ROOM TO BREATHE

Figure 001. Ōtautahi-Christchurch Town Hall.

ROOM TO BREATHE:

Designing a framework for medium density housing in
Ōtautahi-Christchurch

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Abstract

Ōtautahi-Christchurch faces the future in an enviable position. Compared to other New Zealand cities Christchurch has lower housing costs, less congestion, and a brand-new central city emerging from the rubble of the 2011 earthquakes. *‘Room to Breathe: designing a framework for medium density housing (MDH) in Ōtautahi-Christchurch’* seeks to answer the timely question how can medium density housing assist Ōtautahi-Christchurch to respond to growth in a way that supports a well-functioning urban environment? Using research by design, the argument is made that MDH can be used to support a safe, accessible, and connected urban environment that fosters community, while retaining a level of privacy. This is achieved through designing a neighbourhood concept addressing 3 morphological scales- macro- the city; meso- the neighbourhood; and micro- the home and street. The scales are used to inform a design framework for MDH specific to Ōtautahi-Christchurch, presenting a typological concept that takes full advantage of the benefits higher density living has to offer.

Room to Breathe proposes repurposing underutilised areas surrounding existing mass transit infrastructure to provide a concentrated populous who do not solely rely on private vehicles for transport. By considering all morphological scales Room to Breathe provides one suggestion on how MDH could become accepted as part of a well-functioning urban environment.

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Introduction

As Ōtautahi-Christchurch faces projected population increases the city's urban fabric has become more important than ever before. Issues that have arisen in cities such as Auckland and Los Angeles from poorly planned urban sprawl and car-centric planning should act as warnings of what not to do, especially given Ōtautahi-Christchurch's history of replicating low-density environments.

The need to increase urban density has been identified, although standing in the way of densification (in New Zealand as a whole, but particularly in Ōtautahi-Christchurch) are widespread negative connotations held by New Zealanders with respect to higher density urban environments. These connotations are often substantiated by low-quality architecture and urbanities.

In response to this I believe that medium density housing (MDH) provides an opportunity to increase density, improve Ōtautahi-Christchurch's urban environment, and fight the negative connotations of higher density living, if it were to be designed specifically for the local context (as opposed to directly copying typologies from international precedents). There will always be those who dislike MDH, however the one-size-fits-all approach

being taken currently which sees the continued development of stand-alone housing to support low-density car-centric suburbia, fails to address a diverse society with diverse desires and needs.

Not only does MDH provide the opportunity to increase housing options, it also – if done correctly – could play a key role in preventing Ōtautahi-Christchurch from ever facing the same issues as Auckland, Los Angeles, and other cities that have grown in recent decades through urban sprawl models. This would mean that instead of years spent fixing issues (most notably congestion and high cost of housing), Ōtautahi-Christchurch could put the same effort into becoming the most liveable city in New Zealand, if not Australasia.

Ōtautahi-Christchurch is the least congested of New Zealand's 3 main-centres – even less congested than Hamilton (TomTom International BV, 2020). As of Q4 2020 it has the lowest average house price and second lowest average rent of New Zealand's 7 cities (CoreLogic, 2021, pp. 20–23). Combined with pre-existing and underutilised mass transit infrastructure, flat topography, and a rebuilding, modern central city, the city has a strong foundation for a prosperous future.

Research Question

How can MDH (Medium Density Housing) assist Ōtautahi-Christchurch to respond to growth in a way that supports a well-functioning urban environment?

Aim

This thesis aims to create a realistic, and desirable residential growth concept for Christchurch – materialised in a design framework for MDH specific to the local context.

Objectives

1. To explore the urban context of Greater Christchurch-Ōtautahi, past and present, as a method to inform where and how MDH could assist functional growth for a productive & liveable city.
2. Using knowledge of urban design theory, to generate concept designs to inform a design code for a MDH community in a location decided upon using the findings of objective 1 to inform the design.
3. To explore how architecture and urban design can facilitate improved place identities for Cantabrians through MDH.

Scope

Due to the high level, strategic scope of this project, the three objectives will be explored through a masterplan proposal and design code with the view that this higher-level framework

*It should be noted that ‘Micro-Home’, ‘Micro-House’, etc... at no point in this thesis refers to the tiny house phenomena, only the morphological scale.

would be the testing ground for exploring an alternative to low-density residential sprawl, at the lower end of MDH. The desired result will be a suggestion of what I believe could be of future benefit to Ōtautahi-Christchurch, done in a way to support an incremental shift in culture and perception of MDH.

Methodology

This thesis uses research by design to explore the role of MDH in the growth of Christchurch. Research by design when used in an architectural context involves “*making original investigations through generative and propositional modes*” that can be reflected on (Megahed, 2017, p. 339). Research by design offers the potential to explore countless corridors of creative expression, while respecting the observational findings of traditional disciplined research (Hensel, 2012, p. 7).

“Design... ventures into the subjunctive, toward a horizon of possibilities, and does so imaginatively. Research... holds its ground. It makes no claims on times to come because it is sharply attuned to what is given here and now” (Hensel, 2012, p. 7).

Three primary morphological scales will be considered, Macro (the city), Meso (the neighbourhood), and Micro* (the street and the home). Working in three scales allows for consideration of the wider city, and the effects a development and/or building may have on it, and vice versa. This integrated approach is recommended by various academics (Gehl, 2010, p. 195; Southworth & Owens, 1993, p. 286), is

Figure 002. Methodology Diagram.

a clearly defined element of the New Urbanist movement (Talen, 2013, p. 7) and Alexander et al’s book ‘A Pattern Language’ (1977, p. xii). Three scales are also used by Jacobs in defining three different types of neighbourhoods - the City, District, and Street (1961, p. 127).

The initial ideas for the thesis originated from my personal experience and observations of living between Ōtautahi-Christchurch, Wellington; and for 6 months – Eindhoven, The Netherlands. Three remarkably different urban settings, with varying levels of car dependence and density – and of course in Eindhoven I was able to properly experience (a safe) life on a bicycle, in stark contrast to my experience of cycling in Ōtautahi-Christchurch (one that ended the moment I got my driver’s licence).

Design exploration was conducted through sketching, mapping, 3d-modelling (Rhino) and digital rendering (Twinmotion initially, before moving to V-ray due to ease of workflow when working in Rhino).

The designs are supported by a review of literature relevant to how urban design and architecture can influence city life; reviews of case studies/ precedents – chosen through my personal knowledge/interest or finding them while analysing literature; and a review of policies – used to ascertain the current direction of urban development in Christchurch and New Zealand, and how other international examples may provide further direction. The following table shows the relevance of the chosen areas of literature review to each morphological scale:

	City/Region MACRO	Neighbourhood MESO	Street MICRO	Home MICRO
Historic Morphology				
10-Min Neighbourhood				
Green Space				
Accessibility/Mobility				
Amenities				
Social Field of Vision				
Parking				
Role of the Street				
Perceptions of Crime				
Community				
Soft Edges				
Privacy				
Place Identity				

Figure 003. table of relevance.

Defining a well-functioning and liveable city

In the Residential Chapter of the Christchurch Central Recovery Plan entitled A Liveable City, a liveable city is described as containing “attractive central city neighbourhoods with diverse communities to support business growth and development, and bring life to the city centre” (Canterbury Earthquake Recovery Authority, 2015, p. 5). Okulicz-Kozaryn notes that “liveability means quality of life, standard of living or general well-being of a population in some area such as a city” (2013, p. 433). There are a number of internationally developed indices for liveability including one developed by The Economist (The Economist Intelligence Unit, 2019) and another by Mercer (Mercer, 2019). However, these indices focus primarily on quantitative high-level data without the inclusion of qualitative data such e.g. local perceptions. Auckland, for example, is ranked at #3 in Mercer’s Quality of Living Index (Anderson, 2019), and number 12 in The Economist’s (Satherley, 2019). In Deutsche Bank’s Index, comparing prices and living standards, Auckland was #16 (-4 places from 2018), and Wellington #2 (-1 place) (Reid et al., 2019, p. 7). Reid et al. point out that the index is subjective, and the results would vary based on how important different criteria are to different people (2019, p. 2).

Given the wide array of definitions regarding liveability, for the purpose of this thesis ‘liveability’ will encompass quality of life, and the elements of interest that contribute to quality of life. These elements have been identified in literature analysed as either valuable to New Zealanders or key to successful MDH interventions. The elements of interest & importance to MDH are safety (Bryson, 2017, p. 24), accessibility/ connectivity (Greater Christchurch Partnership, 2019, p. 20), community, and privacy (Gjerde et al., 2016, pp. 131–133).

NPS-UD on Urban Development 2020

The National Policy Statement on Urban Development 2020 (NPS-UD) (New Zealand Government, 2020) provides legislative direction to local government on how they must respond to growth “to support productive and well-functioning cities” (Ministry for the Environment, 2020). The NPS-UD encourages higher density developments to better address housing demand, and places importance on the accessibility of a location via public transport (New Zealand Government, 2020, p. 11). While work on this thesis began months before the NPS-UD was released, the goals are very similar, and this thesis

resonates with many of the core elements put forward in the NPS-UD.

The term ‘Well-functioning’ as used in the NPS-UD appears to heavily emphasise the availability of housing (for diverse needs), and the accessibility by public and active transport between housing, jobs, and other amenities. Enabling Māori to express cultural traditions, supporting greenhouse gas reductions, and future resilience to climate change are also included (New Zealand Government, 2020, pp. 10–11).

Supporting the increase in housing availability underpins the move towards MDH provision outlined in this thesis. Issues of accessibility highlighted further validate the need to consider the macro and meso scales to be able to design quality well-functioning MDH communities.

Principles

Given the above, key principles related to the definition of liveability, functionality, and productivity that are to be considered throughout this thesis are:

- 1. Safety
- 2. Accessibility/Connectivity
- 3. Community
- 4. Privacy

Defining Medium Density

According to the Ministry for the Environment (MFE), MDH is defined as:

“developments including four or more dwellings with an average density of less than 350 m2 per

unit... stand-alone dwellings, semi-detached (or duplex) dwellings, terraced housing or apartments within a building of four storeys or less... located on either single or aggregated sites, or as part of larger masterplanned developments”. (2016)

BRANZ (Building Research Association New Zealand) defines MDH as:

“multi-unit dwellings (up to 6 storeys)” (Bryson & Allen, 2017, p. 5)

In the Christchurch District Plan, the Residential Medium Density Zone is defined as:

“development which achieves a net density of at least 30 households per hectare” (Christchurch District Plan, n.d., sec. 8.2.2.8)

Where net density *“means the number of lots or household units per hectare (whichever is the greater). The area (ha) includes land for:”*

- All residential land including parking, roads and corridors excluding major arterials and state highways; local reserves.

Excluding land that is:

- Used for stormwater treatment and retention.
- Geotechnically constrained.
- Protected for ecological, cultural or historic reasons.
- Used for local community and retail (schools, hospitals etc)
- Identified as land subject to development constraint (Christchurch District Plan, n.d.).

For the purposes of this thesis MDH will be defined as: housing (stand-alone, semi-detached, terraced, duplex and apartment) with a minimum net density of 30 per hectare, up to 6 storeys high. Net density will have the same definition as used in the Christchurch District Plan.

Figure 004. The Terrace, Central Christchurch, on a quiet morning.

Contextual Analysis

Ōtautahi-Christchurch

Figure 005. Location of Ōtautahi-Christchurch.

The first inhabitants of Ōtautahi-Christchurch were the Waitaha people. In the 1500s Ngāti Māmoe migrated from the North Island (Te Ika-a-Māui) and assimilated Waitaha through intermarriage and war before a negotiated peace (Christchurch City Council, 2009). The Iwi (tribe) of Ōtautahi and much of the South Island (Te Waipounamu) is Ngāti Tahu, who migrated from the North Island in the 1700s (Ministry for Culture and Heritage, 2016b) and assimilated with Ngāti Māmoe (Tau et al., 2016, p. 44). Ngāti Tūāhuriri are the hapū (sub-tribe) for Christchurch City, traditionally located in Kaiapoi Pā. Ngāti Tūāhuriri have been in Tuahiwi, north of Kaiapoi since the pā's destruction in 1831 (Tau et al., 2016, p. 45).

The name Ōtautahi refers to a pā founded by Tautahi – the son of a Ngāti Tahu chief. The pā was located along the Ōtākaro (Avon) River, near the intersection of Kilmore and Barbadoes Streets (Taylor, 1950, p. 71). In the 1930s Ōtautahi was adopted as a general name for Christchurch. Ngāti Tahu had previously used the Māori names for individual suburbs (Canterbury Earthquake Recovery Authority, 2012, p. 11). Another significant pā is Puāri, a settlement of up to 800 Waitaha people near present day Victoria Square (Thompson-Fawcett et al., 2019, p. 278). Both pā were mahinga kai, or places in which Māori traditionally gathered food for which Christchurch City provided an abundance of fish, birdlife, and rich soils (Tau et al., 2016, p. 46).

B.M. 273

Sheet 2

AREA	COLUMN	GAZETTE & PURPOSE	PROCS.
0.1.00	75	Vested in H.M. the Queen (Crown Land) Gaz. 1969 p. 108	759348

Pt. T.S. 751 & 753 being all the land in CT 389/181
(287p) Taken for Pub. Buildings. of Gen. Govt.
Gaz 1954 p. 491.

Roads closed, Diversion Roads Ordinance
1866 p. 159
Canterbury Prov. Gazette 1866 p. 146

For this portion
see
Sheet 1

B.M. 273 is considered to be
the original plan of Christchurch.
(See File 8/3/35 to 251)

Quila
Chief Surveyor
18/9/39

Certified as a true copy of
Black Map 273

L. (101)
Chief Surveyor
8/9/36

Compared with original plan
18/9/39

Founded in 1850 and planned in a colonial-grid layout (figure 006) (Wilson, 2013, pp. 34–38) Christchurch City was home to 369,000 people as of the 2018 census (Statistics New Zealand, 2018), with 489,069 people residing in the Greater Christchurch area (Canterbury DHB, 2019) (figure 007) – which includes jurisdictions of the Selwyn and Waimakariri District Councils. Projections estimate that by 2048 Greater Christchurch will be home to 640,000 people (Greater Christchurch Partnership, 2019, p. 11).

