

SUBURBIA;

RETAIN, RENOVATE, INFILL.



**Exploring renovation and low rise infill as an
option for densifying suburban Melbourne.**

Acknowledgement of Country

I acknowledge the Traditional Custodians of the land on which this project is situated, specifically the Wurundjeri, Woi-wurrung and Boon Wurrung peoples of the Kulin Nation.

I would like to pay respect to Ancestors and Elders, past and present, and acknowledge Aboriginal and Torres Strait Islander peoples' knowledge of, and connection to, land and sea.

Suburbia; Retain, Renovate, Infill.

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Abstract

This thesis addresses the issue of housing a growing population in the face of the climate crisis within the context of suburban Melbourne. The project aims to propose a development model that challenges current standard practices and instead focuses on retaining, utilising, and transforming the existing post-war housing stock of Melbourne's middle-ring suburbs to facilitate densification while increasing the supply of high-amenity housing and minimising environmental impact.

The model draws from sufficiency principles, which aim to ensure wellbeing for all while avoiding unnecessary resource demand, and is further informed by Damian Madigan's Bluefield Housing Model as well as the additive architectural approach of Lacaton & Vassal. Further references guide how these concepts could be implemented at a suburban scale in the context of Melbourne.

The model is developed and demonstrated through a site-specific proposal in Jacana, a middle-ring suburb of Melbourne. The project begins with the selection of this site as an area suitable for intensification while retaining and adapting existing low-rise housing. The strategies developed in the proposal could be relevant beyond the site to act as a reference for other areas with similar built fabric.

Key Words:

Urban Infill, Urban Density, Sufficiency

Glossary

Suburbia	A collective term for the physical and cultural understanding of a city's suburbs and the way of life of people who live there.
Retain	Keeping a building's existing form, materiality and integrity while accommodating necessary repair, maintenance or adaptation.
Renovate	Making changes to an existing building with the goal of improving its condition and/or functionality. As well as structural changes, renovation can include elements or retrofitting (upgrades which improve how it performs, often through new systems and technologies) and refurbishment (focuses more on aesthetics).
Urban Infill	The development of new dwellings within already developed urban areas. It involves filling vacant or underutilised spaces in established neighbourhoods, typically between existing buildings or on small plots of land (Murray et al., 2011).
Densification	The process of increasing the population or number of dwellings within existing residential areas. It is one part of intensification which is the broader process of redeveloping urban areas to accommodate more people and activities.
Sufficiency	The idea of meeting human needs within ecological limits by reducing material and spatial excess. Applied in the built environment through strategies such as limiting new construction, refusing demolition, designing smaller and multifunctional spaces, and prioritising renovation and shared use (European Environmental Bureau, 2017).
Amenity	Something that helps to provide comfort, convenience, or enjoyment (Merriam-Webster, n.d.).

Urban sprawl	The expansion of a city into its surrounding land, often characterised by low density and car dependency. It is also known as Greenfield development when undeveloped land on a city's fringe is developed for housing for the first time (Madigan, 2024).
Single Family Housing	A residence designed for one household/family unit to be accessed and occupied independently. Usually these are freestanding, sharing no walls with neighbouring properties.
Housing Diversity	A variety of housing types, sizes, tenures, and price points to accommodate a diverse population, including different income levels, family sizes, and life stages.
Housing Adaptability	The physical potential of a dwelling to be modified or reconfigured to accommodate changing needs over time including spatially (e.g ability to change layout), functionally (e.g flexible space that can serve multiple functions) and environmentally (able to adjust to changing climate conditions).
Missing Middle	In cities that transition straight from a high density centre to suburbia, this is a collective term used to describe the missing range of medium density typologies which fall between single family houses and high rise apartment complexes including duplexes, townhouses and low rise apartments (Parolek & Nelson, 2020).
Block	A section of the city bounded on all sides by streets or other public infrastructure (YIMBY, 2023).
Lot	An individual parcel of land (YIMBY, 2023).

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01.

INTRODUCTION

01.1

Purpose

Homes encompass both physical shelter and emotional refuge. They provide comfort, safety and stability. Home is closely linked to our identity and home ownership has deeply ingrained cultural significance. In many cultures, home ownership symbolises success, independence and permanence.

In Australian culture, this is referred to as the Great Australian Dream: owning a large, detached house with a big back yard on a 'quarter acre block'. This ideal has resulted in average house sizes that are among the largest in the world. The large, detached single-family house typology has long been favoured for the amenity it can offer, including privacy, generous indoor space, access to light and views, large green areas, safe spaces for children to play, and room for hobbies and leisure such as gardening or workshops.

Historically, this was realised through

outward expansion, giving rise to dense urban centers surrounded by large expanses of low-density suburbs. Melbourne is no exception. In addition to being Australia's fastest growing city, it is the largest city in Australia by area and one of the lowest-density cities in the world.

However urban sprawl consumes natural and agricultural land, increases car reliance, extends infrastructure networks inefficiently, and contributes to high-carbon, high-consumption lifestyles.

Bigger is not better for the planet, nor for those who do not own their homes and are now struggling to find secure housing which has become increasingly inaccessible due to record levels of unaffordability and low availability.

Australians must moderate consumption if ecological and social sustainability are to



Figure 2. Global situation of this thesis in Melbourne, Australia. Adapted from Passive House Institute (n.d.).

improve and if a more equitable distribution of affluence is to be achieved. This will require ways of living that move away from current consumerist values, protect ecosystems, and support social justice.

Sufficiency principles are at the heart of this behavioural shift. Sufficiency is an emerging global concept in response to the climate emergency that focuses on ensuring wellbeing for all while avoiding excessive resource demand. It is closely linked to efficiency, and both concepts form part of the SER framework for decarbonising the built environment, though they approach climate targets differently.

Efficiency focuses on doing more with fewer resources by improving energy and material intensity. Sufficiency, by contrast, seeks an absolute reduction in demand by questioning preconceived notions of necessity and consumption. It is about “ensuring our wellbeing and meeting our adequate needs while remaining within planetary boundaries.”

Sufficiency aligns with a vision that seeks to fulfil the international human right to

adequate housing, viewing buildings as vital components of societal well-being. Rather than being understood merely as material possessions or tradable assets, buildings can foster social cohesion, employment opportunities, access to infrastructure, safety, culture, and community life.

Applied to Melbourne, the sufficiency framework calls into question the spatial and material excess embedded in prevailing housing models and invites the consideration of alternative approaches that support diverse households, enhance amenity, and reduce resource demand simultaneously.

Through this lens, it can be argued that Melbourne requires densification but that focusing on increasing the number of houses alone is insufficient and the focus must be on densification of affordable, high amenity housing delivered in ways that minimises environmental impact.

01.2

Aim

This thesis aims to propose an alternative development model for Melbourne which targets densification in a way that simultaneously increases amenity and diversity of housing options all while extending the lifespan of the existing housing.

The thesis focuses on one site specific proposal, applying sufficiency principles for urban densification at a site in the suburb of Jacana, a middle ring suburb in Melbourne.

01.3

Research Question

What strategies can be employed in a Melbourne suburban ring block in order to sustainably and affordably increase density while simultaneously increasing amenity?

Sub-Questions

1. What changes can be made to the overlooked spaces between suburban housing for a more effective utilisation of the land?
2. How can these densification strategies contribute to increased neighbourly social connection?
3. How could this densification provide a more diverse range of housing choices to suit changing family and individual needs?
4. Can this construction be conducted in a way that respects the neighbourhood character?

01.4

Delimitations

This thesis will explore ideas about the built environment within the Kulin Nation; lands which have been cared for and shaped by Indigenous Australians for over 65,000 years. This thesis will, however, not be a participatory project working with the traditional custodians of this land; the Wurundjeri Woi-wurrung and Boon Wurrung peoples.

There will also be no participatory design or collaboration with existing residents, which in practice would be a necessary part of the process but is unfeasible through this thesis.

This thesis will zoom in on only one location to demonstrate a range of densification, retrofit and infill strategies.

The project will not address the investment needed in services and other factors beyond the site's border which would need to be developed in tandem to the densification.

Similarly, this thesis will not be assessing existing planning overlays or recommending changes to this.

This thesis will not explore already vacant sites, or on sites with existing housing that is dilapidated to the point where it must be demolished.

When working with existing housing, the structural integrity must be assessed, and considerations for how to safely work with hazardous materials and chemicals must be made. This process will not be investigated through this thesis.

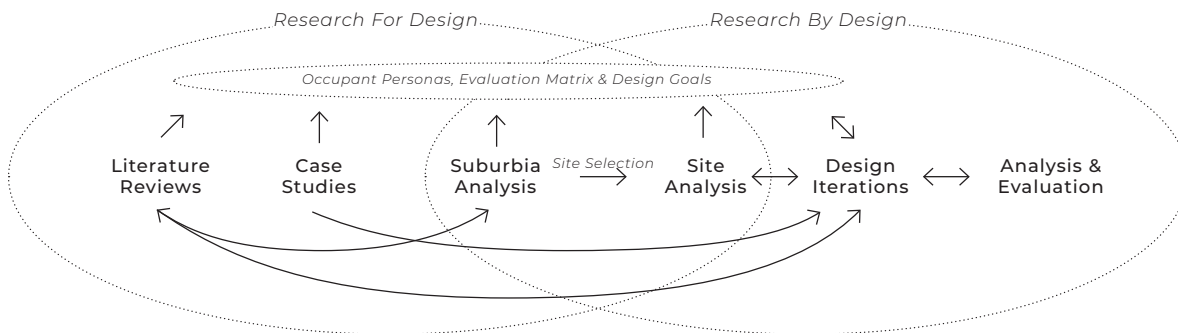


Figure 3. Thesis Method Diagram. Adapted from Brannstrom, M. (2025).

01.5

Methodology

This project is conducted through a combination of research for design and research by design strategies, or a **mixed methods** methodology.

Methods

Firstly, background research, including literature reviews and scientific reports about the history and urban character of suburbia, urban sprawl, methods of densification, sufficiency principles, alternative housing models, methods for evaluating sustainability, population and living conditions, predictions and current regulations, informs the selection of a site that is suitable for intensification.

The project continues to site specific analysis, including environmental analysis and mapping of patterns in buildings, separation of spaces, gardens and other green spaces, and mobility options.

The findings from this analysis, along with the background research and analysis of case studies informs the development of design goals for the proposed intensification model, and the creation of occupant personas to act as imagined stakeholders.

A design proposal for the chosen site is developed and presented through sketching of design iterations and a physical model.

Reflection on the broader implications of the research findings are finally presented.

02.

BACKGROUND

02.1

Sufficiency

Sufficiency is a transdisciplinary perspective that invites a fundamental reconsideration of what is truly essential to live happily. Rooted in a recognition of ecological constraints, it seeks to align human production and consumption with the earth's sustainable boundaries. In regards to the build environment, it is defined as avoiding the demand for materials, energy, land, water, and other natural resources while delivering a decent living standard for all within planetary boundaries (Spenglar, 2016). Additionally, it is a core component of the Sufficiency Efficiency Renewables (SER) framework (European Environmental Bureau, 2017) which seeks to provide guidance for sustainable building practice.

The framework was introduced in early 2000s by the French NGO Négawatt, and by 2015 (négaWatt, 2017), the framework had gained enough popularity to be considered in the design of France's national energy transition law. The three components of the framework address impact at different points in the causal chain; cause, symptom and consequence. Sufficiency tackles the causes of environmental impact by avoiding the demand for energy and materials over the lifecycle of buildings and goods and relies on long-term, non-technological solutions. Efficiency tackles the symptoms of environmental impact by improving energy and material intensities through continuous marginal technological improvements. Renewables tackle the consequences of environmental impact by reducing the carbon intensity of energy supply (Buildings Performance Institute Europe, 2024).

The building sector is a strong candidate for

the implementation of sufficiency practices. In the European Union alone, buildings account for 50% of all extracted material and 40% of total energy consumption (European Environmental Bureau, 2017). The urgency of decarbonising the sector is compounded by the limitations of efficiency-centred approaches; while efficiency improvements have contributed to a 49% decrease in global emissions from residential buildings, these gains have been entirely offset by a 52% increase in floor area per capita (IPCC, 2022). This rebound effect whereby efficiency gains are absorbed by increased consumption rather than translating into net environmental benefit is a key problem sufficiency hopes to address.

However, despite its growing influence, sufficiency is not without criticism. One of the primary concerns is that sufficiency based approaches may inadvertently reproduce social inequities if implemented without careful consideration of differing living standards and cultural contexts (Arceo et al., 2025). Measures such as reducing dwelling sizes, limiting material consumption, or discouraging private ownership can be perceived as imposing constraints on personal freedom or quality of life, particularly in societies where increased consumption remains closely tied to aspirations of comfort, security, and social mobility (Arceo et al., 2025).

Furthermore, sufficiency strategies can themselves be vulnerable to rebound effects. For example, reductions in housing size or operational costs may lower living expenses, potentially freeing financial resources for other forms of carbon-intensive consumption such as air travel or consumer goods (Sorrell et al., 2020). Similarly, individuals may feel they have "done their bit" for the environment through reduced domestic consumption and therefore justify more energy-intensive behaviours elsewhere, a phenomenon

known as negative spillovers (Sorrell et al., 2020). These challenges highlight that sufficiency alone cannot guarantee absolute reductions in environmental impact; rather, its effectiveness depends on broader systemic, cultural, and policy changes that ensure reduced resource use translates into genuine ecological benefit rather than displaced consumption and within the context of architecture, sufficiency must be understood as providing high quality spaces that make a lower consumption lifestyle genuinely desirable.

Modelling of sufficiency measures applied to the European building stock demonstrates their significant potential: a 16% reduction in greenhouse gas emissions compared to past EU trends, a 61% decline in demand for renewable resources, and a 9% decrease in demand for non-renewable resources (Zimmermann, 2022).

The operationalization of sufficiency within architecture begins with a “new is not always better” (Buildings Performance Institute Europe, 2024) approach. This mindset recognises that existing structures contain both great cultural value and “sunk” carbon. However, in situations such as Melbourne, when the existing fabric alone cannot meet housing demands, new construction becomes necessary. In this case, the goal shifts from replacement to symbiosis. New interventions should not be viewed as standalone objects, but as new connective tissue that will come together to make a greater whole.

Guided by these ideas, Buildings Performance Institute Europe's hierarchy for decisions regarding new housing stock is a succinct framework which preferences tackling vacancies, followed by renewing housing units, then converting housing units, then extending housing units, then infill development, then brownfield development and finally presents greenfield

development as the least preferred. (Buildings Performance Institute Europe, 2024)

Some steps for realising sufficiency for reduced environmental impact in the housing sector are to reduce floor area per capita, to provide a variety of dwelling sizes to allow for the flexibility to move into a smaller space if that fits one's needs better and to design multi-family buildings over single family homes. However, given that sufficiency also highlights wellbeing for all, this must be done in a way that offers enough space for privacy and comfort. Importantly, this is not always a trade off and sometimes choosing the lower impact solution simultaneously provides other desirable qualities such as affordability, decreased maintenance burden or increased social opportunity.

Another example of sufficiency in practice is the model of shared amenity living, which minimizes resource demand throughout the building's life cycle, reducing material intensity during construction and lowering energy requirements for heating and cooling during operation (Berrill et al., 2021). Beyond this it also addresses loneliness (Wankiewicz, 2017), helping to foster the built-in support networks provided by close-knit communities.

In Melbourne, this idea of shared amenity living is gaining increasing traction through cooperative and community-oriented housing developments such as the projects delivered by Nightingale Housing. These initiatives respond to shifting urban demographics, including smaller household sizes, housing affordability pressures, and a growing demand for socially connected forms of living, by prioritizing shared amenities such as communal laundries, gardens, and social spaces over larger private dwellings.

02.2

Densification

Sufficiency thinking supports urban densification as a strategy for accommodating a growing population while minimising the negative environmental effects of urban sprawl. By prioritising development within already urbanised areas, densification reduces pressure on undeveloped and agricultural land while also lowering emissions associated with transportation and commuting (Van Neste & Royer, 2022). In addition to environmental benefits, higher density development can also improve quality of life by enabling more people to live closer to employment, education, and existing urban amenities, helping to address some of the social and economic costs associated with dispersed suburban development. (The Urban Task Force, 1999, 36).

These issues are particularly relevant in the context of Melbourne, where population growth has historically been accommodated through low-density greenfield developments of detached housing on the city fringe. This pattern has resulted in a highly dispersed metropolitan structure. For example, Melbourne has roughly half the population of Greater London but occupies an urban area approximately six times larger. Such spatial expansion contributes to car dependency, infrastructure costs, and environmental degradation.

With a rapidly growing population, planning policies over the past few decades have increasingly sought to incentivise higher density urban infill housing in established areas, and much of this has been as high rise development in the inner city, on former

industrial or commercial sites. As land values rise, another increasingly common urban infill model is where existing low density housing is demolished to make room for new higher density housing to be constructed in its place. Although this approach increases residential density, it has been criticised for producing fragmented and piecemeal development patterns resulting in “significant loss of greenspace, and no added services, infrastructure, or residential amenity” (Frantzskaki et al., 2024,).

Density itself is difficult to measure and compare but some common metrics include measuring the number of people or the number of dwellings that are accommodated within a set boundary. Related metrics include site coverage, which is the percentage of land that is built upon, and floor area ratio which takes into account that multi-storey buildings can provide substantially higher floor area within the same build footprint. Additionally, the arrangement of the urban forms in regards to their distribution and access directly impacts the amount of green space, the interaction between dwellings and green space, the access to light and air of both indoor and outdoor spaces, and the spatial experience of the neighbourhood from the street. These ideas are illustrated in the below diagrams.

(The Urban Task Force, 1999, 35)

Determining what constitutes an appropriate or sustainable level of density is debated with no universally accepted definition of optimum levels since what is most appropriate depends on the specific context and goals in terms of energy consumption, economic performance or social sustainability (Ahmadian et al., 2019,). Early twentieth-century planner Raymond Unwin argued that overcrowding should be avoided and proposed a maximum density

of 30 houses per hectare yet several decades later, Jane Jacobs presented the opposite argument, suggesting that vibrant urban life required significantly higher densities, proposing a minimum of around 250 per hectare to support active and participatory city life (Berghauser Pont & Haupt, 2023, 7).

As cities change over time, density goals shift and in Melbourne, recent conversation has focused on the need to focus development on spatial qualities and to include more medium density housing, which is a wide range but in the Australian context can be defined as anything ranging from 34 and 67 dw/ ha (Madigan, 2024, xv). With a focus on how this medium density housing could support more livable, affordable and sustainable suburbs, the concept of ‘missing middle housing’ (Parolek & Nelson, 2020), which refers to a range of multi-unit or clustered housing types, such as duplexes, townhouses, courtyard apartments and small apartment buildings that fall between detached single-family homes and high rise apartment blocks, is seen as a development strategy for achieving densification in Melbourne as these typologies are typically compatible in scale with existing low-rise neighbourhoods while significantly increasing the number of dwellings per hectare (YIMBY, 2023).

While densification in an Australian context has predominantly focused on new builds, there is growing international focus on renovation as a strategy to increase housing capacity within existing neighbourhoods while preserving their spatial qualities. Initiatives such as The European Citizens’ Initiative HouseEurope! argue that renovation and reuse should be the default approach in the building sector, and advocate for the upgrading of existing buildings over demolition (Brandlhuber et al., 2024). Strategies and approaches for this within the context of the large stock of post-

war residential developments in Europe, which make up a significant proportion of their existing housing stock, are particularly relevant to Melbourne’s middle ring suburbs which, although smaller scale, are largely of similar era housing stock. Such strategies could include extension, annexing or transformation of existing housing and aim for densification that takes into account architectural heritage for an increased

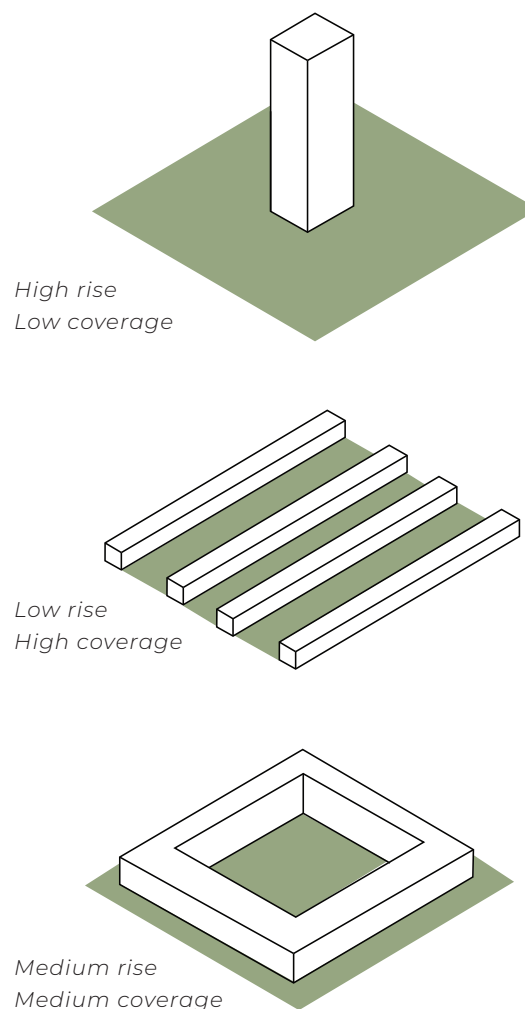


Figure 4. Varied spatial conditions at the same density as a result of varying site coverage. Adapted from The Urban Task Force (1999).

