The Nature of Care

Zara Elizabeth Ely

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Abstract

It is estimated that humans spend 89% of their time indoors, despite having an innate connection to nature that dates back to the origins of human existence. Modern-day life distances itself from nature, with consequences that are not yet fully understood. Nature provides the means of survival, not only physically, but also as a mechanism for restoration, an aid in learning, and support in healing. Many current approaches to design fail to foster a union between the natural and built environments, resulting in degradation of natural systems and a compromise to human health and wellbeing. Exacerbated by recent events, Aotearoa's health system fails to provide a successful model of care to New Zealanders. Noncommunicable disease and disability permeate the population. Projected population growth will compound these points of tension. Rapid rates of ageing are expected to heighten rates of dementia; however, a system already under strain is not equipped to manage these needs for an increase in capacity.

To address these issues, this design-led research asks: How can biophilic design principles be integrated into hospital design to enhance wellbeing and healing in Aotearoa? Moreover, how can these biophilic principles be applied explicitly to a dementia hospital to enhance patients' holistic wellbeing and quality of life? The methodology for this research employs a range of methods and aims to provide a theoretical framework that can be applied in industry to hospital settings around Aotearoa. The framework is then tested in this thesis project at a dementia-specialised hospital.

A series of experiments was applied to test design interventions, grounded in contextual literature. This thesis found that creative approaches to integrating biophilia, such as using fractals as wayfinding tools, considering circadian rhythms, and emphasising the significance of the human scale, can drive design and offer seemingly legitimate approaches to answering this research question.

Figure 1. Native species sketch

Positionality Statement

Kia ora, my name is Zara Elizabeth Ely.

I was born in England and moved to Aotearoa when I was young, where I grew up in Tāmaki Makaurau. I feel privileged to have been brought up in a country with access to the beautiful wilderness of Aotearoa, and I have always felt a deep sense of peace by the water and in nature. I have been fortunate enough to study in Wellington previously and briefly lived in Hawke's Bay, both of which have strengthened my admiration for Aotearoa's flora and fauna, while instilling a deep sense of adventure and a thirst for learning. Crafting and creating, whether through drawing, painting, sewing, or simply making a mess, creativity has played a massive part in my life thus far. Beyond this, I feel strongly about contributing to something greater than myself, primarily through my interests in Architecture.

Growing up away from my English family has at times proved difficult, especially with my grandparents as they age and deal with dementia, among other diagnoses. I have come to understand some of the system's failings in facilitating the vulnerable and retain a sense of optimism that this thesis might reimagine how we look after and understand aspects like wellbeing within the built environment.

Figure 2. Photograph of a fern

Figure 3. Photograph of native bush

Acknowledgements & Dedication

I want to extend my gratitude to my supervisor, Maibritt Pedersen Zari, for her ongoing support, imparting her knowledge, and encouragement. Special thanks also to my co-supervisor, Sibyl Bloomfield, for her nuggets of wisdom and energy throughout this year. This project would not have been possible without either of your insights, support and guidance.

To my cohort and fellow Archi Students, thank you for your encouragement, support, and, most especially, for welcoming me to AUT. Being a new student can be challenging, but I have felt at home thanks to your kindness.

Furthermore, I would like to extend a huge thank you to my family and Ben for your patience and love while I have navigated this period of my life. I am endlessly grateful for you all.

I want to dedicate this thesis to my Grandma Dianne Wall and late Nanny, Barbra Ely.

Contents

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor used artificial intelligence tools or generative artificial intelligence tools (unless it is clearly stated, and referenced, along with the purpose of use), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

- Zara Elizabeth Ely

Use of AI

Written elements of this thesis have included the use of AI. Specifically, Grammarly and ChatGPT to aid in spelling, grammar and some structuring.

Chapter 1: Introduction

The context

The Severing Bond with Nature

The critical disconnect of the human–nature relationship

What is it about flowers that makes them such a familiar gesture in times of love or sympathy? What is it about the ocean that makes people so drawn to it? The human connection with nature is vast and complex. It spans biological understandings, environmental behaviours, human histories, policy, science, and many other fields, making it vastly interdisciplinary (Kahn, 1999). Humanity depends on the literal fruits of the natural world, the energy that powers our very cells, the nutrients we consume, and the ecosystems that purify the water and air (Washington & Ehrlich, 2013). Nature offers more than physical survival; it is a place of humility, a retreat from modern life, a place that offers sanctuary and refuge (Washington & Ehrlich, 2013).

Modern-day life sees humans spend 87% of their time indoors (Santos, 2023). With significant migration from rich natural countryside to dense cities, two-thirds of the developed world experience life in the shadows of metropolitan cities (Kellert, 2005). With the modernisation of daily life, many tasks are increasingly performed indoors, encouraging sedentary pastimes that are inherently interior-based activities (Santos, 2023; Seymour, 2016). For many people, this has replaced time spent outdoors with virtual alternatives (Seymour, 2016). Irrespective of these perplexing statistics, the reality is that we no longer experience nature as an interlocking whole, now coined as 'extinction of experience' (Soga & Gaston, 2016; Washington & Ehrlich, 2013).Prevailing approaches to designed environments leave mass degradation of natural systems, increasing the separation of the natural world and people (Kellert et al., 2008).

Humans' connection to nature is innate, yet modern life distances itself from it in ways we are only beginning to grasp the consequences of (Seymour, 2016). Rates of asthma, obesity, chronic disease, depression, social isolation, emotional wellbeing, attention deficit and other psychiatric disorders have surged as we see our environment further removed from the scales and tones of the natural world (Bernheimer, 2019; Seymour, 2016). Ultimately, we are biologically bound, and if our natural tendencies are not nurtured and stimulated, we risk their dormancy, weakness and dysfunction over time (Kellert et al., 2008).

Figure 4. Native species sketch

The Cost of Care: Barriers in the Aotearoa Healthcare System

The outstanding issues with the current Aotearoa healthcare system

It is becoming increasingly apparent that the healthcare system is failing to provide a successful model of care to New Zealanders (Frizelle, 2022). Not only does Aotearoa find itself in a difficult position, of failing to meet the immediate needs of its current population, but it also faces future population growth (New Zealand Institute of Economic Research, 2023) and rapid rates of ageing (Ministry of Health, 2023a; Te Whatu Ora, 2023) the system is not equipped to manage (New Zealand Institute of Economic Research, 2023). Over the last five years, profound shifts in the Aotearoa healthcare system have occurred as it morphs in response to recent global events and attempts to adopt a modern era of care (Tenbensel et al., 2023). Political turbulence has led to repeated system changes in efforts to meet the current and future needs of New Zealanders; however, we continue to find ourselves in a deficit (Frizelle, 2022).

To break this wicked problem into digestible portions, this next section considers the current system's 'who', 'what', and 'where'. This aims to acknowledge that each closely corresponds to another; however, each has respective issues, influencing factors, and broader implications. Figure 5.

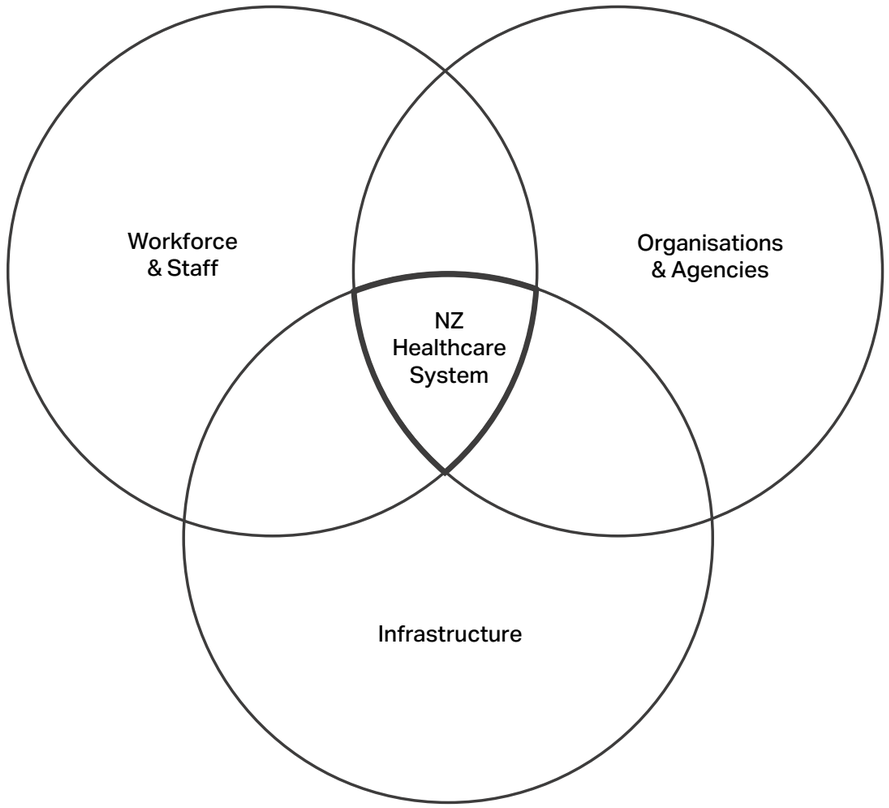


Figure 5. Aotearoa healthcare venn diagram

Structure of Aotearoa NZ Health System

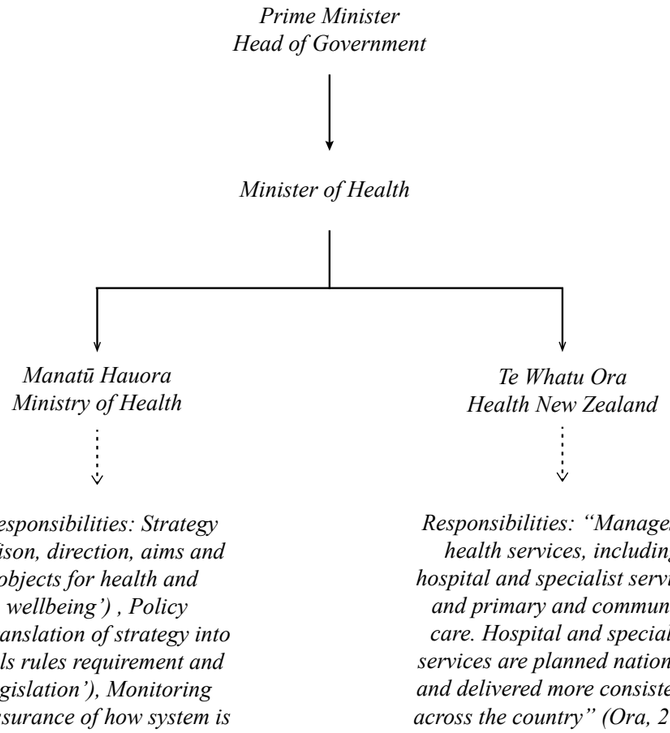


Figure 6. Structure of Aotearoa health system dia-gram

What: Organisations and governance: The Minister of Health, the Ministry of Health and Te Whatu Ora. Their key function is to deliver and make policy regarding the Aotearoa healthcare system.

Health has been a frequently discussed topic over the last five years, primarily driven by COVID-19. Aotearoa's healthcare system has undergone restructuring and legislative shifts in efforts to 'rebuild' the system (Tenbensel et al., 2023). Changes have followed fiscal restraints, workforce shortages, and persistent health inequities, all intensified by the pandemic (Tenbensel et al., 2023). Some argue that the restructuring does not present a logical solution for delivering adequate services to meet demands (Frizelle, 2022). Figure 7 illustrates the historical pattern of this approach's failure, distinguished by short-lived, well-intentioned legislation, strategies, and structures that have consistently failed to deliver long-term results (Frizelle, 2022).

The current system continues to operate under the direction of Te Whatu Ora and Manatū Hauora as a centralised model of care (Ministry of Health, 2024; Te Whatu Ora, 2024), Figure 6 gives a visual depiction.

Who: Workforce and staffing refer to the people on the ground, including nurses, doctors, specialists, and administrators—the individuals who administer the care.

Over successive decades, the Aotearoa Health workforce has struggled to grow to the necessary levels to support New Zealanders' health (Te Whatu Ora, 2023). The 2024/25 workforce plan outlines that underperformance in this sector is driven by: Poor-quality data due to the system's inability to articulate its needs (Te Whatu Ora, 2023). Resulting in not only systemic under-funding but difficulties in acquiring numbers in education and immigration of future workforces (Te Whatu Ora, 2023). A shorthanded workforce is exacerbated by global shortages and Aotearoa's inability to compete (Te Whatu Ora, 2023). The disestablishment of Aotearoa's former District Health Boards has also contributed to this issue, as it was previously responsible for driving domestic competition (Te Whatu Ora, 2023). Newer models of centralised service have rendered such contests obsolete. In addition to the mass immigration of Aotearoa's professionals overseas, we observe existing professionals are rapidly ageing, with disproportionate replacements (Hitchon et al., 2024). Professionals are confronted with persistent arduous working environments, concerning workloads, consistent burnout, stress and reported poorer levels of overall wellbeing (Hitchon et al., 2024).

Aotearoa
Healthcare
Legislative
History Timeline

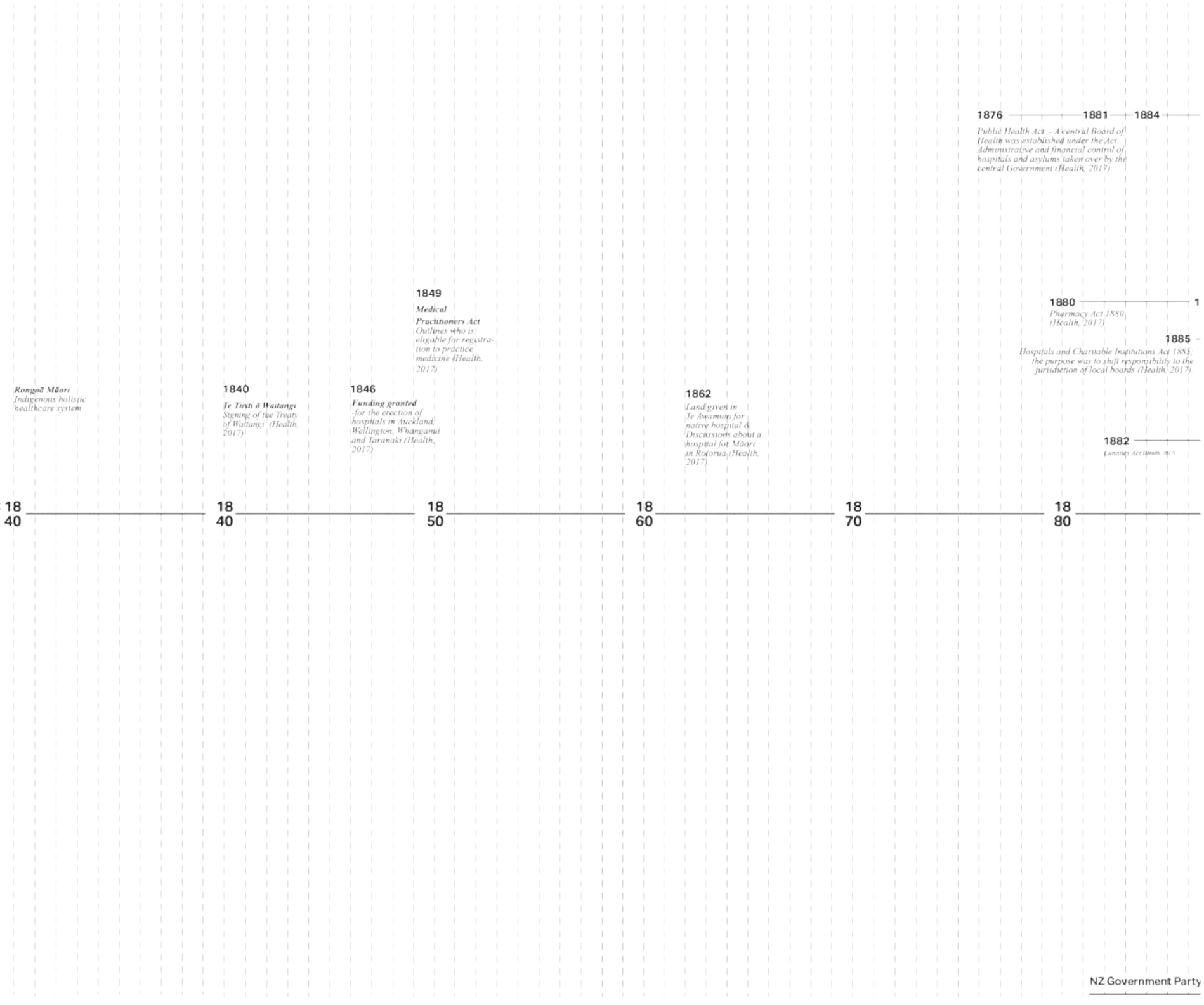


Figure 7. Aotearoa healthcare system legislative history timeline

1893

1900 '01 '02 '03 '04 '07 1908 '10 '15 '18 '19 1920 '40 '47 '51 1956

Public Health Act 1900 (Health, 2017)

Public Health Act 1908 (consolidation Act) (Health, 2017)

Health Act 1920 (Health, 2017).

Health Act 1956 - The Purpose is to improve, promote, and protect public health, while simultaneously establishing legislation for mechanisms such as disease control in the event of amendments and pandemics. (Health, 1956)

1908

The Medical Act 1908 in New Zealand was a consolidation Act (Health, 2017).

'54

1949

Medical Practitioners Act 1950 (Health, 2017)

1905

Medical Practitioners Registration Act 1905 (Health, 2017)

1914

Medical Practitioners Act 1914 (Health, 2017).

1937

Medical Research Council of New Zealand established (Health, 2017).

1950

Medical Research Council Act 1950 (Health, 2017)

887 1898

1939

Pharmacy Act 1939 (Health, 2017)

Hospital and Charitable Institutions Act 1908 (consolidation Act) (Health, 2017).

1900 1907 '08 1928 '29 '32 '36 1938 1957

Hospital and Charitable Aid Boards Act 1900 Public Health (Health, 2017)

Hospital and Charitable Institutions Act 1907 (Health, 2017)

Hospital and Charitable Institutions Act 1926 Amended 1928 (Health, 2017).

Social Security Act 1938 (Health, 2017).

Hospitals Act 1957 (Health, 2017)

1906

Private Hospitals Act 1906 (Health, 2017)

1911

Mental Defectives Act 1911 (Health, 2017)

1928

Mental Defectives Amendment Act 1928 (Health, 2017)

1954

Mental Health Amendment Act 1954 (Health, 2017)

'58

1894 '95 1900 1908

Lunatics Act 1908 (consolidation Act) (Health, 2017).

1901

Nurses Registration Act 1901 (Health, 2017)

1908

Establishment of Mental Hospitals Department (Health, 2017)

1942

Medical Advertisements Act 1942 (Health, 2017).

18 90 | 19 00 | 19 10 | 19 20 | 19 30 | 19 40 | 19 50

1901

Establishment of Department of Public Health (Health, 2017)

1914 -1918

World War I (Health, 2017).

1931

Worldwide economic depression begins to affect New Zealand and the Department of Health (1931) (Health, 2017).

1939 -1945

World War II (Health, 2017).

1900

Central Board of Health suggested establishment of Department of Public Health (Health, 2017)

1908

Quackery Prevention Act 1908 (Health, 2017) made it an offence to publish a false statement about the efficacy of any medicine. (Norris & Beresford, 2011)

1919

Proposals for complete reorganisation of Department of Health (Health, 2017).

1938

The Social Security Act of 1938 (Laugesen & Salmond, 1994)

1909

Māori medical services returned to Native Affairs (Health, 2017)

1906

Department of Public Health takes full responsibility for Māori health (Health, 2017)

1910

Control of Māori health returned to Department of Public Health (Health, 2017).

1927

New Zealand divided into 12 Health Districts (1927) (Health, 2017).

1907

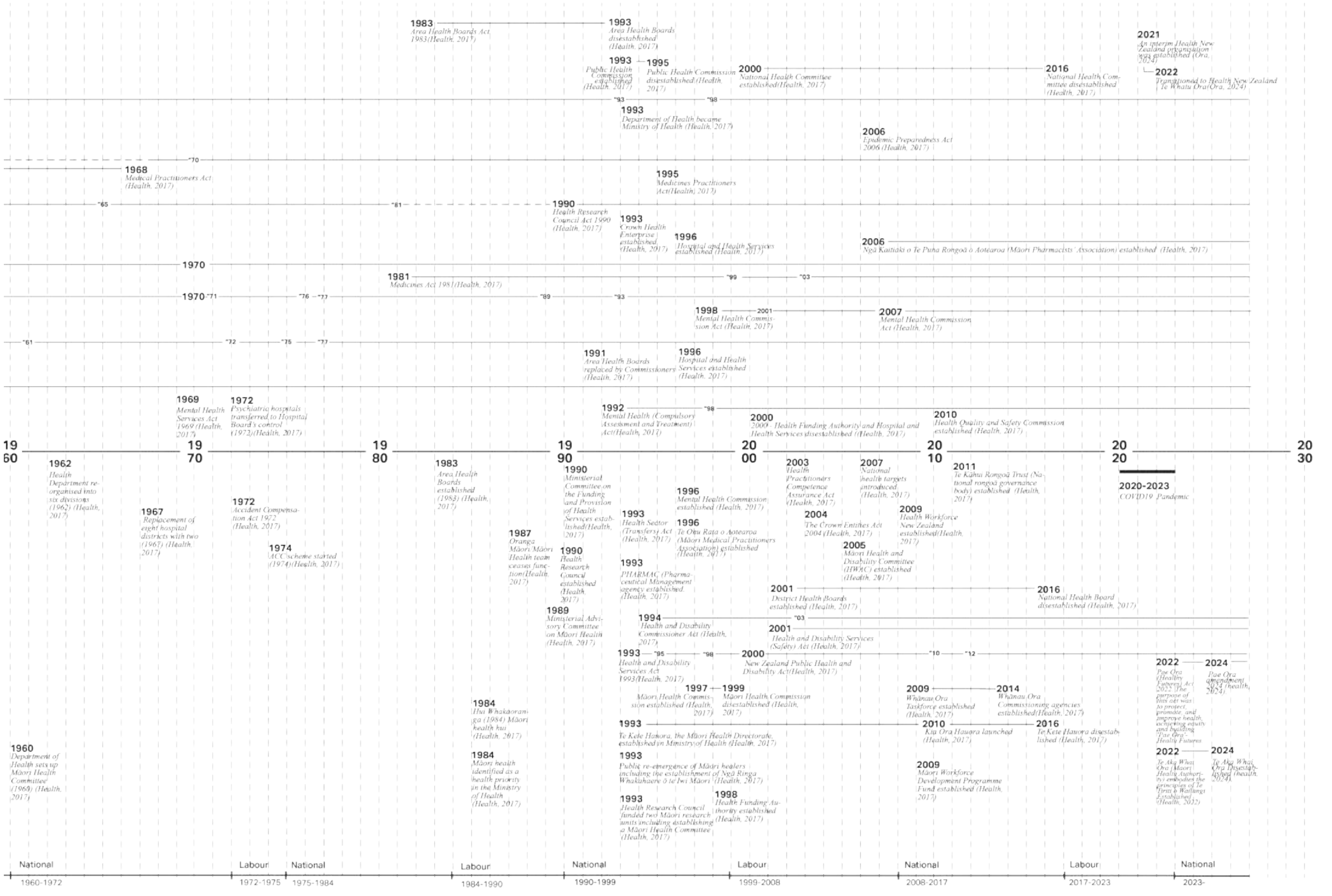
Tohunga Suppression Act 1907 (health 2017) The Act was intended to stop people using traditional Māori healing practices which had a supernatural or spiritual element (Norris & Beresford, 2011).

1929

Opening of Māori Hospital Mahinārangi, Turangawaewae, Ngāruawāhia (Kingitanga Tainui) (Health, 2017).

Timeline

Liberal	National	Reform	United	United/Reform	Labour	National	Labour
1891-1912	1912 - 1919	1919 - 1928	1928 -1931	1931-1935	1935-1949	1949-1957	1957-1960


19
60
70
80
90
00
10
20
30
1962
Health Department re-organised into six divisions (1962) (Health, 2017)
1967
Replacement of eight hospital districts with two (1967) (Health, 2017)
1969
Mental Health Services Act 1969 (Health, 2017)
1972
Accident Compensation Act 1972 (Health, 2017)
1972
Psychiatric hospitals transferred to Hospital Board's control (1972)(Health, 2017)
1974
ACC scheme started (1974)(Health, 2017)
1960
Department of Health sets up Māori Health Committee (1960) (Health, 2017)
1968
Medical Practitioners Act (Health, 2017)
1970
1970
1981
Medicines Act 1981(Health, 2017)
1983
Area Health Boards Act 1983(Health, 2017)
1983
Area Health Boards established (1983) (Health, 2017)
1984
Hui Whakaoranga (1984) Māori health hui (Health, 2017)
1984
Māori health identified as a health priority in the Ministry of Health (Health, 2017)
1987
Oranga Māori Māori Health team ceases function(Health, 2017)
1989
Ministerial Advisory Committee on Māori Health (Health, 2017)
1990
Ministerial Committee on the Funding and Provision of Health Services established(Health, 2017)
1990
Health Research Council established (Health, 2017)
1990
Health Research Council Act 1990 (Health, 2017)
1991
Area Health Boards replaced by Commissioners (Health, 2017)
1992
Mental Health (Compulsory Assessment and Treatment) Act(Health, 2017)
1993
Area Health Boards disestablished (Health, 2017)
1993
Public Health Commission established (Health, 2017)
1993
Department of Health became Ministry of Health (Health, 2017)
1993
Health Sector (Transfers) Act (Health, 2017)
1993
PHARMAC (Pharmaceutical Management agency) established. (Health, 2017)
1993
Health and Disability Services Act 1993(Health, 2017)
1993
Crown Health Enterprise established (Health, 2017)
1993
Māori Health Commission established (Health, 2017)
1993
Te Kete Hakora, the Māori Health Directorate, established in Ministry of Health (Health, 2017)
1993
Public re-emergence of Māori healers including the establishment of Ngā Ringa Whakahaere ō te Iwi Māori (Health, 2017)
1993
Health Research Council funded two Māori research units including establishing a Māori Health Committee (Health, 2017)
1994
Health and Disability Commissioner Act (Health, 2017)
1995
Public Health Commission disestablished (Health, 2017)
1995
Medicines Practitioners Act(Health, 2017)
1996
Hospital and Health Services established (Health, 2017)
1996
Hospital and Health Services established (Health, 2017)
1996
Mental Health Commission established (Health, 2017)
1996
Te Ohu Rata o Aotearoa (Māori Medical Practitioners Association) established (Health, 2017)
1997
Māori Health Commission established (Health, 2017)
1998
Mental Health Commission Act (Health, 2017)
1998
Health Funding Authority established (Health, 2017)
1999
Māori Health Commission disestablished (Health, 2017)
2000
National Health Committee established(Health, 2017)
2000
2000 - Health Funding Authority and Hospital and Health Services disestablished (Health, 2017)
2000
New Zealand Public Health and Disability Act(Health, 2017)
2001
District Health Boards established (Health, 2017)
2001
Health and Disability Services (Safety) Act (Health, 2017)
2001
Mental Health Commission Act (Health, 2017)
2003
Health Practitioners Competence Assurance Act (Health, 2017)
2004
The Crown Entities Act 2004 (Health, 2017)
2005
Māori Health and Disability Committee (HWAC) established (Health, 2017)
2006
Epidemic Preparedness Act 2006 (Health, 2017)
2006
Ngā Kaitiaki o Te Puha Rongoā o Aotearoa (Māori Pharmacists' Association) established (Health, 2017)
2007
National health targets introduced. (Health, 2017)
2007
Mental Health Commission Act (Health, 2017)
2009
Health Workforce New Zealand established(Health, 2017)
2009
Whānau Ora Taskforce established (Health, 2017)
2009
Māori Workforce Development Programme Fund established (Health, 2017)
2010
Kia Ora Hauora launched (Health, 2017)
2010
Health Quality and Safety Commission established (Health, 2017)
2011
Te Kāhui Rongoā Trust (National rongoā governance body) established (Health, 2017)
2014
Whānau Ora Commissioning agencies established(Health, 2017)
2016
National Health Committee disestablished (Health, 2017)
2016
National Health Board disestablished (Health, 2017)
2016
Te Kete Hauora disestablished (Health, 2017)
2020-2023
COVID19 Pandemic
2021
An interim Health New Zealand organisation (HNZ) established (Ora, 2024)
2022
Transitioned to Health New Zealand | Te Whatu Ora(Ora, 2024)
2022
Pae Ora (Healthy Futures) Act 2022 (The purpose of this act was to protect, promote, and improve health, achieving equity and building 'Pae Ora'- Healthy Futures
2022
Te Aka Whai Ora (Māori Health Authority) embodies the principles of Te Tiriti o Waitangi Established (Health, 2022)
2024
Pae Ora amendment 2024 (Health, 2024).
2024
Te Aka Whai Ora Disestablished (Health, 2024).
National
1960-1972
Labour
1972-1975
National
1975-1984
Labour
1984-1990
National
1990-1999
Labour
1999-2008
National
2008-2017
Labour
2017-2023
National
2023-

Where: Infrastructure: Infrastructure refers to the physical hospital buildings and built environments where care is provided.

Aotearoa's health infrastructure is failing to provide a solid foundation for the sector to thrive (New Zealand Institute of Economic Research, 2023). The recent briefing to the incoming health minister in 2025 outlined the need for immense future investment in infrastructure, driven by decades of underinvestment (Ministry of Health, 2025; Rust, 2021).

The estimated lifespan of hospital infrastructure in Aotearoa is 40-50 years (Rust, 2021), on average, infrastructure requires refurbishment every 16 yrs (New Zealand Institute of Economic Research, 2023). These figures are concerning in terms of longevity and sustainability; however, they reach beyond the scope of this discussion. These figures are also of concern when considering a large percentage of Aotearoa's infrastructure construction dates back to the 1950s, 60s, and 70s, making them 55-75 years old (Rust, 2021). Not only is this troublesome due to the lack of replacement beds at newer facilities, but it also creates concerns over structural integrity, material toxicity, and inefficient services (Rust, 2021). The 2023 'Building Healthy Futures' report describes much of the current infrastructure as no longer fit for purpose, and criticises a lack of flexibility required to adopt modern medical advancements and subsequent contemporary models of care (New Zealand Institute of Economic Research, 2023). The report details extensive underfunding of the system, characterised by poor asset management, resulting in historic defiance of maintenance and the reallocation of funds to maintain operational costs and service delivery (New Zealand Institute of Economic Research, 2023). The impacts of this have led to occurrences such as leaky buildings, compliance issues, defective design life, and product and material failures, all of which likely undermine health outcomes (New Zealand Institute of Economic Research, 2023).

Conclude: *The challenges the healthcare system faces daily are well-established and concerning, affecting the quality and delivery of healthcare to New Zealanders. As previously discussed and demonstrated in the legislative history, it is time to consider an alternative approach to care. As Aotearoa grows and ages, it is time to assess how to provide care to people in need best, facilitating not only healing but health and wellbeing in the most appropriate forms (Ministry of Health, 2023).*

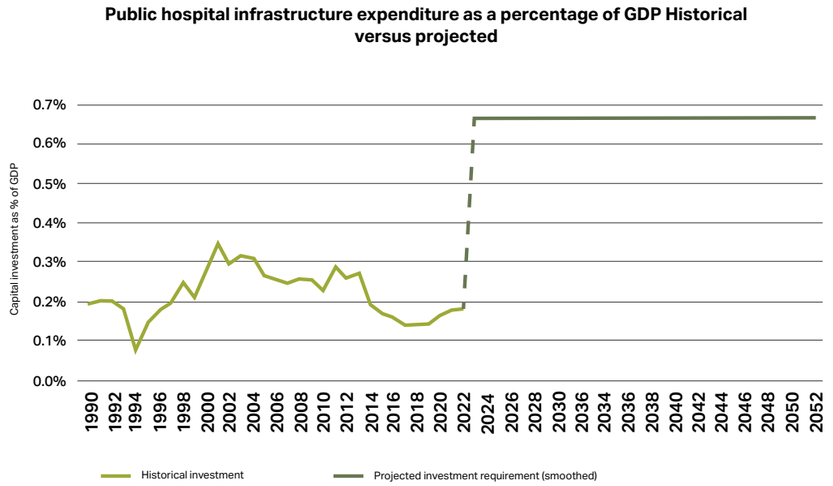


Figure 8. Public hospital infrastructure expenditure as a percent of GDP historical vs projected. Adapted from (New Zealand Institute of Economic Research, 2023)

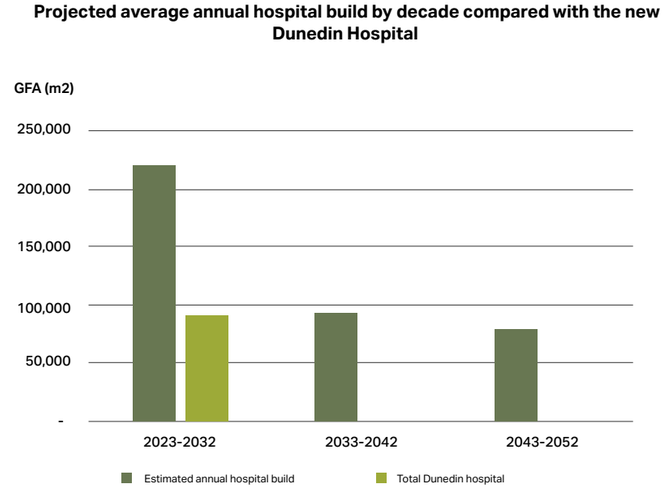


Figure 9. Projected average annual hospital build by decade compared with the new Dunedin hospital. Adapted from (New Zealand Institute of Economic Research, 2023)

Chapter Two: Research Methodologies

What and How

Research Question:

How can biophilic design principles be integrated into hospital design to enhance well-being and healing in Aotearoa?

Moreover, how can these biophilic principles be applied explicitly to a dementia hospital to enhance patients' holistic wellbeing and quality of life?

Research Aims and Objectives

Aims

- *Utilise biophilic principles to enhance the patient and user experience of space by leveraging innate connections to nature.*
- *Design a space that effectively supports New Zealanders in need, creating an environment that promotes their wellbeing.*
- *Devise a theoretical framework usable as a tool for healthcare facility design.*
- *Test and refine this framework through design-led research.*

Objectives

- *Critically analyse Aotearoa's healthcare system to gain an understanding of the current context.*
- *Determine what wellbeing is in an Aotearoa context.*
- *Discover how biophilia can enhance patients' quality of life and healing functions.*
- *Investigate how and when biophilic design principles are appropriately implemented into hospital settings.*

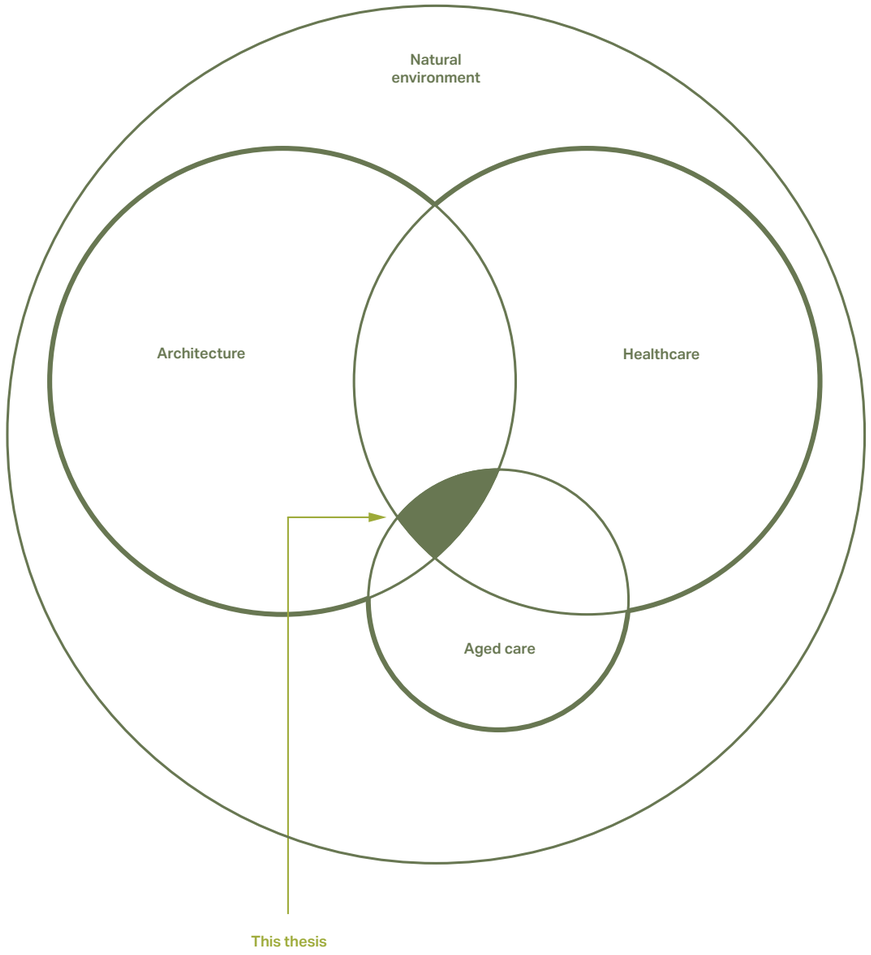


Figure 10.Scope articulation hybrid Venn diagram

Scope & Limitations

Figure 10 illustrates the context within which this thesis will operate. The diagram also situates architecture and its contribution to healthcare and aged care, while illustrating the constant presence of the natural environment despite the thickened resistance to it.

Research Methodology

This is a design-led research thesis that also incorporates design through research, utilising an iterative triangulation process. The key methodologies are outlined in Figure 11. The core of the diagram and the project is Stage '00', which outlines the research question and scope. As time passes, the circles ripple outward; the circularity insinuates a constant rotation of reflection, iteration, and refinement. The circular form also indicates what could be an infinite process.

Design through research contains generalised thinking, writing, verifying, performing and validating of research; however, its importance is in the materialisation into design (McRobert, 2018). The applied research nature of design through research implies real-world constraints and complexities that translate into a 'holistic body of work containing embodied knowledge' (McRobert, 2018).

Design-led, also referred to as practice-led research, is the process of conducting research through a design process within a creative capacity (Smith & Dean, 2009). Smith and Dean (2009) suggest that 'there are many rich and innovative ways ... creative practice can constitute, or contribute to research and further commit to reciprocal relations between creative practice and the revolution of academic research, while simultaneously acknowledging the positive impacts of academic research on creative practices'.(Smith & Dean, 2009).

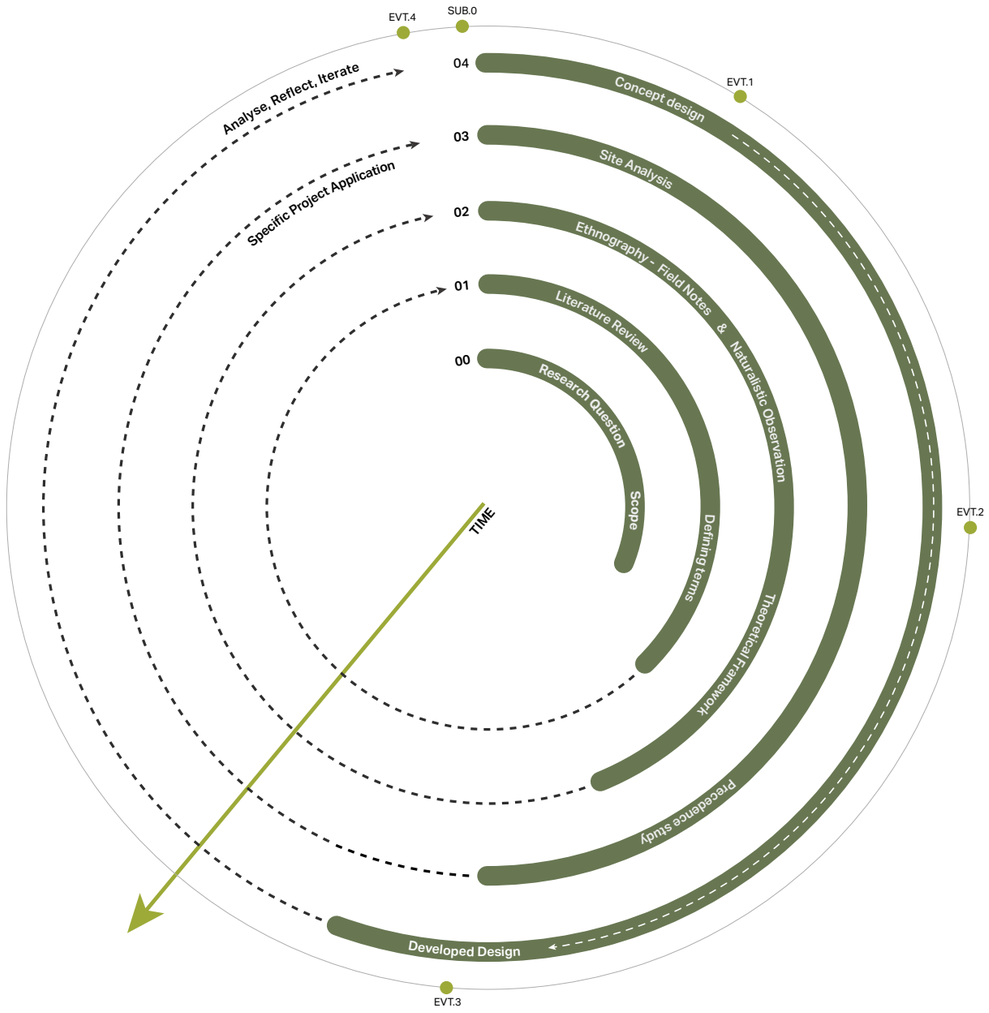


Figure 11.Research methodologies diagram

Methodologies

Table 1.Methodologies breakdown

Stage	Methodology	Thesis Section
00 - Research Proposal	Research Question Scope Articulation Research Methodologies	Chapter 2
01 - Background Context	Literature Review *The literature review will establish and familiarise oneself with typological precedents and offer an understanding of conceptual landscapes (Groa & Wang, 2002). The review will identify and connect topic inquiries, and respond and/or contribute to a state of knowledge that grounds a theoretical framework and eventually influences the final design.*	Chapter 3
02 - Contextual Review	Theoretical Framework Ethnography - Field Notes Documentation & Observational Research – Naturalistic Observation *Ethnography field notes are a qualitative research method to observe the environment and interactions of people, and the quality of space, while documenting human senses and experiences to build rich contextual data (Phillippi & Lauderdale, 2018). This method aims to determine how occupants perceive their surroundings (Groa & Wang, 2002). Naturalistic observation, encompassed as part of ethnography, is a form of unobtrusive descriptive research applied within an area of natural interactions (Angrosino, 2007). The controlled setting allows participants to observe behaviours within their proper contexts. (Angrosino, 2007).*	Chapter 4 Chapter 5
03 – Pre-Design	Precedent Study *Precedent study, aka case study, is defined as an 'empirical inquiry that investigates a phenomenon or setting' (Groa & Wang, 2002). Architects have long used precedent studies informing design processes as inspiration, practical information, and the learning of problem-solving skills (Francis, 2001).* Site Analysis	Chapter 6&9 Chapter 7
04 – Design	Conceptual Design Developed Design	Chapter 8 Chapter 9

Chapter Three: Literature Review

Introduction

This literature review aims to understand the current conceptual landscapes of elected topics. The insights gained will inform a theoretical framework and subsequent conceptual and developmental thinking. The topics included within this review have been selected based on their relation to the research question: How does one design for wellbeing or with biophilia without understanding its definitions and groundings? This text will include a review of wellbeing as a concept, wellbeing in the context of Aotearoa, neuroarchitecture, stress-reducing architecture, and biophilic design. The chapter concludes with a discussion regarding gaps in the literature.

From Illbeing to Wellbeing

In recent years, the topic of wellbeing has been widely embraced; it is something parents aspire for their children and is generally understood as a necessity for everyone (Vazquez et al., 2009). Despite contemporary prioritisation of wellness, historical medical discourse has been dominated by ill-being, positing wellbeing as a relatively antithetical concept (Rusk & Waters, 2013; Vazquez et al., 2009).

In 'The Birth of the Clinic' (1973), Michel Foucault examines aspects of the biomedical paradigm and introduces the concept of the 'medical gaze'(Foucault, 1973). The gaze reflects the shift in the patient-doctor relationship in the late 20th century, brought about by technological advancement, medical knowledge and the institutionalisation of health (Foucault, 1973). The delineation of the shift from 'theory' to 'observations' describes the departure of patient introspection to practitioners' use of direct observations, dissection, and pathological anatomy through authoritative tools and technology (Foucault, 1973). The shift renders the patient's voice secondary and positions hospitals as central to the production of knowledge for illness classification and empirical verification (Foucault, 1973; Ristić et al., 2021). Aleksandar Ristic and colleagues re-evaluate this concept in contemporary contexts, concluding that despite current paradigm shifts, aspects of the clinical gaze prevail today (Ristić et al., 2021). The current paradigm shift refers to the 'rise of the empowered patient' and encourages empowered, activated and informed participants in health (Ristić et al., 2021). This is seen in Aotearoa also, as mirrored in the 2023 New Zealand Health Strategy, which advocates for patient voices and flexibility in the partnership with providers (Ministry of Health, 2023a).

It seems the only thing agreed upon in wellbeing literature is the concept's varied definitions (Jarden & Roache, 2023). The World Health Organisation refers to wellbeing as: 'Not merely the absence of disease or infirmity but a state of complete physical and social wellbeing' (Misselbrook, 2014). Other sources suggest it varies between countries and cultures (Fave et al., 2016). A brief overview of different ways to define wellbeing follows:

The philosophies of Plato and Pythagoras - Early Greek philosophers poetically understood health and wellbeing as a state of harmony and balance (Jayawickrama & Madhanagopal, 2025). Emphasising the interconnectedness of the individual with the larger cosmic order (Jayawickrama & Madhanagopal, 2025).

Hedonic - *Embedded in Greek antiquity, the hedonic approach emphasises positive emotions, life satisfaction and pleasure (Vazquez et al., 2009).*

Eudaimonic – *The eudaimonic approach, rooted in Aristotelian philosophy, emphasises personal growth, purpose and self-actualisation. (Vazquez et al., 2009). The contrast between eudaimonic and hedonic is illustrated in Figure xx.*

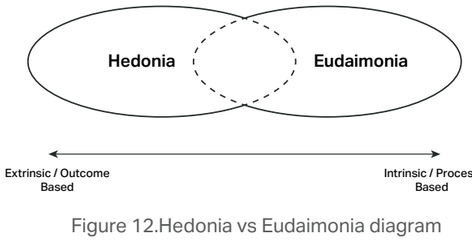


Figure 12.Hedonia vs Eudaimonia diagram

'Flourishing'- *A by Keyes in 2002, 'flourishing' describes a state in which individuals feel positively toward themselves and retain foundational social relations with their environment (Keyes, 2002; Maulana & Khawaja, 2022).*

In 2013, Huppert and So, inspired by 'flourishing' theory, suggested that the experience of wellbeing is associated with one's ability to control their physical health, emotional stability, meaning of life, optimism, and self-esteem (Maulana & Khawaja, 2022). The two argued that wellbeing is the opposite of ill-being, implying that those with mental or emotional disorders are perhaps not able to attain a state of wellbeing (Maulana & Khawaja, 2022). The theorists describe the need for distinction between universal and cultural relativism, emphasising that wellbeing might be specific to different world views, cultural contexts and norms (Maulana & Khawaja, 2022). Notion of cultural guidance in defining wellbeing is also echoed by A. Fave and colleagues (2016), who highlight differences in countries and cultures. This then leads to the question: how is wellbeing defined in the context of Aotearoa?

Wellbeing in Aotearoa

The enduring impacts of colonisation have differentially affected Māori communities, resulting in variations in knowledge of identity, ancestry, culture, and history, particularly in relation to Māori wellbeing and health outcomes (Greaves et al., 2023). Prior to European arrival and later colonisation, it was understood that Rongoā, traditional Māori healing, encompassed traditional values and customs for thousands of years (Mark et al., 2019). Glenis Mark and colleagues break down common misconceptions surrounding the concept and express that within the context of Te ao Māori, the term 'traditional healing' is paramount over other terms as it acknowledges that traditional healing is an 'ancient, intact, complex, holistic healthcare system' (Mark et al., 2019). Glenis Mark and Antonia C. Lyons echo this, outlining that such Ingenious perspectives on holism and wellbeing are grounded in cultural values passed down through generations and include the belief that all life is interrelated with one another, the environment, and the larger cosmos (Mark & Lyons, 2010). Interestingly, this belief is similar to the earlier theories of Plato and Pythagoras as discussed above (Vazquez et al., 2009). However, the westernisation of the Aotearoa health system directly conflicts with such holistic understandings, as these approaches contradict biomedical models that focus on reductionism (Rochford, 2004). 'Whare Tapa Whā: A Māori model of a unified theory of health' explains that the biomedical model fails to acknowledge immeasurable variables and, as a result, considers only physical health as an indicator of wellbeing, failing to meet any holistic endeavour (Rochford, 2004).

The latter period of the 20th century has seen the revitalisation of Māori culture throughout Aotearoa (Johnson et al., 2024). More recently, this has included the introduction of Indigenous health/wellbeing frameworks with various depths and purposes (Johnson et al., 2024). This is reflected in Aotearoa's recent health restructuring in the New Zealand Health Strategy,(Ministry of Health, 2023a), Pae Ora (Health Futures) Document (Ministry of Health, 2022), and Pae Tu Māori health strategy (Te Aka Whai Ora, 2023). Over the last 40 years, two frameworks have prevailed, exerting considerable influence and shaping the understanding of Māori health and wellbeing: Te Whare Tapa Whā and Te Wheke (Johnson et al., 2024). The varying complexities between the two frameworks impact how they are (Johnson et al., 2024). For example, Te Whare Tapa Whā is considered simple and broad; however, Te Wheke offers comprehensive Māori philosophical understandings, such as Hā (Breadth of life), Mauri (Lifeforce) and Mana (Authority) (Johnson et al., 2024).

