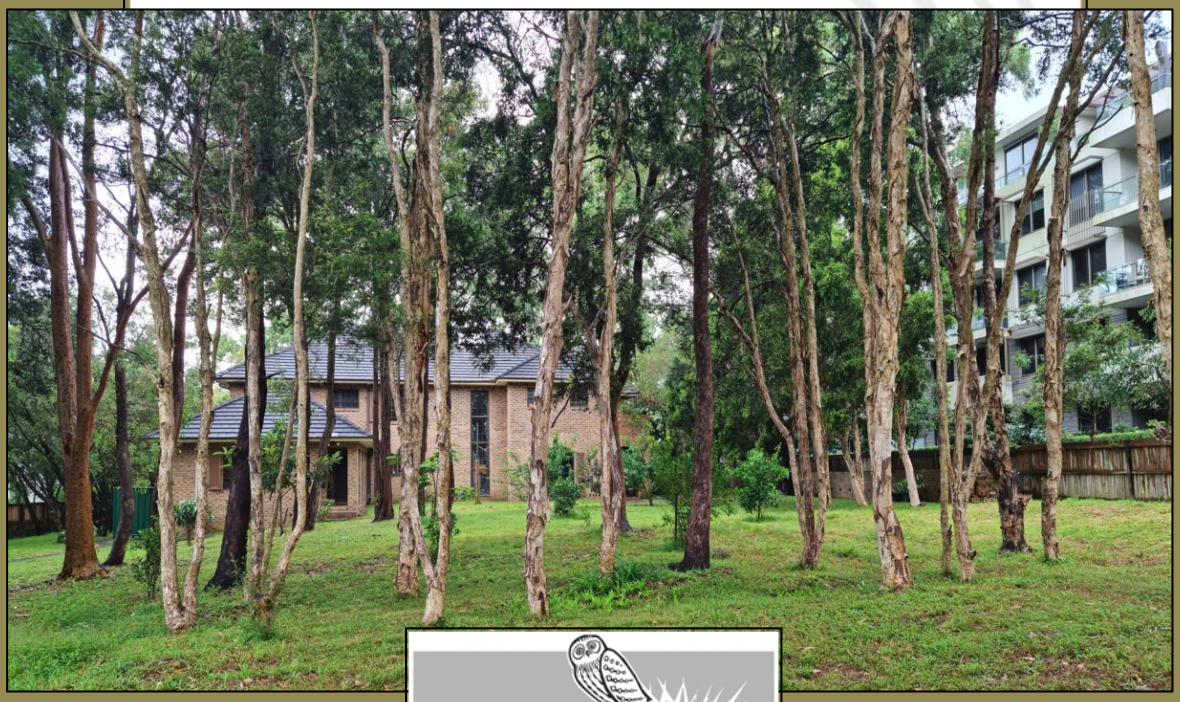
Biodiversity Impact Assessment

Lot 1 DP 748682
130 Killeaton Street
St Ives
Ku-ring-gai LGA

For: AHG Homebush Pty Ltd

REF: KMC 21-1154

28th September 2023



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Cover: The central row of planted native trees in the rear garden.

Photo: E. Ashby, 11th February 2022.

SUMMARY

This Biodiversity Impact Assessment addresses likely impacts of the construction of a residential flat building that would be facilitated by the Planning Proposal to rezone the property at 130 Killeaton Street, St Ives.

The site currently contains a Presbytery and planted garden dominated by Australian native trees. All but one of the trees have been planted in the last 40 years, and the species composition in parts of the front and rear garden is consistent with STIF CEEC.

The STIF trees and native understorey beneath them totals an area of approximately 365 square metres. The potential development will result in the direct loss of approximately 287 square metres of this occurrence of STIF-equivalent vegetation, comprising 14 trees. This is considered to be an insignificant loss, given the local occurrence of STIF is in the order of 22 hectares.

There is no formal requirement for offsetting of this impact, as the Biodiversity Offsets Scheme is not triggered. Notably, even if the scheme was triggered, there would still be no requirement for offsetting as the vegetation on site is Planted Native Vegetation which is specifically exempt in accordance with Appendix D of the *Biodiversity Assessment Method 2020*. The losses can otherwise be ameliorated on site by the enhancement of the remaining garden areas with an emphasis on STIF species.

Survey also established the presence or likely presence of three species of bats:

- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat

The direct loss of trees will represent the loss of potential or realised foraging habitat for these three species. However, again the loss is considered to be very small given the high mobility of each species and the availability of large areas of habitat within the local area, much of which is reserved.

The available foraging resources on site for the Grey-headed Flying-fox can be improved and the potential losses ameliorated by targeted planting as part of the recommended conservation management of the retained areas of garden. Conservation management strategies will also improve the value of the garden as foraging habitat for the threatened microbat species.

Formal consideration has been given to the potential for impact on the relevant listed matters of conservation significance:

- Under Commonwealth legislation, the *EPBC Act 1999* requires that actions judged to significantly impact upon MNES are to be assessed via a formal referral process. This Biodiversity Impact Assessment report has determined that no such a referral needs to be made to the Department of Climate Change, Energy, the Environment and Water; and
- Under NSW legislation, this Biodiversity Impact Assessment report has applied the Test of Significance per the *Biodiversity Conservation Act 2016* to the listed species and communities observed or likely to occur on site. Those tests concluded that a significant adverse impact is unlikely to occur to those entities.

Therefore, no further ecological impact assessments pursuant to Commonwealth or NSW legislation are required.

Potential for the vegetation on site to qualify under the Biodiversity land pursuant to the *Ku-ring-gai Local Environmental Plan 2015* or Greenweb land mapping pursuant to the *Ku-ring-gai Development Control Plan 2022* was explored. The vegetation on site does not satisfy any of the criteria that Council relies upon to

identify such land as it is small and relatively isolated, is not a remnant patch, is not in good condition, is not part of a recognised corridor, and does not contain significant trees. Therefore none of the Biodiversity controls arising from the *KDCP 2022* are applicable, although the recommended ameliorative measures are consistent with those for Canopy Remnant.

The following recommendations are made in order to improve the proposal's biodiversity outcomes and ameliorate some of the potential impacts:

- The retained garden and other new landscaped areas should be planned and managed with a conservation objective as detailed in an approved management plan that is developed and implemented in conjunction with the Landscape Plan.
- The main conservation objectives of this plan shall be *inter alia*
    - Enrichment of STIF with an increase in species diversity and structural complexity.
    - Planting palette to be guided by the use of local provenance material of characteristic STIF species *sensu* NSW Scientific Committee Final Determination
    - Particular attention should be paid to planting of mid storey species, an important structural element generally absent from stands of STIF in urban settings.
    - Weed control using low impact methods.
- For the benefit of *Pteropus poliocephalus* Grey-headed Flying-fox, the following tree species are particularly recommended for planting in order to bolster the foraging resources available in early spring:
    - *Syncarpia glomulifera* Turpentine
    - *Eucalyptus punctata* Grey Gum
    - *Corymbia maculata* Spotted Gum
- Because of the potential for *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat to be roosting in man-made structures on site, it is recommended that demolition is carried out under ecological supervision.
- Artificial roosting habitat suitable for *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat should also be installed in the retained trees in order to compensate for the loss of potential sites in the buildings and / or to enrich the habitat for this species.

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1 INTRODUCTION

1.1 Background and Scope

Keystone Ecological has been contracted by AHG Homebush Pty Ltd to prepare an assessment of the likely impact of a proposed Planning Proposal upon nationally and state-listed threatened flora and fauna, and their habitats. It is proposed to rezone land from SP2 to R4, allowing for the development of a residential flat building in St Ives in the Ku-ring-gai Local Government Area (LGA).

The following standard procedures guided this assessment:

1. Review of the existing literature and information currently available for the development site and general locality to determine issues for consideration;
2. Flora survey to identify species and vegetation communities present on the development site and surrounds;
3. Fauna habitat assessment to identify the likely species present on the development site and in the local area;
4. Fauna survey appropriate to the available habitats;
5. Assessment of the conservation value of the species and communities recorded or identified with potential to occur on the development site; and
6. Identification of specific measures that may be incorporated into the design of the proposed action to provide for amelioration of likely impacts upon biodiversity.

This Biodiversity Impact Assessment (BIA) also takes into account the relevant biodiversity matters detailed in the minutes of the Pre-planning Proposal Application meeting held on 15th December 2021, specifically:

Biodiversity

Council has identified that Council's vegetation mapping does not map a vegetation community / threatened vegetation onsite and as such the Terrestrial Biodiversity Map within the Ku-ring-gai Local Environmental Plan 2015 Section 6.3 and Greenweb mapping within Ku-ring-gai Development Control Plan Part 18 are also not mapped within the site.

Following a site inspection on the 14/12/21, it has been identified that these mapping products require updating. During this visit it was identified that vegetation within the site consists of native - remnant canopy and understory species; amongst planted canopy, mid storey and ground cover species, as well as high understory weed infestation. This native vegetation is considered to form part of the STIF / BGHF ecological communities and may provide habitat for mobile threatened species.

As such it is important that the planning proposal addresses the likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal. This will require an ecological assessment to:

- *Identify any ecological constraints to the planning proposal (e.g. ecological communities listed in the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) or Biodiversity Conservation Act 2016 (BC Act), or habitat for threatened species); and*
- *Identify and map vegetation within the site (addressing NSW plant community types and threatened ecological communities via the Biodiversity Assessment Methodology); and*
- *Identify any fauna habitat features of biodiversity importance or significant trees; and*
- *Examine the proposal against relevant planning and statutory requirements.*

This BIA is also responsive to the decision arrived at by the Strategic Planning Panel of Sydney North whereby it was determined that the proposal has merit and should proceed to a Gateway determination. In their advice dated 25th August 2023, the Panel has specifically requested that the planning proposal addresses the following:

- *Update Arborist Report to confirm the location, species identification, and level of significance of the trees (all included on the one map);*
- *Update Biodiversity Impact Assessment, including recommendations on the impact on significant tree species and potential biodiversity offsets; and*
- *Following the outcomes of the updated Arborist Report and Biodiversity Impact Assessment, confirm updates required to Council's Terrestrial Biodiversity Map and Greenweb Mapping.*

1.2 The Site and the Proposal

The development site is located at Lot 1 DP 748682, 130 Killeaton Street, St Ives in the Ku-ring-gai Local Government Area (LGA). It lies in the Cumberland IBRA subregion in the Sydney Basin IBRA bioregion with the centre of the development site at approximate grid reference 330180 E, 6266524 N (MGA 56, GDA 2020) on the Hornsby (9130-4S) 1: 25,000 topographic map sheet.