Located within the Canterbury region, Christchurch sits to the North of Banks Peninsula on the Canterbury Plains. Christchurch International Airport is the second largest in New Zealand (Christchurch International Airport Ltd, n.d.) and the Port of Lyttleton (located within the Greater Christchurch area) is the third largest Port in New Zealand by revenue (Deloitte, 2020).

87% of travel within the city is by single-occupancy vehicle, despite 66% of trips within Christchurch City being 7.5km or less, of which 57% are by car (Agenda of Greater Christchurch Partnership Committee, 2020, pp. 42 & 54). 7.5km is an important distance to note, as the Dutch Government considers 7.5km to be an acceptable cycling commute (Fruianu & de Munck, 2007, p. 34). This implies that a significant portion of vehicle trips within Ōtautahi-Christchurch could be made by bicycle instead.

Christchurch has a temperate climate, mild winters with regular winter frosts, and warm summers (moderated by sea breezes). Snow is an occasional occurrence, and rainfall is relatively low (Macara, 2016).

Figure 006. Original plan of Ōtautahi-Christchurch.

Figure 007. (Left): The Greater Christchurch Area
Figure 008. (bottom left): City and District Council boundaries of Greater Christchurch

Figure 009. (above): Cathedral Square in 1916

Historical Urban Morphology of Ōtautahi-Christchurch

To competently propose a large urban-growth concept for Christchurch, it is important to have an understanding of how the city got where it is today. Despite a perception that Christchurch is a car city, prior to the 1960s, it was anything but. The city previously held the nickname ‘Cyclopolis’, with almost half the city’s population (40,000 people) in 1928 considered cyclists (The Kennett Brothers, 2004, p. 32). In 1959, a third of all weekday trips were made by bicycle (Wilson, 2013, p. 65). In fact, Christchurch once

had reputedly “more cyclists per capita than any other city in the world” (The Kennett Brothers, 2004, p. 41). A Hollywood film set during World War II Christchurch was lauded for its accurate representation of New Zealand culture, including “the main cast getting about the place on bicycles” (Gates, 2020).

Early city plans included housing intensification in inner-city suburbs, Wilson notes the city’s outer limits in the 1990s still heavily reflected those set by the earliest plan dated to 1936. A 1959 plan proposed MDH in Merivale and Linwood, and HDH (high density housing)

Figure 010. Cyclists in the city, 1945.

Figure 011. Rush Hour in 1961

closer to the CBD. These plans, as Wilson notes, concentrated development within the inner city and suburban nodes (an element ideal for public and active transport). The city retained a Green Belt through the town plans to preserve fertile farmland. However somewhat ironically, the Resource Management Act (RMA) saw the once-protected green belt areas developed as the council implemented a new District Plan (Wilson, 2013, p. 159).

Rolleston, perhaps the most significant satellite town in Greater Christchurch, was first planned to be built on less-fertile soils, connected to the CBD by commuter rail in the 1970s (Wilson, 2013, pp. 159–160).

Trams were also an important form of transport from 1880 to 1954 (Wilson, 2013, p. 62), influencing where many developments within Christchurch occurred (figure 012). Furthermore, heavy rail (used for freight and passengers) connected numerous suburbs, and other towns to the centre of Christchurch. There used to be 42 stations within the Greater Christchurch area (figure 013). At present there are 4.

Between 1950 and 1959, the number of registered vehicles in New Zealand doubled, this coincided with the closure of Ōtautahi's last tram lines, and the demise of cycling as a major form of personal transport (The Kennett Brothers, 2004, pp. 35–40). It also saw urban sprawl fill in the gaps between areas accessible by bike, tram (Wilson,

Figure 012. 1954 Urban footprint of Ōtautahi and tram routes, compared to current urban footprint.

Figure 013. Historic and existing railways and stations of Ōtautahi-Christchurch.

2013, p. 65), and to a lesser-degree train, that had once dictated where people could inhabit.

2011 Earthquakes

A magnitude 6.3 earthquake on 22nd February 2011, and thousands of subsequent aftershocks caused significant damage to the city (figures 014, 015) and 185 lives were lost (Ministry for Culture and Heritage, 2016a). The earthquake has now defined a decade of life for Cantabrians.

The resulting rebuild has seen a focus on cycle

Figure 014. (left): Earthquake damage, corner of Hereford and High Streets

Figure 015. (bottom left): Earthquake damage on Cashel Street, Central Christchurch

friendly infrastructure, and a pedestrian-friendly CBD, with a desire for An Accessible City (Canterbury Earthquake Recovery Authority, 2012, p. 90). As of 2021 the rebuild is still uncompleted (and in many cases yet to begin). Despite this there are signs that it is reviving central Christchurch, with pedestrian numbers in Cashel Mall (one of few areas to be mostly completed) exceeding pre-earthquake numbers (Guildford, 2019), and commercial tenants beginning to leave suburban centres and malls in favour of the central city (Steeman, 2019).

Figure 016. (Below): section of Oxford Terrace pedestrianised in the rebuild

Current Urban Morphology

Christchurch has an average urban population density of 1299/km², lower than Auckland's 2,414/km² and Wellington's 1920/km² (Statistics New Zealand, 2020a, 2020b). Already mentioned is the city's reliance on private motor vehicles, which is in part due to a lower-density and dispersed urban footprint, but arguably also due to a relatively limited congestion problem when comparing Christchurch to other New Zealand cities. This makes driving more convenient than other forms of transport – as an example the 2020 TomTom International B.V. congestion ranking found Auckland, Wellington, and Hamilton to be more congested than Christchurch, with Tauranga and Dunedin close behind (2020).

As shown in figure 017, the city's present morphology still closely follows the location of heavy rail lines, likely as the city's main arterial roads run parallel to the rail lines, and because of the historic growth restrictions imposed by the green belt. Satellite towns that were originally built around heavy rail have expanded organically. Some townships (most notably Lincoln and Prebbleton) had rail lines removed completely and are only serviced by road.

Due to the availability of housing, and the damage caused to Christchurch City housing stock by the 2011 earthquakes, fringe areas of Greater Christchurch in the Waimakariri and Selwyn Districts have continually seen strong population growth, while Christchurch City saw an initial exodus (Greater Christchurch Partnership, 2019, p. 3).

*Urban population densities calculated using Statistics NZ 2020 urban/rural population estimates and urban/rural GIS areas, rounded up.

Our Space: 2018-2048 Greater Christchurch Settlement Pattern Update

The OurSpace: 2018-2048 Greater Christchurch Settlement Pattern Update is a seminal document for this thesis, which outlines where development is proposed and occurring within the Greater Christchurch area. The plan outlines the need for walkable, 10-minute neighbourhoods, and higher-density developments to address diverse ranges of housing requirements (Greater Christchurch Partnership, 2019, p. 37).

One area where this thesis aims to improve on Our Space is in the utilisation of existing heavy rail infrastructure as a potential mode of rapid transit. While it identifies rapid transit corridors that run parallel to, and have the same start and end locations as the heavy rail corridors of Christchurch (figure 018), Our Space proposes brand new infrastructure that would be costly and take a long time to implement. These proposed corridors follow existing 'high demand' routes (2019, p. 26), however the high demand is the result of lower-density environments. This thesis instead proposes creating new high demand 'nodes' designed to be walkable 10-minute-neighbourhoods, along transport corridors that have historically served as passenger transport (Wilson, 2013, p. 56). Development of underutilised areas also has the potential to remove the logistical issues of NIMBY-ism that arise when retrofitting existing neighbourhoods, which can stymie development attempts (Gjerde et al., 2016, p. 129; Sharpin, 2006, p. 22).

Figure 017. An accessible city; areas theoretically accessible within 10 minutes cycle of historic and existing mass transit.

Figure 018. Transit corridors identified in 'Our Space'.

Perceptions of MDH

New Zealanders have, at face value, very negative perceptions of higher density living. The quarter-acre dream in our society/culture has long been desirable, and importantly – attainable. According to BRANZ, New Zealanders perceive MDH to be less safe, offer a less enjoyable lifestyle, reduced sense of community, and be less visually attractive compared to stand-alone housing, which there is an overwhelming preference for (2017, pp. 10–19).

Negative perceptions are in part due to MDH in New Zealand being often of low-quality, in car-dependent areas, and lacking amenity (Bryson, 2017, p. 24; Gjerde et al., 2016, p. 21; Sharpin, 2006, p. 19), all of which are integral ingredients in quality MDH environments. Bryson, in citing Haarhof et al. (2012, p. IX) mentions that MDH in New Zealand has a high turnover of residents, as it's not viewed as a long-term option, something that Bryson calls “a barrier to community cohesion and vibrancy” (2017, p. 24).

A survey of MDH in Ōtautahi-Christchurch found an average quality of ‘basic satisfactory’,

with “a significant proportion of development [being] inadequate or poor” (Christchurch City Council Urban Design Team, 2020, p. 11), confirming prior statements on the inadequacy of MDH in New Zealand. When all knowledge/experience of MDH is of low-quality examples, it should be no surprise that MDH is perceived as undesirable.

There is hope, however. Haarhoff et al. found residents of three MDH developments in Auckland expressed high levels of life satisfaction (2016, p. 12), and another Auckland study found that residents of MDH perceived their neighbourhood's environment to be of better quality when compared to residents living in high and low densities (D. Walton et al., 2008, p. 417). Despite the findings of the BRANZ study, there are arguments that MDH can, for the issues raised, be as good – if not better than – lower density housing.

Figure 019. New MDH on Hereford Street.

Design Phase 1

The first design phase encompasses the *Macro*, *Meso*, and *Micro* morphological scales beginning each with a literature review of relevant factors. These factors align with the overarching principles of the thesis, exploring how safety, accessibility/connectivity, community, and privacy are important across the morphological scales.

MORPHOLOGICAL SCALE MACRO

The largest morphological scale – Macro – seeks to build on the contextual analysis to identify sites that have the potential to feasibly contribute to Ōtautahi-Christchurch’s way of life. On the city scale, accessibility/ connectivity is perhaps the most important principle to consider. If a MDH development is not located in an area with convenient access to amenities and the CBD, it will function as a dense suburbia without suburbia’s largest drawcard – space.

Amenities & The 10-Minute Neighbourhood

The 2048 Our Space plan for Greater Christchurch identifies the need for a 10-minute neighbourhood, which provides “the ability to meet most of your everyday needs locally within a 10 minute journey from home by walking, cycling, or riding local public transport” (Greater Christchurch Partnership, 2019, p. 36). The benefits of a compact, 10-minute (or walkable/ bikeable) neighbourhood are widely acknowledged (Gjerde et al., 2016, p. 129; Montgomery, 2013, p. 47; Sharpin, 2006, p. 9; Stutzer & Frey, 2008, p. 374), and the need for a variety of uses championed by Jane Jacobs (1961, p. 155). On a

Macro scale, a 10-minute neighbourhood could take advantage of existing amenities and needs to be located close to existing (or potential) mass transit systems to provide access to the wider city.

Importance of Accessibility and Mobility

The ability to travel without a motor vehicle has the potential to improve social equity through increased access to facilities for lower income households (Sharpin, 2006, p. 18). Transport costs in Christchurch have been increasing, with an average household spending an extra \$83 a week in 2018 vs 2008 (PricewaterhouseCoopers New Zealand, 2019). Buying, maintaining, and running a vehicle can consume a substantial portion of a lower socio-economic household’s income. One Copenhagen study found the costs of driving are 6 times higher than the cost of cycling (Gössling

Figure 020. Everyday needs should be accessible within 10 minutes on active or public transport.

& Choi, 2015, p. 111). In a society where cycling or walking are both convenient and safe, lower-income residents are not disadvantaged by high transport costs, and can choose to spend the money elsewhere.

This logic can also be applied to improving equity for elderly. Quality active transport infrastructure also creates room where elderly can drive mobility scooters (common in Dutch cycleways [figure 021]), and e-bikes, which allow for easier travel as someone becomes less physically able to cycle. In fact, over 80% of e-bikes sales in the Netherlands (the world's largest e-bike market) are to those 50 years and older (Bruntlett & Bruntlett, 2018, p. 42). While public transport is also useful, maintaining physical activity as someone ages will keep them fitter and healthier for longer, while providing an unobstructed freedom unattainable from transport modes reliant on a timetable.

Benefits of Active Transport

It should be no surprise that cycling to work can reduce premature death, which follows trends of physical activity lowering the risk of cardiovascular diseases, some forms of cancer, and improving emotional health (Tin Tin et al., 2009). Increasing the use of active transport methods provides an opportunity to improve the health of the general population. NZTA found that 90% of New Zealanders who cycle meet guidelines of recommended daily physical activity, compared with 51% of non-active transport modes (Waka Kotahi - NZ Transport Agency, 2020, p. 20).

These health benefits can be translated into economic ones also - \$2.20/km for new cyclists, and \$4.40/km for new walkers (Waka Kotahi - NZ Transport Agency, 2020, p. 43). They are a product of reduced health costs as physical activity

increases, compared to the costs associated with sedentary populations (Gehl, 2010, p. 111).

Place Identity

Place Identity, as described by Sepe, is intertwined with factors of “morphological, natural, historical and cultural invariants”, and the perceptions people have of them. The “*colours, materials, smells and sounds [of a place] become an inseparable part... of the city, and thus emotional components of the urban image*” (2013, p. xii). This description is further backed up by El Nachar & Abdel-Hadi who described place identity as “*a mixture of cognitive, emotional and perceptual processes formed through individuals’ transactions with [the] natural and built environment[s]*” (Catalani et al., 2018, p. 75). El Nachar & Abdel-Hadi echo the general notion put forward by Sepe through describing place identity as a “*process of observations and interpretations*”. Usefully, they explain that placemaking is framed by 5 central functions- recognition, meaning, expressive-requirement, mediating change, and an anxiety and defence function (Catalani et al., 2018, p. 76). To break down both approaches, place identity could be described as a process of one’s perception of the local environment, based on cumulative experiences, encompassing all physical and emotional characteristics and experiences.

