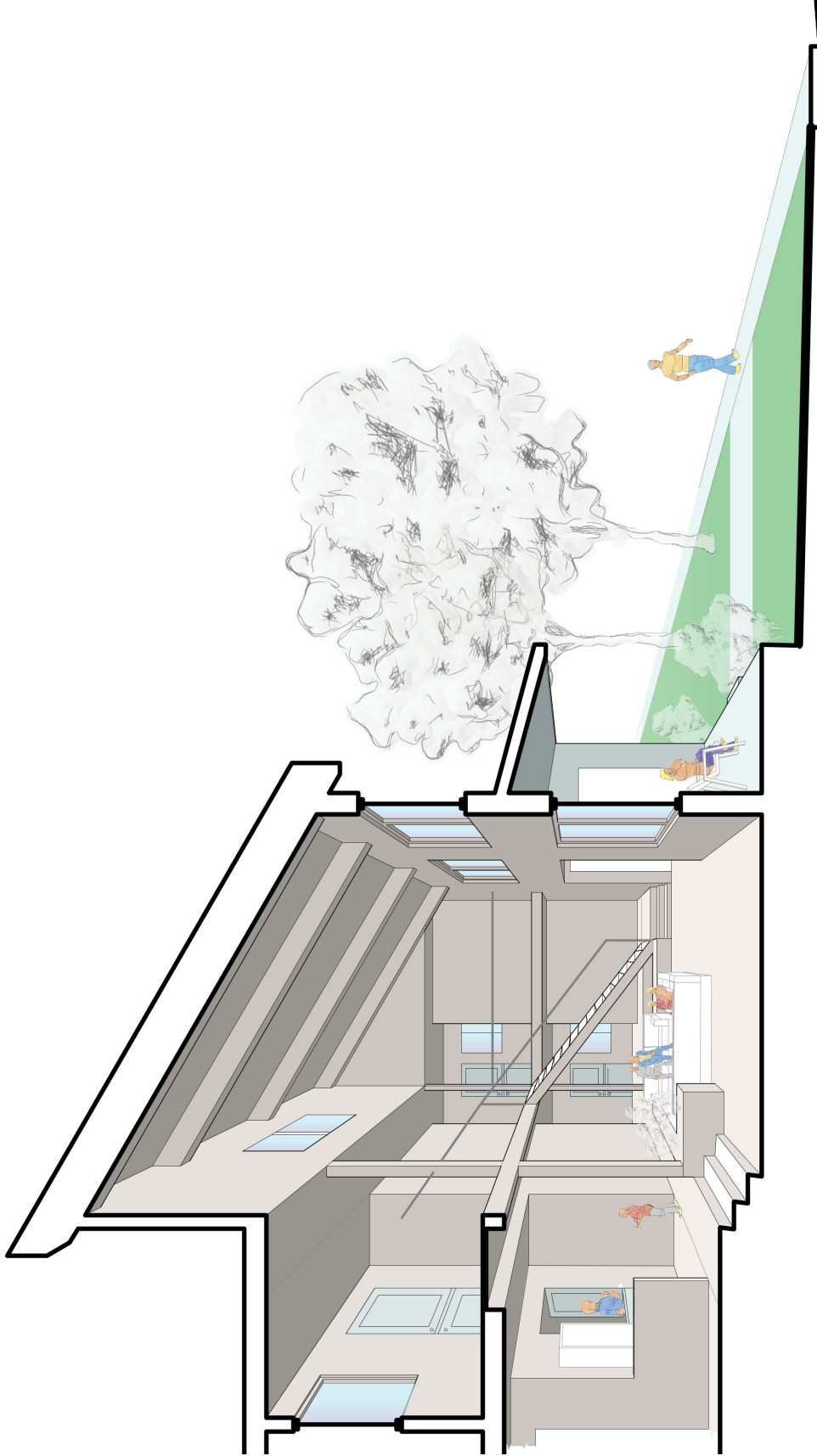
The front entry sequence starts from the street (either an existing city street or the pedestrian street) to a path or bridge onto the porch. This is the first layer towards the private domain. A porch is recognized as an extension of the house, but allows for interaction with people passing by. The back door is also off of a low deck, serving a similar function. Both the front door and the back door lead through an entry area and into the main shared room of the house.

The threshold between the individual and shared space is important. There is a circulation zone separated from the main shared space by planter boxes. A few steps also act as a transition between the two. If the design were taken beyond the schematic phase, changes in floor material, colour, and detailing could also be used to further define the threshold.