The location of the site is shown in Figure 1 in Appendix 1. The distribution of vegetation and development in the local area is shown in Figure 2 in Appendix 1, with a close aerial view at Figure 3. The site is illustrated in Photographs 1 to 8 in Appendix 2.

The site is currently zoned SP2 Infrastructure – Educational Establishment and totals 2,715 square metres in area. It is a rectangular lot with residential flat buildings on either side, and a two-storey aged care facility currently being constructed across the road. The subject lot now contains a Presbytery and large garden, being part of the educational precinct that supports Corpus Christi School to the south west, and Masada College to the south.

The site is situated near the top of a broad ridge that follows Mona Vale Road to the west and is at approximately 158 metres ASL on the Blacktown soil landscape (see Figure 4 in Appendix 1). This is an example of only a few isolated examples of this soil landscape on the Hornsby plateau, as it is otherwise the dominant soil landscape across the Cumberland Plain. It is comprised of Wianamatta Group shales, which on the plateau are underlain by claystone and laminate lenses within the Hawkesbury Sandstone (Chapman and Murphy 1989).

The site is virtually flat, with only a 1 metre fall from the Killeaton Street frontage to the rear boundary.

Prior to European occupation, the rich soils of the Hornsby Plateau (of which St Ives is a part) gave rise to tall forests of Blue Gums, Blackbutts, and Turpentines. These were rapidly felled in the early days of the colony to build Sydney town. The logs felled from the St Ives area were carted along what is now Mona Vale Road to the Lane Cove River for transport to Sydney until the forests were exhausted in the 1870s (Benson and Howell 1990).

Once the forests were cleared from the plateau, the land was occupied and farmed. Citrus orchards were the dominant agricultural pursuit (Rowland 2008), and, unlike other parts of Ku-ring-gai, the advent of the northern railway did not alter the agricultural nature of St Ives. Instead, St Ives remained predominantly rural until the 1950s (Rowland 2008); urbanisation in St Ives has been slower than in other parts of the LGA.

Contemporary St Ives is a characteristically "leafy" suburb, which is a consequence of canopy trees (mostly exotic plantings and native regrowth) in big yards and large street trees (often of exotic species). These urban trees now provide connections between the significant areas of reserved bushland that surround the St Ives district. Locally, reserves are largely concentrated in gullies, a reflection of past clearing and urban growth. Two notable reserve systems occur nearby - Dalrymple-Hay Nature Reserve (approximately 1 kilometre to the south), and Garigal National Park (less than 1 kilometre east).

The site is currently occupied by many mature and semi-mature trees and an exploration of aerial photography from 1943 to 2022 show that all but one of the trees evident today were planted between 1989 and 1991. The site's development history is further detailed in Section 2 of this BIA.

Although the proposal is for rezoning, this BIA must take into account the potential development that is facilitated by the rezoning and intended by the proponent. Therefore, the development considered for impact comprises the following:

- Demolition of all existing structures;
- Removal of trees within the footprint or assessed by the Project Arborist as dangerous or unable to sustain the impact of the footprint to their Tree Protection Zone (TPZ);
- Construction of residential flat building with basement parking;
- Modifications to the existing driveway; and
- Implementation of landscape works.

This BIA relies on the following documents and plans:

- Site survey plan, prepared by Intrax, reference number S#152647, drawing DA-01b, dated 9th October 2020.
- Arboricultural Impact Assessment (including a Tree Protection Plan and Tree Management Plan), prepared by Advanced Treescape Consulting, reference A 22-042a-02 (2023), dated 28th September 2023.

- Ground floor plan, with basement outline prepared by Mackenzie Architects International, reference 21/16, dated 2019.

The potential layout of the proposal is shown in Figure 5.

1.3 Legislative Context

The criteria used to assess likely impacts upon threatened species, populations or endangered ecological communities varies between the Commonwealth, State, Regional and Local jurisdictions.

The ***Environment Protection and Biodiversity Conservation* (*EPBC*) *Act 1999*** is a nationally applicable Act that is administered by the Department of Climate Change, Energy, the Environment and Water. This Act requires approval for actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES).

There are seven MNES that are triggers for Commonwealth assessment and approval. These are:

1. World Heritage properties;
2. National Heritage places;
3. Ramsar wetlands of international importance;
4. Nationally threatened species and communities;
5. Migratory species;
6. Nuclear actions; and
7. Commonwealth marine environment.

Threatened species and ecological communities are listed under Part 13, Division 1, Subdivision A of the *EPBC Act 1999*. Migratory species are listed under Part 13, Division 2, Subdivision A of the Act.

The Department of Climate Change, Energy, the Environment and Water identifies the following:

> *"Under the EPBC Act a person must not take an action that has, will have or is likely to have a significant impact on any of these matters of NES without approval from the Commonwealth Environment Minister. There are penalties for taking such an action without approval.*
>
> *In general, an action that may need approval under the Act will involve some physical interaction with the environment, such as clearing native vegetation, building a new road, discharging pollutants into the environment, or offshore seismic survey.*
>
> *If, following a referral, it is determined that an action is likely to have a significant impact, and approval is therefore required, the action is called a 'controlled action'. The proposal will then undergo a formal assessment and approval process, and cannot proceed unless approval is granted.*

If it is determined that an action is not likely to have a significant impact, then the action is not a controlled action. Approval under the EPBC Act is not required and the action may proceed, subject to obtaining any other necessary permits or approvals."

The ***Biodiversity Conservation (BC) Act 2016*** is the State Act that lists species and communities of conservation significance, and, along with the *Biodiversity Conservation Regulation (BCR) 2017*, also details the assessment and offset process (the Biodiversity Offset Scheme or BOS). It replaces the *Threatened Species Conservation Act 1995* and related parts of the *Environmental Planning and Assessment Act 1979* in regard to impact assessment of listed threatened species and communities, and details the scheme that replaces BioBanking.

In order to determine the type of assessment to be applied and whether the BOS is triggered, it requires consideration of a series of thresholds of the degree of impact.

The first threshold is the relationship of the development footprint with a Biodiversity Values map, as published by the Minister for the Environment and shown in the Biodiversity Offsets Scheme Entry Threshold Tool (https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap) (otherwise known as the orange layer of the BOSET map). This map is curated by the Office of Environment and Heritage, and the Biodiversity Values layer is driven by such things as the known locations of threatened entities, and other protected lands such as important riparian corridors. If the area of clearing is coincident with this layer, then the BOS is triggered and a Biodiversity Development Assessment Report (or BDAR) is to be prepared, in accordance with the Biodiversity Assessment Method (2020) (or BAM).

The other potential triggers for the BOS are the set of primary clearing thresholds detailed in Section 7.2 of the *BCR.* These clearing thresholds are determined by the allowable minimum lot size for the applicable zoning, and the proposed area of vegetation loss. If the proposal exceeds the applicable threshold, then the BOS is triggered and a BDAR is to be prepared in accordance with the BAM.

The type of applicable BDAR is further detailed within Section 3.2 of the BAM. A series of secondary clearing thresholds determine whether it is a "small areas" assessment. If so, a streamlined BDAR is required, as detailed in the BAM.

If none of the area threshold triggers the BOS, then impact assessment is to be conducted in accordance with Section 7.3 of the *BC Act*. Section 7.3 details the test of significance to be applied to all relevant listed matters via consideration of five factors (otherwise referred to as a "5 part test"). If it is considered that a significant impact is likely, then the BOS is triggered.

In this case, the area of impact does not impinge on areas of high Biodiversity Values (see Figure 6 in Appendix 1). There is no Minimum Lot Size attached to this lot, so the actual lot size is used to determine the clearing threshold. In this case, the lot is 2,715 square metres in area, and therefore the primary clearing threshold is 0.25 hectares. The potential area of native vegetation loss here is estimated to be approximately 0.08 hectares, and thus does not exceed the primary threshold.

Therefore, the potential impacts of the proposed development are to be assessed by application of Test of Significance (5 Part tests).

Ku-ring-gai Local Environmental Plan (KLEP) 2015 is applicable to the development site and is to be read in conjunction with the ***Ku-ring-gai Development Control Plan (KDCP) 2022*** to assess planning and development applications within the designated local centres within the LGA. The relevant clauses for this proposal from these local controls are the clauses regarding Biodiversity.

Biodiversity lands are addressed in Part 18 of the *KLCDCP*, where they are further categorised by the Greenweb biodiversity mapping tool. However, the subject lot is not currently affected by any of these local biodiversity provisions.

2 BIODIVERSITY SURVEY AND RESULTS

2.1 Survey Methods

Prior to site survey, the following was carried out:

- Current high quality colour aerial photography (Nearmap) was interpreted prior to field survey to delineate preliminary vegetation community boundaries and areas of disturbance.
- A search of the *EPBC Act 1999* database using the Protected Matters Search Tool on the website of the Department of Climate Change, Energy, the Environment and Water (www.environment.gov.au/erin/ert/epbc/index.html) was completed. The search area was confined to a 10 kilometre radius of the site. This identified MNES listed under the *EPBC Act 1999* that may require further investigation and assessment.
- The online component of the NSW Wildlife Atlas (http://www.bionet.nsw.gov.au/) was interrogated for an area confined to a 10 kilometre radius of the site. This search provided records of threatened species within the locality. These data were further broken down to those within 1.5 kilometres of the site, in accordance with the convention for the buffer recognised by the BAM.
- PlantNet, the online database of the National Herbarium of NSW at the Royal Botanic Gardens was interrogated (http://plantnet.rbgsyd.nsw.gov.au/floraonline.htm) for rare or threatened species that have been recorded in the locality.
- The Atlas of Living Australia (http://www.ala.org.au/) was interrogated for all threatened species recorded within 10 kilometres of the development site. As well as records held by PlantNet and the OEH Wildlife Atlas, this online database also contains records from other institutions (such as State Forests of NSW) or citizen scientists (e.g. via iNaturalist) that may not otherwise be displayed.
- Eremaea Birdline, the online database of bird records for Australia was interrogated (http://ebird.org/ebird/australia/explore) for migratory and threatened species that have been recorded in the locality by citizen scientists.

The resultant lists of threatened species for consideration are detailed in Tables 1 (flora) and 2 (fauna) in Appendix 3.