Maintaining a strong place identity can benefit both the physical and mental health of people over their lifetime, and when accompanied by highly accessible areas with diverse housing options the ability to age in place (or at least the same

neighbourhood) is created (Gjerde et al., 2016, p. 132). This lessens the need to move home, which can be distressing whether by choice or necessity (Catalani et al., 2018, p. 73)

Green Space

Christchurch has long been a type of ‘ecological dead-zone’. Fires lit by Māori resulted in the first tussock environments that dominate the Port Hills today (figure 022), before European arrival decimated the forests of Canterbury that remained (Wilson, 1989, p. 36). Farmland separated the city (and Banks Peninsula) from the Southern Alps. The extent to which Christchurch lacks native ecosystems is highlighted when sightings of single tūī in the Port Hills suburbs garner the attention of national news (Hayward, 2020; Northcott, 2018).

Increasingly, more attention is being paid to the importance of native eco-systems, with native planting on the Port Hills (Otago Daily Times, 2020), proposals to turn the 602ha residential red zone (suburbs condemned after the 2011 Christchurch earthquakes) into restored native wetland (Regenerate Christchurch, 2019), and to create an ecological corridor between the Port Hills and the CBD (Newshub, 2020).

Access to nature is widely acknowledged as an important part of urban life for health and wellbeing (Fleming et al., 2016, p. 8; Frumkin, 2002, p. 207; Montgomery, 2013, p. 111). A number of studies confirmed the importance of accessible nature for New Zealanders (Buckenberger, 2012, p. 84;

Figure 021. Mobility scooter user on Dutch cycleway.

Fleming et al., 2016, p. 6). The Share an Idea consultation found a “major focus on green open space” in the desires of Cantabrians (Christchurch City Council, 2011, p. 6) and importantly many responses outlined a desire for an increase of native plantings to complement the traditionally european flora of the city (2011, p. 37). Kuo & Sullivan further found that crime reduced as the immediate surroundings of low-rise social housing in Chicago became greener (2001, p. 359), which links back to CPTED as a potential method. Montgomery also notes that infusions of nature can make people more trusting and generous towards strangers (Montgomery, 2013, p. 161).

Higher density hosuing can assist these efforts, as less land is required to house people, more can be given to nature, and other important uses such as farming (land around Christchurch City is highly fertile (Greater Christchurch Partnership, 2019, p. 21)).

Figure 022. Port Hills Tussocks

Principles for Site Selection

Subsequent to the covered literature, and the primary principles of this thesis, the following site selection criteria/principles were created to inform the shortlisted and final options:

Accessible/Connected	To minimise the negative effects of urban sprawl the site must provide adequate opportunity for residents to effortlessly and conveniently travel around the city without relying on private motor-vehicles.
Underutilised	Parcels of land that could realistically be developed.
Access to Amenities	A site that could spur further urban regeneration in the surrounding neighbourhood to maximise integration into the urban fabric.
Potential for furture growth	How many amenities exist if residents were to move in today?
Desirability of area	A desirable area already has people wanting to move in, increasing the likelihood people will accept higher densities.

Figure 023. Chosen Sites.

Sites

① Templeton	⑤ Waltham B
② Middleton Railway	⑥ Woolston
③ Addington Industrial Area	⑦ Styx Mill
④ Waltham A	⑧ Belfast

Identified Sites

To meet the principles/criteria for the macro scale 7 sites were shortlisted as possibilities. These sites all had one thing in common, which is that they are on or next to an existing rail line. While there are no commuter rail services in Ōtautahi-Christchurch, the possibility has been raised by ECan (Environment Canterbury/ Canterbury Regional Council) and costed (S. Walton, 2020), as well as being raised by a minor political party under their transport plan (Radio New Zealand, 2020). Of benefit to this thesis is that many sites along the rail lines have been neglected or underutilised and have strong potential to make Ōtautahi-Christchurch a well-functioning urban environment. Given all the sites have mass-transit potential, the evaluation considers how each site could fare if commuter rail were implemented after the development, and strong consideration is given to the reality that Ōtautahi is currently dominated by motor vehicles.

Figure 024. Templeton.

Templeton

located along the Southern Rail Line, and State Highway 1 (SH1), importantly the area between Rolleston and Hornby has seen significant urban expansion in recent years. Templeton also previously had its own railway station.

Figure 025. Middleton.

Middleton

Middleton, currently a freight depot, is located on the Southern Rail Line, however much closer to the CBD. It is in proximity to Westfield Riccarton, Christchurch's largest mall, and a number of 'big box' stores along Blenheim Rd (a major arterial route). It sits next to Riccarton, a popular suburb, particularly for students at the nearby University of Canterbury. Addington Raceway, the temporary rugby stadium, and Christchurch Arena are also nearby. The site is within a long-established and popular area of the city, with the site itself detracting from the quality of its surroundings due to its industrial use.

Figure 026. Addington.

Addington

Addington is the location of the main passenger railway station for Christchurch, with a number of industrial buildings nearby providing potential redevelopment zones. It sits next to the popular ‘Tower Junction’ strip mall, Hagley Park, and the Lincoln Rd commercial area south of the rail line. The CBD is a bike ride/short walk through Hagley park.

Figure 027. Waltham A.

Waltham A

Waltham A is located near Moorhouse Avenue, one of the ‘4 aves’ that ring the central city, placing it within easy walking and cycling distance of Cathedral Square. Currently a freight depot, local amenities include the main campus of Ara Institute of Canterbury (a tertiary insitute), Marian College (Girls’ High School), Waltham Primary School and Catholic Cathedral College.

Figure 028. Waltham B.

Waltham B

Waltham B is located slightly further from the CBD than Waltham A, however is closer to existing residential zones. It sits on Ensors Road, a 25 minute walk to Eastgate Mall. There are fewer local amenities than Waltham A, including Te Kura Kaupapa Māori o Waitaha (full Māori immersion school) and the Woolston campus of Ara. Waltham B was once the site of a railway station.

Figure 029. Woolston.

Woolston

Woolston is an existing industrial area, near Lyttleton port. The site sits next to the Heathcote River, providing natural amenity, and is near The Tannery, a popular commercial redevelopment of industrial buildings. It was previously the site of a railway station, no residential areas exist in close proximity to the site.

Figure 030. Styx Mill.

Styx Mill

is located on the Northern Rail Line next to farmland that is slowly being suburbanised (most notably in the Northwood subdivision). The Northwood Supa Centre provides many commercial amenities directly north of the site, and there are a number of green spaces within the new subdivisions. The site is a medium distance from the central city compared to the others. Main North Rd runs past the site, and the new Northern Motorway extension recently opened nearby.

Figure 031. Belfast.

Belfast

Belfast is an established commuter suburb located far from the Christchurch CBD. The suburb has minimal retail amenities (the closest is the Northwood Supa Centre). It does however have free land that sits next to the new Northern Motorway, and the Western Bypass. The Northern Rail line cuts directly through the site which could, in future, provide direct link with the Centre City.

Final Site

While all of the identified sites have potential to be developed according to the principles of this thesis, one in particular stands out.

Accessibility/connectivity is most important to the Macro scale, and given that the existing rail is unlikely to be used in the short term any site not located within a walkable or cyclable distance of the CBD is not going to meet this principle (figure 032). That rules out Templeton, Styx Mill and Belfast as they fall outside of a 7.5km radius from Cathedral Square (Styx Mill might be inside a direct radius, but the actual distance by road is slightly over 8km).

In other areas of importance, amenities are considerably sparser for both Waltham sites and Woolston. Waltham A and Woolston are also far from any other residential areas, instead being located within less-desirable industrial areas. Similarly Addington is wedged between rail and a major arterial road, and sits on a piece of land that may be needed for rail if regular Rangiora-Christchurch City (or Lyttleton) services were to exist as the rail does not connect in that direction.

This leaves the Middleton site, which has extensive existing retail amenities (figure 033), and is located next to a popular inner-city suburb (Riccarton) that has already seen residential intensification (figure 034). The site is also located directly on the under-construction Nor' West Arc cycle route that connects to the University of Canterbury and the South-Express cycle route (which connects to the CBD via Hagley Park [figure 035]). Two new cycleways designed in conjunction with the masterplan could connect Middleton direct to the CBD, Tower Junction, Westfield Riccarton, and Wharenu School (figure 036).

Middleton has no natural amenity other than a tiny wetland by Matipo Street. Analysis showed that the site was historically a mix of swamp, grass and flax, and grass and fern ecosystems (Ngāi Tahu et al., n.d.; Wilson, 1989). Although as most of the sites have little to no natural amenity this is not a major downside. Notably there are a limited number of schools within close proximity (figure 037).

Figure 032. A 7.5km radius from Cathedral Square

Figure 033. Amenities

Amenities

① Dose Diner	⑨ Sun-Mart (Asian Grocer)	⑱ Early Settler	⑳ Addington Racecourse/Christchurch Arena
② The Warehouse	⑩ Crazy Daves (Green Grocer)	㉑ Java Furniture	㉒ Accomodation
③ Table Tennis Canterbury	⑪ Kosco (Asian Grocer)	㉒ Caltex, Subway, St Pierres Sushi, Jesters Pies	Potentially incompatible with residential:
④ Super Liquor, Big Daddy's (Pub), Punkabi Dhaba (Indian Restaurant)	⑫ Dollar Store	㉓ Divine Cakes	㉒ Flour Mill
⑤ Warehouse Stationary	⑬ Box Cafe	㉔ Squashways (squash courts)	㉗ Dominion Trading co. (scrap)
⑥ Liquorland	⑭ Eco Shop	㉕ Madam Kwong's (Chinese Restaurant)	㉘ Annex Metals (scrap)
⑦ Couplands Bakery	⑮ McKenzie & Willis	㉖ Books and Gifts outlet store	㉙ National Grid (double pylons)
⑧ Mad Butcher	⑯ Urbano Interiors	㉗ Alpha Fitness	
	㉘ Big Save Furniture		

Maps Data: Maxar Technologies. (©2020). [Satellite Imagery]. Google Earth.
Figure 034. Existing land use (rough).

Existing Land Use

Key Cycle Connections

- Little River Connection
 - Quarryman's Trail
 - Southern Express
 - Nor' West Arc
 - Uni-Cycle
 - Northern Line
 - Wheels to Wings
 - Papanui Paralel
 - Additional cycle paths
 - Rapanui-Shag Rock (ends at Ara - barely visible)
- Dotted line = route uncertain

Figure 035. (left) Major cycle routes.

Figure 036. (below) Potential connections for site shown in orange.

Maps Data: Maxar Technologies. (©2020). [Satellite Imagery]. Google Earth.

Figure 037. Schools near site.

Schools

MORPHOLOGICAL SCALE MESO

At the neighbourhood level, the Meso-Morphological Scale begins to place importance on a broader range of factors than simply accessibility. The result for this scale is a conceptual masterplan that integrates with the existing urban fabric and provides the setting for a lifestyle taking advantage of the benefits attainable from MDH.

Morphological Scale Meso

Addressing Perceptions of Crime

One of the more important factors of a neighbourhood, is the perception of its safety. There is a sort of social-disconnect between our trust in strangers, our perceived levels of safety, and reality. Breetzke and Pearson found that in Christchurch, those who fear crime the most are actually the least likely to experience it (2015, p. 100). Dijk further found that despite 6% of Kiwis falling victim to burglary between 2003/04, 36% of Kiwis expected to be victim over the same period (2007, pp. 69 & 127).

This fear of crime can also be exhibited through trust – and trust is often lacking when interactions between strangers are reduced (Montgomery, 2013, p. 52). The ‘wallet experiment’ is used to gauge honesty and integrity amongst urban populations – where wallets (normally with cash) are purposely ‘lost’, to see how many are returned. One experiment in Toronto saw 80% returned, despite just 25% of locals trusting a stranger to return their lost wallet (Helliwell & Wang, 2011, p. 55). A larger study (17,000 wallets, across 40 countries) found New Zealand to be one of the most honest countries in the world, with roughly

80% of wallets with cash returned (beaten only by Sweden and Denmark) (Cohn et al., 2019, p. 1).

The aspects regarding fear of crime materialise in a suburban paradox (figure 038) Families move to the suburbs seeking safer environments to bring up children (Buckenberger, 2012, p. 85; Gjerde et al., 2016, p. 131; Montgomery, 2013, p. 60), while increasing automobile dependency by moving further from amenities and places of work. Increased traffic as a result makes the road a place of noise, pollution, and potentially dangerous traffic, meaning that the play and socialising that historically took place in the street is moved onto the private land surrounding the home (Vale & Khajehzadeh, 2016, p. 2).

“It does not take many incidents of violence on a city street, or in a city district, to make people fear the streets. And when they fear them, they use them less, which makes the streets still more unsafe.” (J. Jacobs, 1961, p. 40)

Using the observations of Jacobs, supported by studies that link fear of crime to a reduction in time spent walking within a resident’s neighbourhood (Deka et al., 2018; Foster et al., 2014, pp. 161–

Figure 038. Paradox of safety in suburbia

163), and the suggestions of Gehl (2010, p. 98), it becomes clear that architecture and urban design can play a part in increasing perceptions of (and actual) safety through increasing the numbers of people in public areas, and creating a connection between private interiors and public external spaces. This is essentially ‘eyes on the street’ (J. Jacobs, 1961, p. 45), which Dovey equates to the common principle of ‘safety in numbers’ (2016, p. 46).