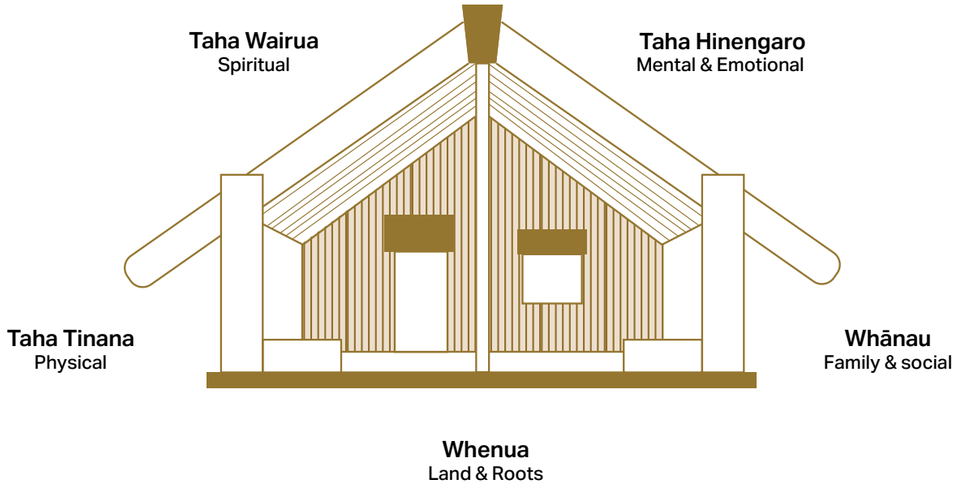


Figure 13. Te Whara Tapa Wha wellbeing diagram adapted from (Mental Health Foundation of New Zealand, 2025)

Te Whare Tapa Whā

This understanding of health and wellbeing was developed by Mason Durie and is represented as a wharenui (Māori meeting house) (Ministry of Health, 2023; Rochford, 2004). The wharenui symbolises the cornerstones of Māori health, the walls and pitched roof represent aspects of wellbeing and suggest that with the breakage or the absence of a singular element, the system is unbalanced and subsequently illbeing is experienced (Ministry of Health, 2023). Each of the wharenui elements represent:

Taha tinana (Physical health)
Taha wairua (Spiritual health)
Taha whānau (Family health)
Taha hinengaro (Mental health)

Figure 13 also includes the whenua (land and roots), which is not typically included in explanations of the framework; however, Figure 13 mirrors the model provided by the New Zealand Mental Health Foundation (Mental Health Foundation of New Zealand, 2025). To this end, the remainder of the thesis will operate in accordance with this model.

Te Wheke

Te Wheke is represented by an octopus (Ministry of Health, 2023c). Each tentacle represents aspects of holistic wellbeing (Ministry of Health, 2023c). The tentacles interweave to represent interconnection and proximity to each other (Ministry of Health, 2023).

Wairuatanga – Spirituality
Hinengaro – The mind
Taha tinana – Physical wellbeing
Whanaungatanga – Extended family
Mauri – Life force in people and objects
Mana ake – Unique identity of individuals and family
Hā a koro ma, a kui ma – Breath of life from forbears
Whatumanawa – The open and healthy expression of emotion.

Neuroarchitecture and Stress-Reducing Architecture

Neuroarchitecture is a multidisciplinary field that bridges between neuroscience, architecture, physiology, and psychology (Assema et al., 2022). Explicitly exploring the relationship between designed environments and the cognitive and emotional responses of people's experiences (Báez et al., 2023). Interest in this interaction has become a contemporary architectural discourse (Lee et al., 2022).

A 2019 study, 'short- and long-term effects of architecture on the brain', explored the influence of the environment on human brain behaviour (Paiva & Jedon, 2019). Finding that short-term effects related to environmental stimuli, changed mood, stress levels, and attention (Paiva & Jedon, 2019). Long-term effects lead to lasting alterations in behaviour, cognitive function, and mental health, identifying that poorly designed spaces can increase chronic stress levels significantly (Paiva & Jedon, 2019).Santos highlights an interesting argument regarding the relationship, articulating two essential points (Santos, 2023). Firstly, human interaction with the built environment influences mental, emotional, and physical states, shaping behaviours and activities (Santos, 2023). Secondly, and commonly unconsidered, people may experience the same environment differently (Santos, 2023). Beliefs, genetics, cultural perspectives, frequency and duration of exposure, are variables fundamental to the experience and internalisation of space (Santos, 2023). This concept is fascinating in healthcare settings, given common preconceptions about such facilities. Both points operate consciously and unconsciously, meaning individuals may not always notice their behaviour in response to these stimuli (Santos, 2023).

In a section of Ian Ritchie's Neuroarchitecture: 'Designing with the Mind in Mind', he describes the physical interfaces between built form and a person, particularly focusing on the senses(Ritchie, 2020). Neuroscientists believe there are 22 to 33 senses within the human body, contrasting the five that are understood at the most basic level (Ritchie, 2020). Passing the boundaries of sight, smell, noise, touch, and taste, Ritchie introduces numerous senses such as balance that is perceived through a trio of vertical and horizontal canals in our ears, whose movement of fluid alerts us to movement – up, down, side to side, forwards and backwards (Ritchie, 2020). The effects of our senses are massively underestimated, or at least vastly underconsidered (Ritchie, 2020).Moreover, sensory elements influence one another, collaborating or conflicting to shape human experiences and memories. (Ritchie, 2020).

Stress

Stress - despite being one of the most studied concepts in health and neuroscience, stress is a difficult thing to define (Cooper & Dewe, 2004; Evans & Cohen, 1984). However, Kellert and colleagues define stress as a 'process of responding to events, environmental features or situations that are challenging, exceed coping resources or threaten wellbeing' (Kellert et al., 2008). Evans and Cohen's definitions also echo this (Evans & Cohen, 1984). To this end, the brain plays a crucial role in the human stress response, and levels of such are a significant factor for an individual's health and wellbeing (Báez et al., 2023). It is acknowledged that stress is inevitably person-based and not solely attributed to one's variation in environmental quality; however, some academics argue that research has overlooked properties of the physical environment in relation to stress (Evans & Cohen, 1984).

A research paper by Gary W. Evans and Janetta Michell McCoy explores the relationship between architectural dimensions and stress, outlining five key components with varying similarities to other literature (Evans & McCoy, 1998). They include:

Stimulation

Definition:

> *'Describes the amount of information in a setting or object that impinges upon the human user' (Evans & McCoy, 1998).*

Stimulation, also referred to as 'environmental enrichment' in the article 'Designing for human wellbeing' by Hala Medhat Assema and colleagues (Assema et al., 2022). This article refers to environmental enrichment as the boost of human stimulation in richly designed environments. (Assema et al., 2022).
Consequences: *Moderate levels of stimulation are considered optimal for humans (Evans & McCoy, 1998). A lack of stimulation can lead to boredom or, in extreme cases, sensory deprivation (Evans & McCoy, 1998). Overabundant sensory stimulation causes distraction and overload that inevitably interfere with cognitive processes and increase the demand for concentration (Evans & McCoy, 1998).*
Influencing factors: *Intensity, complexity, mystery, novelty, noise, light, odour, colour, crowding, visual exposure, proximity to circulation, adjacencies (Evans & McCoy, 1998).*

Coherence

Definition:

> *"Refers to the clarity or comprehensibility of building elements and form" (Evans & McCoy, 1998).*

Allows users to infer identity, meaning and locations of objects and space within a built environment (Evans & McCoy, 1998).
Consequences: *A lack of coherence causes ambiguity, disorganisation, and disorientation, which ultimately leads to stress (Evans & McCoy, 1998).*
Influencing factors: *Legibility, organisation, thematic structure, predictability, landmark, signage, pathway configuration, distinctiveness, floorplan complexity, circulation alignment, exterior vistas (Evans & McCoy, 1998).*

Affordance

Definition:

> *" We utilise interior spaces according to our understanding of the functions that they provide us" (Evans & McCoy, 1998).*

This component of neuroarchitecture dominates much of the literature. Mallgrave similarly references this, distinguishing that an 'affordance' is something 'provides or furnishes'(Mallgrave, 2020).
Consequences: *People generally prefer environments with different and abundant affordances, such as the opportunity to walk, ride, or sit, etc (Mallgrave, 2020). Contrary to neutral environments, environmental enrichment leads to changes in emotion, cellular and molecular body responses, behaviour, and neurological shifts (Assema et al., 2022). Comparatively, Evans and McCoy focus on 'mis-affordances', which references design moves that misinform or ambiguate through a conflict of information about the purpose or use of a space (Evans & McCoy, 1998). Johnson (2020) expands on this through its relation to physical structures. Exploring how structure can forcefully manipulate possibilities of actions within a built environment (Johnson, 2020). Expressing experiences of restricted or free access involves an interaction of structural forcefulness, for example: "You must walk up these steps to gain access" (Johnson, 2020).*
Influencing factors: *Ambiguity, sudden perceptual changes, perceptual cue conflict, feedback (Evans & McCoy, 1998).*

Control

Definition:

> *'Defined as herein as mastery or the ability to either alter the physical environment or regulate exploration of one's surroundings' (Evans & McCoy, 1998).*

Consequences: *Prolonged experience of physical constraints, such as climatic control, overall reduced choice, causes stress (Evans & McCoy, 1998). Further exposure to uncontrollable environments elicits 'learned helplessness' and increases psychological distress that can be associated with physical disease (Evans & McCoy, 1998).*
Influencing factors: *Crowding, boundaries, climatic & light controls, spatial hierarchy, territoriality, symbolism, flexibility, responsiveness, privacy, depth, interconnectedness, functional distances, focal point, sociofugal furniture, arrangement (Evans & McCoy, 1998).*

Restorative

Definition:

> *'Restorative qualities define the potential of design elements to function therapeutically, reducing cognitive fatigue and other sources of stress' (Evans & McCoy, 1998).*

Consequences: *The use of restorative design elements allows occupants to alter the balance between environmental demands and personal resources, restoring an equilibrium of wellbeing (Evans & McCoy, 1998). Settings of therapeutic environments 'uplift the human spirit and promote healing' (Evans & McCoy, 1998).*
Influencing factors: *Minimal distraction, stimulus shelter, fascination, and solitude (Evans & McCoy, 1998).*
Research into this topic has revealed numerous strategies related to neuroarchitecture and environmental psychology that can be applied within a designed setting.

Biophilia

Experts have long affirmed the critical role the natural environment plays in determining the physical, mental, cultural and social evolutions of people (Robinson, 2017). What some might experience as intuitively obvious and deeply tied to a sense of oneself has been described more formally as the biophilia hypothesis: "the inherent human inclination to affiliate with natural systems and processes, especially life and life-like features of the non-human environments" (Browning et al., 2014; Kellert et al., 2008). Biologist Edward O Wilson popularised the term in 1984 (Bernheimer, 2019) however, biophilia has danced through history, including architectural histories (Browning et al., 2014). The resource 'The 14 patterns of biophilic design' references historical examples of this, calling on Ancient Egyptian sphinx motifs or Greek Vitruvian origins, asserting that this modern understanding is not new; it is merely the rediscovery (Browning et al., 2014).

In Western culture, it is believed that the separation between humans and nature began during the Enlightenment period, marking a shift in the belief in domination over nature (Vining et al., 2008). The combination of scientific and technological advancement intensified the divide, allowing humans to manufacture and further transform nature to their liking (Jayawickrama & Madhanagopal, 2025; Vining et al., 2008). As Kellert and colleagues put it, "in our cell phone era, the ever-evolving neocortex of the human brain craves instant gratification… those very impulses perpetuate a distancing from nature's eternal cycles, putting our support system at risk"(Kellert et al., 2008). The importance of this lies in the theory that affinity for nature corresponds to the frequency of natural exposure, demonstrating that individuals with a strong emotional foundation in nature are more motivated to seek direct experience and reap its benefits (Seymour, 2016; Soga & Gaston, 2016). The founding understandings of biophilia relate to some corresponding theories; one commonly referenced and introduced by Edward O. Wilson is the relation to human evolution, which outlines that humans are biologically programmed to prefer settings that have underpinned our survival over millennia (Bernheimer, 2019). Robert Wright, an evolutionary psychologist, delineates this by saying "what the theory of natural selection says…is that people's minds were designed to maximise fitness in the environment in which those minds evolved…the…environment of evolutionary adaptation….or…the ancestral environment" (Pinker, 2005). Kellert and colleagues echo this in their text 'Biophilic design, the theory, science and practice of bringing buildings to life', as do Browning and colleagues in '14 patterns of biophilic design.'

An interesting part of this evolutionist theory is Kaplan's theory of environmental preference, which explicitly references the balance of information in environments as key to human preference (Bernheimer, 2019; Evans & Cohen, 1984). Implying humans thrive on rich contextual information with a balance of refuge, prospect, mystery, and legibility (Bernheimer, 2019). Curiously titled 'nature of space' in '14 patterns of biophilic design' (Browning et al., 2014) and 'evolved human-nature relationships' in Kellert's text (Kellert et al., 2008). Similarly, Nikos S. Salingaros notes that environments with deprived sensory stimuli mimic the experience of illness and bring on feelings of anxiety and neurophysiological breakdowns (Bernheimer, 2019). Other theories contributing to the evolutionary theories include –

- *Colour psychology (Kellert et al., 2008): It is understood humans can differentiate the most shades of green, dating back to primal predator detection (Bernheimer, 2019).*
- *Natural lighting: Referring to humans' dependency on light and dark in the regulation of our diurnal cycles (Kellert et al., 2008).*

Figure 14.Photograph of Tui in a tree

The benefits associated with incorporating biophilia into the design of the built environment are well-documented, and to name a few: reduce stress, enhance creativity and clarity of thought, improve wellbeing, and expedite healing (Browning et al., 2014), improved cognitive function, fewer health and social problems, greater motivation, healthier childhoods, and overall improved quality of life (Kellert et al., 2008). Focusing specifically on application in healthcare settings, Dr Ulrich's research was published in 1984 regarding the effects of hospital window views on surgical patient recovery (Ulrich, 1984). Ulrich outlined that affiliations with nature elicit "positive feelings, reduce fear in stressed subjects, hold interest, and may block or reduce stressful thoughts. They might also foster restoration from anxiety or stress, all key implications for healing and recovery" (Ulrich, 1984).

The currency of much of the literature associated with this topic is a testament to its contemporary relevance and applicability in designed environments. Subsequently, how does biophilic design become a deliberate attempt to translate knowledge of inherent human affinity to affiliate with nature into a designed environment as physical outcomes, as opposed to a design intention (Kellert et al., 2008). There are two existing design manuals for biophilic design applications, which include: 14 patterns of biophilic design (Browning et al., 2014) and biophilic design, the theory, science and practice of bringing buildings to life (Kellert et al., 2008). Please see Figure xx and xx. This outlines key elements of biophilic design.

Table 2. Elements and Attributes of Biophilic design Adapted from (Kellert et al., 2008)

Elements and Attributes of Biophillic Design

Environmental Features	Natural Shapes and Forms	Natural Patterns and Processes
- Colour - Water - Air - Sunlight - Plants - Animals - Natural material - Views and vistas - Façade greening - Geology and landscape - Habitats and ecosystems - Fire	- Botanical motifs - Tree and columnar supports - Animal (mainly vertebrate) - Shells and spirals - Egg, oval, and tubular forms - Arches, vaults, domes. Arches, vaults - Shapes resisting straight lines and right angles - Simulation of natural features - Biomorphy - Geomorphology - Biomimicry	- Sensory variability - Information richness - Age, change, and the patina of time - Growth and efflorescence - Central focal point - Patterned wholes - Bounded spaces. - Transitional spaces - Linked series and chains. - Integration of parts to wholes - Complementary contrasts - Dynamic balance and tension - Fractals - Hierarchically organized ratios and scales
Light and Space	**Place-Based Relationships**	**Evolved Human-Nature Relationships**
- Natural light - Filtered and diffused light - Light and shadow - Reflected light. - Light pools - Warm light - Light as shape and form - Spaciousness - Spatial variability - Space as shape and form - Spatial harmony - Inside-outside spaces	- Geographic connection to place - Historic connection to place - Ecological connection to place - Cultural connection to place. - Indigenous materials - Landscape orientation - Landscape ecology. - Integration of culture and ecology - Spirit of place - Avoiding placelessness	- Prospect and refuge - Order and complexity - Curiosity and enticement - Change and metamorphosis - Security and protection - Mastery and control - Affection and attachment - Attraction and beauty - Exploration and discovery - Information and cognition - Fear and awe - Reverence and spirituality

Table 3. 14 Patterns of biophilic design Adapted from (Browning et al., 2014)

14 patterns of Biophilic Design

Nature in the Space
- Visual Connection with Nature - Non-Visual Connection with Nature - Non-Rhythmic Sensory Stimuli - Thermal & Airflow Variability - Presence of Water - Dynamic & Diffuse Light - Connection with Natural Systems
Natural Analogues
- Biomorphic Forms & Patterns - Material Connection with Nature - Complexity & Order
Nature of the Space
- Prospect - Refuge - Mystery - Risk/Peril

Gaps in the literature

The research into these topics has been fascinating, considering their histories, theoretical foundations, rationales, and implications. Equally insightful were their similarities and interconnections, particularly between Māori understandings of wellbeing and early Greek definitions. Neuroarchitecture and biophilia also exhibited significant overlap. However, sourcing information presented challenges. Neuroarchitecture required precise terminology to access relevant materials, and its relative novelty limited the availability of books, often due to cost. Similarly, academically recognised sources on wellbeing in Aotearoa context were difficult to obtain, as Indigenous knowledge is traditionally passed down through generations rather than formal publications. While many studies discussed each concept, including their importance and history, practical application or design examples were often limited.

Summary and link to next chapter

This review demonstrates the importance of ongoing exploration and application of the discussed concepts in design-led research. Understanding wellbeing and how it can be achieved informs effective design and shapes the direction of this thesis. Research into neuroarchitecture, stress-reducing design, and biophilia provides a strong foundation for later implementation. Overall, the review justifies the relevance of these topics and establishes a solid basis for future research, guiding the development of a theoretical framework for practical application.

Chapter Four: Nature Enhanced Wellbeing in Aotearoa Healthcare Design Framework

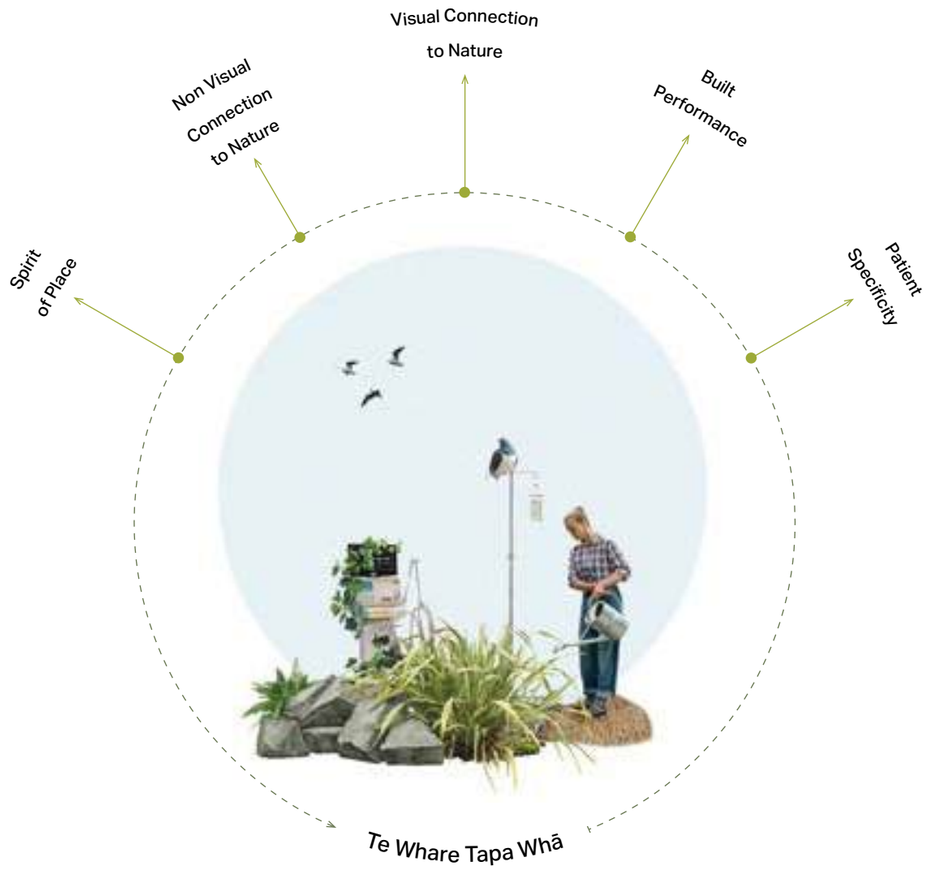


Figure 15.Theoretical framework diagram

Nature Enhanced Wellbeing in Aotearoa Healthcare Design Framework

‘NEW ‘ Aotearoa healthcare design framework

This self-established framework was developed by cross-referencing frameworks identified in the literature review and introduced during my architectural education. The cross-referencing process can be found in the Appendix. The NEW Aotearoa healthcare framework is designed for implementation across diverse hospital settings and specialisations. It draws influence from the following existing frameworks:

- *Biophilic Design Elements and Attributes (Kellert et al., 2008)*
- *14 Patterns of Biophilic Design (Browning et al., 2014)*
- *Mauri Ora Compass (Yates et al., 2022)*
- *Living Building Challenge (International Living Future Institute, 2019).*
- *Te Where Tapa Wha (Mental Health Foundation of New Zealand, 2025)*
- *New Zealand Health Facility Design Guidance (Te Whatu Ora, 2022)*
- *New Zealand Health strategy (Ministry of Health, 2023)*

Figure 15 represents the holistic nature of the framework, emphasising that Te Whare Tapa Whā—the Māori model of health and wellbeing – serves as the central connector and the heart of the circular structure. Wellbeing is portrayed as the manifestation of healthy taiao, referring to the natural world, including the earth, environment, and landscape of Aotearoa.

Spirit of Place

Table 4.Spirit of place

Heading	Consideration	Potential Strategy
Ecology of place	How might urban agriculture or habitat exchange be integrated?	◦ Community gardens ◦ Restoration of existing biodiversity ◦ Connections of habitats through green corridors ◦ Prioritisation of native species
Geographic Connection to Place	How does one interact with the wider physical environment?	◦ Emphasis on prominent geographical features, orientation, views of buildings and landscapes

Non Visual Connection to Nature

Table 5.Non-visual connection to nature

Heading	Consideration	Potential Strategy
Nature of Space	How might form and space influence v psychology	◦ Use of strategies such as prospect, refuge, mystery, complexity, order, coherence, affordance, controllability, and restoration
Natural Shapes and Forms		◦ Use of biomorphic forms, shapes, resistance to straight lines and right angles ◦ Light as shape and form
Natural Processes and Systems		◦ Integration of life-like and non-human environmental processes and systems

Visual Connection to Nature

Table 6.Visual connection to Nature

Heading	Consideration	Potential Strategy
Elements of Nature		◦ Views of: ◦ Nature ◦ Plants ◦ Sunlight ◦ Water ◦ Animals ◦ Direct access to nature
Material Connection to Nature		◦ Natural materials ◦ Non-Toxic Materials ◦ Renewable Materials ◦ Recyclable materials

Built Performance

Table 7. Built performance

Heading	Consideration	Potential Strategy
Passive Design		◦ Insulation ◦ Airtightness ◦ Solar gain ◦ Natural ventilation ◦ Natural heating and cooling
Lighting		◦ Dynamic and defused lighting ◦ Natural lighting ◦ Combination of light and shadow ◦ Lighting pools

Patient Specificity

Table 8.Patient specificity

Heading	Consideration	Potential Strategy
Accessibility & Appropriateness	What are the specific accessibility needs of patients? How will patients experience space? How might design cater to this?	◦ Accessible design ◦ Consideration of eye levels of patients ◦ Consideration of all senses when designing – smell, touch, taste, sound, etc
Safe & Secure	What are the security needs of the patient type? What level of natural exposure is safe for this patient? Consideration of sterility or immunity of patients.	

Every patient may experience a space differently. This section of the framework allows flexibility in its use, enabling application in various hospital environments and specialisations. Ultimately, this section requires the user to ascertain and understand specific patient-related requirements of the environment. The following offers some prompts in this process.

Chapter Five: Hospitals of Aotearoa

Figure 16.Photograph of Northshore Hospital entrance

Introduction

This chapter examines the infrastructure of numerous Auckland hospitals to gain a better understanding of the current underpinnings of New Zealanders' health and wellbeing. Using naturalistic observations, field notes and sketches, each site will be assessed in terms of its perceived function and performance. Attention will be given to how people interact with their environment as well as the qualities of physical settings. Observations will inform the SWOT analysis for each site (found in appendix), from which key insights and considerations will be drawn to guide the design process later.

The hospitals selected for the study represent a range of capacities (number of beds) and specialisations, with particular focus on aged and mental health care. The selection process followed the documentation of hospitals in Aotearoa. Initially, the distribution of public versus private hospitals was assessed (Figure 17), followed by Auckland hospitals within former DHB districts (Figures 18-20), and finally, documentation of all Auckland hospitals' capacities and specialisations.

Due to ethical boundaries and scope limitations, my observations, notes, and sketches are restricted to publicly accessible areas of hospitals, i.e., building exterior, street views, reception and waiting areas. I want to acknowledge that this limited scope cannot fully capture the lived experiences of hospital users and their interactions with space.

Public Vs Private Hospital Mapping

Aotearoa's public vs private hospital distribution: Marker size reflects the number of hospitals in each region (1 hospital = 2 mm). Larger markers indicate greater concentrations of infrastructure

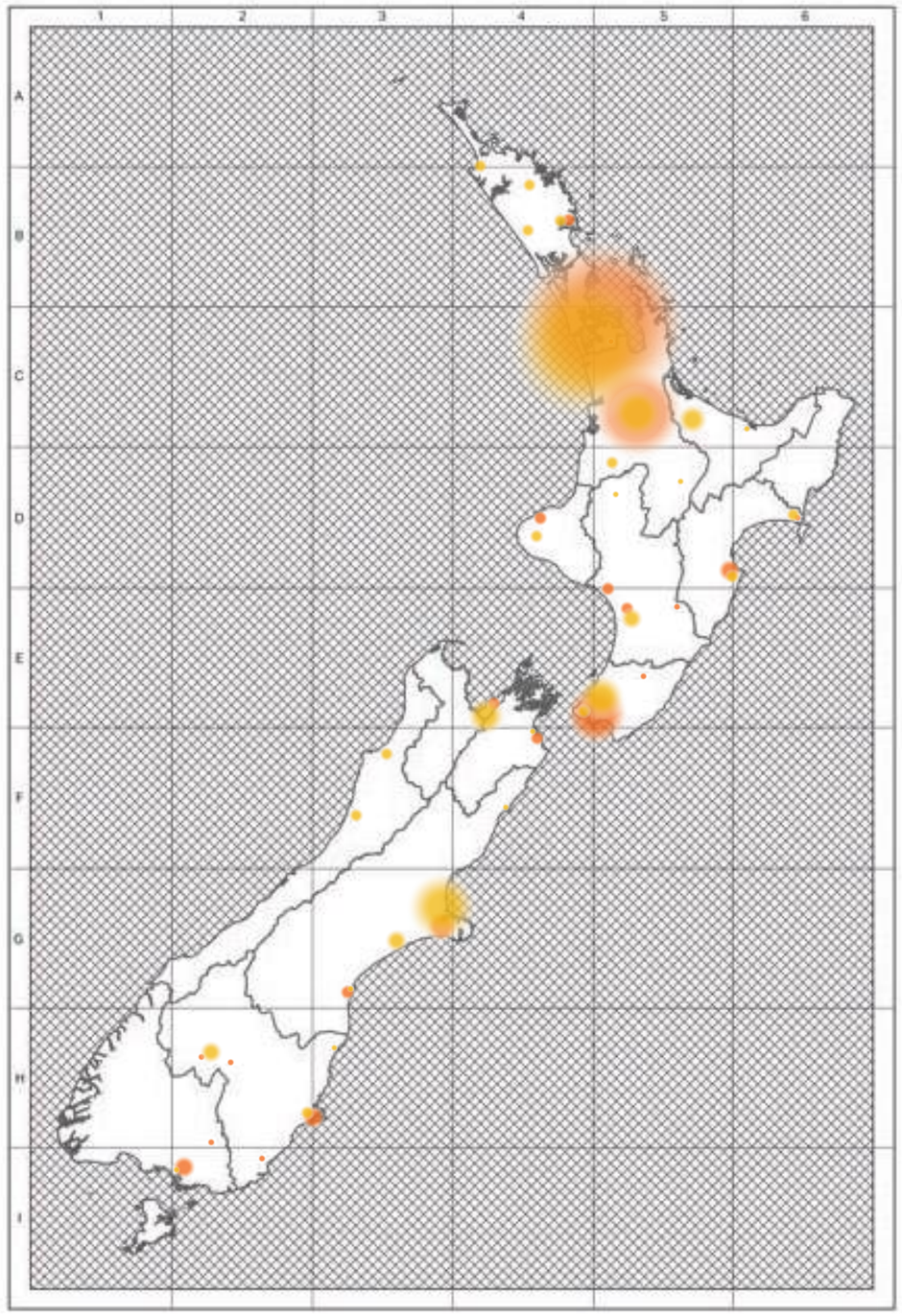


Figure 17.Aotearoa Public vs private hospital map.

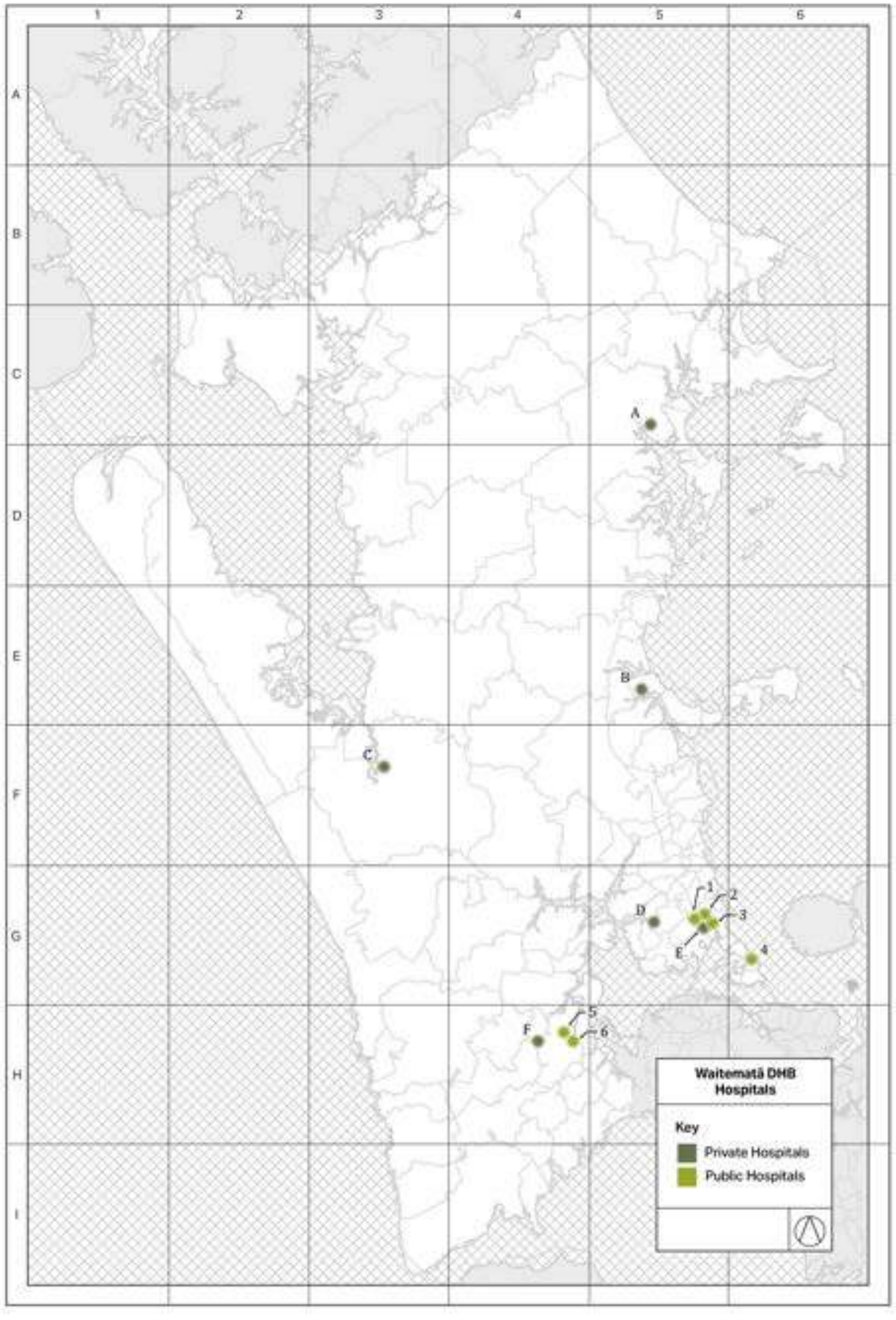


Figure 18.Waitematā district map identifying hospitals

Waitematā District

ID	Hospital	Service	Bed
1	Elective Surgery Centre	Surgical	30
2	He Puna Waiora	Mental Health	35
3	North Shore Hospital	Geriatric, Childrens health, Psychogeriatric, Mental health, Maternity, Surgical, Medical	669
4	Wilson Centre	Physical, Childrens health	30
5	Waiatarau Inpatient Mental Health Unit	Mental Health	32
6	Waitakere Hospital	Mental health, Maternity, Medical, Geriatric, Childrens health, Surgical	392

ID	Hospital	Service	Bed
A	Warkworth Birthing Centre	Maternity	13
B	Hibiscus Hospice	Medical	6
C	Helensville Birthing Centre	Maternity	5
D	Southern Cross Hospital North Harbour	Surgical, Medical	70
E	Harbour Hospice North Shore	Medical	15
F	ABI Auckland Intensive	Medical	36

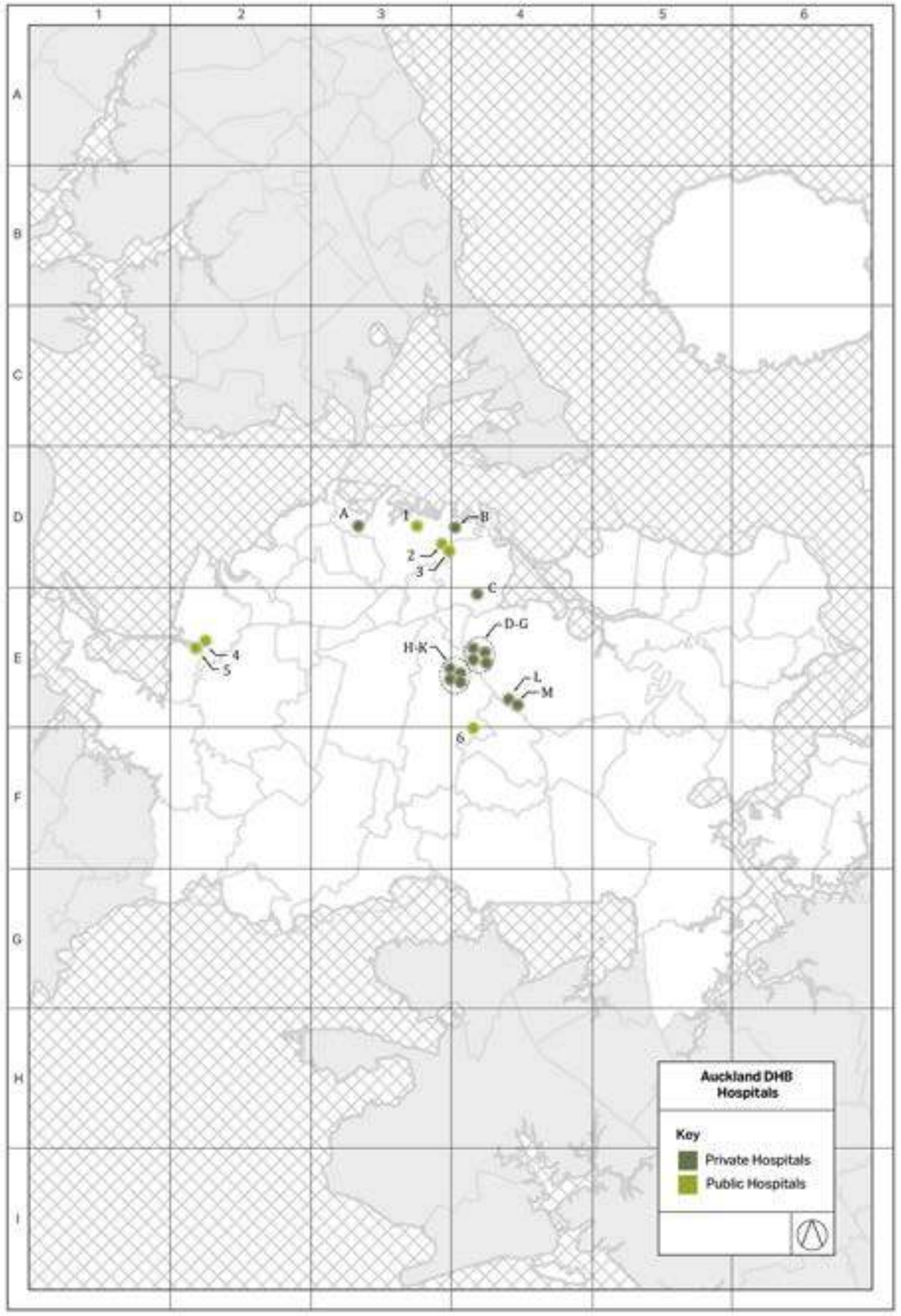


Figure 19.Auckland district map identifying hospitals

Auckland District

ID	Hospital	Service	Bed
1	Medically Managed Withdrawal Service	Mental Health	10
2	Auckland DHB X 3 Units - Mental Health	Mental Health	96
3	Auckland City Hospital	Childrens health, Maternity, Surgical, Medical	1187
4	Buchanan Rehabilitation Centre	Mental Health	40
5	Mason Clinic	Mental Health	126
6	Greenlane Clinical Centre	Surgical, Medical	31

ID	Hospital	Service	Bed
A	Mercy Hospice	Medical	13
B	Quay Park Surgical Ltd	Surgical	4
C	Birthcare Auckland	Maternity	45
D	St Marks Road Surgical Centre	Surgical	4
E	Auckland Surgical Centre	Surgical	17
F	Remuera Surgical Care	Surgical	4
G	MacMurray Centre	Surgical	4
H	Mercy Integrated Hospital	Surgical, Medical	90
I	Southern Cross Hospital Brightside	Surgical, Medical	43
J	Endoscopy Auckland	Surgical	10
K	Gillies Hospital	Surgical, Medical	20
L	Ascot Integrated Hospital	Surgical, Medical	97
M	Kakariki Hospital Limited	Surgical	20

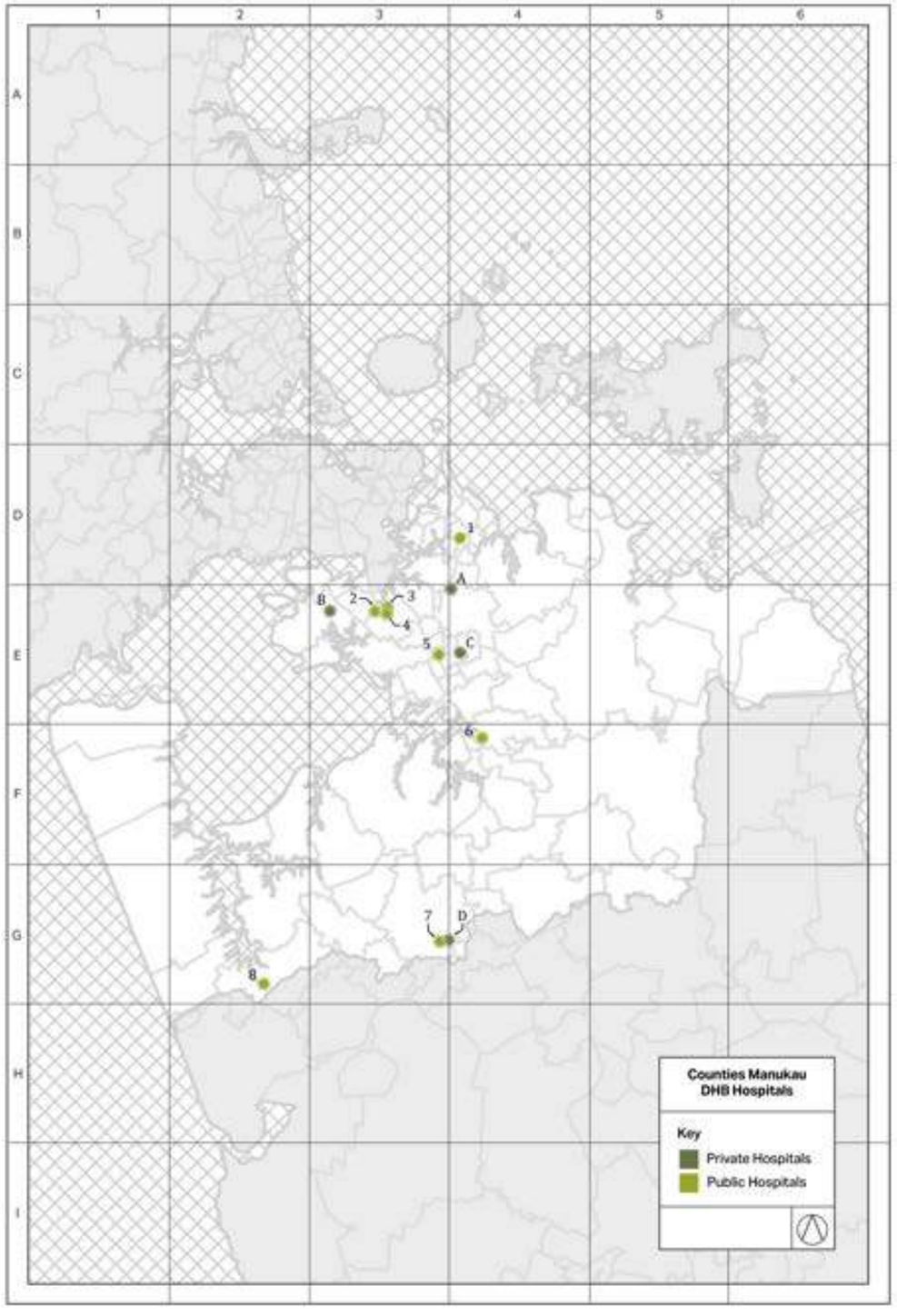


Figure 20.Counties Manukau district map identifying hospitals

Counties Manukau District

ID	Hospital	Service	Bed
1	Botany Downs Hospital	Maternity	20
2	Middlemore Hospital	Medical, Geriatric, Childrens health, Maternity, Psychogeriatric, Mental health, Surgical	905
3	Tamaki Oranga	Mental Health	20
4	Auckland Spinal Rehabilitation	Medical	20
5	Manukau Surgery Centre	Surgical	78
6	Papakura Obstetric Hospital	Maternity	13
7	Pukekohe Hospital	Geriatric, Maternity	32
8	Franklin Memorial Hospital	Geriatric	18

ID	Hospital	Service	Bed
A	Ormiston Surgical & Endoscopy	Surgical, Medical	45
B	Nga Hau Mangere Birthing Centre	Maternity	20
C	Totara Hospice	Medical	18
D	Franklin Private Hospital	Surgical	15

Figure 21.Photograph of an ambulance outside Northshore Hospital

Tāmaki Makaurau Hospital Site Visits

01 Franklin Memorial Hospital

Context

Location: 72 Kitchener Road, Waiuku 2123

Date and time: am - 03/2025

Specialisation: Geriatric (Ministry of Health, n.d.)

Capacity: 18 beds (Ministry of Health, n.d.)

Future Considerations

- *How can future needs be considered when designing? Flexibility and capacity for growth?*
- *Consideration of the extent to which a facility integrates with its surroundings and contributes to the street appeal.*

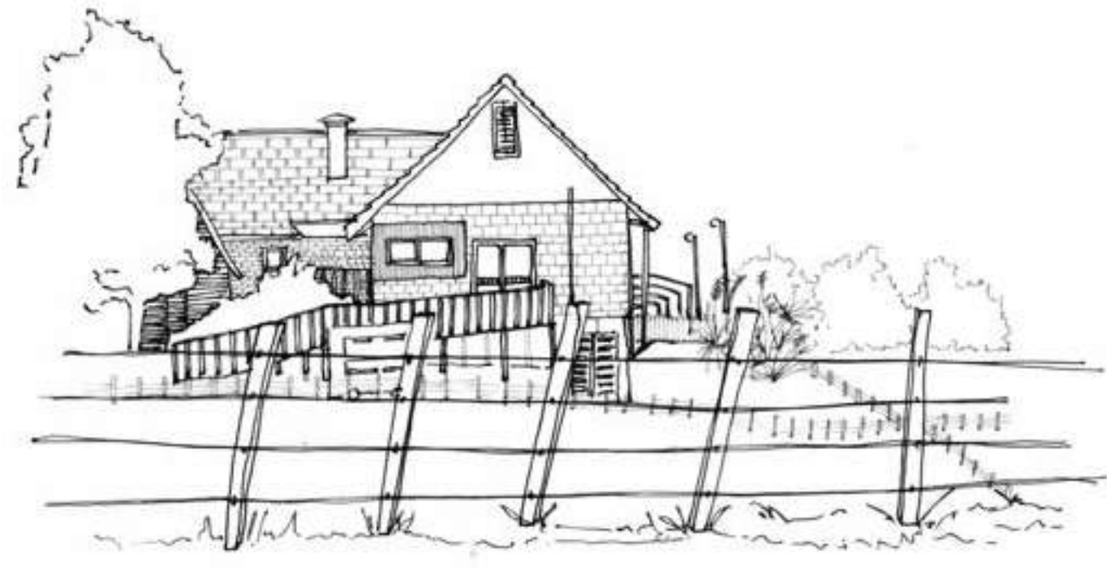


Figure 22.Sketch of Franklin Memorial Hospital

Figure 23.Analysis of Franklin Memorial Hospital

02 Pukekohe Hospital

Context

Location: 82 Kitchener Road, Pukekohe 2120

Date and time: am - 03/25

Specialisation: Maternity and geriatric (Ministry of Health, n.d.)

Capacity: 32 Beds (Ministry of Health, n.d.)

Future Considerations

- *Consideration of people's and patients' experiences before entering the interior environment. How do people arrive on site?*
- *Consideration of not only the built form, but also how people experience the exterior environment, and the potential role this plays in supporting heal-*

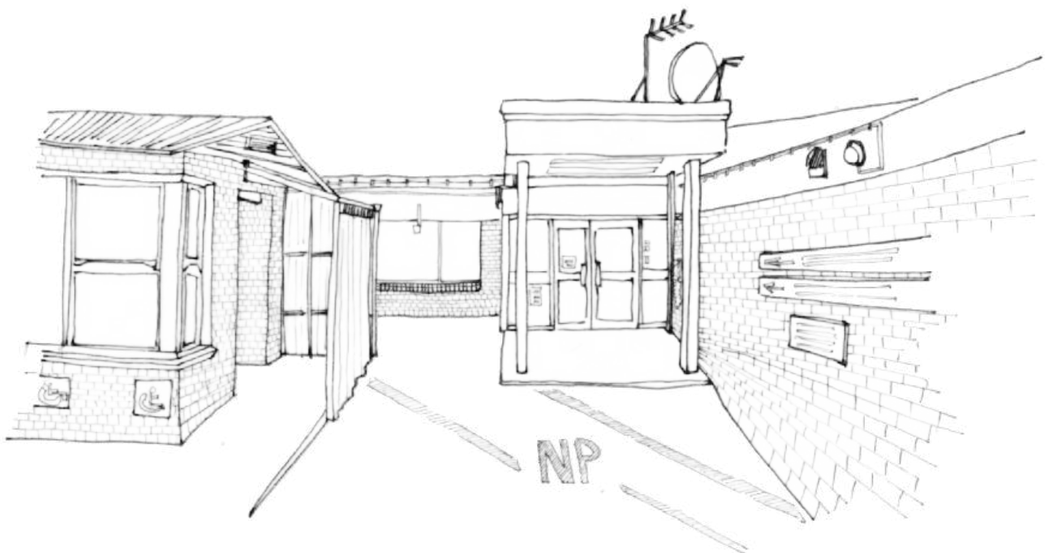


Figure 24.Sketch of Pukehoke Hospital entrance

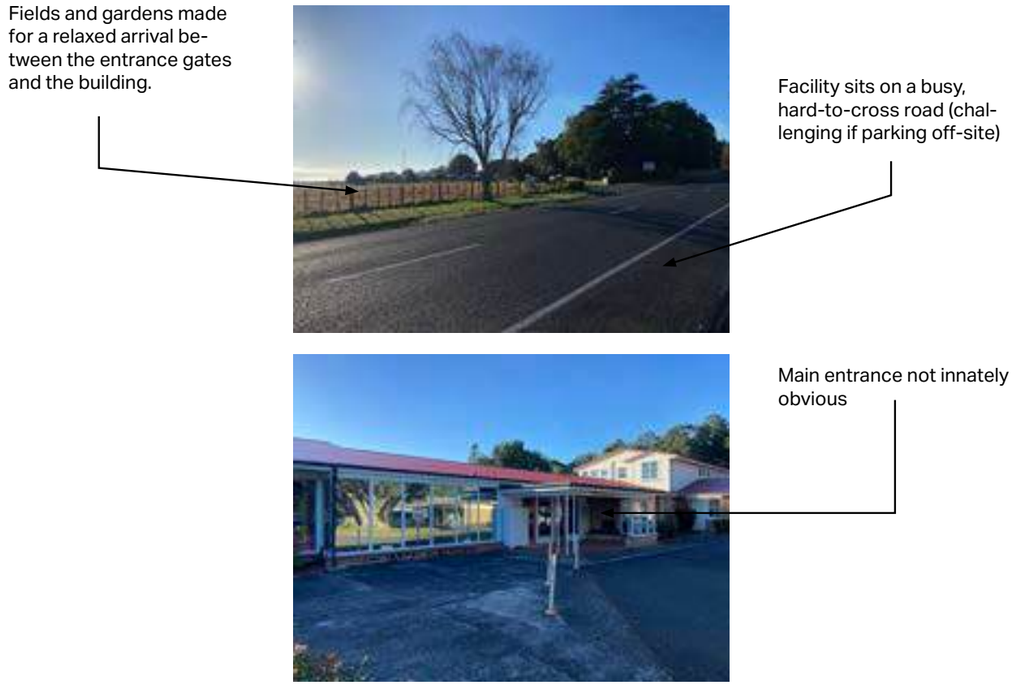


Figure 25.Analysis of Pukekohe Hospital

03 Middlemore Hospital

Context

Location: 100 Hospital Road, Ōtāhuhu, Auckland 2025

Date and time: am – 04/2

Specialisation: Medical, geriatric, children's health, maternity, psychogeriatric, mental health, surgical (Ministry of Health, n.d.)