Site assessment for this BIA was undertaken on the 3rd November 2021, 10th February 2022, 11th February 2022, and 21st December 2022. Survey comprised:

- identification of all flora species on site through intense sampling of a 20 x 20 metres quadrat and random meander across the remainder;
- identification of flora and fauna habitats on site and in the immediate vicinity;
- ultrasonic recording of microbat foraging calls overnight from 10th to 11th February 2022;
- audio recording of diurnal and nocturnal fauna from dusk 10th February 2022 to mid morning 11th February 2022; and
- specific investigation of the identity of each of the trees previously identified as Flood Gum.

Flora specimens collected for later identification if plants were not readily identifiable in the field. Such specimens were identified according to Harden (1990, 1991, 1992, 1993) or Pellow et al. (2009) and the interactive flora (Flora Online) provided online by NSW National Herbarium of the Royal Botanic Gardens (http://plantnet.rbgsyd.nsw.gov.au/floraonline.htm).

2.2 Survey Limitations

All surveys have inherent limitations as they can only ever represent a sample in time and place of the site's biota. It is an acknowledged limitation that, no matter how much effort or expertise is employed, not all species that use a site will be recorded during ecological survey. For many fauna species, this is due to their mobility, cryptic nature and unpredictable movement throughout their habitat. In addition, migratory species may be present on the site at some times of the year, and absent at others. In addition to ecological reasons, environmental factors (such as weather, drought and bushfire) may impact on the type and number of species recorded within a site at any one time.

Notwithstanding these considerations, the survey is adequate for the biota of interest, particularly as this is a long-developed residential site.

Nevertheless, in order to overcome any survey limitations, this report includes a detailed assessment of the habitats present on and near the site. This habitat analysis is then compared to the results of database searches for threatened species occurring within 1.5 kilometres of the site. This comparison allows for the prediction of potential use of the site by species of conservation significance. Any threatened species considered to have potential habitat within the site is then made subject to a Test of Significance. This process ensures that all threatened species with potential to use the site are considered in the impact assessment, and not just those recorded during the brief survey period.

2.3 History of the Site

An exploration of the available historical aerial photography from 1943 to 2005[1] and more recent aerial photography from 2009 to 2022[2] revealed the development of the garden seen today. A selection of these photographs is reproduced at Figures 7A to 7C in Appendix 1. This series shows the following:

- In 1943 the site was entirely cleared of all woody vegetation except for a single tree. This tree is at the same location as tree 51 – a mature multi-stemmed *Syncarpia glomulifera* Turpentine (see Figure 5 in Appendix 1 and Table 3 in Appendix 3).
- By 1970, a line of trees had been planted in the adjacent lands to the east and west along the shared boundaries. Contemporary observations of what is now the neighbouring school grounds to the west indicate that these plantings were a mixture of *Syncarpia glomulifera* Turpentine and *Eucalyptus microcorys* Tallowwood.

[1] Sourced from NSW Government Spatial Services Historical Imagery Viewer: https://www.spatial.nsw.gov.au/products_and_services/aerial_and_historical_imagery
[2] High quality photomaps sourced from Nearmap: https://apps.nearmap.com

- By 1970, rows of street trees had been planted adjacent to the site's Killeaton Street frontage.
- By 1975 the current rear boundary was established, but the subject lot still remained vacant and cleared, with woody vegetation on site still restricted to the single Turpentine in the centre.
- The Presbytery was built between 1982 and 1989.
- The garden was transformed between 1989 and 1991 from a cleared open grassland to a well treed garden dominated by Australian natives. By 1991, the front, rear, and side gardens displayed the pattern of trees seen today: an avenue of Bottlebrush along the western side of the building, a dense mixed forest style of planting in the front garden, a row of trees along the eastern boundary, and a dense stand of trees in the rear garden planted in three rows.
- Between 1991 and 1994 the street trees had been removed and the canopy trees on site had further developed.
- During the 1990s and 2000s the site's trees continued to grow and a dense canopy continued to develop with little real change evident until 2015. In 2015, there was some removal of canopy near a pathway leading from the building to the school grounds. Over that time, a dense understorey of weeds had also developed.
- Between 2017 and late 2018, understorey clearing had occurred and a number of holes had been dug in a grid pattern. Some of these holes are now occupied by fruit trees, so this was presumably an attempt at establishment of an orchard. There is weed mat evident today beneath the ground covers growing under the trees in the entire rear section of the garden. The installation of the weed mat was presumably part of this weed control strategy.

2.4 Survey Results

2.3.1 Flora

A full list of flora species observed is detailed in Table 4 in Appendix 3.

Native canopy trees now dominate the site, all of which (other than tree 51) are considered to have been planted. The species composition of the trees is eclectic but predominantly native to Australia although not all locally native or native to the ridge habitat. Few of the exotic species observed have been planted – these being primarily the fruit trees – with almost all exotic species being weeds.

A total of 57 flora species were identified on site, of which only 13 of the 25 locally-native species are likely to be naturally-occurring. The vast majority of the species considered to be naturally-occurring are ground covers found growing beneath the native trees.

Half of the species recorded are exotic species and includes serious weeds - High Threat Weeds (such as Large-leaved Privet), and a Weed of National Significance (*Asparagus aethiopicus*). This floristic composition is typical of a suburban garden.

The arboricultural assessment identified and assessed the potential impact on 126 trees. Their fate and ecological values are detailed in Table 3 in Appendix 3. In summary, these trees comprise:

- *Allocasuarina torulosa* (10 individuals) - locally native, all likely to have been planted;
- *Angophora costata* (2 individuals) - locally native, all likely to have been planted;
- *Angophora floribunda* (10 individuals) - locally native, all likely to have been planted;
- *Callistemon viminalis* (25 individuals) – native to the NSW north coast and Queensland, all likely to have been planted;
- *Celtis sinensis* (1 individual) - exotic, weedy species, not likely to have been planted;
- *Corymbia maculata* (2 individuals) - locally native, all likely to have been planted;
- *Eucalyptus grandis* (1 individual) - native to the NSW north coast and Queensland, likely to have been planted;
- *Eucalyptus paniculata* (1 individual) - locally native, likely to have been planted;
- *Eucalyptus pilularis* (5 individuals) - locally native, all likely to have been planted;
- *Eucalyptus punctata* (2 individuals) - locally native, all likely to have been planted;
- *Eucalyptus saligna* (26 individuals) - locally native, all likely to have been planted;
- *Ficus rubiginosa* (1 individual) - locally native, likely to have germinated from bird or Flying-fox droppings;
- *Grevillea robusta* (1 individual) - native to the NSW north coast and Queensland, likely to have been planted although it is somewhat weedy;
- *Ligustrum lucidum* (1 individual) - exotic, weed species, not likely to have been planted;
- *Melaleuca quinquenervia* (1 individual) - locally native, likely to have been planted;
- *Melaleuca styphelioides* (31 individuals) - locally native, all likely to have been planted;
- *Pinus radiata* (1 individual) - exotic, likely to have been planted;
- *Pittosporum undulatum* (1 individual) - locally native, not likely to have been planted; and
- *Syncarpia glomulifera* (4 individuals) - locally native, only one of which is not likely to have been planted.

The structure of the vegetation is very simple - canopy trees over shallow-rooted ground covers. This is a legacy of the long-term management of the site as a garden (e.g. regularly mown and raked) and the presence of tough weed mat that limits the growth of deep-rooted shrubs and trees.

2.3.2 Fauna

Fauna species recorded on site are detailed in Table 5 in Appendix 3.

- Common urban bird species were observed and recorded calling at dawn and dusk;
- The only nocturnal bird recorded was a Tawny Frogmouth;
- Common arboreal mammals were detected by scats (Common Brushtail Possum) and calls (Common Ringtail Possum); and
- Three species of bats were recorded, including the following 2 threatened species:
    - *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat was recorded foraging throughout most of the night. Most notably it was recorded just before dawn, indicating that its day roost site is close to the location of the Anabat recorder (placed in the south western corner in tree 1). This species is listed as Vulnerable under the *Biodiversity Conservation Act 2016;* and

- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat was recorded foraging on site for a brief period during the middle part of the night. This species is listed as Vulnerable under the *Biodiversity Conservation Act 2016.*

2.5 Threatened Biota

Results from the OEH Bionet Wildlife atlas online database searches revealed a number of listed entities that require consideration as part of this assessment. Their habitat requirements and their likelihood to occur on site are explored in Tables 1 and 2 in Appendix 3.

Threatened Flora. No habitats suitable for any candidate threatened flora species are available on site due to its current condition, land use, urban context, and history. No threatened species of flora are considered likely to occur on site naturally.

Threatened Fauna. Two threatened microbat species were recorded during survey:

- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat*;* and
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat*.*

It is considered that given the availability of appropriate foraging habitat and the proximity to the Gordon colony, that *Pteropus poliocephalus* Grey-headed Flying-fox may use the site for foraging when the appropriate trees are in flower.

No other threatened species of fauna are considered likely to occur on site.

Threatened Ecological Community. The determination of the type of vegetation on site is difficult in highly modified urban gardens and is reliant on the capacity to find a best-fit vegetation community or Plant Community Type (PCT) that represents the species observed. To aid in the biodiversity impact assessment process, the Department of Planning and Environment has recently updated the vegetation mapping across NSW, releasing both an extant layer and a layer modelling the vegetation present in 1750, prior to European clearing. These maps and models have also standardised the output to represent the current classification of Plant Community Types (PCTs). This State Vegetation Type Map (SVTM)[3] builds on previous map products, and in this area includes the Sydney Metropolitan Area vegetation map and data[4] (OEH 2016). The SVTM also informs the newly-released "Plot to PCT" tool[5] for determining the PCT represented by a vegetation sample quadrat, and is the basis of the output produced by the "Trees Near Me NSW" App[6].

[3] State Vegetation Type Map (SVTM) available at https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
[4] OEH (2016) The Native Vegetation of the Sydney Metropolitan Area – Version 3.1 VIS_ID 4489, available at SEED (https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU).
[5] Available at https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/nsw-plant-community-type-classification/plot-to-pct-assignment-tool
[6] See https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet/state-vegetation-type-map/trees-near-me-nsw

The extant SVTM shows the subject site as not supporting any classifiable native vegetation, with a few small and widely-separated patches of STIF (PCT 3262) in the local area. The most-recent mapping prior to SVTM (OEH 2016) also did not assign a native vegetation type to the vegetation on site, recognising it instead as an urban patch of exotic and native trees. Both map products are shown in Figure 8 in Appendix 1.