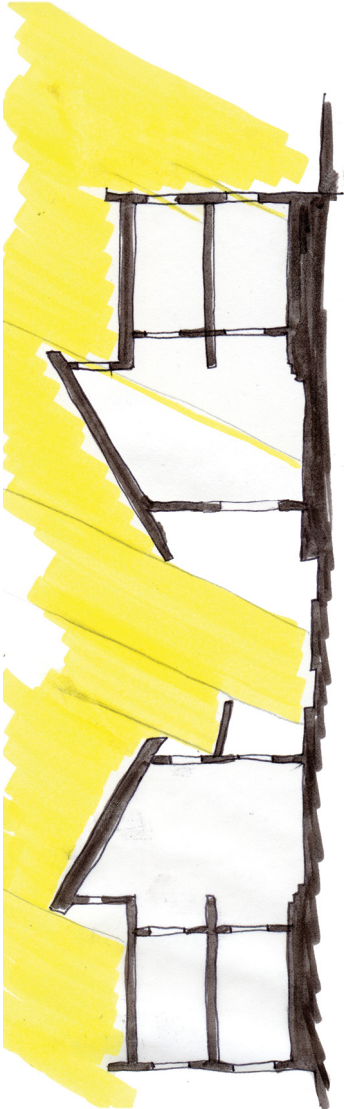
The individual space begins as a vestibule open to the shared space. This area allows the individual to decorate and customize a space that offers their personality to the shared space, but within a space that is unambiguously their own.

The roof form not only serves to identify the individual and shared space within the building. It also does environmental work. The following identifies potential directions for developing environmental strategies with this building form. With only slight variation in the roof over the front porch, both north facing and south facing big houses can achieve good daylighting. The shape also creates an open vertical space that continues above the living areas of house, allowing the stack effect to enhance passive ventilation.

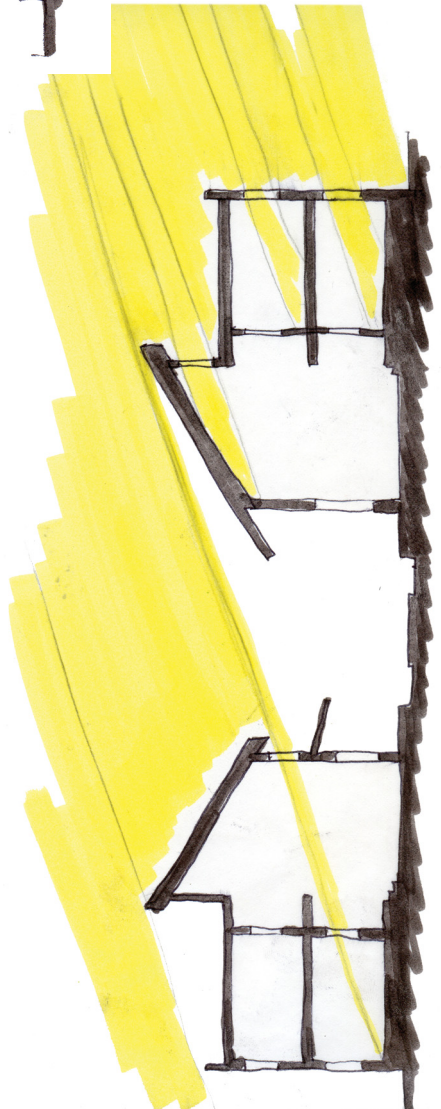




Section/perspective showing the sequence from the street to the porch to the main shared room of the house to the entry to the individual space. The generous size of the shared space is shown. The vestibule to the individual space is also shown, where people can put furniture, potted plants, artwork, etc to personalize and offer character to the shared space. The doors to the individual space are half-doors which allow more control of the level of interaction the person would like to have with the shared space.



Summer sun at noon.



Winter sun at noon.