02.3

Bluefield Model

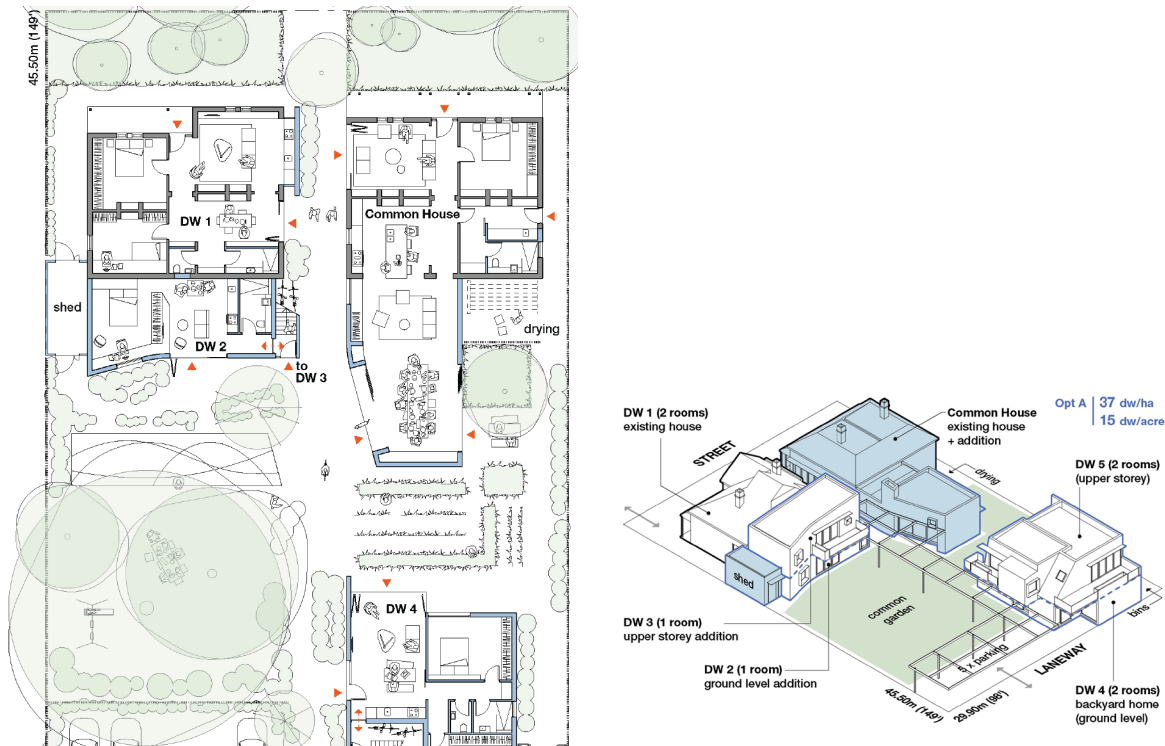
In Australia, Architect and University of South Australia lecturer, Damian Madigan advocates for a type of ‘Missing Middle Housing’ which he describes ‘Bluefield Housing’ (Madigan, 2024). It is an urban Infill model which retains existing housing. Through alteration, and additions this model allows for densification in a way that is suited to consolidation of existing low-rise and low-density suburbs and differs from established patterns of knock down and rebuild. The name Bluefield was chosen to position it as an alternative to established models of greenfield, brownfield or greyfield development (with blue chosen to represent the calmness of suburbia).

<i>development type</i>	<i>location</i>	<i>description</i>
greenfield	urban fringe	Low density new suburban housing development on previously undeveloped land on the city-fringe.
brownfield	existing suburbs	Medium to high density housing development on redundant previously non-residential land (former non-residential buildings demolished and change in land use).
greyfield	existing suburbs	Medium density housing development on redundant previously residential land (former residential buildings demolished).
bluefield	existing suburbs	Medium density housing development operating on an alterations and additions model (former residential buildings retained). existing suburbs

The Bluefield Housing model operates around 7 key principles:

- 1. Facilitate Sharing
- 2. Ignore lot size and yield, and co-locate to avoid land division
- 3. Retain and adapt the lot's original housing
- 4. Leverage the prevailing pattern of alterations and additions
- 5. Create housing in a flat hierarchy
- 6. Arrange housing around shared landscape in a unified design
- 7. Design for social, financial, and environmental sustainability

It emphasises the need for infill of new dwellings in a suburban setting to feel equal and not that they are tucked away as secondary or lesser spaces. It demonstrates the ability for new dwellings to be added without significant impact on the scale or streetscape of the



Figures 5 & 6. Bluefield Housing (Madigan, 2023).

neighbourhood, and in a way that can maintain existing mature trees.

Bluefield Housing adopts some of the approaches to ownership of Pocket Neighbourhoods but at a smaller scale:

- Houses are privately owned with residents owning a share of common areas
- Houses are self-contained with their own kitchen, dining, living and bedrooms
- Laundries, clothes drying areas and tool sheds are often shared
- Outdoor common areas with amenities such as BBQ's outdoor dining are shared
- Residences have a front porch or similar to encourage engagement
- Carparking is consolidated to encourage engagement

Whilst Bluefield Housing retains and adapts the lot's original housing, existing ad hoc building elements that cannot be meaningfully repurposed can be removed. The space these buildings occupy can be given over for the new housing components. Bluefield Housing aims for an appropriate balance of built and landscape space with existing mature landscape retained where possible. Attention to detail is important to ensure that spaces for cars, clotheslines, rubbish bins and storage are considered and resolved.

While this approach focuses on retaining existing heritage housing with planning overlays, it is a relevant reference for a way to work with densifying on lots with homes that do not have heritage protection like in post-war Melbournian suburbs where the houses are not as valued by the community as much older pre-war houses with 'heritage character'.

02.4

Lacaton & Vassal

Architects Anne Lacaton and Jean-Phillipe Vassal realise opportunities by retaining buildings that others would consider suited to Brownfield or Greyfield development. Lacaton and Vassal describe the embedded history in old buildings as the “soul” (Architecture, Au, n.d.). They argue that this should not be destroyed and believe existing buildings should never be demolished but rather upgraded through addition and transformation, and that this creates the opportunity to provide better living spaces than could be achieved if the same budget was spent on knocking down and rebuilding.

In both their renovation and new build projects, they strive for high quality spaces, achieved affordably and with a low environmental impact. They strive to “do more with less” and advocate for providing luxury and some of the ways they measure this include generosity of space, freedom of use, light, comfort and views. At the same time, they focus on minimising structural changes and work with affordable, industrial, and prefabricated materials as a way to further keep costs down while prioritising afforded amenity.

Retaining existing buildings considered by many others to be worth nothing frees up budget to create other additional space which they refer to as “free space” (Lacaton & Vassal, 2023). But this idea of free space is taken much further in their work and is extended to also refer to the non-prescriptive and/or adaptable qualities of their work which offers freedom to residents.

They often add what is missing by creating new winter gardens and balconies that encourage a hybrid of indoor and outdoor living. These additions are described as ‘free space’ because they are intentionally non-prescriptive and free of program constraints. This allows occupants freedom of use and the opportunity to personalize the spaces.

An additional layer of adaptability which is a theme across many of their projects is the ability of operable structures to respond to changes in the environment, like temperature and light levels, or occupant requirements, like desire for privacy. Their project Latapie House (Lacaton & Vassal, 1993), is a low cost new build for a family that demonstrates these ideas on the suburban scale.



Figures 7 & 8. Lacaton & Vassal. (1993). Latapie House.
Image Credits: Philippe Ruault

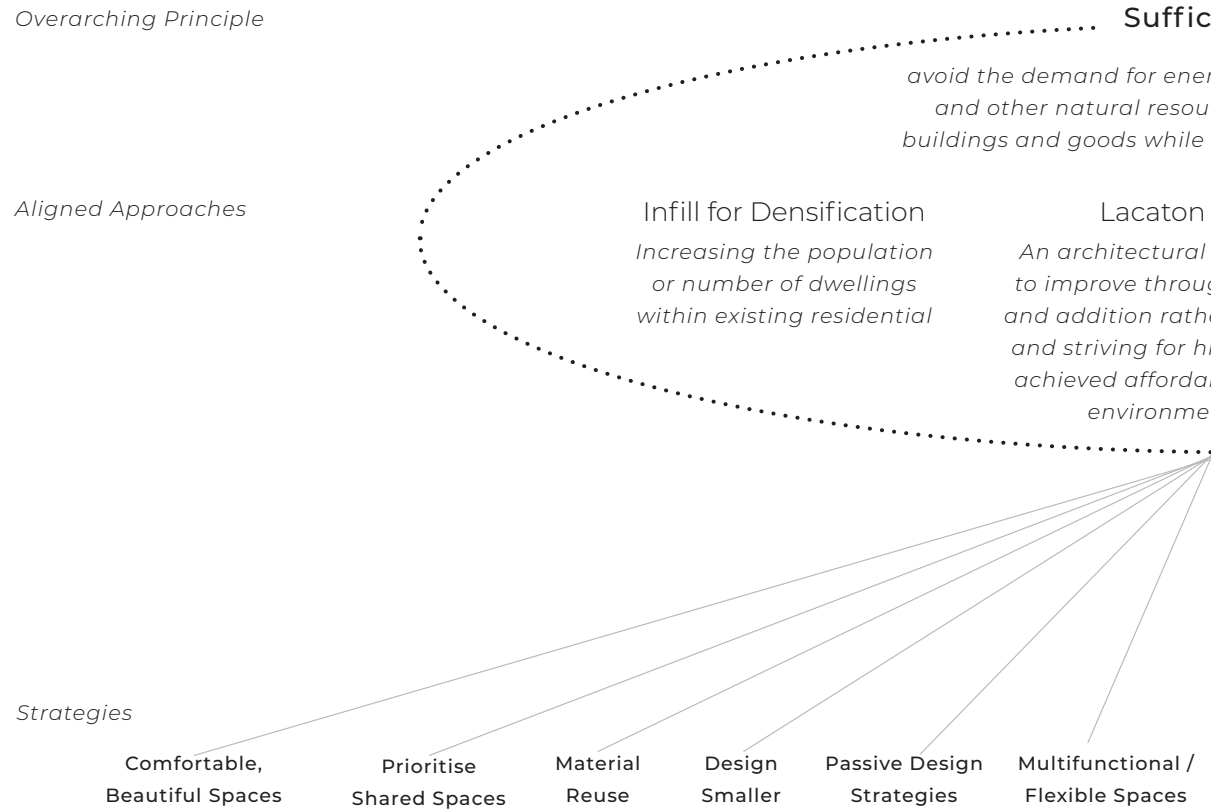


Figure 9. Theoretical framework diagram.

02.5 Theoretical Framework

All of these concepts are aligned with the sufficiency principle to avoid resource demand while increasing amenity, mapped here along with some of their overlapping ideas. These strategies, notably renovation, prioritising shared spaces, and

environmentally adaptive spaces, are taken forward as design considerations.

Further reference projects inform practical implementation of these concepts, particularly within the local context.

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& Vassal

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Bluefield Model

An urban infill model that, through
alterations and additions, allows for
densification in a way that is suited to
Australia's existing low-rise and low-
density suburbs

Environmentally
Adaptive

Avoid Demolition

Preserve Charm /
Identity

Low Cost
Materials

Diversity of
Housing Size and
Type

Diversity of
Housing Tenure

Renovation

02.6

LOCAL REFERENCE PROJECTS

House Adaptation

Thornbury Canopy by Gab Olah is an example of a renovation to a similar era 1960s brick single family house. The family decided to remove existing carports and garages, and to rewild their driveway, extending their garden space to wrap around the side of the house. The internal layout was redistributed so that the living spaces oriented towards the back garden space, and large doors were inserted into this facade for physical connection.

A large operable shading structure allows this outdoor living space to be adapted for varying levels of shade or rain protection depending on the season.

The structure is lightweight, and constructed from cheap off the shelf hardware products. This is kind of like an Australian version of the adaptable wintergardens in Lacaton and Vassal's Latapie House, and, in line with sufficiency, being able to spill out into this space means that the footprint of the main house can remain smaller.

A number of houses on the block have already added some form of shaded outdoor living spaces but for those that don't, these could be added and there is potential that the existing structures could be updated to be more flexible in their use and that the houses could have greater visual/physical connection to these spaces.

From this I am also inspired by the idea that level change of a deck and combined planting could act as a threshold space between public and private if the back gardens were to be shared amongst multiple families.



Figures 10 & 11. Gab Olah. (2024). Thornbury Canopy.
Images Credits: Peter Bennetts



Figures 12 -14. Pop Architecture. (2025). Fitzroy North House.
Image Credits: Willem Dirk

Fitzroy North House by Pop Architecture is an example of an extension to an existing family house which incorporates a new additional living space in their back yard. This unit is accessed via the original house's side gate, and the internal layout of the existing house has been adjusted so that it is also now accessed through this new side entrance. This layout also allows the private areas to remain collected at the front of the original house while the living space opens to the back yard.

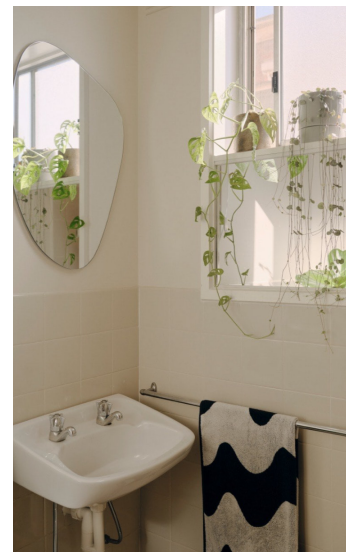
They have made use of recycled brick and corrugated metal - modest robust materials which also relate the intervention to the post-war history of the site. Additional sustainability measures include, their use of deep overhangs, access to solar and cross ventilation opportunities, all helping to reduce the project's environmental impact.

While the addition could not be used for long term independent living without a kitchen, I am inspired by the way both spaces have their own protected outdoor space which overlooks the now smaller but relandscaped shared garden. It highlights the need to consider views, privacy and access if an additional dwelling is to share a back yard space.

Renovation for Shared Amenity

Park Street by Breathe is a local Melbourne example of the renovation of a 1960s brick apartment complex. Breathe have a philosophy of “build less, give more” which in this context meant instead of demolishing and rebuilding these units, or gutting and remodelling them, they took a retrofitting approach where layouts, kitchens and bathrooms were retained and a rooftop solar array, energy-efficient heating and cooling systems, ceiling fans, induction cooktops, efficient appliances and lighting were added.

The ground floor spaces which were originally used for car parking were transformed into shared green space, bike parking, BBQs, seating, clothes lines and vegetable gardens, essentially allowing residents to extend their living spaces and also introducing more social opportunities for neighbourly interaction.



Figures 15-17. Breathe. (2024). Park Street.
Image Credits: Tom Ross



Figures 18-20. Campsie 2914 (Fernández-Abascal & Gra., 2022)

I am inspired by the idea of consolidating individual lots and promoting shared living for increased amenity proposed by Dolores Hayden in her 1980 paper “What Would a Non-Sexist City Be Like? Speculations on Housing, Urban Design, and Human Work” (Hayden, 1980, S184). In this, she suggests a collection of the standard suburban American block and a flipping of public and private space so that the back yards form a large shared courtyard. Residents share services such as childcare, kitchens, laundries, and transportation while reorganizing suburban blocks so private dwellings remain individual but yards, tools, and community spaces become collective.

I see the project Campsie 2914, which is an unbuilt proposal by Fernández-Abascal & Grau for the refurbishment and densification of a site planned for demolition and re-development in the Sydney suburb of Campsie, as one way to implement the ideas at a medium density scale.

The proposed refurbishment involves consolidating the four existing lots into a single title and removing the existing boundary fences to create one site. Shared infrastructure is added at the centre of the four buildings, and two new stairways are introduced to improve access and circulation.

The existing apartments are refurbished, and a range of outdoor spaces, including shaded areas, semi-outdoor terraces, and winter gardens are added to the façades. These spaces provide different levels of shelter and extend the apartments beyond their internal footprint. The proposal also includes four new rooftop dwellings, increasing residential capacity.

New Infill in Suburban Context

Women's Housing by Studio bright is an example of a new build development in the Melbourne suburban context for four individual dwelling units designed for older single women who are on lower incomes and at risk of homelessness. They have used a sloped internal ceiling for more light, sky views and a sense of spaciousness without increasing m2 and even though the dwellings are quite compact, but still have enough space that the living space could be divided for a two bedroom dwelling if needed at a later stage.

The car parking spaces have been designed as flexible gravel spaces so that they can function as shared courtyards. They have also used the front yard space for a productive garden which is then used as an additional social space for the residents.

I take from this project the importance of including benches and places to rest/linger for helping foster a sense of community.



Figures 21-23. Studio Bright. (2021). Women's Housing.
Image Credits: Rory Gardiner



Figures 24-26. Spacecraft Architects. (2023). *Block Party*.
Image Credits: David Straight

Block Party by Spacecraft Architects is a cohousing project in Wellington, New Zealand. It is a block of only 600m² and consists of four terrace houses. Keeping the footprints compact allowed space for a large communal “party room” used for dinner parties, gathering or otherwise extending of living space. The residents also share their garden spaces and a laundry, and at the entrance each dwelling has access to a small private storage garage. Internally, many finishes have been left raw and in this project the architects also make use of a sloped ceiling for a greater sense of generosity without increasing footprint.

03.

CONTEXT

03.1

Site Selection

The selection of the site was guided by four primary criteria:

1. Existing residential area in a middle ring location
2. Connectivity to public transport
3. Building stock from 1950 to 1979
4. Standard suburban lots

1. Existing residential area in a middle ring location

Because these areas already contain significant existing infrastructure and services and are already urbanised, avoiding greenfield sprawl. For this, I take the definition of the middle ring from Infill Opportunities as being between 7 and 25 km from the city center.

2. Connectivity to public transport

Because these areas are already part of Melbourne's broader mobility network, supporting reduced car dependency. I identified areas within walking distance of train stations that are part of both the existing radial train network and the new Suburban Rail Loop (SRL), expected to be completed in 2035, which will run right through this middle ring and see some suburban areas much better connected.

3. Building stock from 1950 to 1979

Because through current standard practice these buildings are most at risk of demolition, aging but not old enough to be perceived to hold heritage value, allowing for a proposal that directly challenges the existing development model. Additionally, the housing on these lots is still relatively low density, offering spatial opportunity for intensification.

4. Standard suburban lots

Because by using standard lot sizes, the proposed design strategies could be transferred and applied to other similar locations across the suburban fabric. For this I take reference from Infill Opportunities report (source) to find an area with lots 15-16m in width, with a minimum length of 38m up to maximum 43m, and with a North-south orientation.

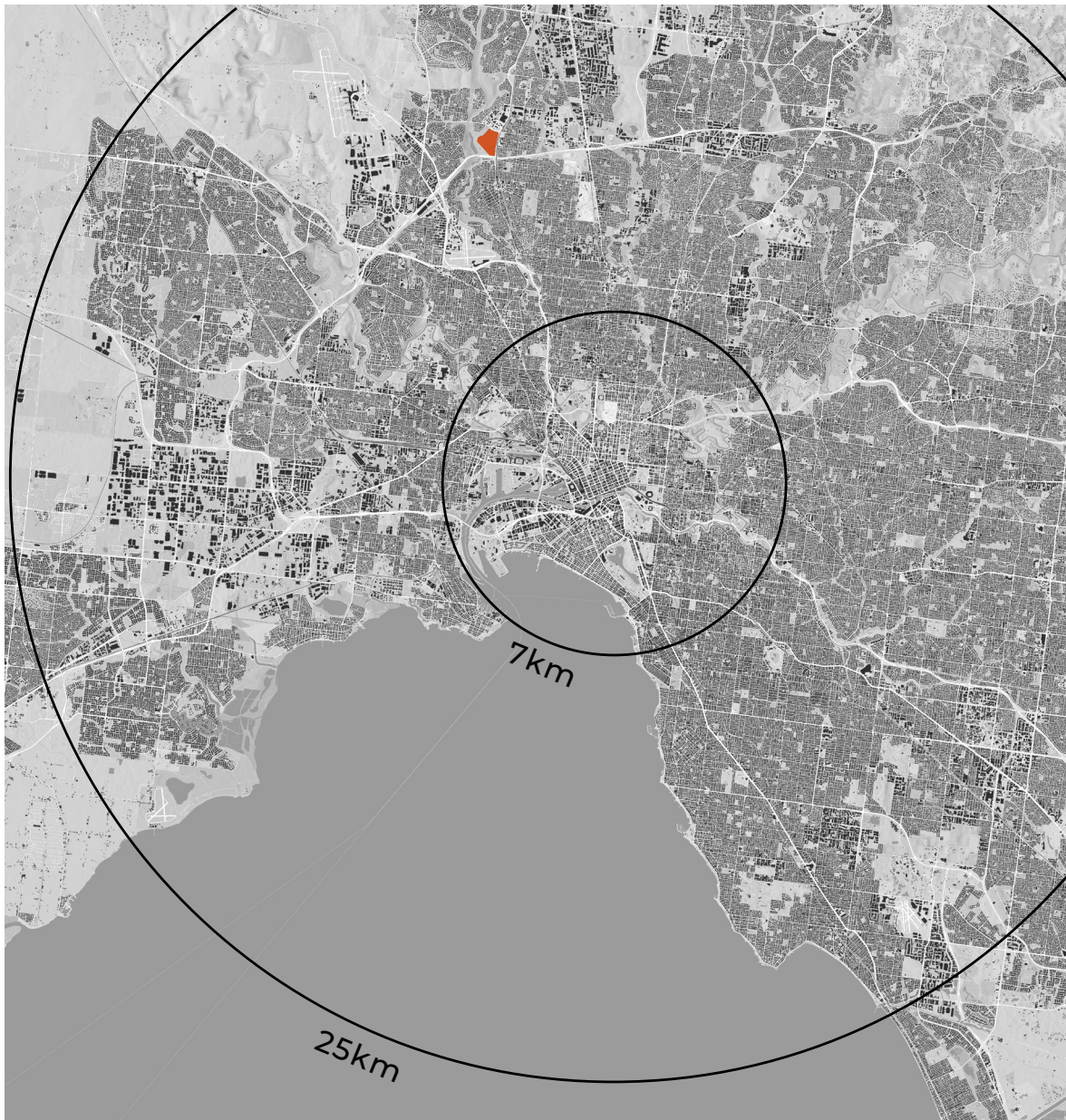


Figure 27. Site position within the "middle ring" in relation to Melbourne's city centre. Adapted under licence from Map of Melbourne (sfg, 1:50.000), by Boundless Maps (2026).

