8.4. Results of March 2020 Aerial Canopy Mapping - Declining Canopy Cover Across North Sydney LGA

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ENDORSED BY: Rob Emerson, Director Open Space and Environmental Services

ATTACHMENTS:
1. Report on Aerial Measurement of Canopy Cover [**8.4.1** - 17 pages]

PURPOSE:

To update Council on the current status of canopy cover across the North Sydney LGA.

EXECUTIVE SUMMARY:

North Sydney Council has been an industry leader in urban forest management, measuring canopy cover as a key performance indicator since 1997 and demonstrating great success in increasing canopy cover from 19% in 1997 through to nearly 34% in 2008. Unfortunately, this success did not continue and canopy cover has been declining at each subsequent measurement since 2008 (2014, 2017, 2020) and has now fallen back to just 27%.

North Sydney Council and the local community pride themselves on the green leafy character of our local government area. Property values are high and an excellent quality of life is enjoyed by residents and visitors thanks to the extensive tree canopy over our parklands, streets and private properties. North Sydney Council recognises the importance of managing our urban forest through two key documents: the North Sydney Street Tree Strategy and North Sydney Urban Forest Strategy. These documents provide mechanisms for setting goals, taking actions to achieve those goals and monitoring or measuring performance. In accordance with these strategic documents, Council strives to conduct a comprehensive canopy assessment every two years, with the most recent aerial canopy audit carried out in March 2020.

This report follows on from previous reports to Council on the issue of canopy cover decline; Overall, there has been a Council-wide decrease in canopy cover of 1.2% since 2017, continuing the downward trend in canopy cover since 2008. This decrease is reflected across all land use and land tenures except public land which remained stable. The data confirms that the greatest canopy losses are continuing to occur on privately owned land which makes up 58% of the land area in the North Sydney LGA: since 2008 canopy cover has decreased by 9.2% across private land. The next highest area of loss is suburban land, falling by 7.8% since 2008.

The New South Wales government has recently committed to increasing urban forest across the Greater Sydney area, setting a target of 40% canopy cover for the entire metropolitan area and providing significant funding through the 5 Million Trees program. The NSW government has also imposed tree planting requirements as part of other grant programs such as the 'Everyone Can Play' playgrounds program. The March 2020 canopy cover data for the North Sydney LGA validates the need for changes to tree protection controls to achieve both local and state canopy cover goals. Proposed changes were recently endorsed by Council and placed on public exhibition as amendments to NSDCP2013.

FINANCIAL IMPLICATIONS:

Nil.

RECOMMENDATION:

1. THAT Council receive the information.

2. THAT Council refers to this report and the data within it when considering public comments on the draft amendments to NSDCP2013, Section 16 Tree and Vegetation Management.

LINK TO COMMUNITY STRATEGIC PLAN

The relationship with the Community Strategic Plan is as follows:

1. Our Living Environment
1.1 Protected and enhanced natural environment and biodiversity
1.2 North Sydney is sustainable and resilient
1.3 Quality urban greenspaces
1.4 Public open space and recreation facilities and services meet community needs

BACKGROUND

On 25 June 2018, Council received a report on Tree and Canopy Cover Statistics for North Sydney LGA 1997-2017 and resolved (Min No. 225):

> *THAT a further report be prepared including input from Council's Planning, Engineering and Open Space staff as to strategies to* ***arrest decline and promote an increase in tree and canopy cover*** *in the North Sydney Local Government Area.*

The draft Urban Forest Strategy 2018 was developed in consultation with Planning, Engineering and Open Space staff and sets out the actions needed to arrest the decline and promote an increase in tree and canopy cover. On 29 October 2018 (Minute No. 409), Council resolved to place the Draft Urban Forest Strategy 2018 on public exhibition for 28 days. And on 29 January 2019 (Item 28. OSE01), Council resolved: *THAT Council adopt the final Urban Forest Strategy to be published on Council's website.*

On 24 February 2020 a report was presented on **Implementation of the Urban Forest Strategy - Review of Tree and Vegetation Management Policies**. This report included a benchmarking survey of other metropolitan council's tree protection policies. In response to that report, Council resolved (Minute No.25 Item 9):

> *1. THAT Council endorse the proposed changes to the tree protection thresholds as outlined in this report.*
> *2. THAT the proposed changes to tree protection thresholds be incorporated into the*
> *comprehensive review of NSDCP 2013 and that the subsequently amended DCP be placed on public exhibition in accordance with NSW legislative requirements.*
> *3. THAT Council staff continue to implement the other remaining actions to the 2019 Urban Forest Strategy.*

On 23 March 2020 Council received a joint report from CiS and OSE on the Review of Tree and Vegetation Management Policies and Proposed Further Amendments to North Sydney DCP Review 2020. Council resolved:

1. THAT the draft amendments to NSDCP 2013 as adopted by Council on 24 February 2020, be further amended as outlined in this report prior to its public exhibition.

The proposed amendments to NSDCP 2013, which incorporate changes to the thresholds for the need to obtain a permit to remove and prune trees, were placed on public exhibition between 25 May 2020 and 22 June 2020. Council is considering a post exhibition report to these proposed amendments concurrently with this report.

All of these reports and Council resolutions relate to the goal of arresting the decline and promoting an increase in Canopy Cover across the North Sydney local government area.

CONSULTATION REQUIREMENTS

Community engagement is not required.

DETAIL

INTRODUCTION

North Sydney Council is committed to maintaining a healthy and sustainable environment and has long recognised the importance of trees and vegetation in the urban setting. North Sydney Council developed a highly-regarded Street Tree Strategy in 1996 (last updated 2016) and had already commenced canopy cover measurement as a key performance indicator well before adoption of the North Sydney Urban Forest Policy in 2011 (updated 2019). To ensure accurate monitoring of canopy cover performance, Council has engaged aerial canopy mapping specialists to regularly collect and analyze the data using the most up to date industry technology.

The New South Wales government has recently committed to increasing urban forest across the Greater Sydney area, setting a target of 40% canopy cover for the entire metropolitan area and providing significant funding through the 5 Million Trees program. The NSW government has also imposed tree planting requirements as part of other grant programs such as the 'Everyone Can Play' playgrounds program. The benefits of increased tree cover are now quantifiable and accepted and have become a high-priority goal across two levels of government in NSW.

NORTH SYDNEY URBAN FOREST - TARGETS AND ACTUALS

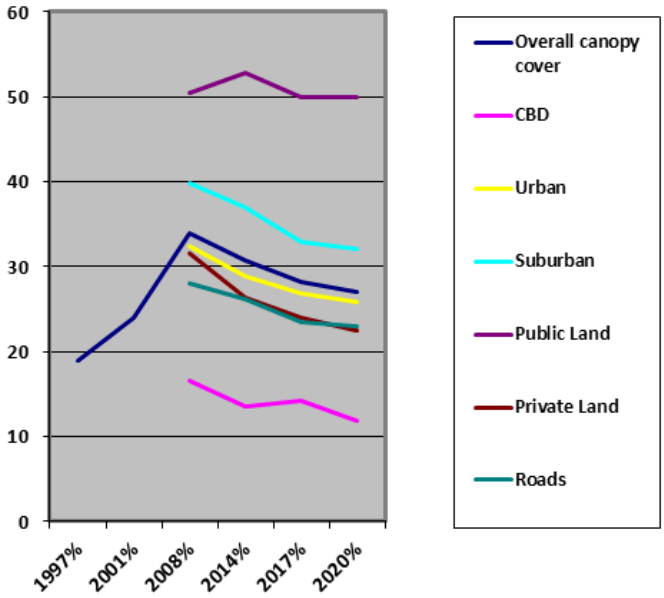
The target canopy cover amounts listed below for North Sydney were derived using international best practice based on realistically achievable canopy cover for the various types of land use.