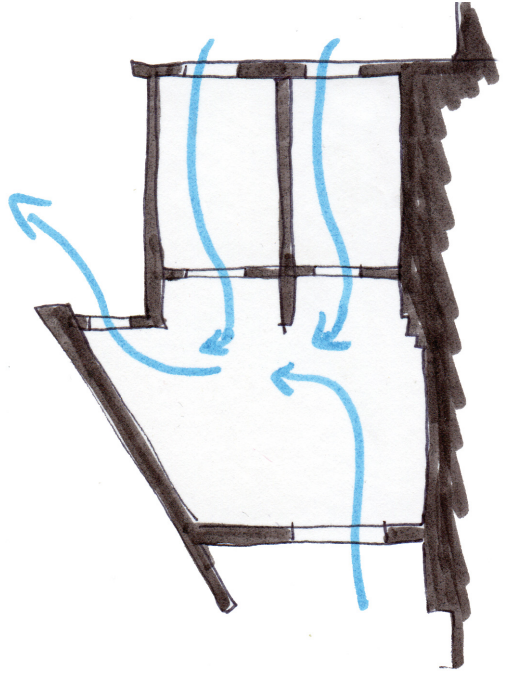
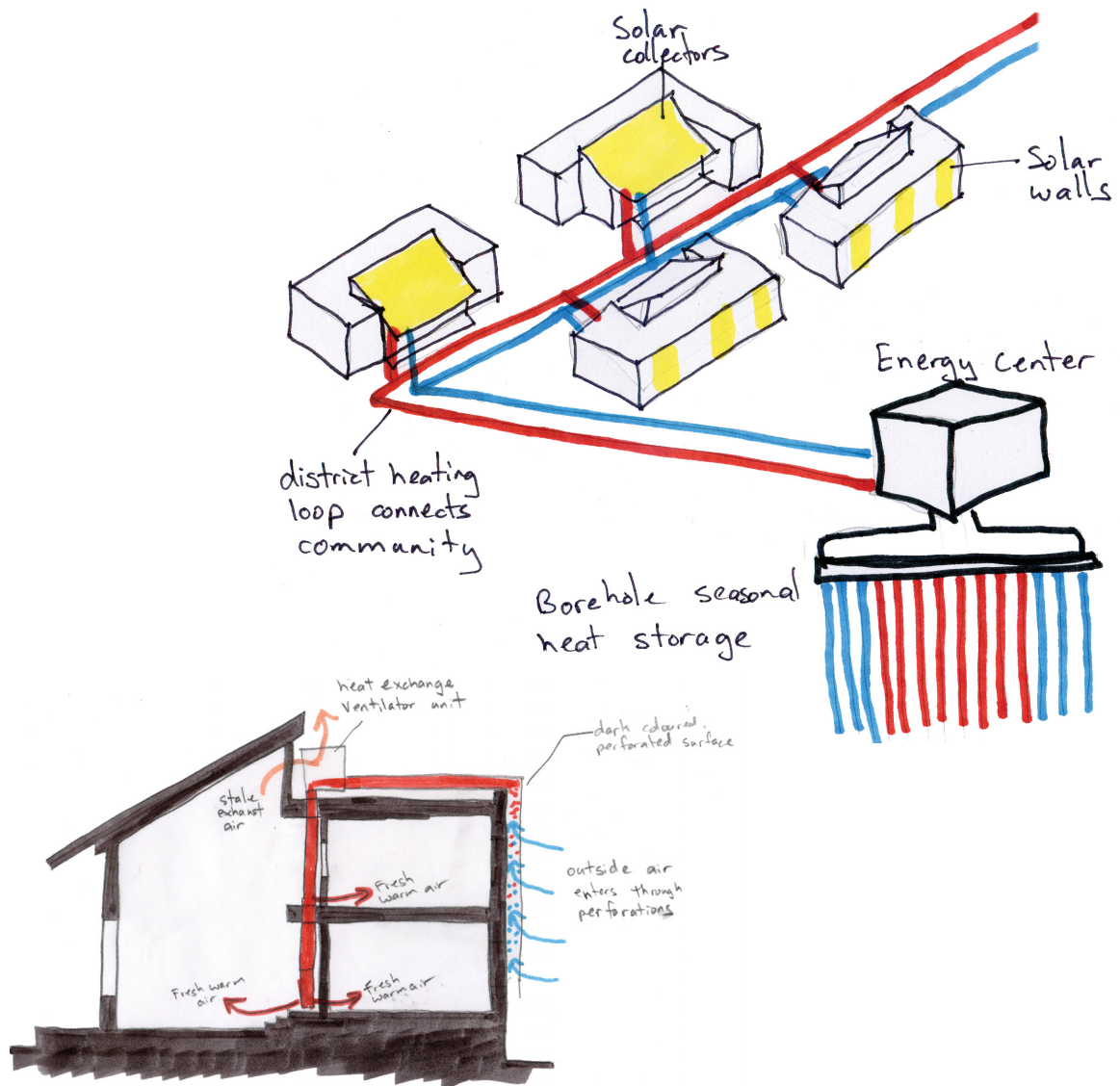


Diagram showing the roof shape taking advantage of the stack effect to enhance ventilation.

An active heating system is necessary, and it takes advantage of the neighbourhood scale of the project. The sloped roofs on the south facing big houses are equipped with solar hydronic collectors which in the summer time collect heat and move it into geothermal wells, heating the ground. In the winter, that heat is brought back up and used to heat the buildings. The heat from this inter-seasonal storage is supplemented by preheating incoming air with a solar wall on the south side of north facing big houses. The north facing and south facing houses both contribute, but in different ways.