However, STIF may now exist only as remnant / old regrowth trees within the urban landscape (NSW Scientific Committee 2019) and Figure 7 shows that tree 51 *Syncarpia glomulifera* Turpentine is the only "remnant" tree on site. As it is a species listed as Characteristic of STIF, the presence of this CEEC is explored.

Of the 96 trees of locally native species on site (see Table 3 in Appendix 3), 20 individuals of 6 species are Characteristic of STIF (NSW Scientific Committee 2019). While only one of these trees is considered likely to be naturally-occurring, it is acknowledged that the remaining 19 planted Characteristic trees contribute to the local gene pool of STIF and provide ecological benefit similar to naturally-occurring STIF.

Moreover, the ground covers beneath these trees contain many STIF species: of the total of 25 locally-native plant species recorded on site, 15 are listed as Characteristic species of STIF in the Final Determination published by the NSW Scientific Committee (2019) – see Table 4 in Appendix 3. Therefore, the 20 STIF-aligned trees are considered considered here to represent an example of STIF in an urban garden. This definition is also in keeping with the definition of Planted Native Vegetation in BAM 2020.

The STIF on site is therefore considered to comprise the following trees with their associated native understorey:

- 10 x *Allocasuarina torulosa* Forest Oak (trees 45, 49, 65, 71, 82, 104, 112, 113, 119, 120)
- 2 x *Angophora costata* Smooth-barked Apple (trees 35, 39)
- 1 x *Eucalyptus paniculata* Grey Ironbark (tree 111)
- 2 x *Eucalyptus punctata* Grey Gum (trees 80, 86)
- 1 x *Pittosporum undulatum* Sweet Pittosporum (tree 114)
- 4 x *Syncarpia glomulifera* Turpentine (trees 51, 60, 62, 67)

The area occupied by the TPZs of these trees on natural ground (i.e. excluding the building and pathways) is approximately 365 square metres. This is shown in Figure 9 in Appendix 1.

While the NSW listing legally recognises small groups of trees in urban settings as STIF, the Critically Endangered listing under Commonwealth legislation (*EPBC Act 1999*) includes important caveats regarding a remnant's size and condition. For STIF to qualify as this Commonwealth-listed community, a remnant must display the following characteristics:

- The vegetation contains some characteristic components from all structural layers (tree canopy, small tree/shrub midstorey, and understorey);

- Tree canopy cover is greater than 10% and remnant size is greater than one hectare. These areas have the greatest conservation value and their high quality and size makes them most resilient to disturbance;
- However, remnants with tree canopy cover less than 10% are also included in the ecological community, if the fragments are greater than one hectare in size and occur in areas of native vegetation in excess of 5 hectares in area. These areas enhance the potential for connectivity and viability of the ecological community. They support native flora and fauna species by facilitating gene flow among remnants and buffering against disturbance.

It therefore excludes patches of STIF where either the native midstorey/understorey or native canopy trees are absent, as well as occurrences of isolated single trees or shrubs characteristic of the ecological community, and trees in backyards. Although such degraded remnants may have some value as biodiversity reservoirs, the structure of these patches has been so severely modified, that they fall outside the definition of STIF.

The STIF on site therefore does not represent the Commonwealth-listed entity.

It is noted that the re-examination of a number of trees on site has resulted in 26 trees previously identified as *Eucalyptus grandis* Flooded Gum in version 1 of this BIA being reassigned to *Eucalyptus saligna* Sydney Blue Gum.

As this species is not Characteristic of STIF (NSW Scientific Committee 2019), it does not contribute to the occurrence of STIF on site. However, Sydney Blue Gum is a Characteristic species of the eponymous Blue Gum High Forest (BGHF), another CEEC known to occur the local area.

Notwithstanding its relationship to BGHF, the evidence is not compelling enough to recognise an alternative or a second CEEC on site:

- Of the 25 locally-native species recorded on site, only 10 are Characteristic of BGHF.
- There are no remnant BGHF trees on site. Unlike the *Syncarpia glomulifera* Turpentine tree 51 that appears to pre-date all of the other built form and garden trees on site (see Figure 7A), there is no evidence to suggest that any remnant Sydney Blue Gum vegetation occurs.
- The only remnant tree on site (tree 51 *Syncarpia glomulifera* Turpentine) is not a listed Characteristic species of BGHF (NSW Scientific Committee 2011), indicating that the natural vegetation is not BGHF.
- Other than the Turpentine (tree 51), between 1943 and 1989, no trees occur in the locations currently occupied by Sydney Blue Gums (see Figure 7A), but by 1991 vegetation is apparent in all of those garden areas and continue to occupy those areas thereafter (see Figure 7B and 7C). The sudden appearance of trees immediately after the completion of the construction of the Presbytery indicates their human origin rather than natural regeneration.
- All but one of the Sydney Blue Gum trees are located in the front garden, and at high density. Their distribution and density reflects a planted landscape, occurring more or less in a row across the front yard (providing privacy from the street), and following the edge of the accessway (an appealing aesthetic).

- The single Sydney Blue Gum tree not in the front yard is located on the eastern boundary, where it provides maximum amenity for the occupants and privacy from the neighbouring lot, further suggesting it is a planted tree.
- If the presence of Sydney Blue Gums on site represented a natural occurrence, then they should also be growing across the rear garden. Despite a diverse array of tree species in the rear yard, Sydney Blue Gum is notably absent.
- The filter function available in the BioNet Vegetation Classification database was applied to the species list and geographic features of the site. This analysis indicates that STIF (top match) is a better fit than BGHF (6th match). This analysis returned PCT 3262 STIF as the best fit of the 1,419 PCTs returned for consideration, having 25 matches to the 27 factors used.

STIF is therefore preferred as the best fit vegetation type for the flora species on site, being indicated by a number of factors:

- Past fine scale vegetation mapping (OEH 2016) shows surrounding patches as being STIF, including the nearest patch;
- Recent updated regional scale State Vegetation Type Mapping of extant vegetation identifies STIF in all surrounding and nearby patches of vegetation;
- The modelled pre-European 1750 State Vegetation Type Mapping shows the site as occurring within an uninterrupted band of STIF on the slope between the BGHF on the broad ridge above to the sandstone PCTs downslope to the east;
- The floristic composition of the site is more like STIF than BGHF (with 15 Characteristic species, compared with the 10 Characteristic species respectively);
- PCT 3262 STIF is the best fit for the species observed, with 25 matches of 27 factors applied to the filter function of the BioNet Vegetation Database; and
- PCT 3262 STIF is the only nominated PCT option returned by the "Trees Near Me in NSW" App.

2.6 Habitat Value and Connectivity

The main fauna habitat features on the development site are the foraging resources and roosting habitat provided by the canopy trees. The ecological values of the 126 trees on site are detailed in Table 3 in Appendix 3.

The canopy trees present (native and exotic) provide suitable foraging habitat for birds and bats and shelter for possums. Pollen and nectar resources are available for a range of fauna species, including the threatened *Pteropus poliocephalus* Grey-headed Flying-fox. The dominant tree is *Eucalyptus saligna* Sydney Blue Gum, which provides high value nectar and pollen in late summer and early autumn.

No hollow-bearing trees were observed.

St Ives is well-treed, and the LGA generally has a network of bushland reserves connected by a network of street trees and vegetated riparian habitats, The connectivity of site and surrounds is

compromised by Mona Vale Road, but good connectivity is available to Garigal National Park to the east and other reserves to the south via vegetated gullies and other stepping stones.

The trees on site therefore would contribute to the localised movement of fauna and be functionally connected to other areas of vegetation by the movements of highly mobile pollinators such as birds and bats. The main road together with the smaller roads, fences, and intervening developed areas also pose barriers to the movement of terrestrial fauna species.

3 IMPACT AND AMELIORATION

The *Biodiversity Conservation Act 2016* requires - and good environmental practice seeks - to avoid impacts in the first instance, to minimise and ameliorate in the second instance, and then to offset or compensate for residual, unavoidable impacts. The threshold question to be then addressed is the degree of impact – guided by the Test of Significance – and whether it is judged to impose a significant impact on a threatened species or community or an endangered population.

The proposal assessed for this BIA is for the demolition of the existing building and construction of a residential flat building that has a footprint approximately half as big again as the current building. In order to minimise impact, arboricultural advice has been heeded in the development of the footprint. The fate of each tree on site is detailed in Table 3.

A total of 11 trees have been identified by the Project Arborist as failing the Visual Tree Assessment (VTA) and removal is recommended irrespective of any development proposal. These include 1 STIF tree, *Allocasuarina torulosa* Forest Oak (tree 65).

Discounting consideration of these 11 trees, the footprint will result in the loss of 60 trees, comprising:

- 12 STIF trees:
    - 5 x *Allocasuarina torulosa* Forest Oak
    - 2 x *Angophora costata* Smooth-barked Apple
    - 1 x *Eucalyptus paniculata* Grey Ironbark
    - 4 x *Syncarpia glomulifera* Turpentine
- 35 locally-native trees (all planted) that do not represent STIF:
    - 1 x *Angophora floribunda* Rough-barked Apple
    - 1 x *Corymbia maculata* Spotted Gum
    - 1 x *Eucalyptus pilularis* Blackbutt
    - 12 x *Eucalyptus saligna* Sydney Blue Gum
    - 20 x *Melaleuca styphelioides* Prickly-leaved Paperbark
- 11 trees native to the NSW north coast:
    - 10 x *Callistemon viminalis* Weeping Bottlebrush
    - 1 x *Eucalyptus grandis* Flooded Gum
- 2 exotic trees that are weeds:
    - 1 x *Celtis sinensis* Chinese Hackberry
    - 1 x *Ligustrum lucidum* Large-leaved Privet

The STIF on site, as prescribed by the TPZs of the characteristic STIF trees on natural ground, is approximately 365 square metres. The removal of 12 STIF trees represents a loss of approximately 287 square metres.

This loss can be ameliorated both quantitatively and qualitatively. Quantitative amelioration can occur in areas outside of the current STIF area (such as the front garden) that can be rehabilitated with STIF species. Qualitative amelioration can occur in areas that are currently within the STIF

area but in poor condition. In these parts, active management and removal of inappropriate and weedy species can be replaced by enrichment plantings of STIF species in accordance with an approved management plan. Importantly, this directed management can replace mid storey elements that are currently missing from the site specifically and generally in urban patches of STIF.