The tables below show that Council steadily increased overall canopy cover over the first 11 years of the study period, peaking close to target in 2008. However, over the next 12 years overall canopy cover has declined even though Council has increased the total number of street trees and planted over 600 parkland trees per annum.

Table 1 – Canopy Cover over North Sydney 1997 – 2020

Description	**% of LGA land area**	**TARGET COVER** Based on industry best practice	**1997 %**	**2001 %**	**2008 %**	**2014 %**	**2017 %**	**2020 %**	**Total Decline Since 2008**
Overall Canopy Cover	100	**34.4%**	**19**	**24**	**33.9**	**30.7**	**28.2**	**27**	**6.9**
CBD	10.0	**15%**			16.5	13.5	14.2	11.9	4.6
Urban	48.3	**25%**			32.4	28.8	26.9	25.8	6.6
Suburban	41.7	**50%**			39.8	37.0	33.0	32.0	**7.8**
Public Land	25.7				50.5	52.8	50.0	50.0	0.5
Private Land	58.0				31.6	26.4	24.0	22.4	**9.2**
Roads	16.3	**30%**			28.1	26.1	23.4	23.0	5.1

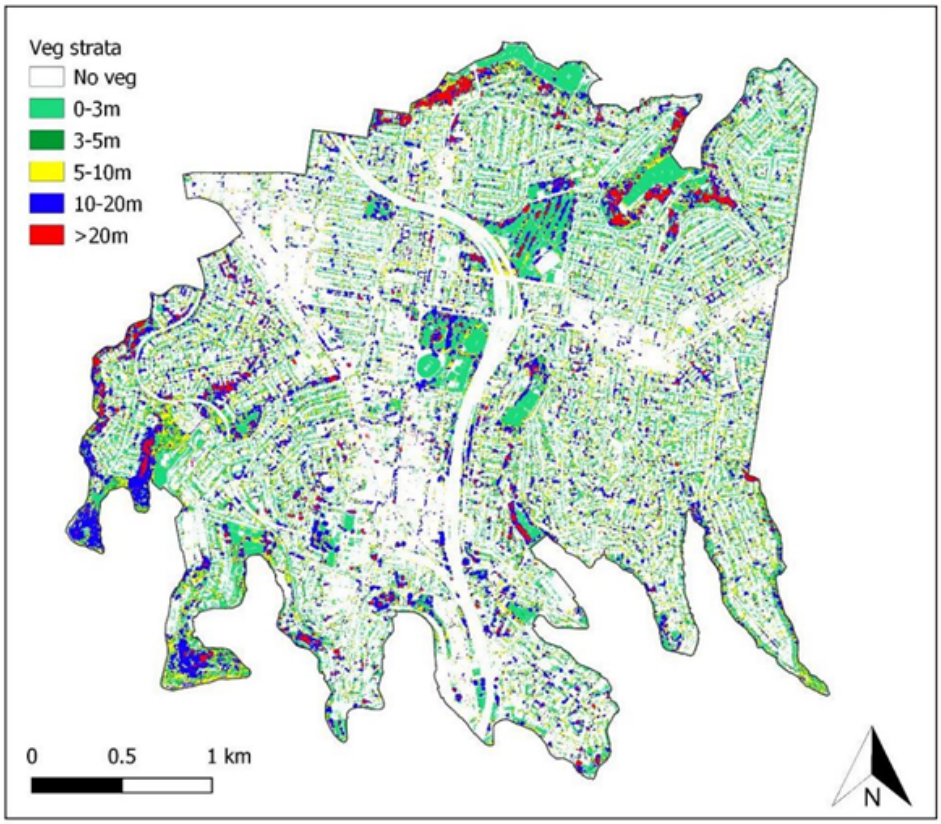
Table 2 – Line Graph Percentage canopy cover over time for the various land use and land tenures.



Notes relating to the tables 1 and 2:

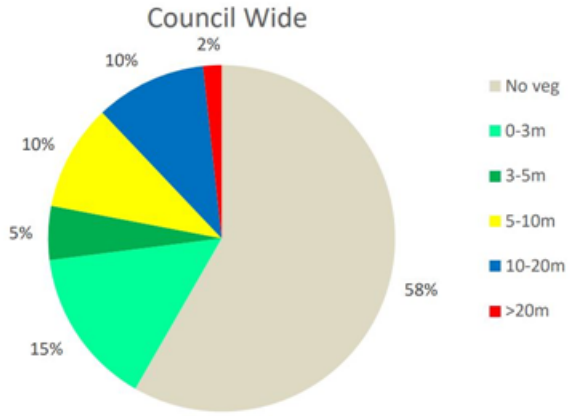
- Detailed breakdown based on land use and land tenure did not commence until 2008
- Council has maintained approximately 50% cover over land under its care and control throughout the measuring period, however public land only makes up 25% of the land area so even if council was able to achieve 100% cover, we would not achieve our target. NB - 100% cover on public land is not realistic as Council must provide sportsfields and other lawn areas to meet the recreational needs of the community.
- Suburban land is internationally recognized as having the most potential to accommodate canopy trees, hence the target of 50% cover over this land use. North Sydney's cover over suburban land has dropped from 39.8% to 32% cover over the past 12 years.
- Privately owned land has had the greatest level of decline dropping from 31.6% to 22.4% canopy cover since 2008. As privately owned land makes up 58% of the total land area of North Sydney, decline in this land tenure has the greatest influence on overall LGA decline.
- Roads make up 16% of the land area and are one of the biggest contributors to the urban heat island effect due to being hard, dark-coloured surfaces. Canopy cover over roads has dropped by 5.1% since 2008. Canopy losses over roads have occurred for B-Line bus lanes, sound walls and other large infrastructure projects. Although street tree numbers have remained steady, the canopy loss relates to removing large mature trees and replacing with juveniles.