Top: diagram showing district heating system with interseasonal heat storage.

Bottom: north facing big houses use a solar wall on their south side to preheat incoming ventilation air.

## CHAPTER 6: CONCLUSIONS

The program and the architecture to responds to a constellation of issues through the lens of sustainability, with an emphasis on how encouraging social sustainability can support the pursuit of ecological and economic sustainability. This chapter will reflect on how well the proposal met this goal.

Through the design process I was looking for opportunities for enhancing sustainability in a collective approach to housing. There are physical opportunities in building form, and scale of technologies. The link was made in chapter four between the strength of a community and the ability of that community to support pro-environmental behavioral change. This relates more directly to social sustainability, so it is where the discussion will begin. It is impossible to know for sure if this design would encourage a strong sense of community without building it, but after the design exercise a good deal of reflection is possible. A good place to start is the program.

Cohousing is an established idea with hundreds of successful communities, even if the idea is only getting its feet wet here in North America. The program decisions in this project of site planning with intentional relationships between dwellings and shared outdoor spaces, and the inclusion of common house facilities are established cohousing practice. The cohousing model is proven to create strong social networks and a sense of community given the right conditions. Attention to thresholds between shared and individual space is emphasized in this project, but it is certainly not an unusual architectural aspiration. The new and perhaps controversial part of this program proposal is the “big house” idea.

The big house is in large part a response to shrinking household size. The intention is to create an extended household as a contemporary substitute for the multi-generational family home. Another strong motivator for the big house idea is that it offers more possibilities to take advantage of a collective approach to sustainability. An example is that very household expects to have a complete set of fixtures and appliances, each with their own energy demands. As households shrink the number of these appliances and fixtures multiplies. The big house is a way of reversing this trend. The comparison on page 81 shows that the proposal accomplishes this goal.

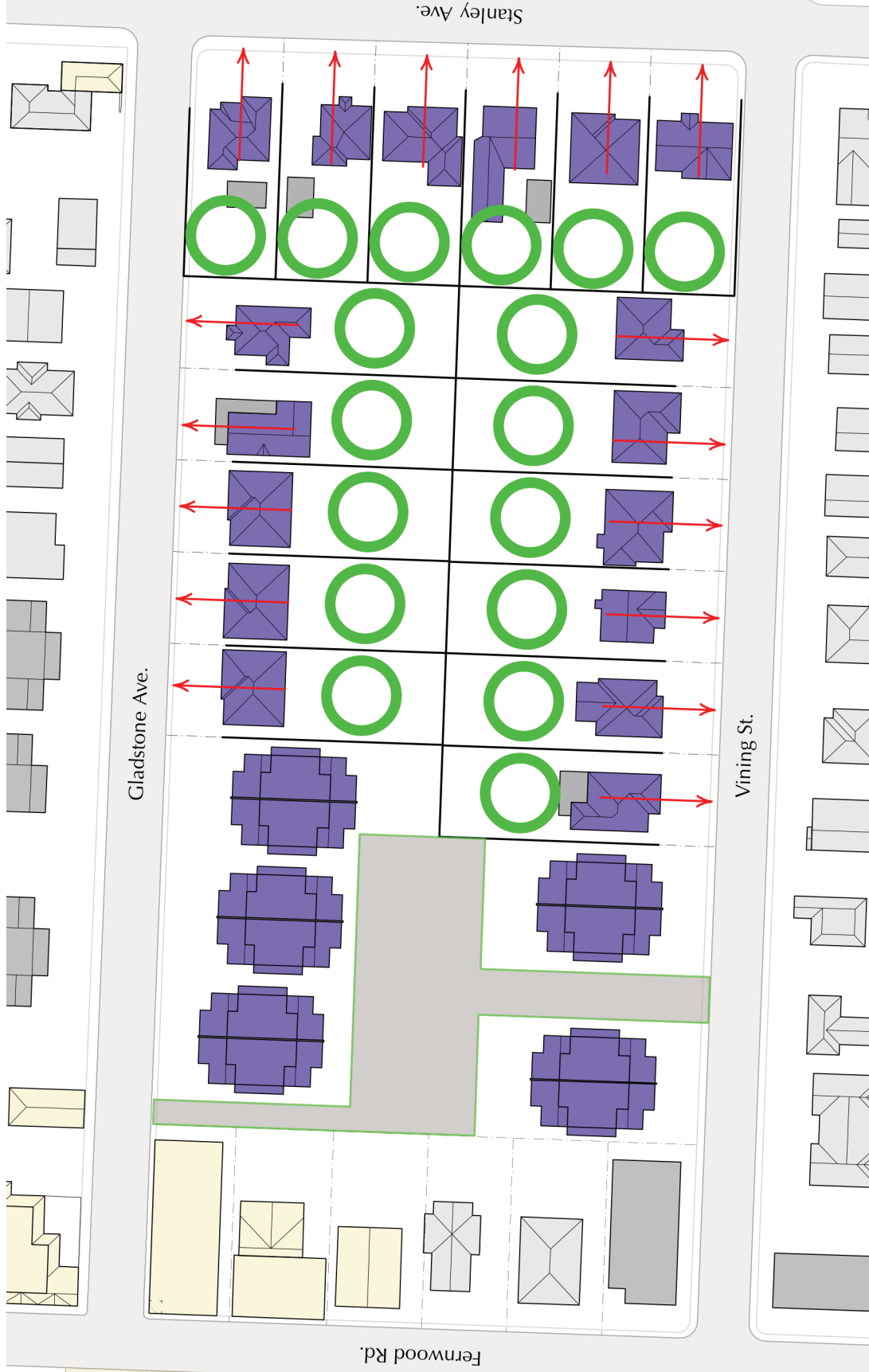
The benefits the of the big house proposal are all for naught if enough people do not find it an appealing housing option. The discussion in chapter three shows that there are likely to be more people willing to take a chance on this different approach to housing in Victoria than in other places. One reason is the progressive culture. Another reason, which is also another point in the constellation of issues this proposal responds to, is affordability.