Many of these elements are encompassed in

CPTED (crime prevention through environmental design) – a technique used by urban planners and architects to design out opportunities to commit crime (such as dark, hidden corners), that has been recognised by the New Zealand Ministry of Justice (2005, p. 5), and the Christchurch City Council through its district plan (Christchurch District Plan, n.d., sec. 14.15.1-h).

The Social Field of Vision

Given Jan Gehl’s recommendation of designing

in order of “life, space, buildings” (Gehl, 2010, p. 198) it is important to mention one key aspect of this. Gehl outlines the ‘social field of vision’ as a way of quantifying sizes of public space relative to the human senses, the most important being 100 metres – from which humans can begin to observe; and 25 metres – where humans can begin to perceive detail and communicate (full communication and detail can be attained from 7.5m). He notes that traditional European squares are infrequently larger than 100m in any direction, and the opportunity to observe urban life is what makes people stay (2010, pp. 33–38). These dimensions are important to consider when creating open public spaces, and connections between the home and street. The latter are particularly important regarding privacy – but also in ensuring interaction between the home and street are possible.

Gehl notes in the final sections of his book Cities for People, that studies in Christchurch and Wellington have made up part of a growing body of knowledge on what encompasses city life (2010, p. 210), hence the importance of taking heed of his recommendations.

Designing for Community

“The most important psychological effect of the city is the way in which it moderates our relationships with other people” – (Montgomery, 2013, p. 37).

Buckenberger found that residents of a low-density Auckland suburb perceived community to be formed by proximity to shops, schools, and nature (2012, p. 84). These perceptions align with the idea that unplanned, random social encounters

(which can only happen in public space) facilitate community building (Gehl, 2010, p. 148), and that these encounters are increased when amenities are made accessible by active transport means and through intensification (Gjerde et al., 2016, p. 129; Lund, 2003, pp. 426–427). Alan B. Jacobs perhaps summarises this best in stating that “streets with many people living along them or near them are more likely to have people on them than those that do not” while explaining the importance of density in community-oriented streets (A. B. Jacobs, 1993, p. 304).

Montgomery (2013, p. 168) refers to a study by Appleyard and Lintell (1972, p. 92) that found residents on streets with low traffic volumes had 3.0 friends per person on the block, and 6.3 acquaintances. On a near identical urban block with heavy traffic, residents had just 0.9 friends per person on block, and just 3.1 acquaintances.

These show that in reducing traffic, providing amenities to support active transport, and increasing density, architecture and urban design/ planning have the ability to influence the quality of community amidst neighbourhoods. The research results demonstrate the strong interdependence within key elements of urban design, as community relies heavily on accessibility, which is also dependent on perceptions of safety.

Precedents

Several neighbourhood precedents were used to analyse international and national examples of best-practice MDH, and local examples that can offer some insight into standard MDH in Christchurch.

Meso-Scale Principles

Used to inform design of neighbourhood masterplan.

Accessibility/Connectivity	The neighbourhood must provide adequate opportunity for residents to effortlessly and conveniently travel around the city without relying on private motor vehicles.
Integrated	The neighbourhood should engage with and enhance existing urban morphology [based off of recommendations by Bentley et al. (2005, p.16)].
Walkable	Residential areas are home to humans first, and should reflect that. Cars are guests.
Community	The conceptual design should provide the setting to build a community.
Amenity	Adequate amenity needs to be provided within a 10 - minute walk of homes.

Figure 039. Home in The Waterfront Seatoun.

Awatea Green, Ōtautahi-Christchurch, Aotearoa-New Zealand.

When	2016-2018 (Fletcher Building Limited, 2016)
Number of Dwellings	~139
Average Density	~Total = 12/ha; urban block = 34.75/ha
Area	~11.3ha
Primary Developer(s)	Fletcher Living
Site	Greenfield
Price Range	Low-Medium

Awatea Green is a MDH subdivision near Wigram in Christchurch New Zealand. This case study focuses on stage 1, as stage 2 is separate, with the two being dissected by the Southern Motorway.

Having spent time living within the terraced homes, Awatea Green has become a personal driver towards this thesis. Notably the terraced homes have a strong connection between living spaces and the street, which has facilitated conversations with passing neighbours (random social interactions) on numerous occasions. The functional layout of the terraced home is spacious, and a single garage accessed via a laneway provides secure parking (some homes have double garages, others designated off-street carparks).

Lack of foresight in the Meso-Scale has seen parked vehicles block the road, vehicles parked over footpaths and berms, front lawns used as parking spaces, and regular complaints from the community. The City Council has been tasked with repairing the situation, including marking white lines for parking bays in 2020. Given the age of this development the problems raised highlight

planning that does not benefit the longevity and functionality of the development.

The external design of the terraced homes is somewhat monolithic and has the bare minimum variation in form – notably Hobsonville Point (an Auckland-based precedent) has several terraced homes similar in appearance, suggesting the designs may be standardised. This becomes a moral dilemma when considering that the less aesthetically pleasing designs are also more affordable, raising questions as to whether bland designs are a beneficial trade-off for affordability.

The suburb is not within 10-minutes’ walk of any amenities except the park (which functions to offset the reduced land sizes, and for stormwater). The Wigram Skies Town Centre (separate, large development by Ngāi Tahu Property) is 20 minutes walk, and requires crossing a busy road, with part of the route missing any footpath entirely. However, there is a yet-unknown commercial development occurring on the Corner of Awatea and Carrs Roads, and a number of years after Awatea Green’s completion the road is being

upgraded. A separated cycle-route runs parallel to the Southern Motorway (on a shared path) into the CBD, although at over 9km to Cathedral Square it is longer than the acceptable 7.5km cycle commute (Fruianu & de Munck, 2007, p. 34). Awatea Green is a MDH development with high car dependency, saved by excess parkland

and good internal layouts (at least in the terraces). This raises a question as to whether MDH can be considered a contributor to urban sprawl while essentially functioning the same as suburbia, just on smaller sections.

Figure 040. Homes surrounding a reserve in Awatea Green.

Figure 041. Row of terraced homes.

Figure 042. Awatea Green site plan.

100m

Maps Data: Maxar Technologies. (©2020). [Satelite Imagery]. Google Earth.

Figure 043. Awatea Green features smaller stand-alone properties.

Figure 045. Terraced homes have an extensive outlook over a public reserve.

Figure 044. Most terraced homes front public green-space.

Figure 046. Rear-access laneway of terraced homes.

The Waterfront Seatoun, Te Whanganui-a-Tara - Wellington, Aotearoa-New Zealand.

When	2002
Number of Dwellings	58*
Average Area	Total = 16.6/ha*; Courtyard homes = 30/ha (Auckland Design Manual, n.d., p. 3)
Primary Developer(s)	Globe Holdings Limited, Studio Pacific Architecture
Site	Brownfield
Price Range	Expensive

The Waterfront, a small subdivision located in Seatoun on Wellington’s Mirimar Peninsula, is a nationally award-winning development encompassing MDH and larger semi-detached and stand-alone single-family units. The development sought to extend “Seatoun’s pohutakawa-lined grid” instead of “developing a new maze of cul-de-sacs” (Studio Pacific Architecture, n.d.).

Figure 047. Homes are partially hidden from a public waterfront walkway.

The development is built on ex-Defence Force land along the coast, and encompasses connections to the coastal walkway. A number of the streets within the development are shared spaces, and only in a few areas are carparking spaces designated.

Figure 048. Townhouses along a shared-space street. Figure 049. The Waterfront features expensive single-family housing.

Figure 050. Design language of this section of laneway subtly defines driving space.

Hobsonville Point, Tāmaki Makaurau-Auckland, Aotearoa-New Zealand.

When	2007-present (2024 target)
Number of Dwellings	4,500
Average Density	Total = 26.9/ha; minus 24ha of parkland & open spaces = 31.5/ha*
Area	167ha
Primary Developer(s)	Hobsonville Land Company (NZ Govt Owned), Panuku (Auckland City Council Owned); Private developers including: Fletcher Living, Winton, Willis Bond & Co, Classic Group, and AVJennings
Site	Greenfield
Price Range	20% Affordable-expensive

Hobsonville Point is the largest master-planned residential development in New Zealand, with a targeted aim of 4,500 homes. The development uses design guides to dictate building form, materiality, street frontage details, landscaping, street-dwelling interfaces, and unique buildings on corners (E. J. Haarhoff et al., 2019, pp. 11–23).

Hobsonville point is roughly a 23km drive from Auckland’s CBD, with a ferry connection as an alternative. Much of the streetscape is dominated by driveways which are often spaced in a way that limits on-street parking. Many housing typologies are monolithic (joined, using similar form and materials). There are however a number of less-monolithic designs, although they are often repeated adjacent to each other with minimal

change to materials. This limits the architectural diversity of the neighbourhood, and the ability for individuality to be expressed by owners. It is important to note that over 20% of Hobsonville Point homes are ‘affordable’ (E. J. Haarhoff et al., 2019, p. 110), and hence would be significantly more constrained by cost.

As Hobsonivlle Point is broken up into separate ‘precincts’ (or neighbourhoods), it has a number of unique design codes. Perhaps more ‘traditional’ (at least for a New Zealand context) than the code of Borneo Sporenburg, the design guidelines for the Sunderland Precinct alone is 53 pages long, and part of a wider 133 page Comprehensive Development Plan (isthmus konstrukt JV & Hobsonville Land Company, 2013).

Figure 052.Higher-end townhomes.

Figure 053. Townhomes similar in appearance to Awatea Green.

Figure 054. Townhomes with tandem-garages.

Figure 055. Hobsonville Point site plan.

100m

Maps Data: Maxar Technologies. (©2020). [Satellite Imagery]. Google Earth.

Accordia, Cambridge, England.

When	2002-2006
Number of Dwellings	Nearly 400
Average Density	40/ha total, 65/ha urban blocks
Area	9.5ha
Primary Developer(s)	Feilden Clegg Bradley Studios (Masterplan & Architecture); Grant Associates (Landscape Architect); Maccreanor Lavington (Architects); Alison Brooks Architects
Site	Brownfield
Price Range	Affordable-Expensive

Accordia is a multi-award winning medium/high density residential development built on a brownfield site in Cambridge, England. Cousins cites Ellis Woodman as stating “Accordia was the first British version of ‘exemplary housing projects that have been built on the edge of Dutch cities’” (2009, p. 132). Accordia was a collaboration between Cambridge City Council, and three

architecture firms (Feilden Clegg Bradley, Maccreanor Lavington, Alison Brooks), which is important as it ensures a diverse architectural aesthetic, a technique also used in Hobsonville Point (E. J. Haarhoff et al., 2019, p. 112) and Amsterdam’s Eastern Harbour District (Cousins, 2009, p. 27). Of note, in all three developments the masterplan provided strict design guidelines for

Figure 056. (above)
Main street of
Accordia.

Figure 057. (Left):
Apartments and
terraced homes front
a public lawn.

Figure 058.
(right) Courtyard
terraced homes.

the architects to ensure a degree of coherence within the developments.

Materials in Accordia were limited to brick, copper, and wood. Architect Keith Bradley noted an overlap of macro (urban and landscape) and micro (house) components “created a strong dialogue between the internal organisation of the

homes and the spatial relationships with the site” (Drew & Richards, 2009, p. 18), helping to provide a real-world basis for the integrated-scale design approach recommended by numerous sources as mentioned in the methodology section of this thesis.

Figure 059. Accordia site plan.

50m

Maps Data: Google. (©2020). [Satellite Imagery]. Google Earth.

Borneo Sporenburg, Amsterdam, The Netherlands.

When	1997 – 2002
Number of Dwellings	2,500
Average Density	~100/ha
Area	23.4ha
Primary Developer(s)	West-8 Urban Design & Landscape Architecture;
Site	Brownfield

Borneo-Sporenburg is a redevelopment of an industrial harbour into residential districts, comprised of primarily large-scale apartment/ townhouse blocks, but also 60 terraced houses which were sold to be developed individually (Cousins, 2009, pp. 25–31; Smith, 2007). Architects were given a simple design code:

- “houses should all have a front door on the street
- a flat roof
- the same height at the eaves
- no construction of more than three storeys
- the first of which must be 3.5 metres high
- despite the absence of space for gardens, the houses must have their own outdoor space, integrated into the dwelling in the form of a patio, roof terrace or loggia
- because of the density of the area, dwellings must be built with a compact, private outdoor space and considerable privacy
- attention had to be devoted to the ‘roof-landscape’ in order to make the neighbourhood interesting from the three high rise blocks
- a limited number of materials from which the houses could be built
- to create a varied street scene the dwellings in the neighbourhood should be designed by a diversity of

architects, from 4 to 100 dwellings” (Smith, 2007, p. 31).

The material palette for the entire development was:

- “Dark red mixed brick
- Oregon pine & Western Red Cedar
- Steel lattice gates
- Robust materials to make sturdy buildings, with connections to the old maritime architecture” (2007, p. 32).

Six architects designed 100 homes to test the design aspirations, before one urban planner, one landscape architect, and one architect generated concepts for 600 houses. The outcomes from this process informed the design code (Smith, 2007, p. 31).

A design code as simple as this allows for designers to interpret the meanings in different, creative ways, with minimal restrictions on form. The code itself has been used to provide a degree of conformity without excessively restricting,or over-complicating, designers.

Figure 060. Individually designed canal houses in Borneo Sporenburg.

Figure 061. Borneo Sporenburg still retains vehicle access. Close proximity of tall homes inevitably causes shading.

Figure 062. Much of Borneo Sporenburg features complexes of apartments as opposed to singular canal homes.

Figure 063. Borneo Sporenburg site plan.

100m

Maps Data: Google. (©2020). [Satellite Imagery]. Google Earth.

Initial Concepts

Initial concept exploration gave 3 separate MDH neighbourhood typologies – primarily based on facilitation of privately owned vehicles which from the outset of the design process has been an important consideration. These are neighbourhoods designed with rear-access laneways (similar to Awatea Green and parts of Hobsonville Point), exclusively on-street parking (as you would find in traditional urban environments), and a design where private vehicles are banned, with parking provided on the periphery (this originally was based off of Eva-Lanxmeer in Culemborg, The Netherlands, although as it was discounted early on Eva-Lanxmeer was not explored as a full case-study).