Table 3 – Height Stratified Vegetation Map



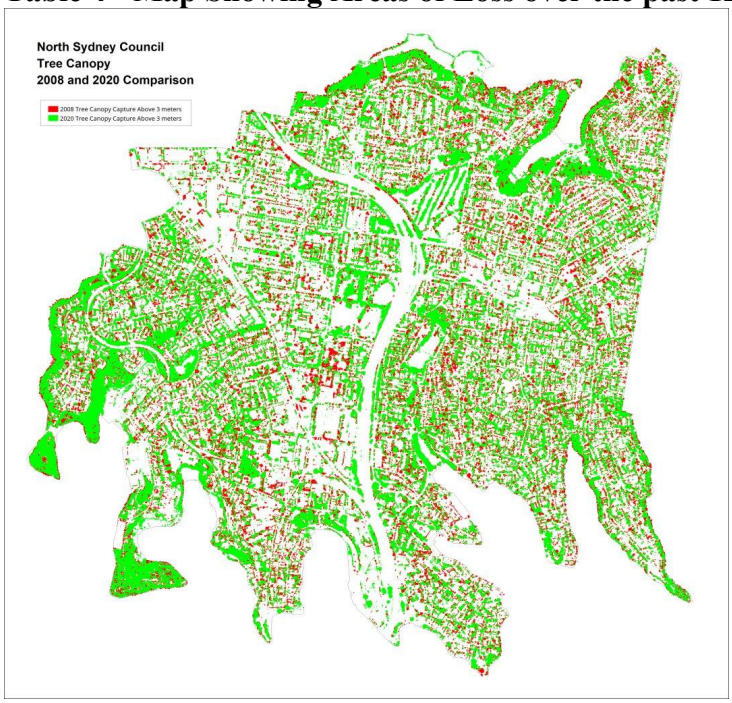
The map above shows where the different heights of vegetation exist:

- White means there is no vegetation, i.e. buildings, roads, paths, carparks etc.
- Light green is lawn or low shrubs. The map clearly shows sportsfields and golf courses.
- The other colours show where the different height trees exist. Most of our tallest canopy trees are in areas of bushland.
- The pie chart below shows the approximate proportions of the different height strata.



The above pie chart shows that 5% of North Sydney's canopy cover consists of small or juvenile trees 3-5m tall, 10% is trees 5-10m tall and 10% is trees 10-20m. Only 2% of our canopy cover is made up of trees greater than 20m and these are mostly located in bushland areas. 15% of our land area is covered by lawns or low shrubs.

Table 4 - Map Showing Areas of Loss over the past 12 years



In the above table, those areas showing as 'Red' represent canopy that has been lost in the past 12 years.

DRAFT AMENDMENTS TO NSDCP 2013

As indicated in the background section to this report, Council endorsed a proposed reduction in the thresholds to the instances when approval must be sought before a tree may be removed or pruned. The proposed amendments were primarily based on Council's need to reverse the decline in the urban canopy as identified under Urban Forest Policy (based on 2017 figures) and the need to meet State targets. Council is considering a post exhibition report to the draft amendments to NSDCP 2013 concurrently with this report.

The post exhibition report highlights that there was strong opposition to the proposed changes to the thresholds which would necessitate the lodging of a permit to obtain approval to remove or prune trees. However, many of the submissions were based on an incomplete understanding of the permit/approval system. In particular, they had in most instances not considered the exemption requirements whereby a permit/approval was not required. The most recent survey clearly shows a further decline in the urban canopy and therefore reinforces the need to impose stricter requirements on the removal and pruning of existing trees.

CONCLUSION

Strategic management of the urban forest including regular monitoring of performance using industry-leading technology has allowed Council to identify trends and implement early actions in an effort to mitigate negative outcomes. The results of the March 2020 aerial canopy mapping confirm what OSE has already reported to Council: Canopy cover across the North Sydney LGA is declining.

Urban canopy increase requires a combination of tree protection, tree maintenance, and tree planting to be fully realised and efficiently implemented. As trees and tree crowns take time to grow, it may require 20 to 30 years to achieve a significant increase in canopy cover hence the importance of a comprehensive long-term strategy that engages all stakeholders, has clearly defined steps, and has easily measurable performance criteria.

The canopy expansion that North Sydney enjoyed from 1997 to 2008 is most likely the result of thoughtful and conscientious planting in the 1980's. To ensure ongoing canopy cover that meets targets Council needs to take immediate action to stop the losses and become more proactive in promoting planting, particularly in those areas that are showing the most significant decline.

Implementation of the actions set out in the North Sydney Urban Forest Strategy 2019 is crucial to halt and reverse the current decline in canopy cover. Council has already endorsed these actions through past resolutions with one of the most critical actions being to review and amend current tree protection policies. The endorsed draft

amendments to NSDCP 2013 will bring North Sydney Council's policy into line with other metropolitan councils and ensure better protection of this extremely important and valuable community resource, particularly across those land uses and tenures that are experiencing the highest levels of decline.

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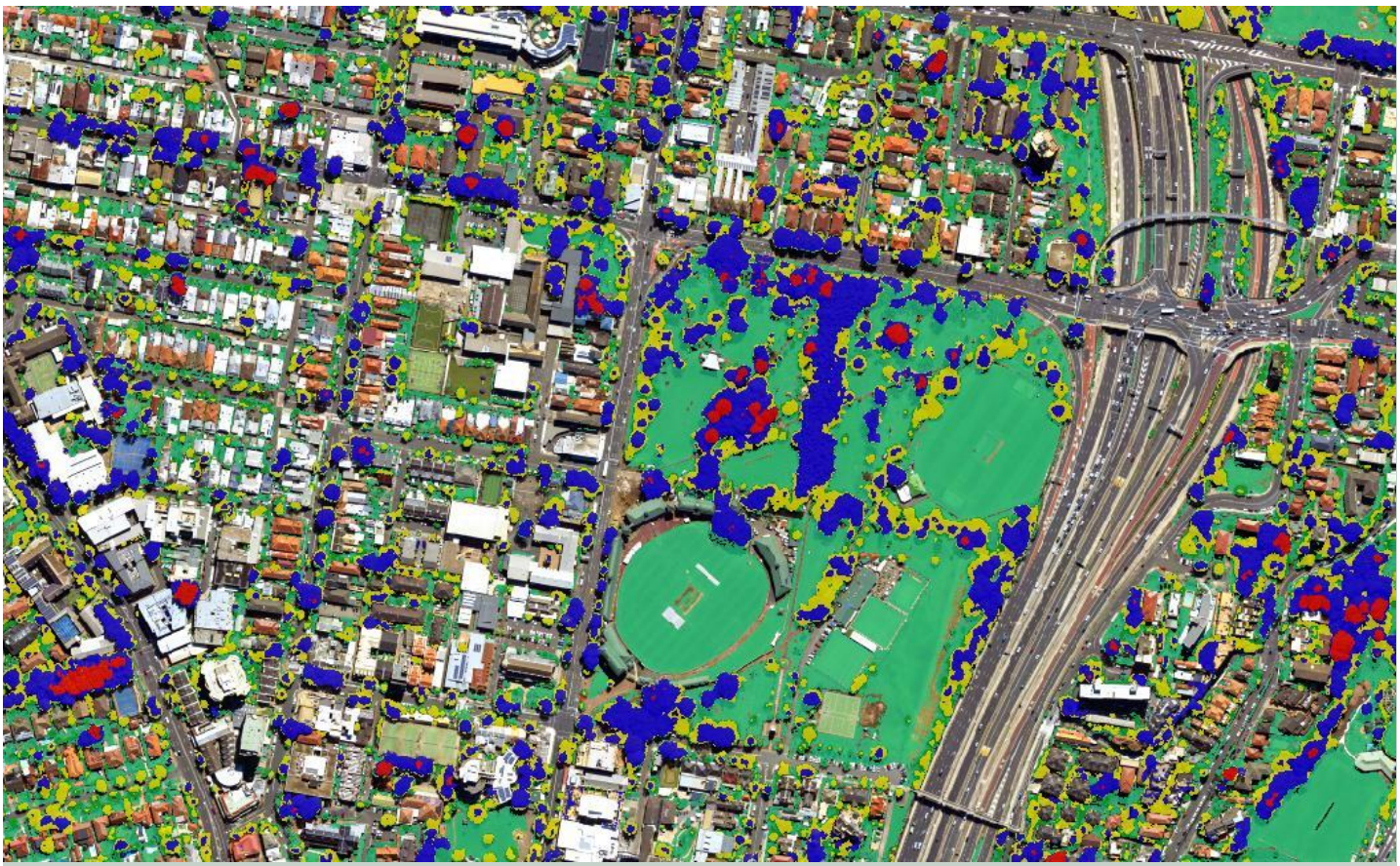