4 IMPACT ASSESSMENT – STATE MATTERS

4.1 Background

Section 7.3 of the *BC Act 2016* requires that the consent authority take into account five factors when deciding whether there is likely to be a significant effect on ecological communities, threatened species, or their habitats. If a significant impact is judged likely to occur, then the Biodiversity Offset Assessment System is triggered, and a Biodiversity Development Assessment Report (BDAR) is required.

For the threatened species of interest recorded within 1.5 kilometres of the development site (see Tables 1 and 2 in Appendix 3), the likelihood of occurrence of each species on or near the development site was determined by analysis of their habitat requirements, the habitats on site and the nature and extent of adjacent habitats.

Each species has been assigned to one of four groups according to their likelihood of occurring on the development site or within adjacent habitats likely to be impacted by the proposed works:

- ***High likelihood to occur*** - species whose preferred habitat features occur on the site and / or have been recorded close by in similar habitat, and / or are able to reach the development site from other known and confirmed locations;
- ***Moderate likelihood to occur*** - species whose preferred habitat features in a strict sense occur on or near to the site but are considered generally unlikely to occur. This may be due to such things as the nature of habitats and disturbances between confirmed locations and the development site, movement patterns of the subject species, the extensive and common nature of the available habitat in the local area, the rarity of the species, the length of time since it was last recorded and / or the size of its home range;
- ***Low likelihood to occur*** - species with specific terrestrial niches and habitat requirements that generally do not occur on or near the development site or species that have not been found the area for a considerable period of time; and
- ***No likelihood to occur*** - these are generally aquatic or marine species.

The impacts of the proposal have been assessed for the threatened entities recorded on site and the species considered likely to occur, being:

- STIF
- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat
- *Pteropus poliocephalus* Grey-headed Flying-fox

Summaries of assessments in accordance with Section 7.3 Test of Significance as required by the *BC Act 2016* are provided below, and complete Tests of Significance (5 part-tests) are provided in Appendix 4. The remaining species assigned to the last three groups (those with no to moderate likelihood to occur) have not been considered in further detail as, although possible, their presence is unlikely.

4.2 Sydney Turpentine Ironbark Forest

This community is represented on site by 20 individuals of 6 characteristic tree species and 9 species of understorey and ground covers. The extent of STIF on the development lot is mapped in accordance with the TPZs on natural ground, and occupies approximately 365 square metres.

It is important to define the local occurrence of the endangered ecological community in order to gauge the potential impact of the works. The Threatened Species Test of Significance Guidelines (OEH 2018) defines the local occurrence as the ecological community that occurs within the study area, with the study area being the subject site (the area directly impacted by the proposal) plus any additional areas which are likely to be affected by the proposal, either directly or indirectly. The study area should extend as far as is necessary to take all potential impacts into account.

Notably, the guidelines further state that the local occurrence may include adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated (OEH 2018). "Contiguous" is undefined, but the ordinary dictionary definition of "neighbouring, in close proximity" or "touching, in contact" are relied upon (Brown 1993).

STIF is highly fragmented, and typically occurs as small groups of trees principally in backyards, a pattern that is evident in the State Vegetation Type Mapping. However, this does not mean that each patch is isolated and unconnected from other patches, as the major components of these urban fragments are canopy trees with wind-dispersed seed, and major pollinators that are highly mobile species such as Grey-headed Flying-foxes and Rainbow Lorikeets.

Southerton et al. (2004) demonstrated that pollen- and / or nectar-feeding lorikeets and bats make a unique contribution to eucalypt population structure because of their capacity to move viable pollen large distances. Birds and bats may travel upwards of 50 kilometres per day during feeding, and further during migration or feeding bouts over several days. For example, Rainbow Lorikeet roosts are frequently 35 kilometres distant from their feeding areas, particularly during their non-breeding phase over summer and autumn when most of the tree species of the subject site are in flower. Scouting parties frequently move distances of 5–10 kilometres and feeding flocks may travel up to 10 kilometres between feeding and mid-day rest areas (Southerton et al. 2004).

Radio-tracking studies have revealed that Grey-headed Flying-foxes may travel more than 45 kilometres to feeding areas and over 80 kilometres during the night whilst foraging for nectar (personal observation). They are highly mobile during the night, moving between several trees within a stand, and between flowering stands separated by many kilometres (Southerton et al. 2004). The effect of pollen transfer by birds and bats on the genetic structure of widespread eucalypt species is potentially greatest in fragmented forests where these animals can traverse gaps of several kilometres between discontinuous stands (Southerton et al. 2004). In the fragmented urban landscape, this means that all patches across these large distances are potentially functionally connected and form part of the local occurrence of the vegetation community.

Notwithstanding the capacity for pollinators to carry genetic material many kilometres, for the purposes of this BIA a more restricted definition of local occurrence is preferred, guided partly by the 1.5 kilometre buffer area of the Biodiversity Assessment Method (BAM) (2020), soil landscape mapping, additional local landscape factors, and the inherent uncertainty in the mapping. The resultant distribution of the patches of STIF considered to comprise the local occurrence is shown in Figure 10 in Appendix 1

Soil landscape is a surrogate for a combination of abiotic factors such as topography, soil, and geology. The subject site is within an area of Blacktown soil landscape, which occupies the area of the local occurrence almost exclusively, thus tying together the set of small patches nominated. The site is located at the top of the landscape on the Hornsby Plateau, and the defined local occurrence is wholly within that landscape position.

The polygons of PCT 3262 within the area shown in Figure 10 are defined as the local occurrence of STIF, and totals approximately 22 hectares. Therefore, the 365 square metres defined as STIF on site represents just 0.17% of that occurrence. The potential direct impact area of 287 square metres of STIF is very small in this context, being only 0.13% of the local occurrence. Notably, there is an opportunity to enhance the STIF on and off site with weed removal and enrichment planting.

The proposal is considered unlikely to have a significant adverse impact on this critically endangered ecological community, such that its local occurrence would be placed at risk of extinction. This is due to both the very small area of impact and the fact that such impact will occur to what is primarily a planted garden.

4.3 *Pteropus poliocephalus* Grey-Headed Flying-fox

This species is regularly recorded in the local area, with a total of over 1,800 records in the broader study area, and 44 records within 1.5 kilometres of the site. It is commonly observed foraging in backyard trees, street trees, and in local reserves, but also unfortunately also as victims of roadkill and electrocution on power lines. This high number of records is unsurprising due to the site's proximity to the significant maternity camp in the Ku-ring-gai Flying-fox Reserve in the Stoney Creek gully in Gordon, approximately 4 kilometres to the south west. At the census of this camp in December 2019, 43,000 individuals were estimated to be in residence.

This species is likely to forage on the blossom available in the trees on site, but particularly in the high value nectar and pollen available primarily in the spring and summer (see Table 3 in Appendix 3 for details).

Given the subject site's proximity to the Gordon colony, it is likely that any animals foraging on site are dominant females and their young, and so are important to the survival of the local population.

An analysis of the trees in Table 3 in Appendix 1 reveals that the proposal will remove 32 and retain 23 of the 55 potential forage trees for the Grey-headed Flying-fox. The impact on availability of foraging resources is restricted to the quantum of forage, with seasonal forage availability in the post-

development landscape a reflection of that in the pre-development landscape. The majority of foraging resources remaining will be potentially available in the summer (20 or 87% of remaining forage trees potentially in flower) and autumn (16 or 70% of forage trees potentially in flower or fruit). One of the 3 winter-flowering trees will remain, and the 4 potentially spring-flowering trees represent 17% of the retained set of trees.

The proposal therefore will not impose a foraging bottleneck or greatly exacerbate the existing winter forage bottleneck for this threatened species. The seasonal availability of high quality foraging resources on site can be addressed by a more judicious planting schedule as part of the STIF enrichment.

The construction of the residential flat building will not interfere with the capacity of this highly mobile species to move through the landscape or further fragment its habitat to any appreciable degree.

The proposal is unlikely to impose a significant adverse impact on this threatened species.

4.4 *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat

This species is reliably recorded in bushland in the local area, with 5 recent records within 1.5 kilometres of the site. It was recorded foraging on site throughout the evening, but most notably just before dawn. This indicates that there is a roosting site near the Anabat recorder, which was placed in the south western corner of the site. There are no hollow-bearing trees on the subject site, but there may be suitable roosting habitat nearby. Alternatively, this species is known to exploit man-made structures as roosting habitat and so may be using such habitats on or off site.

The subject site provides potential foraging habitat below the native tree canopies and some of this available habitat will be directly impacted. However, suitable habitat will also remain on site and in the immediate vicinity, and the loss is considered to be small in the context of the available habitat accessible to this highly mobile species in the local area.

The proposal is unlikely to impose a significant adverse impact on this threatened species.

4.5 *Miniopterus orianae oceanensis* Eastern Bent-wing Bat

This species is reliably recorded in bushland and urban situations in the local area, with 10 recent records within 1.5 kilometres of the site. It was recorded foraging on site for a brief period during the middle part of the night. This indicates that there its roosting site is probably not close, which is unsurprising as it roosts in caves and tunnels. In the local area, such habitat is probably available in the sandstone gullies in Garigal National Park but not on the St Ives shale ridgetop.

The subject site provides potential foraging habitat above the native tree canopies and some of this available habitat will be directly impacted. However, suitable habitat will also remain on site and in the immediate vicinity, and the loss is considered to be small in the context of the available habitat accessible to this highly mobile species in the local area.
The proposal is unlikely to impose a significant adverse impact on this threatened species.

5 BIODIVERSITY AND GREENWEB LAYERS

The subject site is not currently mapped as containing Biodiversity or Greenweb land. The Planning Panel requested an analysis of the site's suitability for inclusion in that mapping.

The Biodiversity mapping and Greenweb mapping for Ku-ring-gai is based on an investigation of biodiversity across the LGA, as detailed in the *Ku-ring-gai Biodiversity and Riparian Lands Study* (the most current of which is version 5, dated June 2016). This study identified lands that have strategic ecological value and the methodology to be used in assessment and decision making processes.

The criteria that define each category of Biodiversity or Greenweb land and the degree to which the vegetation of the site satisfies these criteria are explored in the table provided overleaf.