A couple with two young children would probably be looking for a three bedroom dwelling. The cost of three bedrooms in this proposed development, plus transportation costs, is approximated at \$3,000 a month. Compared to other three bedroom options in Victoria that cost is probably similar to a condo near the city center where the family would not need a car, or slightly less than a condo a bit further away where most families would want one car. The proposal is significantly more affordable than a house, even with income from a secondary suite. (For a more thorough description of the numbers, see appendix one.) The

thesis design is more affordable than other owned housing options, even if only slightly. Living in this design would cost more per month than most three bedroom rentals in the neighborhood, (which run at around \$2,200 per month including transportation costs) but it does allow the family to accumulate equity.

Probably the biggest impact of this project in terms of affordability is that the legal/financial structure takes this housing out of the speculative real estate market. In most cases, a house serves two purposes that are quite different: a major investment and a home. We are so used to this dual-purpose that it is perhaps difficult to see how much friction there really is between these two. Extremely high home prices in Victoria are one consequence, the tragic foreclosures recently in the United States are another. Collective approaches to the financial side of housing, in the form of a land trust or limited equity housing co-op, can change the home/investment relationship in the long term.

In the short term, compared to the similarly priced downtown condo, this proposal offers a very different set of amenities which I believe will be more appealing to enough people to make the project work. The most prominent is the community that comes with living in the proposed design. Residents of cohousing overwhelmingly say that the inevitable extra friction and negotiation that inevitably comes with living closer with people is absolutely worth it for the social benefits of the community (Meltzer 2005, 129-36; McCammant and Durrett 1988, 19-34).



1:1000 plan diagram showing the existing conditions on the site. Back yards are fenced, and the houses address the street, privileging privacy over support for casual social interactions. There is no shared space, with the exception of the four-plex development's parking lot.



1:1000 plan diagram showing the proposal. Casual social interactions can happen in a variety of spaces, including back yards, the pedestrian street, front porches and the common houses, providing a very different social environment in the outdoor space than the existing conditions did.