The laneways option (figure 064) – being one that I have had experience in – offers the complete removal of vehicle access from the main streets, which has the potential to increase pedestrian friendly elements and focus on aesthetics. However, on evaluation, laneways that function only as vehicle access work against the principle of eyes on the street and CPTED, and take a considerable amount of space that could otherwise make up public or private green-space. I am also aiming to avoid designing areas exclusively for motor-vehicles, so decided not to continue with the laneway typology.

The on-street parking typology (figures 065, 066) reflects traditional urban environments, those where eyes on the street were more common, and allows more space to be used for green space or housing. It also discourages car ownership by making parking harder, although that would realistically be despised by many Cantabrians. Parked cars also work to subconsciously signal that the street is the exclusive domain of the vehicle, and they become unwelcoming to pedestrians.

Figure 064. (top) initial concept sketch of a laneway-based masterplan.

Figure 065. (Centre) links to the existing urban morphology were used to influence road placement.

Figure 066. (Bottom) on-street car parking masterplan concept.

The car-free concept (figure 067) relegates vehicles to the peripheral of the site in a similar manner to the Dutch eco-community Eva-Lanxmeer (figures 068, 069). Eva-Lanxmeer is an extreme example of urban planning, designed to have no impact on an ecologically sensitive site. However, again the need for private vehicles in certain situations within Christchurch is something unavoidable – Eva-Lanxmeer works well as residents can access amenities within Culemborg conveniently without vehicles, and a nearby railway station allows for fast inter-city travel. Christchurch does not yet offer comparable infrastructure.

Figure 067. Car-free concept incorporates green space which is also used to ring a town centre linked to the existing commercial area north of the site.

Figure 068. (below) townhouses of Eva-Lanxmeer sit on an ecologically sensitive site.

Figure 069. (below right): single-family housing in Eva-Lanxmeer.

Final Design Concept

Following the initial concept designs, a masterplan with greater detail (to scale) was created, taking heed of the *social field of vision* dimensions as drivers, and the dimensions of the terraced home in Awatea green as a guide (something I can personally visualise). The masterplan incorporates a mix of on-street carparking and off-street to minimise CPTED issues that can arise through parking dominated areas (Sharpin, 2006, p. 6), and ideally facilitate streets used by multiple modes of transport.

For more practical measures Auckland Transport suggests lane widths of 3m (in slower streets) and parking widths of 2.1m (2020, p. 130). Most roads were sized at 10m, 3+3m driving/parking and 2+2m green space either side. Arterial roads no further than 800m apart for vehicle traffic are recommended (from which point more lanes are required) (2020, p. 45). The Auckland Transport resources available are recent and very thorough, hence choosing to use them over what is available from Christchurch-specific sources. The same is true for the Auckland Design Manual (Auckland Council, n.d.), which is used in later design stages.

Layout

The site is constrained by rail, and the national power grid (figure 070). Both can theoretically be put underground to free up space to improve visual and physical integration

1. Site and restrictions

Figure 070.

2. Permeability

Figure 071.

3. Green Spine

Figure 072.

with surrounding areas (rail running underneath to allow life to continue un-impeded above is an element partly inspired by the infrastructure of Best and Delft in The Netherlands). Road layout was informed primarily by linking existing roads and wide driveways on either side of the site (figure 071), with green space defined by the form of existing rail sidings (to provide historical reference), and the location of the existing wetland (figures 072, 073). Secondary roads were added (figure 075) where needed to ensure walkable blocks (in turn encouraging active transport), with Bentley et al. suggesting block sizes of 80-90m (2005, p. 75), and Auckland Transport not providing specific dimensions, but recommending smaller sizes as better (2020, p. 47). Jan Gehl describes the need for smaller blocks as a psychological problem, where longer blocks offer one singular 'vista', tiring the pedestrian before they even begin (Gehl, 2010, p. 127).

Blocks were sized initially to match some from local MDH examples; Hobsonville Point (100x60m & 120x50m), and Seatoun (90x36m & 70x30m). This was further reduced when I began to introduce dimensions of sections to further refine the site (24x7.5m, based off Awatea green – not including the rear laneway), resulting in final concept block sizes of roughly 90x48m, with some larger blocks reaching 130x48m. The sections were orientated north-south (figure 076), and leftover space created where angles changed was designated as green space to increase resident interaction with nature.

4. Green areas

Figure 073.

5. Roads part 1

Figure 074.

6. Roads part 2

Figure 075.

9. Re-align roads

Figure 078.

8. Define sections for site

Figure 077.

7. Sections

Figure 076.

Final design concept

Figure 079.

MORPHOLOGICAL SCALE MICRO; STREET, AND HOME

The Micro morphological scale places more importance on the architecture of the neighbourhood. This segment is split into two main sections:

- The Street: a conceptual re-imagining of the suburban street to better address MDH typologies. Particularly by prioritising people and reclaiming lost living space for a community of higher density, while facilitating car ownership as to not disadvantage residents.
- The Home: conceptual designs of housing at the lower end of MDH integrated with the street scale concept and used to inform a design framework.

The resulting concept will complete the first design stage and provide an initial suggestion on how MDH can be used to create a functional, high-quality urban environment to benefit and take advantage of Ōtautahi-Christchurch.

Parking

One of the many contentious issues associated with density in Christchurch is parking. People in Christchurch are passionate about and opposed to removing car parks. Canterbury has the third highest rate of car ownership per capita in New Zealand (to Nelson-Tasman-Marlborough and Southland) (Figure 080). However given the cost of a parking space in Central Christchurch (\$30k-\$70k each (Osborne, 2020)), and

the desire for a pedestrian-friendly CBD, the peripheral inner-city suburbs must work to facilitate a new direction in urban life. The central city has changed, and the suburbs must change to reflect it.

To improve the desirability of MDH in the city some parking must still be provided so those inhabiting the homes have access to the entire city, not only the meagre offering that would be conveniently accessible by means of active

Figure 080. Vehicle ownership per capita by region (Ministry of Transport-Te Manatū Waka, 2019).

transport. This is echoed by results from a survey of residents of Hobsonville Point, where 42% of respondents were 'highly dissatisfied' with parking, becoming an issue for one car-free respondent when it affected resale values of a property without parking. Residents who had garaging, or an off-street park did not have issues (E. J. Haarhoff et al., 2019, p. 51).

Eventually when more people live in denser areas, facilities may be adequate for the desire (or in many cases the requirement) to drive, to dissipate. However, until that moment, banishing the car from MDH continues to alienate/anger many Cantabrians. The car is a symbol of freedom, to go where you want when you want, and the alternative options (public or active transport) do not offer the same convenience or safety.

Soft Edges

Jan Gehl's concept of 'soft edges' (also known as 'active edges') (2010, p. 75) is one way to create more social and active urban environments, typically through ensuring a ground floor

engages with the street/footpath by retaining an element of permeability, through the likes of a shop window, or café. The importance of clear definition between public and private space is noted by many authors (Dovey, 2016, p. 57; J. Jacobs, 1961, p. 45). Soft edges are also applicable to residential zones, where Gehl suggests front gardens and 'stoops' – although the latter has never been commonplace in Christchurch – (Gehl, 2010, p. 82). Many modern suburban subdivisions in New Zealand acknowledge this by covenanting that front yards must not be fenced (Dastgheib, 2020), although the effectiveness of this is perhaps reduced considering infrequency of walking as a mode of transport, and a trend of living spaces oriented towards private rear yards. This transition zone for residential environments facilitates the opportunity for screening, through low fencing and/or hedging/planting to provide a sense of privacy, while not totally isolating a home from neighbours and the community. This method has been used well in the terraced housing of Awatea Green, in Accordia when homes back onto public green space, and to varying degrees of success in Hobsonville Point.

Figure 081. Soft edge treatments – such as a window – invite interaction. Hard edges repel.

Micro Design-Phase: The Street

Designing a streetscape to enhance the lives of those who live on it is increasingly important at higher densities, where private outdoor space is reduced. The land used by a street offers the opportunity to offset this. As discussed, the street and how it is used has significant effect on perceptions of safety, community, accessibility and privacy. Streetscapes designed for lower densities do not adequately address MDH lifestyles, and therefore should not be used for MDH neighbourhoods.

The Role of The Street

Internationally society has seemingly forgotten historic purposes and uses of streets. Prior to the domination of the automobile, which reduced the safety of streets, they were used as play spaces, parks and markets additional to their uses as transport corridors (Gehl, 2011, p. 45; Montgomery, 2013, p. 69; Vale & Khajehzadeh, 2016, p. 2).

The first street can be dated to between 7,000-3,000BC in Cyprus (Lydon & Garcia, 2015, p. 26), meaning the concept of the street has existed for at least 5000 years. The motor-vehicle however, a recent invention, only became dominant in the streetscape by around 1960 (registered cars in New Zealand doubled between 1950 and 1959). Despite strong and wide-spread anti-vehicle attitudes at the beginning of the 20th century, Kiwis embraced the motor car (The Kennett Brothers, 2004, pp. 35 & 40).

The notion of streets being near exclusively for motor-vehicles has now existed for roughly 60 years, despite the concept of the street existing for between 83 to 150 times longer. 60 years however, is long enough for multiple generations to never experience life in any other way (some of the younger Baby Boomers, all of Gen-X, Millennials, and Gen-Z (Dimock, 2019)). Altering how we use the street is not a new or innovative method, unless you ignore over 5,000 years of human history.

Walkability and Architecture

The benefits from active transport infrastructure, and the need for walkable neighbourhoods have already been discussed. However yet to be discussed is the ways in which the micro-scale can address this. Gehl mentions a psychological issue he terms “*the tiring length perspective*”. Put simply long distances with reduced detail make walks boring before they have begun (figure 082). A winding road constantly opens new vistas, and roads with higher levels of detail (narrow, frequent facades) make walks seem shorter, as the pedestrian is constantly observing new elements (figure 083). Taller buildings, or those that have strong visual verticality enhance this by providing even more detail (Gehl, 2010, pp. 199–133).

Privacy

Privacy is viewed as an important factor in a neighbourhood by 86.5% of Christchurch residents (Kusumastuti & Nicholson, 2018, p.

Figure 082. ‘long’ facades with little detail are detrimental to walkability, Porirua, New-Zealand.

Figure 083. Frequent, narrow facades express verticality in Delft, The Netherlands.

2694), and the importance is only enhanced when people are placed into closer quarters in MDH neighbourhoods, where it becomes an essential amenity (Gjerde et al., 2016, p. 131). Bryson’s survey concludes that Kiwis may be willing to embrace MDH given key focus on safety and privacy (2017, p. 24). Most important to the Micro-House Scale, the street plays a significant role in how successful this can be. Before the onset of the motor car streets functioned as play spaces – a use now served by the backyard. If streets are made safer, and the homes designed carefully with regards to privacy, residents stand to gain significantly more outdoor living space.

Precedents

Precedents were chosen primarily due to their difference to the traditional suburban street norms of Ōtautahi-Christchurch (figures 084, 085). The applications used for each precedent range from suburban, suburban/rural and urban, providing a wider array of typologies to explore.

Micro-Street Scale Principles:

Streets for living:	The street should work to offset the reduced living space that accompanies MDH
Streets for nature:	Daily exposure to nature is important for a healthy life (Montgomery, 2013, p. 113).
Safety/eyes on the street:	To improve perceptions of safety, minimise hidden areas, maximise relationship with the private realms (CPTED).
Accessibility:	Walking and cycling are more important at higher densities and contribute to community building (Gjerde et al., 2016, p. 129; Lund, 2003, pp. 426–427). The architecture of an area plays a part in walkability (Gehl, 2010, pp. 199–133).
Privacy:	Clearly define the transition between public and private spaces – preferably with semi-private front living spaces (gardens/porches etc).

Figure 084. Tika Street in Riccarton represents a standard, wide suburban Christchurch street.

Figure 085. Centennial Street represents a slightly narrower suburban street in Ōtautahi.

Figure 086. Westerstraat plan.

Precedent

Woonerf (Westerstraat, Delft, ZH)

First developed in the 1960s the woonerf (plural ‘woornerven’) is a residential street where people who are not in cars are given priority over those who are. The woonerf was created in Delft when residents began to tear up segments of pavement at night, forcing cars to slow down while navigating the obstacles (Lydon & Garcia, 2015, p. 28). A woonerf (or ‘living street’ in Dutch) is considered to be “an extension of the living room,” speeds are limited to 15km/h (Bruntlett & Bruntlett, 2018, p. 69).

The example used (Westerstraat in Delft) is a traditional, narrow Dutch lane. The road is only defined in segments, with very low kerbs. At intersections and on chicanes there are no road markings or kerbs, helping to signal to the driver that they are tolerated, not embraced. The drivers’ direction of travel is suggested by the placement of street furniture, bollards, and temporary interventions such as parked bicycles. Due to the lack of space, the road is the only area in which people could feasibly walk or cycle, the fringe areas of the road are occupied by pot plants and parked bicycles.

Figure 087. Westerstraat, Delft.

Figure 088. Westersraat sections.

Figure 089. 2nd N/W Avenue Plan.

Precedent

2nd Avenue North West, Seattle, WA

Designed to improve drainage the Street Edge Alternatives Project (SEA) reduced impervious surfaces of the street by 11% (City of Seattle, n.d.). The street retains automobile priority, focusing on environmental outcomes instead, with swales instead of traditional drainage and almost every millimetre of ground not used being given to gardens. The shallow chicanes

and narrowed road will slow traffic slightly. While maintaining the overall corridor of a traditional street it provides the potential for a more fluid relationship between the public and private realms as the flora filled street edge becomes the buffer zone, almost negating the need for fencing. While the SEA project contrasts heavily to traditional street design, it is still retaining the notions of a traditional street in which cars have priority.

