Hibiscus and Bays 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 Hibiscus and Bays

Over **100,000** residents

79% of canopy cover less than **15 metres** tall

500ha of land protected by predator proof fence

46% of canopy cover with no statutory protection

1,317 hectares of Significant Ecological Area

More than **70%** of total canopy cover on private land

Average canopy cover of **23.5%** across local board, including canopy cover of:

- **29%** on public parkland
- **14%** on road reserves
- **42%** on other public land
- **23%** on private land

186 Notable Tree records

314 parks and reserves, with **44** playgrounds

Five statistical areas with canopy cover of more than **30%**

(Hatfields Beach, Whangaparāoa Central, Tindalls-Matakatia, Awaruku, Campbells Bay)

Third highest urban forest tree coverage of Auckland's urban local boards

Includes land zoned Future Urban under Auckland Unitary Plan

155 kilometres of coastline

More than **10,000ha** of land

15 native bush reserves

2,721ha of urban forest in 2013, **decreasing to 2,592ha in 2016/2018**

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Hibiscus and Bays Local Board

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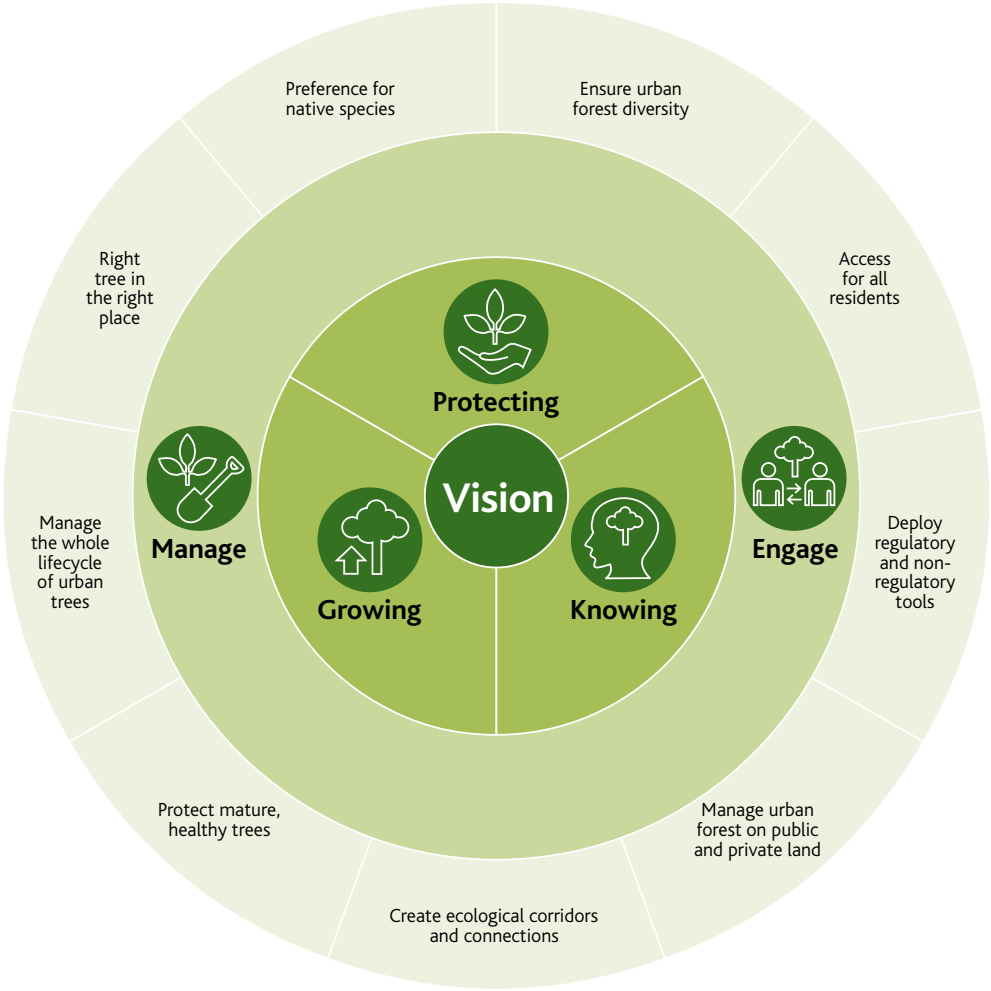
Contents

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. 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, progressing as different parts of the city were developed.

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, much of the Auckland area was under cultivation with a large number of introduced plants and development of farmland in areas such as Rodney, adjacent to Hibiscus and Bays. Along with residential development commencing in the mid-20th century, these actions have now reduced indigenous forest cover to smaller fragments, primarily in local reserves.