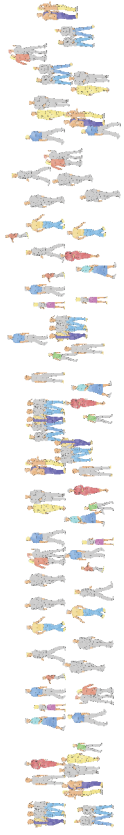


	Thesis Design	Centrally Located Condo	House in Fernwood (with suite)	House in Langford or Colwood
Monthly Cost (housing + transport)	\$3,000	\$3,150	\$3,400	\$4,000
Individual	bedroom bedroom bedroom sitting room kitchen/ dining living room TV room bathroom	bedroom bedroom bedroom living room bathroom kitchen/dining fitness room walls, elevators, hallways, stairs	bedroom bedroom bedroom living room bathroom kitchen/dining floors, walls	bedroom bedroom bedroom living bathroom garage kitchen
shared, same building	kitchen/ dining living room TV room bathroom	fitness room walls, elevators, hallways, stairs	floors, walls	
individual outdoor space	deck and roof terrace (big house)	small balcony	front yard back yard	front yard back yard
shared outdoor space	play area gardens food gardens BBQ area small and large gathering spaces		front yard back yard yards may or may not be shared	
Cohousing Common House	kitchen/dining music room craft/hobby rooms children's rooms small and large gathering spaces			
Neighborhood (10 min walk or less)	shopping school park community center library cafe restaurant bar dog park playground tennis court soccer field golf course beach hiking trail farm vineyard orchard greenhouse compost bin water tap fire pit picnic table benches trash bin recycling bin compost bin	shopping school park community center library cafe restaurant bar dog park playground tennis court soccer field golf course beach hiking trail farm vineyard orchard greenhouse compost bin water tap fire pit picnic table benches trash bin recycling bin compost bin	shopping school park community center library cafe restaurant bar dog park playground tennis court soccer field golf course beach hiking trail farm vineyard orchard greenhouse compost bin water tap fire pit picnic table benches trash bin recycling bin compost bin	

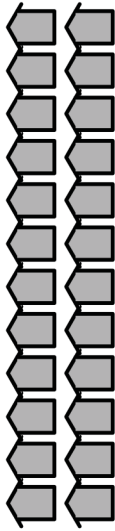
Comparison chart showing the different amenities offered by the thesis design compared to other three bedroom owned housing options in Greater Victoria.

**Before:**

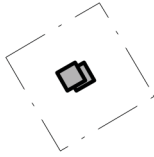
Number of people: ~90



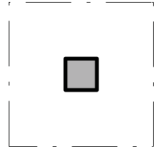
Number of Buildings: 22



Floor area ratio: 1 : 0.38

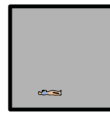


Ground coverage: 22%

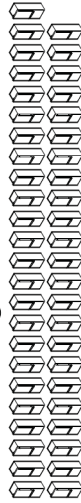


Floor area per person: 67 m<sup>2</sup>

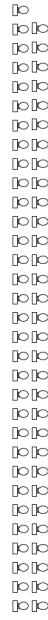
Envelope area per person: 148 m<sup>2</sup>



Number of Refrigerators: 45

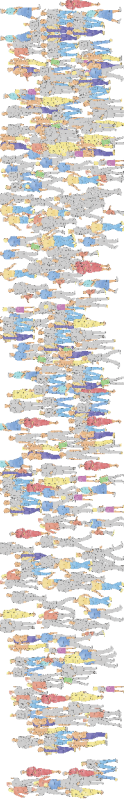


Number of toilets: 63

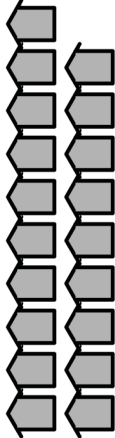


**After:**

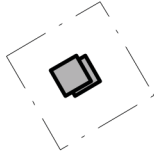
Number of people: ~190



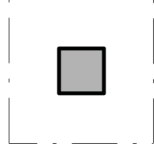
Number of Buildings: 21



Floor area ratio: 1 : 0.54

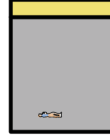


Ground coverage: 31%



Envelope area per person: 84 m<sup>2</sup>  
(74 m<sup>2</sup> in big houses +  
10 m<sup>2</sup> in common houses)

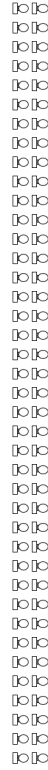
Floor area per person: 43 m<sup>2</sup>  
(38 m<sup>2</sup> in big houses +  
5 m<sup>2</sup> in the common houses)



Number of Refrigerators: 21  
(19 in big houses + 2 in Common Houses)



Number of toilets: 80



Comparison of the proposal to the existing conditions of several indicators.

People will hopefully feel the same way about the big house concept. Smaller household sizes lead to a very different type of domestic life in recent history. The big house might create a new and richer kind of domestic life.

The community offers a wonderful environment for families with children. The fact that parents in the neighbourhood know each other, share meals together, and develop friendship and trust with each other leads to parents feeling very secure about letting children run around and play anywhere in the neighbourhood, confident that a caring and responsible adult will always be nearby. An abundance of playmates and outdoor space away from cars adds to the appeal. Many cohousing communities, when forming, intend to attract a wide variety of ages and family types to live in the community. What often ends up happening, however, is that families with young children are the most interested in living there. In this proposal, this is a happy situation since, as pointed out in chapter three, families with young children are an underrepresented demographic in Victoria.