Figure 090. SEA project Seattle.

Figure 091. 2nd Avenue N/W sections.

Figure 092. Oxford Terrace plan.

Precedent

Oxford Terrace, Christchurch

Designed as part of the Avon/Ōtākaro river promenade, Oxford Terrace is a shared space with priority for pedestrians among an urban environment, replacing a 2-lane 1-way road. Swales, lawns and permanent street furniture separate the areas vehicles are allowed from those they are not. Textured tiles, and shallow gutters draining into

the swales assist in optically narrowing the roadway and defining parking spaces. The entire road is on a flat gradient to enforce the shared space ideals. A lack of pinch points between car parks could sub-consciously signal to drivers that it is safe to drive faster than allowed, and vehicles occasionally park over driveways as the materials used to denote parking spaces continue over accessways and lack clear marking for where parking is allowed.

Figure 093. Swales separate a large footpath from shared space.

Figure 094. Oxford Terrace sections.

Figure 095. Materiality is used to delineate zones instead of curbs.

Figure 096. Seating provided next to a garden and lawn, this used to be 2 lanes of traffic.

Figure 097. Pedestrians and cyclists still stick to the footpath next to the river.

Design Concepts

Design concepts for the Micro-Street morphological scale took inspiration from a number of different elements from the case studies, although functionally take strong inspiration from the chicanes of the woonerven (which Gehl praised as a “very acceptable alternative” to full pedestrianisation (2011, p. 111)), and aesthetically the modern design language of Oxford Terrace. The concepts were sketched to a rough scale, designing for the 85th percentile car as suggested by Auckland Transport (2020, p. 119).

The concepts attempt to balance parking and play space, creating obstacles that drivers must navigate around slowly to minimise rat-running, and provide access for residents. Designing to allow rubbish trucks proved a hindrance, as they require wider streets and shallower chicanes than cars, potentially increasing vehicle speeds. This differs to the woonerven as it is common in the Netherlands to have municipal rubbish bins on the ends of streets, allowing for collection to occur whenever they fill up (as opposed to on a specified rubbish day). Many of these traditional lanes are too narrow for rubbish trucks (some too narrow for vehicles entirely) making municipal rubbish bins the only option. This is obviously not realistic for Ōtautahi-Christchurch as it would require an entirely new rubbish collection system for just one suburb.

Iteration 1 & 2

Iteration 1 was the first rough sketch. Scale was not considered well however, and subsequently I introduced the dimensions of the 85th percentile car (4888x1874mm) and a rear-steered rubbish truck (10300mm long (Auckland Transport, 2020, p. 119), I guesstimated 2500mm wide) and explored various layouts within a 10m street corridor.

Figure 098. Iteration 1

Figure 099. (far right) for iteration 2 vehicles to scale within street corridor.

Transport (2020, 119)

Figure 100.

Iteration 3

Iteration 3 explored a shallow chicane, resulting in 6 on-street spaces for 14 sections, along with 8 driveway spaces (only provided opposite parallel parking segments). Structural grass is proposed to be used in the driveways to reduce the visual impact of impermeable surfaces. The main driving space is envisaged as a shared space, although footpath space is provided behind parked cars.

Figure 101.

Iteration 4

This iteration reduced footpath widths to a bare minimum, but on both sides of the street, and sought to maximise the space given to swales/gardens, in one area including a lawn to provide usable green space for residents.

Figure 102.

Iteration 5

Iteration 5 began a more concerted attempt to replicate a woonerf, with the road mirrored along a centreline to force sharper turns. I also considered whether grass on either side of the chicane could be used to facilitate vehicles with larger turning radiuses.

Figure 103.

Iteration 6

Iteration 6 explored a blurring of the public/private realms by making garden space private. This would also remove swales and hence require traditional street drainage, and individuals may not wish to maintain or plant the native gardens envisaged for the micro-street scale. Because of these two factors iteration 6 was not developed.

Figure 104.

Iteration 7

Iteration 7 aimed to calculate a carpark-house ratio considering the cross-streets, as the existing 1.0 spaces per home is very low considering car ownership rates in Ōtautahi. With the cross-street carparks the total came to 1.16 carparks per home, still not enough. Changing off-street carparks to tandem carparks increased this to 1.9 spaces per home. The cross-street was designed without

9% of this block
(180m² x 24 = 4320m²)
9% = 388.8m²
= 31.86 spaces to CCC minimum
↑
About what is currently included
↳ slightly more included (~33)

Micro Design-Phase: The House

The micro-house morphological scale aims to generate conceptual house designs to maximise the relationship with the street, while retaining the all-important element of privacy. To ensure the suitability of the concepts for the scope of this thesis, the designs will be used to inform a design framework detailing the most integral elements of how the homes work with the street (and subsequently function within the neighbourhood). This framework will theoretically allow other designers to create their own designs, interpreting the framework as they wish, setting the foundation for a coherent neighbourhood aesthetic, while allowing for creative/individual flair.

Figure 105. Interaction of the public & private realms.

Micro-House Scale Principles:

Light	Homes should maximise exposure to natural light (Gjerde et al., 2016, p. 138).
Privacy & Community	Boundaries between public/semi-public/private spaces should be clearly delineated, while providing a connection between the public and private realms.(Gehl, 2010, p. 103)
Diversity	Homes should have an interesting design aesthetic and avoid appearing monolithic. They should respond to neighbouring buildings as to not duplicate similar designs. Still, a level of coherence is necessary to create a sense of place identity.
Space:	homes should aim to enhance perceptions of space to offset smaller plot sizes (Alexander et al., 1977, p. 537).
Longevity	Provide for future needs, including one in which Christchurch may rely less on the private vehicle.

Page 127 & 128, clockwise from top left;
Figure 106. Courtyard homes are on the right;
Figure 107. Homes viewed from the common;
Figure 108. Second floor plan;
Figure 109. First floor plan;
Figure 110. Ground floor plan.

Four Bedroom Courtyard-House, Feilden Clegg Bradley Studios, Accordia.

Section Size	9 x 18m
Floor Area	200m
Bedroom(s)	4
Bathroom(s)	2.5
Living Room(s)	2
Outdoor Area	125m
Carpark(s)	1

1m

The courtyard homes designed by Feilden Clegg Bradley (FCB) form part of a 3-level terrace with rear-access laneways and communal front gardens (Drew & Richards, 2009, p. 48). The communal gardens assist in offsetting the lack of private gardens. Courtyard parking provides secure, flexible space that can be used as additional living space if residents do not own a vehicle.

Three Bedroom Courtyard-House, Feilden Clegg Bradley Studios, Accordia.

Section Size	8 x 12.8m
Floor Area	134m ²
Bedroom(s)	3
Bathroom(s)	2.5
Living Room(s)	2
Outdoor Area	85m ²
Carpark(s)	1

The three-bedroom courtyard home is similar to the layout of the 4-bedroom design, with slightly reduced dimensions, most notably the loss of a second bedroom on the top floor. As pointed out by Drew & Richards, the second living room could easily function as a study or bedroom (2009, p. 51). The Accordia homes maximise use of the site by substituting a ground-level garden for multi-level terraces. This exact concept however may not fit the meso-scale masterplan which provides only one point of access (the street) with private rear gardens.

Figure 111. Ground floor plan.

Figure 112. (top left) the 3-bed courtyard homes are on the right side of the laneway.

Figure 113. (above) communal gardens between the terraces.

Figure 114. First floor plan.

Figure 115. Second floor plan.

Figure 116. (Right) Semi-private transitional space.

Figure 117. Terraced-homes in Awatea Green.

**Awatea Terraced-Homes,
DKO Architecture,
Awatea Green.**

Section Size	6.5 x 24.4m
Floor Area	150m ²
Bedroom(s)	3
Bathroom(s)	2.5
Living Room(s)	1
Outdoor Area	68m ²
Carpark(s)	1

As mentioned, this house is one I have spent time living in. While the Awatea Terraced house was built for affordability the layout is highly functional, particularly regarding the home’s connection with the street. This is mediated by a small patio and garden in front of the home, where hedging can be used to enhance privacy. The most private part of the downstairs – the living room – is furthest from the street, and partially obstructed by the kitchen and dining table. The location of the laundry/WC also provides a section of the living area completely invisible to the street where more expensive items like televisions can be hidden from view. The quiet street is a necessity for this to work. Orientated east/west the homes get both morning and evening sun, and the smaller footprint/ backyard is offset by a large reserve across the street.

Figure 118. Ground (left) and first floor plans. 2m

Design Concepts

The first concepts were sketched exploring where to include parking for a layout similar to the design of the Awatea Green case study (figure 118), with a focus on the connection between the public and private realms. Further iterations took influence from the courtyard houses of Accordia (figure 106-115) where detail was added and designs refined. The front courtyards are envisaged as a solution to parking, and particularly the principle of longevity. The courtyards can be re-purposed as additional outdoor living spaces if residents decide to sell one or more cars. As they are not garages, it is also unlikely residents would use the limited parking space as storage space as is common in Kiwi homes. This was raised as an issue contributing to parking problems in Hobsonville Point (E. J. Haarhoff et al., 2019, p. 51). Placing vehicles in courtyards “behind the line of the façade” as executed in Accordia (Drew & Richards, 2009, p. 28) additionally works to reduce the dominance parked vehicles can have on the streetscape.

The concepts consider Alexander et al.’s suggestion that longer/thinner buildings increase the perceived size of a home due to the longer distances between rooms (1977, p. 537). This addresses the principle of space, and removes the immediate need to alter the dimensions of the sections to include parking.

Figures 128 & 129 explored a single-bedroom, single-level typology.

Figure 121. 3-Bed stage-1

Figure 120. Concept-1.1.

Figure 119. Concept-1

Figure 122. 3-Bed stage-2

Figure 123. 3-Bed stage-4

Figure 124. 3-Bed final concept.

Figure 125. 2-Bed Stage-1 (this became 2-bedrooms due to space constraints).

Figure 126. 2-Bed Stage-2

Figure 127. 2-Bed Concept-1

Figure 128. 1-Bed Stage-1

Figure 129. 1-Bed Concept-1

Design Framework

Why use Design Frameworks?

A design framework aims to provide clarity, to allow a coherent development on a large scale, where designs are done by many different professionals. It is a way for stakeholders to control the outcome of a large project. Importantly for this thesis, a framework allows for a final concept that does not disregard factors that have made a number of the precedent studies successful. Most important is the use of multiple architects to generate a diverse architectural fabric, as was used in Borneo Sporenburg, Accordia, and Hobsonville Point, something that I cannot replicate on my own. Instead, analysis of the design concepts will be used to determine how requirements set out in a framework could require other designers to develop unique designs that retain coherence within the wider development, and above all, work to realise the key goals/principles of the neighbourhood. This method is very similar to the one used to generate the design framework for Borneo Sporenburg.

Result

The first framework was based somewhat off the design code for the Sunderland Precinct of Hobsonville Point (used as it is a local, recent example). Dimensions are from the initial design iterations. I began by prescribing as much detail as possible, on the elements I considered most important to the initial concept designs. In one sense this framework was a messy brainstorm/analysis of the first home concepts, and also included general ideas developed through basic 3d-massing for the central mixed-use core (this was included in the second design stage), and other apartment buildings that I quickly realised fell well outside the scope of this thesis. It did help generate the very rough higher-density areas within the 3D model.

On evaluation, and especially compared to the simplicity of the framework for Borneo-Sporenburg, I decided to simplify the framework as much as possible for later iterations.

Figure 130. Initial design framework.

	<i>Terraced/Semi-Detached With parking</i>	<i>Terraced/Semi Detached without parking</i>	<i>Mixed-use</i>	<i>Apartments</i>
<i>Description</i>	1-4 bedroom homes,	1-4 bedrooms	Commercial, office & apartments	1-3 bedrooms
<i>Number of Floors</i>	1-3*	1-3*	2-6 (lower heights limited on arterial)	2-6
<i>Porosity</i>	Living spaces must interact with front + rear outdoor areas		Active edges to footpaths. Ground floor unit access cannot be through common lobby – must be from street.	Ground floor units must have outdoor living spaces. Upper floors must have balconies (French acceptable with large living space).
<i>Boundary Setback Street</i>	1.5 min 2.5 max, living space required between house and street.		None allowed in Central arterials, no min, 2m max elsewhere.	Case by case basis.
<i>Continuous Frontage</i>	Required.	Permitted, not required.	Required in Central Quarters.	Permitted, not required.
<i>Vehicular Access</i>	2 off-street parks maximum, hidden from road and as small as possible. Garage doors of industrial appearance not permitted. Garage doors no wider than 3m.	On-street parking only. Provision must be provided for secure cycle storage. Moped/motorbike storage permitted if hidden from street.	Basement carpark allowed, entrance must not appear industrial, must be located on side st if one is available. Surface parking not permitted.	Basement carparking allowed, surface parking on street only (limited for short stays).
<i>Maximum Building Length</i>	17m	17m	N/A	N/A
<i>Minimum backyard depth</i>	6m	6m	4m & 45 degree recession plane bordering lower residential scales	N/A
<i>Fencing (front)</i>	Can be flora or man-made. If man-made garden must be provided on street-side of fence. Gates permitted if they are no higher than the fence/flora.		N/A	(Ground Floor units): same as Terraces
<i>Height Setbacks from facade</i>	45 degrees above 2 floors	45 degrees above 2 floors	45 degrees above 3 floors	45 degrees above 3 floors
<i>Materiality (General)</i>	All materials should be long lasting. Wherever possible eco-friendly materials are to be selected over over non-environmentally friendly products.			
<i>Materiality (Specifics)</i>	Use of industrial materials should be limited in residential areas to enforce notions of home environments		Buildings cannot be exclusively clad in glass, and should attempt to minimise reliance on active heating/cooling methods.	