The Hibiscus and Bays 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 Hibiscus and Bays Local Board

The Hibiscus and Bays Local Board covers approximately (c.) 10,725 hectares, extending from Waiwera in the north to Campbells Bay in the south, and including Whangaparāoa Peninsula. The local board area is bounded by beaches and coastline on its eastern side, and by a green belt of bush and rural areas to the west (Wilcox 2012). The local board contains a mix of land use types including urban development and protected environmental areas, such as small remnants of original forest (e.g. Okura Bush Reserve) and regenerating bush reserves, plus small pockets of rural farmland or lifestyle blocks (Auckland Council 2017a; Auckland Council 2019b). Urban areas include Orewa, Whangaparāoa, and residential development along the East Coast Bays. The population of the local board, as of 2018, was over 107,000 residents, and it is recognised as one of the fastest growing areas in Auckland.

Compared to many other areas of Auckland, open space provision in the highly urbanised areas of Orewa and Whangaparāoa is relatively high (Auckland Council 2016). Open space is predominantly clustered around the area's natural features - watercourses and the coast. There are very large open space areas, particularly Shakespear Regional Park and the Okura Estuary Scenic Reserve. Long Bay Regional Park also contains extensive areas of peri-urban forest, and has over one million visitors a year.

Aside from these remarkable locations, open space is well distributed across residential areas, except in the relatively undeveloped northern section and in rural areas of the board (Auckland Council 2016; Auckland Council 2017a). As these areas develop into residential zones, there will be requirements for public parks and reserves (Auckland Council 2016). Urban ngahere and green infrastructure are important considerations in future planning, as relatively undeveloped parts of the local board become more urbanised. Protected areas of new or existing urban forest will also contribute to the Hibiscus and Bays Greenways Plan and North-West Wildlink Project.

An information graphic summarising local board details relating to urban forest is provided at the start of this document.

Mature indigenous forest at Awaruku Reserve

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 Hibiscus and Bays 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, motorway margins and embankments. It also includes both planted and naturally established plants, of both exotic and native provenance.

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 Hibiscus and Bays 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 2019c).

2.3 Data Collection

Urban canopy cover across Auckland was mapped in 2013, 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.

Coastal vegetation on Long Bay Regional Park.

3.0 Results and Discussion

3.1 Urban Canopy Cover Overview

Based on the 2013 data set, urban ngahere covered 24.7% of the Hibiscus and Bays Local Board area, including 15.4% of roads, 27.7% of public parks, 43.3% of other public land, and 24.5% of private land. Further information on the 2013 data has been provided in a baseline report (Hibiscus and Bays Local Board Urban Ngahere Analysis Report 2019; Auckland Council 2019b).

In Hibiscus and Bays Local Board, overall canopy coverage had a net decrease to 23.5% based on the 2016/18 data set (Table 1), representing a net change of c.129 hectares across the local board.

This percentage change is not reflective of total loss, however, as some of the forest lost has been replaced by other vegetation growing to over three metres tall. Analysing the height classification data has shown that total loss of canopy cover over 30 metres tall is c.178 hectares. This is a concern on a local board scale, as the loss of larger trees reduces the environmental services the urban ngahere provides, and it will take many decades for these trees to be replaced.

Despite tree canopy cover losses, Hibiscus and Bays has retained the third highest urban ngahere tree coverage of Auckland's urban local boards (Table 1), having particularly high coverage on other public land and road reserves. The relatively high canopy cover on other public land is likely attributed to the inclusion of the New Zealand Defence Force Land at Army Bay.

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 Hibiscus and Bays Local Board

The urban ngahere is not distributed evenly throughout the local board, as shown in **Figures 1 and 2**, which display variation by statistical area. Relatively new suburbs such as Millwater and Gulf Harbour have very low coverage, along with highly developed areas such as Orewa and Silverdale. At the other end of the spectrum are forested suburbs such as Whangaparāoa Central, and areas with large reserves such as Campbells Bay and Long Bay. The semi-rural areas of Silverdale South and Okura Bush have large areas of pasture without trees, but retain relatively high coverage overall.

Increases in overall canopy tree coverage between the two data sets are most apparent in Red Beach East, Vipond, and Stanmore Bay West, which are all in the same part of the local board. This is potentially a result of street tree growth and maturing of planting in some smaller local reserves such as Red Beach Park.

Decreases in tree canopy coverage occurred in several parts of the local board, most notably Army Bay, Murrays Bay East, and Okura Bush. Tree loss in Murrays Bay, as with other East Coast Bays, appears to be due to clearance of trees on residential properties to allow for house extensions or subdivisions to be carried out. The losses in Okura Bush are largely attributed to clearance of pine plantation in the rural part of this statistical area, which is also likely to have been a main driver for loss of trees more than 30 metres tall between the two data sets (further outlined in Section 3.3). Future Urban zoning of parts of the rural areas of Hibiscus and Bays Local Board is most likely going to increase the trajectory of canopy cover losses and reduction in taller canopy cover.