Aerial Measurement of Tree Canopy Cover - 2020

North Sydney Council

Report No. J20442

22nd May 2020

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REVISION SCHEDULE

Revision	Report Description	Submission Date	Author(s)
A	Aerial measurement of tree canopy cover	22 May 2020	Briony Williams

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Executive Summary

North Sydney Council (the Council) covers approximately ten square kilometres and is characterised by steep or hilly terrain and 18.6km of harbour foreshore. The Council has a comprehensive Urban Forest Strategy and has been measuring canopy cover regularly since 1997. The last aerial measurement was carried out in 2017 and showed the average canopy cover at approximately 28%. Accurate canopy cover data is essential for the Council to review and report publicly on canopy cover performance, and for the Council to identify issues and develop targeted actions and/or budgetary expenditure.

The Council engaged ArborCarbon to acquire, process and deliver remotely sensed data that will be used by the Council to report on their urban forest targets. ArborCarbon maintains a unique 11-band airborne multispectral camera system (ArborCam) optimised for the accurate detection of vegetation and subtle changes in vegetation condition. The ArborCam was used to acquire high resolution imagery that was used to accurately quantify canopy cover. Canopy cover statistics were extracted and categorized into different height strata, land zones and land ownerships, as determined by the Council.

High-resolution airborne multispectral imagery was acquired at 14,000 ft above ground level over the Council with cloudless conditions between 12:00 and 14:00 on March 15. Imagery was acquired for this project with the ArborCam system with a ground sample distance (GSD) ranging from 14 cm/pixel to 40 cm/pixel. A Digital Surface Model was generated from the acquired imagery for the full extent of the Council, enabling the stratification of vegetation into five pre-determined height categories as follows: 0-3m, 3-5m, 5-10m, 10-20m and >20m. For the purposes of this report, all vegetation >3m above the ground was classified as canopy.

Height-stratified vegetation cover was calculated for the Council as a whole. Over half (614.7 ha, 58%) of the Council is non-vegetated. The remaining 42% is covered by vegetation of various strata levels, totalling 440.05 ha. 15% of the total area is covered by vegetation 0-3m in height. Both the 5-10m and 10-20m categories cover 10% of the Council each. Vegetation 3-5m in height covers 5% of the Council, while vegetation >20m in height covers the remaining 2%.

Overall, there has been a Council-wide decrease in canopy cover of 1.2% since 2017, continuing the downward trend in canopy cover since 2008. This decrease is reflected across all land use and land tenures except public land which remained stable. Canopy cover over the CBD decreased by 2.3%, urban decreased by 1.1%, and suburban decreased by 1%. Canopy cover in private land declined by 1.6% and roads by 0.4%.

Table of Contents

List of Figures

List of Tables

1 Introduction

North Sydney Council (the Council) covers approximately ten square kilometres and is characterised by steep or hilly terrain and 18.6km of harbour foreshore. There are two major business districts that feature high density high-rise buildings; North Sydney and St Leonards. There are also a number of low-rise commercial areas at Cammeray, Crows Nest, Cremorne & Neutral Bay plus smaller village centres at Kirribilli, Milson's Point, Blues Point, Waverton and Wollstonecraft.

The Council has a comprehensive Urban Forest Strategy and has been measuring canopy cover regularly since 1997. The last aerial measurement was carried out in 2017 and showed the average canopy cover at approximately 28%. Accurate canopy cover data is essential for the Council to review and report publicly on canopy cover performance, and for the Council to identify issues and develop targeted actions and/or budgetary expenditure.

The Council engaged ArborCarbon to acquire, process and deliver remotely sensed data that will be used by the Council to report on their urban forest targets. ArborCarbon maintains a unique 11-band airborne multispectral camera system (ArborCam) optimised for the accurate detection of vegetation and subtle changes in vegetation condition. The ArborCam was used to acquire high resolution imagery to accurately quantify canopy cover. Canopy cover statistics were extracted and categorized into different height strata, land zones and land ownerships, as determined by the Council.

2 Methods

2.1 Airborne Imagery Acquisition

High-resolution airborne multispectral imagery was acquired at 14,000 ft above ground level over the Council with cloudless conditions between 12:00 and 14:00 on March 15. Imagery was acquired for this project with the ArborCam system with a ground sample distance (GSD) ranging from 14 cm/pixel to 40 cm/pixel dependent on the spectral band. Imagery was comprised of three broad bands in the visible (VIS) region of the electromagnetic spectrum, and an additional seven narrow bands strategically positioned in the VIS and near infra-red (NIR) regions to detect subtle variations and changes in vegetation condition.

2.2 Data processing and analysis

The high-resolution airborne imagery datasets were geometrically corrected and orthorectified using ArborCarbon's 2017 North Sydney Council airborne datasets. A Digital Surface Model was generated from the acquired imagery for the full extent of the Council, enabling the stratification of vegetation into five pre-determined height categories as follows: 0-3m, 3-5m, 5-10m, 10-20m and >20m. For the purposes of this report, all vegetation >3m above the ground was classified as canopy.

Height-stratified vegetation cover statistics were calculated in pre-determined land use boundaries (CBD, suburban and urban areas; Figure 1) and land tenure boundaries (private, public and roads; Figure 2).

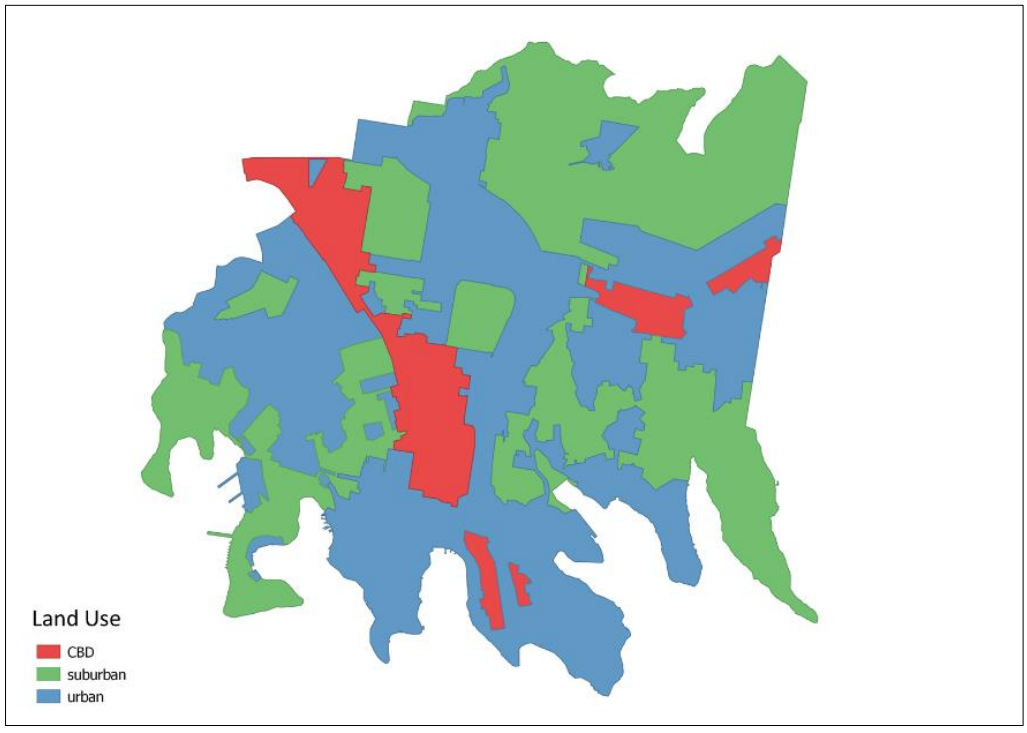

Figure 1: Land Use boundaries for the North Sydney Council.