Capacity: 905 Beds (Ministry of Health, n.d.)

Future Considerations

- *Consideration of how people experience the hospital prior to arriving in the building and perhaps prior to seeking medical attention: Carparking implications and master planning? What feelings do the waiting rooms evoke? Privacy, safety, calming?*
- *Organisation of zones and facilities, with attention to how adjacent areas interact with each other, e.g., managing noise levels between waiting areas and cafes.*

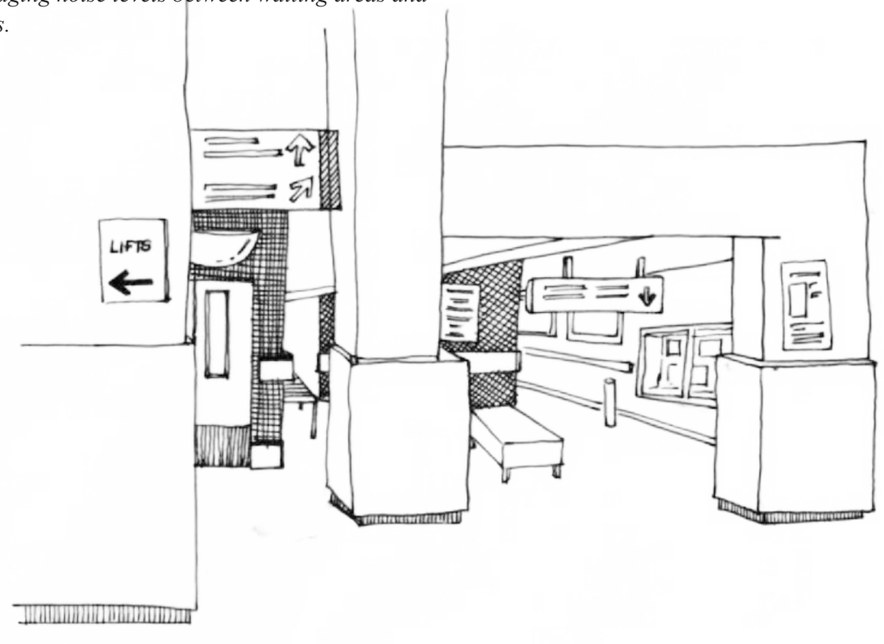


Figure 26.Sketch of the waiting room in Middlemore Hospital

Stressful and overwhelming associated with crowding, noise, and high-paced movement

Nice use of native species and park bench/seating areas around the carparks.

Buildings seem to have many extensions and have diverse architectural languages - do not feel cohesive.

High-density vertical for creates a lack of interface between ground dwellers and room users in high-rise buildings.

Carpark consistently full, expensive parking fees.

Figure 27.Analysis of Middlemore Hospital

04 Buchanan Rehabilitation Centre (BRC)

Context

Location: 27 Sutherland Road, Point Chevalier, Auckland 1025

Date and time: am – 04/25

Specialisation: Mental health (Ministry of Health, n.d.)

Capacity: 40 Beds (Ministry of Health, n.d.)

Future Considerations

- *Human-scale, living scale. How can 'daily life activities' be included in a building that is essentially responsible for institutionalisation? Use of a washing line? Village-scaled master planning?*

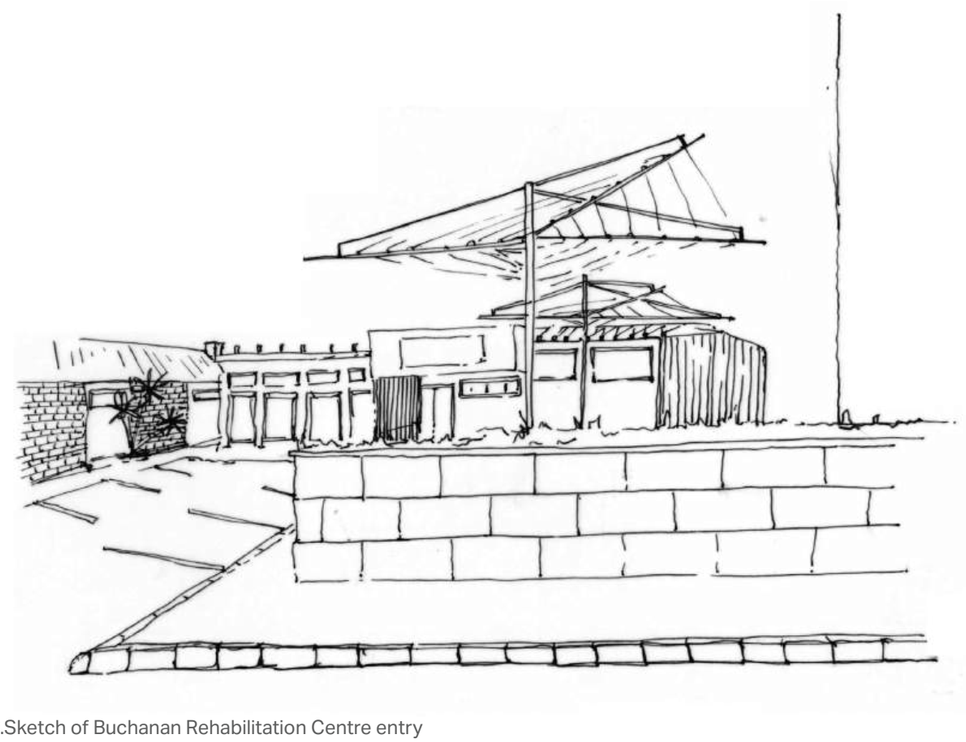


Figure 28.Sketch of Buchanan Rehabilitation Centre entry

Figure 29.Analysis of Buchanan Rehabilitation Centre

05 Waitākere Hospital

Context

Location: 55 Lincoln Road, Henderson, Auckland 0610

Date and time: am – 04/25

Specialisation: Mental health, maternity, medical, geriatric, children's health, surgical (Ministry of Health, n.d.)

Capacity: 392 Beds (Ministry of Health, n.d.)

Future Considerations

- *Community relations and integration*
- *Simplicity is sometimes more effective than arbitrary structural angles and posters. (level of stimulus)*

Figure 30.Sketch of the waiting room in Waitākere Hospital

Lots of building styles, varying in age and levels of deterioration

Well-kept gardens and use of native plants around newer buildings

Excessive and arbitrary use of intersecting/angled architectural forms adds visual intensity and distraction.

Disconnected layout between key departments (e.g., moving between reception and ED requires walking outside in the rain)

Figure 31.Analysis of Waitākere Hospital

06 Auckland City Hospital

Context

Location: 2 Park Road, Grafton, Auckland 1023

Date and time: am – 04/25

Specialisation: Children's health, maternity, surgical, medical (Ministry of Health, n.d.)

Capacity: 1187 beds (Ministry of Health, n.d.)

Future Considerations

- *How structure can be used to communicate the intention of a space: Low ceilings are more intimate, potentially better suited for waiting areas.*
- *Consideration of entrance design, allowing for a more gradual and welcoming transition from exterior to interior.*

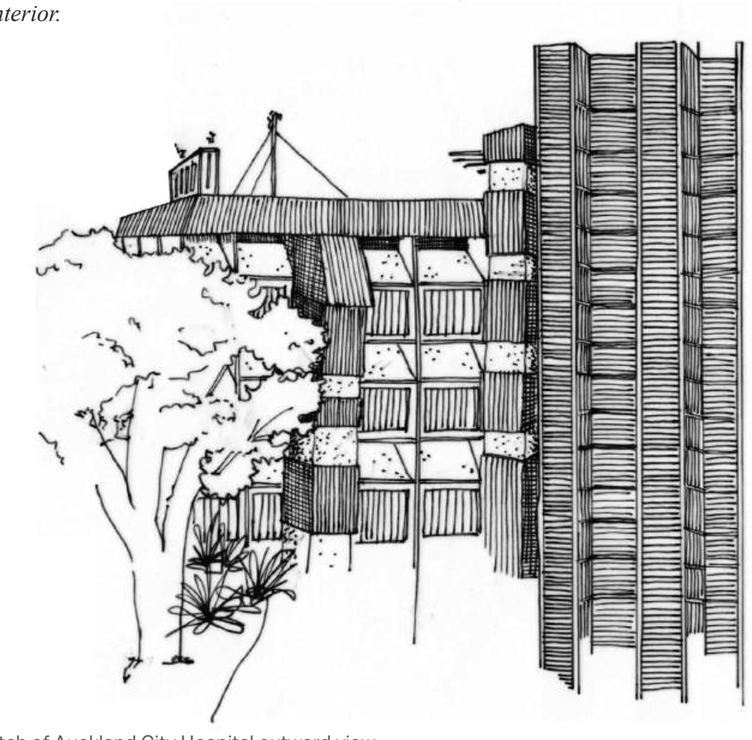


Figure 32.Sketch of Auckland City Hospital outward view

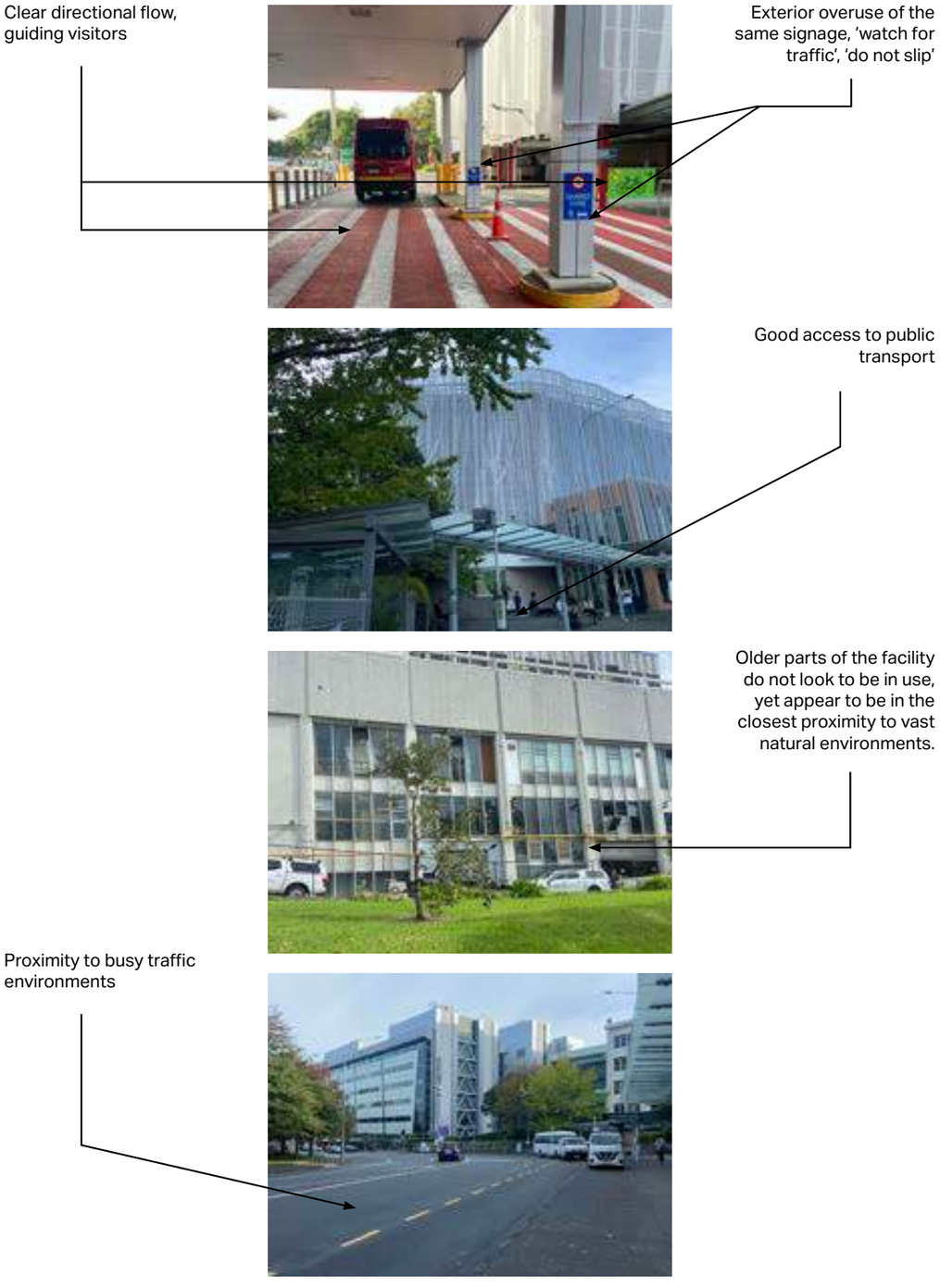


Figure 33.Analysis of Auckland City Hospital

07 Medically Managed Withdrawal Service

Context

Location: 136 Hobson Street, Auckland Central, Auckland 1010

Date and time: am – 04/25

Specialisation: Mental health (Ministry of Health, n.d.)

Capacity: 10 Beds (Ministry of Health, n.d.)

Future Considerations

- *Concealed emergency/private entrances and exits. The assessment of what is appropriate to users, do people want their arrivals to be announced or inconspicuous?*
- *If the surrounding environment is noise/light-polluted and creates a counterintuitive environment, what strategies can be put in place to mitigate these stimuli?*

Figure 34.Sketch of Medically Managed Withdrawal Service

Building is architecturay beautiful and opens to the streetscape

Incorporates living plants on facade

Difficult to locate – it's within the Auckland city mission, and not advertised.

The street it is located on is run down – abandoned rubbish trolleys, what seems to be a non-active construction site, degraded foot paths, graffiti, etc.

Busy roads all around

With it being in CBD, noise and light pollution are most likely to continue throughout the night

Figure 35.Analysis of Medically Managed Withdrawal Service

08 Northshore Hospital

Context

Location: 132 Shakespeare Road, Takapuna, Auckland 0622

Date and time: am – 04/25

Specialisation: Geriatric, children's health, psycho-geriatric, mental health, maternity, surgical, medical (Ministry of Health, n.d.)

Capacity: 669 beds (Ministry of Health, n.d.)

Future Considerations

- *Diversity in seating: location, occurrence and types of seating. Giving options to users, giving a sense of choice and controllable comfort.*

Figure 36.Sketch of Northshore waiting area

Clear signage throughout, reducing disorientation.

Has a garden to wander around sponsored by community charity

Figure 37.Analysis of Northshore Hospital

Exercise Reflection

This process highlighted real-world considerations through observing building users and personal experience within hospital facilities. Despite limited access to non-public areas, the key takeaways largely align with concepts from the literature review, including spatial psychology in neuroarchitecture and biophilia. Future research could benefit from more patient-specific observations, but this exercise has helped initiate conceptual thinking

Figure 38. Photograph of Auckland Hospital

Figure 39.Photograph of a Manuka bush

Chapter Six: The project

Project Brief

The remainder of this thesis will focus on how the NEW Aotearoa Healthcare Design Framework can inform a design process, resulting in a final hospital design. The decision to focus on a specialised hospital followed discussions with tutors about scope and time constraints. A geriatric and psychogeriatric dementia facility was selected, reflecting early research on Aotearoa's ageing population.

Health of older New Zealanders

Our population is changing; it is projected that Aotearoa's population aged 85+ will more than triple by 2053 (Ministry of Health, 2023a). With the projected rise in neurodegenerative conditions, particularly Alzheimer's, Aotearoa's government and health sector are acutely aware of current system shortcomings, as outlined in the 2025 briefing to the incoming minister and the 2023 NZ Health Strategy (Ministry of Health, 2023a, 2025). Significant causes of death and disability in Aotearoa are dominated by noncommunicable diseases, such as diabetes, heart disease, stroke, cancer, back pain, mental health issues, Alzheimer's, and dementia. In light of this, aged care services are under immense stress, considering limited capacity and extended admission wait times (Ministry of Health, 2023a; Moore et al., 2024). This expected increase in population and non-communicable diseases amplifies the need for Aotearoa to expand its Aged Residential Care (ARC) facilities, prioritising the health of the elderly.

Types of Aged Residential Care in Aotearoa

Aotearoa offers four ARC types to cater to the varying needs of older generations.(Ministry of Health, 2016).

This thesis will focus on a combination of dementia care and long-stay hospital-level care.

Aged Residential Care (ARC)

Rest Home Care	Dementia Care	(Long-stay) Hospital Level Care	Psychogeriatric care
"..care for older people who can manage some daily tasks, but need help with personal care and who would find it difficult to live safely in their own homes"(New Zealand Government, 2021).	"... care for people suffering from dementia or other mental illnesses, and who could be a risk to themselves or others" (New Zealand Government, 2021).	"... care for people who have significant medical problems or disability. They need healthcare from registered nurses and support from others to move about" (New Zealand Government, 2021).	"... care for people who have difficult behavioural problems, including severe dementia or addictions, and need a high level of specialist nursing care"(New Zealand Government, 2021).

4 out of 5

People know someone who has it

Figure 40. Illustration of dementia prominence

What is Dementia?

Dementia is an umbrella term employed to cover a host of symptoms caused by damage to the brain as a result of disease (Carr, 2017; Pollock & Fuggle, 2013). Dementia is not a disease in its own right and isn't indicative of ageing (Carr, 2017). Dementia is generally a 'late-in-life', progressive condition that worsens over time (Alzheimers New Zealand, 2016; Arvanitakis & Bennett, 2019; Cheung et al., 2022), for the majority, its prevalence is concentrated in 65-80+-year-olds (Arvanitakis & Bennett, 2019; Carr, 2017; Geldmacher & Whitehouse, 1996; Livingston et al., 2024). While the term doesn't imply causation or pathological processes, it is characterised by loss of cognitive and emotional abilities, with the severity impacting daily function and quality of life (Geldmacher & Whitehouse, 1996).

Contrary to popular belief, this may or may not include memory and language loss (Carr, 2017). Despite each 'type' of dementia having differing early symptoms and potential causes, the most common types of dementia start with the shrinkage of brain tissue (Carr, 2017). Treatments vary between patients and often medications are used to manage symptoms; however, such strategies do not prevent its advancement or provide a cure (Alzheimers New Zealand, 2016; Arvanitakis & Bennett, 2019).

The next page further explores the two most prominent types of dementia and their specific symptoms. More types of prevalent dementia types can be found in appendix.

Table 9. Most prominent types of Dementia

Type of Dementia	Notes	Symptoms
Alzheimer's Disease	*Alzheimer's is the most common cause of dementia, with 70% of patients affected by it (Carr, 2017; Geldmacher & Whitehouse, 1996). Alzheimer's also seems to be the best understood (Carr, 2017).*	• *Short-term memory deterioration (Carr, 2017; Geldmacher & Whitehouse, 1996)* • *Language impairment – difficulty finding words/vagueness (Carr, 2017; Geldmacher & Whitehouse, 1996)* • *Mood/behavioural changes – range from passivity to hostility (Carr, 2017; Geldmacher & Whitehouse, 1996)* • *Decreased emotional expression stubbornness, greater suspiciousness, iwmpulsiveness (Geldmacher & Whitehouse, 1996; National Institute on Aging, 2025)* • *Problems recognising friends and family (Carr, 2017; National Institute on Aging, 2025)* • *Delusions – specifically of deceased family members, pets/animals and unknown intruders (Geldmacher & Whitehouse, 1996)*
Vascular Dementia	*Vascular Dementia is the second most prevalent (Carr, 2017; Geldmacher & Whitehouse, 1996). This form of dementia is an abnormal condition related to diseases of blood vessels affecting the blood supply to the brain, and can be closely associated with major strokes (Carr, 2017).*	• *Problems planning, coordinating and memory function (Carr, 2017; National Institute on Aging, 2025)* • *Weakness down one side of the body or issues with speech and vision (Carr, 2017)* • *Trouble following instructions and retention of new information (National Institute on Aging, 2025)* • *Hallucinations and delusions (National Institute on Aging, 2025)* • *Poor judgment (National Institute on Aging, 2025)*

Overarching Implications of Dementia

Further research into common symptoms of dementia and their potential relationship to brain activity and function can be found in Appendix.

Design for Dementia

Part one:

> *"Despite the fact that aging is a lifelong experience, not just a later life occurrence, the current narrative speaks to a focus on loss and decline rather than opportunity for autonomy and growth. Changing the current narrative on dementia care is not an easy task, because societal and personal views of aging are extremely entrenched"*
> *- (Roberts, 2023).*

Dementia

/dɪˈmɛnʃə/

Origin – Latin

'Demens'/dement – out of one's mind
(Jellinger, 2010)

Mate Wareware

Te Reo Māori

Translation – English 'Dementia"

Ill – forget or to be forgotten
(Kia Tiki Nursing New Zealand, 2019)

Often, dementia is closely associated with negative social connotations and stigma (Ministry of Health, 2013). Many people are frightened of its diagnosis, as they believe, due to its incurable nature, there is nothing to be done to help them (Ministry of Health, 2013). The origin of the word dementia, as above, encapsulates historical perspectives of the diagnosis; often morbidly interpreted as 'a complete and total loss of self', resulting in impending initialisation (O'Sullivan et al., 2014). An article by Grave O'Sullivan and colleagues advocates for dementia patients playing an active role in the provision of health, being acknowledged as experts of their own experience, to prompt the review into models of care (O'Sullivan et al., 2014). Dementia has become an ever-increasing obstacle to healthcare systems and economies globally (Ministry of Health, 2023a; O'Sullivan et al., 2014). In response to this, the Ministry of Health released the document, 'New Zealand Framework for dementia care,' addressing these issues and proposing a framework to better support people with dementia and their whānau (Ministry of Health, 2013). The New Zealand Framework is broken into three integral parts:

1. *Following a person-centred and people-directed approach.*
2. *Providing accessible, proactive and integrated services that are flexible to meet a variety of needs.*
3. *Developing the highest possible standard of care.*

Shifting toward designing for dementia, these principles will be considered as central to what success may look like in an eventual design.

Part two:

The task now is to determine how these care principles translate into design and tangible outcomes. Guided by this framework, existing dementia design recommendations are compiled and presented.

While many dementia design guides were identified in the literature, two were selected to inform this process: Aotearoa-specific, 'Secure Dementia care home design information resource, a person-centred perspective,' released by the Ministry of Health (Ministry of Health, 2016). Secondly, the Australasian Health Facility Guidelines to inform programmatic requirements (lliance, 2019).

The design manuals and guides have been organised into three scales: Programme, macro and micro responses to aid in their implementation. However, the following exercise has examined the responses and identified those of primary focus, which will now be referred to as the 'patient-specific' portion of the NEW Aotearoa Healthcare Design Framework moving forward.

Programmatic –
Purpose and function of the building

Macro –
Form making and master planning

Micro –
Sensory and detailed scale

Programmatic:

- *Entry / Reception*
- *General / Open Inpatient Zone (Low dependency)*
- *High Dependency Zone*
- *Clinical Support*
- *Staff Areas*

Table 10. Patient-specific section of the NEW Aotearoa Healthcare Design Framework

Patient-specific section of the NEW Aotearoa Healthcare Design Framework		
	Macro	Mico
Home-like Therapeutic environments:		
Human scale:	• *'Clustered care'* • *Common spaces of domestic size*	• *Domestic furniture*
Variety of space:	• *'Hosting space' where friends and family can gather* • *Gardens and quiet places* • *Spaces to show or create art*	• *A child-friendly environment (e.g., children's play areas)*
Personalisation:	• *Comfortably sized rooms for the ability to customise*	• *Allowance for pictures and familiar things in people's own rooms*
Security:	• *Unobtrusive boundary ¬security – no obviously high gates or fences* • *Systems that allow family and friends to enter easily*	
Gardens and Environment:		
Outdoor space is designed as an extension of indoor space:	• *Opportunity for independent physical access from inside to outside* • *Visual and physical access between inside and outside*	• *Appropriately surfaced and consistently coloured pathways*
Outdoor space with opportunity:	• *A continuous looped path with destination points but no dead ends (with well-placed benches and sheltered rest areas)*	
Outdoor space for social interactions and environmental engagement	• *Mixed spaces – large and small*	• *Seating and tables* • *Space for children*
Outdoor space and garden designed to provide sensory stimulation		• *Flowers, colour, water, textures* • *Seasonal variation* • *Vegetable gardens* • *Scented plants (to stimulate memory)*

Patient-specific section of the NEW Aotearoa Healthcare Design Framework		
Size and Density:		
Scaled	• *Scale that helps people feel in control* • *Multiple clusters within a large care home to allow for the clustering of people with similar needs – people with dementia are not a homogeneous group*	
Colour and contrast:		
Dementia care homes use colour and contrast effectively	• *Surfaces of different textures* • *Application of the psychology of colour the way different colours evoke different feelings*	• *Low contrast in the transition from one surface to another* • *Contrast between plates and tablecloths* • *Colour contrast to demarcate walls and floor* • *Even colours on floors – no patterns*
Lighting:		
Secure dementia care homes are designed to maximise natural light and lighting that assists orientation	• *Natural light maximised*	
Memory Aids/Cues and Floor Plans		
Secure dementia care homes are designed to incorporate components to provide memory aids and cues	• *Landmarks to aid in wayfinding*	• *Personalised doors to people's rooms* • *Cues positioned lower than might seem natural*
Community links:		
Secure dementia care homes are designed to incorporate links with the community	• *Design of buildings and gardens that welcome the community into the space*	

Precedent Study

Projects: The Hogeweyk

Architect: **BuroKade**

Initiation Partners: **Vivium Care Group**

Location: **Weesp, Netherlands**

Date: **2009**

The Hogeweyk was founded in 2009 in the Netherlands, establishing an innovative and revolutionary approach to dementia care (Dementia Village Associates, 2009). The focus of this initiative was to establish a programme that prioritised the care and wellbeing of residents while maintaining a neighbourhood within the community of Weesp and deinstitutionalising what nursing homes historically looked and functioned as (Dementia Village Associates, 2009).The focus for residents is on possibilities, not disabilities, aiming to put boredom, loneliness, and hopelessness into a different perspective (Dementia Village Associates, 2009).

The interest in this dementia village lies in its paradigm shift, exemplifying how architecture can achieve excellence when mindsets evolve and traditional care models are critically examined. A secondary point of interest is the inclusion of leisure facilities such as a pub and theatre, which extend beyond conventional notions of care. Although little has been published on this, it raises an intriguing question: how might such activities translate within an Aotearoa context? What leisure experiences are culturally specific to Aotearoa?

Chapter Seven: Site Analysis

Totara Park

Site Selection & Criteria

The site location was determined by filtering through a set of criteria. This aimed to establish not only the site's most advantageous position but also its relevance to its broader context. Maximum impact was the key consideration throughout this process.

Figure 41.Photograph of a totara tree

Stage One:

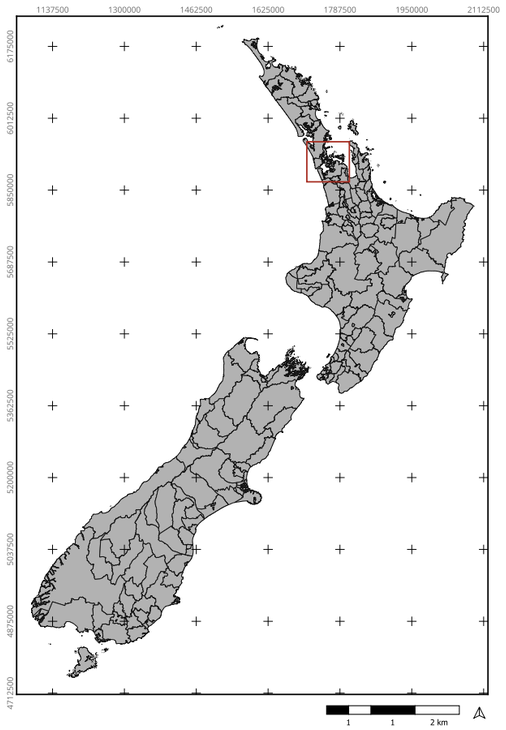


Figure 42.Map of Aotearoa adapted from (QGIS, 2025)

Auckland-based

With dementia rates rising globally (Livingston et al., 2024) and projections estimating 130 million cases by 2050 (Cullum et al., 2020). Selecting a site in Auckland, where much of Aotearoa's population is concentrated (Insch, 2017), would offer the greatest benefit and impact.

Stage Two:

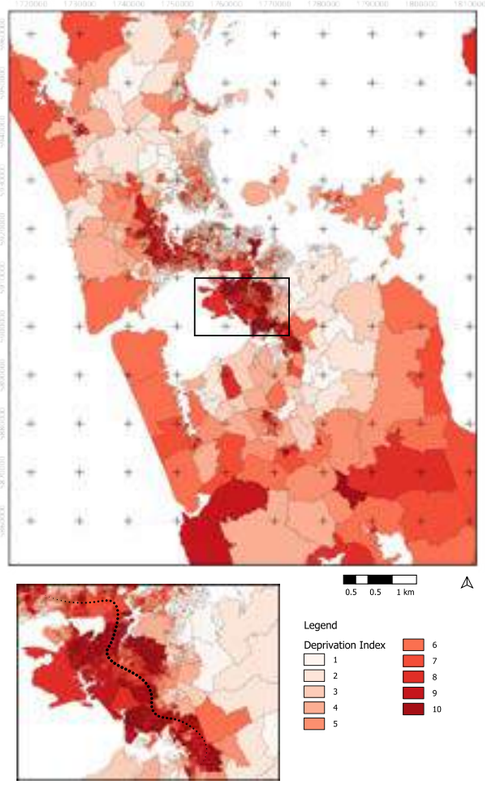


Figure 43.Deprivation Map of Auckland, adapted from (QGIS, 2025)

Deprivation levels

Although age is the primary risk factor for dementia, nearly half of global cases could be delayed or prevented through modifiable factors (Coates et al., 2025). Key contributors include obesity, diabetes, low education, hearing loss, air pollution, brain injury, and social isolation (Coates et al., 2025; Livingston et al., 2024). Dementia, like many chronic diseases, disproportionately affects lower socio-economic groups due to socially determined variables influencing behaviour and lifestyle (Cha et al., 2021; Coates et al., 2025). Reflecting access to resources, knowledge, employment, and social standing (Salmond & Crampton, 2001). Given the projected rise in diagnoses (Cheung et al., 2022). Site selection should prioritise areas with the most significant socio-economic need.

Table 11.Local boards with the Highest levels of 65+ years

Local Board	Total number of 65 years +
Henderson-Massey	13,860
Franklin	13,929
Ōrākei	14,553
Hibiscus and Bays	21,213
Howick	21,915

Concentration of Aucklanders within the 65-74 age group

The consideration of this age group was specific to the typical retirement age in Aotearoa of 65 (Employment New Zealand, 2024). Targeting this age range caters to a considerable pool of people within the life-stage specific to dementia. The table below highlights the top 5 Auckland districts with the highest population of people aged 65 and above, based on the 2023 New Zealand census (Bade, 2025).

Stage Three:

Proximity to urban centres and close to families

From personal experience with grandparents in care facilities, a loved one's residence becomes an anchor for whānau. Between regular visits and urgent calls, accessibility is vital. Dementia affects not only patients but also their families (Cha et al., 2021), making a site central to whānau essential.

Concentration of the natural environment

Locating a site by filtering through the concentration of the natural environment and basic ecosystems allows future design to find itself nested within the environment, to focus on inherent experiences and connections of occupants to nature.

Risk of natural disasters

In the event of natural disasters, ensuring that loved ones are safe and minimally affected should be a key consideration in site selection. Older generations are often more vulnerable, so locating facilities in low-risk areas is essential to meet their needs appropriately. Figure 46 illustrates tsunami evacuation zones. Maps of sea level rise and floodplains can be found in Appendix.

Figure 44.Map of Auckland indicating the proximity of urban centres, adapted from (QGIS, 2025)

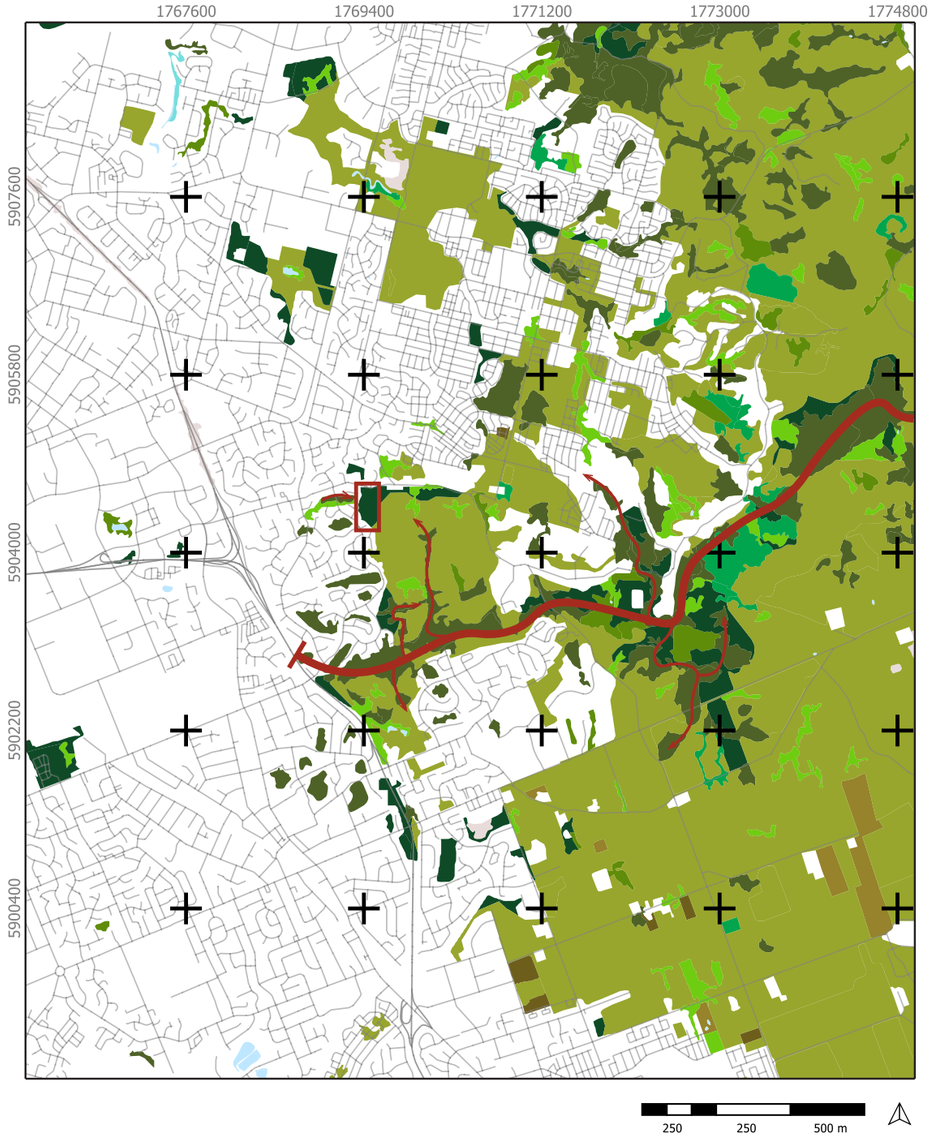


Figure 45.Auckland Land Use Map adapted from (QGIS, 2025)

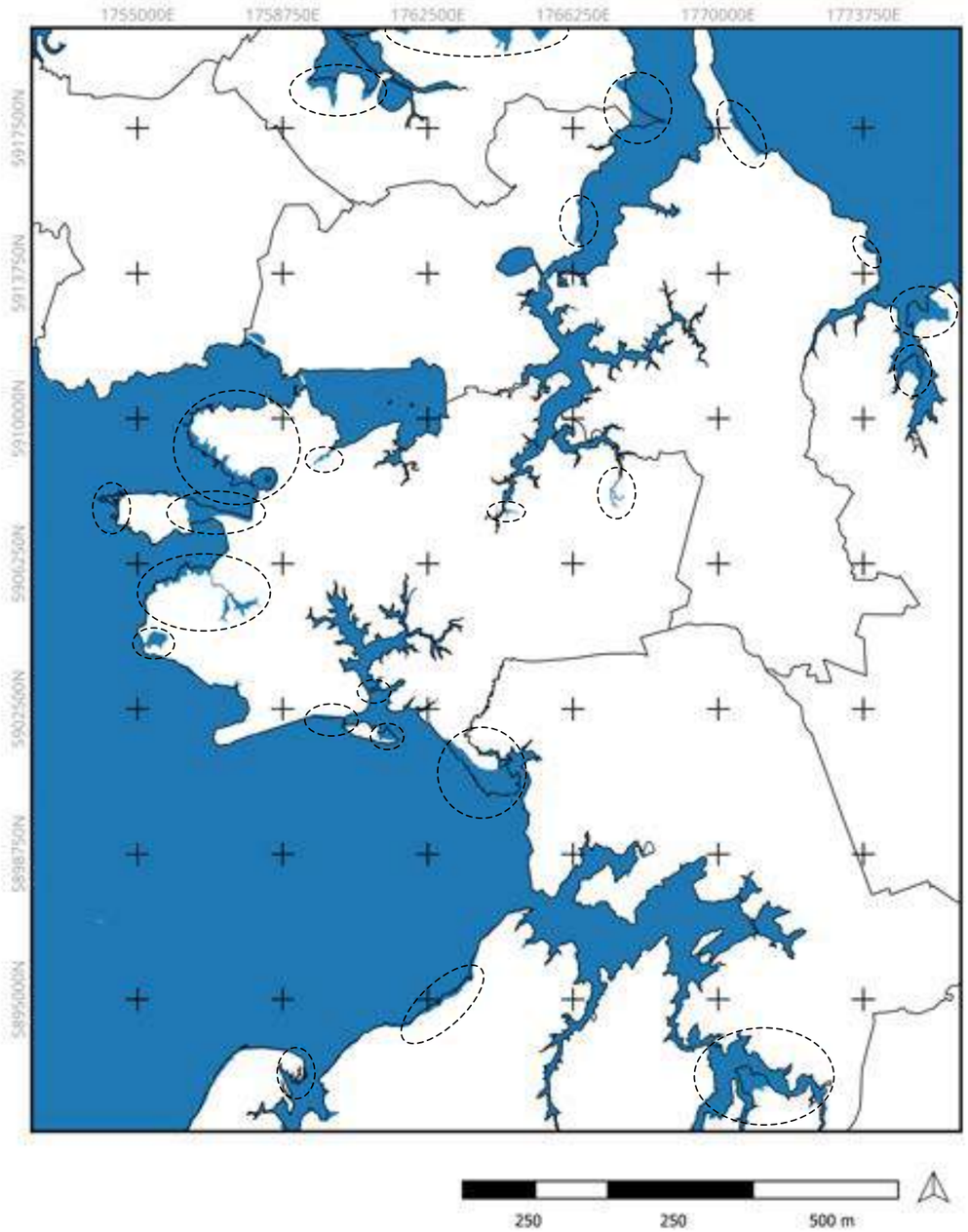


Figure 46.Auckland Tsunami evacuation zones adapted from (QGIS, 2025)

Figure 47.Photograph of Totara Park

Totara Park

Address: 140/Redoubt Road, The Gardens, Auckland, 2016, Aotearoa

Situated between the suburbs of Manukau and Manurewa, Totara Park is an extensive 216-hectare Auckland council owned public park (Auckland Council, n.d.). The park is home to a wide range of recreation activities, landscapes, ecologies, stream systems and backs onto the Auckland botanical gardens (Bespoke Landscape Architects, 2017). As highlighted in Figure 48, the elected site falls under the 'Mixed houses suburban zone bordering on 'informal recreation zones' of the wider site on the unitary plan. The location retains a particular urban and rural character as urban density has drastically engulfed neighbouring suburbs in recent years (Bespoke Landscape Architects, 2017). In the early 1920s the land operated as a homestead and was eventually sold to Auckland Council in 1966 (Bespoke Landscape Architects, 2017).

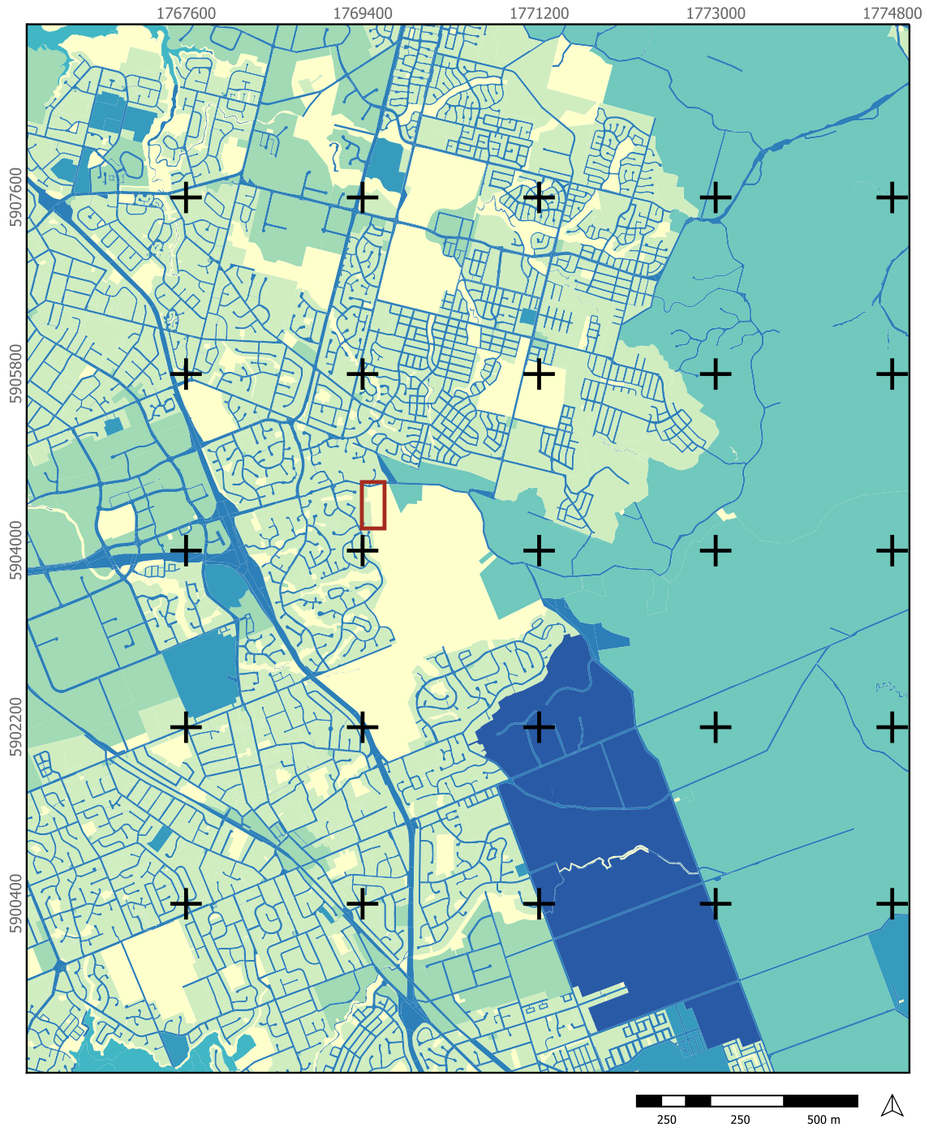


Figure 48.Auckland Unitary planning zones, adapted from (QGIS, 2025)

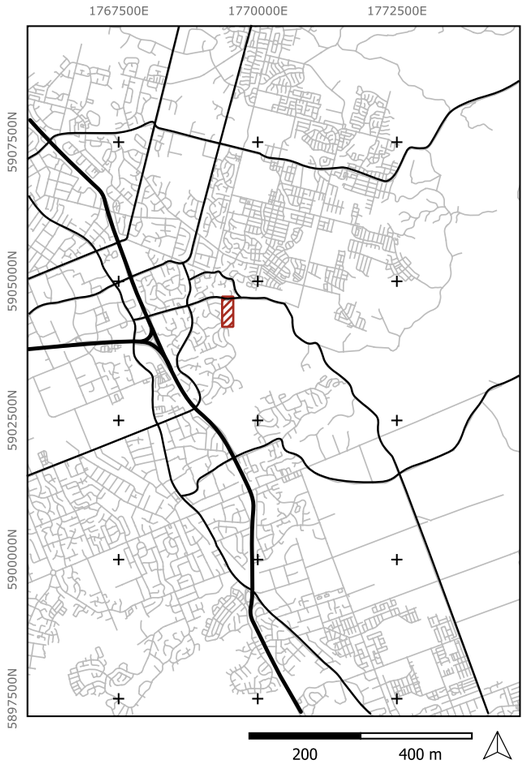


Figure 49.Local to site major roadways, adapted from (QGIS, 2025)

Wider Site Analysis

Wider site analysis included the mapping of the following:

- *The unitary plan (Figure 48)*
- *Natural land types (Figure 45)*
- *Locality of the surrounding suburbs (Figure 44)*
- *Motorways and immediate arterial roads (Figure 49)*
- *Local train route and stops (Figure 50)*
- *Local bus routes and stops (Figure 51)*
- *Floodplains (Appendix)*
- *Overflow paths and topographies (Appendix)*

Site identification

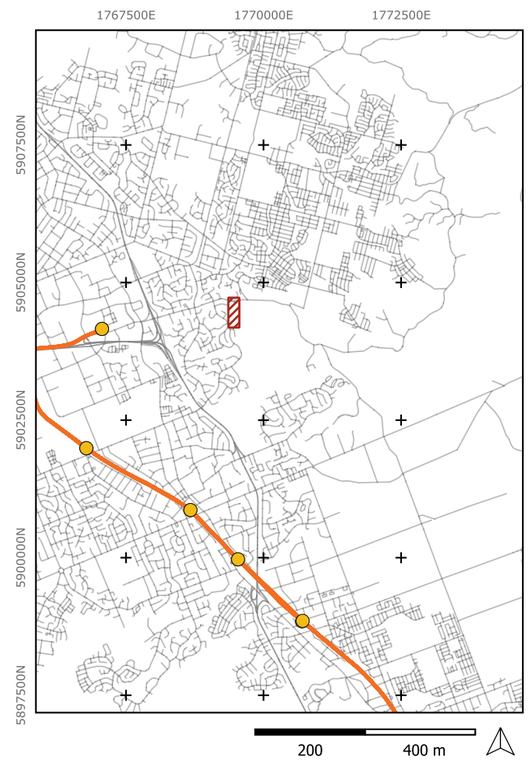


Figure 50.Local to site train routes and stops, adapted from (QGIS, 2025)

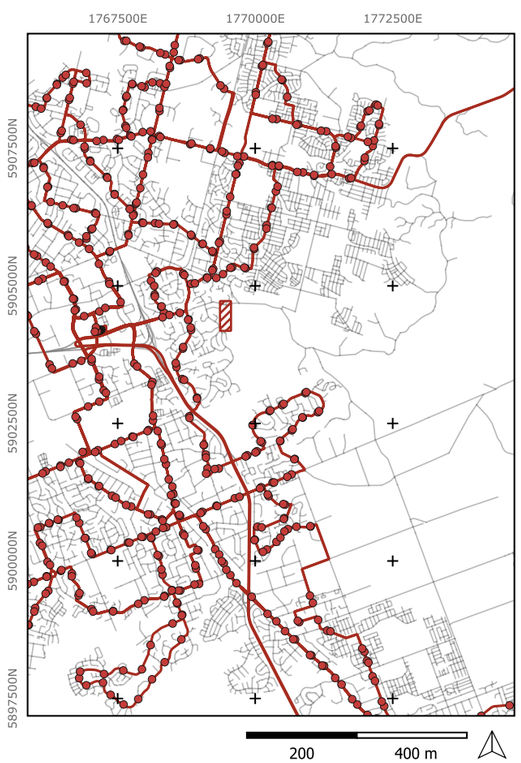


Figure 51.Local to site bus routes and stops, adapted from (QGIS, 2025)

Local Site Analysis

Local site analysis includes Site mapping, site images, colour compilation, and a representative collage.