*1 story buildings should be limited

Design Phase 1 Evaluation

The initial design explorations provide a conceptual foundation for this thesis. Suggestions to improve further from external reviewers included creating community ‘clusters’ – an exercise that is backed up in literature with the suggestion that neighbourhoods should be small (J. Jacobs, 1961, p. 131). Alexander et. al. recommends neighbourhoods are no larger than 500 people, and 300 yards (274m) in any direction, and that busy roads degrade neighbourhood identity and belonging (1977, p. 82); Gehl suggests thinking smaller, and mentions a Danish housing project with 15 homes per ‘social unit’. Orientated around squares or streets, the clusters benefit from communal space that can foster unplanned social interactions, which in turn fosters additional communal life (2011, p. 57). Designed correctly, I believe the woonruimte-inspired streets of the micro-scale could take up this function.

Further suggestions detailed how exploration of new typologies could include blurring the lines between public/private land ownership, however the aim of the thesis is to provide a higher-density alternative to suburbia, and many will still be seeking the comfort of privately held land – particularly in Christchurch where body corporates have been undesirable following the earthquakes. Inclusion of more apartments in the masterplan however is going to be important/relevant, particularly given the NPS-UD that was released around the time of this review.

The master plan as a concept creates bounds in a large site, although it misses inclusion of amenities and importantly does not identify a location for the railway station. The standard north/south orientation is also working against the recommended east/west orientation for terraced housing (Auckland City Council, n.d.).

Finally, the Micro-House scale has not been developed far in phase 1, requiring significantly more development and detail to meet the desired outcome of this thesis.

OXFORD TCE, CHRISTCHURCH

Figure 131. Original sketch-analysis for Oxford Terrace.

Design Phase 2

Design phase two aims to address the issues raised in the phase 1 evaluation and further build detail, particularly on the micro-house scale which was only considered roughly in phase 1. Phase 2 is somewhat the equivalent of a detailed concept stage before phase 3, the final design.

Morphological Scale Meso

The need to include amenities (including the railway station) and reorientate the sections to reflect the recommendations of the Auckland Design Manual (Auckland City Council, n.d.) were the main considerations raised in the evaluation. I also decided to include more 'greenways' (streets with wider shoulders for planting) to connect the north and south of the site (the east-west is served by the large green space for indigenous ecosystem rehabilitation) to meet the criteria regarding access to nature.

In addition, the micro-house morphological scale concepts were used in combination with massing to generate a conceptual 3-dimensional element to the master plan. This is important to properly design the framework and designate building form/size/height relative to the initial ideas. To

meet the requirements of the NPS-UD building heights were increased to 6 storeys to reflect its location in a tier one urban area, immediately next to (potential) mass transit. Surrounding taller buildings, densities and heights are tapered down to the lower buildings of the micro-house morphological scale to avoid conflicting typological scales.

Tiered setbacks above 3-storeys ensured higher density areas were less imposing. This follows the street-building height ratio suggested by the Auckland design manual (1:1 1:2 & 1:3) (Auckland Transport, 2020, p. 52) with the average ratio along the arterial route being roughly 1:2, and 1:1 in southern parts of the site where buildings are higher.

When tapering densities from highest to lowest it became sensible that duplexes should be included

Figure 133. phase 1 design

Figure 132. Phase 2 redesign.

as an in-between typology. These would further assist in creating a community with diverse housing options for a diverse range of demographics and price ranges. Alternative typologies to those explored in the micro-house morphological scale may not be suited to the strict section allocations that lower densities are, therefore in those areas the lots defined in the masterplan should only be used as a guide – which could increase the overall

density of the development. The thesis remains oriented towards the lower-density end of MDH however, so the inclusion of duplexes and similar will only be noted in the masterplan. Massing of the higher density areas was only updated once more in phase 3 as it falls outside the scope of work.

Figure 135. View of the 3d model over Matipo Street, towards Annex Road.

Figure 134. Greenways and other green connections across the phase 2 masterplan.

100m

Figure 136. Densities could be increased slightly where more open space is provided, with mixed to provide some amenity.

Figure 140. Tapering heights build up to the highest building, located on the southern side of the central area to minimise shading.

Figure 137. (Centre-left) application of the Micro-Street concept.

Figure 138. (Bottom-left): concept modeling of the central arterial.

Figure 139. Model viewed from Annex Road

Morphological Scale Micro-Street

As design phase two focused on updating the meso scale and adding a new level of detail to the micro-house scale, the micro-street scale was not updated outside of fitting it to the new masterplan.

Morphological Scale Micro-House

The second design phase began with the first floor plans for sections without carparks (figure 144, 146, 147), and further development of plans with carparks (figure 145). Detail in 3D, on top of the rough massing conducted for the meso scale was next. Given the micro-scale's scope one street was selected and homes along the street detailed to generate vague visualisations of the desired outcome for the thesis. Detail focused on the provision of windows, roof form, and other important exterior design variations.

Earlier iterations considered place identity, and the colonial-style architecture that is prominent in some Ōtautahi-Christchurch suburbs. I trialled massing forms (figure 141) to reflect some of them – although it was becoming tacky and I proceeded with the more modern styles instead (figures 142, 143).

Figure 141. Attempt to include colonial form.

Figure 142. Modern massing replacement.

Figure 143. Concept house massing.

Figure 144. (Cont. top left opposite page): development of an angled typology.

Figure 145. Development of carpark topology.

Figure 146. Development of a no-carpark typology.

Figure 147. Development of what becomes NCP1 (see Design-Phase-3).

Design Phase 2 Evaluation

On evaluation of the house designs, I began to analyse (using dimensions from the 3D working-model) shading of courtyards, and the privacy provided through relatively small backyards where two-storey buildings back onto each other. My main concern after another visit to the townhouse in Awatea Green, was that the sense of privacy I enjoyed about the development would not be present in my designs as the separation between buildings in Awatea Green is much larger (figure 148, 149). In Awatea this provides total privacy from neighbours looking into living spaces at the rear of the home. The backyards are not totally private from adjoining neighbours, although smaller windows on the second floor meant it never felt uncomfortable. In my concepts residents can effortlessly view into neighbouring living rooms from upper-floor windows, something that would make me personally uncomfortable.

A survey of Hobsonville Point residents by Haarhoff et al. is a valuable resource in understanding the meaning of privacy to those living in recent Kiwi MDH. Concerns raised were almost all about visual privacy as opposed to acoustic. Satisfaction with privacy within the home was 62%, with noise from neighbours at 61%, and privacy in external spaces at 57%. Haarhoff et al. note that some homes in Hobsonville Point have their main or only outdoor living space facing the street, an element critiqued in Christchurch MDH also (Christchurch City Council Urban Design Team, 2020, p. 21). These street living spaces have only ever been considered as secondary for this thesis, with the main outdoor living space provided in a private rear garden. Interestingly the decision to

place parking in front of the house, to allow for an uninterrupted backyard (as opposed to laneway access parking) was validated by the opinion of one Hobsonville Point resident, in commenting “it would be better to put the garages at the front and have a full back garden” (E. J. Haarhoff et al., 2019, p. 47).

As a result, I continued exploring the extent of privacy from rear-neighbours. I decided to settle on increasing the section size, with a 10m deep backyard (was 6m). I estimated that a 3m high fence (1m above standard) would block a 6ft (1.8m) tall person from viewing into a living room. Fences 3m high are however, unrealistic, and increasing the sections any more risks making overall density less than 30 homes per hectare. Strategic provision of foliage could provide adequate privacy, although the design framework may need to consider upper-floor window sizing too. The extra 38m² per section created because of the deeper backyard meant additional alterations to the Meso plan and signalled the start of design phase 3.

A smaller issue I noticed within the masterplan was the lack of separated active-transport infrastructure along the main arterial route through the centre of the site. Because the centre is not a focus area of this thesis, I chose not to update this due to time constraints. Separated active-transport routes along the central arterial would be a necessity to meet the accessibility principles as the arterial would be used by heavy vehicles, making the route unsafe and unpleasant for cyclists.

Figure 148. Backyard of an Awatea town-house.

Figure 149. Sketch of Awatea (below) and current concept (above)

Design Phase 3

The third and final design phase focused primarily on the micro-house scale, which had been underdeveloped. *Meso* and *Micro-street* scales were altered to add the detail needed for the final concept, and as required by the micro-house scale.

Morphological Scale Meso

The aim of the larger sections discussed in the phase 2 evaluation is to provide the privacy to the backyards desired, and often lacking in MDH. This is not economically necessary, but an extra 4m of depth might make an important qualitative difference for residents. This could be a deciding factor for many Cantabrians who have never considered MDH before. I know the extra square metres in the Awatea Green townhouse is not excessive, but it goes a long way to making the home more comfortable.

These changes (figure 151) resulted in 92 fewer lower-MDH (L-MDH) sections, and 6 new apartment buildings (figure 151). These would need around 15 units each to offset the loss in density, which I think should be achievable. Dotted

between lower density environs, the apartments would be more likely to have views. This provides the larger sections to those who want private outdoor space (and are able and willing to pay for it) and provides for apartments with better views and natural light for those who may desire but not require a semi-suburban lifestyle.

Christchurch has plenty of space, economising it, while maintaining room to breathe is possible and could potentially be a desirable way to provide density for Cantabrians, where other, more space-constrained cities must cram out of necessity. The result is an increase in housing diversity, something that provides better for a diverse population whose needs can be addressed within one area.

Figure 150. Phase 3 redesign.

- =Public Green Space
- =Block/Lots removed
- = Apartments/H-MDH
- =Central Area (mixed uses)
- =L-MDH
- =Sub-neighbourhoods (new)
- =Site Boundary

Figure 151. Density loss.

Green-Connections

Figure 152.

Figure 153.

Accessibility

- = Rail
- = Active Transport Routes
- = One-way residential street
- = Dual direction secondary route
- = North/South Arterial
- = West > East Through Route
- = East > West Through Route

Morphological Scale Micro-Street

To finalise the micro-street scale, dimensions of the road were altered to be more accurate. This widened them slightly, but also made them more viable. All of the residential streets were finalised as the woonerven-inspired design, with every intersection sized to allow for a 10.3m rear-steered rubbish truck's turning circle – likely the largest vehicle to regularly use the roads (Auckland Transport, 2020, p. 103) (figure 156). Roads connecting to the existing urban fabric were also added. I had the realisation that the cul-de-sac turning circles present in the light industrial areas would need to remain to allow for heavy vehicles to u-turn so they do not travel through the neighbourhood's narrow streets. I

believe this is possible given careful consideration of the design, and in the final masterplan I gave the excess turning area a separate material to the through-road to reduce complexity. If going into further detail adding low (easily mountable at a slow speed) kerbs would likely be necessary to force a direction of travel while providing a turning facility (figure 157).

As the masterplan was updated and detailed, the 3d massing of the central mixed-use core was updated to reflect the new layout and the increasing importance I had been placing on verticality in facades for walkable neighbourhoods (figures 159-161).

Figure 155. Entrance from Moncur Place.

Figure 156. Turning radius of rubbish truck.

Figure 154. Updated master plan.

Figure 157. The central core would be the location of the railway station.

Figure 158. Arterial looking north.

Figure 159. Northern block of arterial.

Figure 160. Central park near railway-station..

Figure 161. Final Meso site.

Morphological Scale Micro-House

Following the updated designs for the larger scales the Micro-House morphological scale designs were altered. Significantly more detail was added to the external appearance of the homes to allow for conceptual-level diagrams and renders/imagery to be produced, as well as to analyse how the designs work regarding initial framework explorations. Some unexpected limitations I had not considered regarding the extent of this thesis were uncovered - such as the level of detail required to adequately explore the privacy of corner sections (which in itself could be a thesis). The need to involve multiple designers to generate an interesting visual aesthetic was further highlighted, as I noticed similarities within my own design concepts that somewhat work against my desire for visual diversity.

I categorised designs as those with carpark (CP) and those without (NCP), and subsequently by their floorplan. All floorplans had at least two design variations to vary external appearance and create a more diverse street scene - this also works to illustrate how layout can be less important than external appearance. The two housing types (car park or none) each had one, two, and three-bedroom iterations, reflecting a trend to smaller house sizes, and the likelihood that smaller households would be more attracted to smaller housing typologies. One concept (figure 144) was not possible within the site when rough measurements for elements such as walls and stairs were considered. The other floor-plan concepts were achievable.

Figure 162. View of shared space.

Figure 163.

No Car Park 1.1

3 bedrooms | 2 design variations

This design was the continuation of one I had roughly modelled in phase 2, based on a sketched floorplan. Fitting 3-bedrooms within a narrow first floor on an already narrow section resulted in the stairwell and laundry/WC being placed between dining and living areas, although use of both spaces is flexible. This was a deviation from the idea of having seamless living spaces from the front to the rear of the home to engage the street. A wider hallway retains some visual connection, which helps to mitigate this. The smallest bedroom on the first floor is located next to an adjoining wall of two properties, so to allow for a window and natural light this iteration could only be built in tangent with a single-story neighbour. NCP1.2 features boxier aesthetics attempting to use vertical louvres to increase privacy.

2m

Figure 164. Ground-floor plan (left) and first floor plan (right).

Figure 165. Concept sketches exploring materiality.

Figure 166.
No Car Park 1.2
 3 bedrooms | 2 design variations

2m

Figure 167. Ground-floor plan (left) and first floor plan (right).

Figure 168.

No Car Park 2.1

2 bedrooms | 2 design variations

The two-bedroom design has a different kitchen/laundry/WC/Stairs arrangement to the previous, with a linear kitchen used to increase flow/connectivity between the street and rear-living areas. Even less of the site-width was used for this design, providing marginally more outdoor space, and increasing aesthetic variation on the street. The space constraints brought by the new stair layout meant there was no space for an ensuite. NCP2.2 is oriented for a corner section, something I had not put much consideration into. Given the complexities of privacy and passive surveillance needs, more thought is likely required for corner sections, and as such the designs created are merely place fillers. I believe NCP2.2 is a much more successful design concept due to well-proportioned forms that play with the notion of a box. The design does not have a secondary living space to the front, rather locating it for the cross-street instead.