03.2

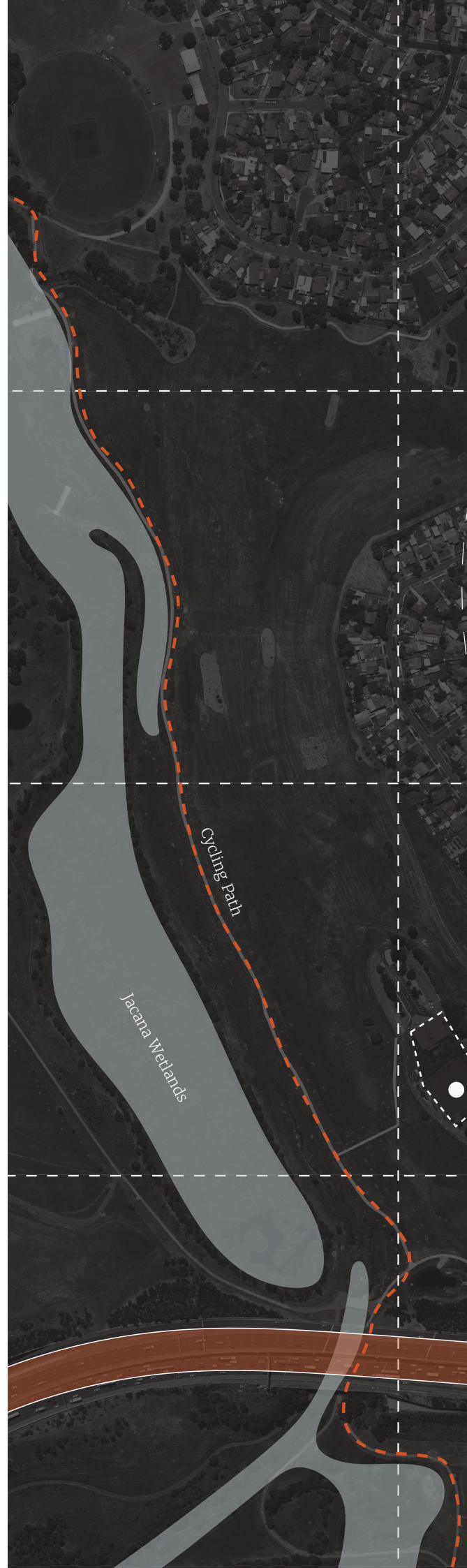
Location

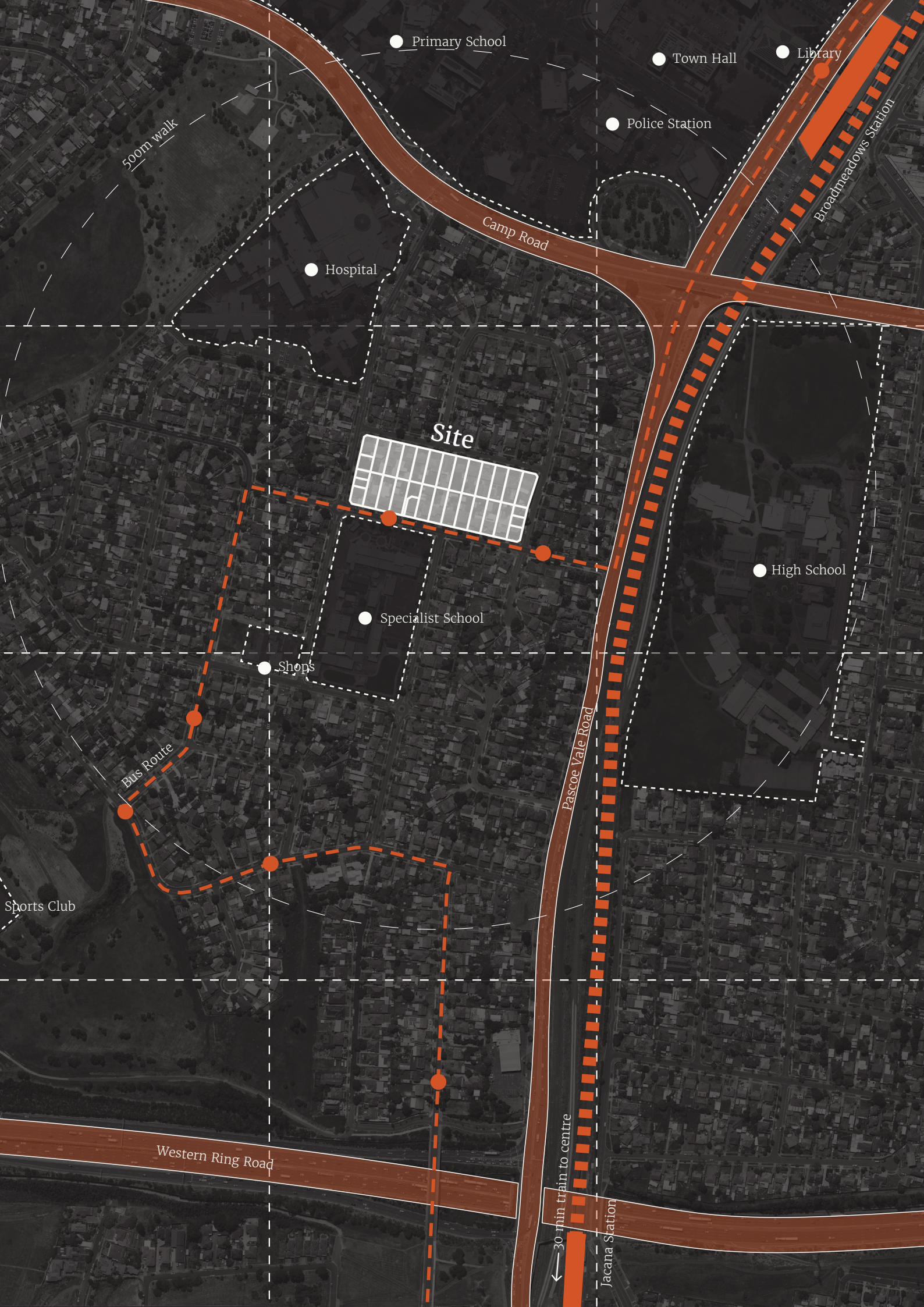
Jacana, located approximately 13km north of Melbourne's city centre has been identified as a suitable area for intensification based on the above criteria. It is an existing residential area with established services including schools, shops, a hospital and connection to public transport, that was largely constructed by the Housing Commission of Victoria (HCV) between 1958-59.

The HCV completed around 1700 houses in Jacana and neighbouring Glenroy between 1953 and 1957, which were all 3 bedroom brick veneer houses with similar floorplans and conforming to one of five different house options. There were four different internal layouts with a 5th option arising through a different roof construction, presumably offered for a more visual variation of the streetscape.

The suburb is within walking distance of Broadmeadows train station which is set to become a major transport interchange after the completion of the SRL in 2035. This positioning not only also positions the area not only supporting reduced car dependency more viable, it also positions the area as a key site for development in the coming years, meaning that much of its existing building stock is at risk of demolition.

Within the suburb I have chosen a cluster of lots, with north-south orientation and dimensions of roughly 15m x 40m, combined for a total area of 1.59ha, to act as the location for the site specific proposal of this thesis.





Primary School

Town Hall

Library

Police Station

500m walk

Hospital

Camp Road

Broadmeadows Station

Site

Specialist School

High School

Shops

Bus Route

Pascoe Vale Road

Western Ring Road

← 30 min train to centre

Jacana Station

Sports Club



Figure 29 & 30. Images of Jacana's streetscape.

Jacana is a quiet, low scale residential suburb with the older housing stock consisting primarily of single-storey detached homes, while more recent developments are typically double-storey dwellings. The area is dominated by separate houses (over 80%), with approximately 10% semi-detached or townhouse-style dwellings and around 8% apartments. The most common dwelling type is a three-bedroom house (63.3%), followed by two-bedroom homes (20.1%) and four-or-more-bedroom homes (12.4%).

In terms of tenure, around 30% of residents own their homes outright, 30% own with a mortgage, and 37% rent. The suburb is generally considered one of Melbourne's more affordable, lower socio-economic areas.

There is an average of 2.6 people per dwelling. Families make up around 70% of households, with Jacana having a notably higher proportion of single-parent and "other" family structures compared to the Australian average. Single-person households account for 25%, and group households represent 6%, which is also higher than the national average. Among families with children, the average number of children is 1.7.

Jacana is well connected to local amenities, including schools, sporting facilities, shops, and a hospital. It is well connected to local public transport, and is moderately well connected to the city centre via a train journey that takes approximately 30 minutes. The suburb is also located near the Moonee Ponds Creek wetlands, offering green open space, sports facilities, and a cycling path that connects to Melbourne's northern suburbs and, albeit via a longer ride of nearly an hour, directly to the CBD.

The average number of motor vehicles per family is 1.7. Approximately 10.4% of households own no car, 40.1% own one car, 32.3% own two cars, and 14.7% own three or more cars.



Figure 31 & 32. Images of Jacana's streetscape.



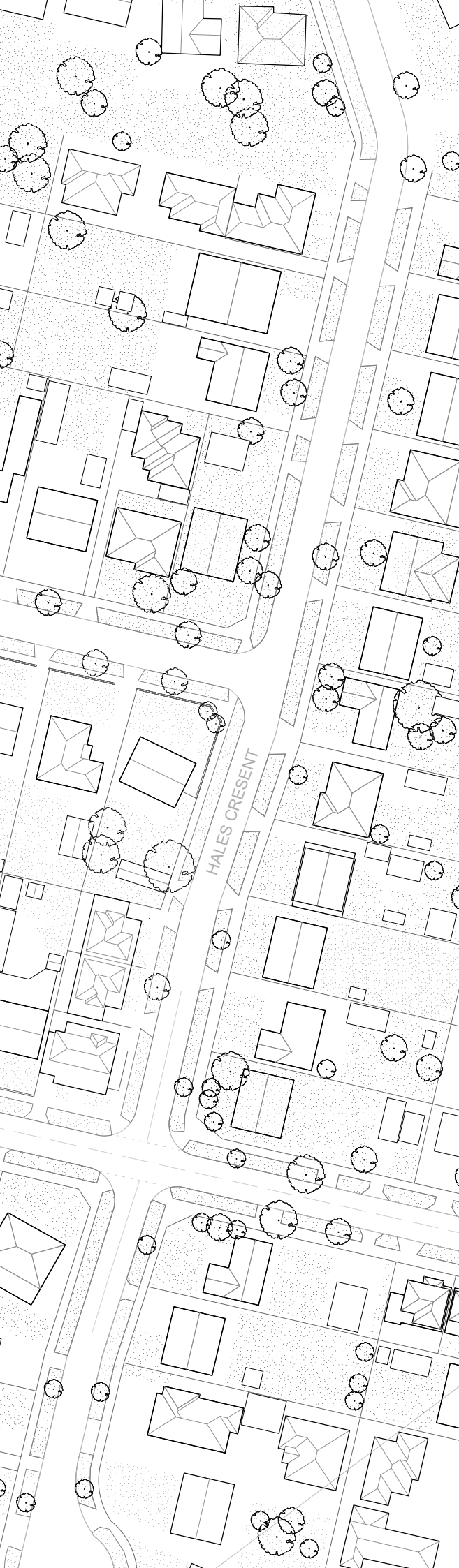
BAMBURGH STREET

KINNARD STREET

LIGHTFIELD AVENUE

5 20m

Figure 33. Existing Site Plan 1:1000 @A4



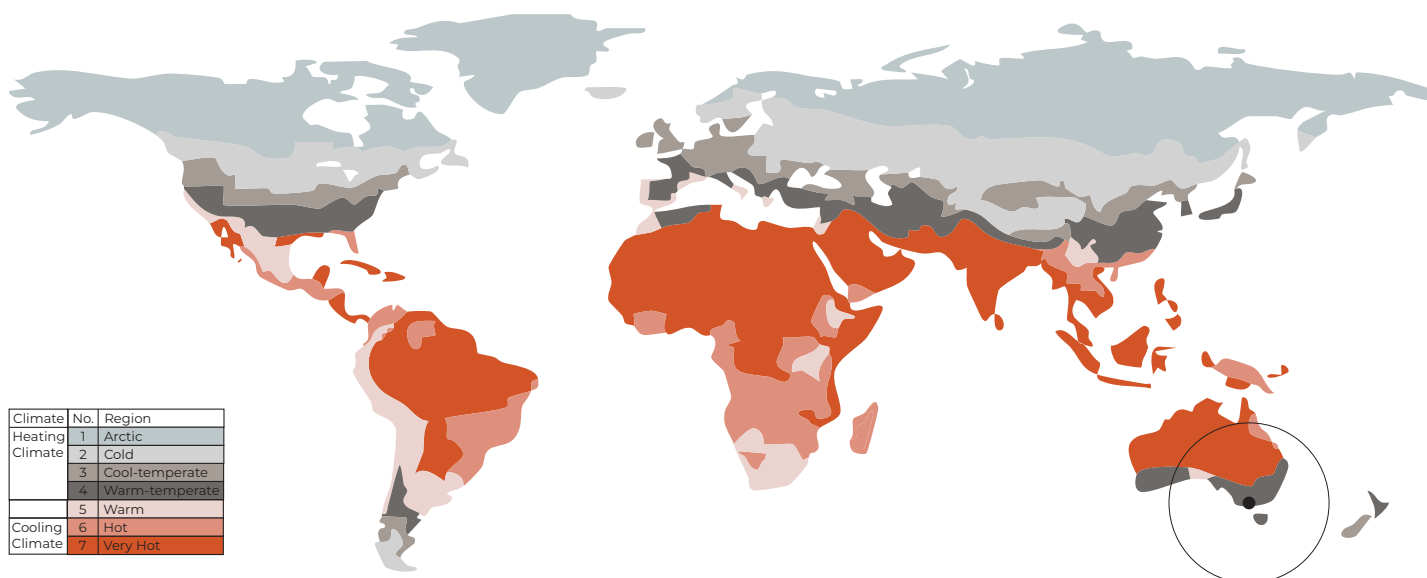


Figure 34. Global Climate Zones. Adapted from Passive House Institute (n.d.).

03.3

Climate

Australia is a very large country with regions that have vastly different climate conditions. To assist with design and assessment of energy efficiency, Australia's Nationwide House Energy Rating Scheme (NatHERS) divides Australia into 69 NatHERS climate zones. Jacana in Melbourne is in Climate Zone 60. It has a temperate climate with warm summers and cool winters. Weather patterns are highly variable. Thermal mass and passive design solutions are quite effective due to the high diurnal range across both summer and winter. (CSIRO, n.d.)

Guidelines for Melbourne's climate include different shading solutions for different orientations. To the north, fixed or adjustable horizontal shading above windows, to the east and west fixed or adjustable vertical louvres or blades, or deep verandahs or pergolas with deciduous vines and deciduous planting to the south east and south west. (McGee & Reardon, n.d.)

In very southern parts of the world, much of the weather is linked to low-pressure storms that almost continually move eastward around Antarctica. The storms create cold fronts with storms that regularly reach as far north as Melbourne.

Melbourne also has the large, hot land mass of continental Australia to the north. Warm high-pressure weather systems travel over inland Australia gaining heat

before reaching Melbourne. These weather systems create regular heat waves in Melbourne where temperatures can reach up to 45 degrees Celsius in summer. (Van Huet, n.d.)

After a heat wave in Melbourne, cold fronts from Southern Ocean storms often collide with very warm high-pressure air. The stark difference between the weather systems creates strong winds, intense rainstorms and can result in 'cool change' drops in temperature of 20 degrees Celsius or more. In Jacana in Melbourne, the prevailing winds are from the North throughout most of the year. However, during the warmer months from December to March prevailing winds are often from the south and part of a 'cool change'. (CSIRO, n.d.) It is desirable to be able to open windows to achieve south to north cross-ventilation to naturally cool homes when a 'cool change' arrives in summer.

Heating is the largest energy consumer in existing homes in the Jacana area (CZ60). Existing homes in the Jacana area consume an average of 422.3MJ/m² annually for heating. Existing homes in the Jacana area consume an average of 49.3MJ/m² annually for cooling. (CSIRO, n.d.)

Melbourne's rainfall is about 650mm per year. Melbourne has 5-10 rainfall days per month and averages 45mm – 65mm of rain per month (CSIRO, n.d.).

Melbourne averages 20 to 25 dry weather days per month (CSIRO, n.d.). Clothes can

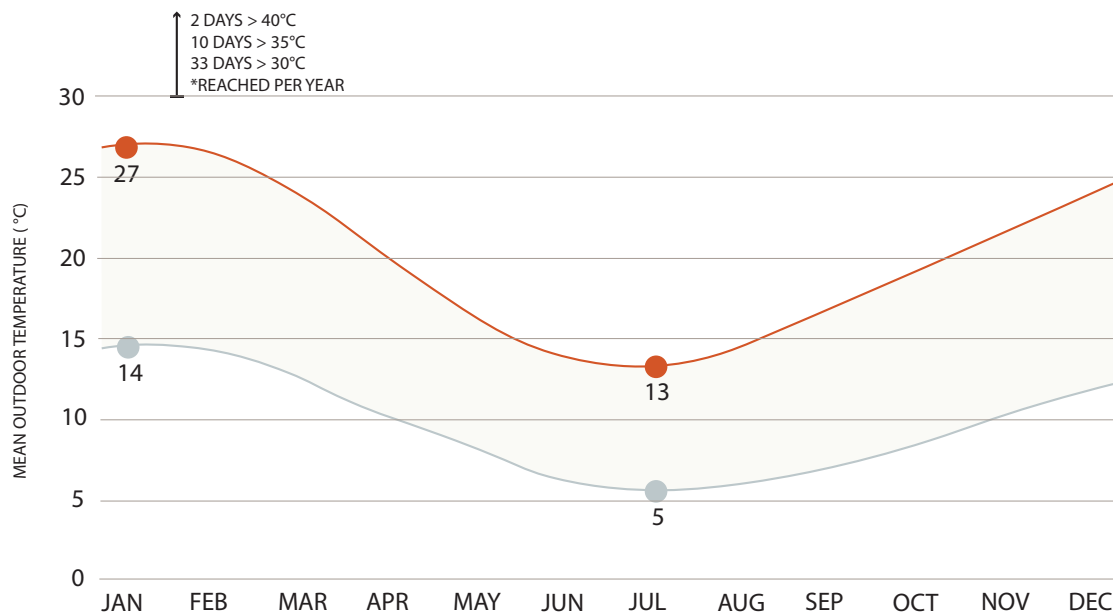


Figure 35. Site Annual Temperature Averages. Based on data from Australian Bureau of Meteorology (n.d.).

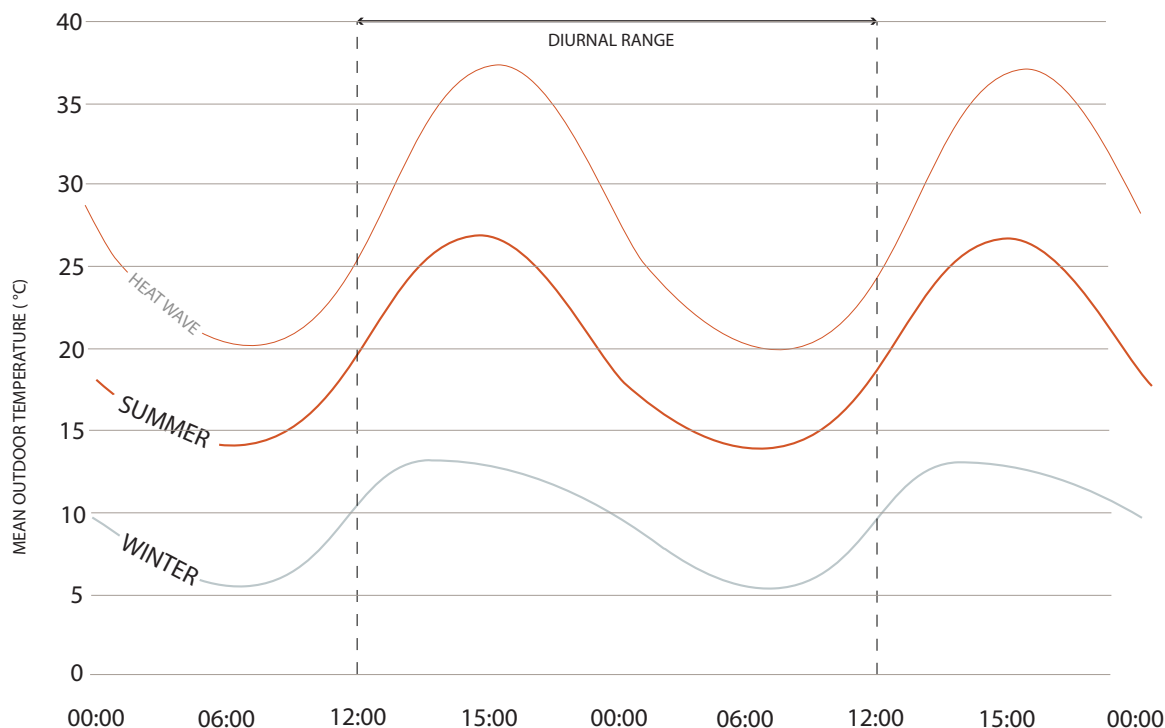


Figure 36. Site Daily Temperature Averages. Based on data from Australian Bureau of Meteorology (n.d.).

be dried outdoors on dry weather days throughout the year. It is desirable to provide outdoor clotheslines for residences.