Tōtara Park Site






Tōtara Park Lower Park






Figure 52.Totara Park site images

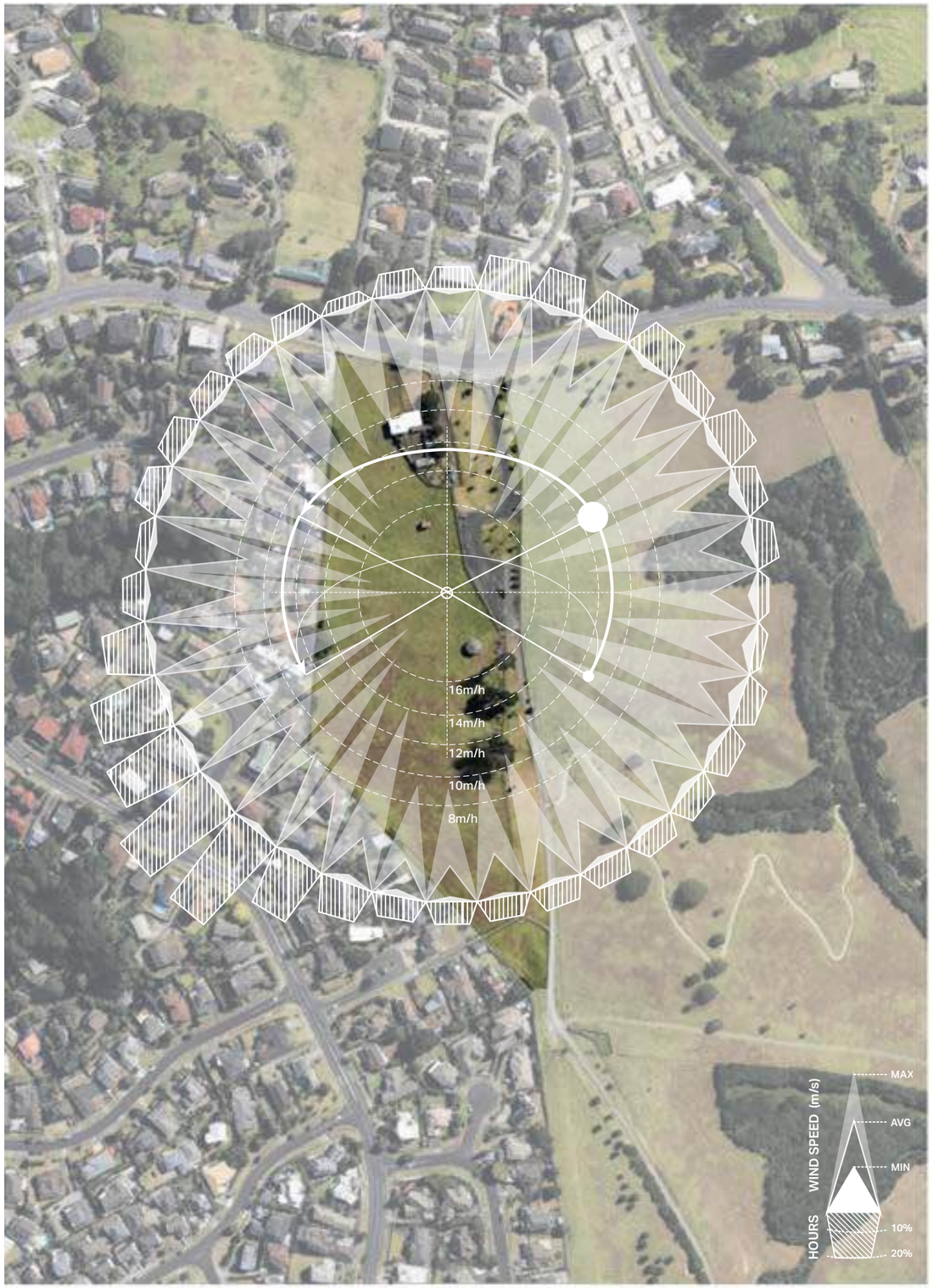


Figure 53.Site analysis

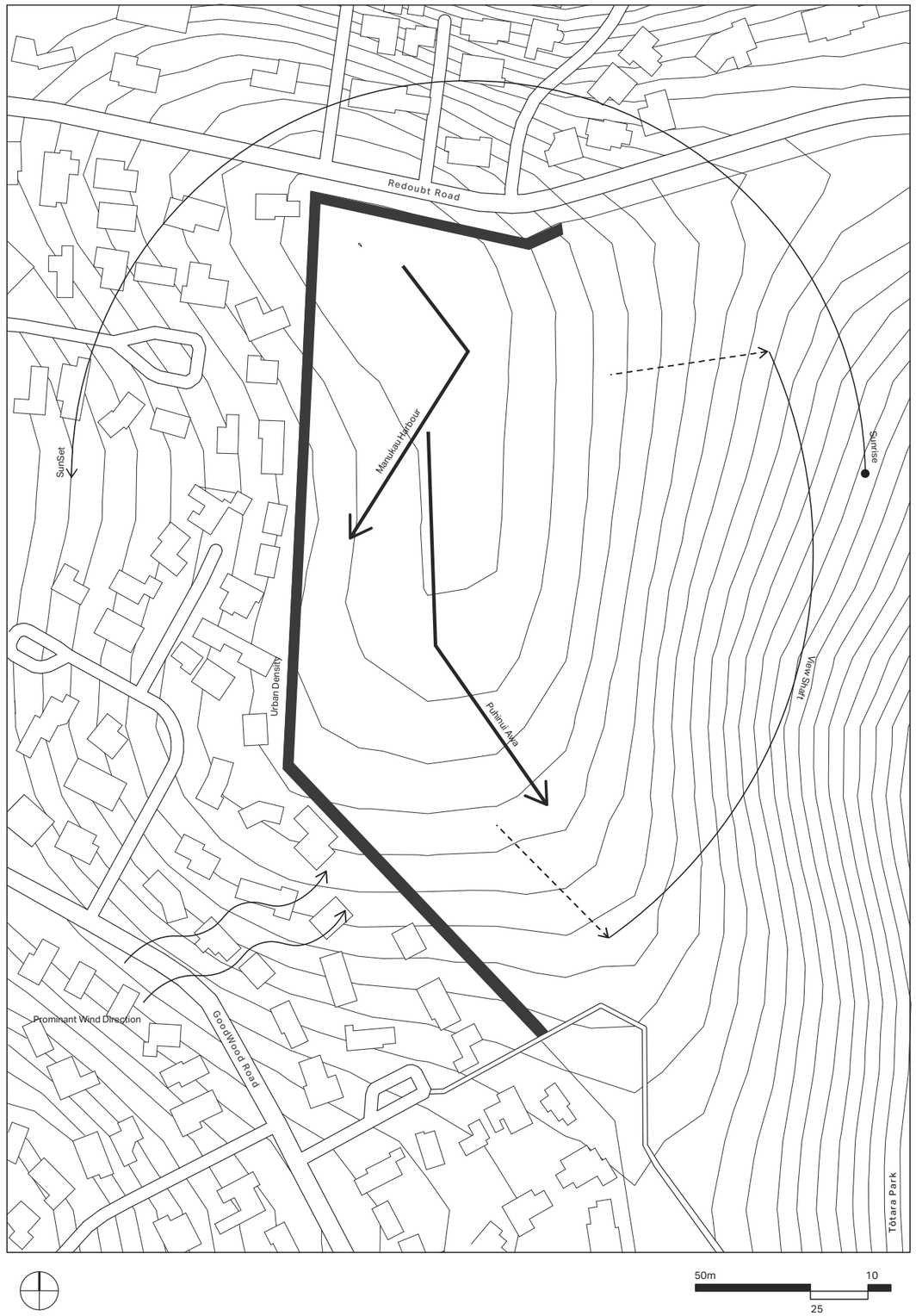
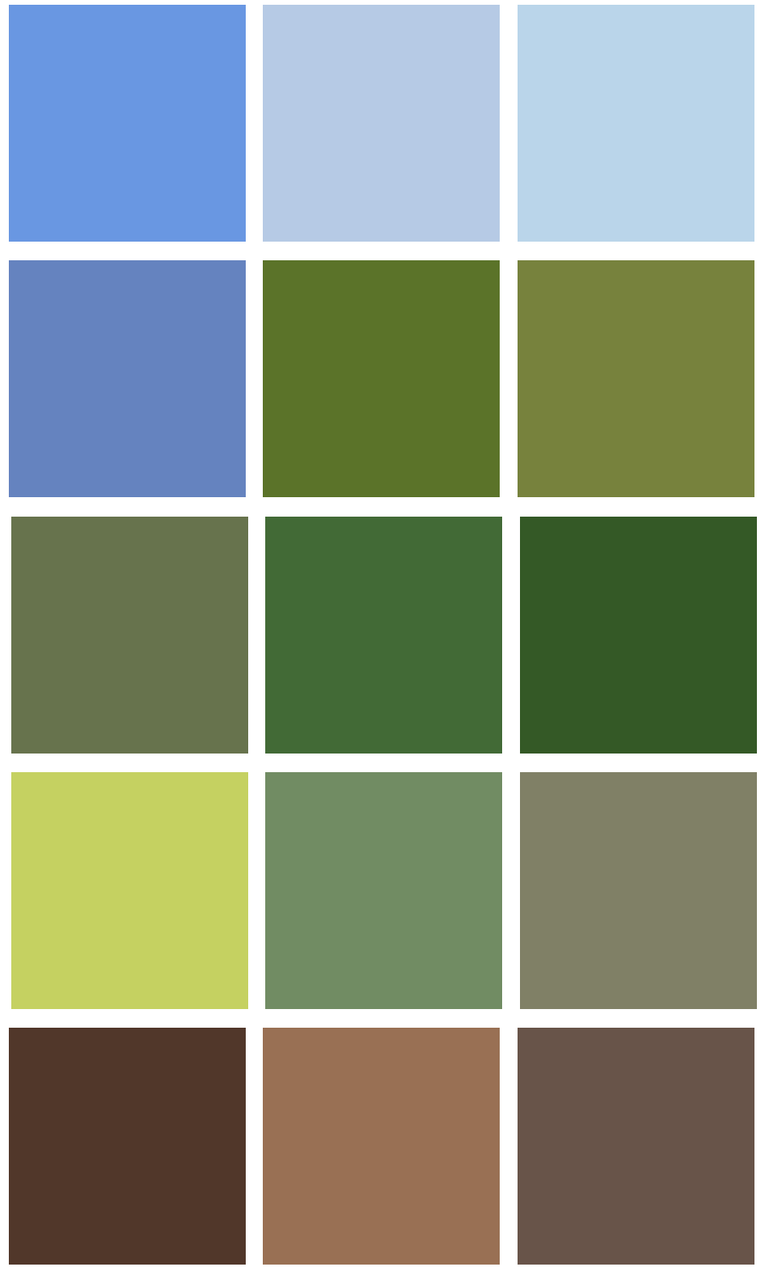


Figure 54.Site map parti diagram

Colour Compilation of Site

Colours have been extracted from images taken from Totara Park with the intention of being used in the design process.



Site Collage

Figure 55 was inspired by observations made during several site visits.

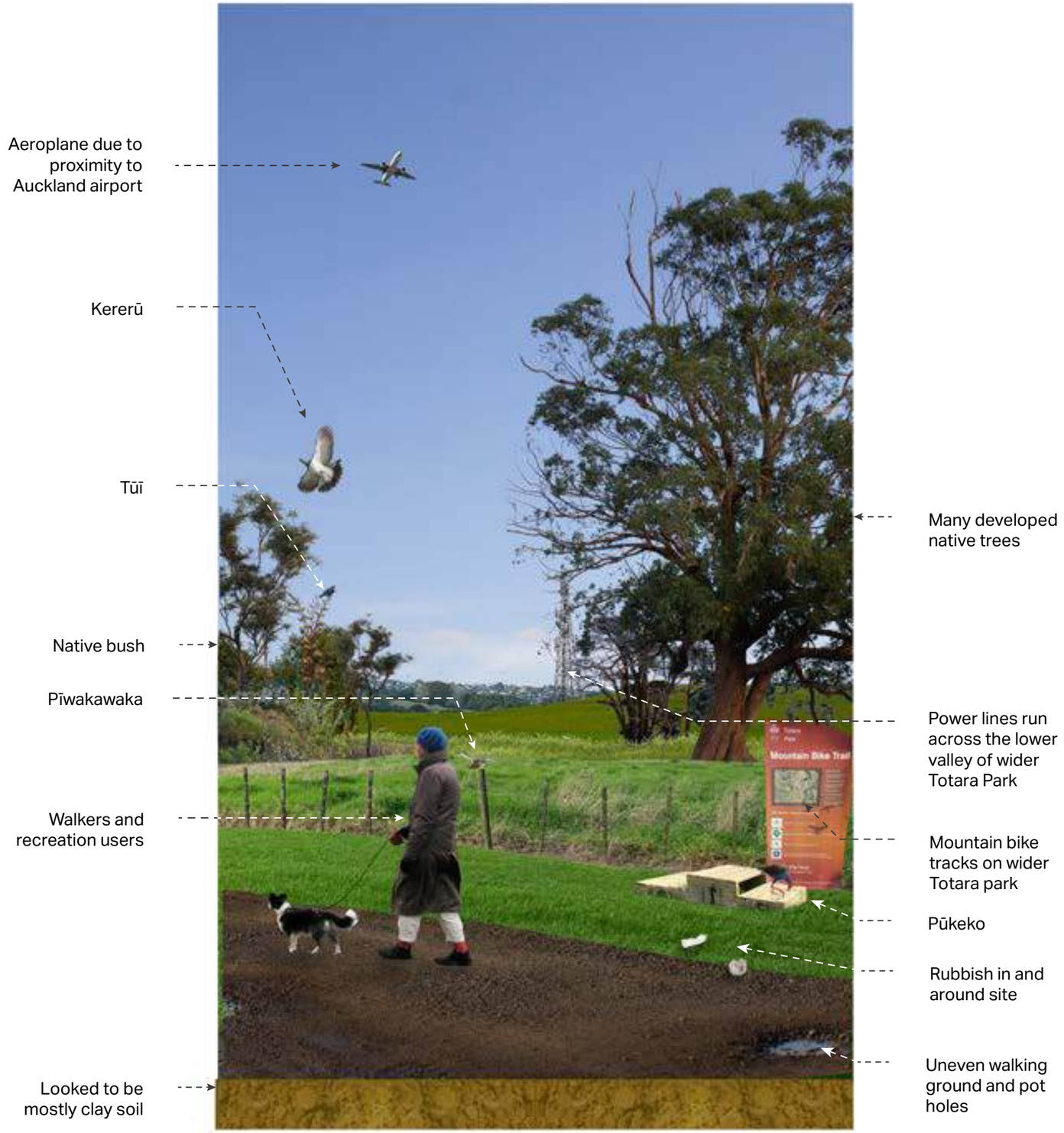


Figure 55. Collage of elements observed on site

S

- On the ridge of the hill, water naturally drains from the site
-
- Central to many surrounding suburbs
-
- Due to its elevation, it is not directly affected by rising sea levels and natural disasters such as tsunamis
-
- Particular urban/rural character

W

- Public transport does not proceed onto Readout Road (Entrance to site)

O

- Continue the ‘natural forest’ through planting of native species (See site analysis maps for more in-depth context site analysis). By doing so, it will increase people's connection to nature, as it encourages thriving ecosystems
-
- Lots of community and recreation activities happen in the broader site, meaning community is central and accessible

T

- Entrance is on the main road – Not ideal for turning access traffic to pull into

Site SWOT Analysis

Figure 56.Photograph of Totara Park

Chapter Eight: Concept Design

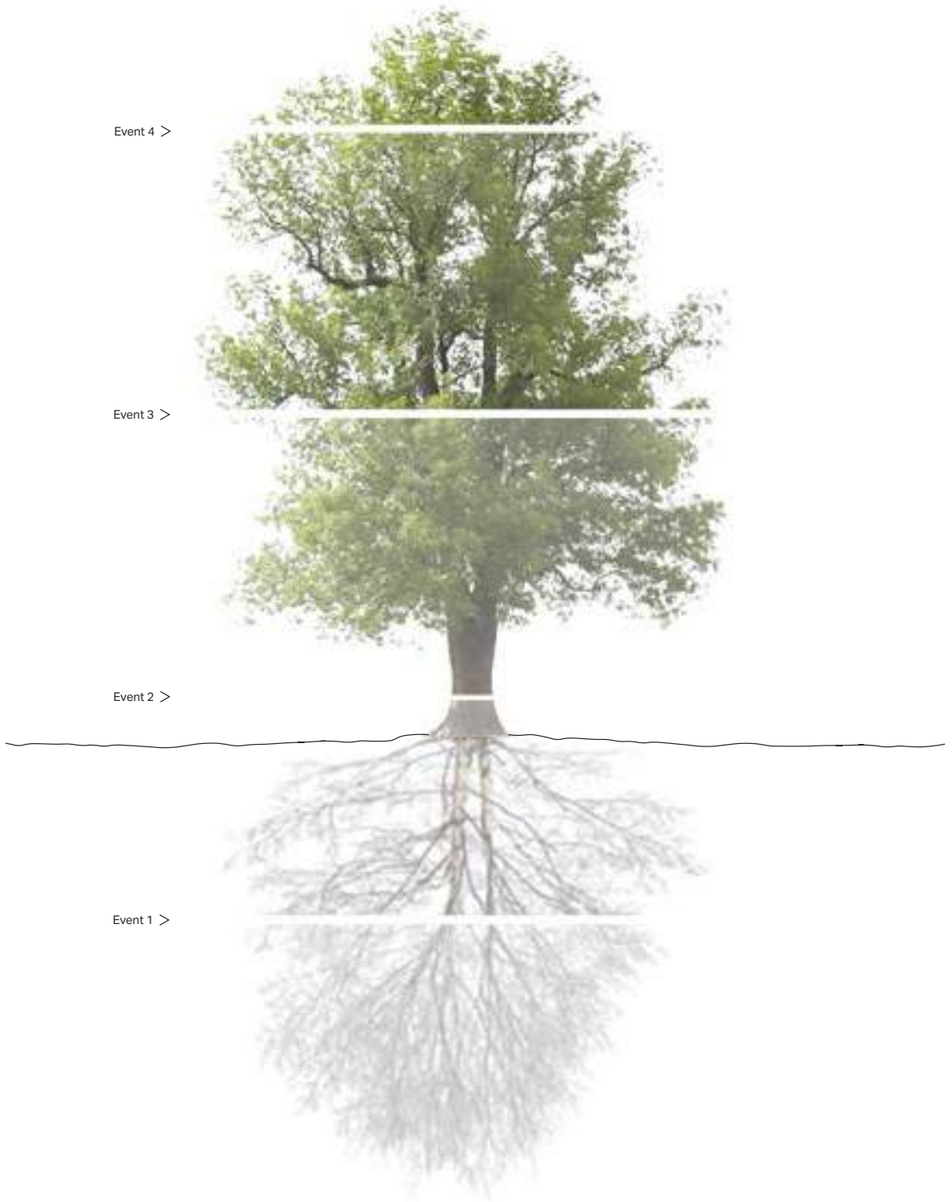
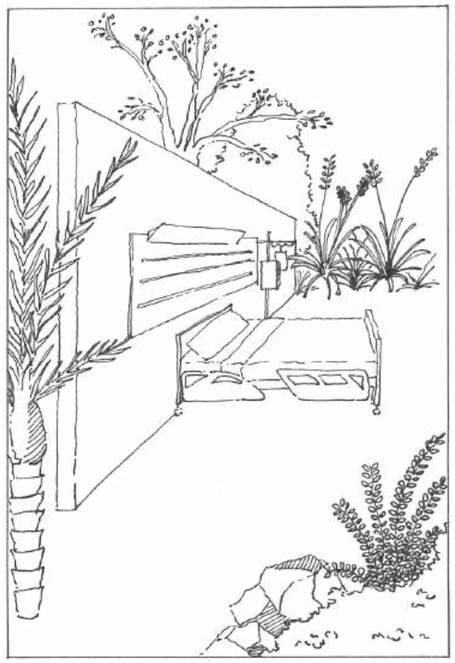


Figure 57.Concept design diagram

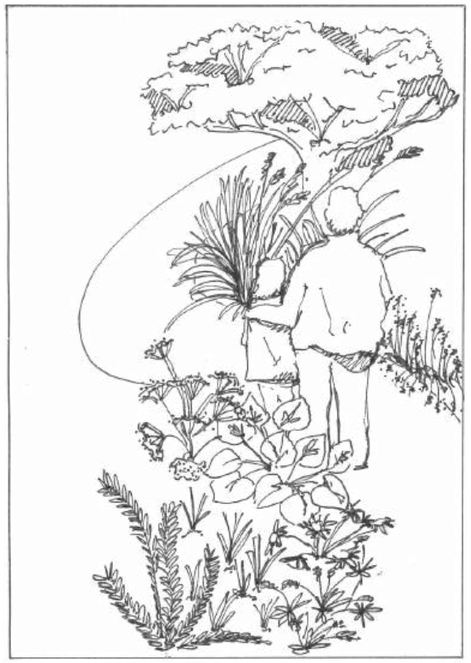
Introduction

The concept design comprises a series of experiments and explorations that inform the final proposal. Figure 57 illustrates these experiments as tree roots embedded within the NEW Aotearoa Healthcare Design Framework (represented by the soil line). The roots feed into a central trunk, symbolising the developing core concept, which expands upward and outward through the design process. Interrupting voids represent key 'events'- presentations, feedback sessions, and reflections, occurring throughout the year. The following two chapters describe these experiments, the critique events, and the subsequent development informed by reflection.
As previously introduced, the following symbols will indicate the relation of each experiment to the theoretical framework. Please see the specified icons:

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Built Performance
- Spirit of Place
- Patient Specificity



01



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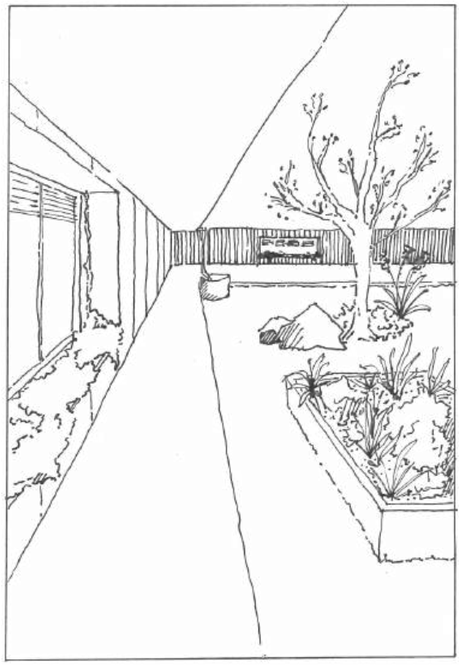
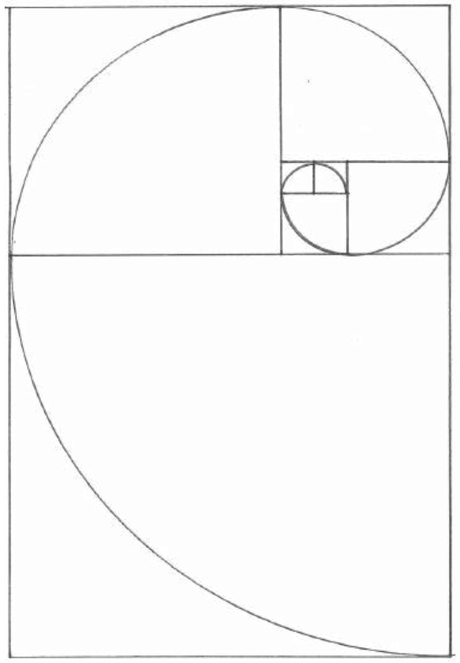


03



04

Figure 58.Series of conceptual sketches

Experiment 1: Quick Start Design Challenge

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Built Performance
- Spirit of Place

Rationale

Proceeding with the design process, I used a 20-20 quick-start exercise to capture initial thoughts and overcome the starting hurdle.

Method

Dividing a square into nine boxes and spending 20 minutes sketching any ideas about how to answer the thesis question. I then selected the top ideas and spent another 20 minutes re-sketching, please see the Figure 58.

Findings & thoughts

I found this a helpful exercise to start the process. However, I found myself using this as a tool to express project aspirations rather than physical architectural outcomes.

Sketch Notes:

1. *Natural materials, incorporating nature into the room, natural ventilation, views of the natural world, and natural lighting.*
2. *The journey and experience of space as a path to wellbeing and healing, supported by whānau.*
3. *Experiential corridors, spaces with the capacity to occupy social wellbeing and a certain level of self-sufficiency with vegetable gardens, etc.*
4. *Wayfinding, natural geometries, through the potential use of the Fibonacci ratio.*

Figure 59.Collage of hospital beds in a native forest

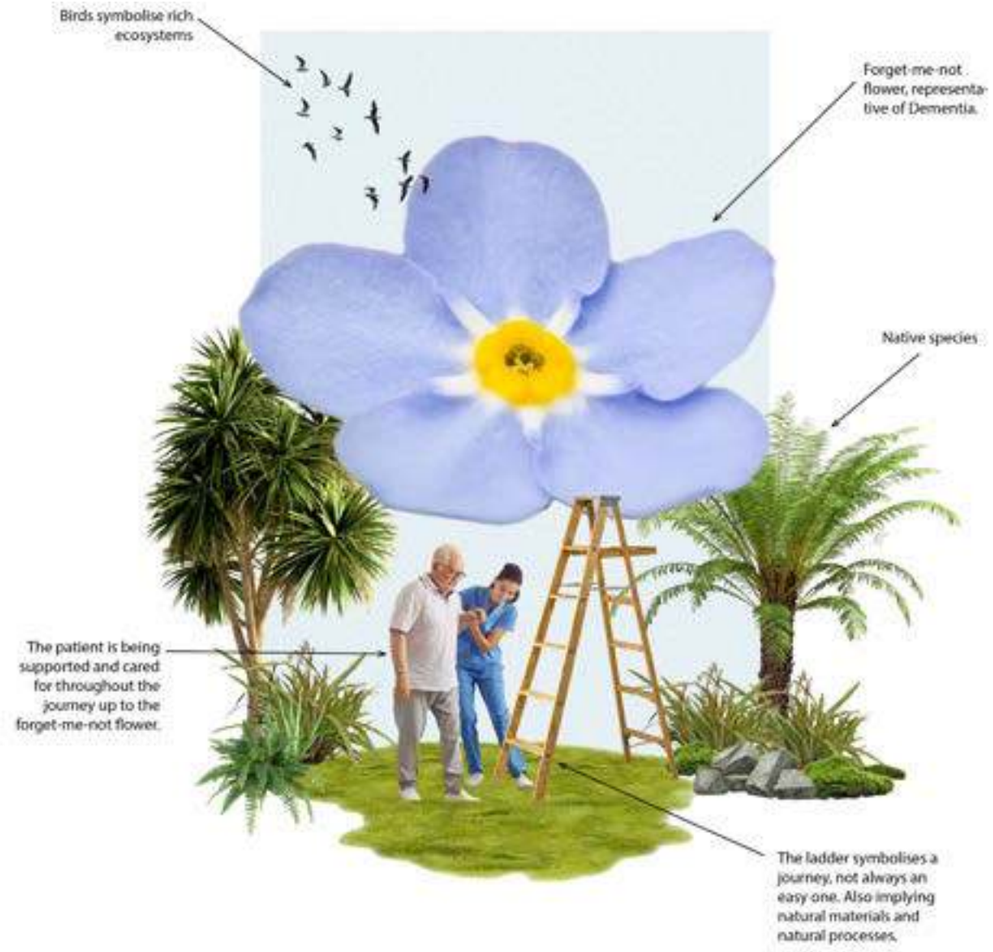


Figure 60.A collage of an elderly gentleman and a nurse

Experiment 2: Collages

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Built Performance
- Spirit of Place
- Patient Specificity

Rationale

Following the quick start, these evocative collage explorations were developed. Figure 59 examines the boundaries in healthcare architecture, including who defines boundaries or baseline assumptions and what they are based on. Visually, this collage is a provocation that metaphorically explores the disconnect between healthcare and the natural world, with the intention of provoking a design discourse and stimulating further exploration. Figure 60 generated a specificity towards the patient type (those with dementia), introducing ethics of care, including how that care might be administered or provided, and by whom.

Method

Both images were created through a digital collage process.

Figure 61.Photo series of leaves

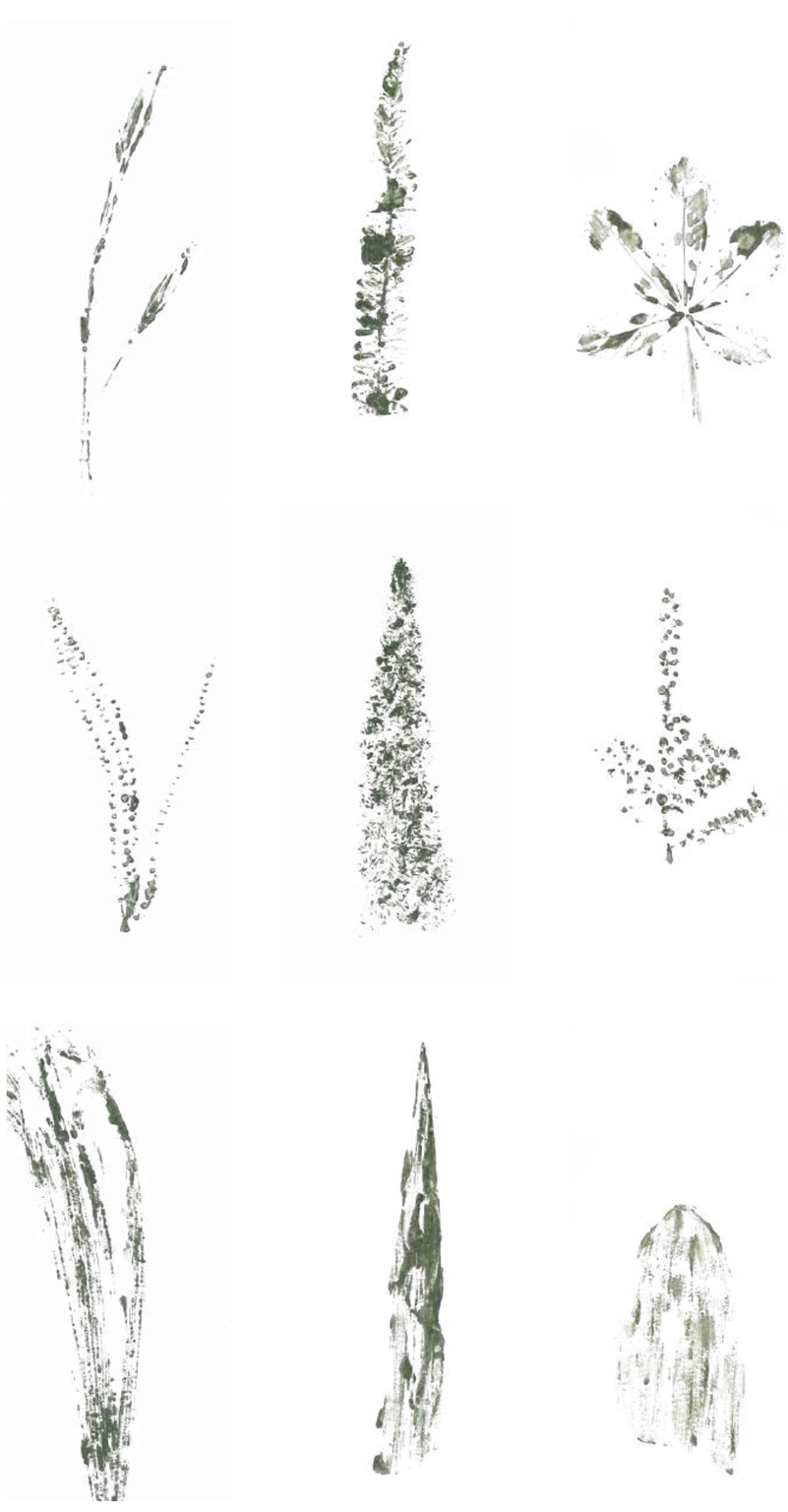


Figure 62.Leaf print series

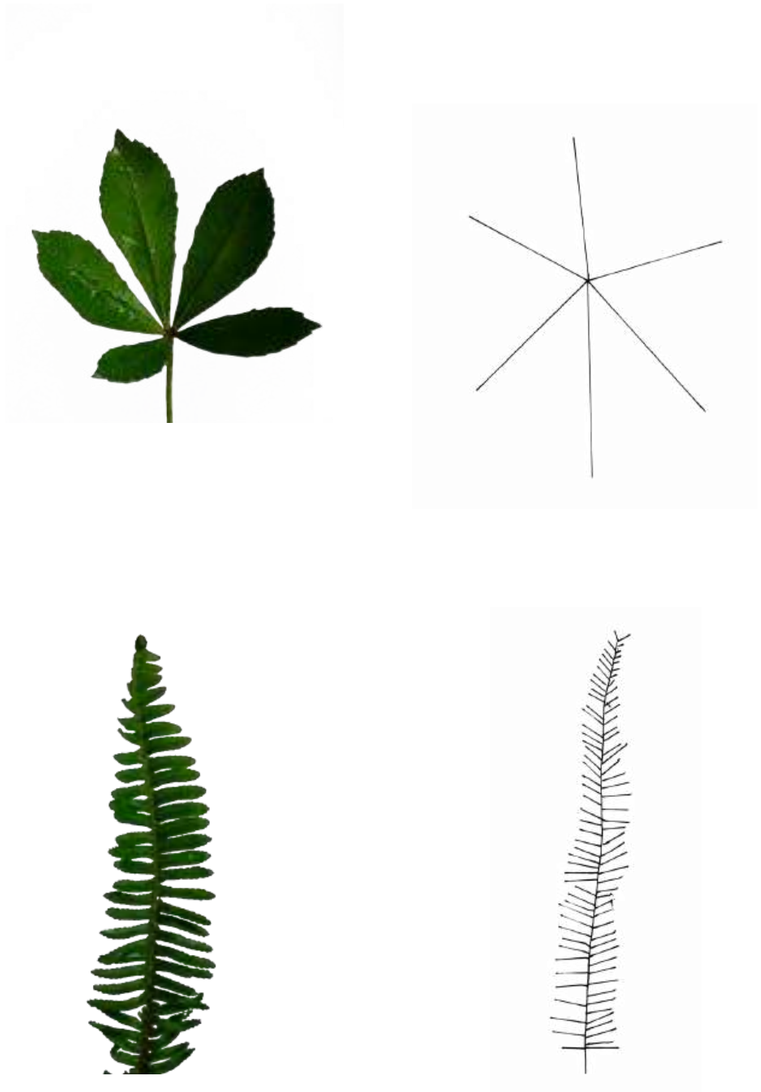


Figure 63.Leaf image and analysis

Experiment 3: Leaf Prints

Visual Connection to Nature

Spirit of Place

Patient Specificity

Fractals:

> *"Ordinarily, variation on a basic pattern is the norm, whether it be thematic diversity based on size or spatial or temporal scale. Related and similar forms are often called 'fractals" (Kellert et al., 2008).*

A basic understanding of fractals has inspired the explorations of leaf printing and tectonic timber blocks. In alignment with previous research into biophilia and neuroarchitecture, fractals are named as a key element and attribute of natural 'process and patterns' (Kellert et al., 2008). Further research into fractals established that their presence in design environments or art can have stress-reducing tendencies (Taylor, 2006). An Article by R.T. Taylor explores this concept, specifically the depths of fractal dimensions and defines the optimal dimension to have such stress-reducing effects (Taylor, 2006).

Rationale

The rationale for this experiment is that, if fractals are innate to human wellbeing, and wayfinding is a key issue among patients with dementia, could a wayfinding pattern inspired by the formations found in leaf patterns inform a more intuitive wayfinding experience for patients with dementia?

Method

Leaves have been collected, painted, and pressed on paper to create prints (Figure 61,62). Further sketches were explored to consider how these structures might translate to form. Figure 63 illustrates an example.

Findings & thoughts

The variation in leaves provided some options for the axis of programmatic and navigational planning for future development. Figure 63 illustrates key patterns of interest.

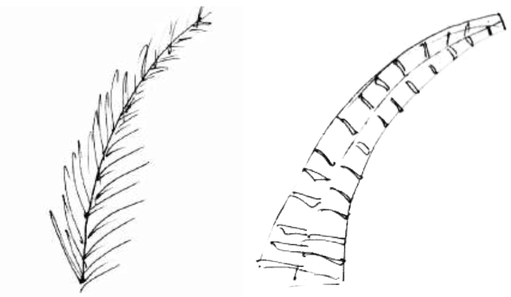


Figure 64.Leaf sketches

Figure 65.Conceptual tectonic blocks

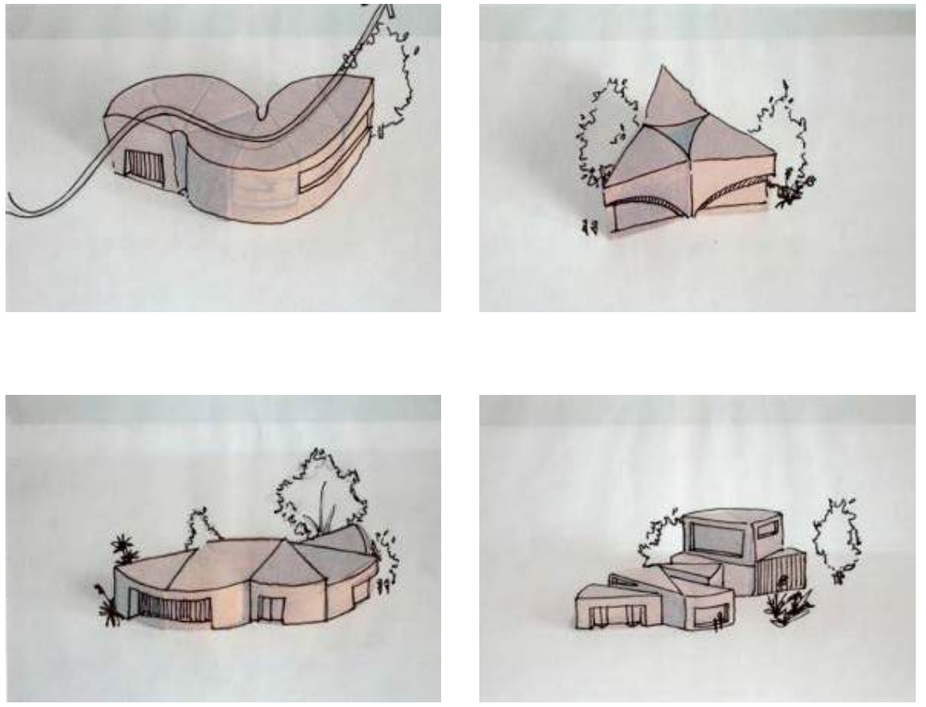


Figure 66.A series of conceptual tectonic block configurations

Experiment 4: Tectonic Timber Models

Non-Visual Connection to Nature

Visual Connection to Nature

Rationale

Building on the idea of fractals and incorporating other biophilic shapes and forms has inspired this tectonic approach to form-making. Making blocks could be a quick way to iterate from opportunities. Figure 66 illustrates this. More images of iterated forms can be found in Appendix.

Method

The blocks were created through a process that involved using a hole saw to cut through recycled native timber; the circles were then further divided into fractions, which varied in final height and size.

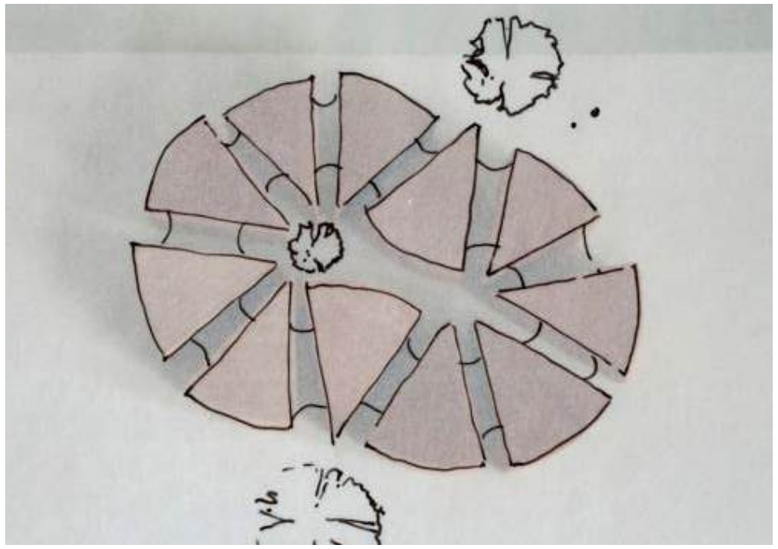


Figure 67.Conceptual tectonic black configuration

Findingds & Thoughts

Figure 67 promoted a compelling idea concerning the separation between buildings on the site. Inspiring interest in how one might transition from one space to another, potentially through an interaction with nature (perhaps walking outside), symbolising a coming to presence with exposure to the natural world.

Figure 68.Collage of a gentleman on boardwalk

Figure 69.Photograph native species

Event One

Presentation:

Event one focused on articulating the thesis research question. I presented information about hospital site visits, elected site, aspirational collages, leaf prints and tectonic modelling. A photo of a pin-up can be found in the Appendix.

Feedback:

- *Consider ways in which the site could influence concept development.*
- *Prolong this exploration of physical making as part of concept development.*
- *Find a way to maintain the sensitivity taken towards*
- *the concept while moving towards more technical architectural outcomes.*
- *Clarify position – what is the value in an architectural intervention?*

Next moves:

Getting site-specific and determining how the site might further influence the developing concept.

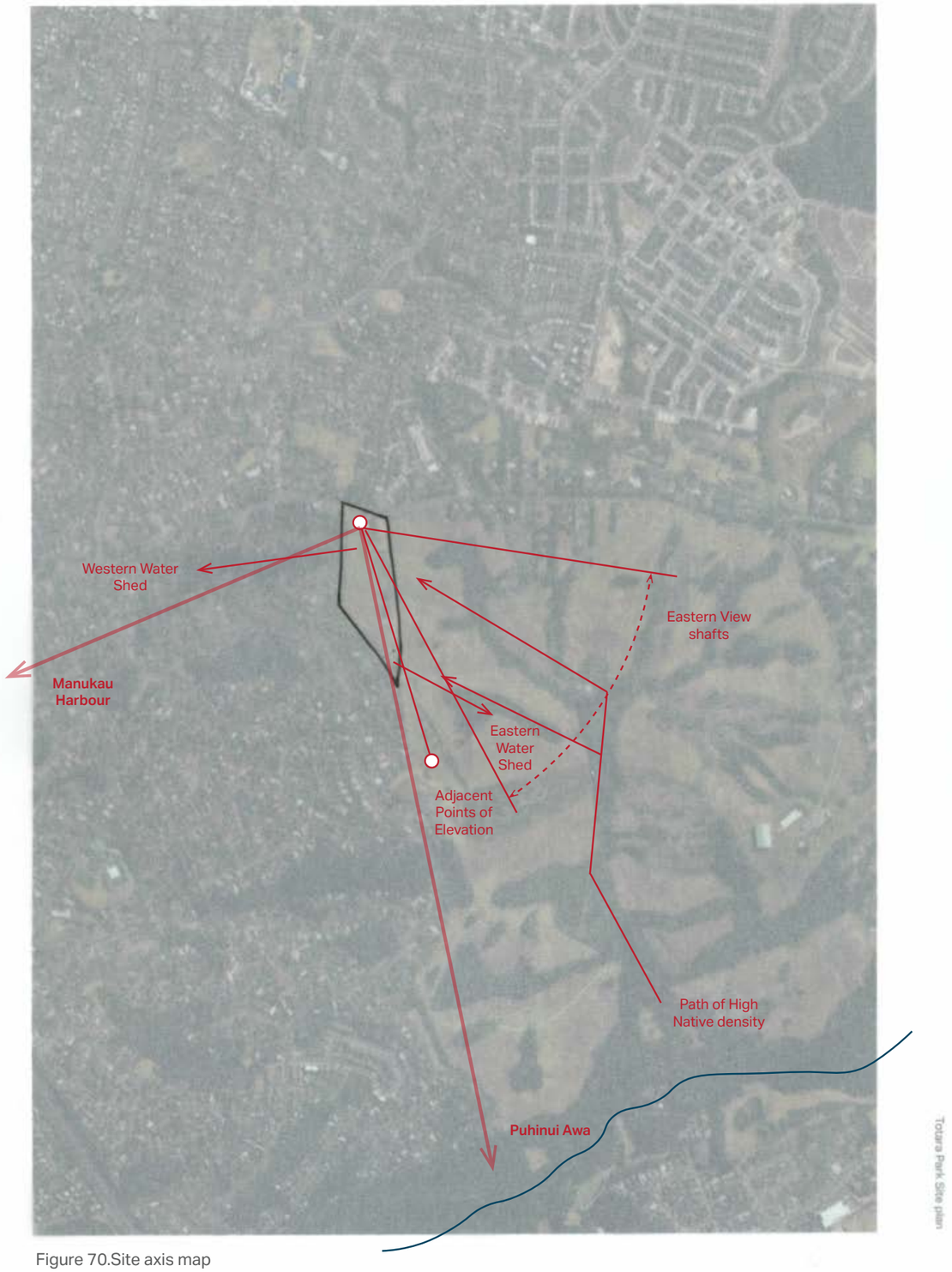


Figure 70.Site axis map

Experiment 5: Site Axis

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Spirit of Place

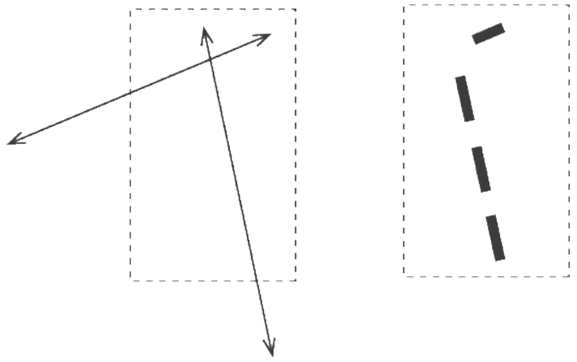
Rationale

Feedback from Event One motivated the diversification of form-making processes, which included examining place-based information to determine master planning. Please note that the awa (river) highlighted in Figure 70 is not indicative of its current pathway; however, it is included to indicate its presence.

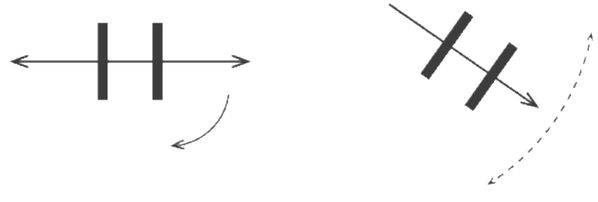
Findings & thoughts

After laying various axes over the site, three key axes prevailed. Figure 70 illustrates these.

This series of parti diagrams explores the response to continue the densification of the native bush on the site. As established in site analysis, the native bush follows lower contours and watershed paths of the greater Totara Park. Consideration of building orientation and subsequent pathways enables the continuous growth of vegetation without spatial interruption, allowing ecosystems to expand.



Orientation indicative of the Puhunui awa and Manukau harbour fosters the spirit of place. As previously discussed, water has powerful restorative properties (Browning et al., 2014; Kellert et al., 2008). Although the site does not have visual or auditory access to such bodies of water, the spiritual connection through orientation aims to contribute to a state of balance and harmony. This parti diagram explores a potential master planning axis.



The wellbeing importance of views of nature have been well established (Browning et al., 2014; Kellert et al., 2008). This constitutes a connection to the spirit of place. This parti diagram explores how this integration might land.

Figure 71.Series of site parti diagrams

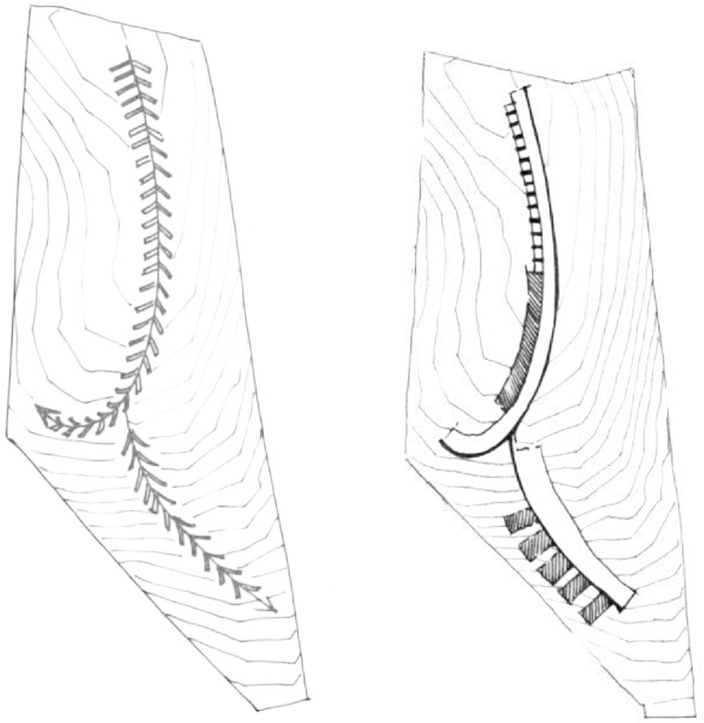


Figure 72.Conceptual sketch series

Concept Formulation

Non-Visual Connection to Nature

Visual Connection to Nature

Spirit of Place

Patient Specificity

Rationale

The use of the site axis and leaf structures heavily informed this initial concept

Method

The first iteration was realised through sketching and layering of tracing paper to build up the architectural structure. This is highlighted in Figure 72.

Findings & thoughts

Although a start, I was not convinced of this concept's potential success. Specifically, it:

- *Lacks circularity: the form creates many potential dead ends and a long corridor, which would be counterintuitive for the wandering tendencies of dementia patients.*
- *Lacks a clear communal space or 'heart' of the master plan.*
- *Could the concept benefit from better integration of the natural processes of the site, perhaps sunrise or sunset interactions?*

Next, consider more patient specificities; further investigating 'living clusters' as research suggests is helpful for patients with dementia. (Pollock & Fuggle, 2013).

Experiment 6: Passing Time

Visual Connection to Nature

Built Performance

Spirit of Place

Patient Specificity

Figure 74.A series of trees

Without the ability to read the time or look at our phones, how do we presume the concept of time? The physical time of day and the seasons throughout the year. Patients with dementia have been observed to have a particularly hard time with agitation, extra confusion, disorientation, anxiety, and aggression in the mid to late afternoons (Khachiyants et al., 2011). This is referred to as the 'sundown phenomenon', officially defined as a set of neurophysiological symptoms occurring at the time of sunset (Khachiyants et al., 2011). Despite various theories of its cause, the exact reason for this phenomenon is unknown; however, recent studies have speculated its connection to circadian rhythm disorders (Khachiyants et al., 2011). With this in mind, I have hypothesised that perhaps a design that enforces circadian rhythms through natural interventions could therefore improve this phenomenon in people with dementia.

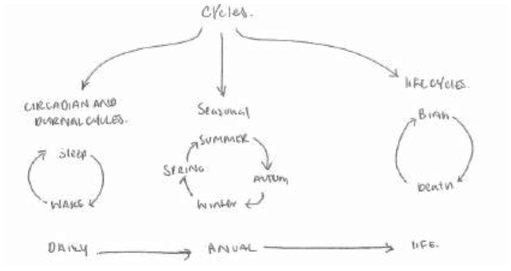


Figure 73.Sketched 'cycles' diagram

Experiment 6.1: Changing Flora

The use of deciduous trees and perennial vegetative species, I felt, could provide a visual indication of season change as their leaves change colour and die with the change of seasons. This would support the experience of inevitable changes in climate and weather conditions. 14 patterns of biophilic design and Keller's book of biophilia describe the advantages of using native species (Browning et al., 2014; Kellert, 2005). However, Aotearoa has a limited number of deciduous tree species (McGlone et al., 2004). Due to this, I have elected to supplement native species with non-natives; however, this would be achieved by planting non-natives as 'landmarks' rather than densely planting them. The table below looks at some potential native species.