Figure 2: Land Tenure boundaries for the North Sydney Council.

3 Results and Discussion

3.1 High-resolution imagery

The acquired data was processed to produce high-resolution True Colour Composite (TCC) imagery (Figure 3), False Colour Composite (FCC) imagery (Figure 4) and a height-stratified vegetation cover dataset (Figure 5) across the 1049 ha of the North Sydney Council.

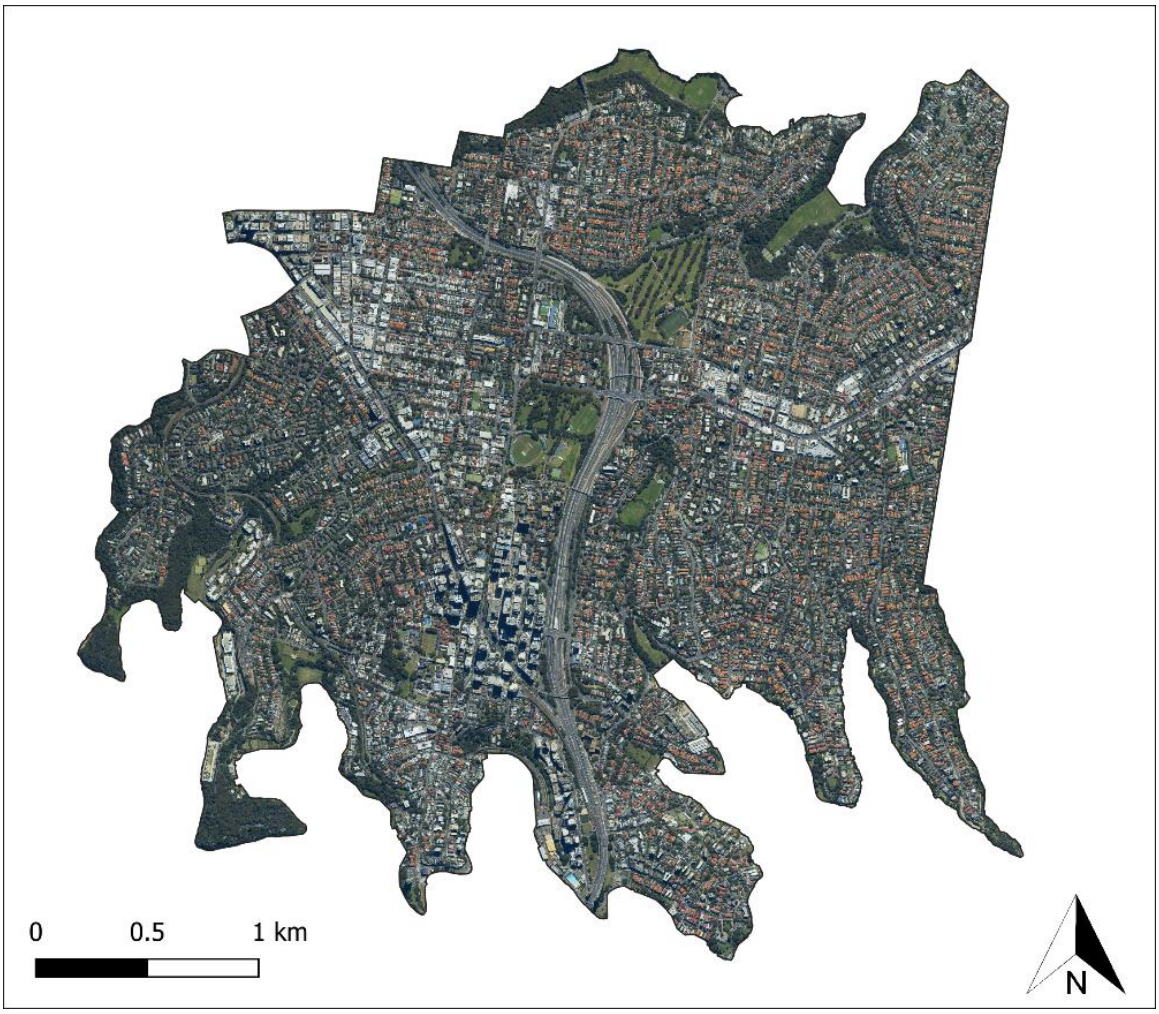

Figure 3: High-resolution true colour composite of North Sydney Council.