Melbourne is susceptible to El Niño-Southern Oscillation. This heating and cooling of the Pacific Ocean can result in long droughts. During the Millennium Drought between 1996 and 2010, Melbourne's drinking water storage dropped to 33% (Heggie, n.d.).

It is desirable to harvest rainwater in tanks to enable gardens to be watered during the hot dry periods between summer rainstorms and during periods of drought. Tank water can also be used for laundries,

toilet flushing and car washing so that homes use less drinking water.

In the development of Jacana, permeability was reduced because ground surfaces were sealed for buildings, roads and footpaths. Tributary creeks were replaced by underground stormwater drains (David Widdowson, n.d.) but heavy rainfall poses a particular threat as the rapid runoff can cause flash flooding downstream in central Melbourne. Harvesting rainwater and increasing site permeability could reduce the load on the municipal stormwater system and risks of flash flooding downstream.

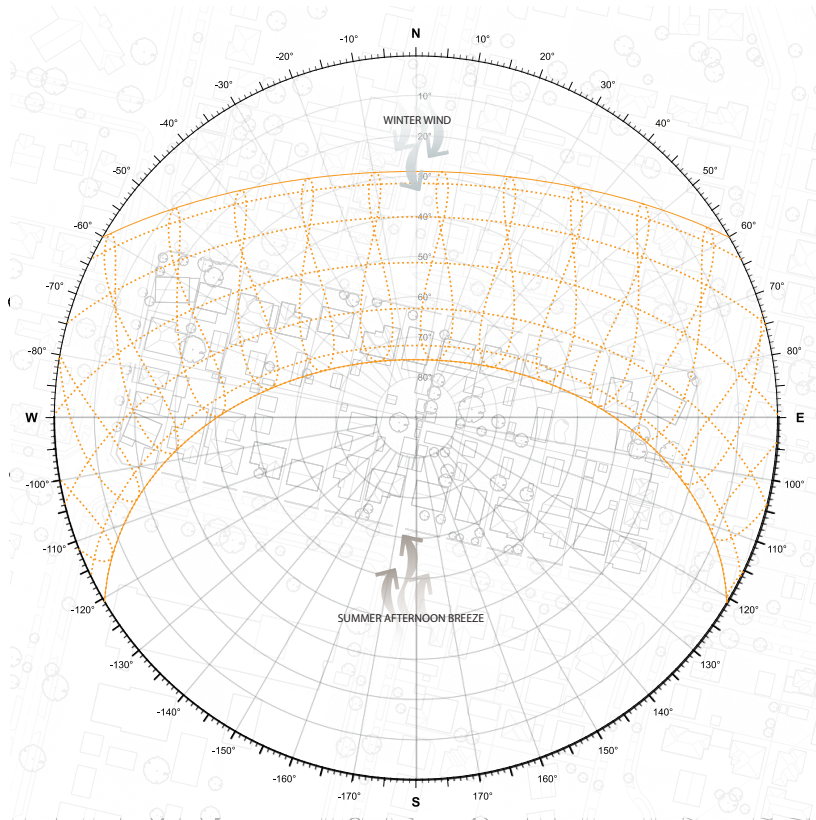


Figure 37. Site Climate. Solar position data from SunPath3D (Marsh, 2026).



Figure 38. Established Trees

03.4

Existing Conditions

From the site climate analysis, the goals are to prioritise orienting living spaces to the north and to ensure windows are adequately shaded, particularly on north-facing façades. It is also a goal to minimise south-west facing glazing to reduce the risk of summer afternoon overheating, and to prioritise north-south cross ventilation to support passive cooling.

Protection from northern winter winds should be considered, although this is a low priority, and it is advantageous to include thermal mass to help take advantage of the diurnal temperature range.

The site's larger, well established trees are located in the backyards and are distributed across the site but form rough clusters. Retaining these is a priority.

The site is directly accessible from all directions and dwellings are accessed directly from the street via their driveways and the most common approach is from the north-west or north-east corner, for pedestrians coming from Broadmeadows train station and shops, or from the south west access to the local shops, wetlands and cycling path. The site is rarely accessed from the east.



Figure 39. Site Access



Figure 40. Site Circulation

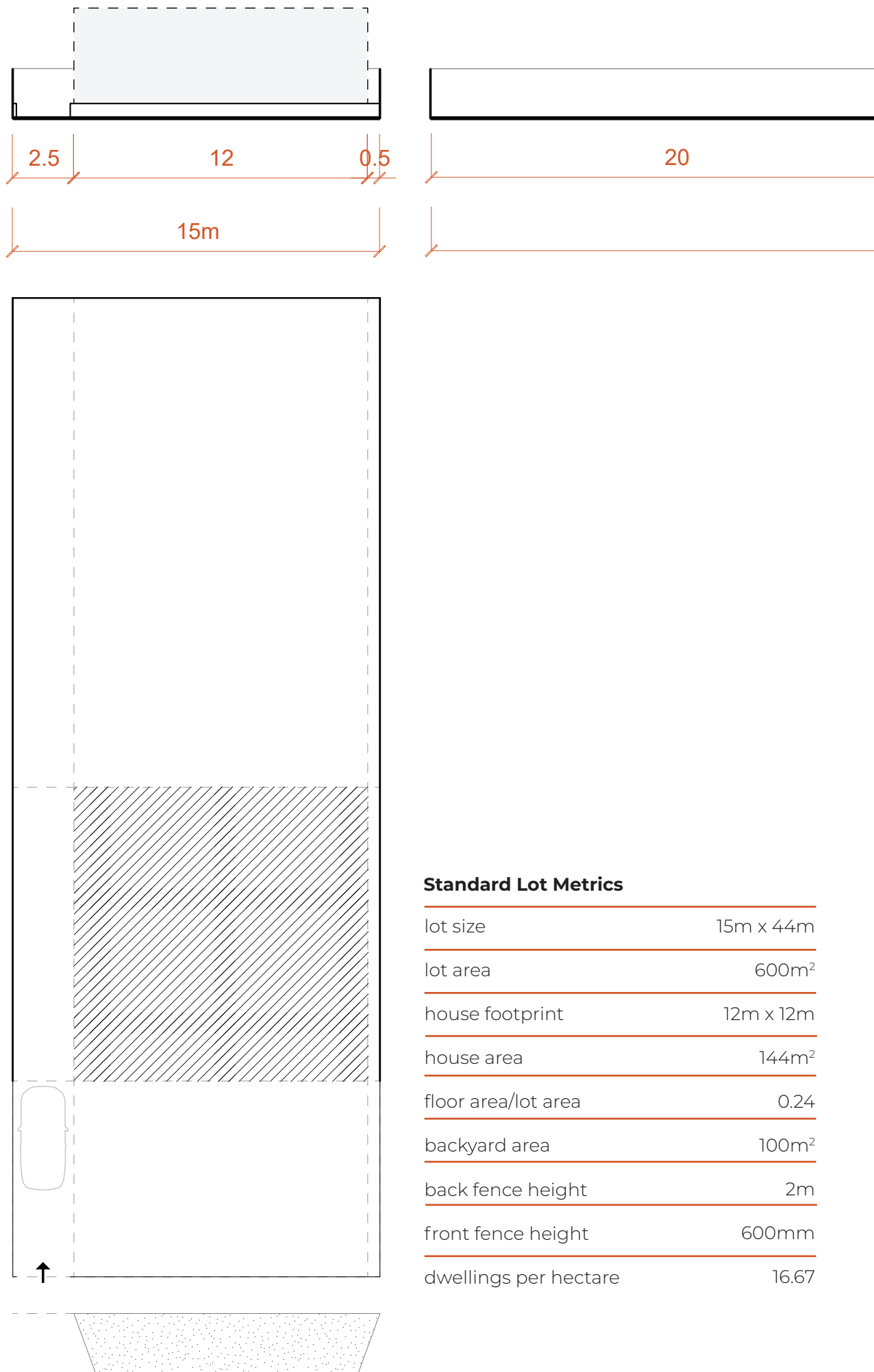
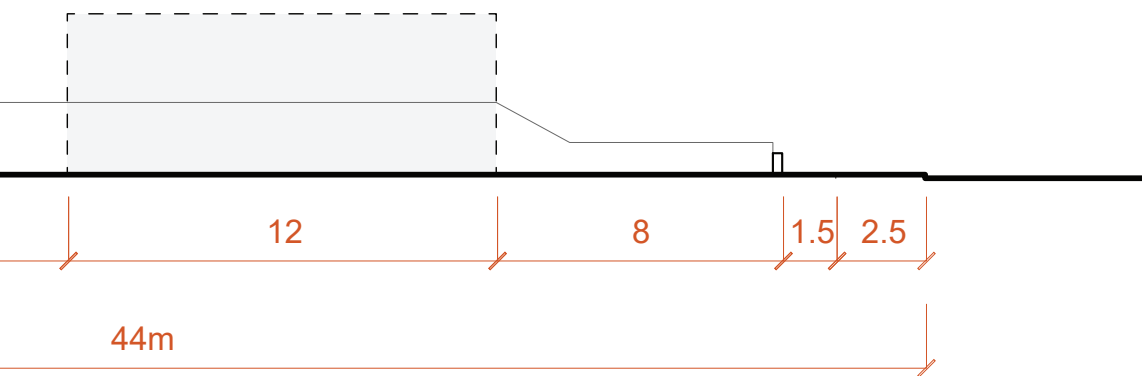


Figure 41. Standard Lot Plan and Volumetric Sections. 1:200 @A4.



The site is made up of standardised rectangular lots are around 600m² each and when combined form the typical suburban fabric of front yard, house, large private back yard all separated by fences.

Lots contain a variety of lightweight metal structures, most commonly a carport and a garden shed.

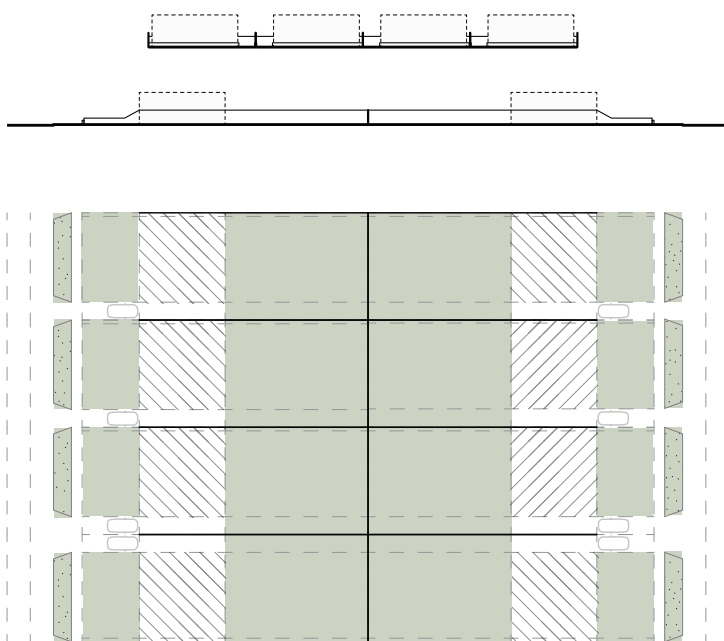


Figure 42. Standard Pattern of Lots in Plan and Section. 1:500 @A4

Standard House Metrics

storeys	1
bedrooms	3
bathrooms	1.5
external doors	2
foundations	stumps
floor height	430mm
ceiling height	2400mm
roof cladding	tiled
roof angle	20 °
roof overhang	600mm
wall construction	brick veneer
external wall	250mm
internal wall	110mm

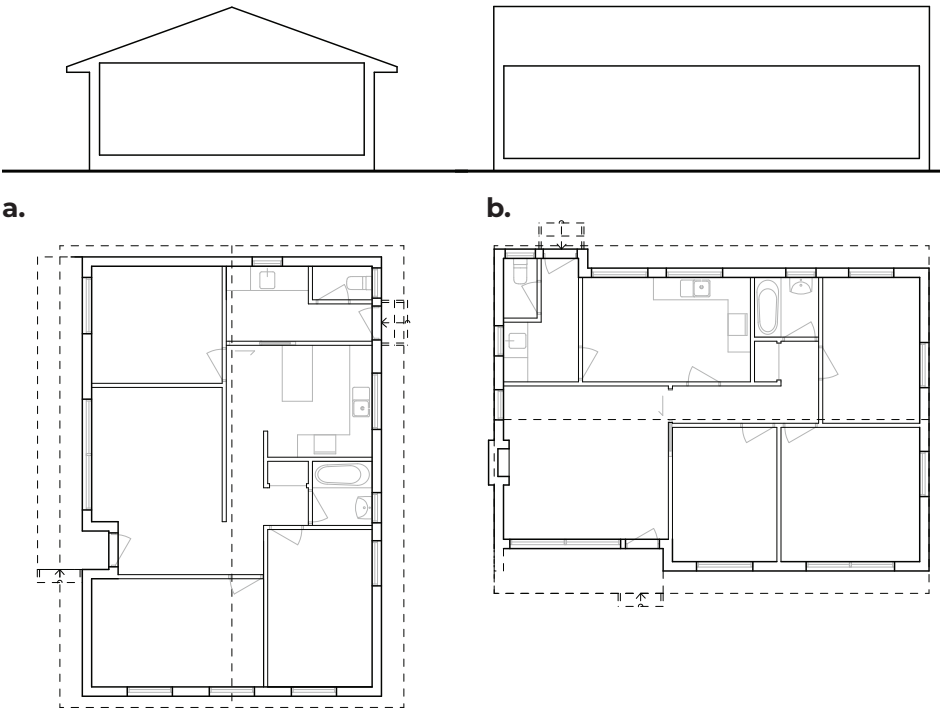


Figure 43. Standard "Pattern" House Floorplans and Volumetric Sections. 1:200 @A4.

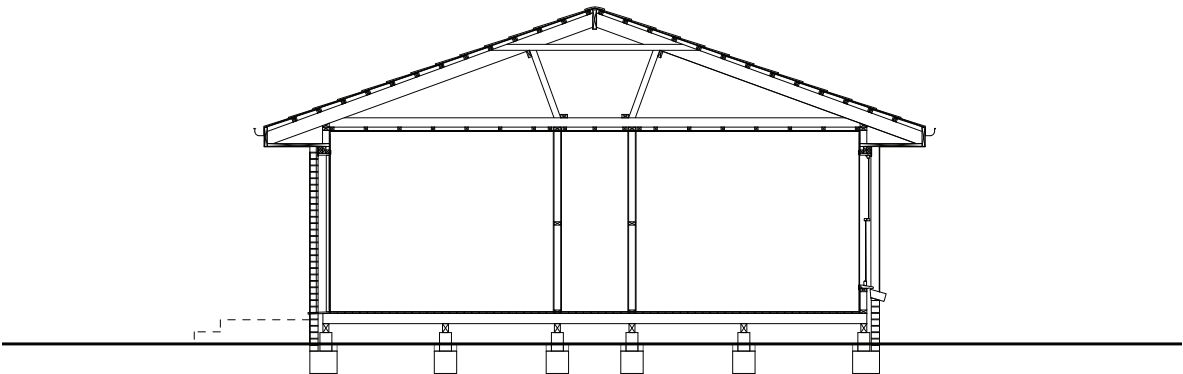
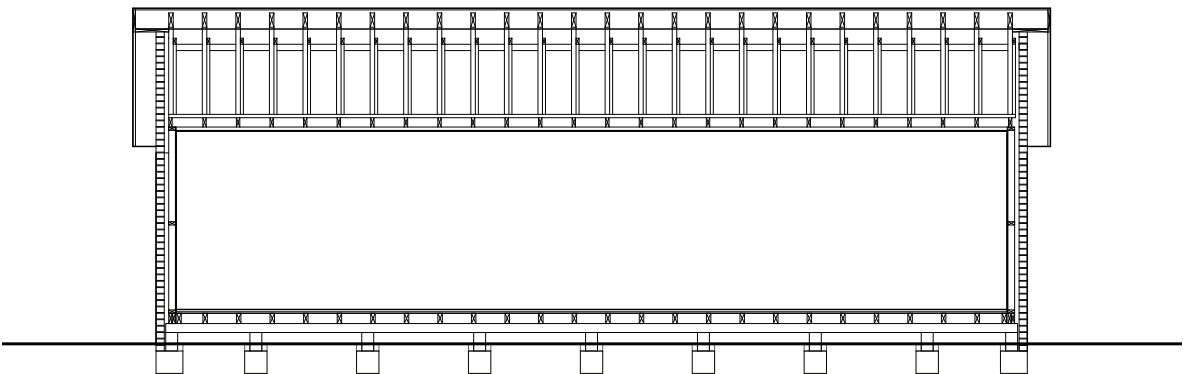
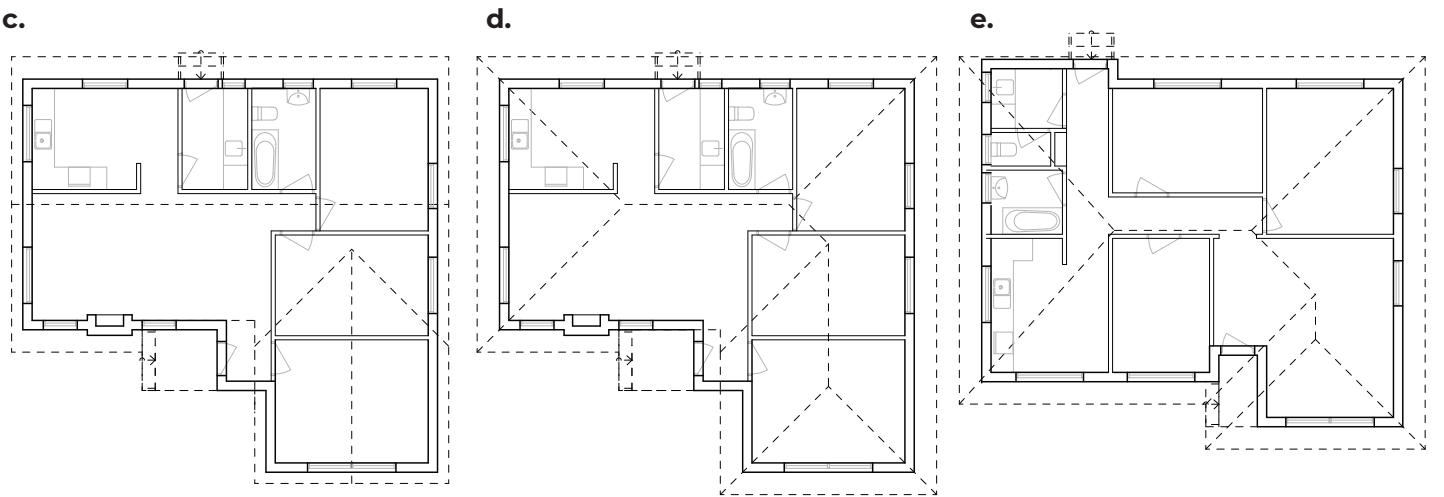
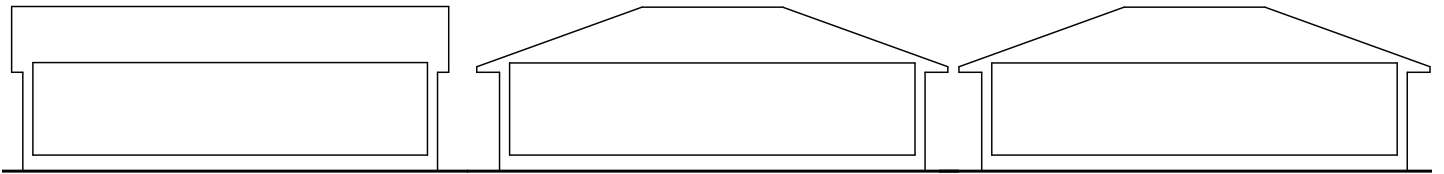


Figure 44. Sections Showing Standard Construction Detail. 1:100 @A4.

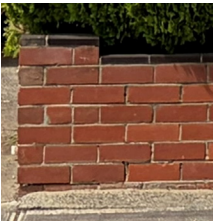
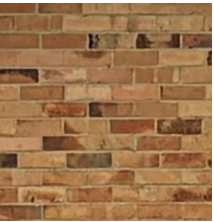


Materiality

house roofing
clay tile



house cladding & fencing
varied brick



fencing, sheds & carport cladding
varied metal sheeting



fencing & sheds
timber



Figure 45. Collage of existing materials found across the site.

Site Images



Figures 46-55. Existing post-war one storey 3 bedroom dwellings (top 6) and new dwellings which have been infilled along the border of the site (bottom 4).



Figures 56-64. Infill structures across the site. Mostly lightweight but sometimes quite large garages, carports and garden sheds in varying condition.

Additional Infill

This has been determined through a combination of on site visual observation, analysis of real estate listing photos and descriptions from the site. Without access to some spaces, additional functions have been imagined based on asking friends and family for photos and stories of how other similar backyard structures are used.