Table 12.Native Deciduous trees Adapted from (McGlone et al., 2004)

Species	***Leaf Phenology***	***Growth from***	***Habitat & Substrate***
Discaria Toumatou (McGlone et al., 2004)	*Deciduous*	*Thorny, divaricating shrub/small tree (5-14m)*	*Grasslands and shrublands. Gravel, riverbeds, alluvial fans, eroded soils, sand dunes.*
Muehlenbeckia Astonii (McGlone et al., 2004)	*Deciduous*	*Divaricating shrub up to 3m*	*Open shrub lands. Alluvium stony ground*
Plagianthus regius (McGlone et al., 2004)	*Deciduous*	*Small tree up to 15m*	*Lowland forest, second-growth bush; sometimes forming groves. Alluvial terraces, riverbanks and fertile soils*

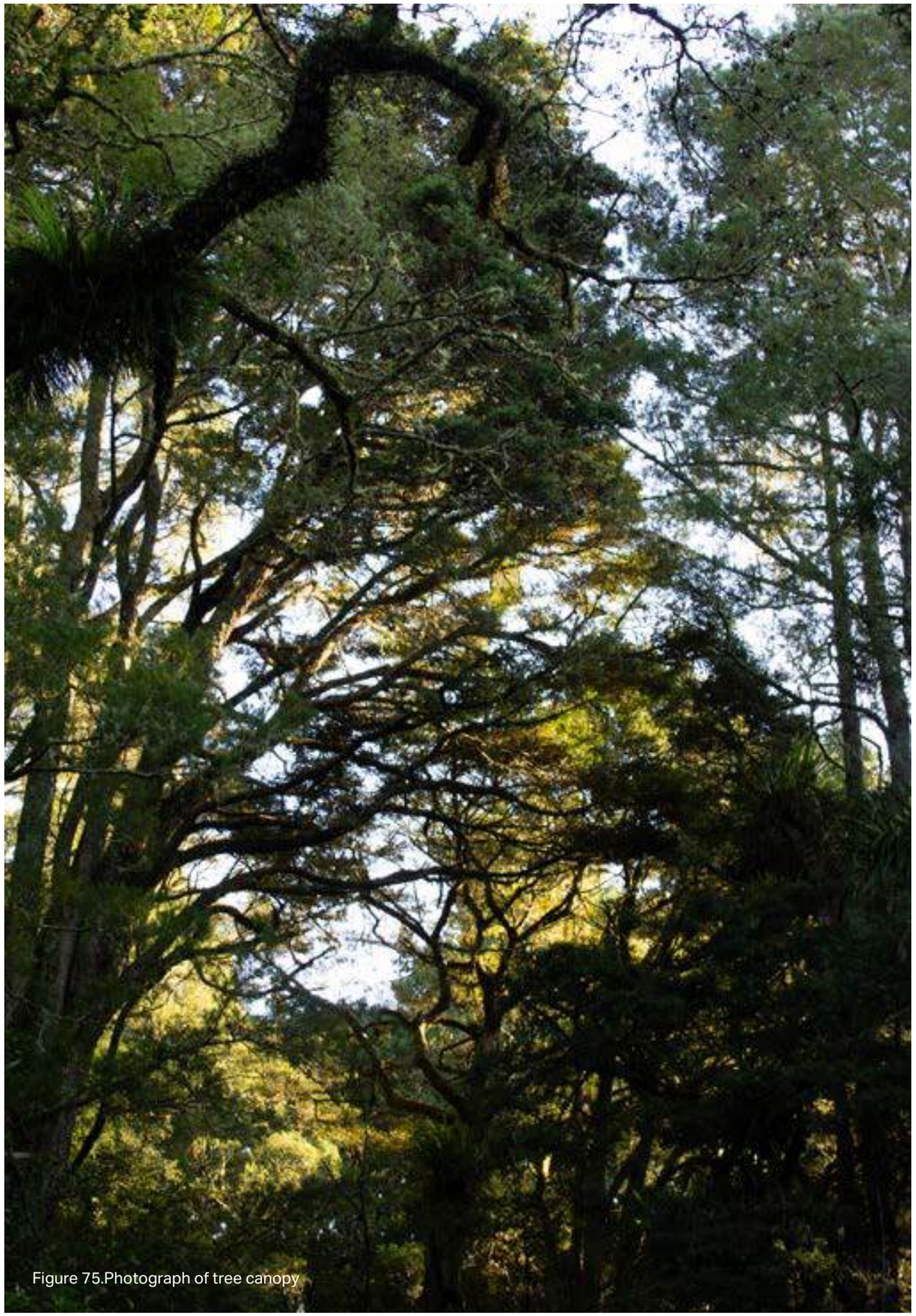


Figure 75.Photograph of tree canopy

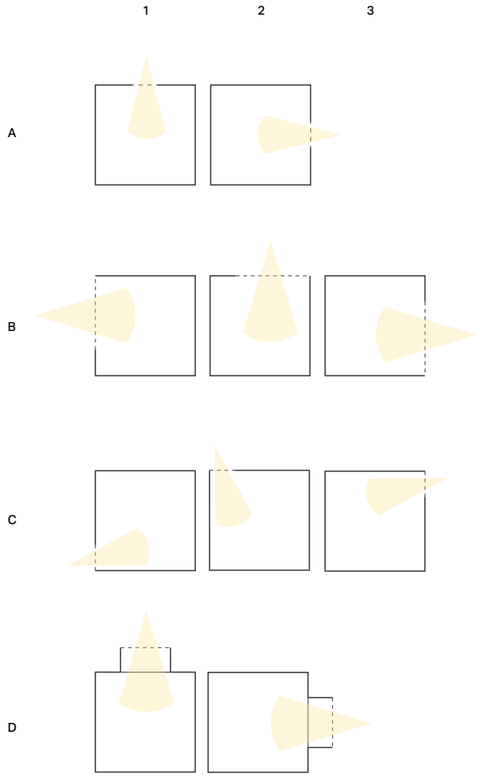


Figure 76.Parti diagrams of light voids

Experiment 6.2: Changing Sun

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Built Performance
- Spirit of Place
- Patient Specificity

Rationale

The introduction of light as a biophilic principle establishes a connection to circadian rhythms and serves as the basis for the following exploration. Sunrise and sunset will be used to reinforce such circadian rhythms, i.e., exposure to sunrise upon waking and sunset in the evenings, signalling the end of the day. While the orientation of buildings within the master plan will be a considerable aspect of interaction, this experiment examines how light can enter the building and be utilised to create different interactions and subsequent experiences.

Method

Figure 76 shows a diagram of prospective light interaction models that were later modelled; however, only the iterations I found to be successful have been included (Figure 77). Images of less successful interactions can be found in the Appendix. These models were crafted as scaled cardboard cubes, and a light was used to simulate sun paths.

Findings & thoughts

I found this experiment helpful in gaining a deeper understanding of light's capabilities. For example, it could be used to illuminate an architectural outcome, such as a pathway or a focal point. These experiments also highlight the difference in light quality throughout the day, suggesting how they might be integrated to purposefully interact with a specific activity.

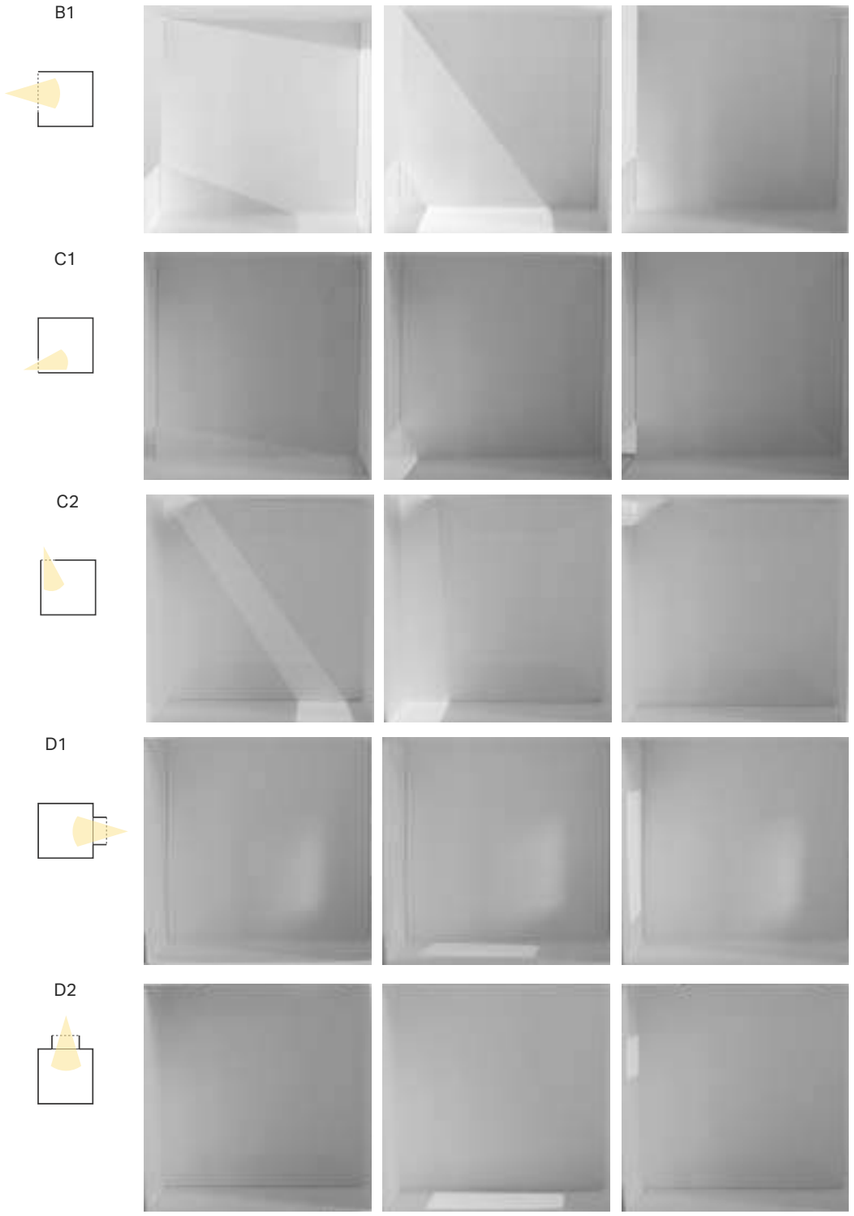


Figure 77.Photographs of tested light models

Figure 78.Photograph of Herekeke

Figure 79.Conceptual diagram

Final Concept

The final concept for this project is grounded in a form to whenua relationship. It draws on influence from the theoretical framework, which outlines that wellbeing is centred around notions of Te Whare Tapa Whā, but is also a manifestation of healthy te taiao and is inspired by a deeply rooted and respectful relationship to the natural world. Form to whenua represents the physical notion of how we touch the earth, while simultaneously and symbolically representing spiritual inclinations and connection to nature in all its forms. Whares for rest and

- Non-Visual Connection to Nature
- Visual Connection to Nature
- Built Performance
- Spirit of Place
- Patient Specificity

recuperation are nurtured by nature, nourished through a retreat into nutrient-rich soil. Nature offers support and sustenance in times of human need. Communal built forms exist in harmony with the whenua, emphasising a minimal conscious touch through consideration for the wellbeing of te tiaou, including the advocacy of designated space for rich ecosystems to thrive. Figure 79 provides visual parti diagrams of these two types of relationships.

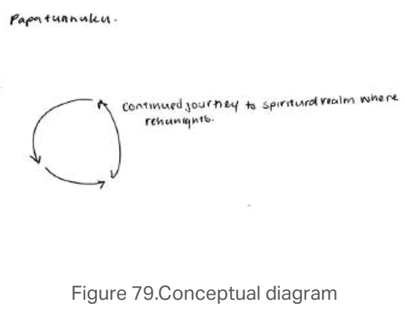
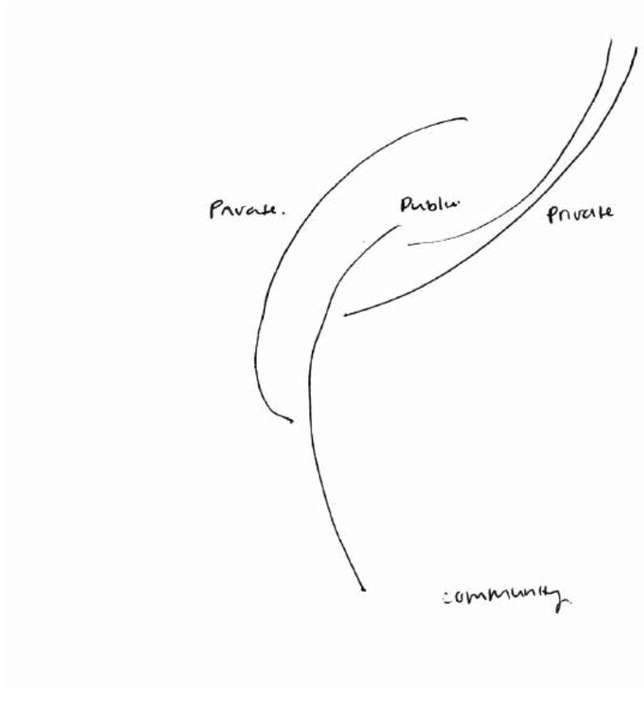
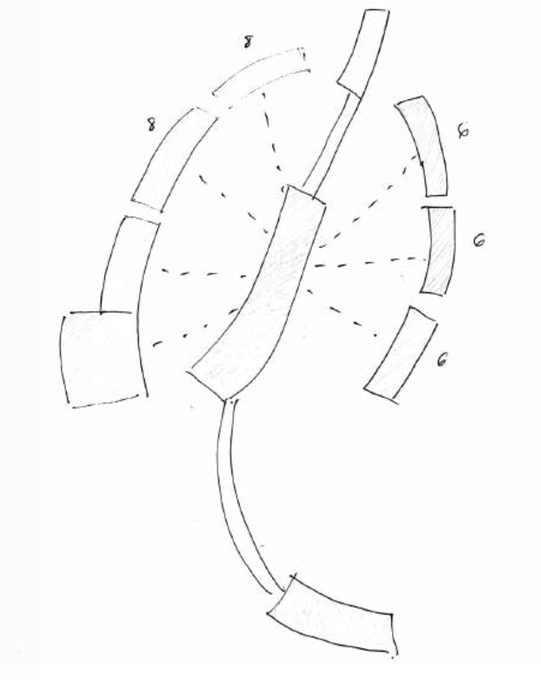


Figure 79.Conceptual diagram





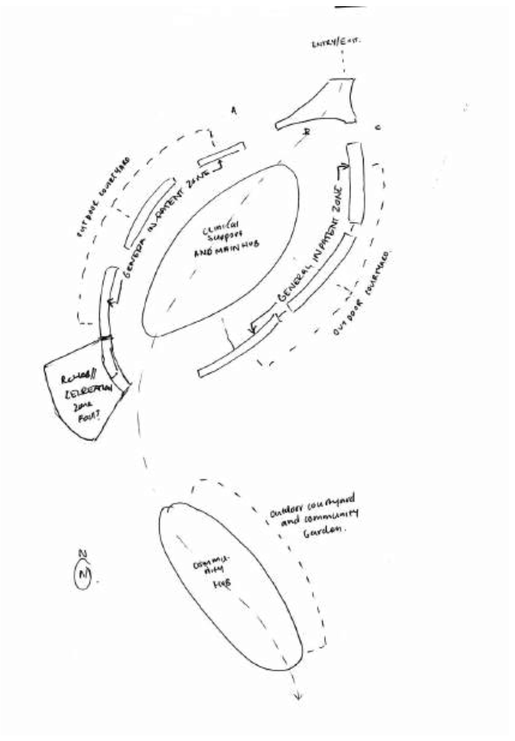


Figure 81.Conceptual development sketches

Figure 82.Concept model photograph 1

Figure 83.Concept model photograph 2

Figure 84.Concept model photograph 3

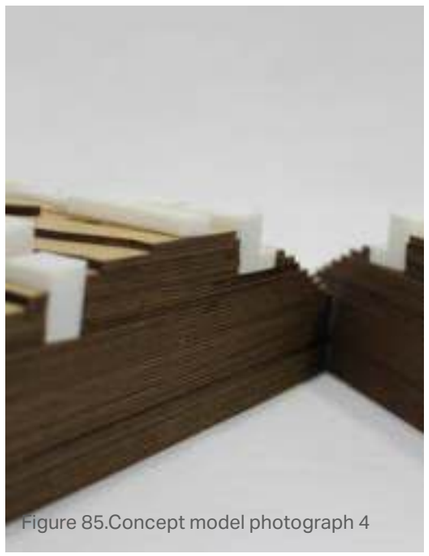


Figure 85.Concept model photograph 4

Figure 86.Concept materials photograph

Program key

a. Recreation Hub

Program	QTY	M²
Physiotherapy rooms	2	
Small Gymazium	1	
Swimming pool	1	
Toilet - Accessilbe		6

b. High Dependency Zone

Program	QTY	M²
Airlock - Entry	1	10
1 Bed Room	8	15
A Ensuite	8	5
Staff / Consumer Interface	2	10
Lounge / Dining / Activity	2	60
Toilet - Accessible		6
Lounge - Patient / Family	4	10

c. Community Hub

Program	QTY	M²
Community Gardens	1	
Arts and craft space	1	
Community Hall	1	
Kitchen	1	
Toilets		6

d. Resident Hub

Program	QTY	M²
Kitchen / Servery	1	20
Store - Equipment	1	25
Disposal Room	1	10
Dirty Utility	1	10
Cleaner's Room	1	5
Dining Room / Beverage	1	40
Lounge - GeneralBay	1	30
Clean Utility / Medication rm	1	16
Toilet - Accessible	1	6
Laundry - Mental Health	1	15

e. Entry / Reception / Staff Areas

Program	QTY	M²
Airlock - Entry	1	10
Reception / Clerical	1	10
Waiting	1	10
Toilet - Accessible	1	6
Office	2	18
Office - Workstation	2	8.8
Photocopy / Stationery	1	8
Meeting Room	1	15
Staff Room	1	20
Property Bay - Staff	1	2
Shower - Staff	2	6
Toilet - Staff		3

f.Low Dependency Zone

Program	QTY	M²
1 Bedroom	18	16.5
Ensuite	18	7
Staff / Consumer Interface	3	14
Office - Clinical Workroom	3	15
Lounge - General	3	30
Toilet - Accessible		6
Lounge - Patient / Family	12	

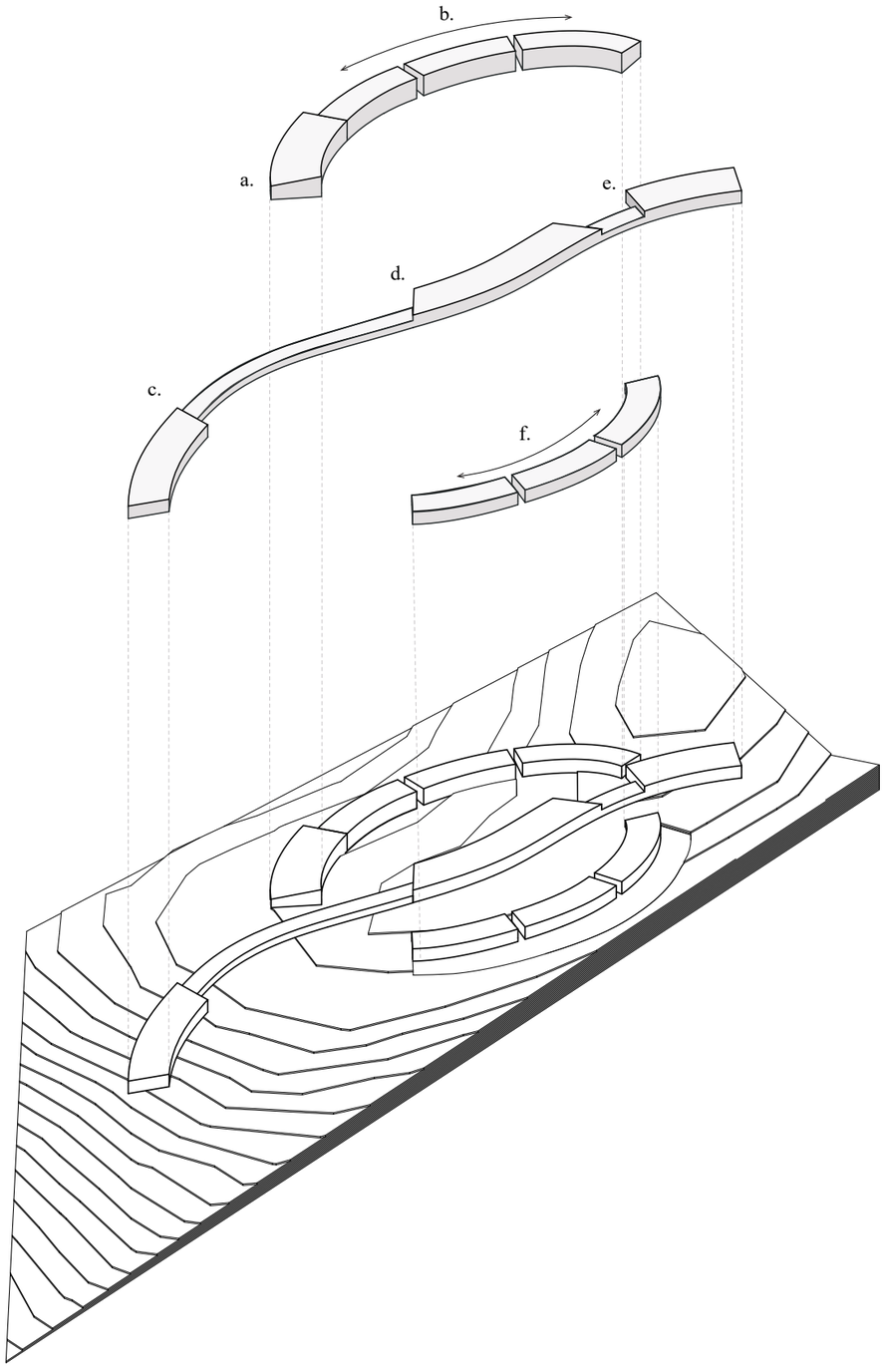


Figure 87.Concept exploded isometric diagram

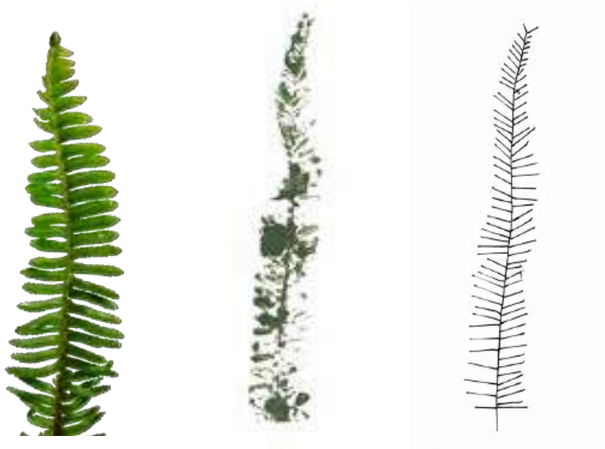


Figure 88.Leaf, print, sketch series

Master planning: *The village model was inspired by the specific patient needs of the theoretical framework, the Hogeweyk president's analysis, and key considerations following a site visit to the Buchanan Rehabilitation Centre (BRC). The separation of buildings on site also allows for seamless transitions between the interior and exterior as daily life is carried out, offering a sense of coming presence as one is surrounded by nature.*

Physical planning: *The Leaf spine is represented in the master plan as the central ridge, orientated to shadow contours of the site and the direction of the awa/ harbour. From top to bottom, the ridge represents the key direction of travel and points of social engagement (main entry from top of site to community hub at the bottom). Ricocheting structures are spaces of rest and recuperation anchored to the ground and placed on site to directly interact with sunrise and sunset.*

Figure 89.Collage of a gentleman with grandson out-side

Figure 90.Collage of Grandma with grandson gardening

Figure 91.Collage of patient being wheeled in bed

Event Two

Presentation:

This presentation included the pitch of concept (from to whena connection) and introduced potential materials as mentioned above. An image of the presentation pin-up can be found in the Appendix.

Feedback:

On the right track with the concept, especially with the leaves and scientific theories such as circadian rhythms.
Interesting contrast in materials, the cleanliness and natural qualities are compelling
The healthcare context is typically interventionist, re-moved from time, and isolated from the natural world, however, aged care differs, and perhaps this is something to capitalise on.
With all the curved buildings, light will interact with each room differently. It may be challenging to control light as described in relation to sunrise and sunset.

Figure 92.Tectonic model photograph 1

Figure 93.Tectonic model photograph 2

From to whenua tectonic modelling

Conceptual tectonic modelling. These two models were crafted to communicate the form in relation to the whenua and illustrate the two typologies: Nestled into the whenua and touching the whenua lightly.

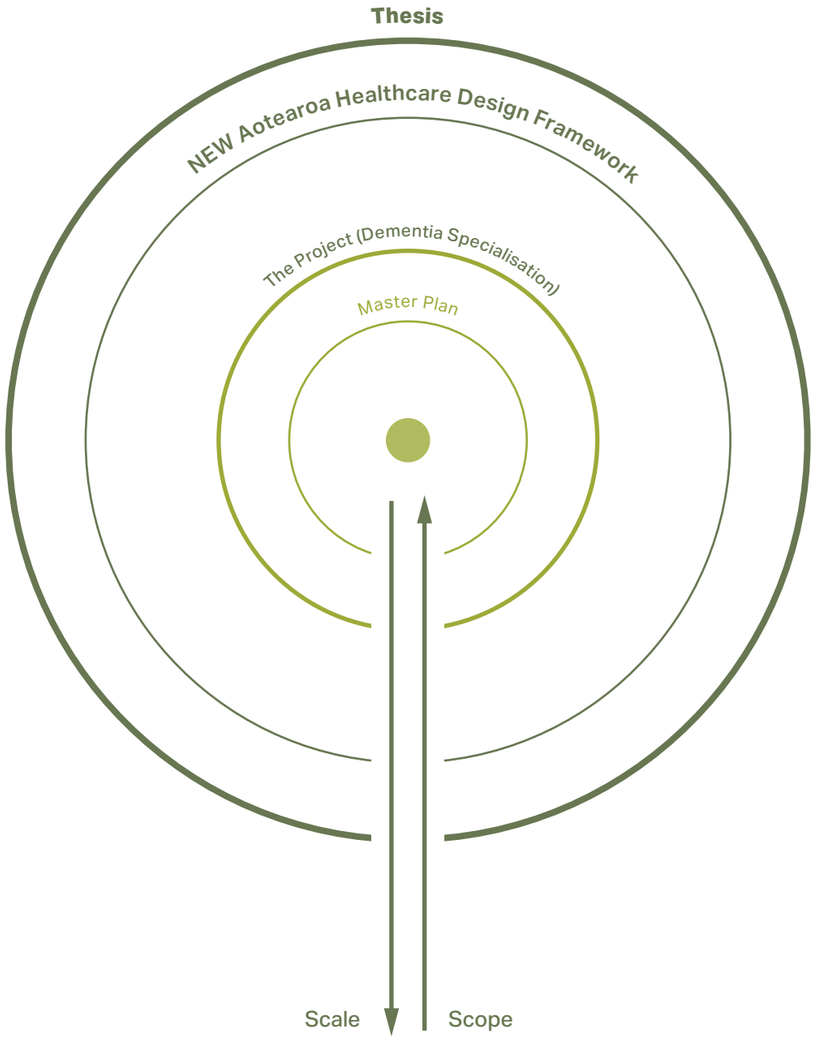


Figure 94.Re-scope diagram

Reflection & Re-Scoping

Figure 94 Illustrates the narrowing of scope as further detail develops. The core of the circle identifies the low dependency unit as the most inner part of the diagram and subsequent development. Figure 95 in the next chapter expands on this rescoping.

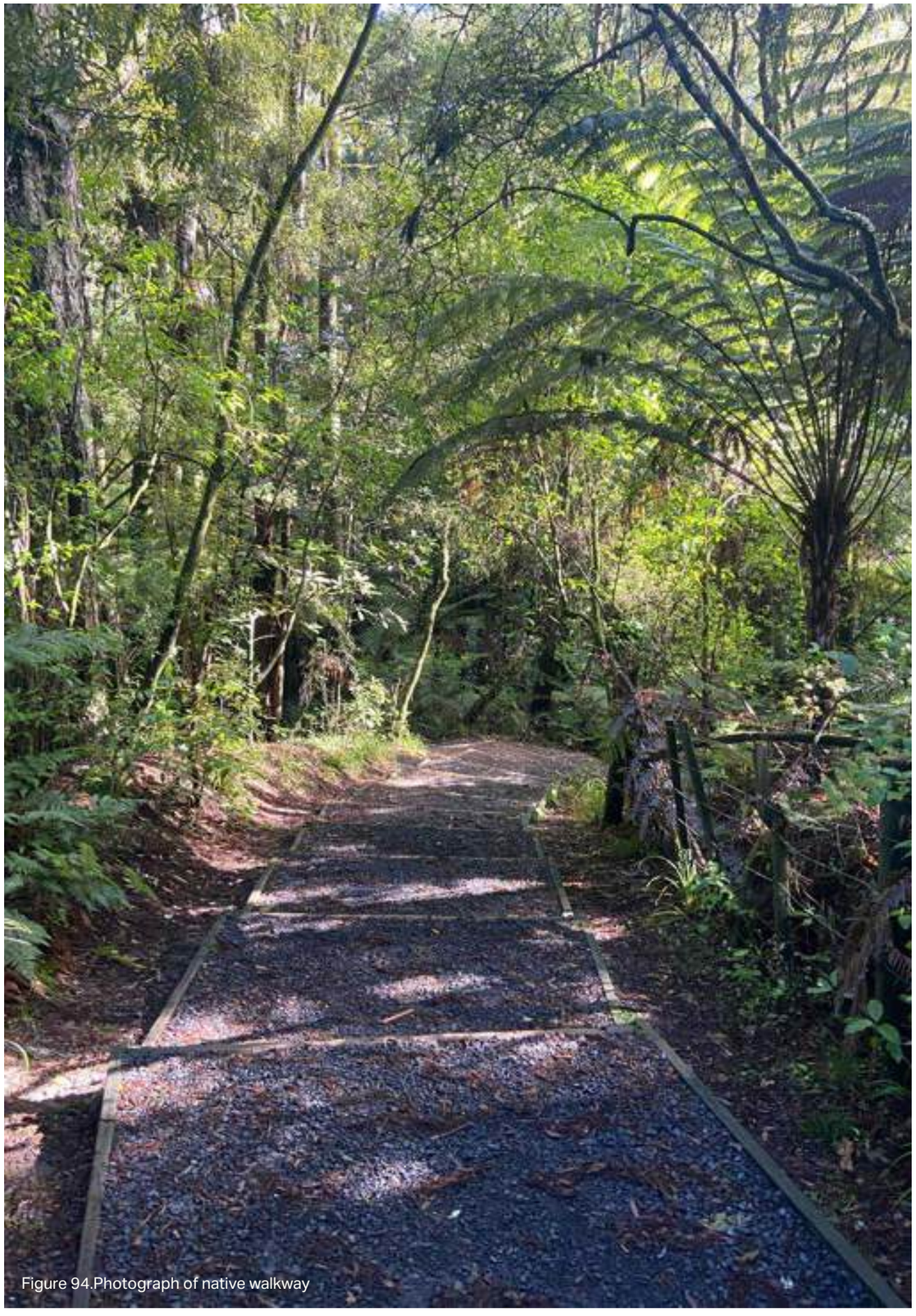


Figure 94.Photograph of native walkway

Chapter Nine: Developed Design

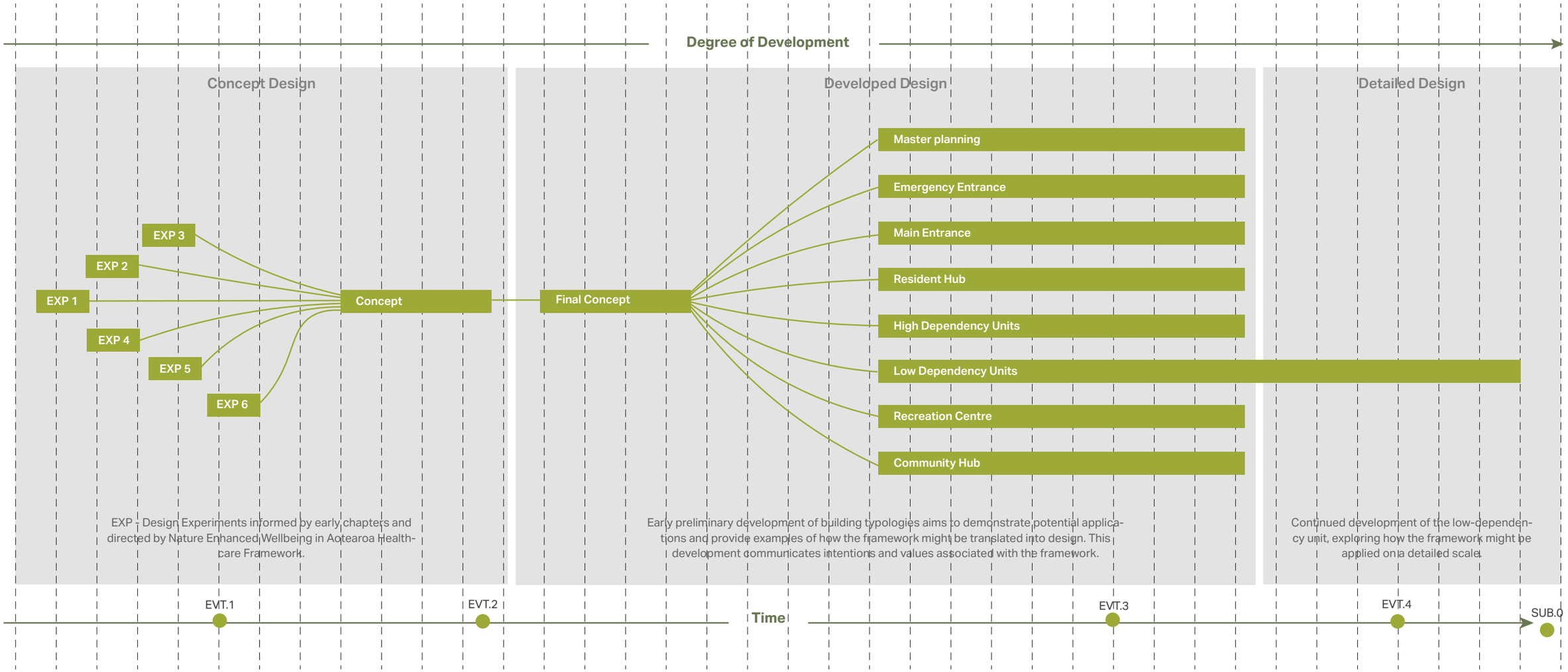


Figure 95.Design stages diagram

Introduction

Drawing on previous conceptual design experiments and the consideration of the NEW Aotearoa healthcare design framework, the development of each building on the master plan to followed an iterative process of sketching and tracing onto butter paper, reflecting, through further iteration. The structure of this chapter follows a series of hand-drawn developments, progressing to final plans, and some onto experimental drawings aiming to illustrate the NEW Aotearoa healthcare design framework's intentions and values, culminating in the use of the framework itself to critique the developed design work.

Figure 95 illustrates the scope of this chapter, including the subsequent development of the buildings on the project's master plan, which leads to further development

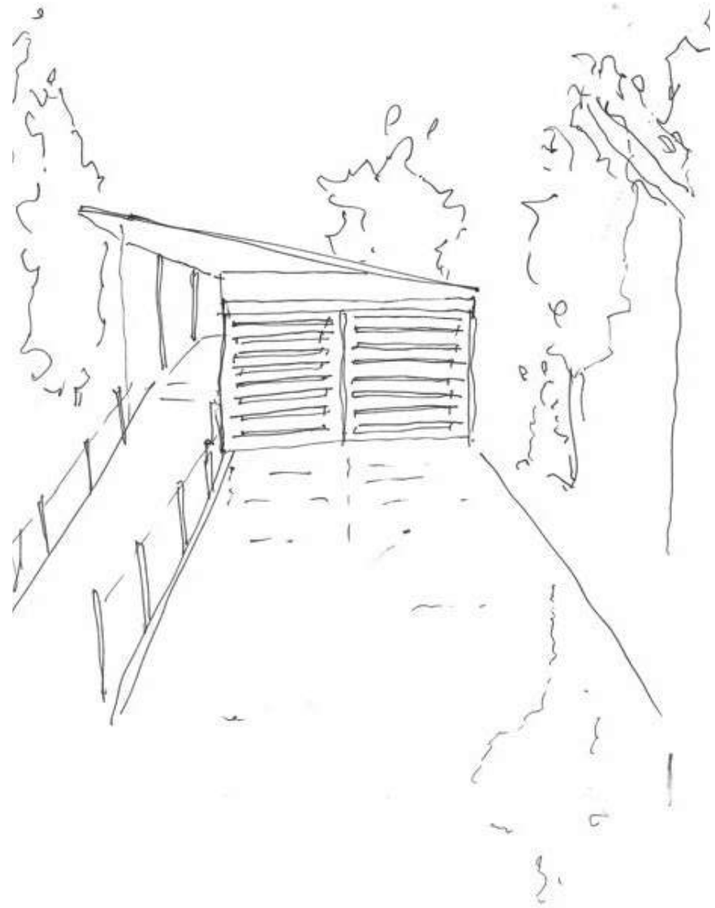


Figure 96.Precedent sketch 1

Precedent Study

Projects: **Simpson-Lee house**

Architect: **Glenn Murcutt**

Location: **Mount Wilson, New South Wales, Australia**

Date: **1988-94**

"The ground drops beneath the floor slab as the itinerary projects further above the hillside, thereby dramatising its progress through the site, emphasising the fall in the ground, accentuating the sense of gradual detachment from the world sought after by the clients."
- (Murcutt, 2003)

Affiliation with this project lies in the continuity between landscape and building. The beauty in how the built form makes the light and shadow dance, the elongation of the structure with its long transitions between spaces. As quoted above, the eloquent detailing, especially around the roof, shading structures, and transitions of space, is what makes all these elements so successful within this project.

Precedent Study

Projects: Maggie's Yorkshire

Architect: **Heatherwick Studio**

Landscape architect: **Balston Agius**

Location: **Yorkshire, United Kingdom**

Date: 2019

Program: **Cancer support centre offering professional counselling, support groups and workshops to cancer patients and families (Maggies, n.d).**

"The interior of the centre explores everything that is often missed in healing environments: natural and tactile materials, soft lighting, and a variety of spaces designed to encourage social opportunities as well as quiet contemplation.' – Maggies.

This architecture offers a compelling example of how biophilic elements can be effectively integrated to serve a specific patient group. This precedent sucsefully manages an inherently medical program with full committment to the intergration of the natual world.

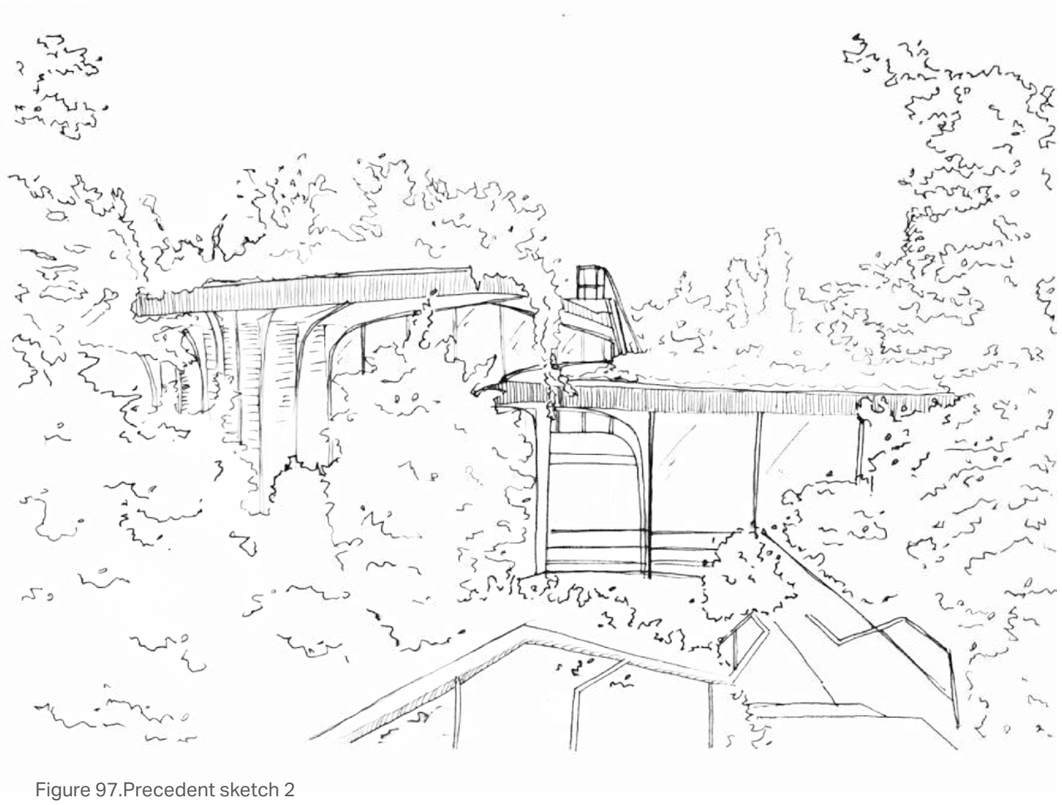


Figure 97.Precedent sketch 2

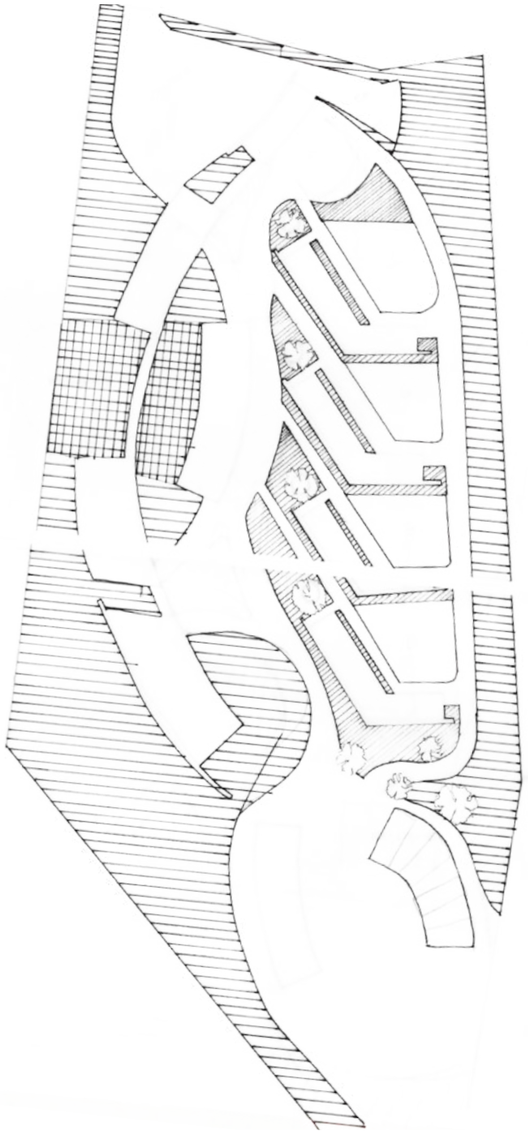


Figure 98.Concept development

Figure 99.Concept development 2

Master Planning

Development

Master plan

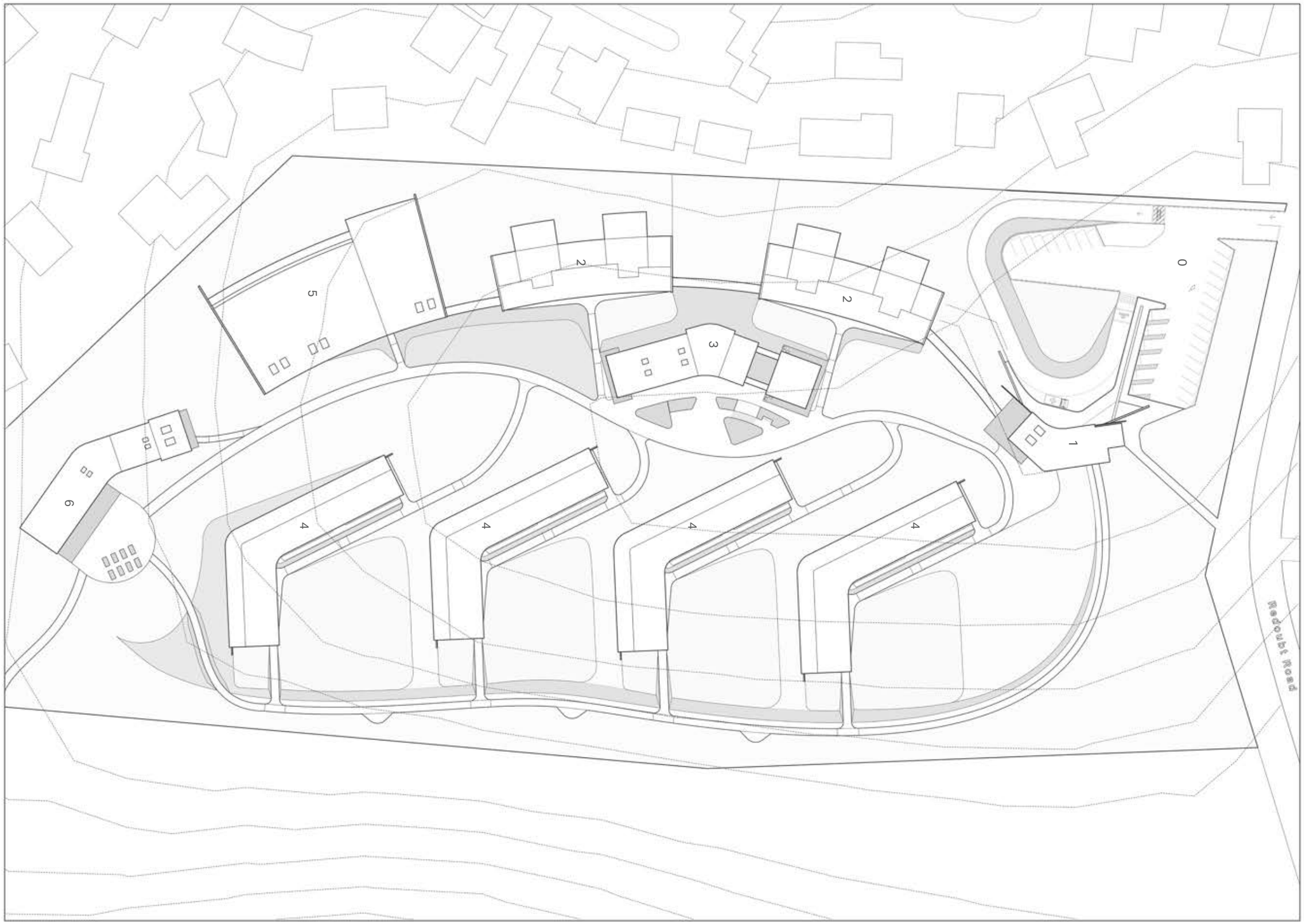


Figure 100.Master plan

Master plan Legend

ID	Program	Qty
0	Car Park	1
1	Main and emergency entrance	1
2	High dependency unit	2
3	Residents Hub	1
4	Low dependency unit	4
5	Recreation centre	1
6	Community Hub	1

Table 13.Master plan Key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Circularity of pathways**	*Continuously looped pathways in and around buildings allow patients to wander uninterrupted, while staying on site. This is also implemented as a security strategy, as only paths leading off-site require passing through secured areas.*	*Security, outdoor space with opportunity*	*Patient specific*
2	**Separation of the program**	*Further separating buildings on-site contributes to the village model. The newly introduced separation and focus of orientation in response to the sun, in the low dependency unit, produce street-like formations as they radiate from the master plan ridge.*	*Natural light, Size and density*	*Patient specific*
			Natural ventilation, heating, and cooling	*Built Performance*
3	**Variability in scaled experiences**	*Scattered 'moments' around the master plan offer seating at lookouts, or secret paths and gardens, which provide an intimate scale within an inherently large-scale master planning exercise.*	*Gardens and quiet spaces*	*Patient specific*
4	**Variability in the garden**	*Implementation of site-specific needs, such as wetlands, in response to water management and connection to Aotearoa's native Flora and fauna.*	*Ecological and geographical connection to place*	*Spirit of place*

Built Performance Spirit of Place Patient Specificity

Please note that all key design moves relate to more than one category of the NEW Aotearoa healthcare framework; however, the tables below only highlight the core intention of each design move