The vegetation of the site fails to satisfy the criteria in all categories. In summary -

- The site does not qualify as **Core Biodiversity Land** because:
    - It is not in or near reserved land
    - It is not within an area recognised as providing Regional Fauna Habitat, nor does it have the features of such land
- The site does not qualify as **Support for Core Biodiversity Land** because:
    - The site does not adjoin Core Biodiversity Land
    - The site has not been recognised as providing local fauna habitat and does not comply as this relies on the presence of well connected natural vegetation with a relatively intact understorey
    - The site does not occur in a riparian zone
    - The site does not occur within a Biodiversity Corridor
- The site does not qualify as **Landscape Remnant** because:
    - The site does not support a larger patch of a Key Vegetation Community in good or moderate condition
    - The site does not contain trees that could be classified as significant (e.g. no hollow-bearing trees, no trees of exceptional form or size)
- The site does not qualify as **Biodiversity Corridor and Buffer Areas** because:
    - The site is not within 8 metres of Biodiversity Lands or Support for Core Biodiversity Lands
    - The site does not occur within a Biodiversity Corridor
- The site does not qualify as **Canopy Remnant** because the vegetation on site is a planted garden. While it can be classified as equivalent to STIF (which is a KVC) for the purposes of impact assessment, it is not a remnant patch and does not occur within a matrix of other larger KVC patches.

Therefore, the vegetation of the site does not satisfy any of the definitions of Biodiversity pursuant to the *KLEP 2015* or Greenweb categories pursuant to *KDCP 2022*.

LEP Land	DCP Greenweb Category	Sub-category	Definition	Site compliance
Biodiversity	Core Biodiversity Lands	Office of Environment and Heritage Protected Areas	Formal reserves containing Office of Environment and Heritage estate managed for the purpose of biodiversity protection.	Not applicable – private land.
		Ku-ring-gai LGA Natural Areas	Formal reserves consisting of areas managed by Ku-ring-gai Council as Natural Areas under the NSW *Local Government Act 1993* for the purpose of biodiversity protection.	Not applicable – private land.
		Regional Fauna Habitat	Regional Fauna Habitat as mapped by Ku-ring-gai Council consists of regionally important connected areas of habitat. These areas provide resources for threatened and non-threatened fauna species and populations.	None mapped. None present as vegetation on site is isolated.
Biodiversity	Support for Core Biodiversity Lands	Key Vegetation Communities (KVC) adjoining Core Biodiversity Lands	Areas of KVC directly adjoining lands mapped as Core Biodiversity Lands.	Not applicable as not adjoining Core Biodiversity Land.
		Local Fauna Habitat	Local Fauna Habitat as mapped by Ku-ring-gai Council is provided by isolated remnants located more centrally in the LGA. This includes areas within private and public land ownership	Not applicable, none mapped as this feature is based largely on bushfire prone land mapping as a surrogate for well connected well structured vegetation. Provides habitat for only the most mobile of species, such as birds and bats.
		Vegetation within Core Riparian Zones and KVCs adjoining	All vegetation within Core Riparian Zones, including native and non-native species, with the exception of Riparian category 3a (consisting of piped creeks). For Riparian category 3a, mapped areas are limited to lands containing KVCs only **AND** KVCs adjoining vegetation within Core Riparian Zones identified above.	Not applicable as site is not near any riparian zones.
		All vegetation within Biodiversity Corridors	All vegetation including non local / non native species, within Biodiversity Corridors as mapped by Ku-ring-gai Council.	Not applicable, no corridor mapped.
Biodiversity	Landscape Remnant	Larger KVC patches or KVC in good to moderate condition	Patches (areas of adjoining) KVCs that are ≥ 0.1ha in size; **OR** KVC vegetation of good or moderate condition. Good condition vegetation, includes:	Not applicable. The vegetation on site is a planted garden and the planting palette includes species characteristic of the

LEP Land	DCP Greenweb Category	Sub-category	Definition	Site compliance
			• Canopy, mid-storey and understorey in good condition. • Regeneration occurring within all layers. • Native dominated within all layers. Moderate condition vegetation, includes: • Native medium to dense tree overstorey, with native shrub and ground layers, and • Native dominated within 2 layers.	KVC STIF. Although it can be considered as an example of a KVC of a kind, it is not in good or moderate condition due to the absence of structural complexity and preponderance of weeds
		Significant trees within Key Vegetation Communities	Includes patches containing significant trees within KVCs identified by the Ku-ring-gai key vegetation community mapping. The mapping is not considered to capture every significant tree within the urban landscape. Factors considered in determining significance include the presence of habitat (e.g. a hollow), provision of food for wildlife, and/or exceptional form or size.	Not applicable. No hollows were observed in the trees on site and are not remarkable in the potential habitat they provide. The trees in the garden were planted between 1989 and 1991 and therefore are not of an exceptional form or size.
Biodiversity	Biodiversity Corridors and Buffer Areas	Buffer Area for Core Biodiversity Lands and Support for Core Biodiversity Lands	Includes all areas within 8m of lands mapped as Core Biodiversity Lands or Support for Core Biodiversity Lands. Including both vegetated and non-vegetated areas that are not already included within categories listed above.	Not applicable. There are no Core Biodiversity Lands or Support for Core Biodiversity Lands mapped or present within 8 metres of the site.
		Biodiversity Corridors areas lacking vegetation	This includes areas lacking vegetation, within Biodiversity Corridors as mapped by Ku-ring-gai Council.	Not applicable. The site does not occur within a Biodiversity Corridor.
Not Applicable	Canopy Remnant	Smaller Key Vegetation Community Patches NOT in good to moderate condition	Patches (areas of adjoining) KVC (excluding areas containing vegetation in good or moderate condition) that are <0.1ha in size.	Not applicable as the KVC patch is an isolated planted garden.

6 CONCLUSIONS

This Biodiversity Impact Assessment addresses likely impacts of the construction of a residential flat building that would be facilitated by the Planning Proposal to rezone the property at 130 Killeaton Street, St Ives.

The site currently contains a Presbytery and planted garden dominated by Australian native trees. Although all but one of the trees have been planted in the last 40 years, the species composition in parts of the front and rear garden is consistent with STIF CEEC.

The STIF trees and native understorey beneath them totals an area of approximately 365 square metres. The potential development will result in the direct loss of approximately 287 square metres of this STIF occurrence, comprising 14 trees. This is considered to be an insignificant loss, given the local occurrence of STIF is in the order of 22 hectares.

The losses can be ameliorated on site by the enhancement of the remaining garden areas with an emphasis on STIF species.

Survey also established the presence or likely presence of three species of bats:

- *Pteropus poliocephalus* Grey-headed Flying-fox
- *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat
- *Miniopterus orianae oceanensis* Eastern Bent-wing Bat

The direct loss of trees will represent the loss of potential or realised foraging habitat for these three species. However, again the loss is considered to be very small given the high mobility of each species and the availability of large areas of habitat within the local area, much of which is reserved.

The available foraging resources on site for the Grey-headed Flying-fox can be improved and the potential losses ameliorated by targeted planting as part of the recommended conservation management of the retained garden. Conservation management strategies will also improve the value of the garden as foraging habitat for the threatened microbat species.

Formal consideration has been given to the potential for impact on the relevant listed matters of conservation significance:

- Under Commonwealth legislation, the *EPBC Act 1999* requires that actions judged to significantly impact upon MNES are to be assessed via a formal referral process. This Biodiversity Impact Assessment report has determined that no such a referral needs to be made to the Department of Climate Change, Energy, the Environment and Water; and
- Under NSW legislation, this Biodiversity Impact Assessment report has applied the Test of Significance per the *Biodiversity Conservation Act 2016* to the listed species and communities observed or likely to occur on site. Those tests concluded that a significant adverse impact is unlikely to occur to those entities.

Therefore, no further ecological impact assessments pursuant to Commonwealth or NSW legislation are required.

The following recommendations are made in order to improve the proposal's biodiversity outcomes and ameliorate some of the potential impacts:

- The retained garden and other new landscaped areas should be planned and managed with a conservation objective as detailed in an approved management plan that is developed and implemented in conjunction with the Landscape Plan.
- The main conservation objectives of this plan shall be *inter alia*
    - Enrichment of STIF with an increase in species diversity and structural complexity.
    - Planting palette to be guided by the use of local provenance material of characteristic STIF species *sensu* NSW Scientific Committee Final Determination
    - Particular attention should be paid to planting of mid storey species, an important structural element generally absent from stands of STIF in urban settings.
    - Weed control using low impact methods.
- For the benefit of *Pteropus poliocephalus* Grey-headed Flying-fox, the following tree species are particularly recommended for planting in order to bolster the foraging resources available in early spring:
    - *Syncarpia glomulifera* Turpentine
    - *Eucalyptus punctata* Grey Gum
    - *Corymbia maculata* Spotted Gum
- Because of the potential for *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat to be roosting in man-made structures on site, it is recommended that demolition is carried out under ecological supervision.
- Artificial roosting habitat suitable for *Micronomus norfolkensis* Eastern Coastal Free-tailed Bat should also be installed in the retained trees in order to compensate for the loss of potential sites in the buildings and / or to enrich the habitat for this species.

