Waitematā Local Board Ngahere Analysis Update 2021

Canopy cover changes with the 2013 to 2016/2018 LiDAR data

Urban Ngahere Strategy 2019
Knowing Programme

A summary of the urban environment in Waitematā

Over
82,800
residents

Over half of statistical areas with less than **20%** canopy cover

Less than **1%** of canopy cover above **30 metres** tall

Almost **70%** of total canopy cover on public parks and other public land

Average canopy cover of
19.1%
across local board, including canopy cover of:

- **43%** on public parkland
- **17%** on road reserves
- **10%** on other public land
- **15%** on private land

Over
100 parks
including Auckland Domain Premier, Western Springs Lakeside and Cox's Bay reserve

Nearly
2,000
hectares of land

100,000
commuters to the city centre,

53%
use public transport, cycle or walk

180,000
jobs in the city centre

New zoning under Auckland Unitary Plan includes Mixed Housing Urban and Terrace Housing and Apartment Buildings

368ha of urban forest in 2013,
increasing to 371ha in 2016/2018

Date: September 2021

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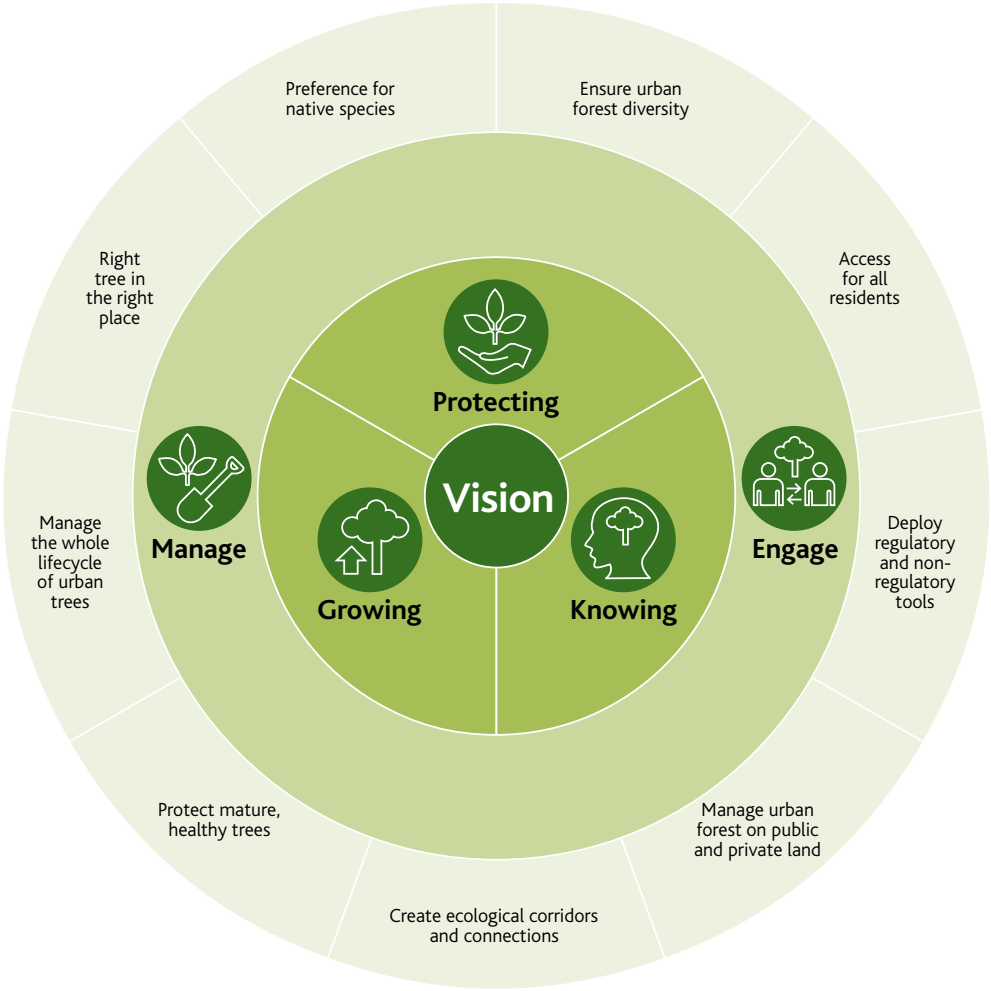
Contents

1.0 Preface

Tāmaki-Makaurau / Auckland is New Zealand's largest city, and plantings of exotic and native trees have taken place as the region has developed. In pre-human times, much of the area that now comprises the Waitematā Local Board would have been cloaked in a contiguous cover of coastal broadleaved forest with occasional patches of mixed podocarp-broadleaved-kauri forest. Pōhutukawa forest would have also adorned the coastline from Westmere to Hobson Bay. Early Māori settlers would have planted trees such as karaka, pūriri and tōtara to indicate a special place or to mark a celebration, while European settlers planted trees that were familiar and provided a sense of place. London Plane, English Oak, and European Lime trees were some of the earliest recorded plantings in Auckland. Settlers arriving from around the world commenced the history of Auckland's diverse and unique tree cover.

When European settlers arrived to Tāmaki-Makaurau / Auckland, the gullies of the isthmus were filled with raupō, edged with a varied growth of sedges and other moisture loving plants; and slopes of gullies covered with karamū and cabbage trees. By the late nineteenth century, significant areas of land in Waitematā was under cultivation with a large number of introduced plants. Along with residential development, these actions have now reduced indigenous forest cover within the Waitematā Local Board to small fragments in local reserves.

The Waitematā Local Board has provided locally driven initiatives funding to Auckland Council's Principal Advisor Urban Ngahere (Forest) in the Parks, Sports and Recreation Department to develop an analysis of the tree cover in its area of responsibility. This update report is the result of a programme of work by Auckland Council involving detailed analysis of urban tree coverages on public and private land, aiming to identify opportunities to nurture, grow and protect urban trees in the local board area. The analysis work is directed by the Auckland Council's Urban Ngahere (Forest) Strategy 2019, which has 18 key objectives to help Council and local boards to deliver a healthy ngahere for a flourishing future.