Emergency Entrance

Development

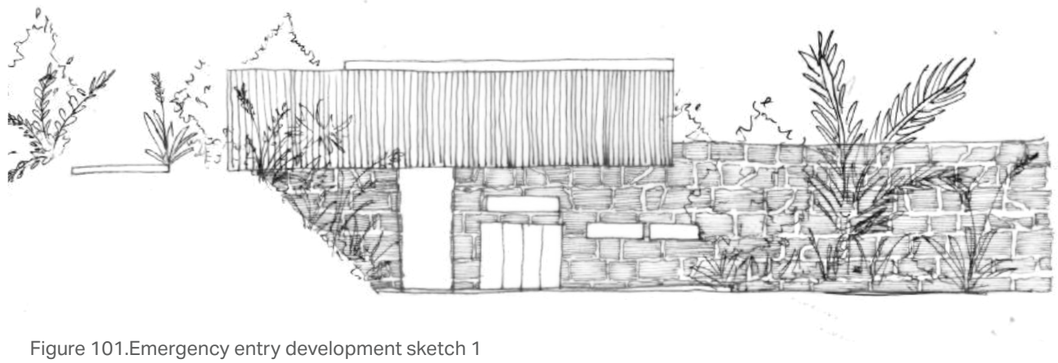


Figure 101.Emergency entry development sketch 1

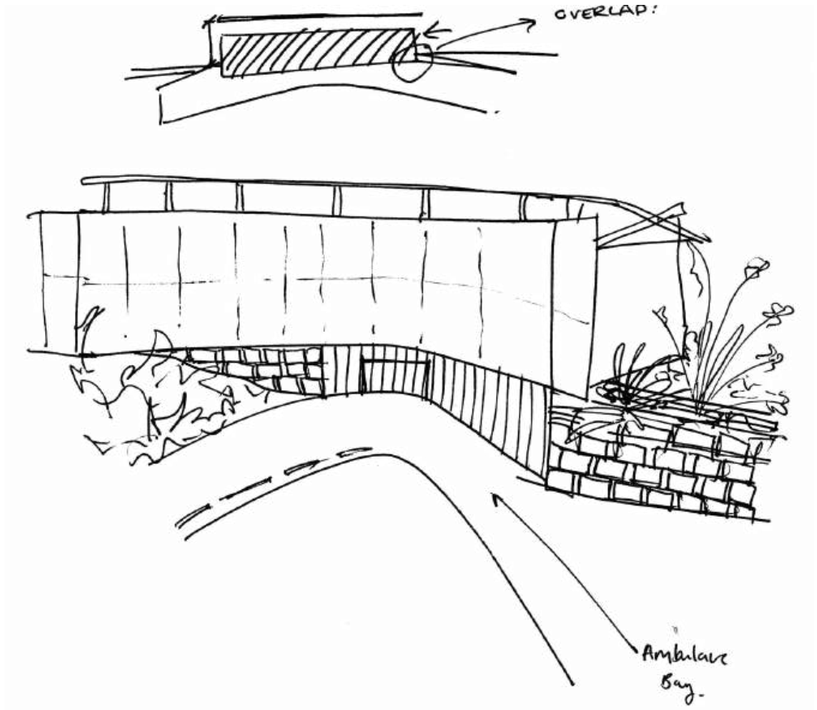


Figure 102.Emergency entry development sketch 2

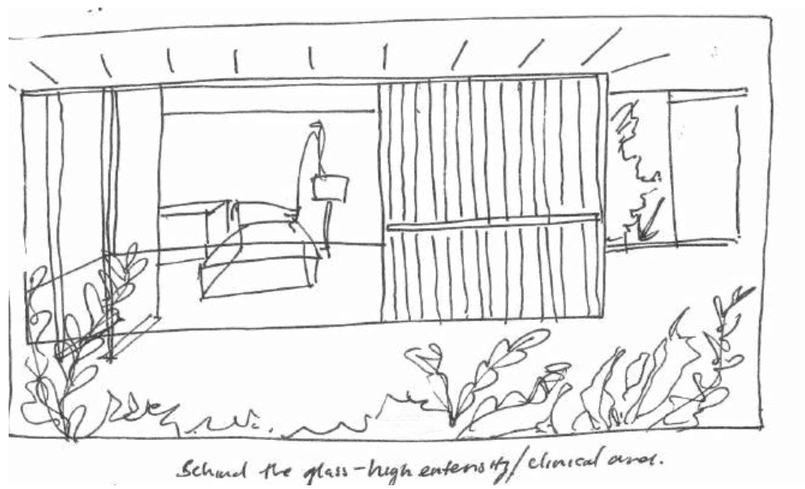


Figure 103.Emergency entry development sketch 3

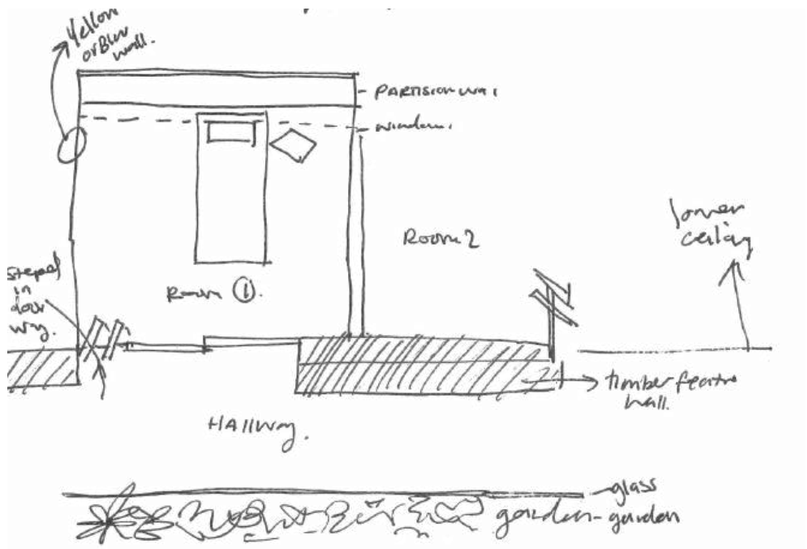


Figure 104.Emergency entry development sketch 4

Figure 105.Emergency entrance render

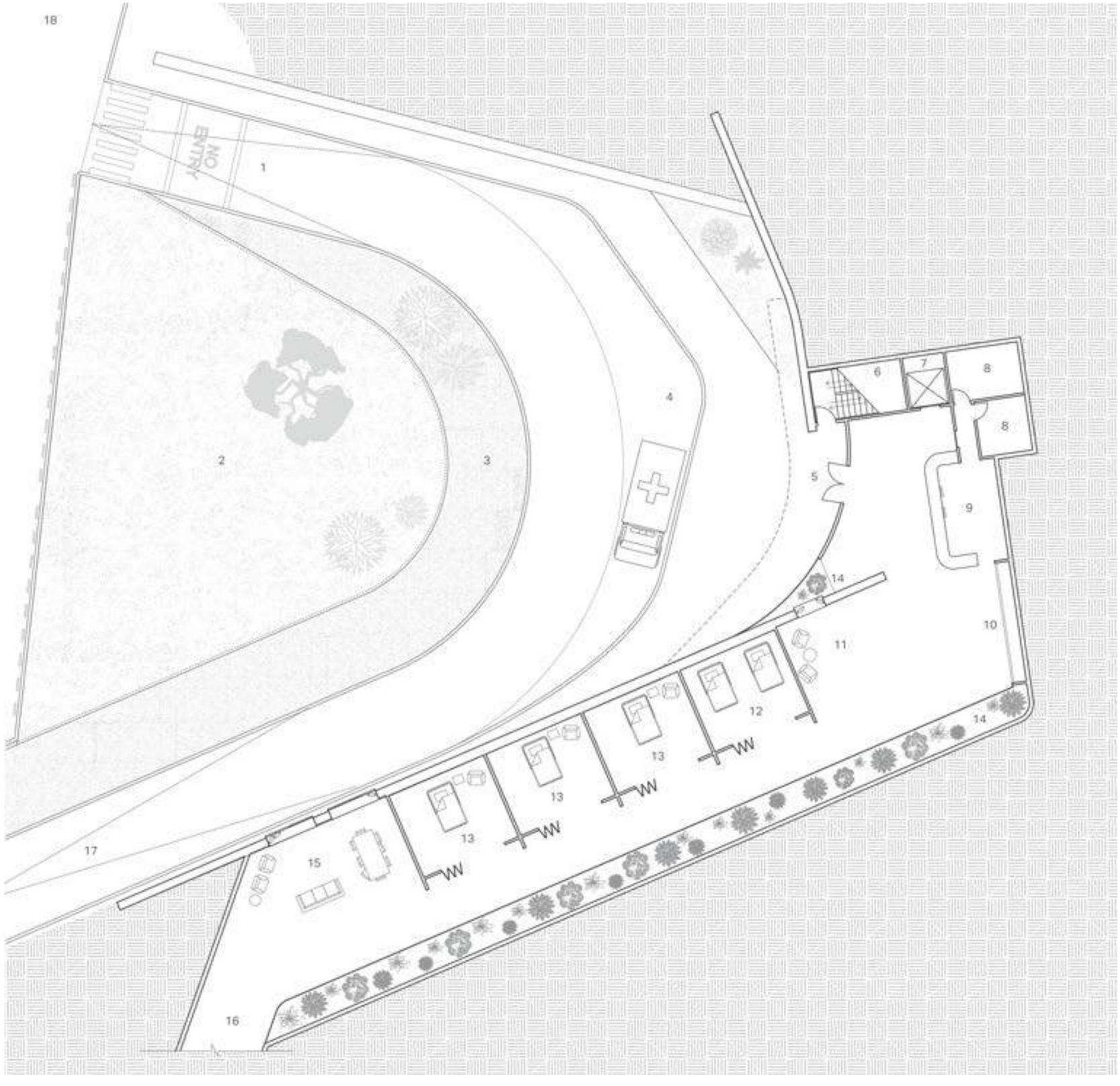


Figure 106.Emergency entry plan

Emergency Entrance Plan - GF

Scale 1:200

ID	Program	Qty
1	Ambulance driveway	1
2	Garden	1
3	Vegetated sloped retaining strategy	1
4	Ambulance bay	1
5	Main entrance	1
6	Emergency stairs	1
7	Elevator	1
8	Office	2
9	Reception	1
10	Storage	1
11	Waiting area	1
12	Treatment room	1
13	Private room	3
14	Fully enclosed interior garden	2
15	Staff and patient lounge	1
16	Internal access to high dependency units	1
17	Ambulance exit	1
18	Main carpark	1

Figure 107.Emergency entry identification map

Table 14.Emergency entrance key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Consistent with the concept**	*The program is designed to provide higher-level care to residents in need during emergencies. The form sinks into the ground, metaphorically held by the earth, and gains nutrients from the earth.*	*Geographic connection to Nature*	*Geographic connection to Nature*
2	**Concealed but prominent entrance**	*The folded form offers privacy while maintaining adequate environmental information, suggesting a sense of entry*	*Prospect and refuge*	*Non-visual connection to nature*
3	**Interior garden**	*Absolute physical exposure to nature is limited in highly clinical areas due to patient immune compromise. However, introducing views of nature through a fully enclosed garden, as a separate environment, protects against potential harm while still offering restorative views.*	*Elements of Nature*	*Visual connection to nature.*
4	**Natural lighting**	*Use of skylights and framed windows*	*Natural and defused lighting*	*Building performance, patient specificity*

Non-Visual Connection to Nature

Visual Connection to Nature

Built Performance

Spirit of Place

Patient Specificity

Main Entrance

Development

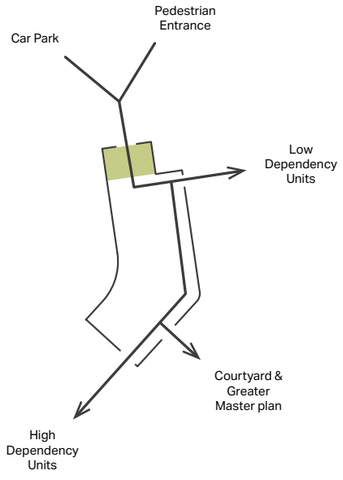
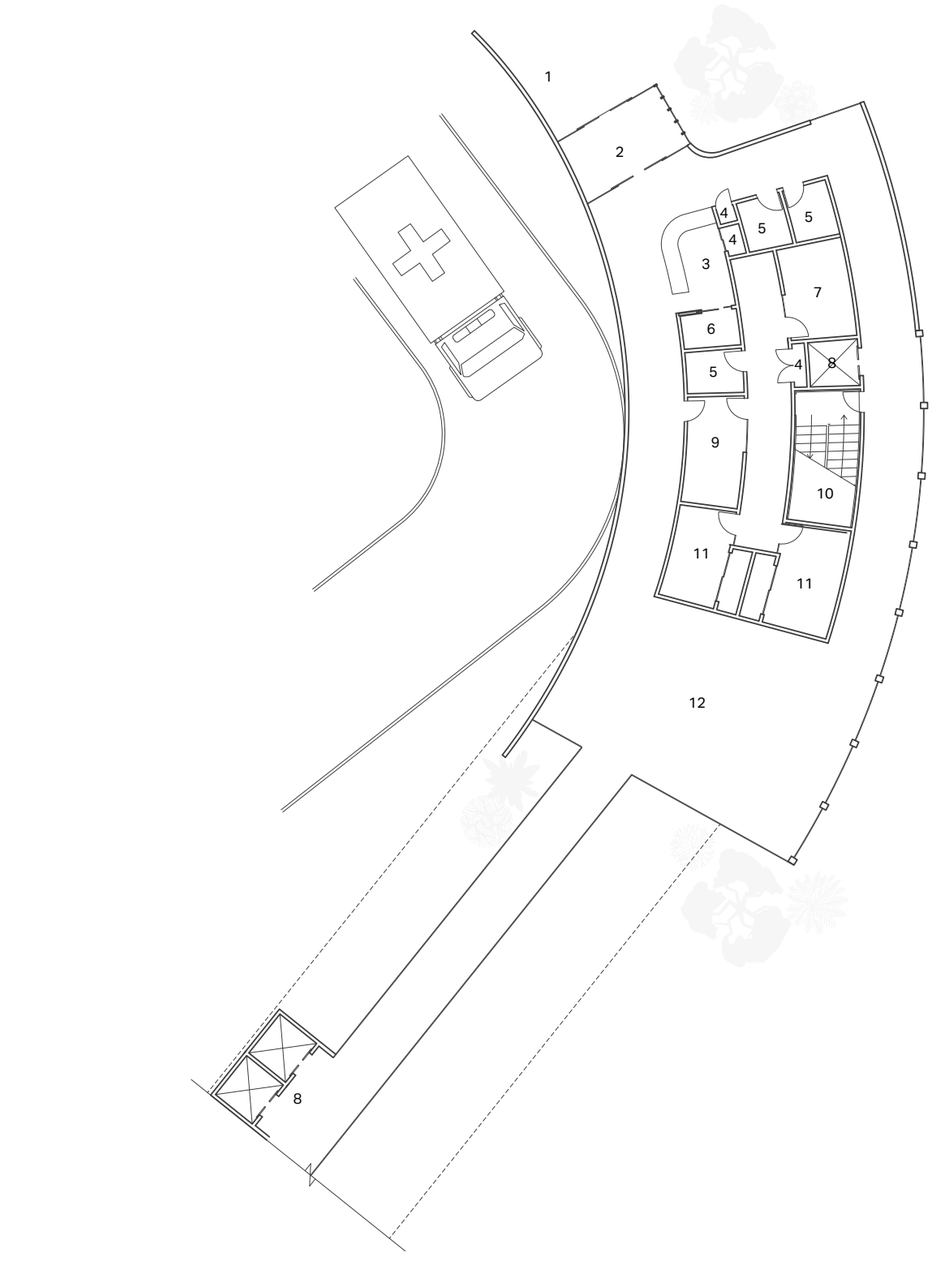


Figure 108.Main entry Parti diagram

Parti diagram showing paths of travel. The diagram highlights that all users' pass-through 'air locks' (highlighted in green) and the main reception to gain access to the broader site. This ensures security and supports the strategic design of space by avoiding dead ends, which allows patients to wander without interruption.



Main Entry & Reception

Scale

1 Main Entrance
2 Airlock entry
3 Reception
4 Storage
5 Bathroom
6 Resource room
7 Staff room
8 lift
9 Meeting room
10 Emergency Stairs
11 Office
12 Waiting lounge

Figure 109.Main entry development plan

Figure 110.Main entry plan

Main Entrance Plan - LVL 1
Scale 1:200

ID	Program	Qty
1	Car Park 23 Standard Parks (2.6x4m 30-degree angle)(Auckland Transport, 2013),6 Disabled parks	1
2	Off-street pedestrian entrance	1
3	Access to wider site & Low dependency units	1
4	Main entrance	1
5	Emergency & ambulance Entrance – Lower floor	1
6	Airlock Entry	1
7	Reception	1
8	Storage	1
9	Emergency stairs	1
10	Elevator	1
11	Accessible toilets	2
12	Quiet sitting area	1
13	Drinking fountain	1
14	Facilities management/storage room	1
15	Staff room	1
16	Waiting lounge area	1
17	Exterior deck	1
18	Exterior Courtyard	1
19	Pathway to the high dependency unit	1
20	Low Dependency unit	1

Figure 111.Main entry identification map

Figure 112.Main entry render

Table 15.Main Entry key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Slow transition between outside and inside**	*Rich native planting surrounds the main entrance, creating a gentle transition from the natural to the built environment through a combination of glaze and slim timber battens.*	*Elements of Nature: nature, plants, sunlight*	*Visual connection to nature*
2	**Natural Process**	*Materiality: Cornet steel. The weathering and patina process of the material.* *The narrow roof south of the airlock allows water to drip onto the garden during rainfall.*	*Natural processes and systems*	*Non-visual connection to Nature*
3	**Circularity**	*The floor plan avoids dead ends to encourage uninterrupted movement.*	*Security, Outdoor space with opportunity.*	*Patient specific*
4	**Compression and release**	*Upon entry, a solid wall covers the key eastern view shaft, directing users down the hall. Arrival in the waiting area signifies the form opening to the vista*	*Mystery, refuge, complexity, restoration*	*Non-visual connection to Nature*
5	**Variety of space**	*Variance of space and size, including multi–use areas: main waiting area, intimate seating area (#13 on program table), Exterior courtyard, and exterior deck.*	*Human scale, community links (welcomes community with adequate space)*	*Patient specific*

Non-Visual Connection to Nature

Visual Connection to Nature

Patient Specificity

Resident Hub

Development

Figure 113.Resident hub development sketch 1

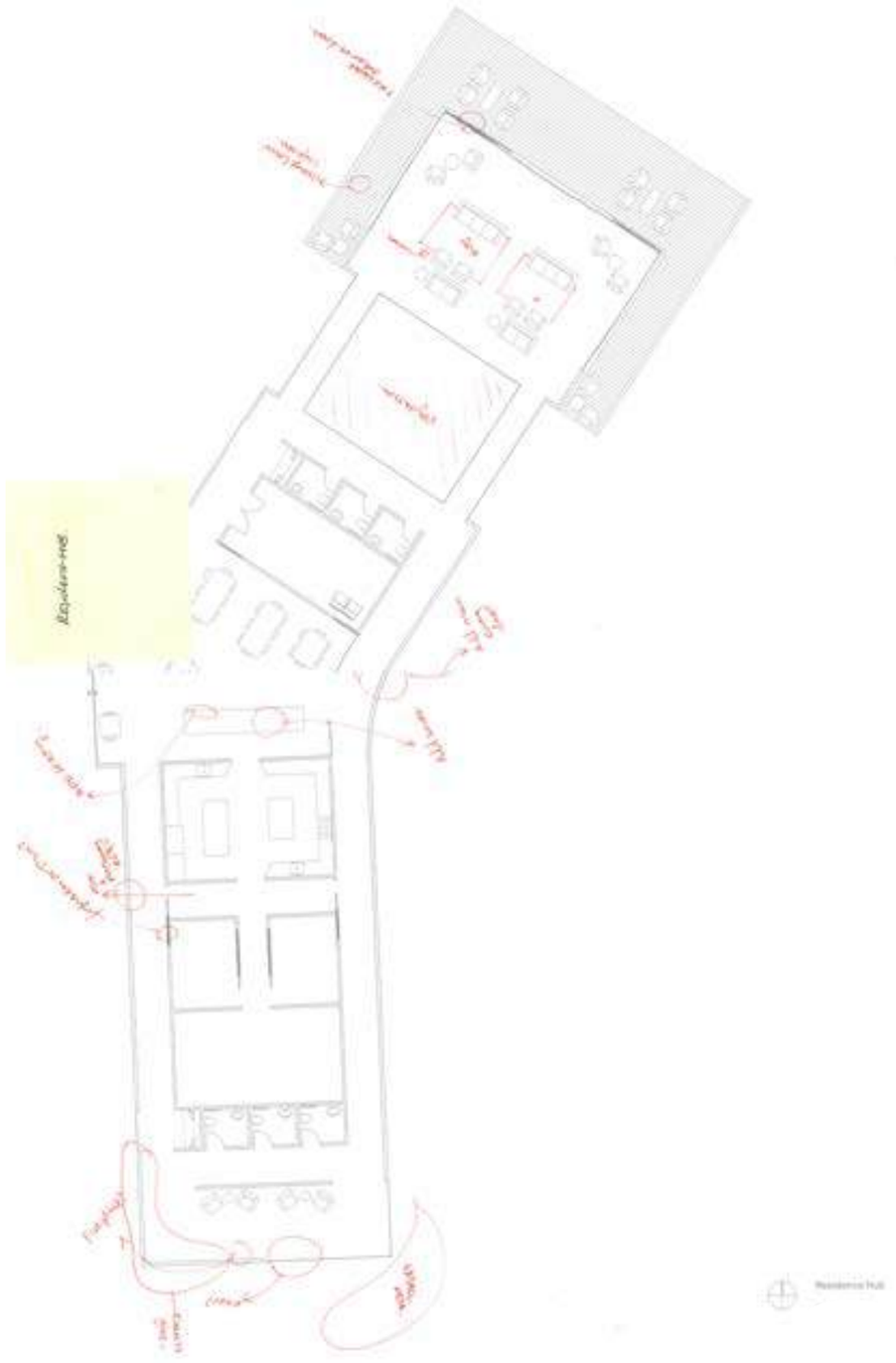


Figure 114.Resident hub development sketch 2

Figure 115.Resident hub plan

Resident Hub Plan
Scale 1:250

ID	Program	Qty
1	Access to upper masterplan	1
2	Raised Garden bed with bench	1
3	Raised Garden bed	6
4	Decked boardwalk over garden	2
5	Exterior deck	1
6	Main Lounge	1
7	Exterior courtyard	1
8	Cosy Seating space	2
9	Accessible toilets	6
10	Equipment storage	1
11	Dining Hall	1
12	Main Entrance	1
13	Kitchen	1
14	Storage	1
15	Cleaners room	1
16	Dirty utility	1
17	Intimate Lounge	1
18	Front courtyard	1
19	Wetland garden	1
20	High dependency unit	2
21	High dependency unit access path	2
22	Sky Bridge between high-density units	1
23	Low Dependency Unit	2
24	Low dependent access path	2
25	Access to the lower masterplan	1

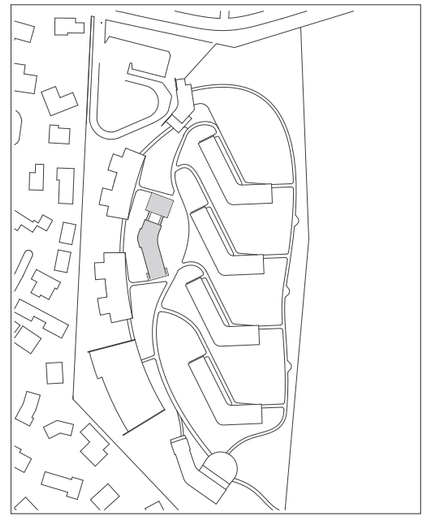


Figure 116.Resident hub identification map

Table 16.Resident hub key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Centrally located**	*The resident hub sits at the centre of the master plan, reflecting that it is the heart of the facility, and all paths lead back to it.*	*Human scale, outdoor space with opportunity*	*Patient specific*
2	**Access to nature**	*The form sits on the contour ridge of the site and orients towards key view shafts, in turn affording visual connections to natural systems and outlooks over the larger Totara Park.*	*Elements of nature*	*Visual connection to nature*
			Geographic connection to place	*Spirit of place*
3	**Fluid form**	*Right-angle-resistant tectonic form mirrors naturally occurring curvature.*	*Natural Shapes and Forms*	*Non-visual connection to nature*
4	**Variety of living**	*In and around form offers various opportunities for wandering, sitting and other activities.*	*prospect, refuge, mystery, complexity, affordance, and restoration*	*Non-visual connection to nature*


Non-Visual Connection to Nature


Visual Connection to Nature


Spirit of Place


Patient Specificity

1 of 2 High Dependency Unit

Development

The master plan includes two units, both of which are mirror images of each other.

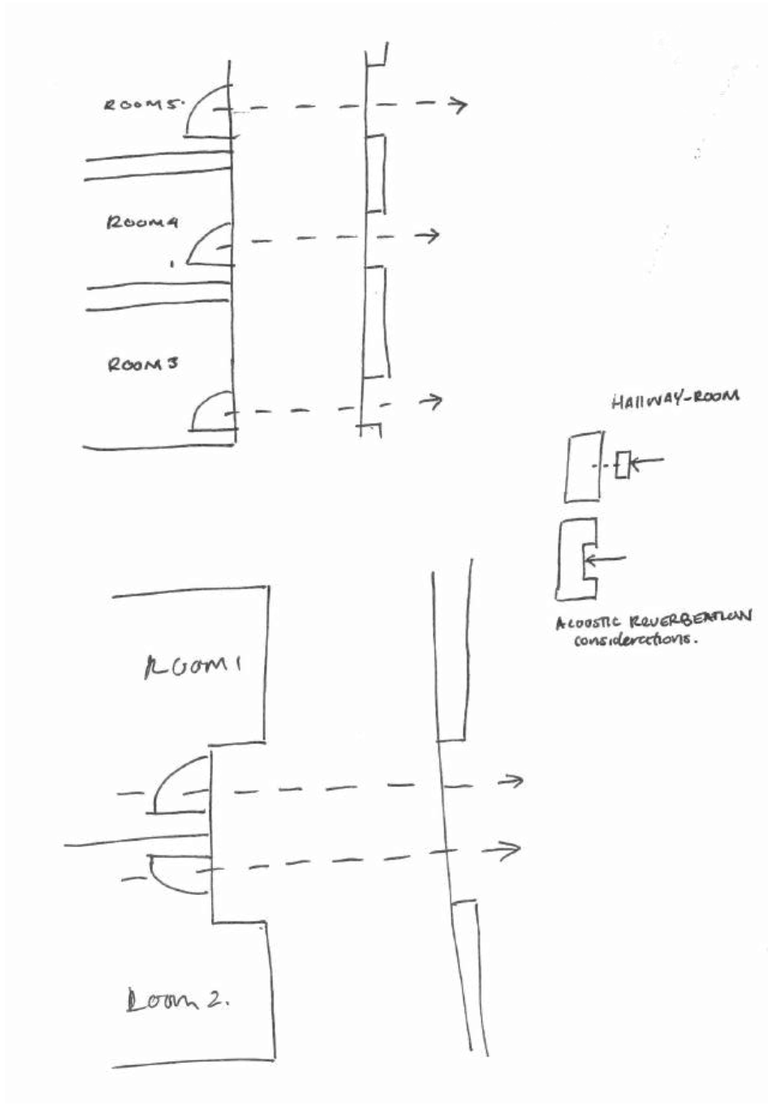


Figure 117.High dependency unit development sketch

Figure 118.High dependency unit plan

1 of 2 High Dependency Unit Plan
Scale 1:250

ID	Program	Qty
1	Underground access to Emergency entrance/exit	1
2	Internal entrance from main entry	1
3	Side Lounge	2
4	Reading nook	2
5	Main communal lounge	1
6	Internal Gardens	3
7	Communal bathrooms	2
8	Resident bedrooms	8
9	Resident ensuite	8
10	Nurse station	2
11	Emergency elevator leading to emergency entrance/exit	2
12	Internal access via sky bridge to the second high dependency unit	1
13	Main entrance	1
14	Resident hub	1

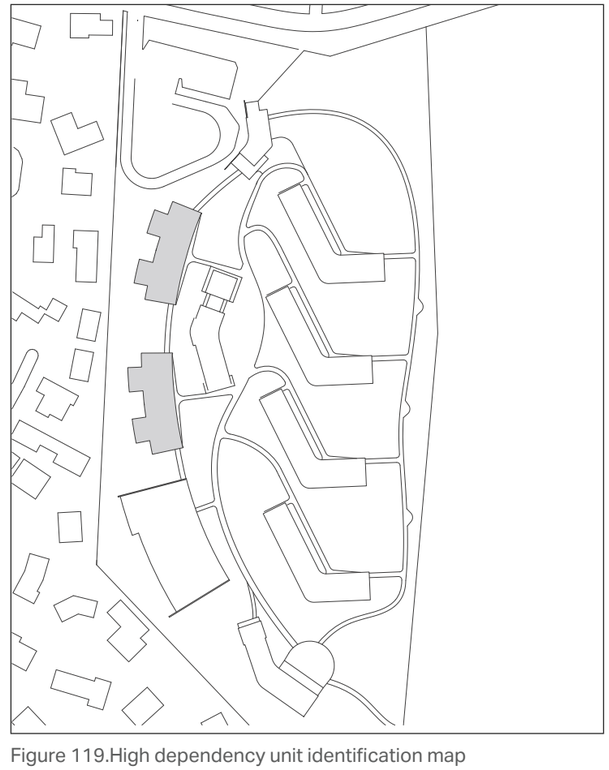


Figure 119.High dependency unit identification map

Table 17.High dependency unit key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Oriented for sunset**	*Form is positioned on site to purposely interact with sunset in the evening to reinforce circadian rhythms (as explored in experiment 6)*	*Natural lighting*	*Patient specific*
2	**Views of nature**	*Densely planted trees, including deciduous species, line the western site boundary. This provides views of nature from the patient room, indicating seasonal changes (as per Experiment 6). This strategic planting also protects the greater master plan from prominent winds*	*Elements of nature*	*Visual connection to nature*
			Passive design	*Built performance*
3	**Scaled clusters**	*Each unit features two groups of four resident rooms, creating intimate living clusters.*	*Human scale*	*Patient specific*
4	**Variability and privacy**	*Staggering of rooms allows for patient privacy from both internal hallways and exterior views. This strategy also aids in auditory reverberation effects.*	*Size and density*	*Patient specific*

Visual Connection to Nature

Built Performance

Patient Specificity

Recreation Centre

Development

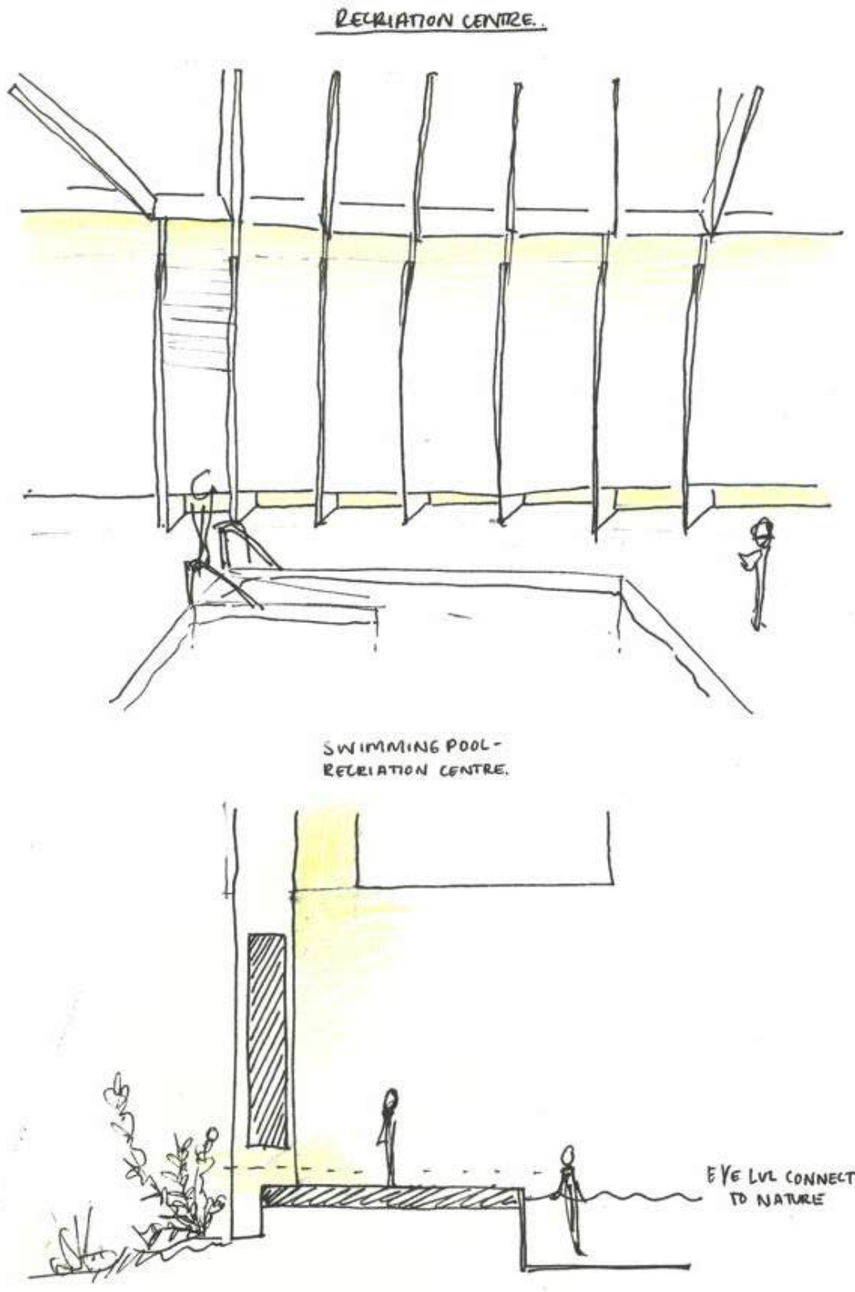


Figure 120.Recreation centre development sketch

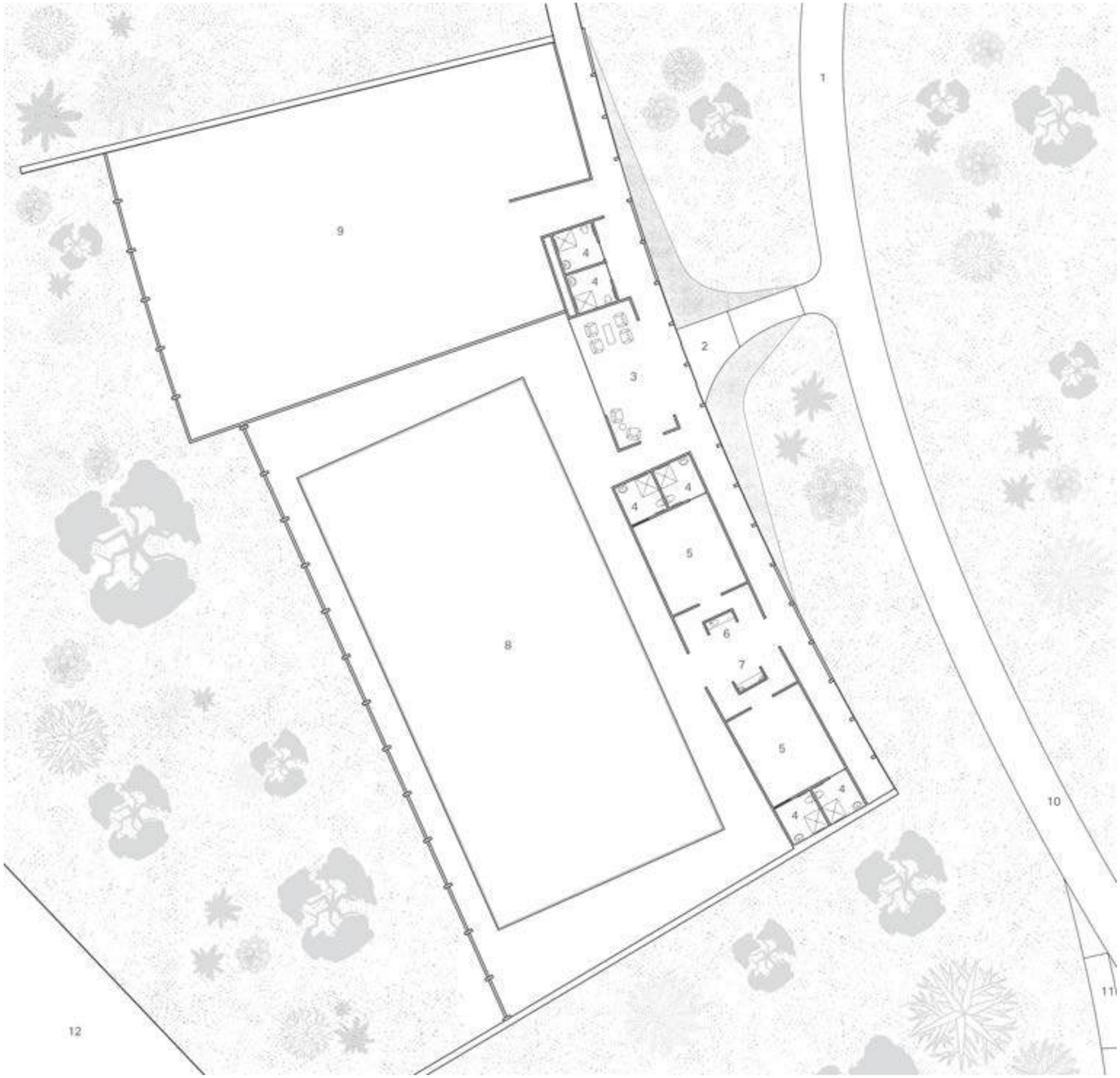


Figure 121.Recreation centre plan

Recreation Centre Plan
Scale 1:200

ID	Program	Qty
1	Access to northern part of the master plan	1
2	Main entrance	1
3	Entrance lounge	1
4	Accessible bathroom	6
5	Changing room	2
6	Water bottle top-up station	1
7	Waiting seating area	1
8	Swimming pool	1
9	Gymnasium	1
10	Access to southern parts of the master plan	1
11	Access to the community centre	1
12	Site boundary	1

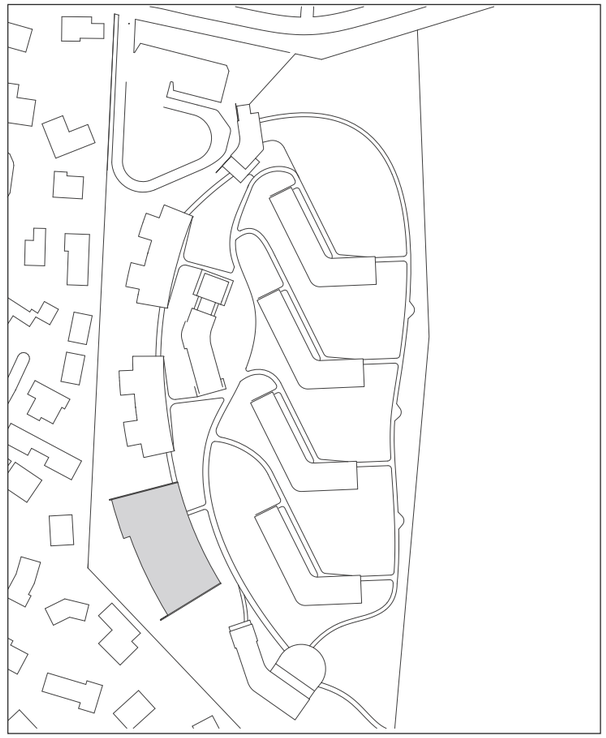


Figure 122.Recreation centre identification map

Table 18.Recreation centre key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Community ccessible**	*Facility available for community use.*	*Community links*	*Patient specific*
2	**View shafts**	*User view shafts are considered, specifically eye level, when using the pool, allowing a consistent visual connection to the exterior.*	*Elements of nature*	*Visual connection to nature*
3	**Natural materials**	*User view shafts are considered, specifically eye level, when using the pool, allowing a consistent visual connection to the exterior.*	*Material connection to nature*	*Visual connection to nature*
4	**Light**	*Natural defused lighting strategy as explored in experiment 6*	*Lighting*	*Built performance*
			Elements of nature	*Visual connection to nature*
5	**Natural ventilation**	*Natural ventilation of the cool and hot air through a series of varied height openings.*	*Natural ventilation*	*Built performance*

Visual Connection to Nature

Built Performance

Patient Specificity

Community Hub

Development

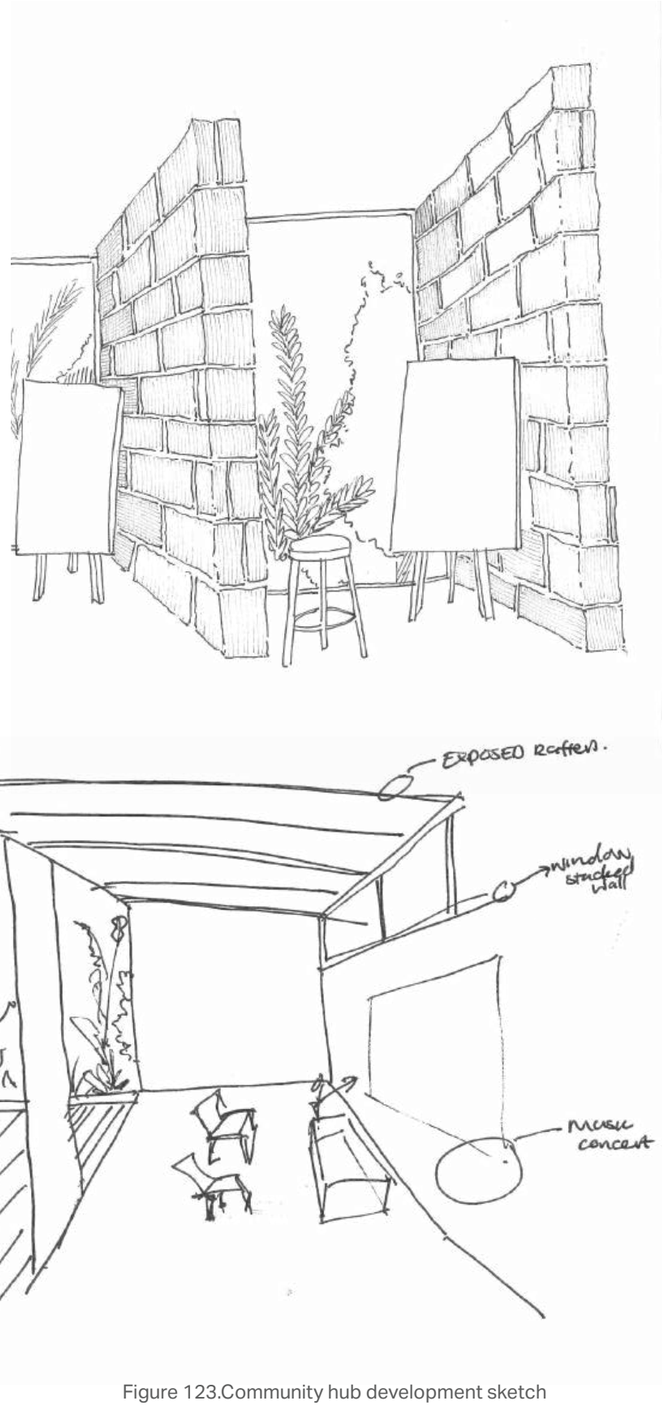


Figure 123.Community hub development sketch

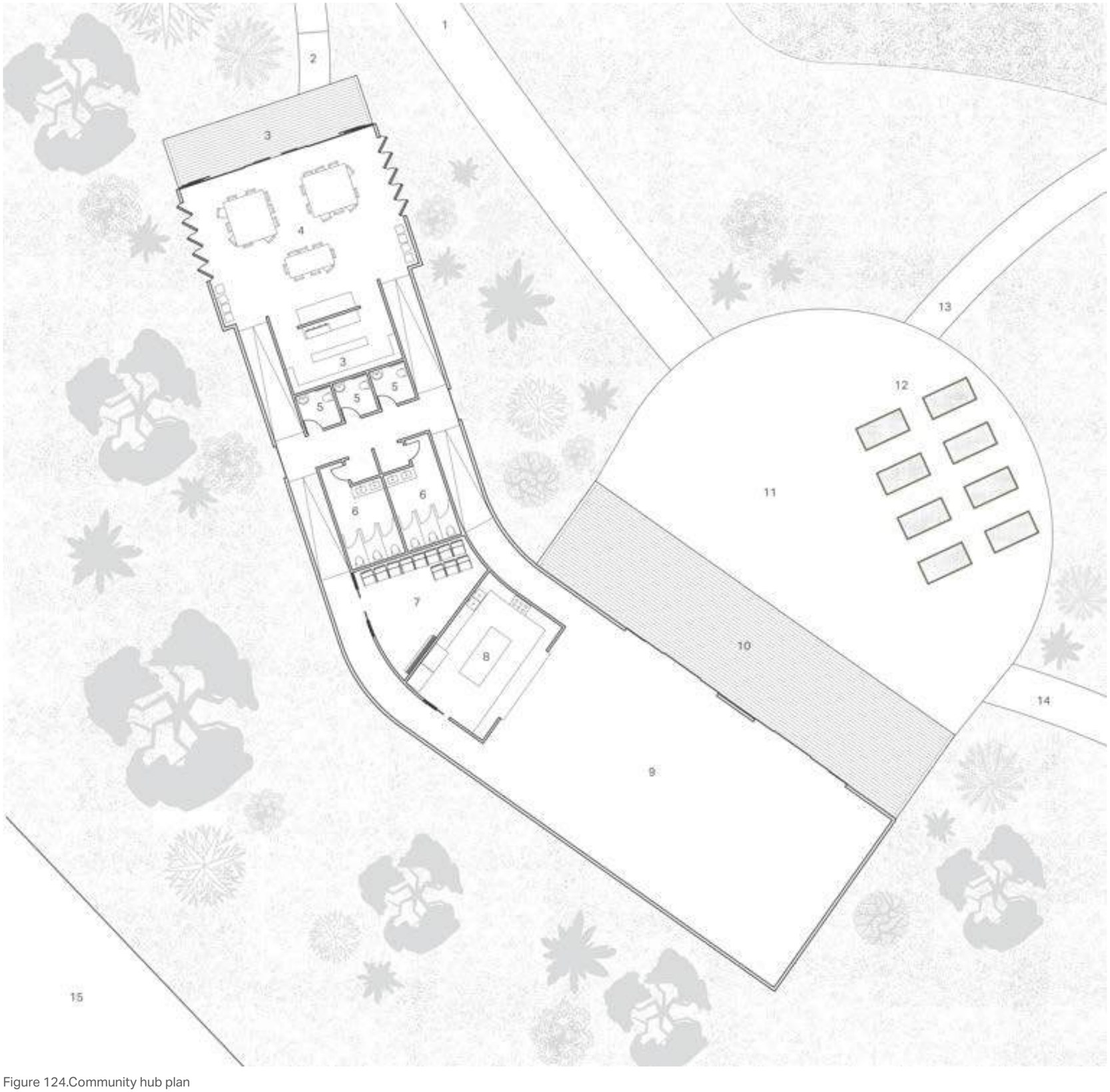


Figure 124.Community hub plan

Community Hub Plan
Scale 1:200

ID	Program	Qty
1	Main Masterplan entry pathway	1
2	Art studio pathway entrance	1
3	Art studio deck	1
4	Studio storage and supply room	1
5	Accessible Toilets	3
6	Public Toilets	6
7	Hall storage room	1
8	Community Kitchen	1
9	Mixed-use community Hall	1
10	Exterior community deck	1
11	Courtyard	1
12	Community vegetable gardens	1
13	Low-dependency unit access path	1
14	Community entrance	1
15	Site boundary	1

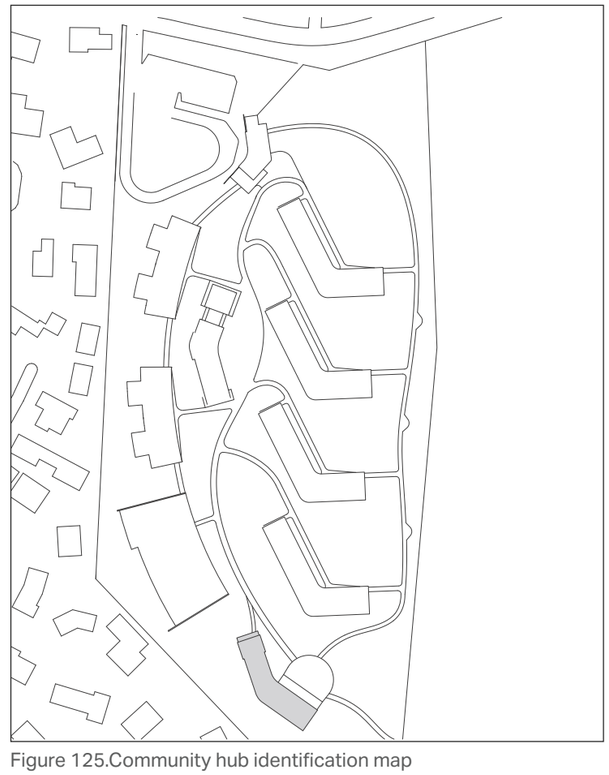


Figure 125.Community hub identification map

Table 19 .Community centre key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Community link**	*This building program welcomes the community into the facility. Aiding in social and whānau wellbeing.*	*Community link*	*Patient specific*
2	**Levels**	*This building contributes to the 'touching the ground lightly' building typology that promotes the wellbeing of a healthy taiao. As the whenua descends, the form vertically staggers in response.*	*Geographic connection to place*	*Spirit of place*
3	**Form curvature**	*Form echoes other 90-degree resistant angled tectonic forms on site. The curvature protects against strong winds while offering a welcoming entrance to users of the lower site.*	*Natural shapes and forms*	*Visual connection to nature*
			Prospect, refuge, coherence, affordance	*Non-visual connection to nature*
4	**Urban agriculture**	*Community-led vegetable gardens encourage community involvement and support cognitive therapy for dementia patients.*	*Ecology of place*	*Spirit of place*


Non-Visual Connection to Nature


Visual Connection to Nature

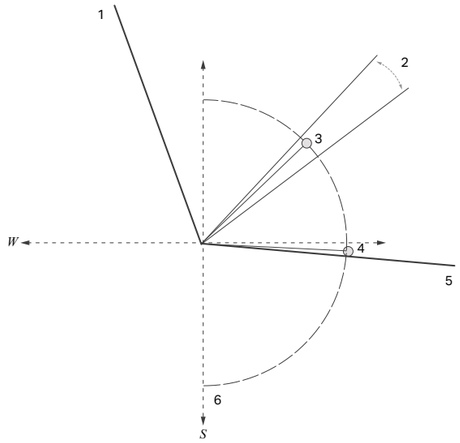

Spirit of Place


Patient Specificity

1 of 4 Low Dependency Unit

Development

The master plan comprises four units, all of which are mirror images of one another.