Areas of remnant forest, particularly in locations such as Okura, are now highly important for providing ecosystem services related to the hydrological cycle, improvements to water quality, and carbon sequestration.

Environmental Awareness Festival held at Okura Park.

Native restoration planting in Shakespeare Regional Park, Whangaparāoa.

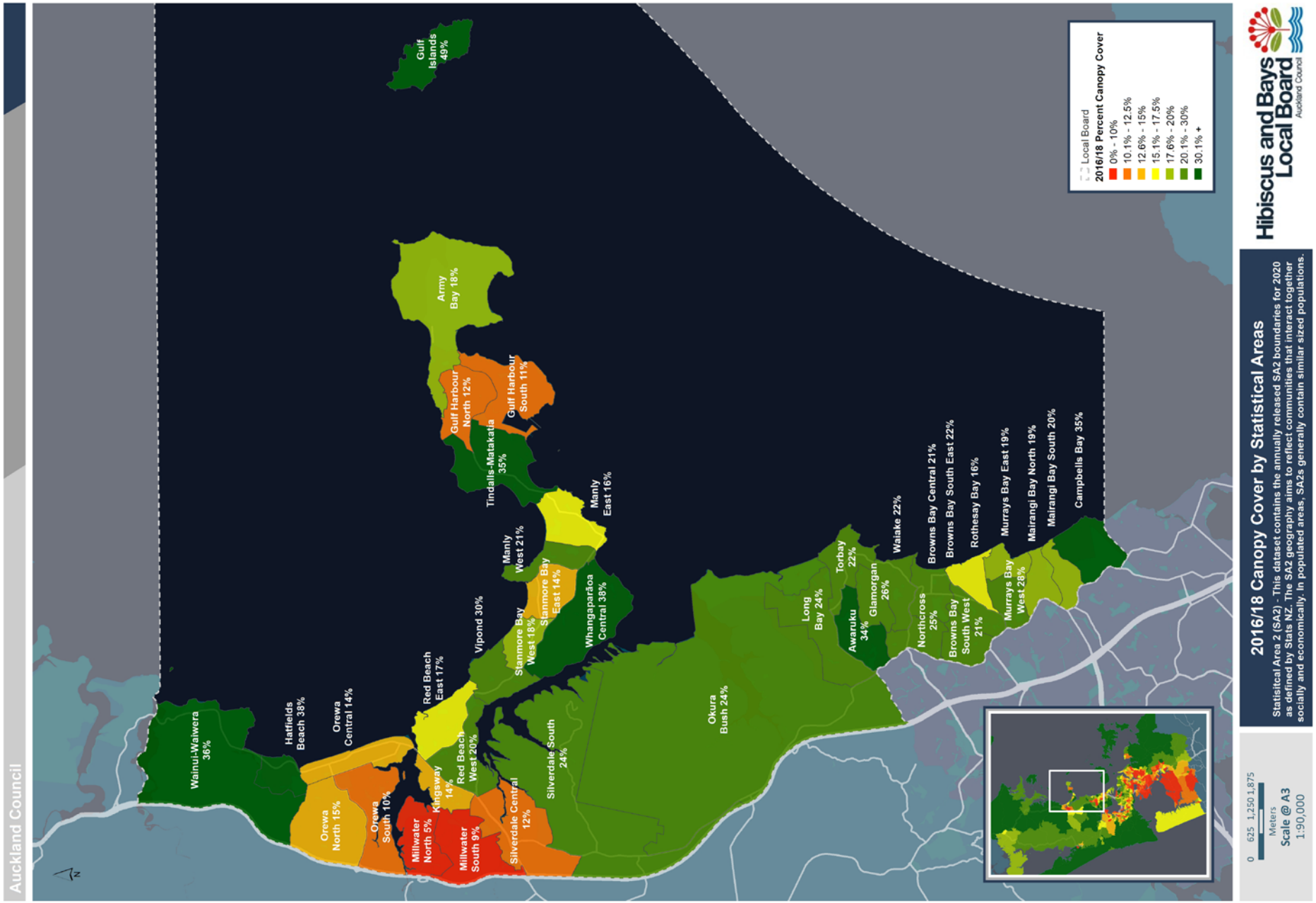


Figure 1: 2016/18 Canopy Cover by Statistical Areas

Te matomatotanga o Te Ngahere-a-Tāone Te Rohe o Hibiscus and Bays

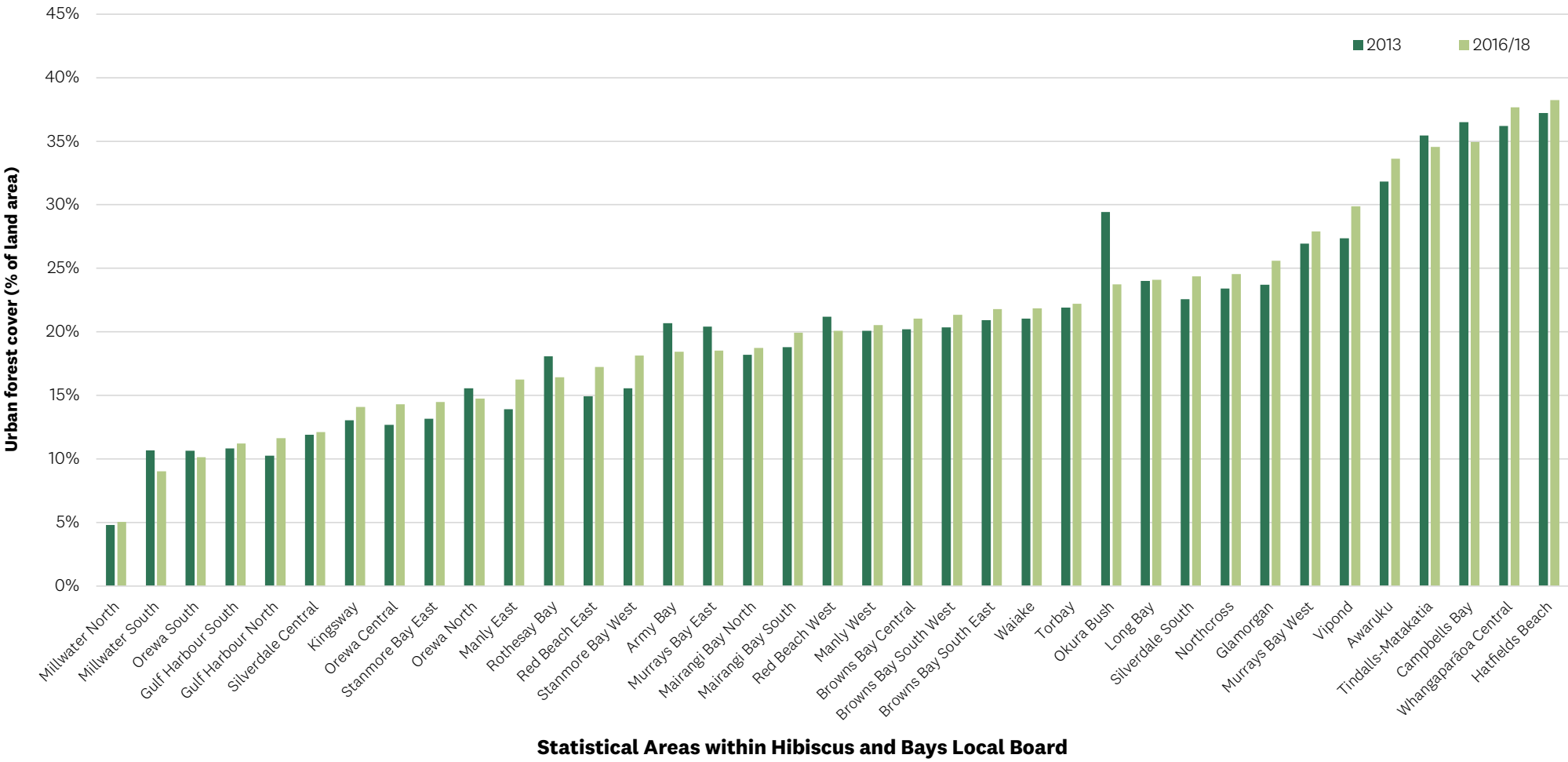


Figure 2: Spatial distribution of urban ngahere canopy within the statistical areas of Hibiscus and Bays Local Board

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 tree canopy coverage within Hibiscus and Bays Local Board is displayed in **Figure 3**. In 2013, approximately one fifth of the urban ngahere was between 3-5 metres tall, increasing to one quarter in 2016/18. The increase in proportion of short canopy cover in the more recent data set replaced canopy cover more than 30 metres tall, which dropped from 7% of the total urban ngahere in 2013 to only 1% in 2016/18.

As discussed earlier, this is largely due to clearance of pine plantation in eastern Okura, although there is likely to have been scattered clearance of larger trees throughout the local board, as the proportion and total extent of canopy cover in the 20 to 30 metre height category also decreased. This is a concern for the Hibiscus and Bays area, given 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.