2.0 Introduction

2.1 Waitematā Local Board

The Waitematā Local Board covers approximately (c.) 1,940 hectares (ha) on the central Auckland isthmus and is bounded on the North by the Waitematā Harbour, south and west by Albert-Eden and east by Ōrākei. Waitematā encompasses the Auckland City Business District (CBD), fringe retail and commercial areas, and the inner-city residential suburbs. The local board is well connected to all areas within the Auckland Region through the Central Motorway Junction, the Auckland Train Network, the passenger and car ferry terminal, several paths and cycleways and the second largest port in New Zealand, making it the heart of the Auckland Metropolitan Area. The Waitematā Local Board is densely developed, with a population of over 82,800 residents, representing a 7.4% increase since the 2013 census. Driven by the city centre, the Waitematā area is the primary hub of employment and commerce in Auckland, with the city centre providing a total of 186,000 jobs with a total of 100,000 commuters.

Waitematā contains 33 statistical areas. The land use is predominately made up of commercial suburbs in the centre including Queen Street, Karangahape, Grey Lynn East, New Market, Eden Terrace and Auckland – University, Hobson Ridge and Quay Street – Customs Street. The western half and eastern edge of the local board are predominantly residential suburbs including Parnell, Grey Lynn, Ponsonby, Freemans Bay, Herne Bay and Westmere South – Western Springs.

Remaining urban forest and tree canopy covers around 19% of the local board area. Most of the vegetation, indigenous and exotic, is restricted to parks and reserves such as the Auckland Domain, Western Park, Victoria Park, Western Springs Premier, and Grey Lynn Park. Overall, 104 local parks are present within the Waitematā Local Board. Significant pockets of indigenous forest are confined to The Auckland Domain, Arch Hill, Ayr Street reserves, Western Springs Premier and the coastal fringe. Collectively, they cover only a small percentage of the local board area. However, many new areas of indigenous scrub have been planted in recent decades within local reserves and along the motorway corridors.

Amongst these sensitive ecological sites and other scattered areas of vegetation, portions of the local board area are now zoned for development intensification under the Auckland Unitary Plan. The new zoning, including the Mixed Housing Urban Zone and the Terrace Housing and Apartment Buildings Zone, now allows for significantly smaller sections, particularly around Freemans Bay and Parnell. Consequently, significant portions of the urban forest canopy are under a range of pressures from future development, which could potentially lead to irreversible changes in urban forest cover.

An information graphic summarising local board details related to urban forest is provided at the beginning of this report.

View of the urban ngahere in the western suburbs of Waitematā

Urban trees within the Grey Lynn Area

2.2 Study Background

'Urban ngahere' ('urban forest') comprises all the trees within a city – including parks, coastal cliffs, stream corridors, private gardens and streets – both native and naturalised exotic species. For the purposes of this report, 'urban ngahere' is defined as all of the trees and other vegetation three metres or taller in stature within the Waitematā Local Board, and the soil and water systems that support these trees. This urban ngahere definition encompasses trees and shrubs in streets, parks, private gardens, stream banks, coastal cliffs, rail corridors, and motorway margins and embankments. It also includes both planted and naturally established plants, of both exotic and native provenance.

The scale of the tree and shrub cover across Auckland is sufficiently extensive on both public and private land to make a meaningful contribution to the liveability and sense of place for its residents. Benefits of the urban ngahere include:

Social

- Improve health and wellbeing
- Reduce the urban heat island effect
- Provide shade
- Enhance visual amenity

Environmental

- Enhance biodiversity
- Improve air quality
- Carbon sequestration
- Improve water quality

Economic

- Increase property values
- Reduce flood risk
- Reduce energy costs
- Reduce healthcare costs

Cultural

- Support education
- Local food growing
- Sustain and enhance mauri
- Cultural heritage

The Auckland Unitary Plan offers various degrees of protection to urban ngahere and groups of trees meeting specific characteristics (e.g., pre-identified significance, vegetation by coasts or streams); however, other important urban ngahere assets have no statutory protection and can therefore be removed. The completion of a study in urban canopy cover in Waitematā is important to provide information on baseline tree distribution that future canopy cover measurements can be compared to. This baseline data also provides information on where there are pressures on canopy cover and opportunities for tree planting. Increases in canopy cover are also intended to contribute to other Auckland Council programmes such as Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan (Auckland Council 2019b).

2.3 Data Collection

Urban canopy cover across Auckland was mapped in 2013 (Bishop and Lawrence 2017), and again in 2016/18 by use of LiDAR (Light Detection and Ranging). Airborne LiDAR is an optical remote sensing technology that irradiates a target with a beam of light; usually a pulsed laser, to measure an object's variable distances from the earth surface. Two LiDAR data sets are covered in this report, collected in the years 2013 and 2016/18. The second survey (2016/18) had to be completed over two years due to unfavourable weather conditions that limited data quality. As these two LiDAR data sets provide a solid baseline for future comparative work, investigations into alternatives to LiDAR for mapping urban ngahere are currently underway.

3.0 Results and Discussion

3.1 Urban Canopy Cover Overview

Based on the 2013 data set, urban ngahere covers 19% of the Waitematā Local Board area, including 42% of public open space, 15% of roads, and 16% of private land. Further information on the 2013 data has been provided in a baseline report (The urban forest of Waitematā Local Board in 2013; Auckland Council Technical Report 2017/006; Bishop and Lawrence 2017). Overall canopy cover increased to 19.1% based on the 2016/18 data set (Table 1). The percent of urban ngahere cover within the Waitematā Local Board is higher than the average of 18% across Auckland's urban area. As the local board is already largely covered in high-density development, this canopy percentage cover provides a good basis for maintaining and increasing a healthy urban ngahere.

In Waitematā Local Board, there was a net increase in canopy cover of c.3.4 hectares over the measured time period. This provides promising evidence that clearance of trees has not occurred to the extent that may have been predicted following removal of general tree protection; however, the detailed analysis shows there has been a decrease in the proportion of taller canopy cover within the local board.