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APPENDIX 1

FIGURES

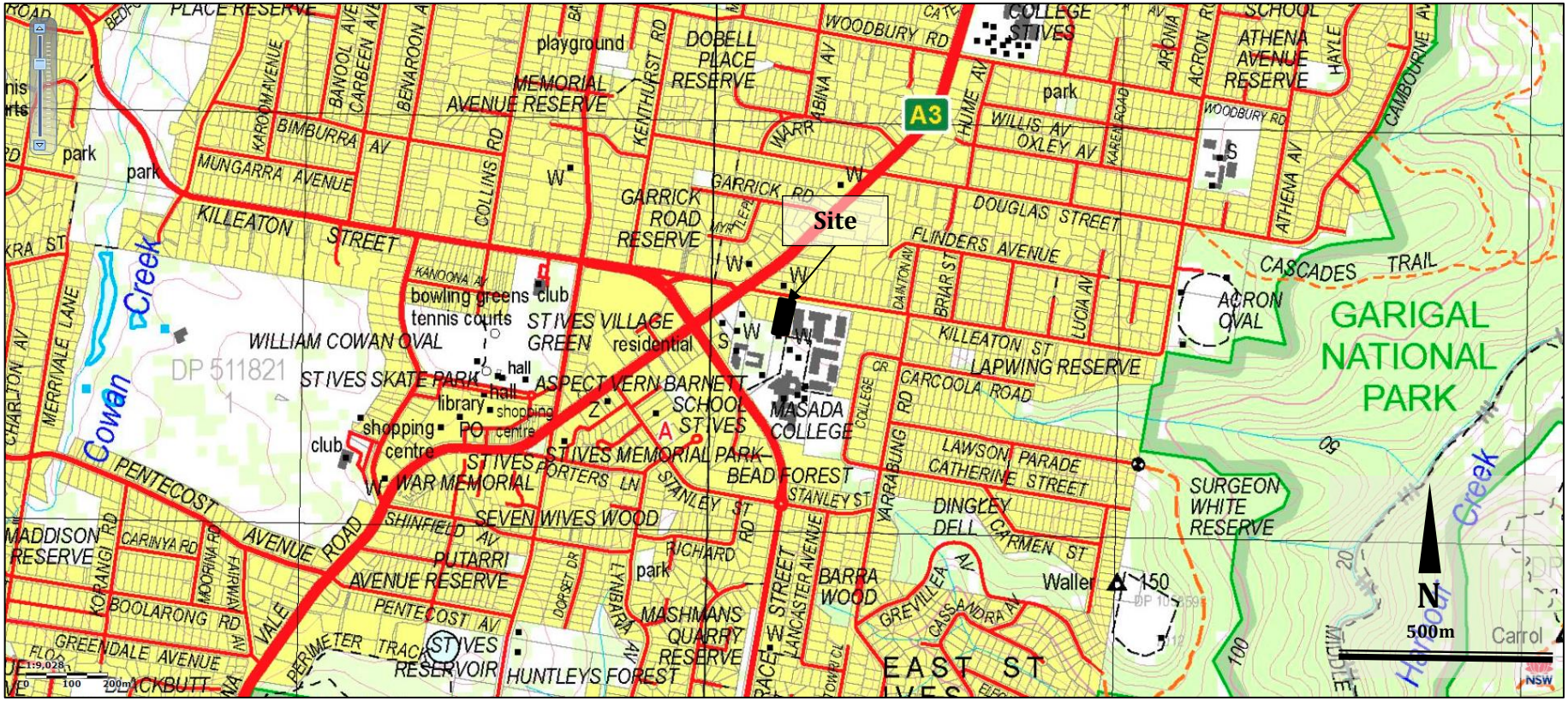

Figure 1: Topographic map showing the development site (black) in relation to surrounding features. Source: Hornsby (9130-4S) 1:25,000 topographic map.

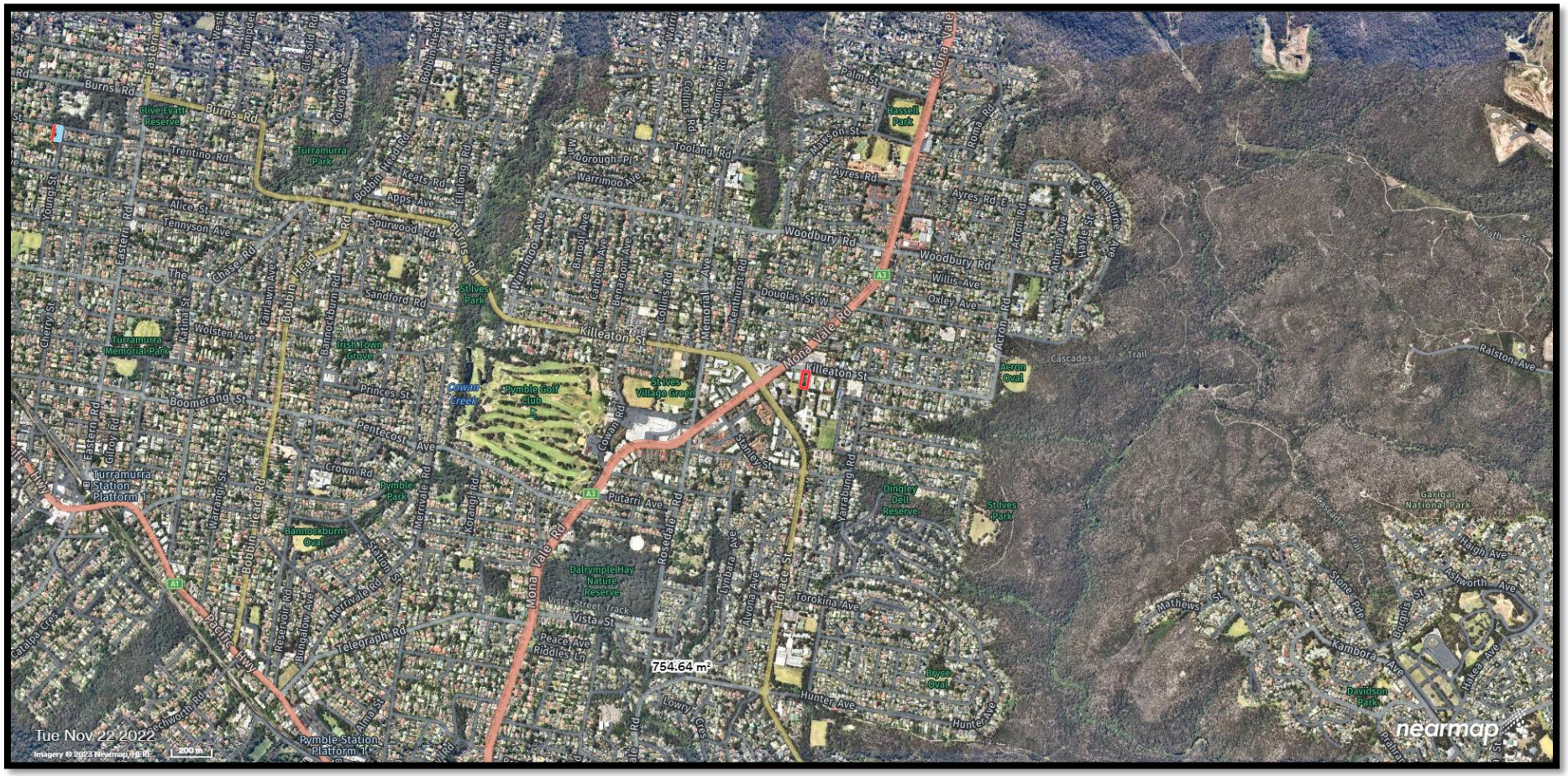

Figure 2: Aerial imagery showing the development site (red) in relation to surrounding development. Source aerial: Nearmap.

Figure 3: Close up aerial imagery of the subject lot, showing also the locations and numbers of the existing trees (yellow = non STIF tree, green = STIF tree to be retained, red = STIF tree to be removed) and the location of the flora sampling quadrat (pink square). Source: Nearmap aerial imagery, dated 29th January 2022.

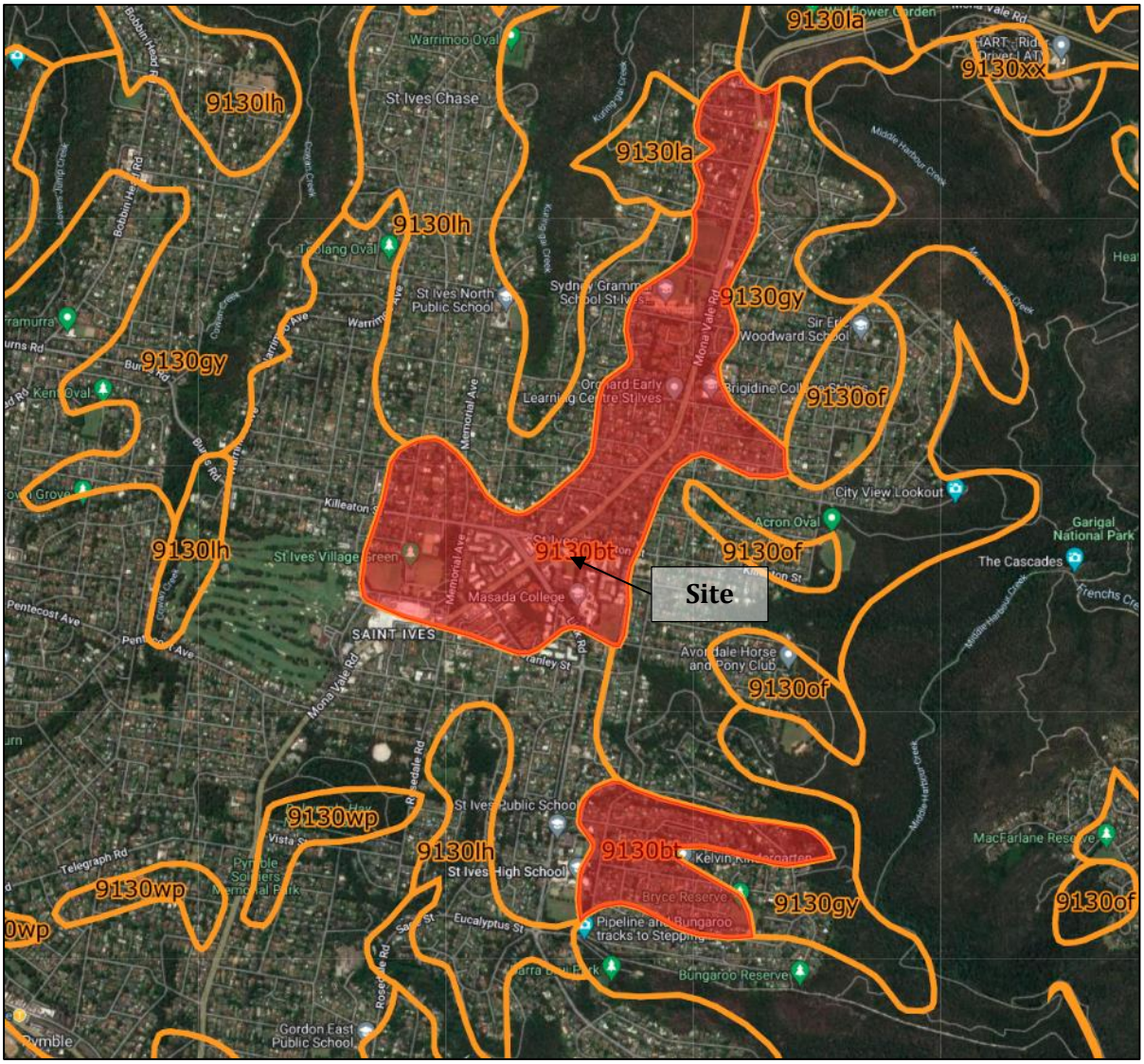

Figure 4: Soil landscapes mapped on and near the site. 9130bt = Blacktown soil landscape. Source: eSpade v2.2.

Figure 5: Proposed layout, and its relationship to the areas of STIF on site (red = STIF to be removed, pinkish cream = STIF to be retained) and the distribution of all trees.