1	Built Y Axis - Sleeping quarters	[110º]	4	Summer Sun Azimuth	[158º]
2	Range of bedroom Orientations	[47º]	5	Built x Axsis - Communal spaces	[355º]
3	Winter Sun Azimuth	[42º]	6	Key Veiw shaft	[EAST]

Figure 126.Low dependency unit orientation diagram

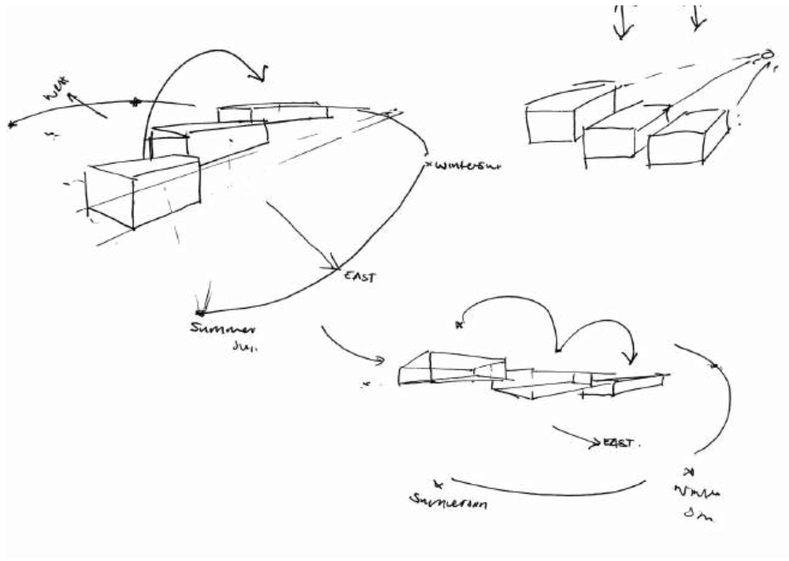
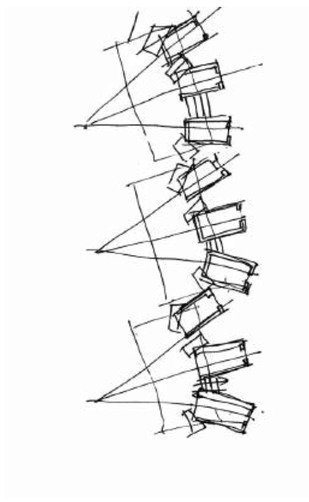
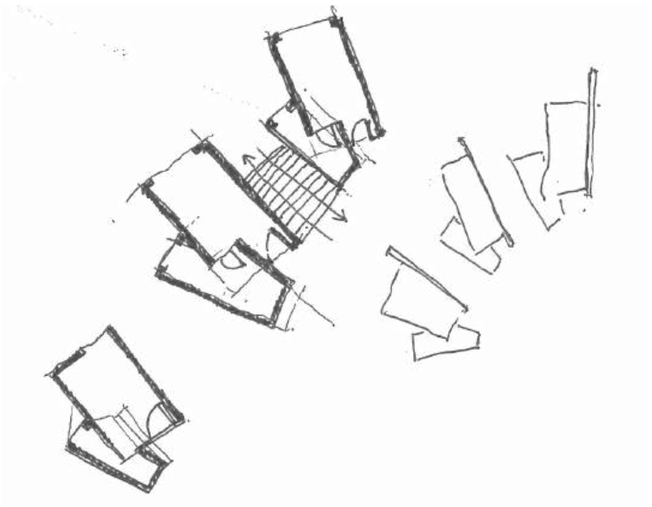


Figure 127.Low dependency unit development sketch 1





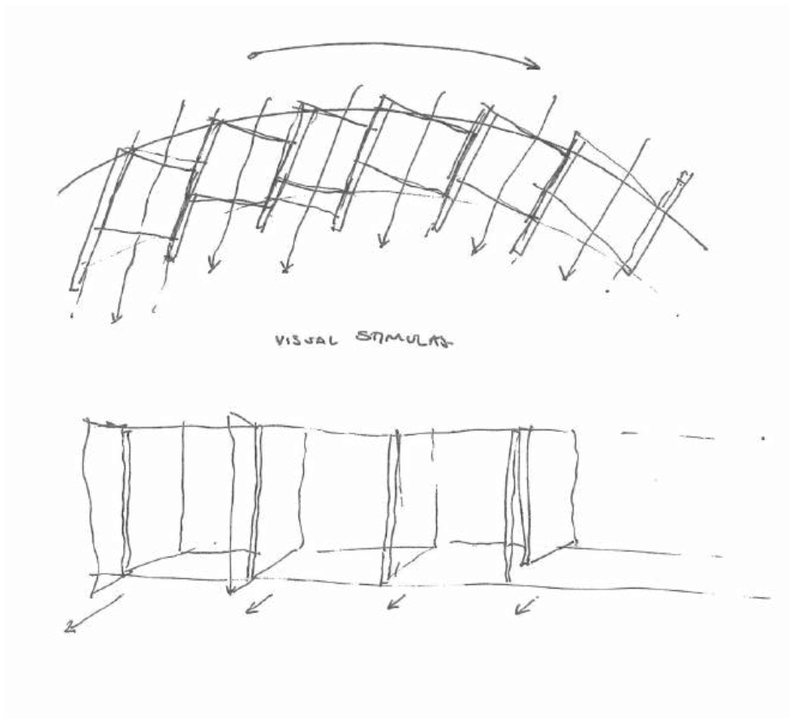


Figure 128.Low dependency unit development 2

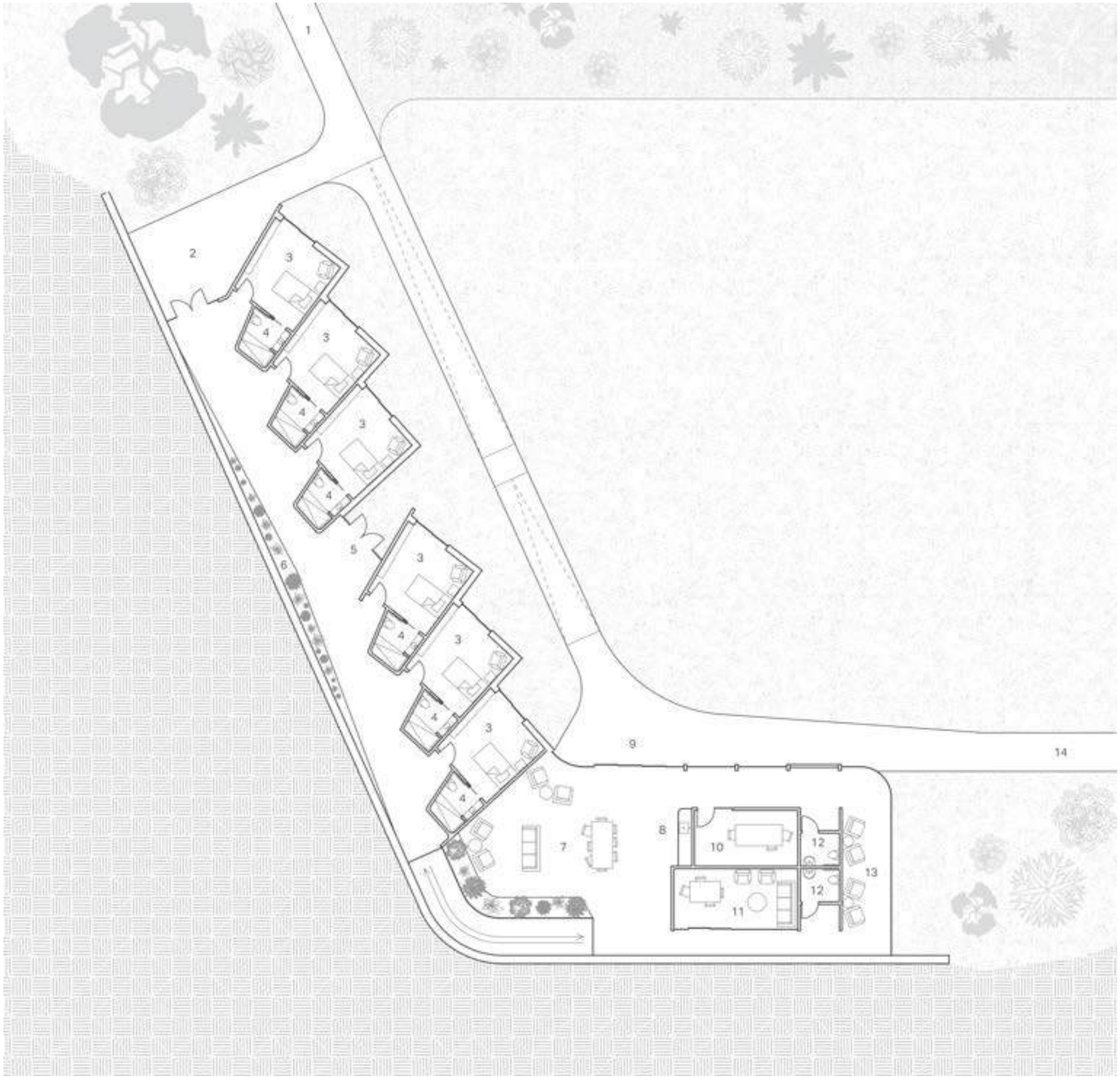


Figure 129.Low dependency unit plan

1 of 4 Low Dependency Unit Plan
Scale 1:200

ID	Program	Qty
1	Main entry pathway 'driveway'	1
2	Side entrance	1
3	Resident Bedroom	6
4	Resident Ensuite	6
5	Exterior access door	1
6	Internal garden	2
7	Communal living	1
8	Kitchenette	1
9	Main entrance	1
10	Staff interface	1
11	Private whanau room	1
12	Public toilets	2
13	Quiet living breakout space	1
14	Eastern masterplan access	1

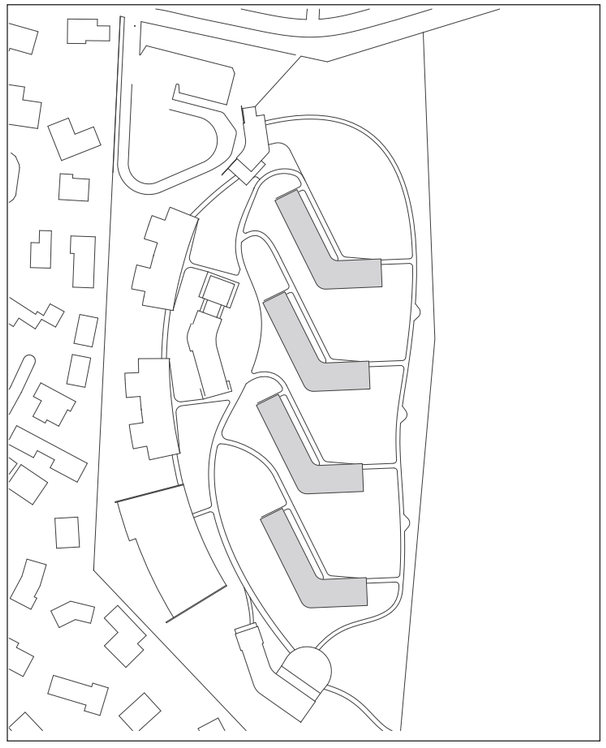


Figure 130.Low dependency unit identification map

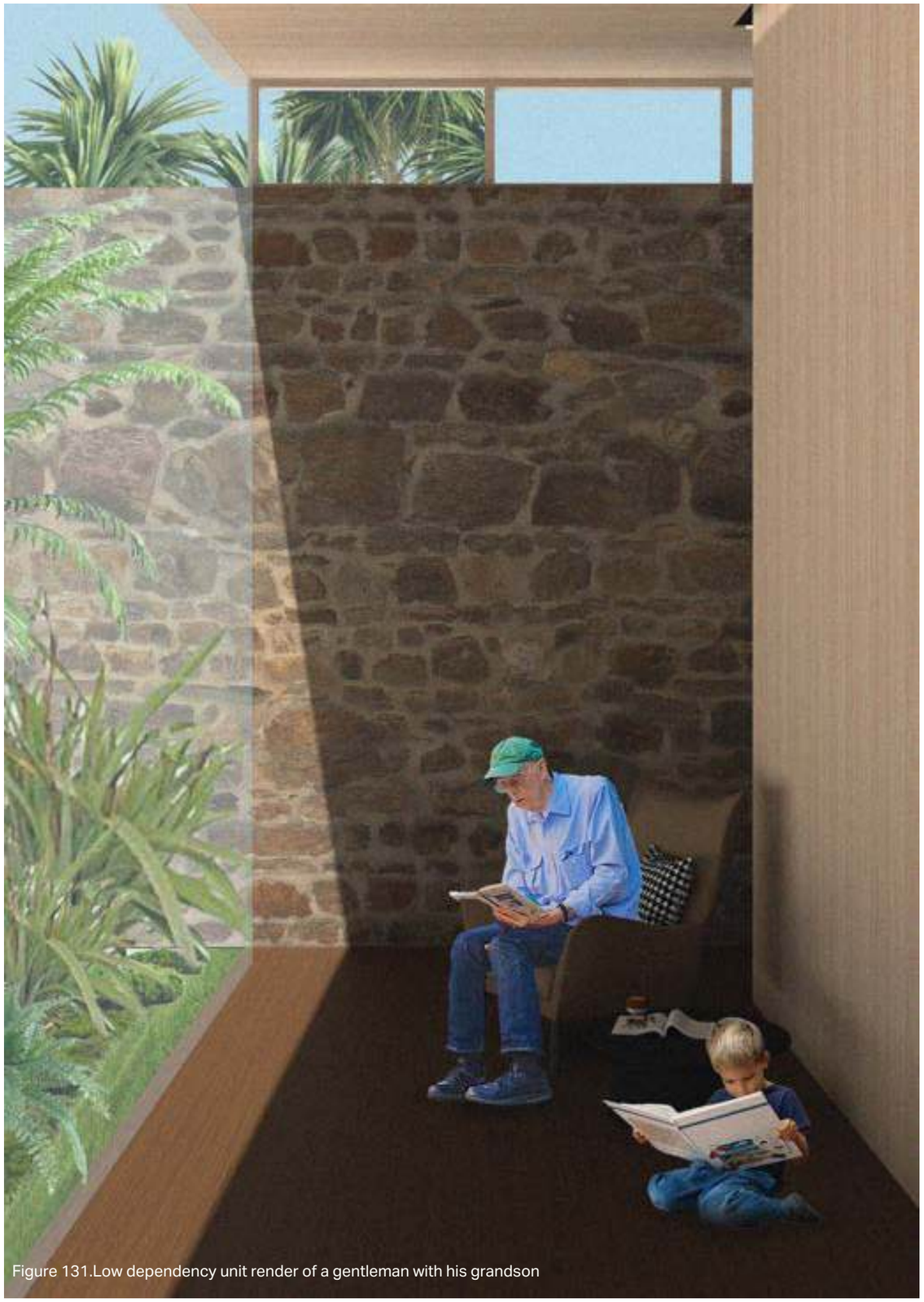


Figure 131.Low dependency unit render of a gentleman with his grandson

Figure 132.Low dependency unit hallway render

Table 20.Low dependency unit key design moves

Key Design Moves				
ID	Key Design Move	Description	Relation to the NEW Aotearoa Healthcare Framework	
			Specific consideration	Category
1	**Embedded in the Whenua**	*As this unit's program is of rest and recuperation, the form predominantly sinks into the ground, metaphorically allowing an energy transfer from the earth in times of need.*	*Geographic connection to place*	*Spirit of place*
2	**Spirit of place**	*Each unit houses six patients. Each room has a personalised entryway and exterior access/personal garden. Gaining access to the main entry requires descending the 'driveway' past residents' exterior garden spaces, which serve as a street model, aiming to foster social connection.*	*Human-scaled, personalised*	*Patient specific*
3	**Orientation**	*The entire unit is oriented on site to facilitate interactions with sunrise and sunset, as explored in Experiment 6. Bedroom angles vary, ensuring sunrise exposure in both winter and summer. The foundational western wall is stacked with a glazed top quarter, allowing sunlight to stream in during sunset.*	*Natural lighting*	*Patient specific, Build performance*
4	**Programmatic considerations**	*Floor planning retains circularity, carefully avoiding dead ends. The scale of living areas reflects the standard size of houses. For example, the inclusion of a seemingly redundant washing line or stripped-back kitchenette reinforces familiar domestic habits and experiences.*	*Home-scaled*	*Patient specific*
5	**Variability of space**	*The unit offers a multitude of different communal spaces, varying in scale and feel. This aims to give residents and their whānau the choice to occupy and utilise their space as they see fit.*	*Prospect, refuge, mystery, complexity, order, coherence, affordance, controllability, and restoration*	*Non-visual connection to nature*

Non-Visual Connection to Nature

Built Performance

Spirit of Place

Patient Specificity

Event Three

Presentation:

This presentation of design work was to both internal and external reviewers. It included an initial site introduction, a series of conceptual experiments, the NEW Aotearoa Healthcare Framework, and aspirational collages. This event introduced developing plans, perspective renders, concept supporting diagrams, an initial material palette and tectonic modelling. An image of the presentation can be found in the Appendix.

Feedback:

- *Drawings do not convey the concept as well as it is spoken about. Perhaps consider rethinking the drawings to better represent the concept.*
- *This is, in part, a landscape architecture project; the drawings need to show the building in the landscape and be more dramatic.*
- *The use of a model could also help improve the level of communication.*

Next moves:

A significant amount of effort was later invested in developing drawing lists to ensure clear communication of the concept. This mind mapping exercise can also be found in Appendix.

Low Dependency Unit
Continued Development

This next section follows the further development of the low dependency unit into a detailed design. Strategies and approaches have shifted to respond to feedback and, in an effort to provide examples of framework implementation at a detailed design scale.

Differentiating between the four units

As there are four low dependency units on site and they mirror each other, patients struggling to differentiate between them in order to recognise their own living quarters might be a potential issue. To mitigate this, four colours of identification were introduced that will be scattered in and around each unit as an aid and memory cue. These four colours are:

Orange Karaka

Green Kākāriki

Yellow Kōwhai

Blue Kahurangi

Figure 133.Low dependency unit identification collages

The presence of these colours will be dispersed throughout the surrounding gardens through planting and sculptural art. The colours will be visible from each unit's main entry and accented in detail throughout the interior, such as the kitchenette backsplash and art. Figure 134 &135 provide an example

Green Kākāriki

Figure 134.Low dependency kitchen elevation

Figure 135.Low dependency native bush

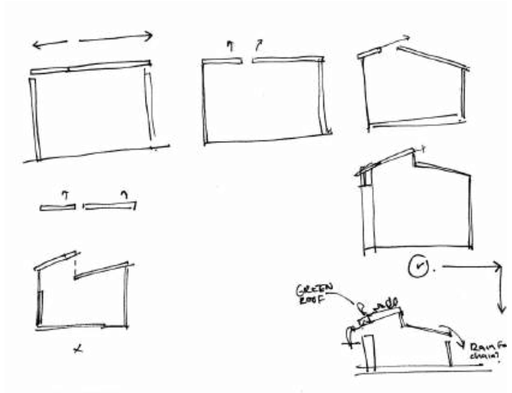


Figure 136.Roof structure parti diagram series

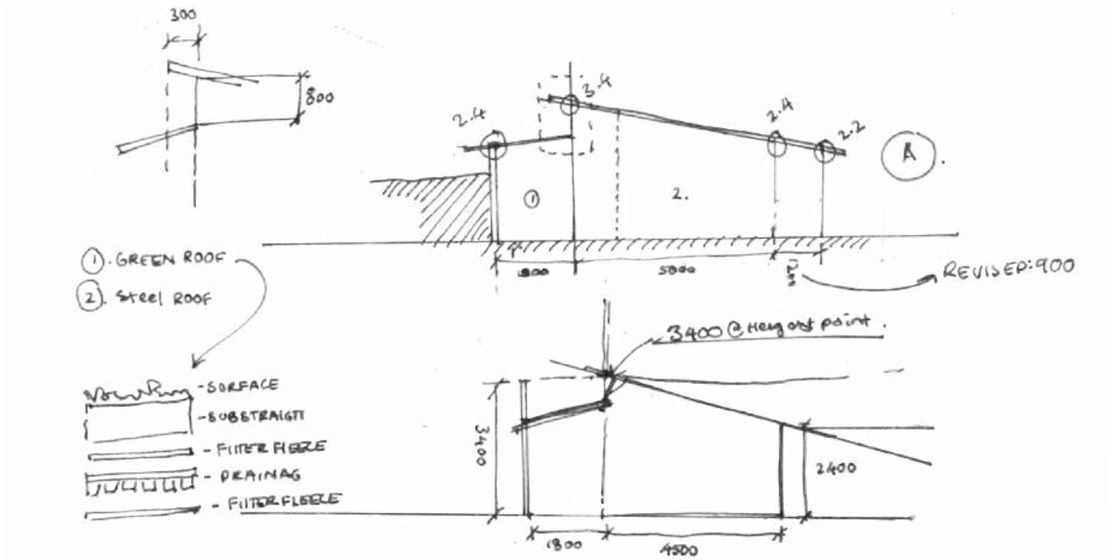


Figure 137.Roof pitch development sketches 1

Differentiating between the four units

Prompted by the need for increased lighting in the hallway and to enhance passive ventilation, a reconsideration of the roof structure was undertaken. The previous roof was mono-sloped; the newer version includes a celestial roof.

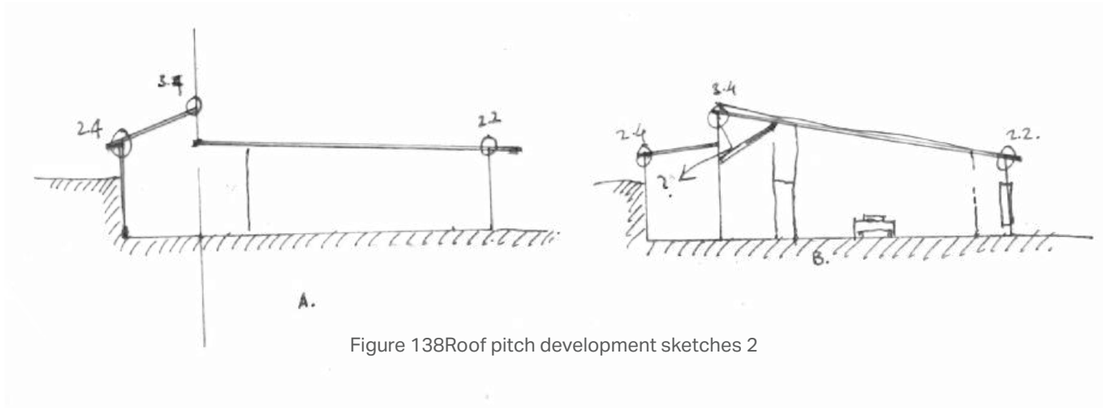


Figure 138Roof pitch development sketches 2

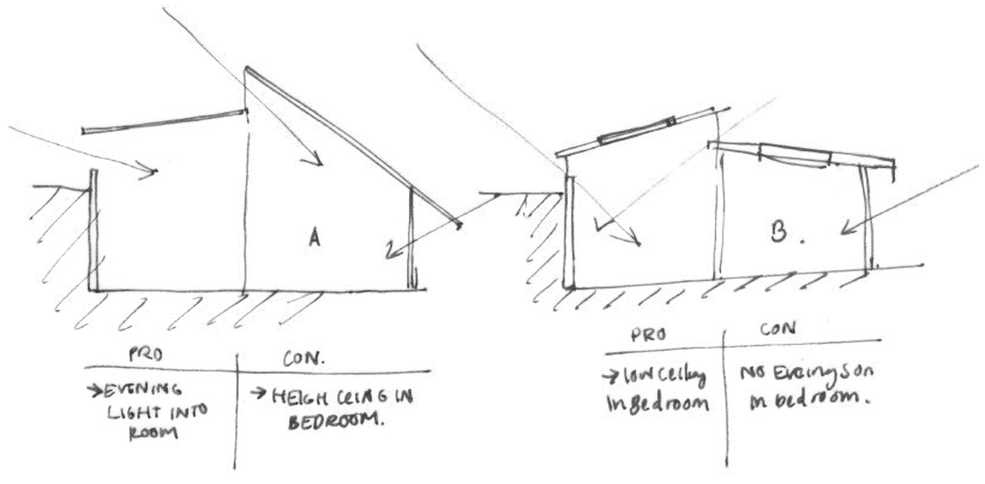


Figure 139.Roof pitch orientation comparison sketch

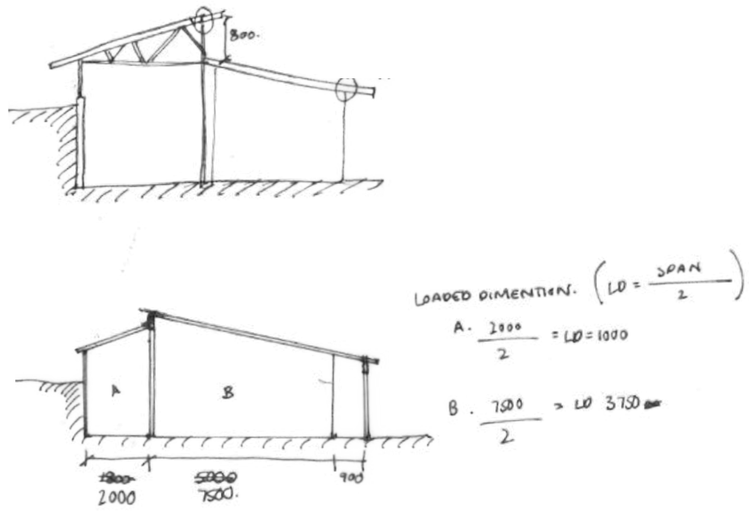


Figure 140.Roof structure construction development

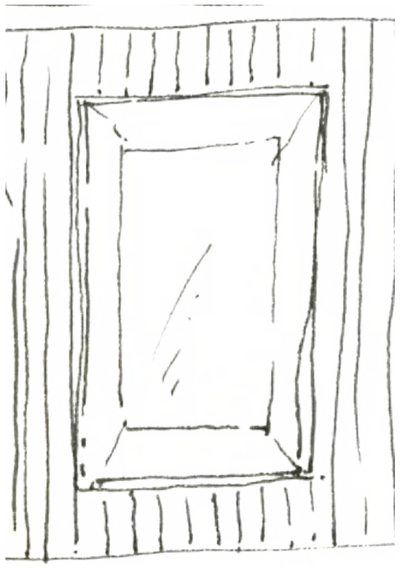


Figure 141.Window elevation sketch

The snug window

Leveraging the concept of prospect and refuge in biophilia and the variability of sitting spaces as a patient-specific feature, the inclusion of a sitting 'snug' in each bedroom (Figure 141 &143) creates a private retreat and offers added privacy from bypasses through increased window depth.

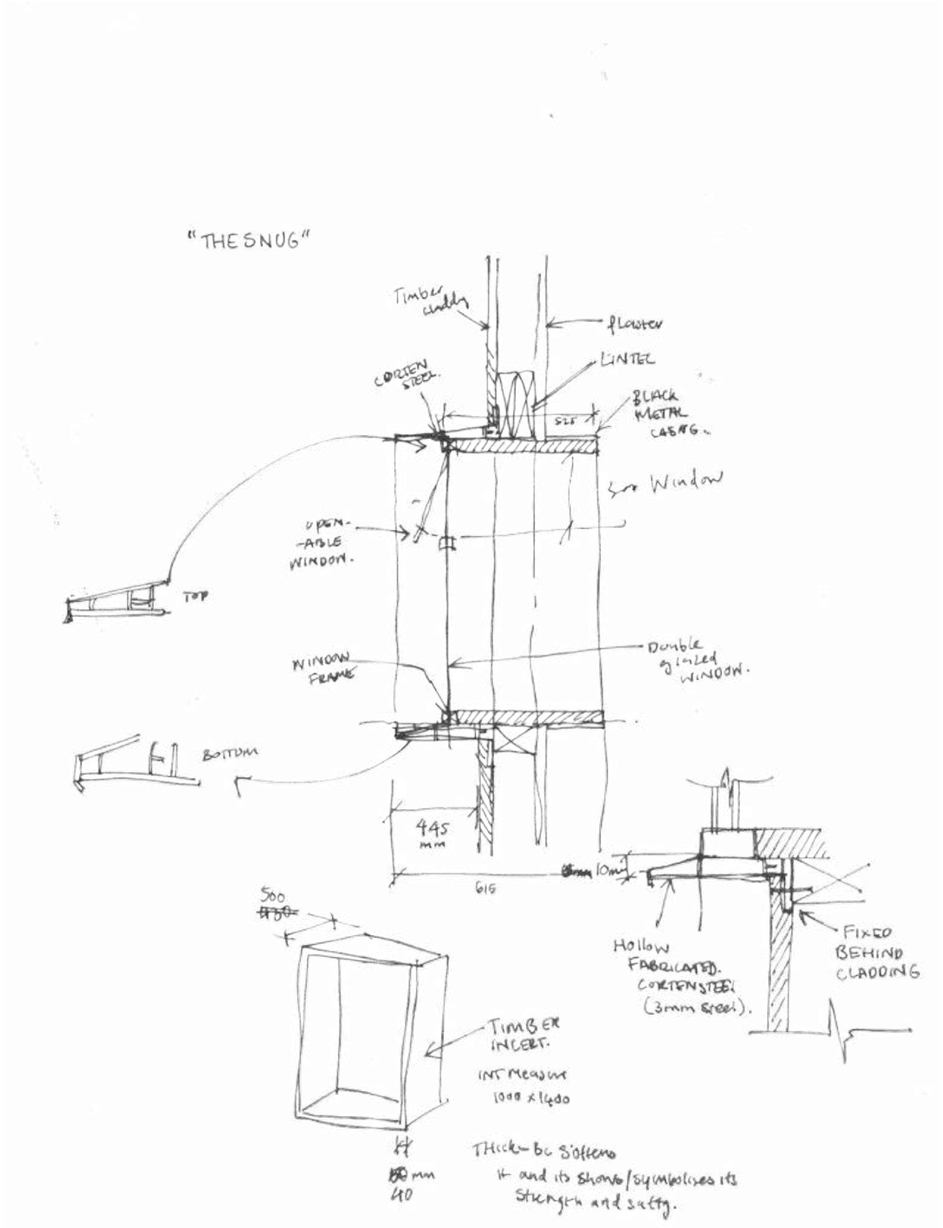
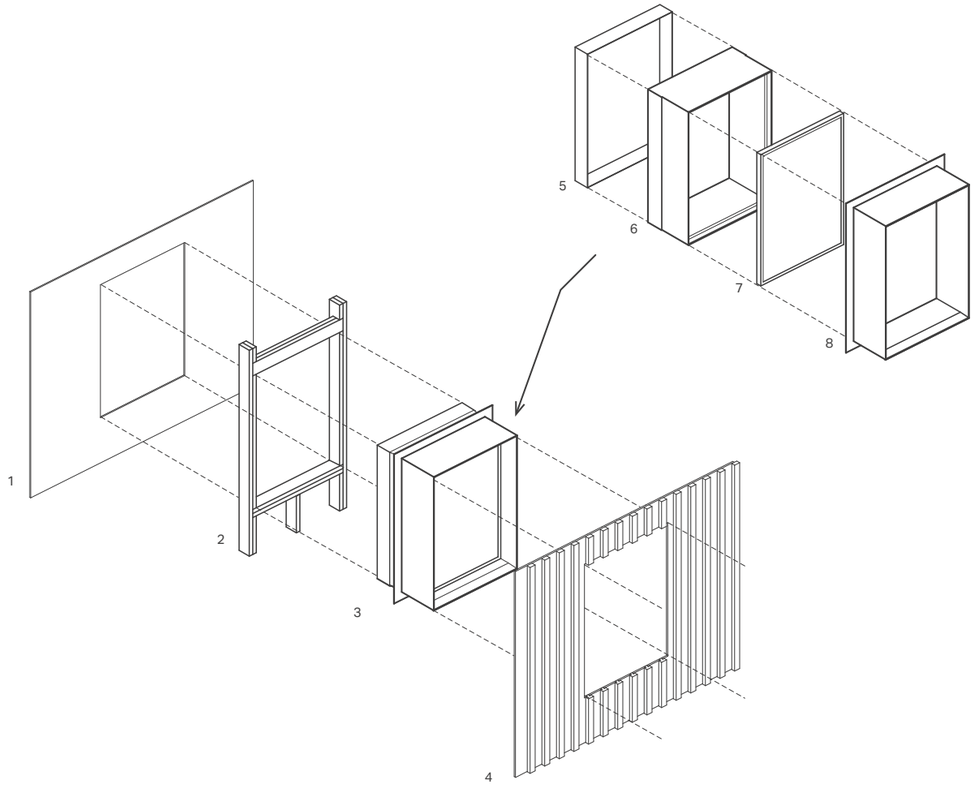
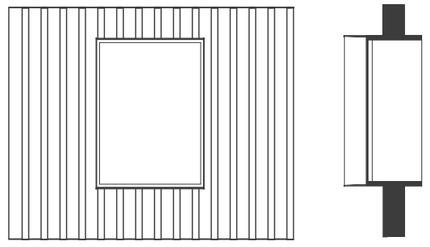


Figure 142.Window detail development

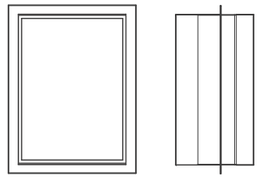
Figure 143.Window render





Window Assembly

1- Internal lining: Plasterboard
2- Timber Framing
3- 'The Snug'
4- Exterior cladding: Board and batten



'The Snug'

5- 3mm Stainless Steel Trim
6- 40mm Timber Shell
7- Aluminiom Window
8- 3mm Corten Steel Exterior Frame

Figure 144.Window construction drawings

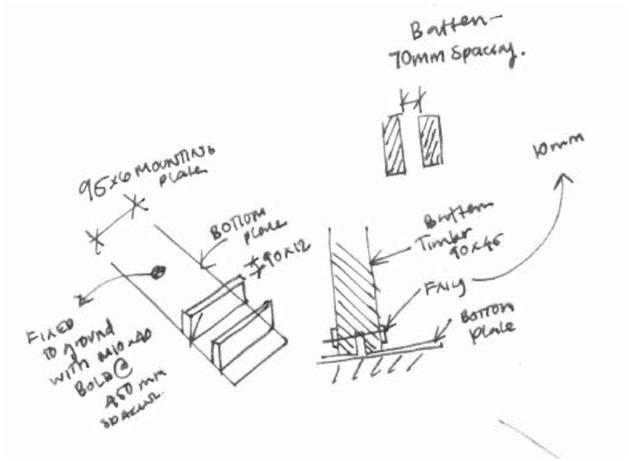


Figure 145.Reading nook detail development

The nook

Scale redesign: After reflecting on previous experiential drawings, taller ceiling heights unintentionally depersonalised designed spaces. This is especially evident in earlier Figure 131, which shows a grandfather and grandson reading together. The redesign of ceiling heights was a key consideration within the development of this reading nook.
Hallway re-design: Accessible solutions were utilised as a resource to inform the safe dimensions of ramps - D1 Access Routes (Ministry of business innovation and employment, 2004)

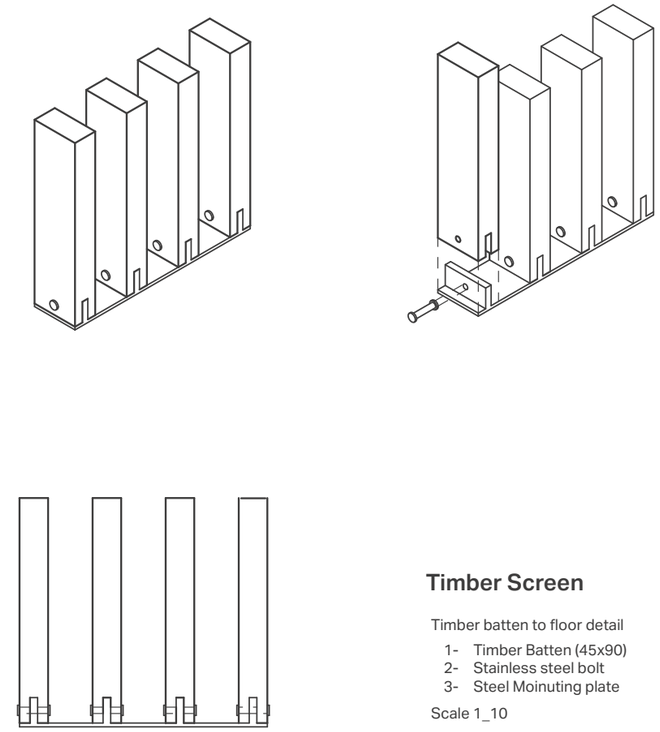
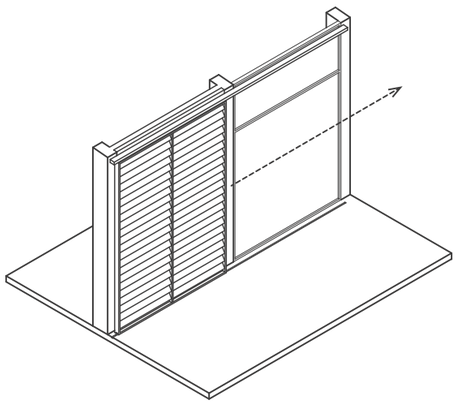
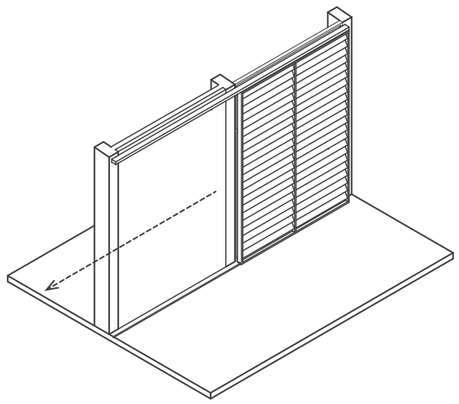
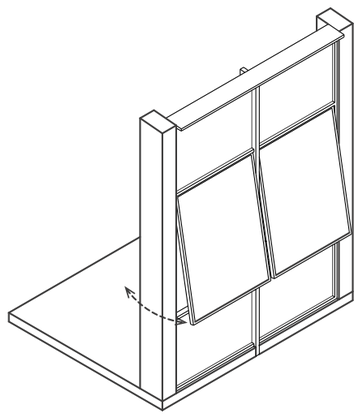


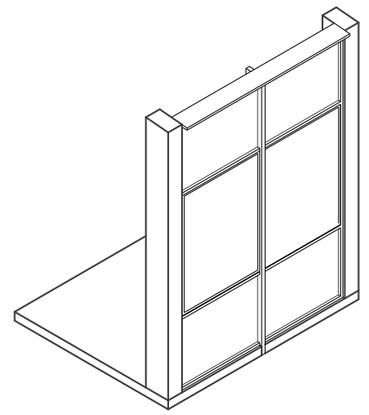
Figure 146.Reading nook detail

Figure 147.Reading nook render









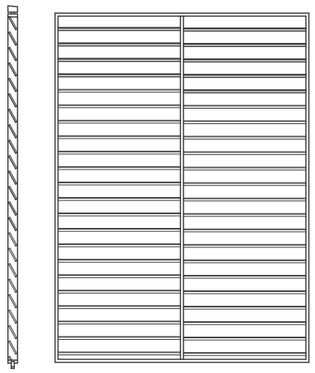


Figure 148.louvre detail drawings

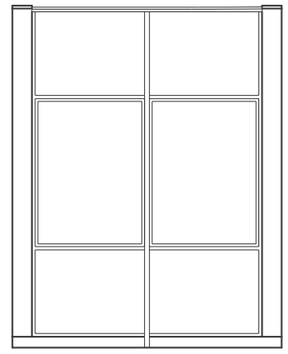


Figure 149.Window detail drawings

Openable windows & Louvres

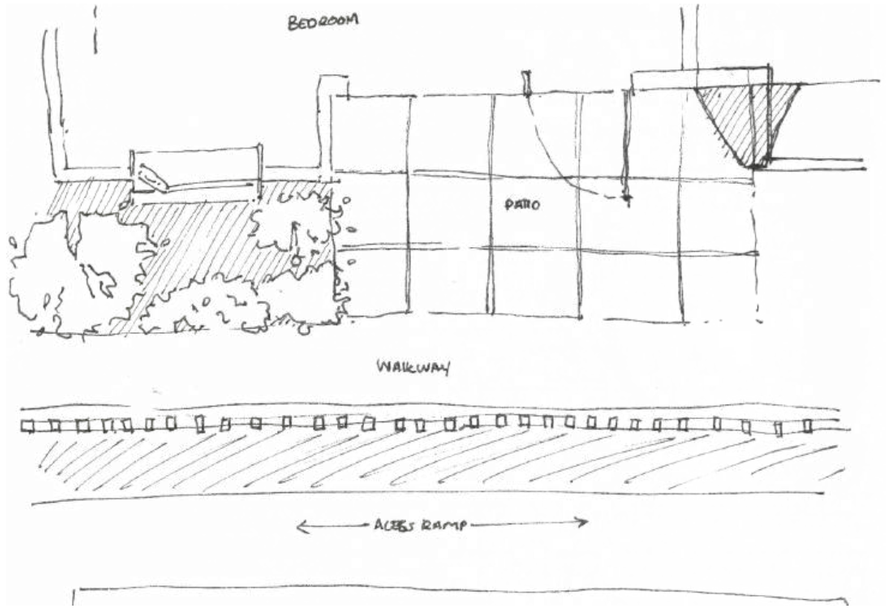
According to one concept of neuroarchitecture, part of providing comfort for building users is offering control over the physical environment. In combination with ensuring dementia patients, who at times experience paranoia, don't feel trapped, designing accessible openings, aka windows and louvres, allows them to feel in control.

Outside Bedroom

Providing personal access to outside environments has previously been recommended. The design of each room's outdoor areas offers social opportunity while maintaining privacy and personal space. Outdoor sitting areas provide a choice of seating when Whānau come to visit, and the small garden between each room enables privacy and the possibility for patients to personalise and engage in beneficial cognitive tasks, such as gardening.

Figure 150 illustrates how the bedrooms are designed to gently open up towards the natural environment and offer views of nature, as well as key view shafts.

Figure 150.Bedroom parti diagram



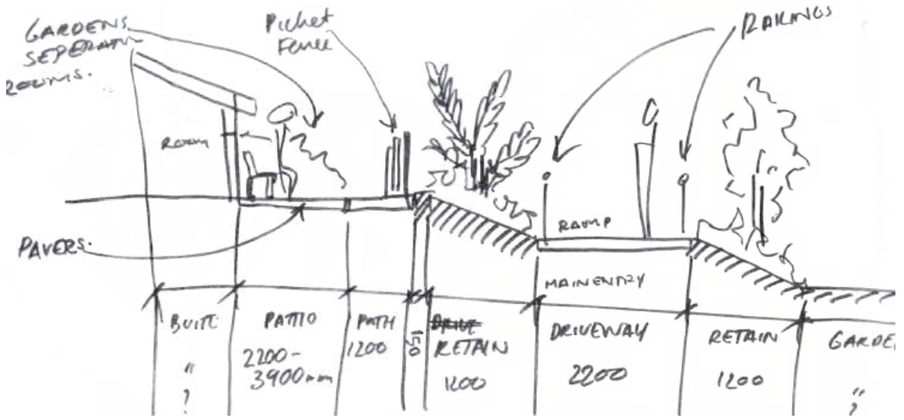


Figure 151.Bedroom Exterior development sketches

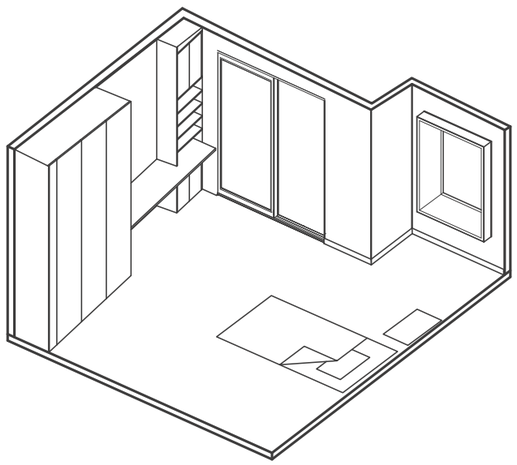


Figure 152.Bedroom isometric

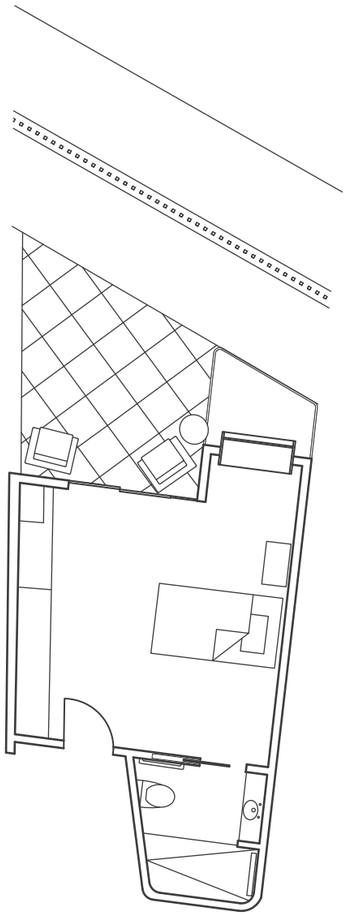


Figure 152.Bedroom plan

Figure 153.Bedroom exterior render

Event Four

Presentation:

This presentation was for internal and external reviewers. Final draft images of the low dependency unit development and master plan were presented. This was supported by earlier site and concept works. Image of final presentation can be found in the appendix.

Feedback:

- *Better oral communication would be beneficial, perhaps cue cards, etc*
- *Supporting works on a slide show, including concept development, could also be used to convince the audience of the scheme's success and depth.*
- *Its clear design strategies are sensitive and considered; however, it's not immediately obvious how they relate to biophilia and cater to dementia specifically. This might be an exercise in refining the presentation layout and the way each intervention is discussed.*
- *Once experiential drawings are complete, they will be more convincing, but reviewers also encouraged being more playful.*

Reflection:

Many questions with event four could have been answered through having the exploded presentation of the NEW Aotearoa healthcare design framework. This will be considered for the final oral examination.

Figure 154.Low dependency plan

Low dependency plan

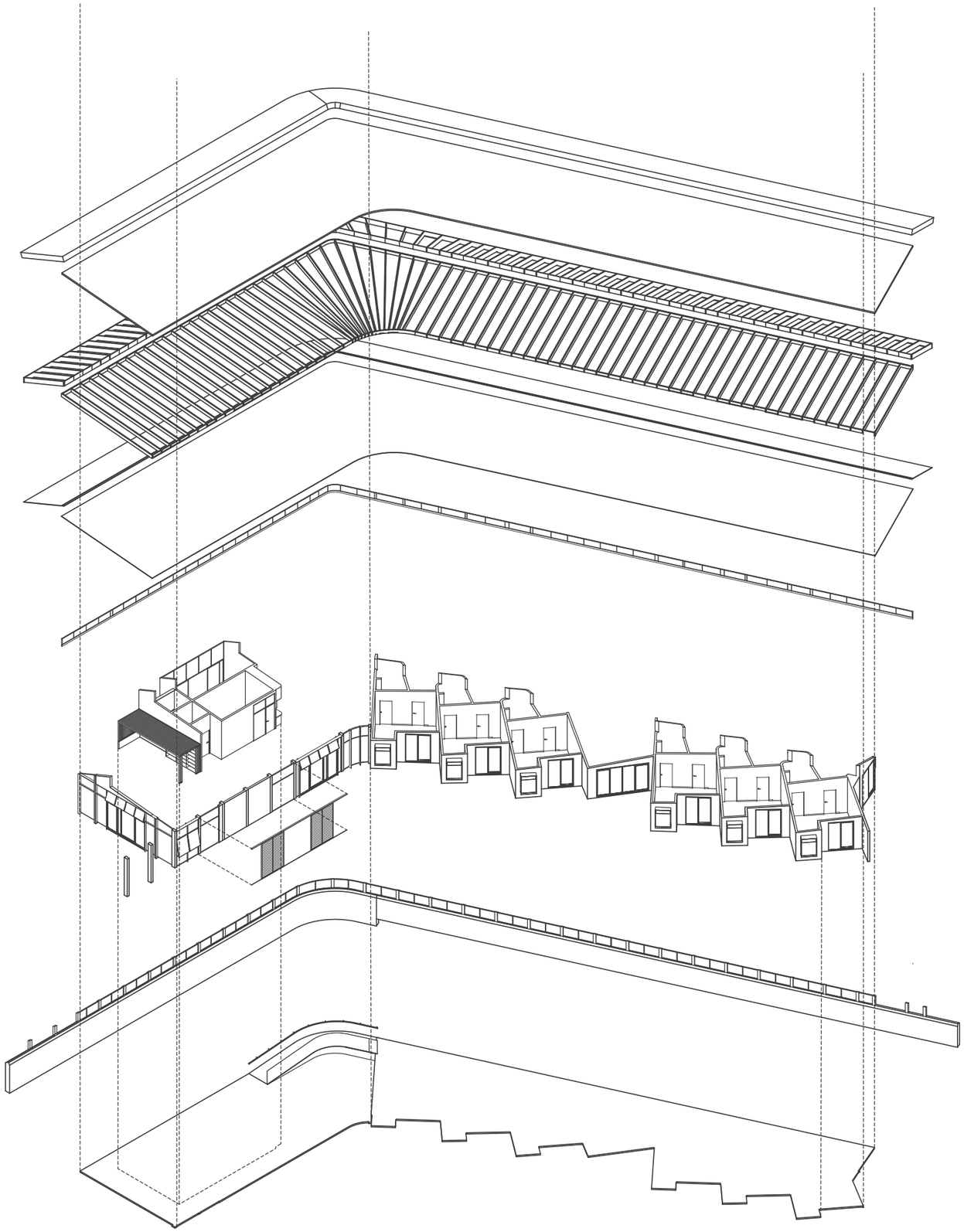


Figure 155.Low-dependency unit isometric

Figure 156.Low dependency unit entry pathway render

Figure 157.Low dependency unit kitchenette render

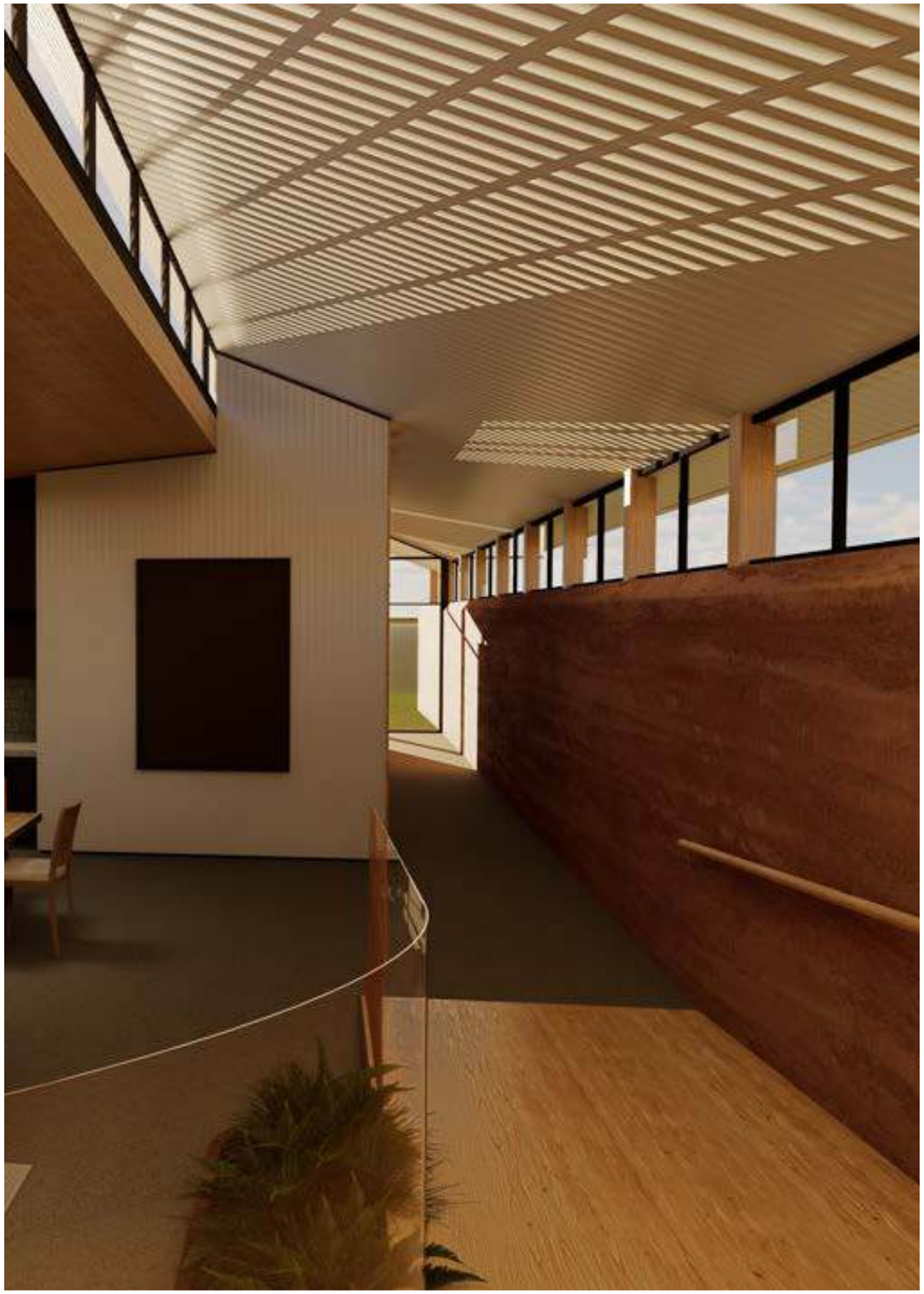


Figure 158.Low dependency unit entry to communal space render

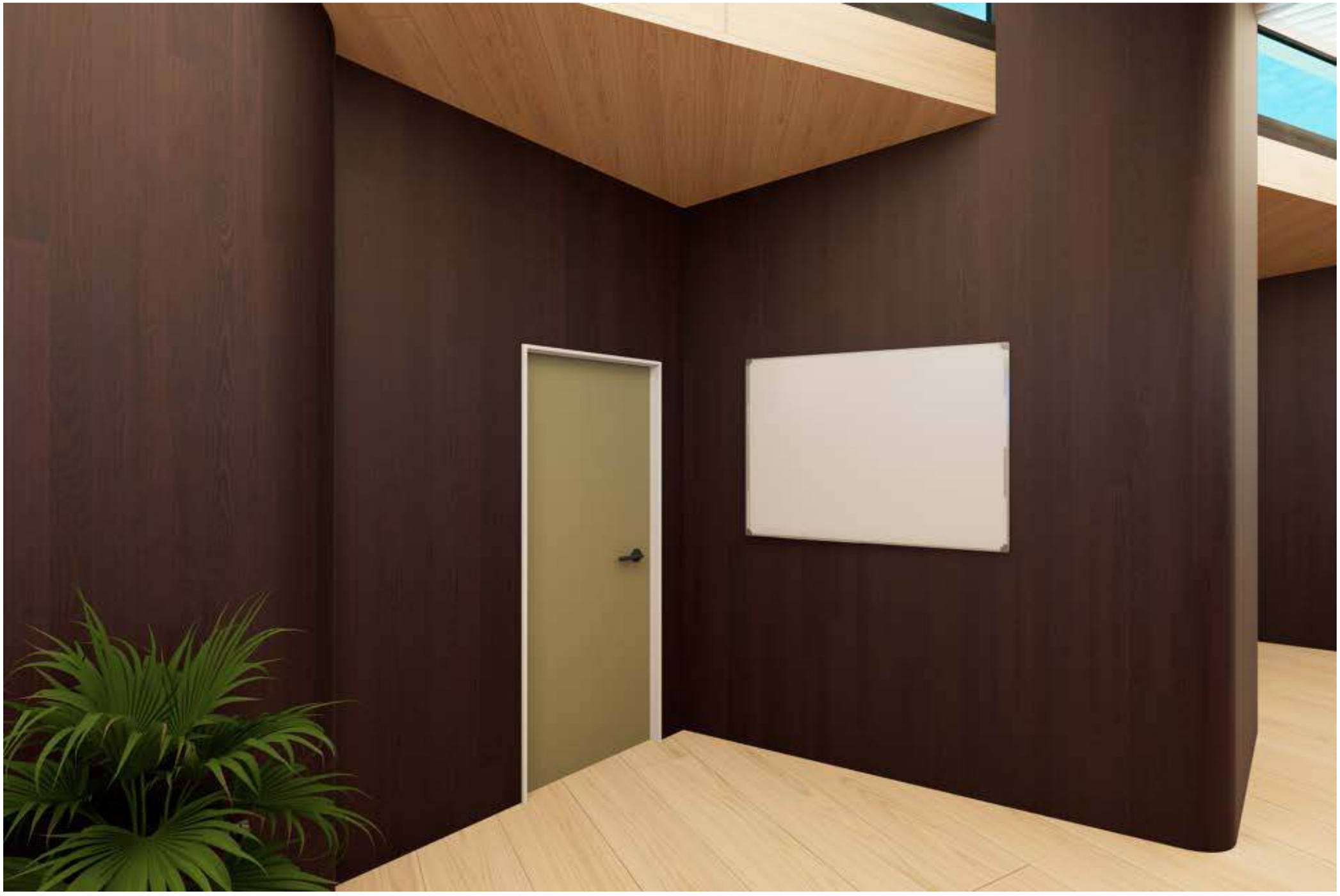


Figure 159.Low dependency unit bedroom entry

Design Analysis

Table 21.Design Analysis

NEW Aotearoa healthcare design framework	Score	Example and evidence	Future consideration
Spirit of Place	●●●○○	*Embedded in the ground, orientation to key view shafts, Prioritisation of nature species*	*Continued consideration through more in-depth, detailed design.*
Non-Visual Connection to Nature	●●●●○	*Variability in space, considered circulation patterns, resistance of 90-degree angles, light as shape and from, consideration of environmental psychology concepts*	*Continued consideration through more in-depth, detailed design.*
Visual Connection to Nature	●●●●○	*Considered views of Nature, plants, relationship with natural light, direct access to nature. Natural materials*	*Further development into non-toxic, renewable and recyclable materials*
Built Performance	●●○○○	*The integration of built performance considerations, particularly at the architectural scale through the roof and ventilation systems, is convincing. However, these aspects are less thoroughly addressed at the detailed design scale.*	*Continued consideration through more in-depth, detailed design.*
Patient Specificity	●●●●○	*Spatial planning, personalisation, variability of space, human scale, outdoors with opportunities, size and density, memory cues, and the successful use of light.*	*Continued consideration of previously established micro interventions associated with dementia specificity.*

Chapter Ten: Results, Discussion, Reflection

Introduction

This chapter critically reflects upon and discusses the design exploration in relation to the aims, objectives, and research questions.