While some of this is interpreted to represent a culture of spatial and material excess, particularly in regards to the doubling, tripling quadruppling etc. of more seldom used items such as gardening supplies and tools, sports equipment.

Certain items are frequently used or carry strong sentimental value, while others actually become a burden to their owners,

as discussed in decluttering philosophies.

At the same time, many of these spaces undeniably provide real function and pleasure however, when shared with neighbours, they hold the potential to offer even greater value. For example, what if, as a child, instead of having access to a single cubby in a private backyard, you had access to a larger, collectively shared playground?

The approach to this existing infill is questioning:

What could be shared?

What spaces and/or materials could be reused?

What could be relocated and/or repurposed? What embodies excess and could be reduced?

<i>Category</i>	<i>Description</i>	<i>Use</i>
Garden shed	<i>Lightweight sheet metal constructions varying in height from 1.5-2.5</i>	<i>Storing gardening tools & supplies</i> <i>Storing power tools & hand tools</i> <i>Storing bikes</i> <i>Storing sports equipment</i> <i>Houses pool pump and equipment</i>
Small carport	<i>Roughly 2.5m high sheet metal constructions at the end of driveways with large roller door or tilt up doors</i>	<i>Storing cars</i> <i>Storing extra furniture</i> <i>Storing christmas decorations</i>
Larger carport	<i>Taller and/or larger footprint carports for used for storing either more vehicles or additional items</i>	<i>Storing cars & trailers</i> <i>Storing bikes</i> <i>Storing furniture</i> <i>Storing camping gear</i> <i>Storing tools</i>
Cubby	<i>Small timber play house structure for children</i>	<i>Childrens play space</i>
Greenhouse	<i>Polycarbonate and/or mesh structure</i>	<i>Growing plants</i>
Garage	<i>Large scale metal shed, with windows</i>	<i>Additional living space with couches</i> <i>Recreation space with pool table</i> <i>Workshop setups</i> <i>Home gym setups</i>
Bungalows	<i>Essentially a garage with thicker walls and slightly smaller scale spaces more designed for living</i>	<i>Home office</i> <i>Guest bedroom</i> <i>Hobby studio</i>
Verandah	<i>Open air timber structure extension with polycarbonate or sheet metal roofing attached to house. Most commonly to rear for outdoor living but sometimes over driveway to side for protected car parking.</i>	<i>Protected outdoor living, dining & barbequing</i> <i>Drying laundry</i>

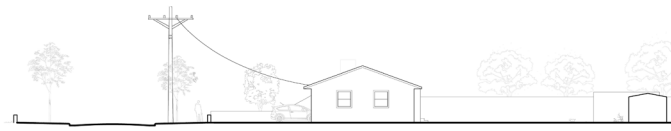
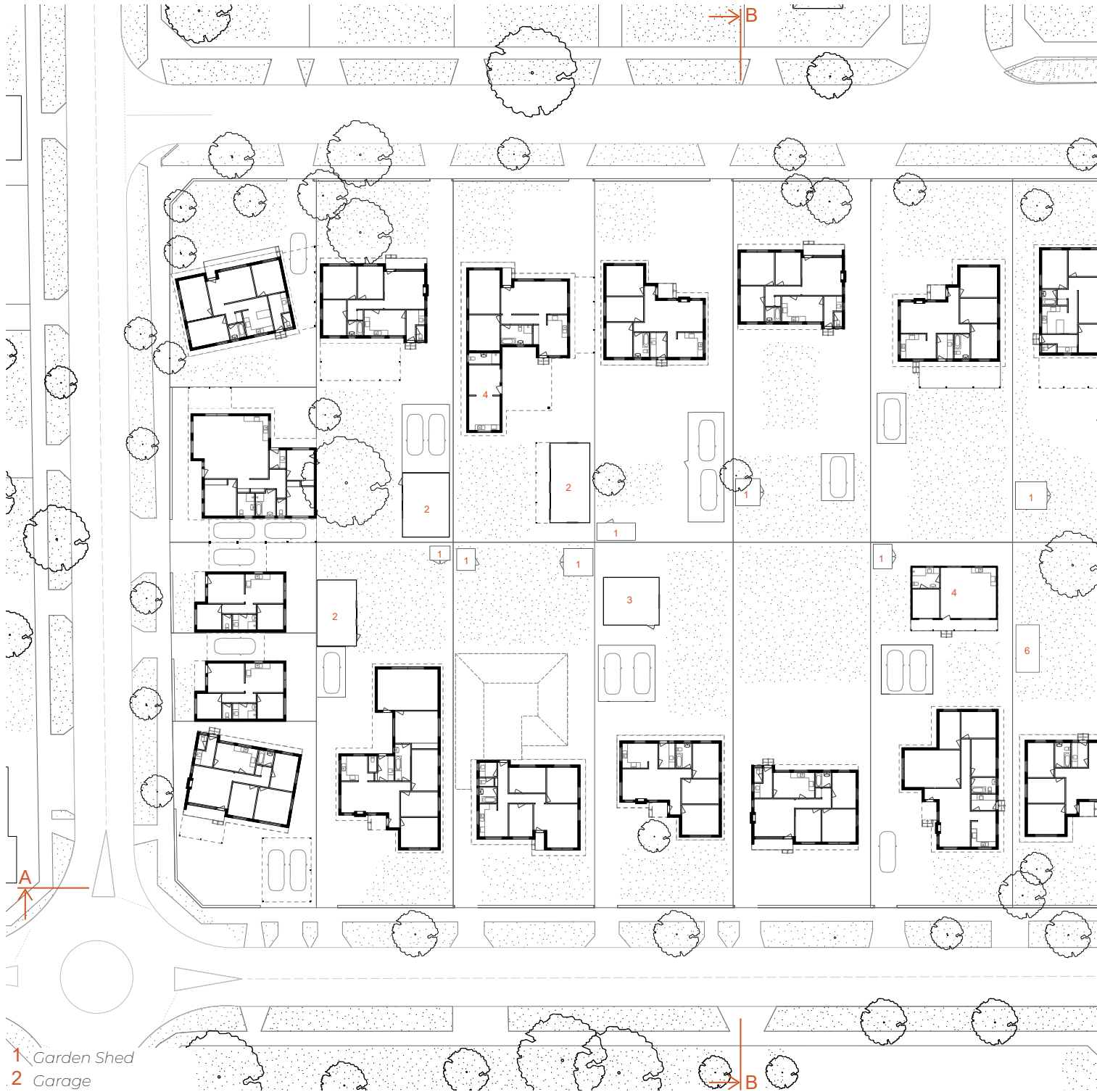


Figure 65. Existing Site Short Section. 1:600 @A4.

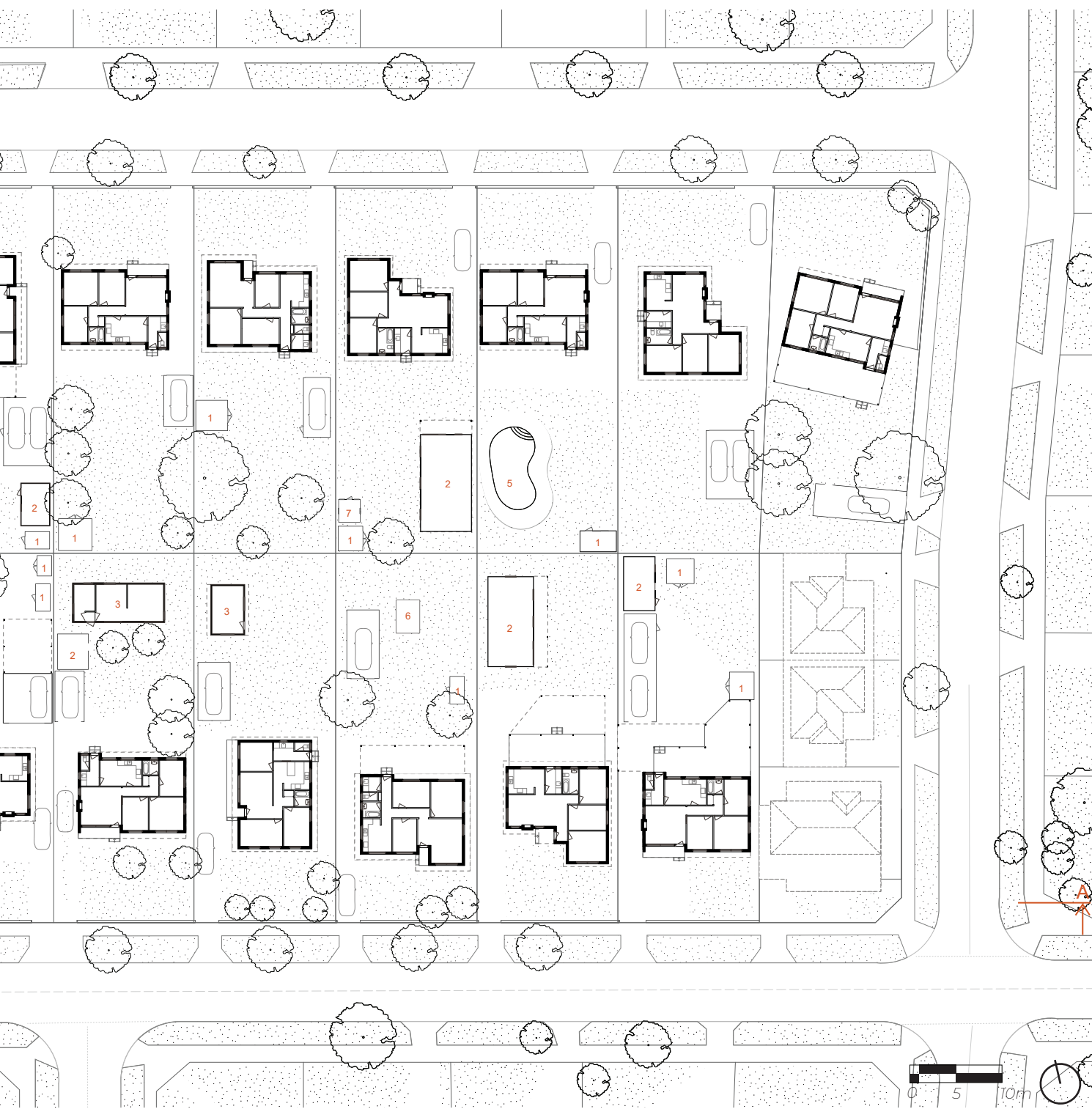


Figure 66. Existing Site South Elevation. 1:600 @A4.



- 1 Garden Shed
- 2 Garage
- 3 Bungalow
- 4 Additional Dwelling
- 5 Pool
- 6 Greenhouse
- 7 Cubby House

Figure 67. Existing Site Short Section. 1:600 @A4.



	Strengths	Weaknesses
<i>Cluster Scale</i>	<i>Consistent street rhythm and setbacks create visual cohesion</i> <i>High amount of green space / permeable ground</i> <i>A number of mature trees</i> <i>High amount of privacy</i> <i>Quiet, low traffic, peaceful streets</i> <i>Well connected to public transport</i> <i>Well serviced by local amenities (schools, shops, etc.)</i> <i>No flooding overlay</i> <i>Generous lot sizes</i> <i>Strong solar access due to low rise context</i>	<i>33 dwellings on 1.59 hectares (20.7 dwellings/hectare) which is low density</i> <i>Low diversity of housing choice</i> <i>Front yards and nature strips are mostly unused grass spaces</i> <i>High amount of space reserved for concrete driveways / car parking</i> <i>Inefficient duplication of amenities</i> <i>Limited neighbourly interaction</i>
<i>Individual Scale</i>	<i>Good access to daylight and air</i> <i>Large windows in living rooms with views to front gardens</i> <i>Large back yards allow space for play & hobbies</i> <i>High ability for personalisation / sense of ownership</i> <i>Clear separation of public/private zones</i>	<i>Inaccessible levels to access</i> <i>Awkwardly positioned toilets</i> <i>Varied condition with some aging kitchens, laundries and appliances</i> <i>High energy consumption for heating / cooling</i> <i>Living spaces face the street, disconnected from the active green space of back yards</i>

Opportunities

Threats

Removal of dividing fences could open up large connected green spaces

Development could be opposed by neighbours if highly visually impactful from the street

Car sharing could reduce number of vehicles required

Heatwaves can cause short bursts of very hot temperatures

Opening of the new rail line could further reduce car demand

Lack of permeable ground causes downstream flooding of nearby creek

Repetition of house plans lends itself to modular interventions which could increase affordability

Droughts are frequent in Australia

Climate lends itself to passive design ideas

Only hallway walls are load bearing, providing the opportunity for more easy internal reconfiguration

Difficult to accurately assess individual structural conditions/limitations

Passive retrofitting (insulation/glazing) could improve thermal comfort and/or

Opportunity to repurpose existing infill structures

Single storey provides the opportunity for vertical annexing

03.5

Design Goals

1. Amplify existing amenity of the site
2. Increase number of households supported by the site (from low density of 20 dw/h to medium density of 40-60 dw/h)
3. Include a range of housing types and sizes suited to varying household constellations
4. Retain and reuse existing housing
5. Consider repurpose of existing infill structures and or/ reuse of their materials
6. Provide thermal comfort through passive solutions
7. Consider visual impression from the street

Evaluation

Quantitative Considerations	Metric	Qualitative Considerations
Site area	m ²	Usable outdoor social space quality
Floor area	m ²	Cohesive, beautiful landscaping
Build footprint	m ²	Connection of living spaces to garden
Number of dwellings	number	Retention of suburban scale/character
Density	dwelling/ha	Diversity of dwelling sizes
Number of bedrooms	number	Options to sit/stand/linger
Car spaces	number	Spaces for privacy/retreat
Floor area ratio (FAR)	floor area m ² /site m ²	
Site coverage	footprint m ² /site m ²	

A SWOT analysis of the existing site conditions was conducted and this analysis, along with background research and references, informed the seven initial design goals. These goals established a framework for approaching densification through a sufficiency lens and helped guide early spatial and strategic decisions moving into the next stages of the design proposal.

The context mapping and analysis also informed the development of the design matrix, which was created as a tool for assessing different design iterations against a series of criteria and has been continually revisited and updated throughout the process. As the project progressed, the matrix evolved alongside a growing understanding of which metrics were most important when evaluating densification through a sufficiency lens.

Initially, the matrix was far more extensive and attempted to quantify both spatial and qualitative considerations through a scoring system. However, one of the key takeaways from the process was that numerical evaluation alone is often insufficient in assessing sufficiency-based design approaches. An overreliance on measurable data can risk overlooking important spatial qualities such as privacy, accessibility, adaptability, and flexibility. Similarly, the qualitative criteria were originally ranked on a scale from one to five, but as the process developed it became clear that these aspects were too subjective to be meaningfully reduced to a score. Instead, they became more useful as guiding principles that informed design decisions throughout the project rather than as metrics to optimise.

04.

PROPOSAL

04.1

Narrative

Now 60 years since these homes were first sold, the area is seeing a generational shift with many properties coming up for sale and new families moving into the area. Rising land values, mean that the area is seeing rapid redevelopment. There is precedent of this redevelopment occurring while retaining and/or renovating the existing buildings and when this happens it occurs as axehead subdivision where the driveway is extended to the new dwelling. However with the almost negligible monetary value of the housing compared to the land value, it is often favorable to demolish the original house to make way for a newer, bigger house in its place or to make enough room to fit three dwellings on the original lot.

In recognition of how many more people Melbourne needs to be able to house, the government has planned changes to the planning overlays to further encourage development in the area. While nothing has been announced for the site just yet, these changes include allowing up to 12 storeys for any new development occurring in Broadmeadows, just north of the site.

This thesis is a speculative proposal which

imagines that instead, the government buys back the mid section of the lot for one cohesive development cluster.

A range of household personas have been imagined as future residents of this cluster and while creative liberty has been taken, to imagine a range of family constellations, these personas attempt to roughly reflect trends outlined by the most recent Australian Census including continued dominance of couple families with children, the significant proportion of one-parent families, the steady growth in single person households, and the rising share of Australians aged 65 and over.

The inclusion of a multigenerational household reflects increasing instances of older parents living with adult children, influenced by ageing, housing affordability pressures and cultural diversity. The sharehouse acknowledges the growing number of unrelated adults living together, particularly among younger age groups facing high housing costs. Their imagined values include a range of the functions and amenities offered by the existing site, and additional considerations.

	 Single Parent	 Couple	 Multigenerational
Occupants	Sarah (36) Jasper (2)	Ben (25) Charlie (25)	Patrick (68) Jonathan (37) Nadia (35) Finn (6) Sophie (6) Oliver (4)
Background	Part time working mum	Young couple with a dog, one who works full time and one who studies	Family with a grandparent who has moved in
Values	Visual connection to outdoor play space Community support Space to host birthday parties	Bike storage Access to green space for their dog Car access for weekends away	Accessible living space, bedroom and bathroom for Patrick Access to a car for weekend sports games



Figures 68-71. Examples of recent development in the Jacana area.



Nuclear Family

Chris (51)
Amy (49)
Jack (19)
Lucas (17)



Single

Deb (72)



Sharehouse

Jess (30)
Naomi (29)

Two full-time working parents, two teenage kids and a dog

A resident who's kids have moved out and would love to downsize

2 friends living together

Workshop space
Space for independence
Gym/fitness space

Neighbourly encounters
Space to host visiting family
Gardening

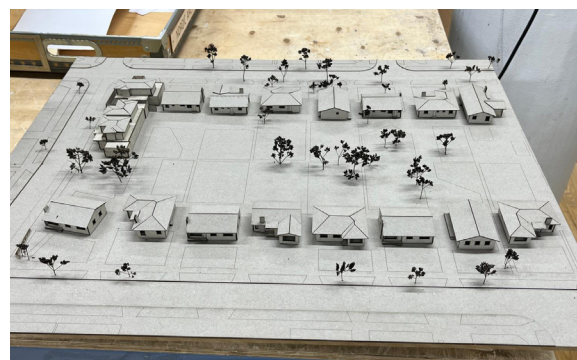
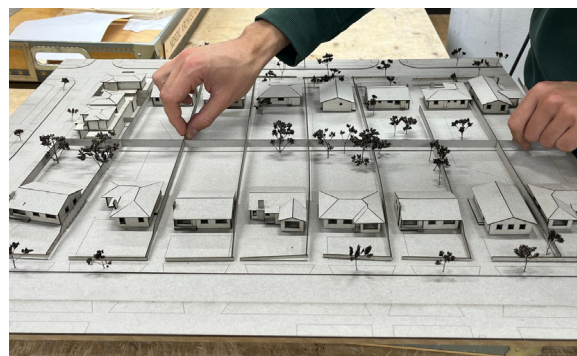
Space to grow food
Outdoor BBQ area
Spaces for privacy

04.2

Initial Explorations

Initial space planning explorations looking at ways the density could be increased, either through building up with vertical annexing or through infill within the existing yard spaces were tested through diagrams and using a physical model. This was also used to look at how repositioning the existing fences could change the access or removal of fences could open up large shared garden spaces.

This revealed that the biggest spatial challenge for densifying the block is to resolve how the centre can be accessed.



Figures 72 & 73. Images from physical model testing.

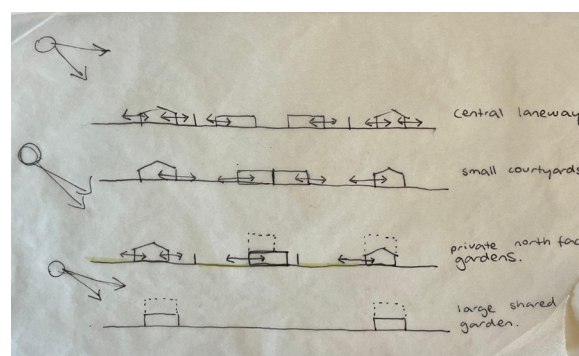
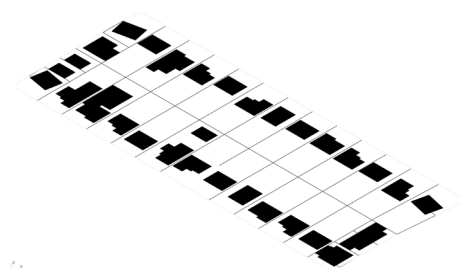
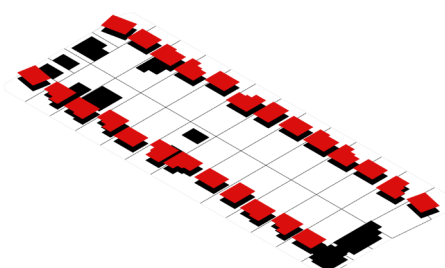


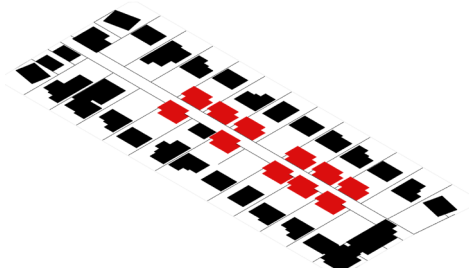
Figure 74. Testing impact of different options in section.