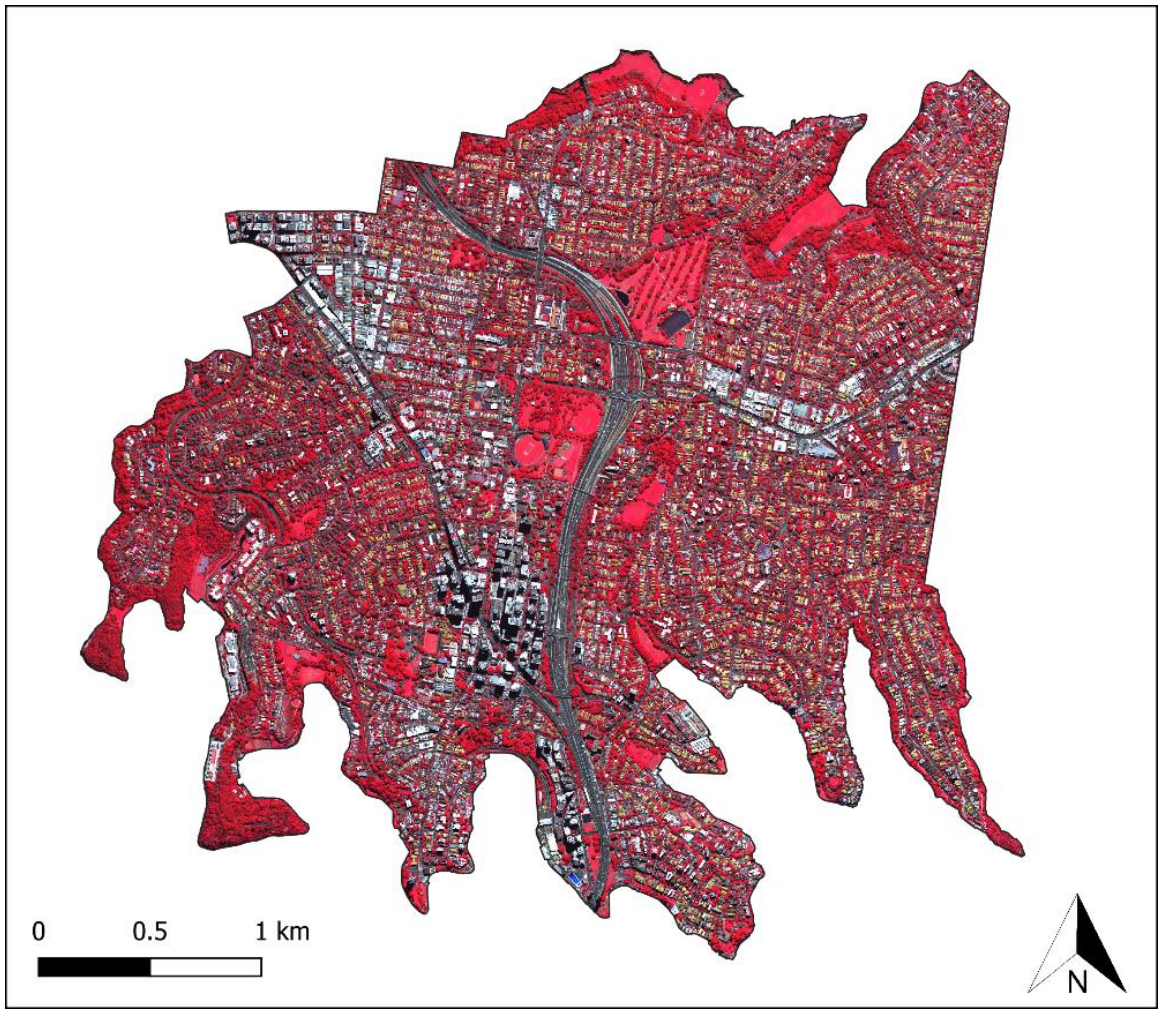

Figure 4: False colour composite over the North Sydney Council showing vegetation (red pixels).

The FCC dataset (Figure 4) was derived from a 3-band subset of the multispectral imagery (NIR, red and green). FCC imagery is commonly used in remote sensing to illustrate vegetation cover, which is displayed as red pixels.

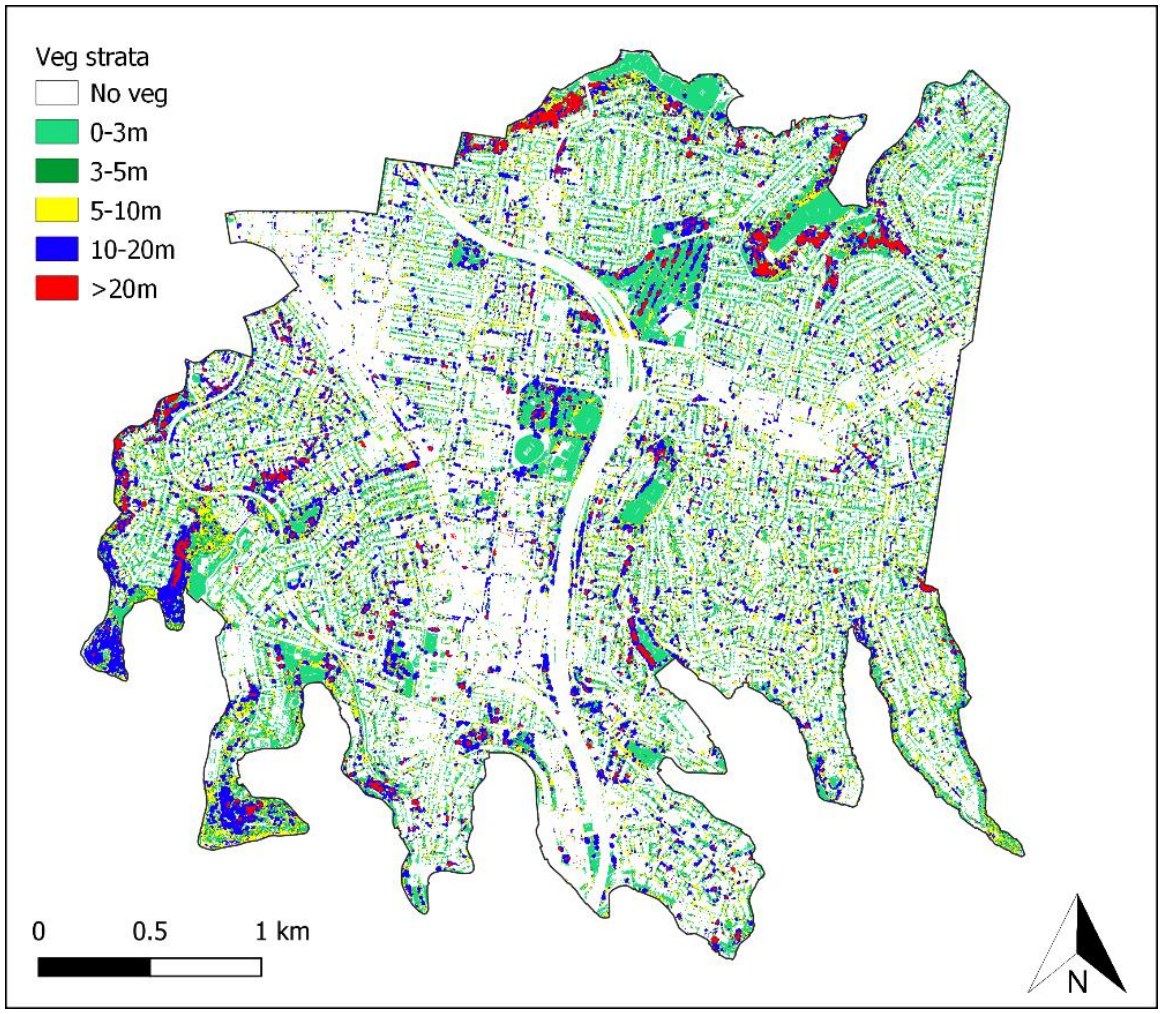

Figure 5: Height-stratified vegetation dataset derived with each strata displayed in a different colour: 0-3m light green, 3-5m dark green, 5-10m yellow, 10-20m blue, and >20m red.

The height-stratified vegetation cover dataset (Figure 5) is comprised of specific height strata colourised as follows: 0-3m light green, 3-5m dark green, 5-10m yellow, 10-20m blue, and >20m red. This colour scheme is used in all illustrations of the height-stratified dataset in this report.

Examples of close-up imagery derived from each of these datasets and the different layers of information they provide appear in Figure 6.