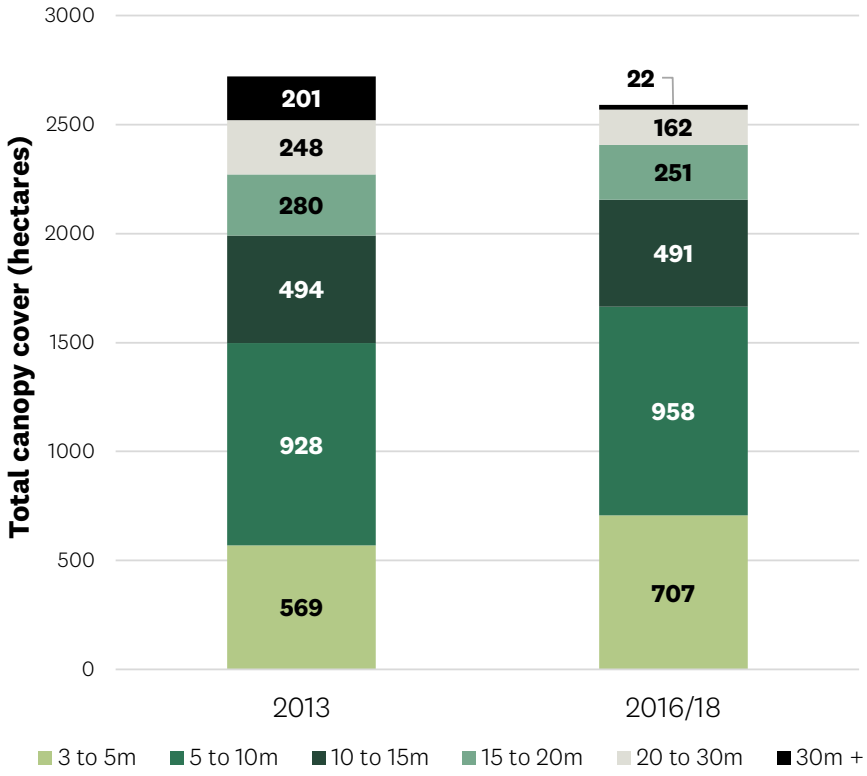


Figure 3: Height class distribution of urban ngahere canopy across all land tenures within Hibiscus and Bays Local Board

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 tree coverage within the Hibiscus and Bays Local Board is displayed in **Figure 4**. Nearly 70% of the urban ngahere is located on private property, which will include private commercial sites, residential lawns and gardens, and larger rural land holdings. Public Parks and other publicly owned land (e.g., schools) contain a similar proportion of urban ngahere, being 13% and 12% of the total urban ngahere cover, respectively. The percentage of urban ngahere in the road corridor (7%) is relatively typical for Auckland local board areas.

Other public land has the highest proportion of urban ngahere relative to area out of all the land tenures, as shown in **Figure 5**. This is likely due to a large portion of this land being the Defence Force base at Army Bay, which has high coverage of regenerating indigenous forest. Canopy cover in public parks is also of note, given this is the only land tenure that had an increase in tree coverage across the measured time period. Among new tree planting projects, a large portion of the increase in cover is likely to be due to maturation of previously completed restoration plantings in locations such as Shakespear and Long Bay Regional Parks. It was also observed in the original study (Auckland Council 2019b), however, that the East Coast Bays generally have a very low fraction of their canopy cover on public land, compared to trees and small pockets of forest on residential properties. Further planting in parks could be undertaken in these areas to have wider accessibility to residents.

Street trees have a lesser role in the provision of urban ngahere in Hibiscus and Bays, with the coverage of this land tenure (c.15%) being relatively low compared to other land tenures in the local board. Protecting existing street trees and establishing new street tree plantings in areas where they have less prominence, such as along the Whangaparāoa Peninsula and in the East Coast Bays (Arran Road in Browns Bay, for example), therefore provides a good opportunity to increase urban ngahere cover within the local board.

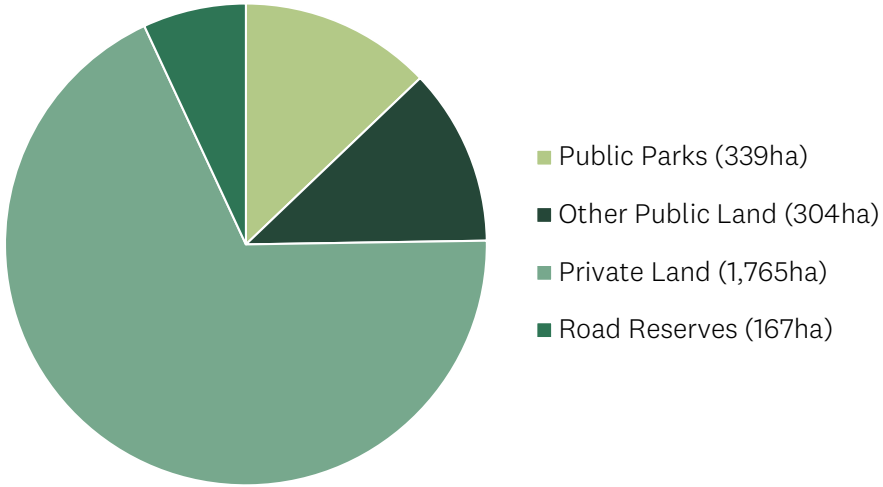


Figure 4: Tenure distribution of urban ngahere canopy within Hibiscus and Bays Local Board (2016/18 data set)