Urban Local Board	Public open space		Private land		Roads		Other public land		Overall coverage	
	2013	2016/2018	2013	2016/2018	2013	2016/2018	2013	2016/2018	2013	2016/2018
Kaipātiki	63	64	25	25	12	14	33	34	30	30
Upper Harbour	50	52	29	30	11	13	10	11	27	28
Hibiscus and Bays	28	29	24	23	15	14	43	42	25	24
Puketāpapa	50	50	17	16	10	12	15	15	20	20
Albert-Eden	33	34	19	18	17	20	19	18	20	20
Ōrākei	25	25	20	19	14	16	20	20	20	19
Waitematā	42	43	16	15	15	17	11	10	19	19
Whau	34	34	17	16	12	13	12	12	17	17
Devonport-Takapuna	24	27	17	17	11	13	13	14	16	16
Howick	25	26	17	17	6	8	11	12	16	16
Henderson-Massey	30	32	14	14	7	8	11	12	15	15
Papakura	16	17	15	15	8	11	8	9	13	14
Manurewa	24	26	11	12	6	9	7	7	12	13
Maungakiekie-Tāmaki	21	23	9	9	10	12	11	11	11	12
Ōtara-Papatoetoe	13	14	8	8	7	9	10	10	9	10
Māngere-Ōtāhuhu	14	14	7	7	7	9	8	8	8	8

Table 1: Urban ngahere in Auckland's urban local board areas: data includes percentage cover (to nearest whole number) of urban ngahere for different land tenures, and the overall percentage cover of urban ngahere within each board, with a comparison between the 2013 and 2016/18 data sets.

3.2 Canopy Distribution across Waitematā Local Board

The urban ngahere is not distributed evenly throughout the local board, as shown in **Figures 1 and 2**. More than half of the local board statistical areas have less than 20% urban ngahere cover. Low urban ngahere cover correlates with dense commercial business areas. Cover is lowest along the waterfront wharves in Quay Street – Custom Street and Wynyard Viaduct, and along the main streets of the commercial city centre, in Queen Street, Hobson Ridge North and Shortland Street. High cover is generally associated with residential statistical areas, such as Parnell, Freemans Bay and Herne Bay; and statistical areas such as Auckland University, Symonds Street East and Parnell West, which encompass large public open spaces and parks.

Increases in overall canopy cover between the two data sets are most apparent in Queen Street, Anzac Avenue, Herne Bay and Grey Lynn North, likely due to the growth and planting of street trees and roof-top gardens. Decreases in overall canopy cover occurred between 2013 and 2016/18 in Symonds Street East, attributed mainly to development of the Auckland City Loop Path. Decreases also occurred in Anzac Avenue and Herne Bay due to several small lot residential developments and subdivisions. Canopy cover should increase in this area in future data, given the extensive planting that has been carried out within motorway corridors, and plantings around subdivisions. There is also opportunity for future planting of street trees within these statical areas and increased amenity trees on public parks such as Salisbury Reserve.

Over the whole local board, gaps in urban ngahere are generally associated with two categories, the first being high density buildings in commercial areas. These are mainly found around the Auckland CBD, New Market and Eden Terrace. Such areas feature extensive buildings and carparks with very little vegetation present.

The second category of urban ngahere gaps on a local scale is associated with extensive grasslands typical of sports fields and large recreation reserves. In the Waitematā Local Board this includes Auckland Domain Sports Fields, Victoria Park, Cox's Bay Reserve, St Paul's College, Grey Lynn Park, Western Springs Outerfields, Salisbury Reserve and Sneddon Fields. While planting urban ngahere within the sports complexes is not feasible, works could involve increasing forest cover on the edges of the fields and elsewhere in the parks.