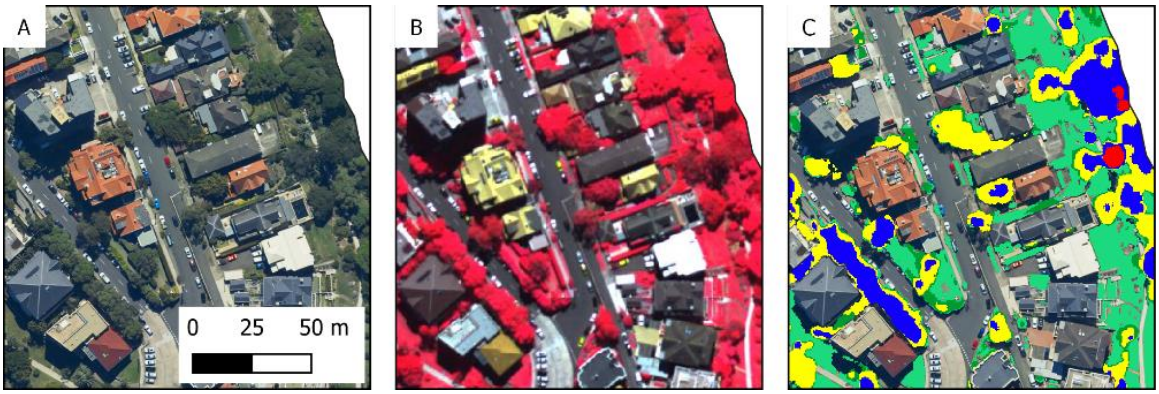

Figure 6: Close-up image of each of the datasets generated for the North Sydney Council: A) High-resolution True Colour Composite; B) False Colour Composite (FCC) showing vegetation in red; C) Height-stratified vegetation cover, with each stratum displayed as a different colour.

3.2 Change in canopy cover over time

Overall, there has been a Council-wide decrease in canopy cover of 1.2% since 2017. This decrease is reflected across all land use and land tenures except public land, which remained stable. Canopy cover over the CBD decreased by 2.3%, urban decreased by 1.1%, and suburban decreased by 1%. Canopy cover in private land declined by 1.6% and roads by 0.4%.

Table 1: Change in canopy cover (vegetation >3m in height) in the North Sydney Council over time.

		Canopy cover (% of land use/tenure area)					
Land use/tenure	**% of LGA**	**1997**	**2001**	**2008**	**2014**	**2017**	**2020**
Council wide	100.0	19.0	24.0	33.9	30.7	28.2	27.0
CBD	10.0			16.5	13.5	14.2	11.9
Urban	48.3			32.4	28.8	26.9	25.8
Suburban	41.7			39.8	37.0	33.0	32.0
Private Land	58.0			31.6	26.4	24.0	22.4
Public Land	25.7			50.5	52.8	50.0	50.0
Roads	16.3			28.1	26.1	23.4	23.0

3.3 Analysis of vegetation cover

3.3.1 Council Wide

Height-stratified vegetation cover was calculated for the Council as a whole. Over half (614.7 ha, 58%) of the Council is non-vegetated (Table 2, Figure 7). The remaining 42% is covered by vegetation of various strata levels, totalling 440.05 ha. 15% of the total area is covered by vegetation 0-3m in height. Both the 5-10m and the 10-20m categories cover 10% of the Council each. Vegetation 3-5m in height covers 5% of the Council, while vegetation >20m in height covers the remaining 2%.

Table 2: Area of council wide height stratified vegetation cover in hectares.

	Height Stratified Vegetation Cover (ha)						
	Total area (ha)	**No veg**	**0-3m**	**3-5m**	**5-10m**	**10-20m**	**>20m**
Council Wide	1054.7	614.7	154.7	53.0	104.6	109.5	18.2

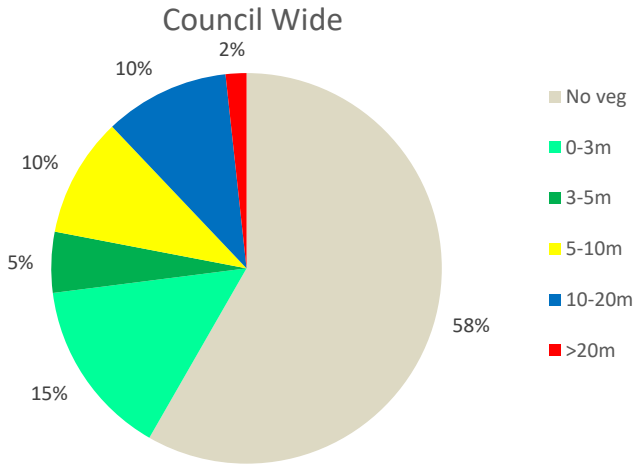

Figure 7: Contribution of each vegetation height strata across the total North Sydney Council area.

3.3.2 Land Use and Land Tenure

Height-stratified vegetation cover was calculated for each land use and each land tenure category. 85% (89.5 ha) of the CBD surface, which makes up 10% of the total Council area, is non-vegetated (Figure 8 A, Table 3). The remaining 15% is vegetated. 3% of the area is covered by vegetation 0-3m in height, while 2% is 3-5m in height. The remaining 10% is evenly split between 5-10m and 10-20m in height.

Over half (53%) of the suburban area is vegetated (Figure 8 B). There is 92.2 ha of vegetation 0-3m in height (Table 3). This represents 21% of the total suburban area. The remaining vegetation is 6% 3-5m, 11% 5-10m, 12% 10-20m and 3% 20m and over.

Urban areas had 37% vegetation cover (Figure 8 C), which is 16% less than suburban areas. The categories that make up canopy (>3m) were similar in coverage to suburban areas – 5%, 10%, 10% and 1% for 3-5m, 5-10m, 10-20m and >20m, respectively. Vegetation 0-3m covers 11% of suburban areas.

In terms of land tenure, 65% (369.7 ha) of private land is non-vegetated (Figure 8 D, Table 4). 13% is covered by vegetation 0-3m in height, 5% is 0-3m, 10% is 5-10m, 10% is 10-20m and 1% is >20m.

Public land has the least percent coverage (19%) of non-vegetated surfaces (Figure 8). Vegetation 0-3m in height covers 31% of public land, or 53 ha (Table 4). 24% of public land is covered by vegetation 10-20m in height. 15% of the land is covered by vegetation 5-10m in height. The remaining vegetation is >20m (6%) and 3-5m (5%).

68% of road reserves is non-vegetation (Figure 8). The remaining 32% is vegetation. The strata categories 0-3m, 5-10m and 10-20m each make up 9% of the vegetation cover. The remaining vegetation cover is 3-5m (4%) and more than 20m (1%).