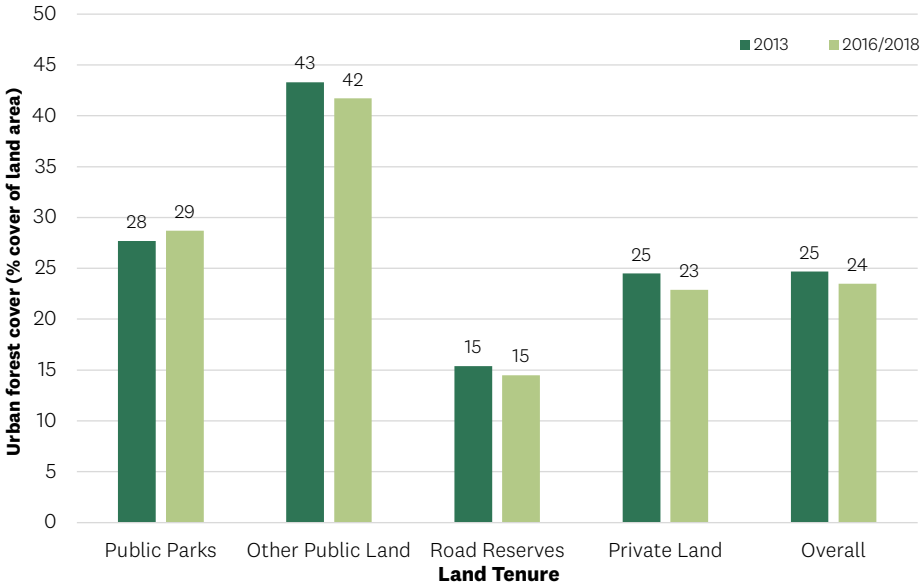


Figure 5: Change in urban ngahere cover of different land tenures in Hibiscus and Bays Local Board between 2013 and 2016/18

3.5 Urban Ngahere in Relation to Growth Pressures

The Significant Ecological Area overlay (SEA; **Figure 6**) prioritises the areas of urban ngahere in Hibiscus and Bays Local Board with the highest ecological value, providing a starting point for protection. The SEA is centred around the Waiwera Hills in the north, Okura River, and Shakespear Regional Park on the Whangaparāoa Peninsula. There are also smaller pockets of SEA around the East Coast Bays and Okura, and it is these areas that are most likely at risk from future development and intensification.

Canopy cover in relation to the Auckland Future Urban Land Supply Strategy (Auckland Council 2017b) forecasting areas of growth is shown in **Figure 7**. A lot of the land in Hibiscus and Bays is not zoned for more intensive residential development, however there are small pockets that are likely to change from rural to residential land use in the near future. These include the Future Urban-zoned land north of Hatfields Beach and to the west of Okura around East Coast Road, along with yet undeveloped parts of the Whangaparāoa Peninsula. Without consideration of existing trees, development in these locations could lead to a loss of urban ngahere with unfavourable outcomes for future residents that would then have new small developing trees rather than the mature trees currently present. Replacement plantings will take many decades to reach the same height and associated benefits to both the environment and residents 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, meaning existing trees should be retained and developed around where practicable.

Correspondingly, urban ngahere plantings should also be incorporated in all new developments. Recent examples in the local board such as Millwater show how this can be achieved, with street tree planting of larger specimen trees carried out as houses were being built, and extensive planting carried out in stormwater reserves. Continuing to plant in association with stormwater management is encouraged, particularly in subdivisions containing streams as the Hibiscus and Bays Local Board have made a commitment to work with local communities caring for local waterways (Auckland Council 2017a). Green infrastructure can help offset the impact of urban intensification through retaining natural vegetation in riparian zones, and planting trees and restoring wetlands, as opposed to creating man-made infrastructures (Auckland Council 2019b). It is effective, economical, and has many other benefits that enhance quality of life in urban areas.