Ngahere and Te Ara i Whiti / The Lightpath cycleway, Auckland Central City

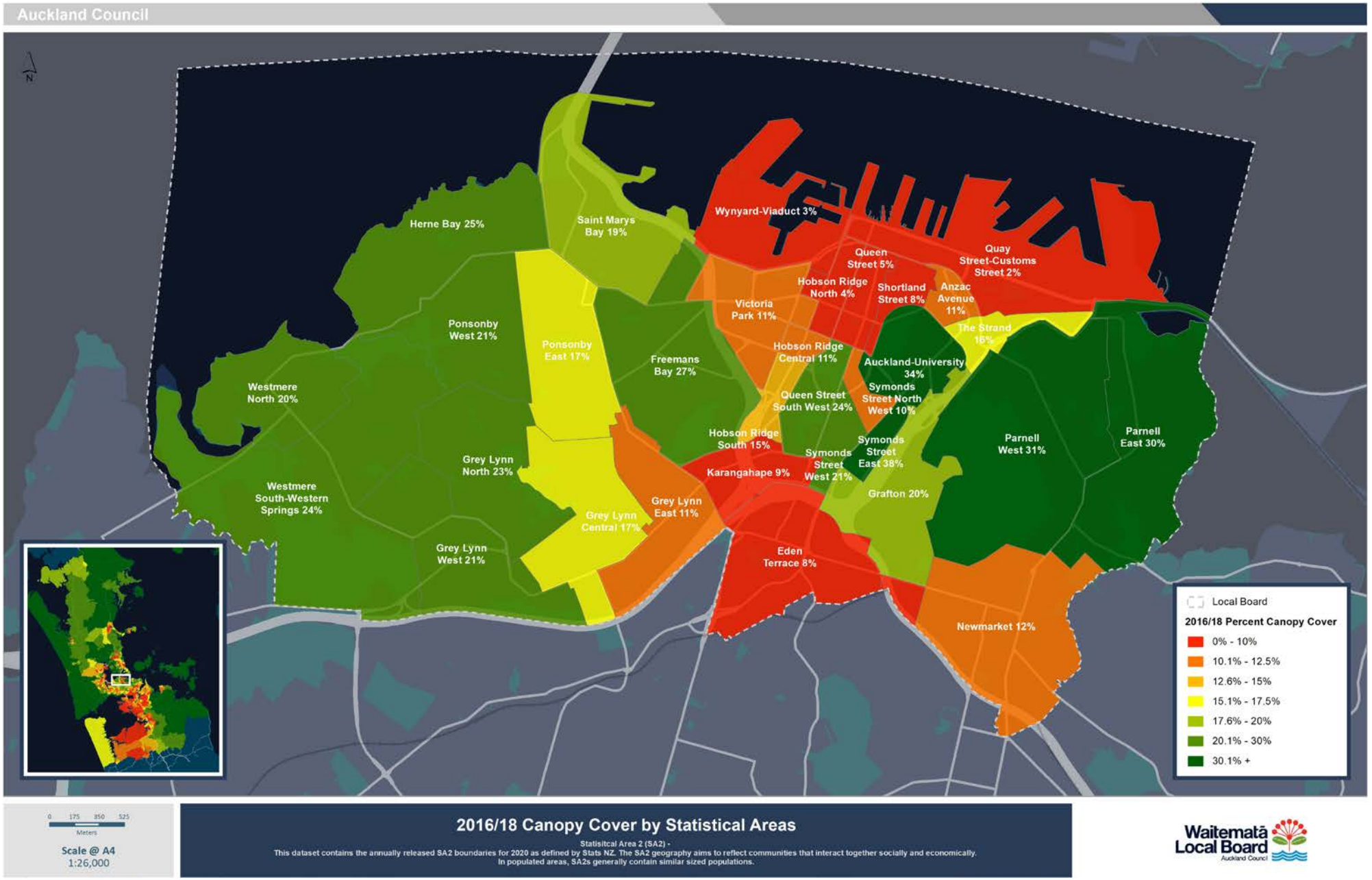


Figure 1: 2016/18 Canopy Cover by Statistical Areas

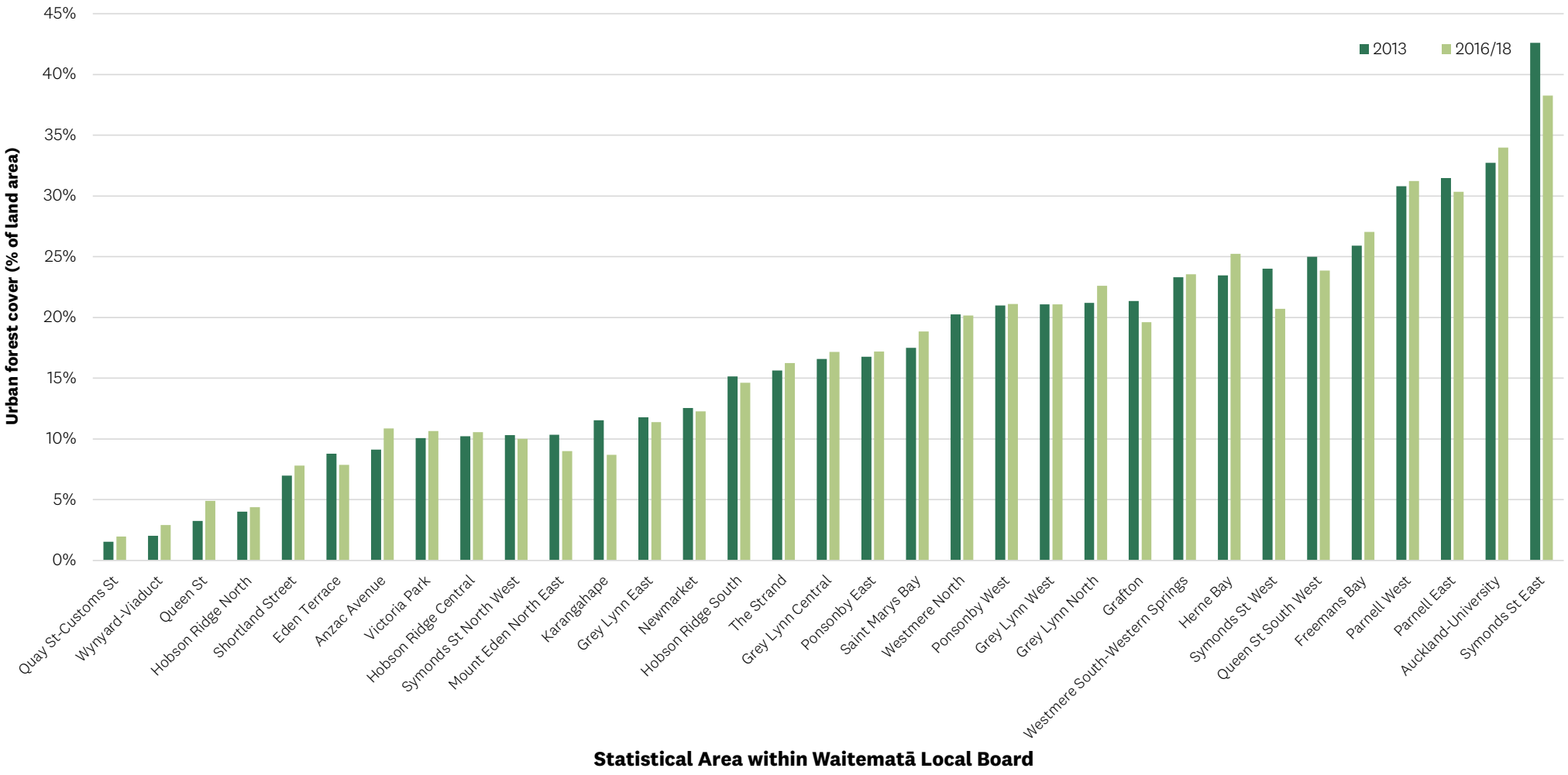


Figure 2: Spatial distribution of urban ngahere canopy within the statistical areas of Waitematā Local Board

3.3 Urban Ngahere Canopy Height

LiDAR data includes a height component, and this information was used to split the recorded canopy cover into different height categories: 3-5 metres; 5-10 metres; 10-15 metres; 15-20 metres; 20-30 metres; and taller than 30 metres. This data is representative of canopy cover height, rather than tree height, as each individual tree may be recorded in several categories.

The height class distribution of the urban ngahere canopy within the Waitematā Local Board is displayed in **Figure 3**. In 2013, more than one quarter of the canopy cover was between 3-5 metres tall, almost one half between 5-10 metres tall, and the remaining percentage represented canopy taller than 10 metres. This distribution remained similar in the 2016/18 data sets, although the percentage of canopy cover over 10 metres tall slightly decreased (from 36% to 32%), being replaced by an increase in canopy cover 3-10 metres tall.