Analysis and Discussion

This thesis aimed to explore how biophilic design principles can be integrated into hospital design to promote wellbeing and effective healing for New Zealanders. This was tested through the design of a dementia-specialised facility.

An initial literature review set the foundations for an exploration of biophilia, neuroarchitecture, stress-reducing architecture, and wellbeing in the context of Aotearoa. The review also clarified foundational knowledge structures that informed the NEW Aotearoa healthcare design framework, proving to be a pivotal tool when implemented across a range of architectural scales throughout design phases. The NEW Aotearoa healthcare framework is a core strength of this thesis.

Not only does it encapsulate key biophilic principles, but it also brings an Aotearoa specificity through the influence of holistic indigenous Māori wellbeing models. The framework aligns with Aotearoa's future health aspirations, characterised by the relationship it has to the New Zealand Health Facility Design Guide and Health strategy. The adaptability of this framework lies in the patient-specific section, which enables it to be adopted across various hospital settings. It also proved to be a functional tool for assessing and reflecting on key design decisions.

Key Hypotheses and Findings:

The following section outlines key findings that emerged from the design process, demonstrating the merit of incorporating biophilic approaches into dementia hospital settings to enhance healing and wellbeing.

Key Finding 1: Fractals are useful as a wayfinding strategy for dementia patients:

Fractals were investigated as a wayfinding strategy in experiment 6, through the creation of leaf prints. The rationale was that if humans inherently recognise fractals as naturally occurring patterns, and wayfinding is a key issue among patients with dementia, would a circulation pattern inspired by fractals make wayfinding more intuitive for patients? This was tested during the design process in the master planning stages and seems to have merit from a desinerly point of view. This key finding warrants further quantitative testing to ascertain if it is a valuable and legitimate approach to address wayfinding difficulties among patients with dementia.

Key finding 2: Consideration of circadian rhythm can drive design:

Research into dementia and the associated 'sundown phenomenon' has suggested a correlation between this condition and disruptions to humans' circadian rhythms. Based on this, the hypothesis was that a designed environment that actively reinforces circadian rhythms could help mitigate the sundown phenomenon in patients with dementia, thereby supporting improved wellbeing and quality of life. This was assessed in the planting schedule of the greater master plan, with the addition of deciduous trees to signify seasonal changes and the orientation of rest and recuperation programs (in the low- and high-dependency units) towards sunrise and sunset. Strategically angled bedrooms ensured that each room had direct interaction with the sunrise/sunset and therefore supported natural body rhythms. This strategy provides an example of how patient specificity can be related to biophilia and foster a considered and purposeful contribution to patient wellbeing. This appeared to be a successful design strategy.

Key finding 3: Human scale is important in design for biophilia:

The iterative development process of the low-dependency unit underscored the importance of engaging both human and natural scales. This finding aligned with existing literature on neuroarchitecture, which emphasises the roles of stimulation, coherence, affordance, control, and restoration, as well as the biophilic 'nature of space' qualities—prospect, refuge, mystery, and risk or peril. Design moves such as village model master planning, orientation in relation to view shafts, human-scale qualities like washing line and 'home-scaled' living areas, ceiling heights, variability in breakout areas (the snug, the reading nook), circularity of floor planning, bedroom arrangements, and associated opportunities (personal entrance way and small garden), encouraging residents' stewardship and an opportunity to personalise.

These three key findings demonstrate the importance of a design-led research process and the use of design experiments, which resulted in viable design strategies. However, to validate their effectiveness, a post-occupancy evaluation would be necessary, which falls beyond the scope of this thesis. Testing the framework among other hospital specialisations could also be explored, allowing further refinement. Overall, these findings appear to indicate helpful directions for future research.

A final avenue to explore in future research results from the recognition of a tension between the use of natural materials and Aotearoa's clinical standards. This tension is particularly evident in material selection, where requirements for infection control and hygiene intersect with programmatic and service needs for medical and technical equipment. Investigating ways to reconcile these competing demands presents a valuable opportunity for future research, with potential to inform more integrated and restorative healthcare design practices.

Chapter Eleven: Conclusion and Recommendations

Conclusion

The natural world offers refuge, sanctuary, and prosperity, while also enabling physical survival for humans. However, increasing severance from nature, sees humans spend large portions of their time indoors, with potentially unforeseen future wellbeing consequences. As a result, the upward trend of non-communicable diseases afflicts demand on an already constrained healthcare system. This research explored how biophilic design principles could be integrated into hospital design with the intention of improving wellbeing and healing in Aotearoa. The resulting NEW Aotearoa Healthcare Design Framework proved to be the most significant contribution to practice arising from this thesis. Testing the framework through a series of design experiments, using a design-led research method for dementia specialisation, answered the secondary research question: how can these biophilic principles be applied explicitly to a dementia hospital to enhance patients' holistic wellbeing and quality of life? Fractal-inspired wayfinding, synchronisation of circadian rhythms, and consideration of scale demonstrated how architecture can offer more than functional provision and improve the wellbeing and quality of life of patients through working with nature. Ultimately, this thesis substantiates architecture's contribution as a means to reconnect humans with nature and support effective wellbeing and healing in Aotearoa's healthcare.

Recommendations for Architectural Practice

In the era of modern technological advancement, the importance of reconnecting with the living world as a means of improving wellbeing is growing. Nature's capabilities and positive impacts on human wellbeing are only beginning to be fully understood and 'proven' within Western scientific frameworks of understanding. While people have intuitively known this for centuries, formal scientific validation of these effects through measurable data has only accelerated since the late twentieth century. This includes evidence of nature's impact on early childhood, learning, healing, and quality of life, emphasising the necessity for humans to rekindle their connection to it.

Architects must realise that successful biophilic design is not limited just to the presence of plants. While important, biophilic design invites deeper, meaningful integrations of all natural environments and systems. As inherent creatives, architects possess the ability to explore how the built and natural environments interact, and how nature can restore and support modern-day lives (and perhaps vice versa). The contribution of this thesis is to help illuminate the value and possibility of this. My final reflection is an invitation to built environment professionals to remain curious, think boldly, and design with imagination and care in the field of design for wellbeing and its intersection with biophilic design.

List of Figures

All Figures are authors creation unless otherwise stated.

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Appendix Figures

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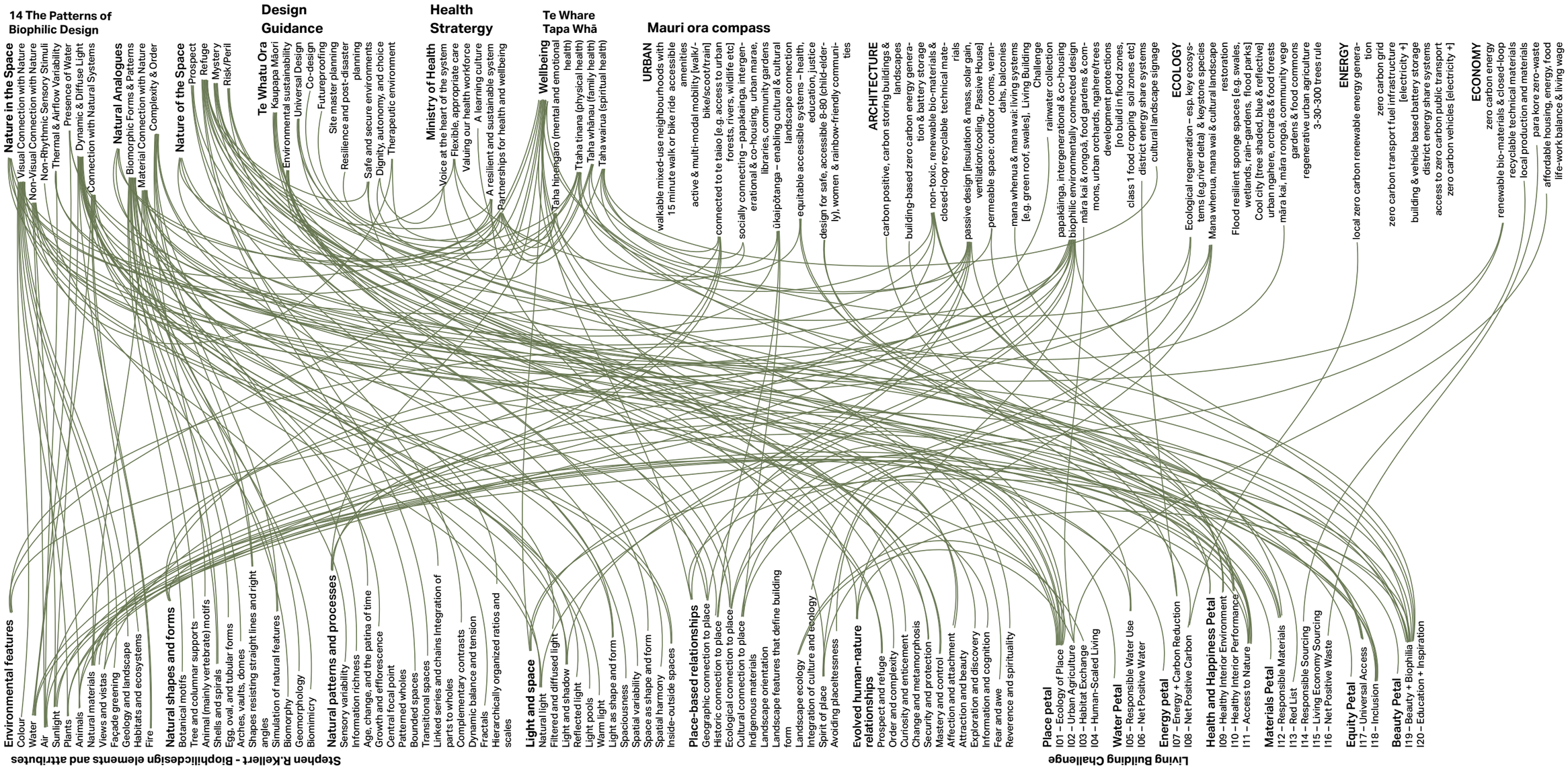
Appendix

Figure 160.Theoretical Cross-Framing process



Tāmaki Makaurau Hospital Site Visits SWOT Analysis

Franklin Memorial Hospital

Findings:

People interactions:

- *Only one passer-by observed: little to no activity inside or outside the facility.*

SWOT Analysis:

Table 22.Franklin Memorial Hospital SWOT Analysis

Strengths	Weaknesses
• *Large trees and semi-dense vegetation on the roadside provide privacy from the roadside and potential acoustic insulation.* • *Facility has a lean-to pavilion with what looks like an exterior sitting area.* • *Materials and architectural language fit in with the broader surroundings* • *Has community grounding as it was commissioned in memory of First World War veterans (NZ History, n.d.).*	• *Entrance has a typical hospital cover/ drop-off area with a cantilevered roof. – Affecting persons' pre-conceived Bias about healthcare? Infrastructure is run-down in places – signs of degradation* • *Presence of Semi-permanent structures (Generator, dentist van), suggesting infrastructure not meeting needs?* • *Excessive exterior services (Plumbing and electrical pipes) & clearly non-pre-existing* • *Limited ramps and poor wider site accessibility.* • *Limited land and landscaping around the building perimeter.*
Threats	**Opportunities**
• *Floodlights from neighbouring courts could negatively impact night-time light quality.* • *Carpark padlocked and curtains drawn – unwelcoming appearances* • *Security concerns: heavily advertised surveillance, but no visible staff presence during visit.* • *Sloped site makes accessibility and mobility infrastructure harder to implement.*	• *Predominantly surrounded by green spaces (golf course, paddocks), with potential for integration into a richer native ecosystem.* • *Neighbouring sports courts could be better integrated with the facility and residents.* • *Expansion of exterior pavilion to allow more outdoor activities*

Pukekohe Hospital

Findings:

The reception and grounds had a quaint, relaxed atmosphere, with both staff and patients friendly in conversation.

People interactions:

- *The car park was full with people searching for spaces. Reception and grounds staff were active with upkeep, while only a few patients were observed, including an older woman being picked up.*

SWOT Analysis:

Table 23.Pukekohe Hospital SWOT Analysis

Strengths	Weaknesses
• *Welcome gates created a friendly threshold and sense of arrival.* • *Fields and gardens made for a relaxed arrival between the entrance gates and the building.* • *Specialises in Geriatric and maternity, making for an interesting age contrast and relationships between patients.* • *Low-density, single-storey 'wing' layout giving most rooms a view* • *Lots of windows allow natural light and access to exterior views* • *Streetlights between the entrance gate and reception give character and enforce feelings of safety* • *Overall Atmosphere: quaint, slow pace and somewhat relaxed.*	• *Limited capacity carparking – could enforce negative/stressful feelings prior to hospital experience.* • *Interior felt dated with old, deteriorating materials.* • *Minimal natural light in reception areas* • *Waiting chairs parallel to the reception felt cramped and lacked privacy* • *Main entrance not innately obvious* • *Bare/barren garden* • *Despite a reasonably sized site, the lack of paths or garden spaces limited opportunities to walk the grounds.*
Threats	**Opportunities**
• *Facility sits on a busy, hard-to-cross road (challenging if parking off-site)* • *Limited parking capacity causes congestion*	• *Lots of space for greater garden beds. Existing ones were bare and contained minimal to no native species.* • *Located next to urban centres and amenities* • *Surrounded by green land, developed trees, and animals such as sheep.*

Middlemore Hospital

Findings:

People interactions:

- *Car park packed; many people circling for spaces. Paid parking*
- *Wide diversity of people: all ages, nationalities, socioeconomic backgrounds.*
- *Patients observed: in gowns, wheelchairs, with wristbands, or walking around reception, waiting area, café and shops (some singing/yelling).*
- *One patient repeatedly walked the waiting area with a walker, loudly breathing/yelling, raising arms at the automatic doors opened for fresh air.*
- *Patients are transported in beds through public areas, even in front of the reception.*
- *Café was busy by 10 am, and the majority of tables are full. Café staff run off their feet to keep up with demand.*
- *Seating (foam benches) 'floating' in space, left people feeling exposed/vulnerable due to constant circulation.*
- *Most people respected the colour-marked flooring for circulation and rest zones.*

SWOT Analysis:

Table 24.Middlemore Hospital SWOT Analysis

Strengths	Weaknesses
• *Large hospital offering a wide range of centralised services.* • *Nice use of native species and park bench/seating areas around the carparks.* • *Some Māori wall art is present in sitting areas.* • *Colour-marked flooring (White for movement, grey for rest)* • *Centralised public transport with local bus stops and train stations.* • *There was a public courtyard and a staff courtyard.* • *Staff bike storage* • *Most rooms looked to have their own window*	• *Stressful and overwhelming associated with crowding, noise, and high-paced movement.* • *Train station under construction – not currently fully accessible.* • *Carpark consistently full, expensive parking fees.* • *Bike storage locked – swipe card access only – potentially just for staff?* • *Interior lacked natural light* • *Waiting areas were overstimulating, with noises, directions of corridors and the number of doors* • *Cleaning cupboards were cluttered and were too small and also in direct site* • *Overwhelming smell of cleaning products* • *Buildings seem to have many extensions and have diverse architectural languages - do not feel cohesive.* • *Staff offices are on the bottom story, making interior office space visible to by passers – may cause privacy concerns?* • *With vertical construction, there is a lack of interface between ground dwellers and room users in high-rise buildings.*
Threats	**Opportunities**
• *Busy arrival: People, cars, noise – Overwhelming before entering the building.* • *Patients wandering and yelling in public areas with little reaction from staff.*	• *Train station development will make the hospital more accessible* • *Shops next to entrance* • *Outdoor benches*

Buchanan Rehabilitation Centre (BRC)

Findings:

People interactions:

- *Minimal people were observed during the visit. Some cars were driving around, attempting to park in a nearly full car park.*

SWOT Analysis:

Table 25.Buchanan Rehabilitation Centre (BRC) SWOT Analysis

Strengths	Weaknesses
• *Secluded, calm setting consistent with a rehabilitation facility's purpose* • *Green surrounds and established trees from neighbouring properties* • *Dwellings are separated into smaller units, making it feel village-like and human-scaled.* • *Buildings circle around a central green field.* • *Curved access road creates a more organic, less institutional feel.* • *Small-scale, in-house operations (e.g., washing lines) reflect self-sufficiency and homeliness.*	• *Buildings and interiors appear dated and run down (visible through windows)* • *Makeshift/unprofessional infrastructure (e.g., extractor fan pipe hanging) suggests poor maintenance* • *Parking is limited and temporary* • *Limited outdoor amenities: mostly grass with few pathways or seating options* • *Lack of native planting in the immediate surroundings* • *Located next to many busy trafficked areas*
Threats	**Opportunities**
• *Poor maintenance and makeshift fixes* • *Heavy surrounding traffic and limited parking undermine accessibility and tranquillity* • *A grass-dominated outdoor environment, feeling monotonous and underutilised without intentional landscaping.*	• *Rethinking the exterior landscaping, including native species and outdoor seating, and an intentional journey* • *Expansion of parking solutions* • *Central green field could be activated as a therapeutic outdoor communal hub*

Waitākere Hospital

Findings:

People interactions:

- *Staff were charming and approachable*
- *Volunteers selling handmade goods and providing directions created a welcoming, community-like environment; however, this was limited to the reception and café areas.*
- *Visitors made use of the café gift shop and had conversations with volunteer staff/support people.*
- *Time spent in the emergency waiting room was quiet, with some families passing through with young children. They made use of the seating area, but noticed there was not much to keep children entertained, and they turned to climbing the furniture for such.*

SWOT Analysis:

Table 26.Waitākere Hospital SWOT Analysis

Strengths	Weaknesses
• *Staff and volunteers added warmth and a communal presence in reception areas.* • *Main entrance feels welcoming with café, gift shop and volunteers' home-made gift shop* • *Drop-off bays and intuitive parking made for good accessibility* • *Well-kept gardens and use of native plants around newer buildings (especially ambulance area).* • *Natural light in the emergency waiting area included angled high windows.* • *Tidy and relatively calming emergency areas – granted, they were quiet at the time of the visit.*	• *Disconnected layout between key departments (e.g., moving between reception and ED requires walking outside in the rain)* • *Confusing circulation and maze-like interior; maps are not intuitive.* • *The layout of the master plan makes the hospital feel like a series of unintended extensions over time, lacking efficient connections between.* • *Overabundance of posters, saturated walls with mixed colours. Overwhelming rather than calming.* • *Excessive and arbitrary use of intersecting/angled architectural forms adds visual intensity and distraction.* • *The interior of both reception and waiting areas lacked connections to the natural environment despite lovely, small external gardens.*
Threats	**Opportunities**
• *Fragmented site layout and weather exposure reduce accessibility and patient/visitor comfort.* • *Patients observed being moved through main areas in beds, highlighting the dual use of public vs private and clinical space.*	• *Signage indicated the hospital was designing a new ICU; this could be a future opportunity to anticipate how it might transition to future renovations or extensions – Future planning* • *Further development of volunteer and community presence*

Auckland City Hospital

Findings:

People interactions:

- *The triage desk was well used by visiting people*
- *Desks, seating and amenities such as some books and outlets were well used by people in the waiting areas*
- *High volume of people in the entrance and waiting area felt calm due to clear circulation.*
- *Varying ceiling heights and columns create safe seating zones while guiding traffic flow.*
- *Some of the seating backed up to columns and walls – these were the most used seating*
- *Users included walkers, wheelchairs, and prams; no issues observed with their use*

SWOT Analysis:

Table 27.Auckland City Hospital SWOT Analysis

Strengths	Weaknesses
• *Entrance/waiting area is peaceful.* • *Clear directional flow, guiding visitors* • *Non-specialist triage desk before reception, guiding patients and visitors.* • *Wide and spacious corridors/walkways* • *Parking entrance is very organised* • *General environment feels busy but organised avoiding high stress* • *Main reception: naturally light, large windows, bright seating areas* • *The waiting area also has desks and appropriate power points for visitor use.* • *Use of carpet in the sitting area of the reception feels warm and welcoming* • *Signage is concise and not too much* • *There are on-site cafes that are busy and have dedicated seating.* • *Good access to public transport* • *Some timber incorporated*	• *Paid parking only* • *Lower ceilings as you initially enter feel claustrophobic* • *Lacking hierarchy of doors and hallways in areas can be overwhelming and confusing* • *Smells very clinical as soon as you walk in, especially outside the café, which could be off-putting for eating and drinking.* • *Does not seem to be much natural ventilation* • *Very bright synthetic lighting upon entrance* • *Initial entrance has limited natural light and limited visual access to the exterior* • *Plastic plants In places* • *White 2-dimensional walls, absence of texture throws scale off.* • *Arrangement of furniture isn't well thought of in relation to the space* • *Older parts of the facility do not look to be in use, yet appear to be in the closest proximity to vast natural environments.*
Threats	**Opportunities**
• *Proximity to busy traffic environments* • *Exterior overuse of the same signage, 'watch for traffic', 'do not slip'* • *Lack of natural ventilation and lighting in the entrance of the building.*	• *Close to the future train entrance and many bus stops* • *There are many other medical specialists and businesses in the neighbouring building providing centralised services.* • *Very close to the urban centre*

Medically Managed Withdrawal Service

Findings:

People interactions:

- *Many homeless people gather around (sitting on the ground and standing) the door, talking or shouting at passers-by and each other. No Medical staff or city mission employees observed. Other by-passers and delivery vans were pulling in regularly.*

SWOT Analysis:

Table 28.Medically Managed Withdrawal Service SWOT analysis

Strengths	Weaknesses
• *Building is architecturally beautiful and opens to the streetscape* • *Incorporates living plants on facade* • *Bus stops outside, making it accessible* • *The site is situated where* • *location reflects local demand, situated in a high-density urban area*	• *Difficult to locate – it's within the Auckland city mission, and not advertised.* • *Conference room/lounge visible from the street looked messy and did not seem to serve a purpose. No people and random furniture* • *The street it is located on is run down – abandoned rubbish trolleys, what seems to be a non-active construction site, degraded foot paths, graffiti, etc.* • *Due to high density, lots of windows would most likely look into other buildings.*
Threats	**Opportunities**
• *The gathering of homeless populations around the front door made it intimidating* • *Busy roads all around* • *With it being in CBD, noise and light pollution are most likely to continue throughout the night*	• *Very close to a key urban centre*

Northshore Hospital

Findings:

People interactions:

- *Patients waiting with family, some being transported by wheelchair — strong presence of carers alongside patients*
- *Emergency department overcrowding, a range of injuries waiting to be treated. The waiting area was full, and no available chairs. The whole environment felt high-stress.*
- *Volunteers actively engaging, asking if people need help in reception waiting areas, offering to escort patients to other departments.*
- *There were several cafes, all of which were full of patients, visitors and staff (Admin, nurses and doctors) but not overcrowded*
- *There were many different sitting nooks; these were all occupied prior to the standard seating arrangements.*
- *Sitting areas that backed onto walls and were mid-corridor were also in high demand.*

SWOT Analysis:

Table 29.Northshore Hospital SWOT Analysis

Strengths	Weaknesses
• *Variety of seating areas* • *Natural materials and motifs: timber panelling, patterned chairs, framed art add warmth compared to clinical posters.* • *Cafés and pharmacy at the entrance* • *Volunteers present and engaging with patients* • *Clear signage throughout, reducing disorientation.* • *Friendly staff at the front desk* • *Has a garden to wander around sponsored by community charity*	• *Harsh, artificial LED lighting dominates, with a lack of skylights or windows, lacking a sense of weather or time.* • *Emergency waiting area overcrowded with limited seating* • *Busy circulation: irregular hallways and many random doors create confusion* • *Some structural and ceiling elements feel arbitrary rather than purposeful.* • *Interior layouts are maze-like (e.g., café circulation)*
Threats	**Opportunities**
• *Overcrowding in waiting areas* • *Lack of natural light and reliance on harsh LEDs* • *Confusing circulation*	• *Increase natural light through skylights, glazing, or light wells to enhance orientation*

The project - What is dementia

Table 30.Types of dementia

Type of Dementia	Notes	Symptoms
Fronto-Temporal Dementia	*Fronto-Temporal Dementia refers to a range of conditions affecting the frontal and temporal lobes (Carr, 2017). In all forms of the disease, the frontal and/or temporal lobes of the brain shrink (Carr, 2017).*	• *Behaviour change – loss of inhibition (Carr, 2017), Impulsive, emotional flatness or excessive emotions (National Institute on Aging, 2025)* • *Speech and language issues(Carr, 2017) – Making and understanding speech (National Institute on Aging, 2025)* • *Shaky hands (National Institute on Aging, 2025)* • *Issues with balance and walking (National Institute on Aging, 2025)*
Lewy Body Dementia	*Aka Lewy bodies is closely associated with Parkinson's disease dementia (Walker et al., 2015). Generally, patients are less likely to experience brain shrinkage; instead, deposits of proteins are observed in the cerebral cortex, limbic system, and brainstem, eventually damaging visual pathways in the frontal lobe (Carr, 2017). Early vision and focus loss are attributed to this (Carr, 2017)*	• *Early vision deterioration (Carr, 2017)* • *Early focus and concentration loss (Carr, 2017; National Institute on Aging, 2025)* • *Disorganisation or illogical ideas (National Institute on Aging, 2025)* • *Muscle rigidity (National Institute on Aging, 2025)* • *Coordination loss (National Institute on Aging, 2025)* • *Reduction of facial expressions (National Institute on Aging, 2025)* • *Insomnia (National Institute on Aging, 2025)* • *Excessive daytime sleep(National Institute on Aging, 2025)*
'Other '	*There are more diseases related to dementia that are less common and understood, including: Hydrocephalus Dementia, Creutzfeldt-Jakob Disease, etc. (Geldmacher & Whitehouse, 1996)*	

Dementia and Brain Activity

Below further examines some of the trending symptoms of dementia and how they might relate to brain activity and function

Table 31.Dementia and brain activity

Symptom	Cause/Relation to brain activity
Language	*The Auditory cortex is located in the rear region of the brain and is responsible for processing sounds (Carr, 2017). Sound passing through the temporal lobe enables us to process the meaning of words. (Carr, 2017). Talking requires both the auditory cortex and the temporal lobe, as we rely on hearing our own voice when we speak; however, both these areas of the brain are affected by dementia (Carr, 2017).*
Memory	*Episodic Memory = Memory of Events at certain times and places. (Carr, 2017)* *Semantic Memory = General knowledge, ie objects and meanings of words (Carr, 2017)* *Procedural Memory = Memories of skilled learned(Carr, 2017)* *Hippocampus – located in the medial temporal Lobe of the brain, and is an important part of the limbic system (Carr, 2017). Hippocampus is associated with long-term memory, and also plays an important role in spatial navigation (Carr, 2017).* *Memories of past events may employ multiple of the above, giving a sense of what we saw/heard and how we felt, dementia can affect all parts (Carr, 2017)*
Emotion and Behaviour	*A human's response to the environment relies on the brain's limbic system (Carr, 2017). This system regulates emotions in response to sensory stimuli and information.(Carr, 2017)* *Amygdala = Signals fear in response to danger (Carr, 2017)* *Frontal Lobe = Deals with Rational thoughts, assesses potential threats (Carr, 2017)* *The progression of dementia also impacts both parts of the brain and is often responsible for things such as behaviour change, hallucinations, and paranoia (Carr, 2017).*

As previously established, forms of physical decline are also a common occurrence among patients with all forms of dementia; however, their potential causes and relation to brain function are not as well documented (Carr, 2017; National Institute on Aging, 2025)

Site Selection, Criteria and Analysis

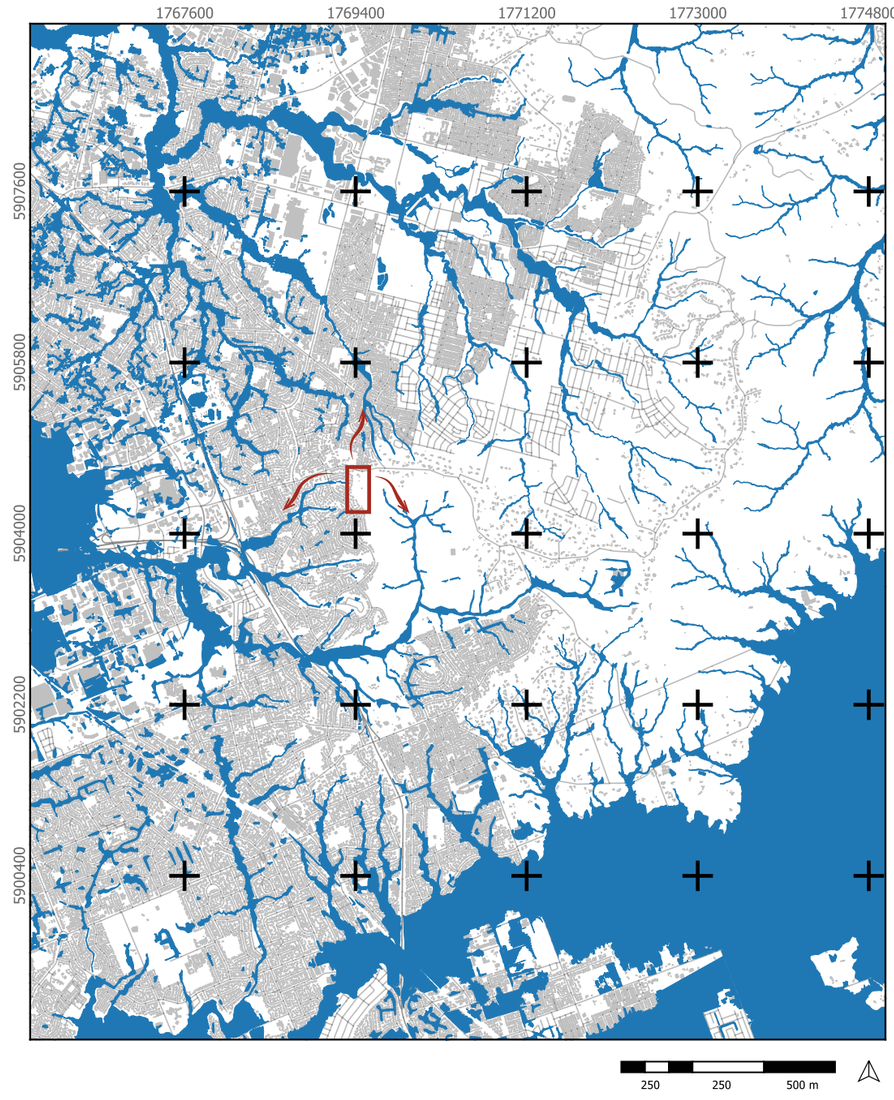


Figure161.Wider site floor planes map adapted from (QGIS, 2025)

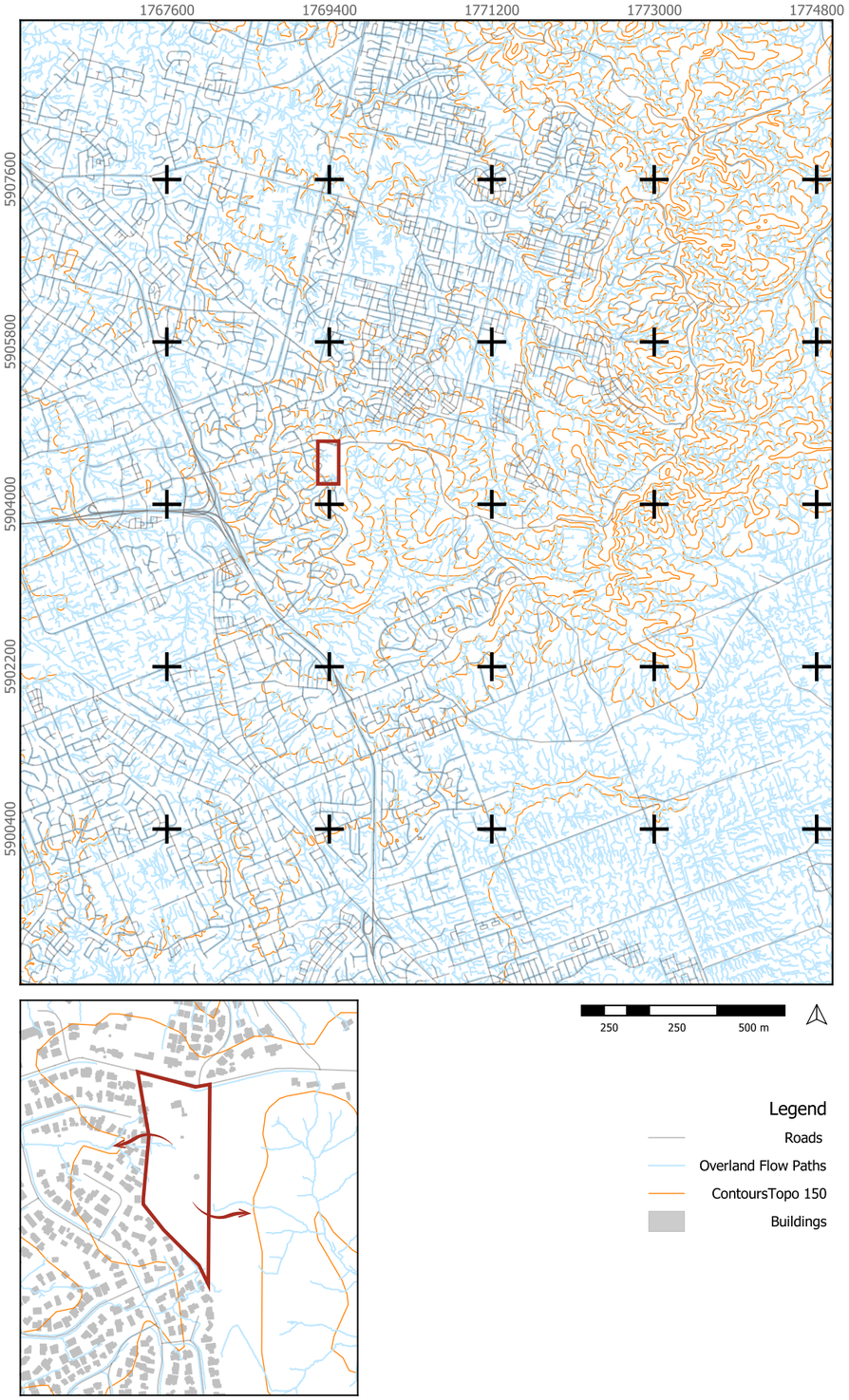


Figure 162.Wider site overflow map adapted from (QGIS, 2025)

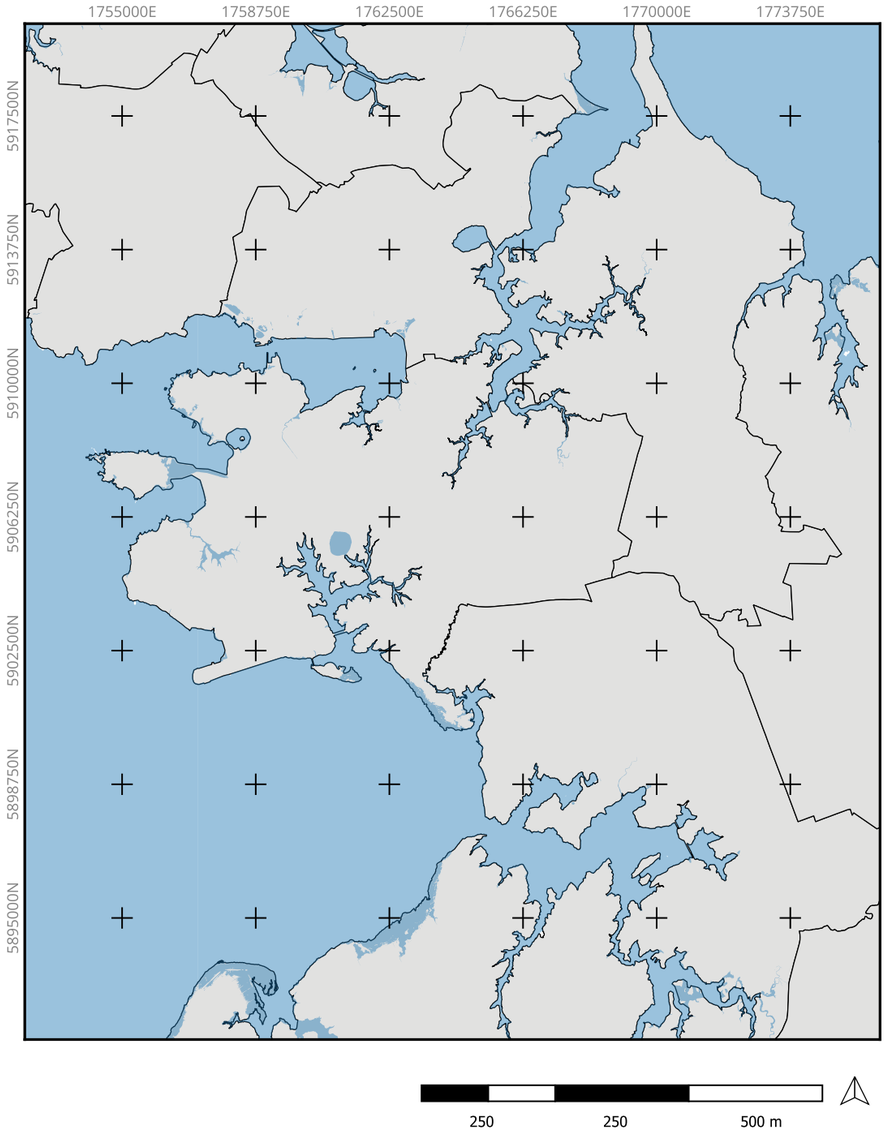


Figure 163.Wider site map of coastal indentation, 50 years, adapted from (QGIS, 2025)

Experiment 4:
Tectonic Timber Models

Figure 164.Timber tectonic model configurations

Experiment 6.2
Changing sun

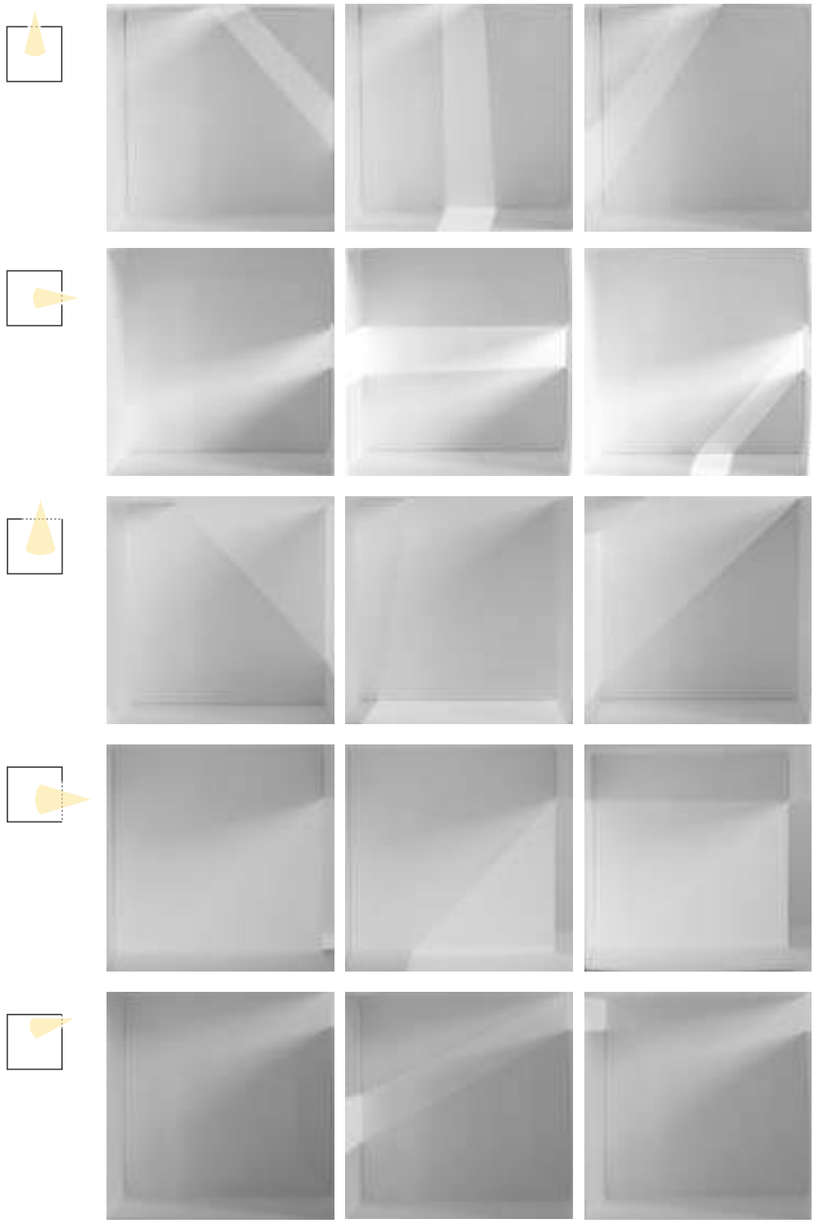


Figure 165.Light interaction models

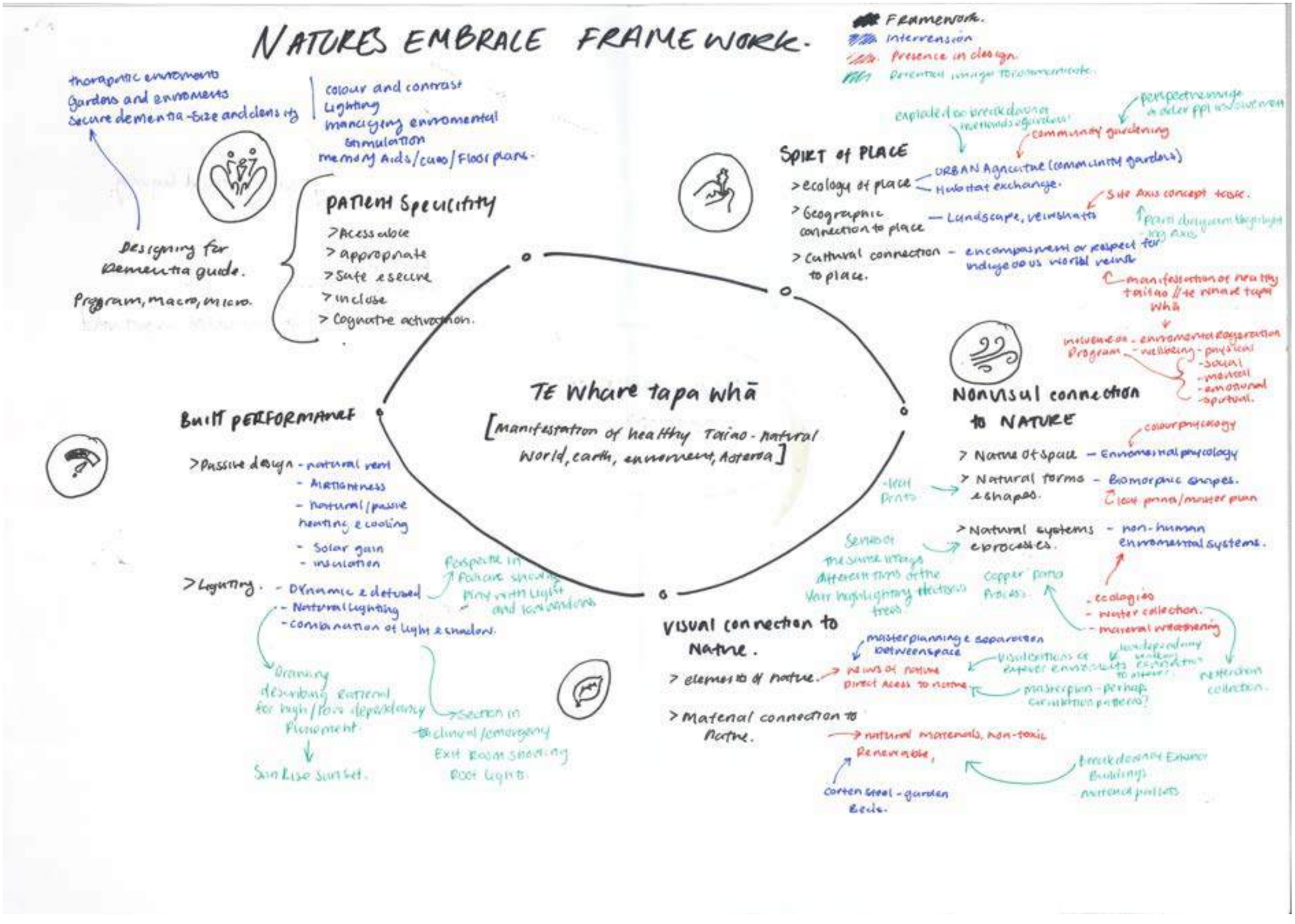


Figure 166.Mind mapping

Event One

Figure 167.Event one pin-up

Event Two

Figure 168. Event two pin up

Event Three

Figure 169.Event three Pin up

Event Four

Figure 170.Event Four pin up