A long-term focus on urban ngahere enhancement of public parks will also make these more attractive for local residents who will have progressively less open space on private properties as intensification continues. Public land is a good place to focus additional urban ngahere planting as this offers the best opportunities for long-term sustainable management due to the lower chance of conflict with future housing intensification, less infrastructure conflicts (which is often a major negative associated with street tree plantings), more considered selection of appropriate species and location for plantings, better arboricultural management, and alignment to the Hibiscus and Bays Ngahere Action Plan for ongoing planting of new and replacement trees. The greater accessibility of trees on public parkland also means that the benefits they provide (e.g., better shade and increased emotional well-being for park users) apply to a larger number of people, which is a major positive in terms of overall cost-benefit outcomes.

Norfolk Island Pines are part of the coastal plantings along the Orewa foreshore

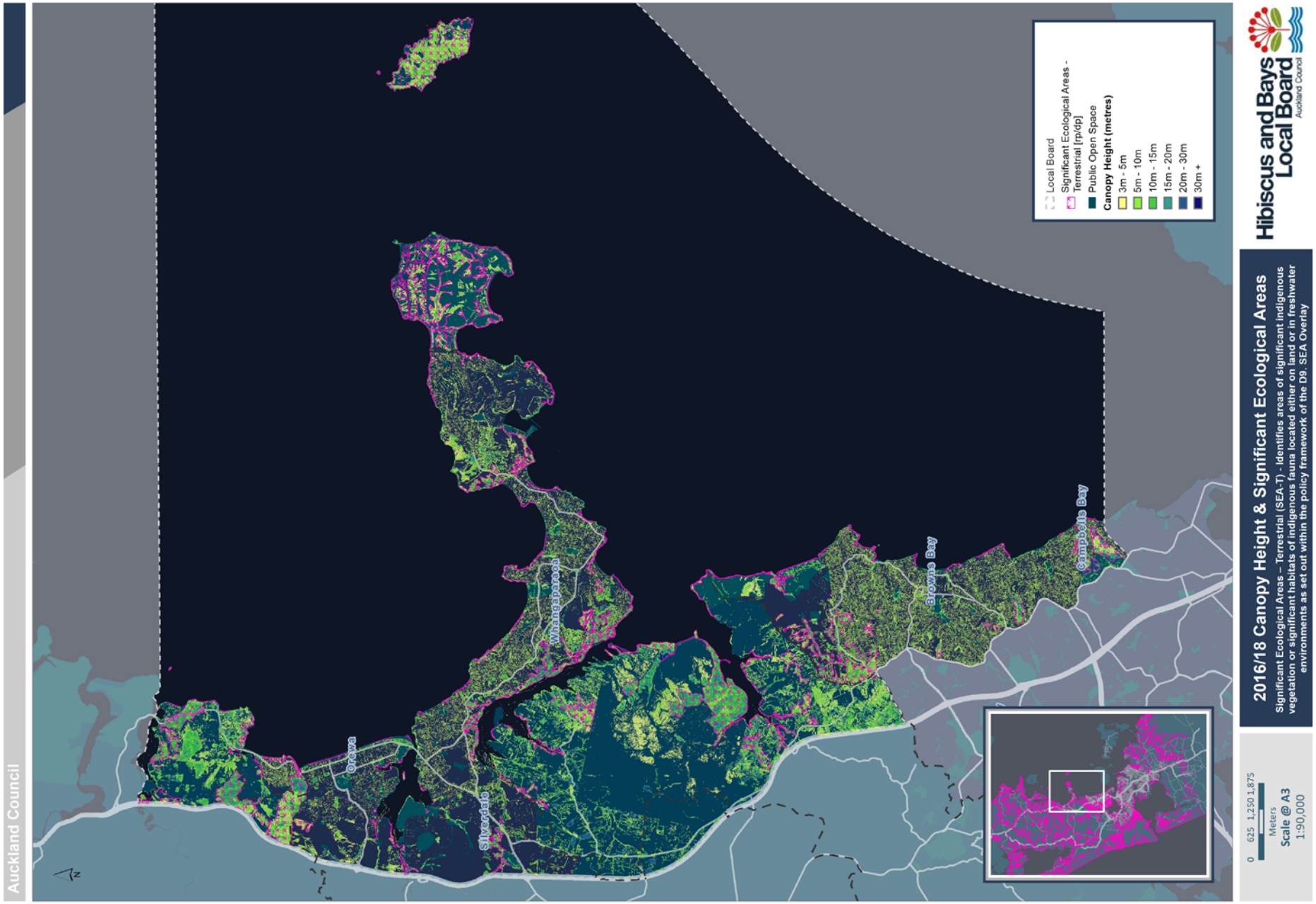


Figure 6: 2016/18 Canopy Height & Significant Ecological Areas

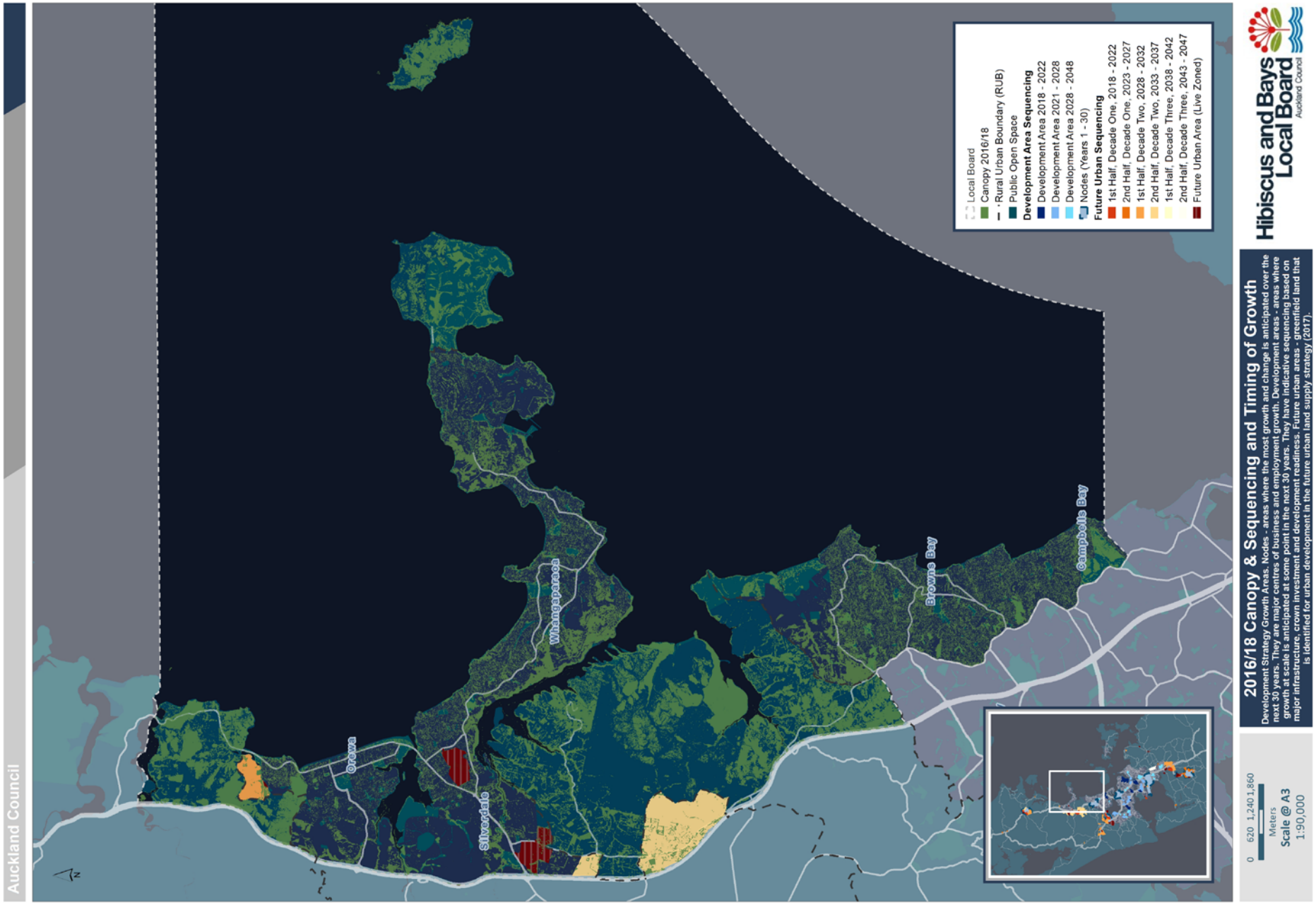


Figure 7: 2016/18 Canopy & Sequencing and Timing of Growth

3.6 Recommendations

Recommendations for future urban ngahere management to Hibiscus and Bays Local Board include:

- Focus tree planting efforts in line with the Hibiscus and Bays Urban Ngahere Action Plan 2020, including locations where tree coverage is currently low, along with areas that:
    - Have greater population densities, particularly of child populations
    - Could contribute to water management (e.g., flood mitigation) or treatment (e.g., of stormwater)
    - Could contribute to ecological corridors such as the North-West Wildlink
- work towards a co-ordinated approach in overarching strategic planning at the local level, combining with the Greenways Plan, new developments, iwi and other stakeholders involved in ecological restoration and tree planting efforts
- consider urban ngahere and green infrastructure in planning of all new development projects, particularly where rural land is being converted to urban land
- 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
- continue carrying out urban canopy cover analysis on a regular basis to monitor trends and increases throughout the local board area.

The metrics of the canopy analysis will be used to help inform and prioritise the efforts of the Hibiscus and Bays 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.

Pōhutukawa are an integral part of coastal forests and regularly planted in urban parks

4.0 Acknowledgements

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