In addition to community, many more amenities are offered by this proposal that make it more appealing than a downtown condo of similar price. A typical condo might have chairs in a lobby that no one sits in plus a fitness room as the amenities provided outside the private dwelling. This proposal offers a variety of outdoor spaces, including gardens, back yards, public patios, and children's play areas. The common house facilities include a commercial kitchen, and flex rooms that could become children's play rooms, teen rooms, arts and crafts rooms, workshops, music rooms, librarys, or anything else. Living in the community gives one the ability to participate in the planning

for what those spaces should be. I believe that because of all these factors the proposal will be appealing to enough people to make it work.

The advantages of a collective approach to housing for ecological sustainability are demonstrated by this project. The big house concept cut the number of refrigerators on the site by more than half, decreasing energy demand. A typical cohousing development would probably have doubled the number. Refrigerators were quantified specifically, but the same could be said for any number of other appliances. Floor area per person is significantly less in the proposal than on the existing site. This means less building materials will go into it than a typical housing development on a per person basis. Also, envelope area per person is significantly reduced, improving not only material use but also reducing heating demand. At this schematic level the ecological advantages of a collective approach to housing are already clear. If the design were moved into the next stage, more ecological advantages could be explored, especially technologies that only become feasible or affordable at a certain scale.

The proposal significantly increases the density of people living there, with benefits for the businesses and community services of Fernwood square. It increases the Floor Area Ratio and ground coverage of the site, but not dramatically. The combination of greatly increased people density and moderately increased building density makes it an appropriate development proposal from the point of view of the city plan, which calls for the area to become a transition between the downtown core and the surrounding residential neighborhoods.

The quantifiable advantages of this proposal are clear. I've also made a case for the more qualitative, social aspects of this design. Pursuing social sustainability by taking inspiration from cohousing's social idea, with the added idea of the big house, has clear opportunities for improving economic and ecological sustainability.

## **APPENDIX 1: AFFORDABILITY ANALYSIS**

The analysis in chapter 3 showed that families with young children are an under-represented demographic in Victoria, in large part because of housing costs. This appendix compares the cost of the design proposed in this thesis to common home ownership options in Victoria. The analysis is illustrative, not an exact cost estimate, to support the analysis in Chapter 6.

The legal entity that is assumed here is a Community Land trust. It is a dual-ownership model, where the Land Trust purchases the land with the intention of owning it forever. Buildings on the land are owned separately by an individual homeowner or a cooperative housing corporation. The Land Trust leases the land to the building owner through a long-term ground lease. The lease agreement protects the building owner's security and equity while enforcing the Land Trust's interests in preserving the appropriate use of the land. The lease agreement also includes the option for the Land Trust to repurchase any structures on the land should the building owner choose to sell. The formula for the resale price is in the lease and is designed to give the current owner a fair opportunity for equity while giving potential future buyers fair access to housing at an affordable price (Emmeus Davis 2007). The details may be different from a limited equity housing cooperative, but the intent is similar and the either would be appropriate for the architecture in this design.

The land costs are assumed to be approximately \$12,000,000. This figure is arrived at by looking at real estate listings for similar properties in the neighborhood (Canadian Real Estate Association 2011). The four-plex development is estimated as the cost of seven houses, since it takes up the space of seven lots.

<b>Land Costs</b>		
	24 lots, an average purchase price of \$500,000 per lot	\$ 12,000,000
	Demolition	\$ 200,000.00
	Sub-Total	\$ 12,200,000.00
	HST	\$ 1,830,000.00
	<b>Total</b>	<b>\$ 14,030,000.00</b>
<b>Construction Costs</b>		
<b>Hard costs</b>	New Construction Square Footage	60,000
	Cost Per Square Foot	\$ 220
	New Construction Cost	<b>\$ 13,200,000</b>
	Renovation Cost (four existing houses, about \$30,000 each)	<b>\$ 120,000</b>
	Landscaping	150,000
	<b>Total</b>	<b>13,470,000</b>
<b>Soft Costs</b>	20% of hard costs	<b>\$ 2,694,000</b>
	Sub-Total	16,164,000
	HST	\$ 2,424,600
	<b>Total</b>	<b>18,588,600</b>

Table showing total costs, divided by land costs and construction costs.

This analysis assumes that the Land Trust can negotiate favourable terms for a mortgage on the land purchase: a 99 year repayment term with 3.00% interest rate. This is optimistic, but not outside the realm of possibility. The lender could be a local credit union wishing to support community non-profit affordable housing initiatives.

Hard costs are assumed to be \$220 per square foot for new construction. Typical spec housing is built currently at \$150 per square foot in Victoria. Even though care has been taken to minimize costs through simple building form, familiar materials, etc. (see page 44-45), construction costs are estimated to be more than spec housing due to added environmental features, which will reduce the operating costs.