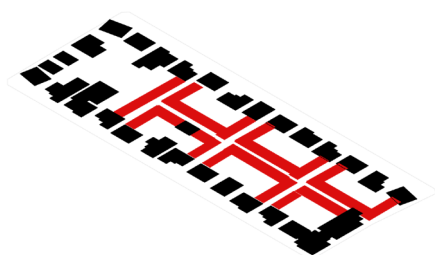
Existing



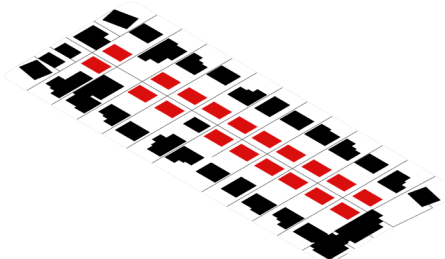
Annexing with private backyards maintained



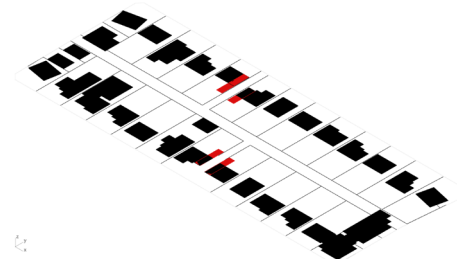
Clustering of infill into multi-storey units for lower site coverage



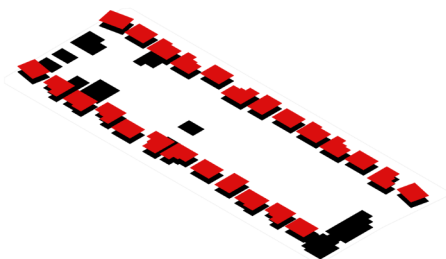
Creation of smaller courtyard clusters



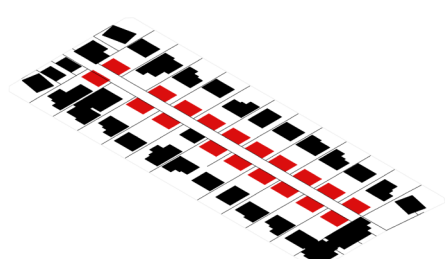
Back yard units accessed via driveways



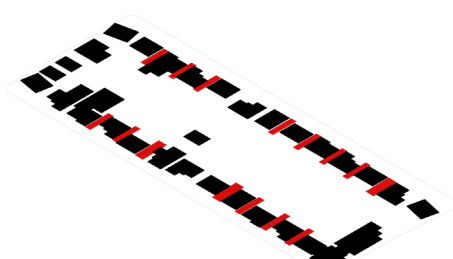
Renovation of houses adjacent to double width driveways to maintain privacy in these houses while allowing more access opportunity into the centre of the site



Large central garden



Introduction of a central laneway



Building between houses on existing driveway spaces for an enclosed large internal courtyard

Figure 75. Matrix of initial block planning explorations.

Lot Planning Exploration

Initial lot planning explorations of strategies across different scales, from within existing building envelopes to across multiple lots were investigated through sketching of

design iterations based on what specific conditions are afforded by the different house types, orientations and existing infill.

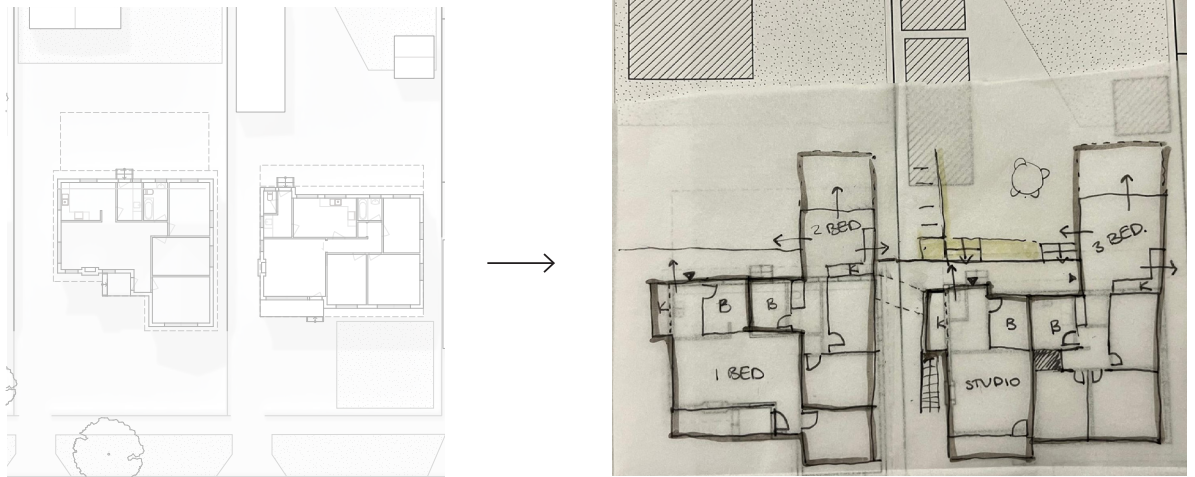


Figure 76. Initial sketch combining rear extension and internal subdivision for more dwellings.

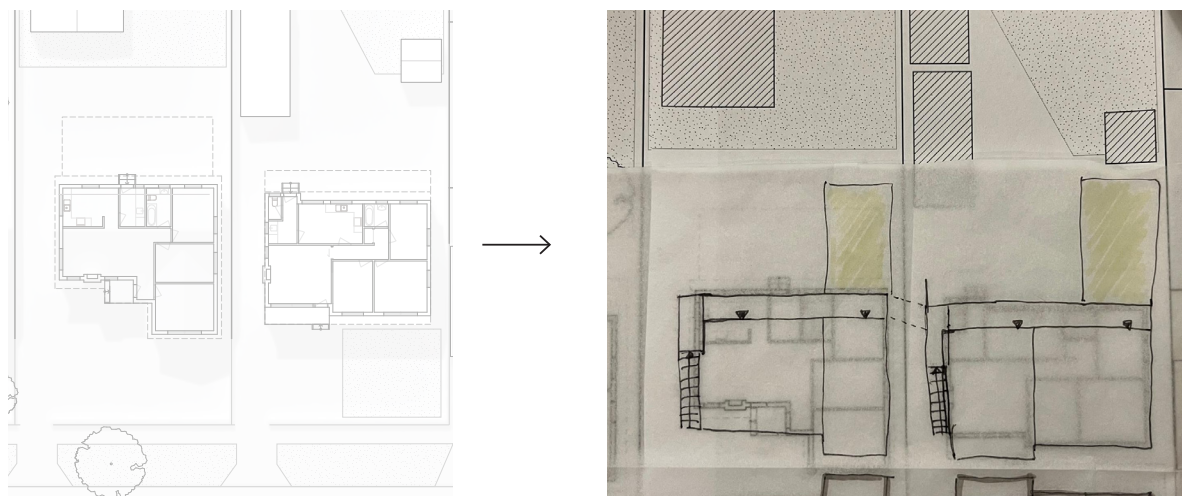
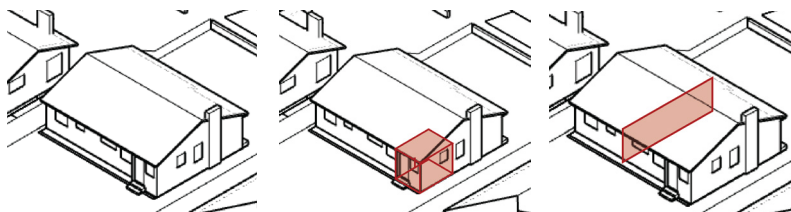


Figure 77. Initial sketch of vertical annexing opportunity.

Within Existing Building Envelope

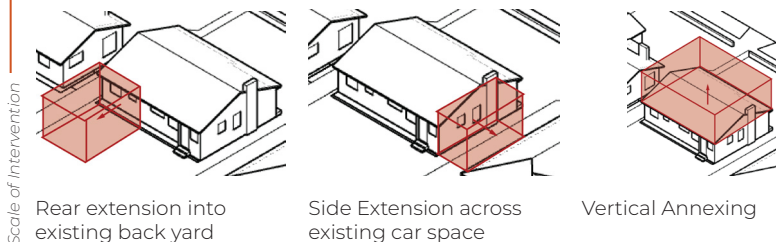


Retain as is

Upgrades for accessibility

Internal subdivision for more dwellings

Within Existing Lots

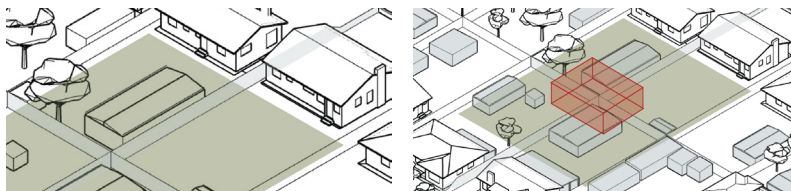


Rear extension into existing back yard

Side Extension across existing car space

Vertical Annexing

Across Clusters of Lots



Removing fences allows for large shared gardens and densification through development across existing lot borders

Removing existing sheds and other temporary or non livable structures opens up the opportunity for central infill within the cluster.

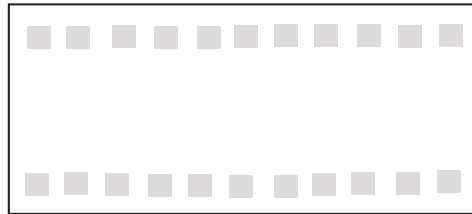
These strategies, or a combination of them, could happen independently at different time scales across the same site.

While this scale does require some demolition, I argue it is worthwhile for the increased amenity that can be offered, ultimately extending the lifespan of the housing stock.

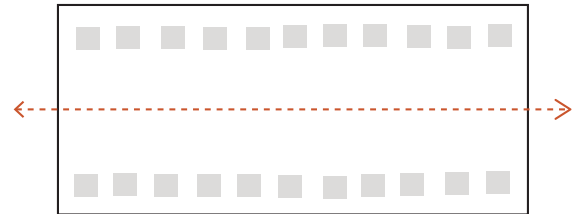
Figure 78. Matrix of initial lot planning explorations.

04.3

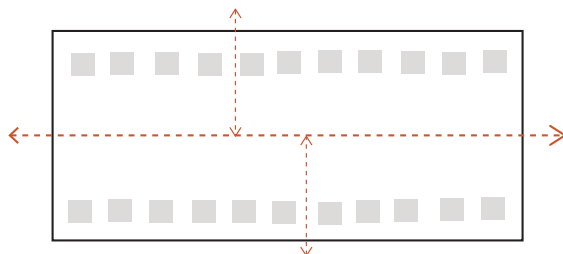
Block Planning Strategy



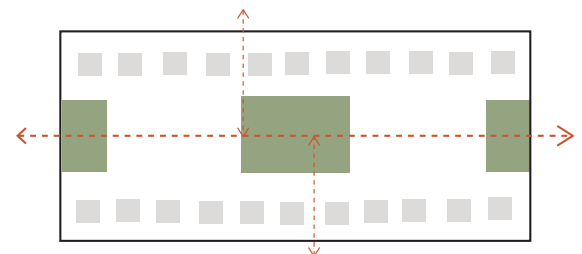
1. Existing housing around perimeter



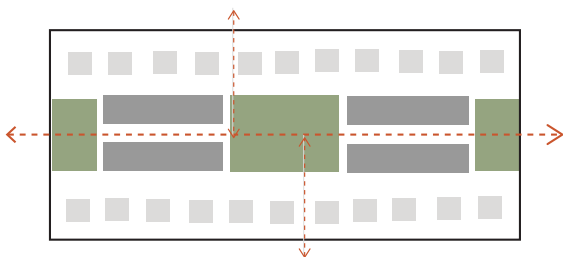
2. Introduce main central circulation axis wide enough for a car to pass if required



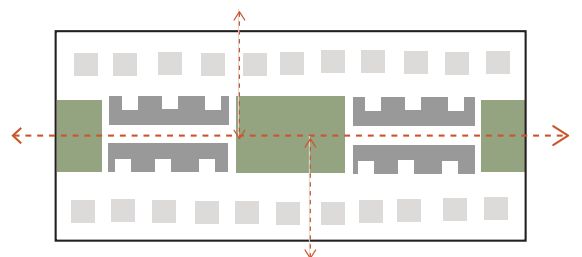
3. Identify conditions which afford secondary circulation opportunities for pedestrian access



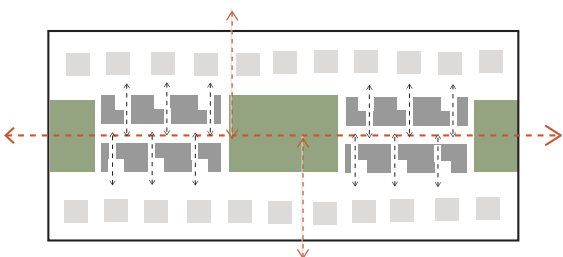
4. Anchor entrance points and block centre with large communal green space



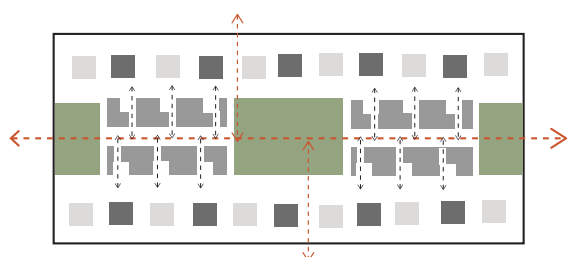
5. Infill remaining back yards with additional dwellings



6. Minimise impact on existing dwellings by following prevailing build pattern of positioning infill around lot boundaries



7. Allow access from existing dwellings to new communal spaces



8. Vertically annex roughly half the existing dwellings, distributing this to afford central block sunlight

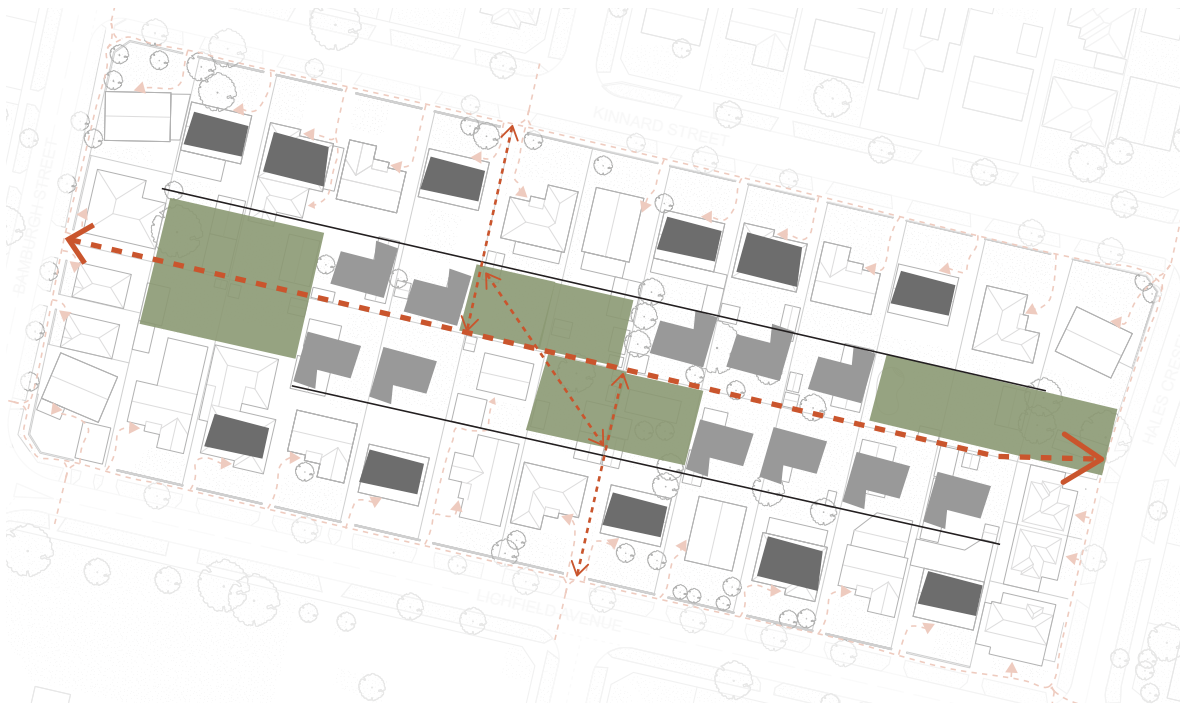


Figure 79. Block planning strategy applied to the specific Jacana site.

When beginning to sketch design iterations, the biggest obstacle was how any additional dwellings would be able to be accessed.

Therefore the block planning strategy for the transformation of the block into a higher density neighbourhood as diagrammed here begins with establishing a central route through the site. While this represents the ideal generic scenario which must then be adapted based on what opportunities the specific site affords.

In the specific application at the Jacana site, this is through centre and utilising the two existing back to back double driveways for additional secondary circulation routes into the new central access route.

Green nodes at either end and in the centre of the block act as communal spaces and consolidate the amenity provided by the existing private back yards.

The existing infill of carports, sheds and garages are situated directly adjacent to existing fences around the perimeter

boundary of the lots so this prevailing pattern is followed to minimise the impact of any new buildings on the existing dwellings. Building within existing lot boundaries also allows for the strategy to be implemented on a lot by lot basis. This provides the opportunity to exclude lots with existing extensions or secondary dwelling units from densification.

New backyard infill dwellings have the opportunity to be quite connected with the existing housing and accessed via the existing driveways or to function more independently and accessed only via the new central laneway.

When mapping opportunities for further densification by vertical annexing of existing houses, the repetition of floorplans in the existing housing affords the opportunity to propose a replicable solution. House type B and E are identified as most suitable due to being most common with varied distribution across the site and their similar footprint also provides the opportunity for one proposed annex layout.

04.4

New Infill

While it is important to note that in this type of project there will always be diversity, and so the infill across the combined block will vary depending on individual user needs, desires and site conditions, one potential design for each of the backyard infill and vertical annex is presented to start to illustrate the densification strategy's implementation.

The existing dwellings, together with the proposed annex units, continue to be accessed primarily via the existing driveways. These driveways retain the capacity for a private parking space where required, while also offering the opportunity to extend the existing front yards into a shared landscaped garden space.

The proportions of the backyard infill module, combined with the omission of windows along its east and west facades, allow existing carports to be relocated within this zone. This creates the potential to repurpose these structures as shared amenities accessible to all residents, functioning as communal laundries, additional living areas, workspaces, storage, or other adaptable uses depending on occupant needs. Alternatively, the space may remain open as additional shared green space.

Optional fencing enables each dwelling to operate with a high degree of independence while still maintaining access to both

private open space and communal areas. Where fencing is omitted, a larger collective garden is established, with each dwelling connecting to it through a transitional buffer of semi-private deck spaces. The placement and orientation of openings are carefully considered to balance visual connection to the shared landscape with a sense of privacy between neighbouring dwellings.



Figure 80. Ground floor plan - Lot layout.
1:200 @A4

Vertical Annex

The proposal is designed to support flexible occupancy arrangements over time, functioning either as a single three-bedroom apartment or as two separate dwellings comprising one two-bedroom apartment and one one-bedroom apartment.

Access is provided via stairs from both the street frontage and rear laneway, allowing for independent entry arrangements where required. Windows are positioned to enable north-south cross ventilation and visual connection to green space.

Integrated cupboard spaces positioned adjacent to the central bathroom core are designed to accommodate future kitchen connections, including plumbing, electrical, and ventilation, allowing for subdivision or reconfiguration of the dwelling with minimal alteration.

A generous semi-private access balcony offers open outdoor space while private covered balconies facing the street provide sheltered outdoor living areas. The access balcony provides shelter for a new deck introduced below, extending the amenity of the existing ground-level dwelling and strengthening its relationship to the surrounding garden.

The depth and shape of these balconies should be differentiated, being adjusted to accommodate different usability desires and also in response to exact window placement and solar access requirements of the dwelling below.

The intervention is contained within the footprint of the existing house, allowing the original roof form to be retained. Existing roof tiles are reused to support material sustainability while relating to the established character and visual continuity

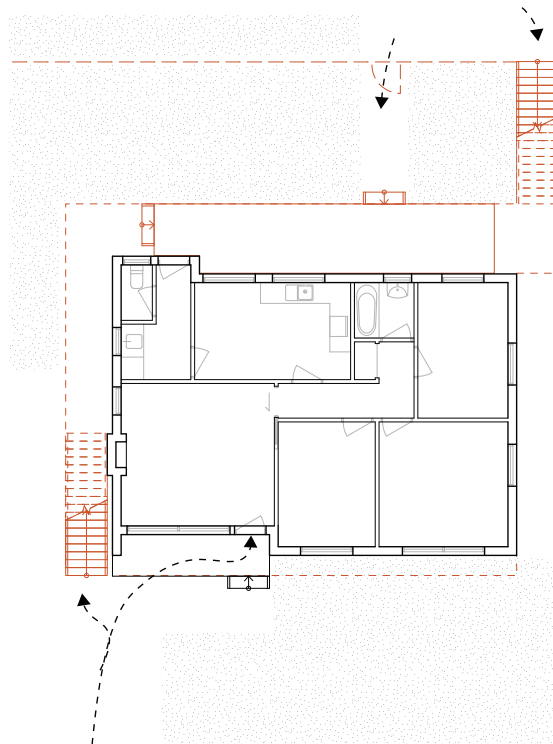


Figure 81. Ground plan - Annex to house type B
1:200 @A4.