This data shows only low presence of tall canopy cover within the local board area, with all cover taller than 15 metres (including height categories 15-20 metres, 20-30 metres, and 30 metres plus) representing approximately 12% of the total urban ngahere canopy assessed. Research has shown that many of the benefits attributed to urban ngahere are disproportionally provided by larger trees (Davies et al. 2011, Moser et al. 2015). Large trees typically create more shade per tree due to a larger and wider canopy spread (Moser et al. 2015); intercept larger amounts of particulate pollutants and rainfall due to significantly larger leaf areas; contain more carbon and have higher carbon sequestration rates (Beets et al. 2012, Schwendenmann and Mitchell 2014, Dahlhausen et al. 2016).

Additionally, trees are often less susceptible to careless or malicious vandalism by the general public once established; can be pruned to provide higher canopy clearance over roadways; carparks and pedestrian footpaths; typically contribute more to calming and slowing traffic on local streets than small trees; and absorb more gaseous pollutants. It is therefore an immediate priority to retain existing large trees across the local board area to ensure the positive benefits of these are not lost, in line with the Ngahere Strategy (Auckland Council 2019a) that specifically highlights the importance of retaining trees that are over ten metres in height to maximise the benefits that trees of this size provide.

The increase in proportion of shorter vegetation in the 2016/18 data set indicates existing vegetation reaching the height (three metres) at which it qualifies as urban ngahere for the purposes of this study. This vegetation is likely to include restoration planting efforts associated with recent development, for example the completion of the Auckland City Loop Path. Restoration planting is also progressively occurring at Newmarket Park, Jaggers Bush and along Waiatarua Stream.

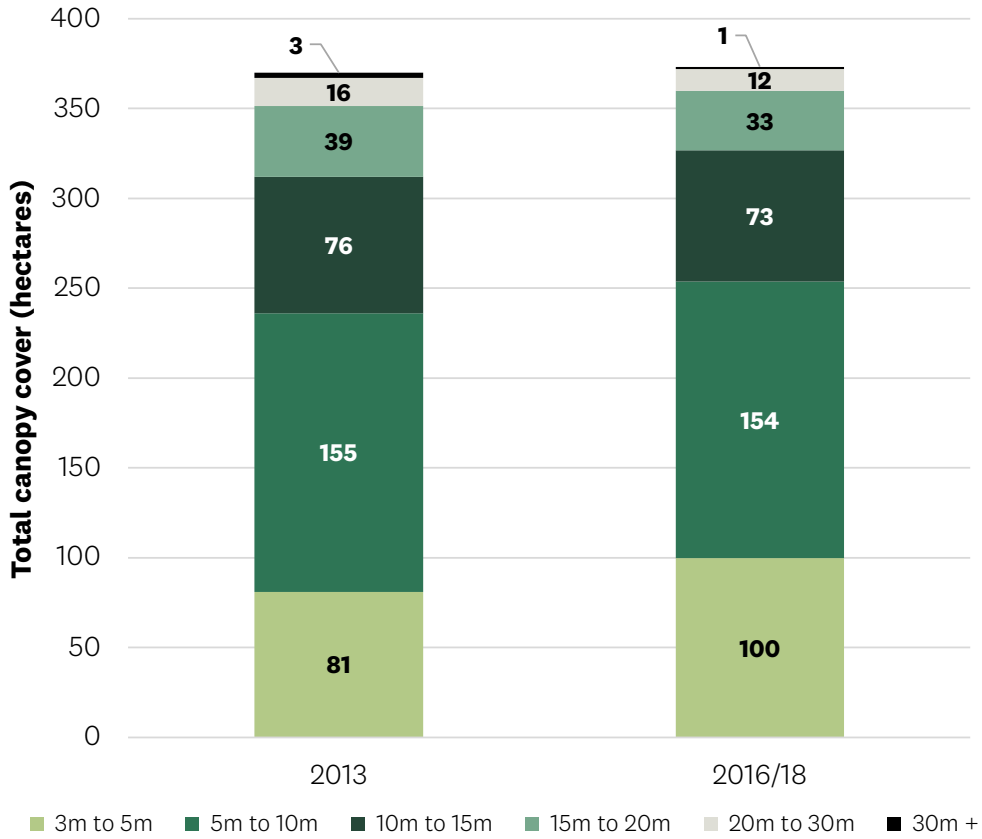


Figure 3: Height class distribution of urban ngahere canopy across all land tenures within Waitematā Local Board

3.4 Urban Ngahere Tenure

The tenure of urban ngahere described in this report relates to the zoning and ownership of different land parcels within the local board. Publicly owned land is described as either 'public parks' or 'other public land' (e.g. schools, Council-owned property), trees in the road corridor/road reserves are described as 'street trees', and privately owned land (residential or commercial) is described as 'private land'.

The tenure distribution of urban ngahere canopy within the Waitematā Local Board is displayed in **Figure 4**. Over half (69%) of the urban ngahere is located on public parks and other publicly owned land (e.g., schools). Trees in the road corridor make up 20% of the total urban ngahere cover, and private land contains the lowest proportion of urban ngahere being 10% of the total urban ngahere cover, respectively.

Public parks have double the urban ngahere coverage relative to area, compared to all the land tenures, as shown in **Figure 5**. There has also been an increase in urban ngahere canopy in public parks and road corridors between the two survey data sets. The percentage canopy cover of other public land and private land has decreased likely due to development of motorways and cycle paths, and removal of unprotected trees of private properties.

Street trees currently have a lesser role in the provision of urban ngahere in Waitematā, with the coverage of this land tenure being average compared to other urban local boards. The recommendation to address this is to protect wherever possible existing street trees and increase efforts to establish new street tree plantings. Areas where they have less prominence, such as Wynyard-Viaduct, Queen Street, Queen Street-Customs Street and Hobson Ridge North, provide opportunities to increase urban ngahere cover within the local board that will provide long term benefits to communities. The increase in urban ngahere cover in public parks and road corridors from the most recent data set indicates initial actions to increase canopy cover are proving to be successful, along with growth of existing street trees.