Mortgage amount	\$ 14,030,000
(Purchase price of land)	
Interest rate	3.00%
Term (years)	99
Monthly payment	\$ 36,979

Table showing monthly payments on land purchase mortgage.

The utilities and maintenance could be organized through the Land Trust itself or through an owner's association. Either way, the costs will be the same. This analysis assumes that there are 63 economic households living in the proposed development, an average of just over 3 people per household.

The following tables compare the monthly costs of housing plus transportation of various housing options from the point of view of a household of four (a couple with two young children). The options are all three bedroom dwellings available at market prices in the Victoria area. Prices are estimated based on current listings and recent sales (Canadian Real Estate Association 2011).

<b>Monthly Costs</b>	
Land Mortgage Payments	\$ 36,979
Property Taxes	\$ 9,500
Utilities, Maintenance, etc	\$ 10,000
<b>Total Costs:</b>	<b>\$ 56,479</b>
<b>Monthly Income</b>	
number of economic households	65
<b>average fees per economic household</b>	<b>\$ 896</b>

Table showing monthly cash flow at the collective level.



	Monthly Costs	
Mortgage amount	\$	309,810
Interest rate		6.00%
Term (years)		30
		<b>Text</b>
Monthly Mortgage Payment	\$	1,857
Land Trust fees	\$	896
Bus pass (2 at \$82.50, children under 6 free)	\$	165
Occasional Taxi	\$	60
<b>Monthly Total</b>	<b>\$</b>	<b>2,979</b>

Table showing estimated monthly costs in the proposed thesis design. Mortgage amount is calculated by dividing the construction costs by the number of economic households, adjusted for household size. Land Trust fees are from the previous table. Assumes that this family would use public transit instead of owning a private vehicle.

	Monthly Costs	
Mortgage Amount	\$	475,000
Interest Rate		6.00%
Term of Mortgage (years)		30
Monthly Mortgage Payment	\$	2,848
Utilities, Taxes, etc.	\$	300
Bus Pass (2 at \$82.50, children under 6 free)	\$	165
Occasional Taxi	\$	60
<b>Monthly total</b>	<b>\$</b>	<b>3,373</b>

Table showing estimated monthly costs for a three bedroom house in the Fernwood neighbourhood.

	Monthly Costs	
Mortgage Amount	\$	625,000
Interest Rate		6.00%
Term of Mortgage (years)		30
Monthly Mortgage Payment	\$	3,747
Utilities, Taxes, etc.	\$	350
Income From Basement Suite	\$	(900)
Bus Pass (2 at \$82.50, children under 6 free)	\$	165
Occasional Taxi	\$	60
<b>Monthly total</b>	<b>\$</b>	<b>3,422</b>

Table showing estimated monthly costs for a three bedroom house with a basement suite in the Fernwood neighborhood.

	Monthly Costs	
Mortgage Amount	\$	360,000
Interest Rate		6.00%
Term of Mortgage (years)		30
Monthly Mortgage Payment	\$	2,158
Utilities, Taxes, etc.	\$	250
2 cars (depreciation, maintenance, gas, and financing, monthly average)	\$	1,600
<b>Monthly total</b>	<b>\$</b>	<b>4,008</b>

Table showing estimated monthly costs for a three bedroom house in Colwood or Langford, suburbs of Victoria. Most families living here would have one car per adult.

	Monthly Costs	
Mortgage Amount	\$	350,000
Interest Rate		6.00%
Term of Mortgage (years)		30
Monthly Mortgage Payment	\$	2,098
Utilities, Taxes, etc.	\$	300
Condo Fees	\$	525
Bus Pass (2 at \$82.50, children under 6 free)	\$	165
Occasional Taxi	\$	60
<b>Monthly total</b>	<b>\$</b>	<b>3,148</b>

Table showing estimated monthly costs for a three bedroom Condominium near downtown where the family would not need a private vehicle.

	Monthly Costs	
Mortgage Amount	\$	300,000
Interest Rate		6.00%
Term of Mortgage (years)		30
Monthly Mortgage Payment	\$	1,799
Utilities, Taxes, etc.	\$	300
Condo Fees	\$	475
Bus Pass (one)	\$	83
Occasional Taxi	\$	60
1 car (depreciation, maintenance, gas, and financing, monthly average)	\$	800
<b>Monthly total</b>	<b>\$</b>	<b>3,516</b>

Table showing estimated monthly costs for a three bedroom Condominium or townhouse a mid-distance from downtown. The family has one car.

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