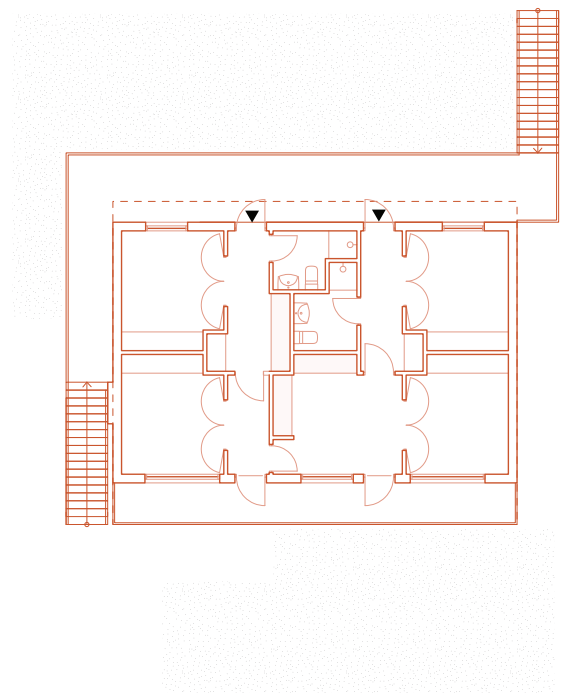


Figure 82. Level 1 plan - Annex to house type B
1:200 @A4

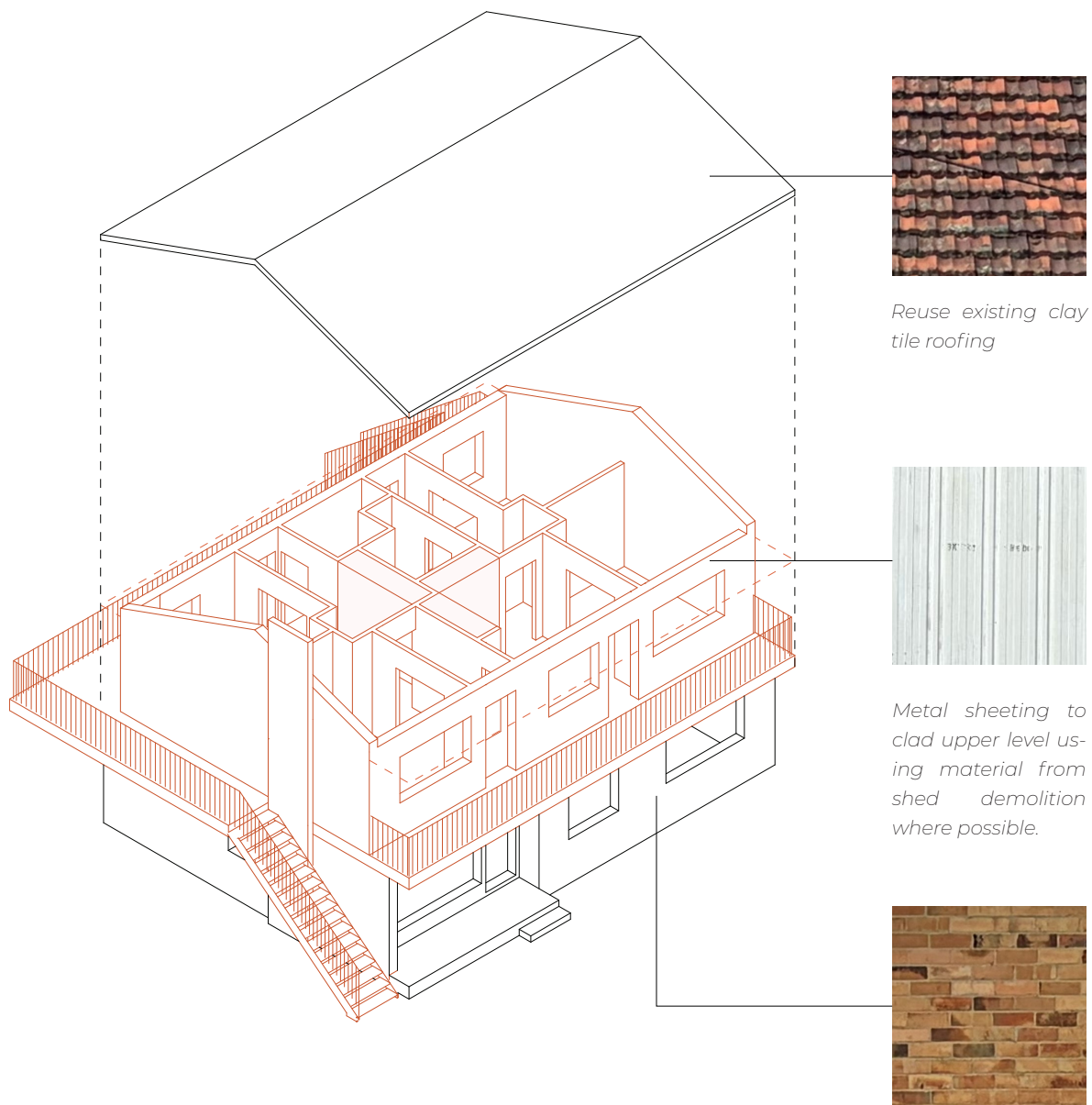


Figure 83. Exploded isometric - Backyard infill module.

Existing brick base

Backyard Infill

The roof form is shaped to minimise solar overshadowing of neighbouring properties while creating generous internal volumes and spatial quality within the small footprint of the new dwellings.

The layout supports north-south cross ventilation for passive thermal comfort, and reducing reliance on mechanical cooling.

Window placement and orientation are designed to strengthen visual and spatial connections to the surrounding garden spaces while maintaining privacy both in terms of views into the dwelling and overlooking between neighbouring residences.

Material selection prioritises reuse, affordability and a reflection of the existing character. Recycled brick is proposed for the ground floor construction, sourced from local demolition where possible, while

corrugated metal cladding is used for the upper level and roof form. This approach allows for the potential reuse of materials salvaged from existing sheds on site.

The main access point is directly off the block's new internal laneway and the layout supports multiple occupancy configurations over time. The dwelling may operate as a single three-bedroom townhouse or alternatively as an accessible one-bedroom apartment at ground level with an additional self-contained one-bedroom apartment above, allowing for intergenerational living, rental income, or changing household needs. This flexibility is enabled through the entrance hall layout and the provision of plumbing, electrical, and ventilation connections within the level 1 wall adjacent to the bathroom, allowing for the future installation of a kitchen with minimal intervention.

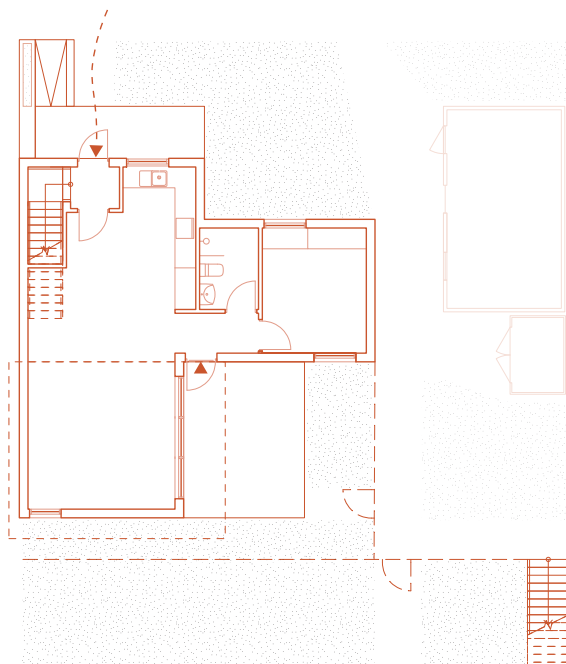


Figure 84. Ground plan - Backyard infill module
1:200 @A4

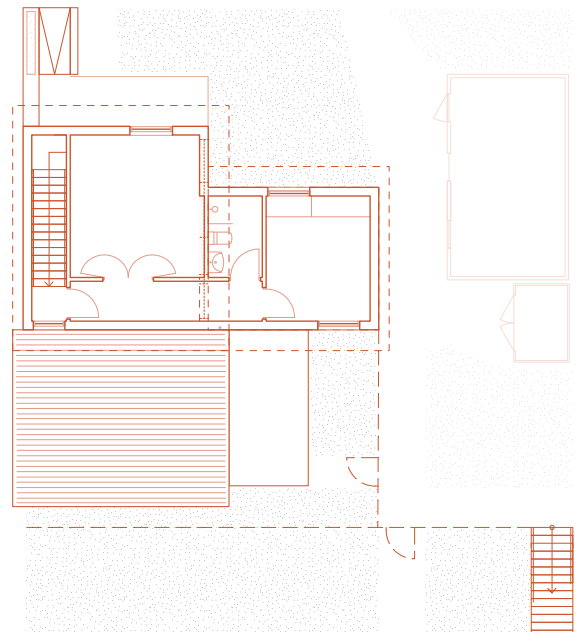
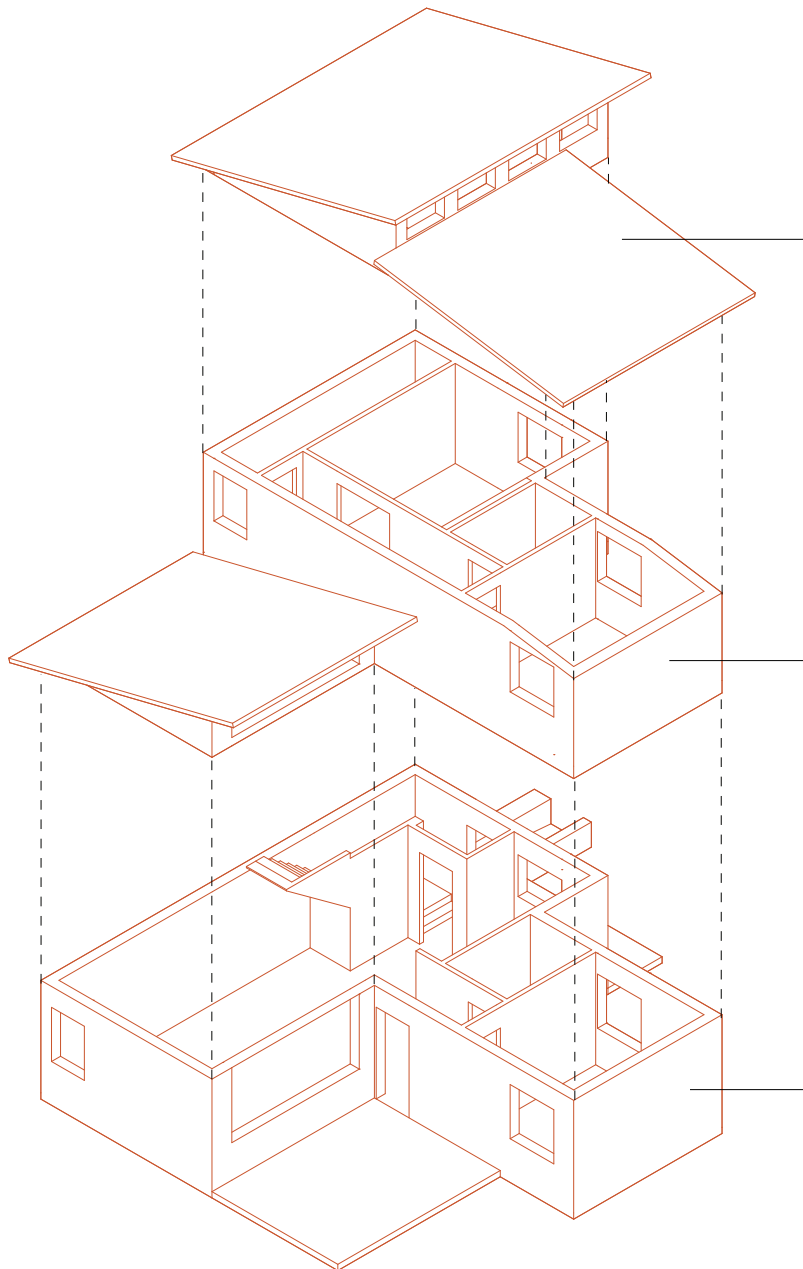


Figure 85. Level 1 plan - Backyard infill module
1:200 @A4



Metal sheeting to clad upper level and roof. Use material from shed demolition where possible.



Brick base. Where possible recycled from any local demolition.

Figure 86. Exploded isometric - Backyard infill module.

04.5

Transformed Block

Zooming back out to the block scale shows what this could start to look like across the whole site and how these new interventions relate to the existing structures.

Within the centre and entrance green nodes, some of the existing infill structures have been able to be retained and transformed into new communal functions accessible to everyone across the block.

There is shared bike storage and a waste room at the entrance nodes and the cubby house has been relocated and added to for a large playground. The existing habitable infill structure is transformed into a bookable guest suite, and there is now a central shared workshop with tool storage.

The visual impression of the interventions is slightly visually varied based on which salvaged materials can be reused.



Figure 88. Laneway Facades Perspective Collage



Figure 89. Backyard Infill Living Room Perspective Collage

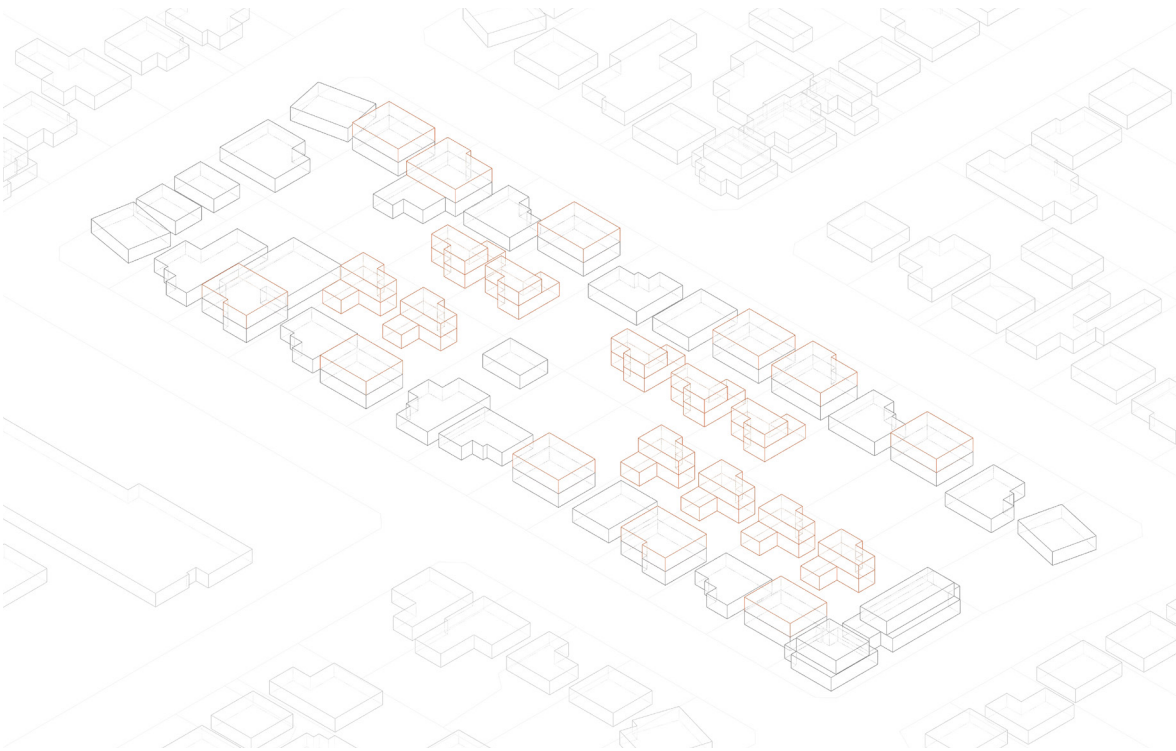


Figure 87. SE Isometric with maximum infill volumes.



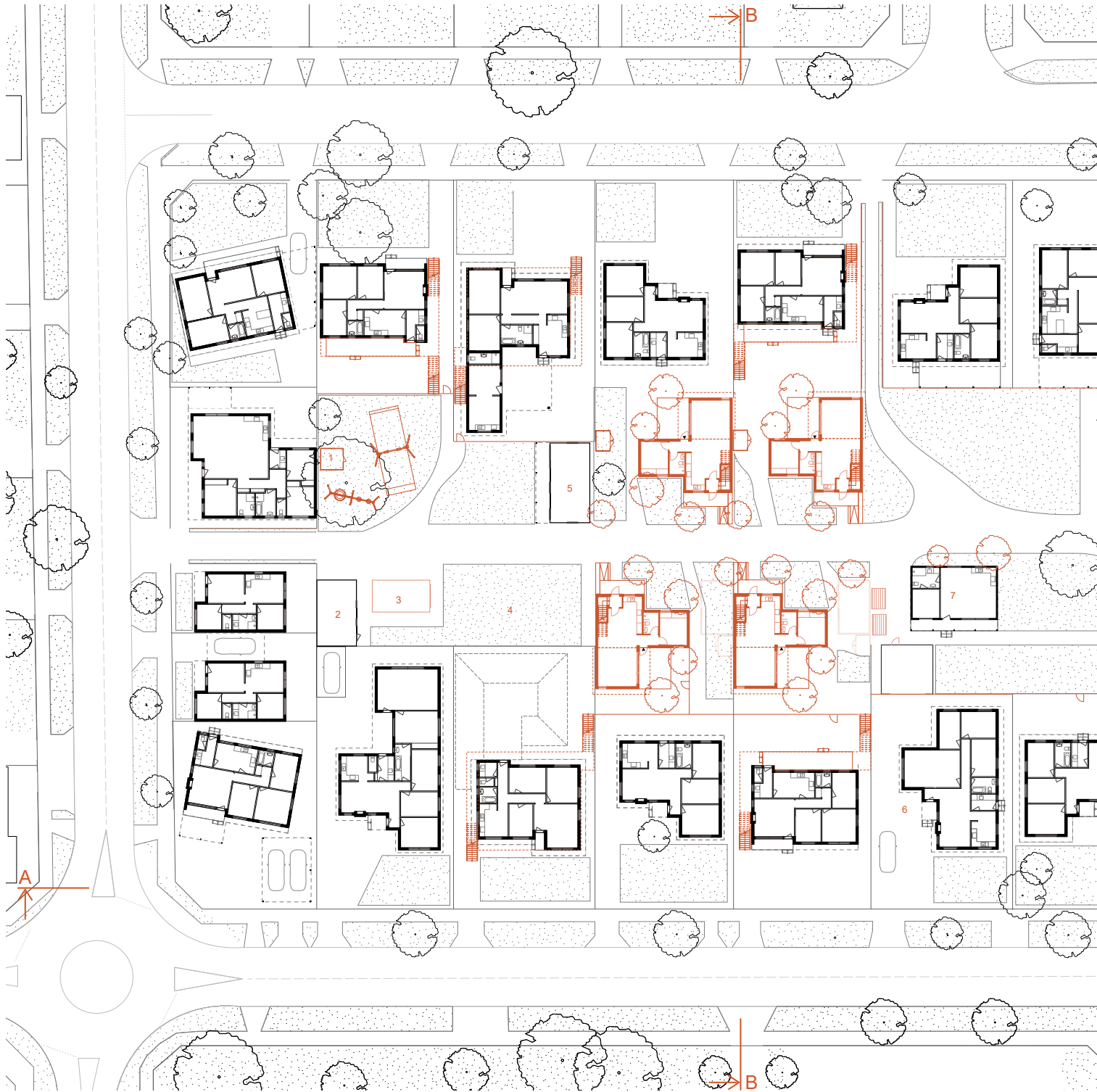
Figure 90. Annex Street Facade Perspective Collage



Figure 91. Backyard Infill Materiality and Entry Bench Perspective Collage

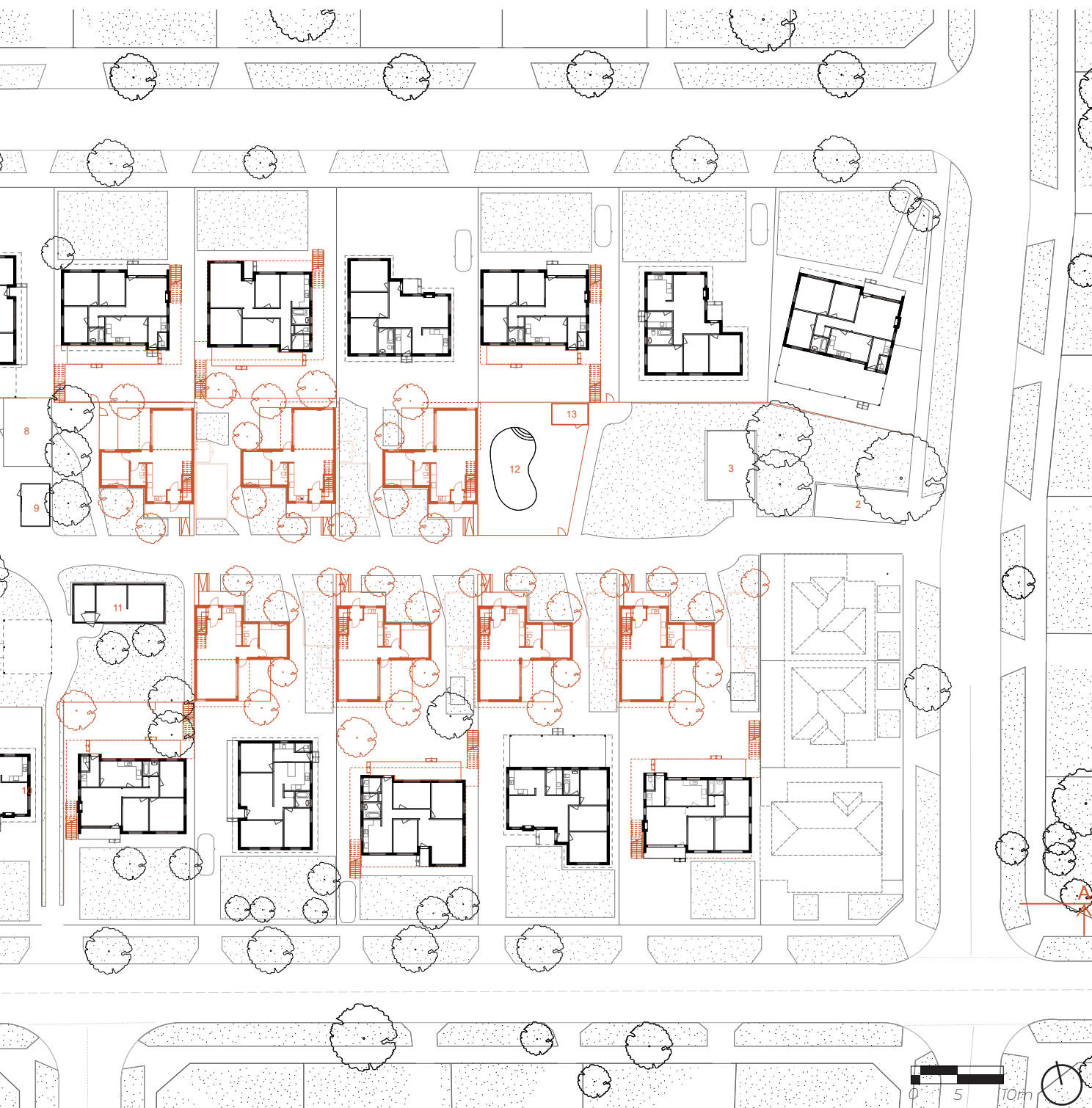
Figure 92. Transformed Site Short Section. 1:600 @A4.