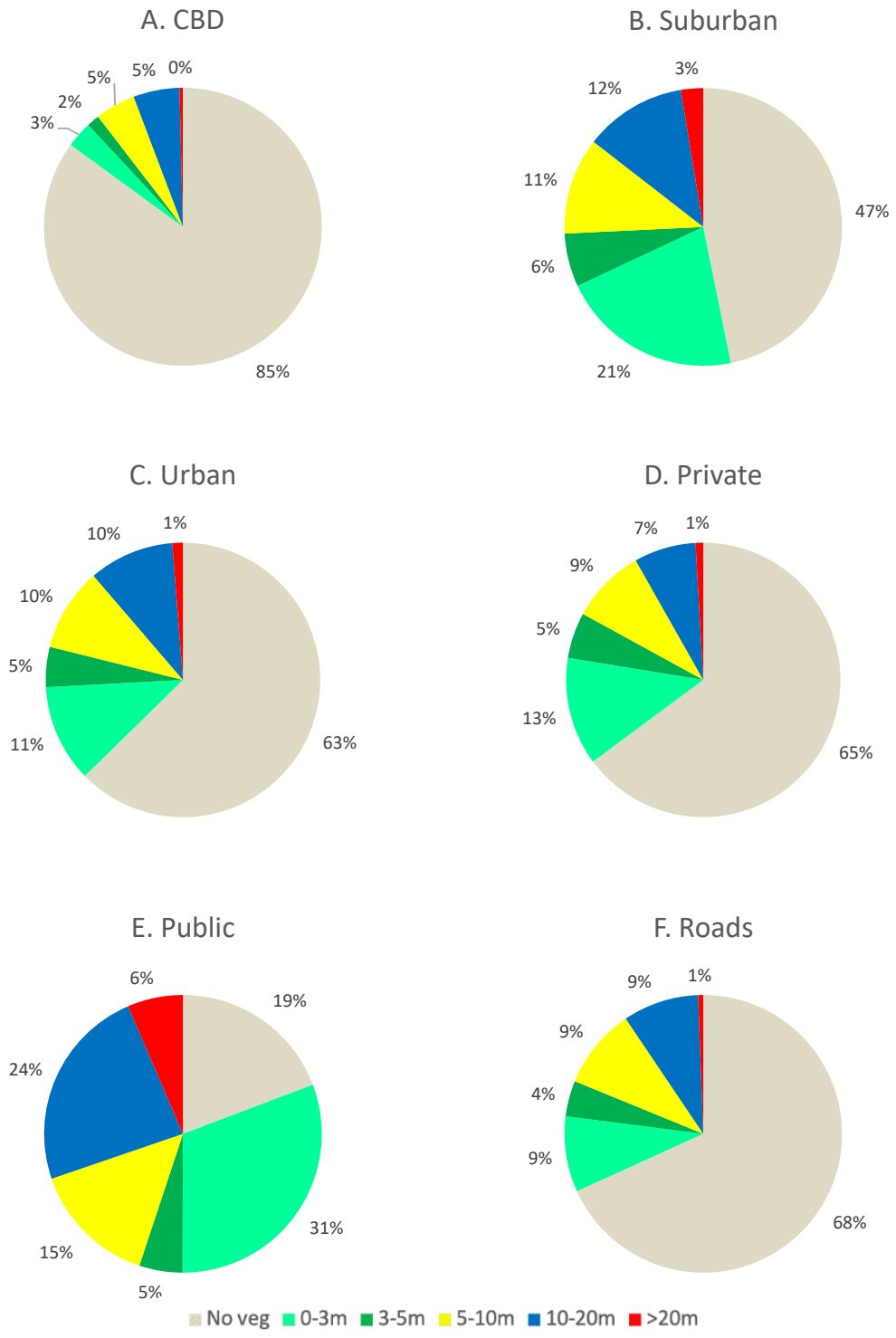

Figure 8: Height-stratified vegetation cover, including non-vegetation, for land use categories CBD (A), suburban (B), and urban (C), and land tenure categories private (D), public (E) and roads (F).

Table 3: Area of height stratified vegetation cover in hectares for land use areas.

	Land Use Height Stratified Vegetation Cover (ha)						
	Total area (ha)	**No veg**	**0-3m**	**3-5m**	**5-10m**	**10-20m**	**>20m**
CBD	105.3	89.5	3.2	1.5	4.9	5.7	0.4
Suburban	438.4	205.3	92.9	27.3	49.4	52.2	11.4
Urban	506.5	317.4	58.2	24.0	49.7	50.9	6.3

Table 4: Area of height stratified vegetation cover in hectares for land tenure areas.

	Land Tenure Height Stratified Vegetation Cover (ha)						
	Total area (ha)	**No veg**	**0-3m**	**3-5m**	**5-10m**	**10-20m**	**>20m**
Private	611.75	396.72	77.83	33.07	53.98	44.65	5.50
Public	172.03	33.12	52.98	8.66	25.24	40.89	11.14
Roads	270.93	184.81	23.87	11.28	25.41	23.96	1.60

As discussed in earlier reports, previous canopy cover studies of the North Sydney Council have used different land use and land tenure boundaries for analysis, resulting in different statistics that are not directly comparable. The 2017 report discussed and compared canopy cover between the years of 2008 and 2017, therefore this report will focus on canopy change from 2017 to 2020 only. The current study has used the same boundaries, and similar acquisition and analysis techniques to 2017, resulting in data that is more comparable. The only known issue that may be causing some uncertainty among the canopy change figures is the different time of year of acquisition for 2017 and 2020. Acquisition in 2017 occurred in November 2017 when many Jacaranda *(Jacaranda mimosifolia)* and other deciduous trees still lacked foliage or were in flower, preventing their accurate detection. The 2017 figures used in this report include analysis subsequent to the 2017 report that estimated the cover of the missing Jacaranda trees.

The greatest loss of canopy (2.3%) between 2017 and 2020 was in the CBD. This equates to 2.4 ha of canopy. Figure 9 illustrates the loss of canopy between 2017 and 2020 in the CBD due to construction.

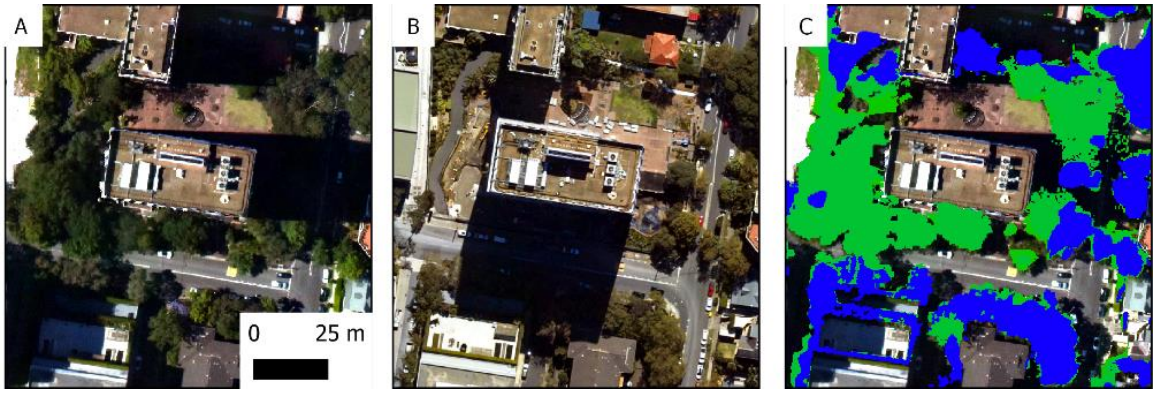

Figure 9: Canopy loss in the CBD between 2017 and 2020. A) 2017 true colour composite. B) 2020 true colour composite. C) The green polygons are canopy in 2017, while the blue polygons are canopy in 2020, demonstrating a loss in canopy where trees were removed.

Private land also experienced a 9.9 ha (1.6%) decrease in canopy cover. Figure 10 illustrates loss of mature trees and canopy cover as a result of land clearing.

Figure 10: Canopy loss in the private land between 2017 and 2020. A) 2017 true colour composite. B) 2020 true colour composite. C) The green polygons are canopy in 2017, while the blue polygons are canopy in 2020, demonstrating a loss in canopy where trees were removed.

4 Conclusion

This study provides an accurate measurement of vegetation cover, that can be compared to previous year's canopy cover estimates.

At the time of acquisition, in March 2020, the North Sydney Council had a total area of 440.05 ha of vegetation, covering 42% of the total Council area. Of this, 285.4 ha was canopy, equating to 27% of the total Council area. This is a 1.2% decrease in canopy since 2017, continuing the downward trend in canopy cover since 2008.