2m

Figure 169. Ground-floor plan (left) and first floor plan (right).

Figure 170.
No Car Park 2.2
 2 bedrooms | 2 design variations

2m

Figure 171. Ground-floor plan (left) and first floor plan (right).

Figure 172.

No Car Park 3.1

1 bedroom | 2 design variations

The simple, single level design acts to reduce the intensity of the street -often apparent in MDH, and potentially provides for older people who may want to retain an independent lifestyle while living somewhere that is lower maintenance. Space constraints of the site mean that only one-bedroom units are possible as single-storey dwellings. The courtyard provided along the side of the home is at the front as opposed to being wedged between two 'wings' as in other design iterations. Where NCP3.1 is more standard in styling, NCP3.2 uses an accentuated gable roof to define the main section of the home.

2m

Figure 173. NCP3.1 Floor plan.

Figure 174.

No Car Park 3.2

1 bedroom | 2 design variations

2m

Figure 175. NCP3.2 Floor plan.

Figure 176.

Car Park 1.1

3 Bedrooms | 2 design variations

This design iteration is the bulkiest in appearance, and one of the main elements I would explore further if time allowed would be the extent the dwelling would shade neighbouring properties. This design features a walk-in closet and ensuite for the master bedroom, and a laundry connects the front courtyard to the backyard (in other designs a joint laundry/WC is partially underneath the stairs) which could cater well to a family. The NCP designs could allow access to the backyard without walking through the home. Clad in wood, the verticality of the design is enhanced.

Design 1.2 ended up being for a corner section. I broke the building up using alternating roof pitches to improve detail for the cross street and altered the location of the living area to ensure eyes on both streets. Windows for the primary living space would need to have treatments such as venetian blinds to avoid fabric blinds being pulled throughout the day. Wider nature strips on the cross street will assist in providing privacy also, however that detail is outside of the scope of this thesis. While there is reduced privacy in the front courtyard, a private backyard is imperative, making a fence necessary.

2m

Figure 177. Ground-floor plan (left) and first floor plan (right).

Figure 178.
Car Park 1.2
 3 Bedrooms | 2 design variations

2m

Figure 179. Ground-floor plan (left) and first floor plan (right).

Figure 180.

Car Park 2.1

1 bedroom | 2 design variations

CP2.1 is almost the same as the original concept (figure 128, page 132). A single-level one-bedroom unit provides opportunities for those with mobility constraints, while the carpark allows for residents to own a vehicle also. Both one-bedroom designs account for increasing numbers of people living alone, or as single couples in younger stages of life .

CP2.2 uses two gable roofs with alternating cladding, providing a contemporary take on a traditional style. The floor plan remains the same with the only alteration being a window in the laundry.

2m
Figure 181. CP2.1 Floor plan.

Figure 182.

Car Park 2.2

1 bedroom | 2 design variations

2m

Figure 183. CP2.1 Floor plan.

Figure 184.

Car Park 3.1

2 bedroom | 2 design variations

CP3 returns to the 'lighter' less-bulky forms explored in NCP1 & NCP2 by retaining a narrower upper floor. The flow from the living area to the street is slightly reduced due to the narrow footprint, and is an element I would consider in greater detail moving forward. This is perhaps not helped by the laundry which prevents the living space flowing across the entire width of the site as has been done in other iterations. A balcony on the street side provides a design feature, and as an element that could improve the perception of eyes on the street. CP3.2 trades the balcony for a larger bedroom and explores the possibility of having higher windows along the sides of the building on the first floor, which would allow plenty of natural light while preventing occupants from viewing into neighbouring properties – something potentially an issue in other designs. Development of the layout from CP3.1 resulted in better use of space, introducing a walk-in wardrobe for the master, and a separate W/C.

Figure 186.
Car Park 3.2
 2 bedroom | 2 design variations

2m

Figure 187. Ground-floor plan (left) and first floor plan (right).

Figure 188. Concept sketches of typologies.

Final Design Framework

The final iteration of the design framework is a result of the design process. Initial concept designs took into consideration my own beliefs/preconceptions, and what I had uncovered through literature research before the first framework was generated. The initial framework lent more towards a brainstorm however, and exploring various elements of precedents (particularly Borneo Sporenburg) led me to decide that a short and succinct framework would be most effective, providing clear guidelines to create a level of cohesion yet near total freedom in regard to design language. The core of the framework is oriented towards functionality primarily, with the aesthetic requirements to ensure no bland or repetitive facades reduce visual appeal of the street (which could potentially affect walkability).

Design Classifications

‘Like’ designs = Identical materiality and/or form*1

Identical designs = Same form, with or without material variation*1

Functional Points:

- Buildings must remain within allocated building footprints, a minimum of one courtyard is required in NCP designs – within the allocated footprint (figure 189).
- Buildings must exhibit a clearly defined relationship between public and private realms
 - A semi-public secondary outdoor living area to street
 - A totally private backyard (primary outdoor living area)*2.
 - Privacy from neighbours viewing into living rooms from backyards.

Aesthetic Points:

- There must be variation in form within individual dwellings (a change of material is not enough).
- ‘like’ or identical designs must be dispersed.
- ‘like’ designs must not be located immediately next to each other (including diagonally across the street [figure 191])
- Identical designs must be dispersed by 3 sections either side on the same street (both sides) or 2 sections either side behind. Designs may not be repeated in the same lot on streets either side to avoid duplicate streetscapes. Materiality of identical designs on the same block must vary (figure 190).
- Full-height fencing must begin behind façade (no traditional garage doors to carparks)
- Façade setbacks must vary to avoid continuous walls.

*1 Floorplan is not considered, only external appearance.

*2 Being overlooked by immediate neighbours is unavoidable, but they must not view into the living room.

Figure 189. Maximum buildable area of site (to retain coherence, natural light to courtyards).

Figure 190. Identical design restrictions.

Figure 191. 'Like' design restrictions.

Figure 192. Homes on the corner of a cross-street.

Figure 193. 2m, 2.5m, and 2.8m fences (top to bottom). None provide privacy I desired.

Design Phase 3 Evaluation

The outcome of this thesis is a short framework specific to the design of a conceptual MDH community for Ōtautahi-Christchurch. This explores how MDH (and lower-density suburbia) could be reimagined acknowledging the space available, but also the benefits possible from higher densities. As with any project, there are several areas I was unable to cover due to them being too ambitious, and others in which I would make alterations given more time, or if I knew everything I do now when I began work on this thesis.

Masterplan

Tapering of the higher densities in the centre to the lower density housing explored in the Micro-House scale would be integral to the success/liveability of these designs. The higher density areas would provide for an even more diverse range of housing needs, with the inclusion of commercial amenities and office space.

I was also unable to consider where mixed-use could come into the lower-MDH areas. Kusumastuti and Nicholson's study suggested some uses are more accepted than others by Cantabrians, although still exhibits a trend favouring single-zoned suburbia (2018, p. 2694). This might restrict the placement and frequency of mixed-uses within the lower-density MDH area.

Along with commercial amenity, the need for new schools and other public institutions may arise given the number of new residents a development of this scale would bring, these as with many other

details fell outside of the scope of work achievable but would be important in moving forward.

The integration of the rail is another element that needs further thought. I had been wondering about how realistic it would be to build homes directly on top of a tunnel, something in the means of a linear park above it could fix this, although would essentially begin an entirely new masterplan concept. This builds on thinking that I could have explored initial Meso-Scale concepts in more abstracted directions as opposed to only creating links to the existing urban form.

Street

The micro-street scale is the one I am most content with. Small details such as the width of the material that delineates the edge of the driveable area could do with changing – widening it would optically narrow the street further to lower vehicle speeds. The cross-street was barely mentioned due to the broad area the work covers and is an entirely different typology, although the only road users would be those finding carparks, and active transport users thanks to the accessibility plan (figure 153 page 157).

Housing

Privacy remains the largest issue in the design of the individual house concept, the initial efforts I had made to prevent occupants in upper floor rooms viewing into living spaces had not accounted for the higher ceilings introduced in the third design phase and had been based on

fences that were unrealistically high. The result is that upper floor windows view into neighbours living rooms still, however this could still be offset by strategic planting to provide further privacy. Likely, the window sizes on upper levels would need to be limited also. Of course, increasing the section depth again could remove this issue, it may however push the designs under the density threshold for MDH – a trade-off that would fail to meet the aims of this thesis that specifically seek medium density.

Designing homes for the corner section raised the need for more exploration into how privacy, and interaction with the street is addressed, something that I did not have time to complete.

I am not totally content with several of the design concepts, although because they had to be produced quickly there was not as much time as I would have liked to perfect/detail them. Due to the extent to which the homes are built next to each other, internal gutters are almost a necessity as overhanging roofs would not be possible in most situations. This was one area where I am wary many of the designs appear similar – which works to illustrate the need for multiple designers to create a diverse streetscape.

Figure 194. (opposite) NCP homes behind carparking.

The width of the lots could do with more analysis regarding carparking. As space needed for wall and fence thickness (also gates for pedestrians and cars) add up, they may be slightly too narrow, or potentially just wide enough if these homes were to be developed to a more realistic/detailed level.

Framework

One area of the designs that I had initially included was to restrict ‘industrial’ materials to retain a residential-scale design aesthetic. However, that would logically restrict the use of concrete and metals, both of which have increasingly been used in residential architecture, and some of the concept designs I came up with relied on these materials for their design language. This made me reconsider restricting any specific materials. A potential option would be to explore further the types of materials that were once primarily used for industrial purposes, and how they are now used in residential applications. However, as much as providing too many restrictions could negatively affect the design outcome, too few could also be detrimental. I do not have a preferred solution, and this remains unresolved.

Conclusion

Room to Breathe: Designing a framework for medium density housing in Ōtautahi-Christchurch provides a concept of MDH that responds to growth to support a well-functioning urban environment by providing a community designed to take advantage of all MDH has to offer. Located in an accessible location with existing mass transit infrastructure, the community minimises negative impacts on the wider city.

As addressed in the ‘defining a liveable city’ section in the introduction, liveability as defined for this thesis concerns safety, accessibility/connectivity (which is what the NPS emphasises for ‘well-functioning cities’), community, and privacy.

Safety is addressed in this concept by providing the groundwork for a development that will increase the frequency and number of people using the street. This is achieved by locating the site close enough to the CBD to reduce vehicle use and rethinking the design of the streets to reflect this. Amenities provided within the neighbourhood encourage active transport outside of the weekday commute. Working in tandem are the many ‘eyes on the street’ provided by the framework’s requirement for living spaces to connect with the public realm, assisting to minimise the perception of isolation that can decrease safety.

Accessibility/Connectivity is provided through new amenities, but also streets designed to be friendlier to those not in vehicles with connections to the wider city’s growing network of separated cycleways. Providing access primarily designed for active transport (with the potential for public transport in the form of bus or train) works to reduce the number of new vehicles that will be

added to Ōtautahi’s roading network in peak times, a step toward retaining the relatively low congestion Christchurch demonstrates (when compared to Auckland, Wellington, and Hamilton).

Community development cannot be built, however, the built environment can be designed to foster it. The design concept focuses on a walkable environment, and one where even those at home remain connected to the public realm, providing a setting for random social interactions. Individual streets have the potential to provide social space for neighbours to interact, a nod toward the idea of creating community clusters. A community that interacts within itself creates personal connections. And with personal connections comes trust in those around you.

None of the conceptual homes are isolated from the public, yet they still provide privacy. While there is limited opportunity for immediate neighbours to peer into your backyard, the chance for them to peer into your living room is reduced, although not to the level I had initially desired. Levels of privacy for those particularly sensitive to it can be enhanced through special window treatments such as venetian blinds, which can improve perception of privacy without the need to completely shut out the public environs.

Limitations for the thesis mainly relate to the broad scope of the thesis, and the time constraints that inevitably followed. There are several areas which I would have liked to explore in greater detail, including the massing for the higher-density scales, need for specific designs for corner sections, design of the cross-streets, and

materiality within the framework.

Combined, I hope that this concept provides a feasible solution to growth in Ōtautahi-Christchurch, one that seeks to avoid serious issues that can suffocate cities where expansion is poorly planned. The broader ideas presented in this thesis could be applied in many ways, specific design is of course subjective. The location could be different – so long as it is within fair distance of the CBD or mass transit; the streets could be laid out in other ways – but they need to work with MDH and the existing urban environment; and the housing could be in any form, so long as it connects to the community, respects the impact architecture can have on walkability, provides space, and privacy.

Figure 195. Site looking south.

A functional city sets the groundwork for a successful city. This thesis presents a vision of how Ōtautahi can use medium density housing to become a well-functioning urban environment. With minimised congestion, diverse housing and transport options, and enough housing supply to prevent the crises affecting many Kiwi cities, Ōtautahi-Christchurch has the opportunity to become New Zealand's most liveable city. The design of the built environment, at all scales, has considerable impact on quality of life, so to match the needs and desires of the 21st century new ways of building must be explored for architecture to support the development of well-functioning modern communities, and society.

Figure 196. (Above) Massing of the central core.

Figure 197. Parking-protected footpath and semi-public front gardens.

Figure 198. (Next Page) view of homes next to a chicane.

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Appendix

On-street (public) car parks: 671
 Homes with parking: 343
 Public car parks per street: 15
 Car parks per home: 1.9

Figure 199. Plan of typical micro-street scale layout (Used in final presentation).

Privacy with 2m high fence

Privacy with 2.5m high fence

Privacy with 2.8m high fence

Privacy with 2.8m high fence and foliage

Figure 200. Diagrams illustrating privacy concerns between living rooms and upper floor bedrooms
(Used in final presentation).

Figure 201. Diagram illustrating the relationship between the public and private realms within the micro-street and micro-home morphological scales (Used in final presentation).