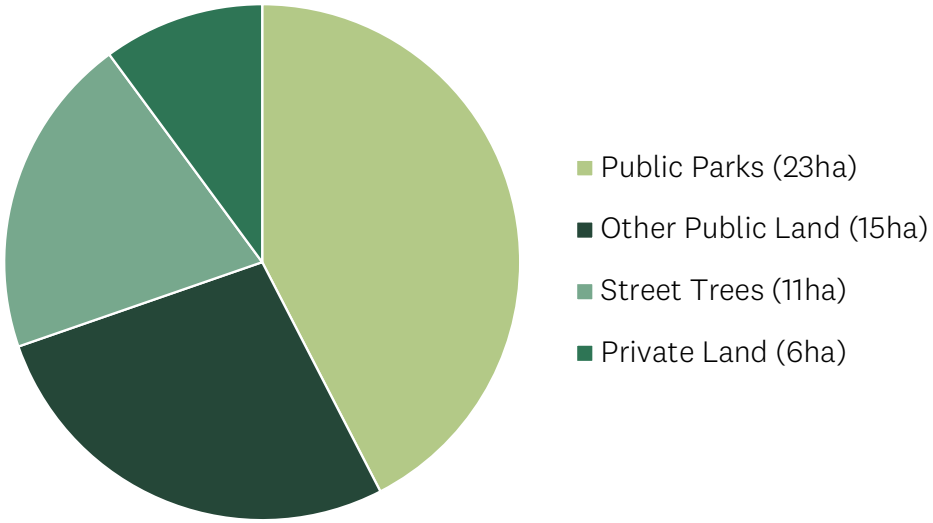


Figure 4: Tenure of urban ngahere canopy within Waitematā Local Board (Auckland Council 2019b)

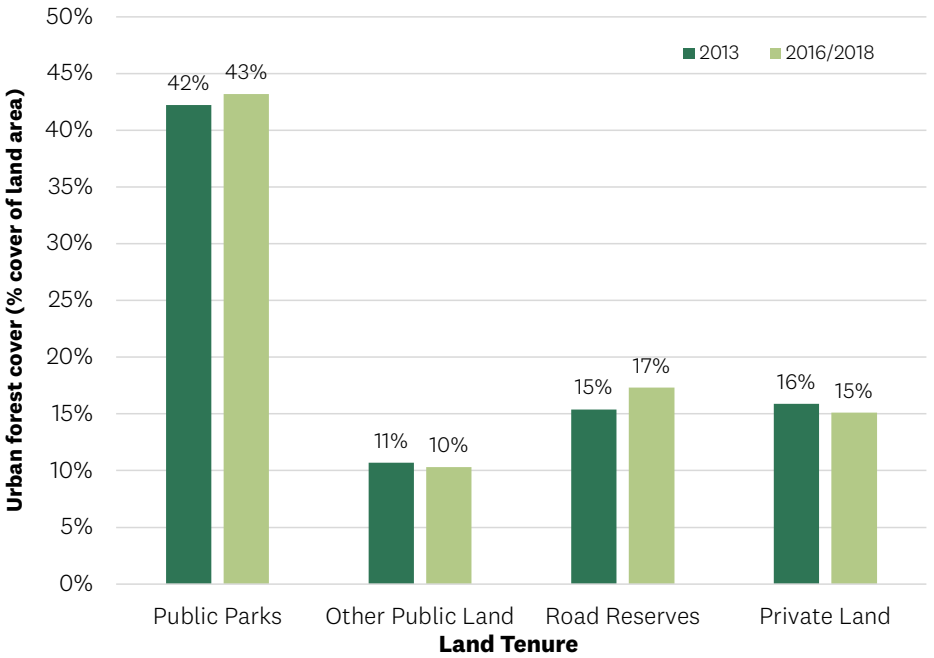


Figure 5: Change in urban ngahere cover of different land tenures in Waitematā Local Board between 2013 and 2016/18

3.5 Urban Ngahere in Relation to Growth Pressures

The Significant Ecological Area overlay (SEA; **Figure 6**) prioritises the areas of urban ngahere in Waitematā with the highest ecological value, providing a starting point for protection. SEA areas include Western Springs and areas of indigenous bush at Auckland Domain, with only small areas present on privately owned residential properties. With future development and urban intensification, these SEA and other continuous areas of urban ngahere are at risk.

Canopy cover in relation to the Auckland Future Urban Land Supply Strategy (Auckland Council 2017) forecasting areas of growth is shown in **Figure 7**. In Waitematā, much of the land is zoned for more intensive residential development, including 'Residential – Terrace Housing and Apartment Buildings' zoning, as well as further commercial development. This could lead to an even greater loss of urban ngahere, particularly in regard to trees that can be removed as a permitted activity (i.e., no protection status). For trees that do require consent for removal, while considered on an isolated basis the effects may be considered small, however on a cumulative basis the effects may be large, and these environmental impacts are generally beyond the scope of what is assessed in an application.

This is of particular concern for taller trees, as replacement plantings will take many decades to reach the same height and associated benefits as the canopy cover that has been lost. As such, the Urban Forest Strategy (Auckland Council 2019a) aims to limit loss of percentage of trees larger than 10 metres tall.

Correspondingly, incorporating urban ngahere plantings in new developments, such as The Isaac, will become essential in retaining and increasing urban ngahere cover throughout the board area. A long-term focus on urban ngahere enhancement of public parks will make these more attractive for local residents who will have progressively less open space on private properties as intensification continues.

It will also likely be necessary to implement non-regulatory rules in addition to Auckland Council's regulatory tools that act to protect the urban ngahere. Since the removal of blanket tree protection rules, non-regulatory tools will become increasingly important to control the removal of trees and vegetation, particularly on private properties. Examples include landowner advice and assistance with tree care and planting, community education and outreach programmes, and raising awareness of the value and benefits of the urban ngahere. These tools, if implemented effectively, will help to instil pride for privately owned trees reducing the risk of these being removed, for future development or otherwise.