Figure 93. Transformed Site South Elevation. 1:600 @A4.



- | | | |
|--|------------------------|-----------------------------|
| 1 Relocated cubby & new play equipment | 6 Shared laundry | 11 Shared work/study space |
| 2 Covered bike storage | 7 Bookable guest suite | 12 Shared pool |
| 3 Waste room | 8 Shared tool workshop | 13 Relocated pool pump shed |
| 4 Productive garden | 9 Hobby/studio space | |
| 5 Shared gathering/hosting hall | 10 BBQ space | |

Figure 94. Transformed Site Plan. 1:600 @A4.





Figures 95-97. 1:500 Full Block Concept Model.



Figures 98 & 99. 1:200 Physical Model Facade Perspectives.

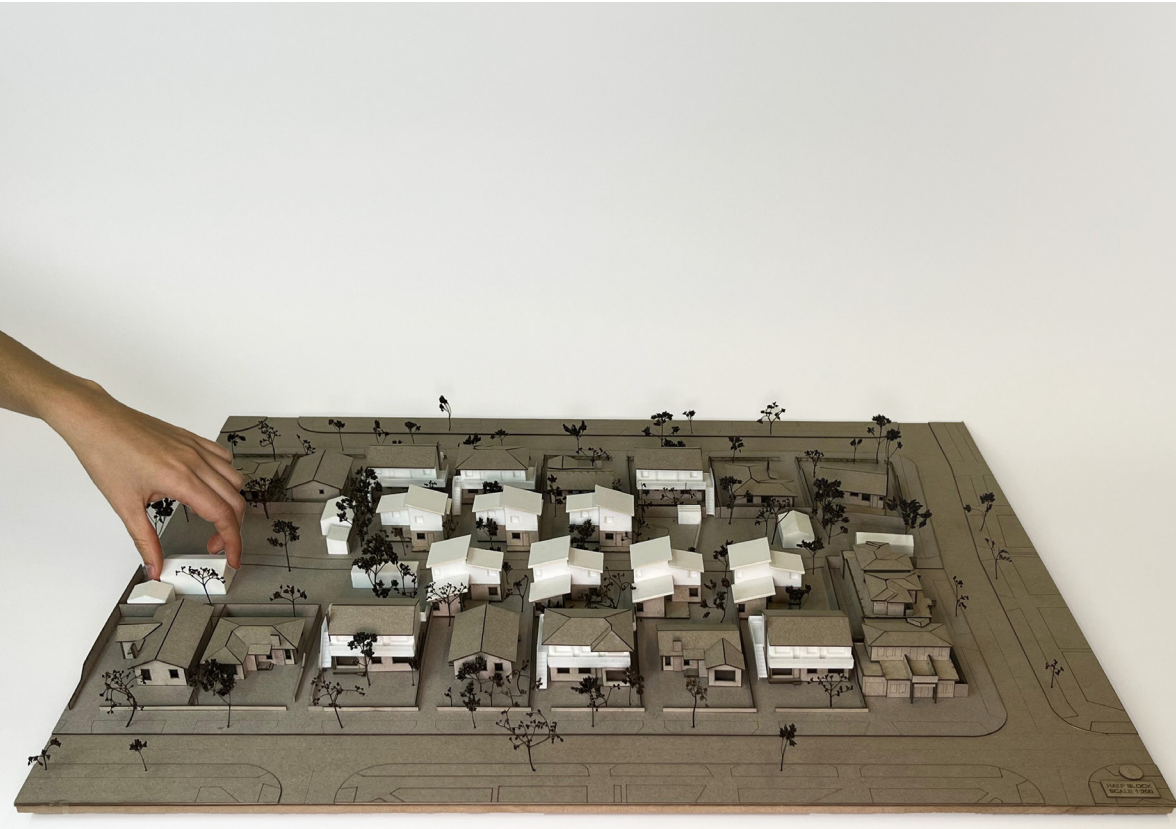


Figure 100. 1:200 Half Block Site Model.

05.

DISCUSSION

Consideration	Existing	Additional	Final	Metric
Site area	15,921 (1.59ha)	-	15,921	m ²
Floor area	4144	2623	6767	m ²
Build footprint	3942	801	4743	m ²
Number of dwellings	33 - 35	22 - 44	55 - 79	number
Density	20.7 - 22.0	13.8 - 27.7	34.6 - 49.7	dwelling/ha
Number of bedrooms	96	75	171	number
Car spaces	≈100	-	0 - 33	number
Floor area ratio (FAR)	0.26	0.17	0.43	floor area m ² /site m ²
Site coverage	24.8%	5%	29.8%	footprint m ² /site m ²

05.1

Evaluation

The evaluation matrix functioned as a tool for comparing design iterations and testing how effectively ideas responded to the project's goals, and was updated through the design process. Initially, the matrix attempted to quantify both spatial and qualitative criteria through fixed rankings, combining measurable metrics such as density, floor area ratio, site coverage, dwelling numbers and parking provision with more subjective considerations including privacy, connection to landscape, shared amenity, and retention of suburban character. However, throughout the design process it became clear that many important architectural qualities resist direct numerical comparison. Metrics such as the connection to garden space or the balance between communal interaction and privacy proved difficult to reduce to

fixed values without becoming arbitrary.

Similarly, the focus on flexibility complicated more conventional forms of measurement. A dwelling capable of operating as either one larger household or two smaller apartments challenges static definitions of density, dwelling count, and room function. This also shows how arbitrary some of these measures are in the first place and supports a more nuanced idea of densification.

As a result, the final matrix evolved away from seeking an optimal solution, instead becoming a framework for identifying priorities and trade-offs. The use of ranges in the final matrix reflects the reality that measurement of sufficiency-based densification cannot be defined by single values.

05.2

Conclusion

This thesis has explored how Melbourne's middle-ring suburbs could accommodate increased population growth through low-rise densification strategies centred on retention, renovation, and infill rather than demolition and replacement. Situated within the suburb of Jacana, the proposal investigates how existing post-war housing stock can be transformed through additive and adaptable interventions that increase housing diversity, density, and amenity while reducing material consumption and environmental impact.

Guided by sufficiency principles, the project argues that densification should not only focus on increasing dwelling numbers but also on improving the quality, affordability, and adaptability of housing. Drawing from the Bluefield Housing model and the work of Lacaton & Vassal, the proposal treats the existing suburban fabric not as obsolete, but as a resource containing embedded material, cultural, and social value. Through strategies including vertical annexing, backyard infill, shared landscape, adaptive reuse of existing structures, and flexible dwelling configurations, the project demonstrates how suburban blocks can evolve incrementally while maintaining their low-rise character and spatial generosity.

The proposal also reconsiders the relationship between private and communal space within suburbia. Existing

underutilised driveways, garages, sheds, and fenced backyard conditions are reimagined as opportunities for shared amenity, social connection, and collective green space. At the same time, the design attempts to preserve qualities often associated with suburban living, including access to light, greenery, ventilation, privacy, and a sense of ownership.

Importantly, the thesis does not propose a universal or optimal density model. Instead, it argues for a context-sensitive approach that carefully maps and responds to existing conditions. While the strategies developed for the Jacana block may be transferable to other middle-ring suburbs, their application would necessarily vary according to the specific spatial, social, and environmental circumstances of each site.

Equally important, the success of such an approach depends on the active involvement of residents and local stakeholders throughout the process. Because the proposal relies on incremental adaptation, shared spaces, and evolving patterns of occupation, participation, negotiation, and mediation are essential components of its implementation. Residents play a critical role in shaping how spaces are shared, which interventions are prioritised, and what neighbourhood character is maintained while accommodating change, all of which must be mediated.

05.3

Reflections

One of the biggest things I realised through this thesis is how difficult it is to work within existing suburban conditions without relying on demolition. The main challenge was access into the middle of the block, especially once I began mapping how much existing infill already occupies these sites. Garages, sheds, carports, extensions and fences often leave very little room to introduce new circulation paths or additional dwellings. This became even more difficult on corners where many lots had already been subdivided over time. While the project argues for retaining existing housing, it also revealed how messy and spatially constrained suburbia already is beneath its seemingly repetitive appearance.

Another challenge was trying to define what “successful” densification actually means. Throughout the project it became increasingly clear that there is no single optimum density or ideal suburban model, and that increasing dwelling numbers alone says very little about the actual quality of living being created. Questions around privacy, access to green space, adaptability, neighbourly interaction and long-term flexibility often became just as important as more measurable outcomes such as dwelling yield or site coverage. This reinforced the idea that densification should be understood as a balancing of competing priorities rather than a purely quantitative exercise.

The proposal also raised questions around privacy and changing expectations of suburban living. Care has been taken throughout the design process to position

windows carefully, introduce buffer spaces such as decks and balconies, and maintain opportunities for retreat and separation between dwellings. However, this kind of intensified and more collective suburban living inevitably challenges traditional Australian ideas of privacy centred around the detached house and isolated backyard. Increased density requires a greater tolerance for overlooking, shared circulation, and visual proximity to neighbours. While this may initially feel uncomfortable within the cultural expectations of suburbia, the project suggests that this may not function as a trade off but instead create opportunities for stronger neighbourly relationships, shared amenity, and more efficient use of land and resources.

The project also challenged some of my own assumptions about what is valued in suburbia. A large percentage of the existing site is currently dedicated to cars, whether through driveways, garages or hard paved areas, and the proposal assumes that much of this could gradually be reduced over time. While roughly one car space per driveway remains possible, many of these spaces are reimagined as shared gardens or communal outdoor areas instead. This assumption relies partly on a personal prediction of future reductions in car dependency following the completion of the Suburban Rail Loop and improved public transport connections. Although this does not align with current planning regulations requiring private parking for each dwelling, it felt important to question whether these standards still reflect future needs or whether they continue to reinforce car dependent patterns of suburban living.

I also began this thesis searching for a “standard” suburban block that could support a modular and replicable densification strategy across Melbourne. However, the more deeply I mapped the site, the more I realised there is no such thing as a truly standard condition. Even within a repetitive housing estate, every lot had evolved differently through extensions, landscaping, subdivision and occupation over time. This meant the proposal became much more site-specific than I initially anticipated. While the broader strategies developed through the thesis may still be transferable, their exact architectural outcomes would always need to respond carefully to the existing conditions of each site.

Finally, the imagined resident personas were useful in helping guide ideas around shared amenity and communal space, but they were still speculative. Future research would benefit from participatory design processes involving residents directly to better understand what kinds of communal functions are genuinely wanted, and how negotiation between different users would shape the space over time, and what forms of collective organisation, governance or financing would realistically support this type of project.

06.

REFERENCES

06.1

Literature

Ahmadian, E., Sodagar, B., Mills, G., Byrd, H., Bingham, C., & Zolotas, A. (2019). Sustainable cities: The relationships between urban built forms and density indicators. *Cities*, 95. ScienceDirect. 10.1016/j.cities.2019.06.013

Arceo, A., Touchie, M., O'Brien, W., Hong, T., Malik, J., Mayer, M., Peters, T., Saxe, S., Tamas, R., Villeneuve, H., & Schmaltz, B. (2025). Ten questions concerning housing sufficiency. *Building and Environment*, 277, 112941. ScienceDirect. 10.1016/j.buildenv.2025.112941

Architecture, Au. (n.d.). 'All constraints can be turned into good': Lacaton and Vassal. Architecture, Au. <https://architectureau.com/articles/lacaton-and-vassal/>

Berghauser Pont, M., & Haupt, P. (2023). *Spacematrix: Space, Density and Urban Form - revised edition*. TU Delft OPEN. https://research.chalmers.se/publication/543740/file/543740_Fulltext.pdf

Berrill, P., Gilligham, K. T., & Hertwich, E. G. (2021). Drivers of change in US residential energy consumption and greenhouse gas emissions, 1990–2015. *Environmental Research Letters*, 16(3), -. 10.1088/1748-9326/abe325

Brandlhuber, A., Engel, L., Grawert, O., & Kolar, A. (2024). HouseEurope! e-flux architecture. <https://www.e-flux.com/architecture/framing-renovation/605982/houseeurope>

Buildings Performance Institute Europe. (2024, October 22). Prioritising existing buildings for people and climate. BPIE. Retrieved March 8, 2026, from <https://www.bpie.eu/publication/prioritising-existing-buildings-for-people-and-climate/>

CSIRO. (n.d.). Climate Zones. Australian Housing Data. Retrieved March 8, 2026, from <https://ahd.csiro.au/dashboards/energy-rating/climate-zones/>

David Widdowson, D. (n.d.). Down the Drain – Lost Tributaries of the Moonee Ponds Creek. <https://www.mooneepondscreek.org.au/wp-content/uploads/2022/09/Down-the-Drain.pdf>

Domschky, A., Kurath, S., Mühlebach, S., & Primas, U. (2022). *Densification of Urban Landscapes: Post-war Housing Developments Between Preservation and Renewal*. Triest Verlag.

European Environmental Bureau. (2017, 06 01). Sufficiency. Sufficiency. <https://eeb.org/en/sufficiency/>

Frantzeskaki, N., Moglia, M., Newton, P., Prasad, D., & Pineda Pinto, M. (Eds.). (2024). *Future Cities Making: Mission-oriented Research for Urban Sustainability Transitions in Australia*. Springer Nature Singapore. 978-981-97-7671-9

Hayden, D. (1980). What Would a Non-Sexist City Be Like. *Signs*, 3(3), S170–S187. <https://www.jstor.org/stable/3173814>

Heggie, J. (n.d.). Australia's Growing Water Problem. National Geographic. <https://www.nationalgeographic.com/environment/article/partner-content-australia-water-problem>

IPCC, Cabeza, L. F., Bai, Q., Bertoldi, P., Kihila, J. M., Lucena, A. F.P., Mata, É., Mirasgedis, S., Novikova, A., & Saheb, Y. (2022). 2022: Buildings. In IPCC, 2022: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge University Press. 10.1017/9781009157926.011

Lacaton & Vassal. (1993). Latapie House. Lacaton & Vassal. <https://www.lacatonvassal.com/index.php?idp=25>

Lacaton & Vassal. (2023). Free Space. Rothwell Public Lecture. <https://www.bing.com/videos/riverview/>

Madigan, D. (2024). Bluefield Housing as Alternative Infill for the Suburbs. Routledge. <https://bluefieldhousing.com.au/damian-madigan-writing/the-bluefield-housing-book/>

McGee, C., & Reardon, C. (n.d.). Shading | YourHome. | YourHome. Retrieved March 8, 2026, from <https://www.yourhome.gov.au/passive-design/shading>

Merriam-Webster. (n.d.). Amenity. In Merriam-Webster.com dictionary. Retrieved February 25, 2026, from <https://www.merriam-webster.com/dictionary/amenity>

Murray, S., Bertram, N., Ramirez, D., et al. (2011). Infill Opportunities Design Research Report [Research Report]. Monash University

NégaWatt. (2017, 08 01). négaWatt 2017 Scenario. négaWatt 2017 Scenario. <https://negawatt.org/Scenario-negaWatt-2017-2050>

Parolek, D. G., & Nelson, A. C. (2020). Missing Middle Housing: Thinking Big and Building Small to Respond to Today's Housing Crisis. Island Press.

Sorrell, S., Gatersleben, B., & Druckman, A. (2020). The limits of energy sufficiency: A review of the evidence for rebound effects and negative spillovers from behavioural change. *Energy Research & Social Science*, 64, 101439. ScienceDirect. 10.1016/j.erss.2020.101439

Spenglar, L. (2016). Two types of 'enough': sufficiency as minimum and maximum. *Environmental Politics*, 25(5), 921–940. <https://doi.org/10.1080/09644016.2016.1164355>

The Urban Task Force. (1999). Towards an Urban Renaissance. Taylor & Francis. <https://www.35percent.org/img/urban-task-force-report.pdf>

Van Huet, S. (n.d.). Why is Melbourne's weather so unpredictable? | this. Deakin University. Retrieved March 8, 2026, from <https://this.deakin.edu.au/society/why-is-melbournes-weather-so-unpredictable/>

Van Neste, S., & Royer, J.-P. (2022). Contested densification: Sustainability, place and expectations at the urban fringe. *Frontiers in Sustainable Cities*, 4. <https://doi.org/10.3389/frsc.2022.975130>

Wankiewicz, H. (2017). The re-emergence of co-housing in Europe. Routledge. <https://www.taylorfrancis.com/chapters/edit/10.4324/9781315659886-11/potential-cohousing-rural-austria-heidrun-wankiewicz>

YIMBY. (2023). Melbourne's Missing Middle. Australian Policy Online. <https://apo.org.au/node/329474>

Zimmermann, P. (2022). Transition pathways for the European building sector: Comparison of environmental savings from sufficiency, consistency, and efficiency measures. *Journal for Technology Assessment in Theory and Practice*, 31(2), 32-39. <https://doi.org/10.14512/tatup.31.2.32>

06.2

Figures

All figures and drawings not listed below are the work of the author and unless otherwise stated, all photographs are by the author. All images by others are with permission from the photographer named under the image.

Figure 1. Suburban Melbourne (Google Maps, 2025)
<https://www.google.com/maps/>

Figure 2. Global situation of this thesis in Melbourne, Australia. Adapted from Passive House Institute. (n.d.). Climate zones list and map. https://passivehouse.com/media/filer_public/95/19/9519f0a1-5000-4699-9aed-f5d13aadd0b3/hw_climate-zones-list_and_map_en.pdf

Figure 3. Thesis Method Diagram. Adapted from Brannstrom, M. (2025). Parking: expired: Transformation of a 50-year-old rowhouse parking lot into complementary housing and climate resilient green space [Master's thesis, Chalmers University of Technology].

Figure 4. Varied spatial conditions at the same density as a result of varying site coverage. Adapted from The Urban Task Force (1999). Towards an Urban Renaissance. Taylor & Francis. <https://www.35percent.org/img/urban-task-force-report.pdf>

Figures 5 & 6. Bluefield Housing (Madigan, D., 2023. Bluefield Housing as Alternative Infill for the Suburbs (1st ed.). Routledge. <https://doi.org/10.4324/9781003293736>

Figures 7 & 8. Lacaton & Vassal. (1993). Latapie House. <https://www.lacatonvassal.com/index.php?idp=25>
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Figures 10 & 11. Gab Olah. (2024). Thornbury Canopy. <https://www.habitusliving.com/projects/gab-olah-thornbury-canopy>
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Figures 12-14.. Pop Architecture. (2025). Fitzroy North House. <https://www.poparchitecture.com.au/fitzroy-north-house>
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Figures 15-17. Breathe. (2024). Park Street. <https://www.breathe.com.au/project/park-street>
Image Credits: Tom Ross

Figures 18-20. Campsie 2914 (Fernández-Abascal & Gra., 2022). Remaking our suburbs' 1960s apartment blocks: a subtle and greener way to increase housing density. The Conversation <https://doi.org/10.64628/AA.m44s75es9>

Figures 21-23. Studio Bright. (2021). Women's Housing. <https://studiobright.com.au/project/wpi-housing-project/>
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Figures 24-26. Spacecraft Architects. (2023). Block Party. <https://www.spacecraftarchitects.co.nz/Block-Party>
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Figure 27. Site position within the "middle ring" in relation to Melbourne's city centre. Adapted under licence from Map of Melbourne (sfg, 1:50.000), by Boundless Maps (2026). <https://boundlessmaps.com>

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Figure 35. Site Annual Temperature Averages. Based on data from Australian Bureau of Meteorology (n.d.). https://www.bom.gov.au/climate/averages/tables/cw_086282.shtml

Figure 36. Site Daily Temperature Averages. Based on data from Australian Bureau of Meteorology (n.d.). https://www.bom.gov.au/climate/averages/tables/cw_086282.shtml

Figure 37. Site Climate. Solar position data obtained from Marsh, A. J. (2026). SunPath3D (3D sun-path analysis tool) [Computer software]. Andrew Marsh. <https://andrewmarsh.com/apps/staging/sunpath3d.html>

06.3

AI Appendix

AI tools, including ChatGPT and Gemini, were used during the writing process as a reflective and editorial support tool. Their use included proofreading for spelling corrections, reviewing the clarity and structure of written text and occasionally suggesting alternative wording or sentence structures for better flow of ideas.

The AI tool ResearchRabbit was used for assisting in the identification of relevant literature for further review.

All AI-generated suggestions were critically evaluated by the author before use. The research, analysis, design work, and conclusions presented in this thesis are entirely the author's own.

Suburbia; Retain, Renovate, Infill.

Claudia McLennan

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