Example of tree plantings incorporated into Apartment Housing development at The Isaac, Grey Lynn

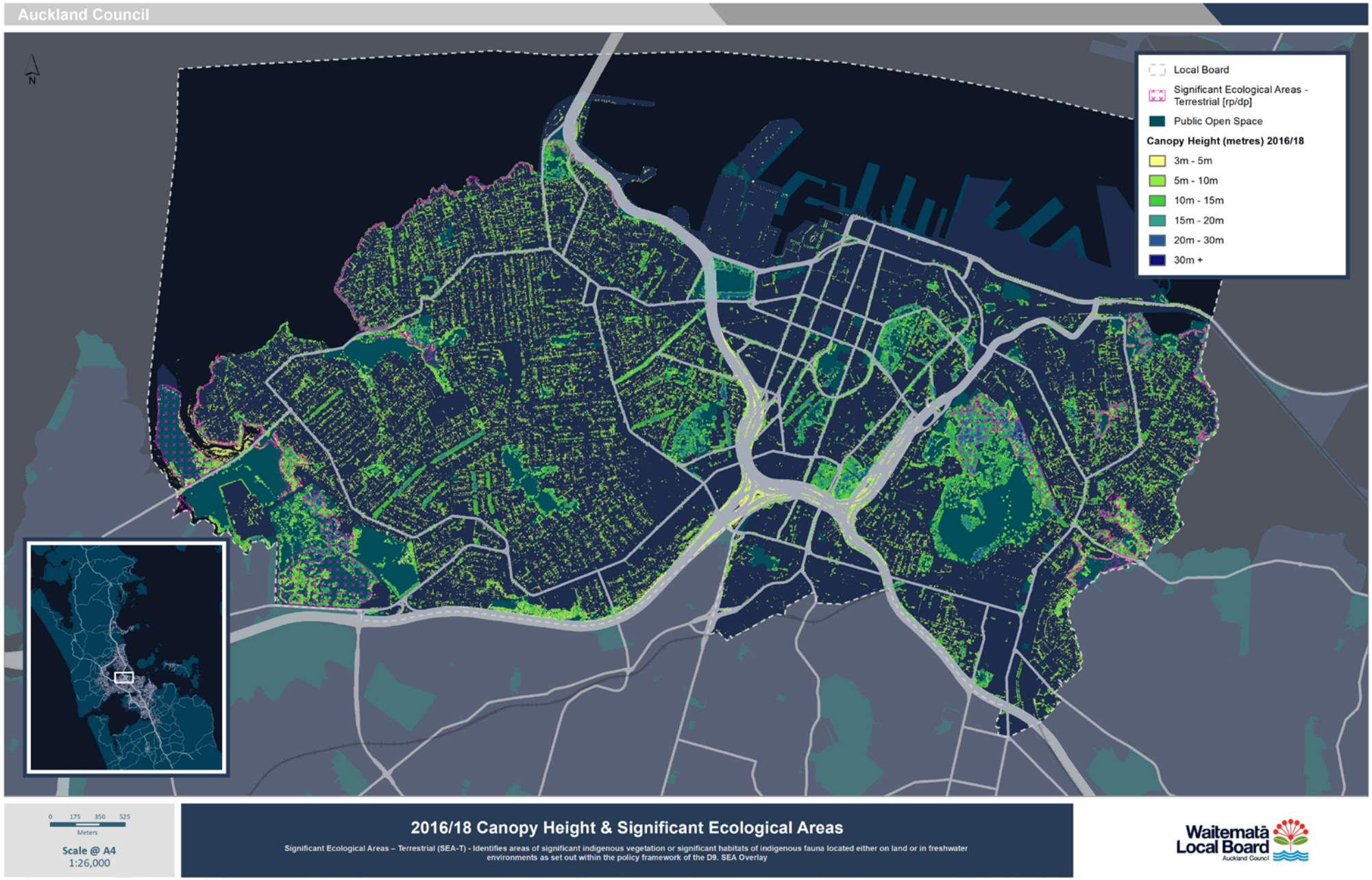


Figure 6: 2016/18 Canopy Height & Significant Ecological Areas

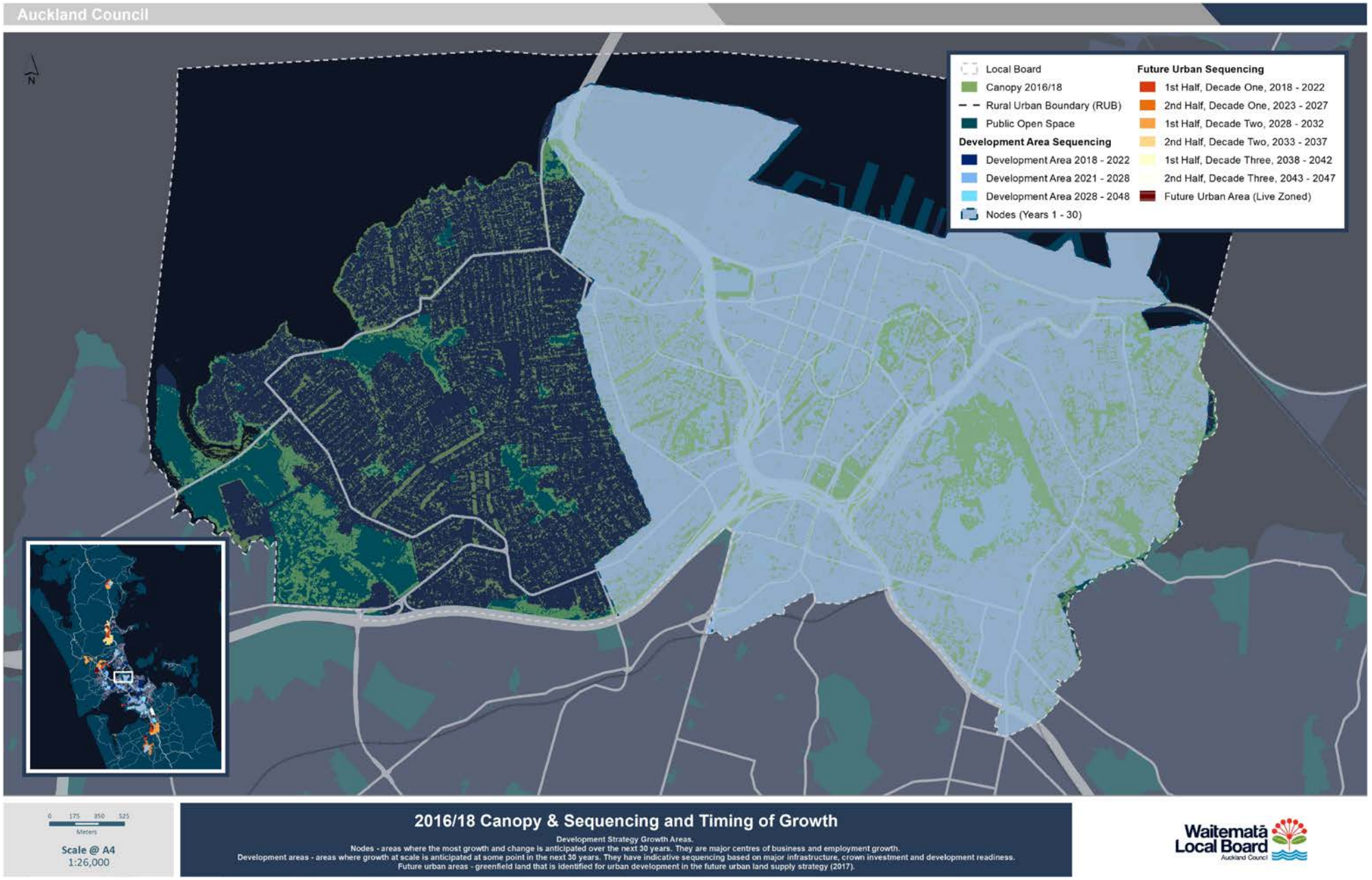


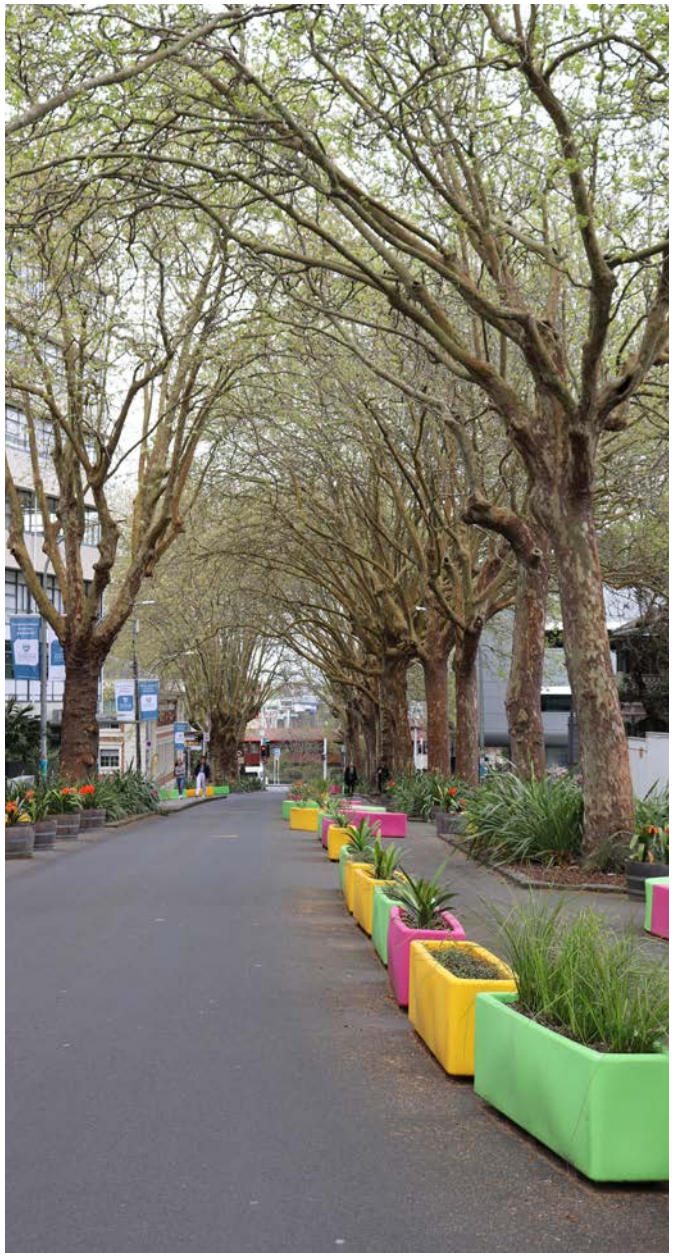
Figure 7: 2016/18 Canopy & Sequencing and Timing of Growth

3.6 Recommendations

Recommendations for future urban ngahere management in Waitematā Local Board include:

- Raise awareness of the value and benefits of urban ngahere canopy and provide advice and assistance to private landowners looking to plant trees on their properties
- to prioritise new plantings in existing reserves with little or no urban ngahere, for example Fraser Reserve and Basque Park, with locations determined through consultation with park users
- to ensure plantings allow for open green space to be retained in parks for recreational purposes
- to ensure tree plantings are designed to add value to a space, for example providing shade for play areas
- to focus initial opportunities for urban ngahere growth in locations where existing forest is in poor health and/or providing less than 20% coverage
- to determine if existing mature and over mature trees are in good condition and will be safe for the next five years, or otherwise where over mature trees could benefit from further active management and replacement, for example the pines trees in Western Springs Lakeside
- to work with the local community to plant a more diverse range of trees which will provide natural shade for current and future generations
- continue and expand planting around local reserves, Waiatarua Stream and Meola Creek
- to regularly review the Auckland Urban Forest Strategy and monitor whether the right trees are being planted in the right locations.
- continue to implement new tree planting in accordance with the Waitemata Local Board Urban Ngahere Action Plan 2019

The metrics of the canopy analysis will be used to help inform and prioritise the efforts of the Waitematā Urban Ngahere Action Plan. The action plan highlights the areas to plant new trees and sets out the process to fund, implement, and find ways to protect and nurture existing ngahere on public and private land.



Avenue of Notable London Plane Trees, Alfred Street, Auckland Central City

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Waitematā
Local Board
Auckland Council