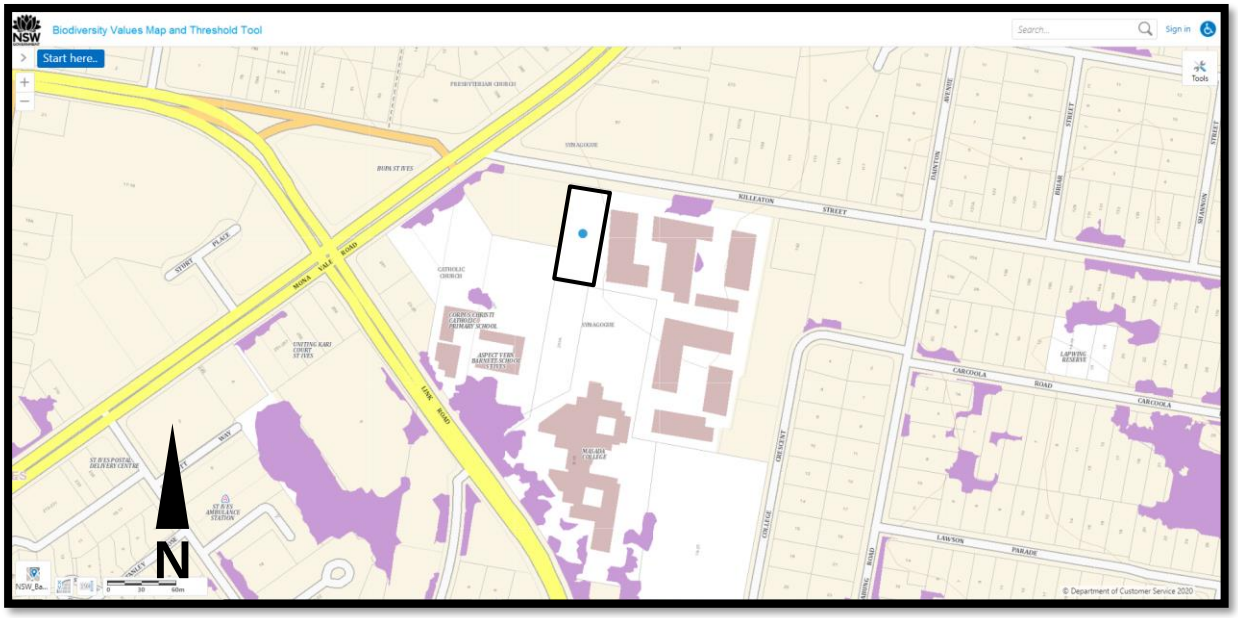

Figure 6: Biodiversity Values map showing that the subject site (black outline) contains no areas identified as Biodiversity Value (purple). Source: Biodiversity Values Map and Threshold Tool, last accessed 27th September 2023 at https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BOSETMap

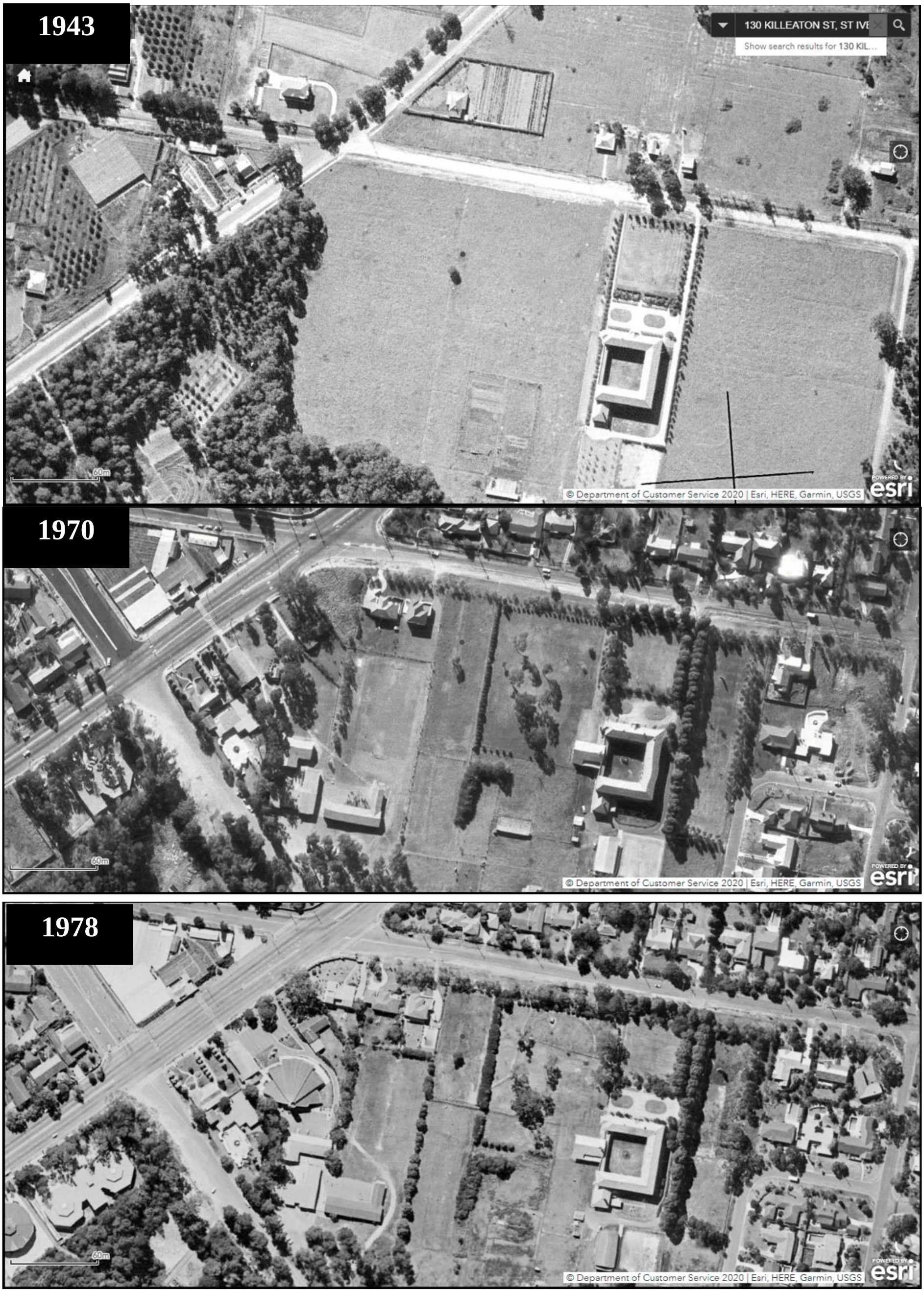

Figure 7A: Historical aerial photography – 1943, 1970, 1978.

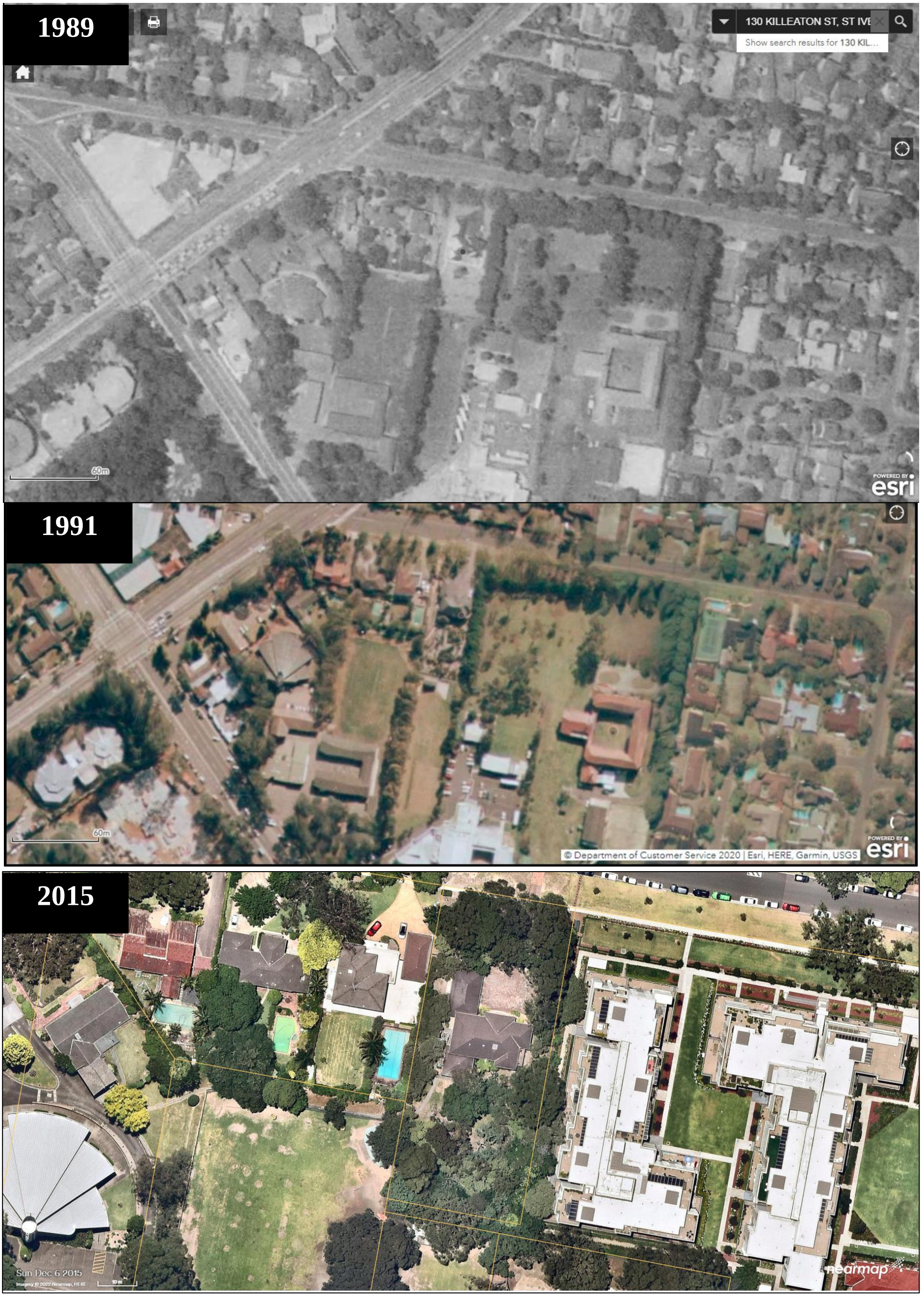

Figure 7B: Historical aerial photography – 1989, 1991, 2015.

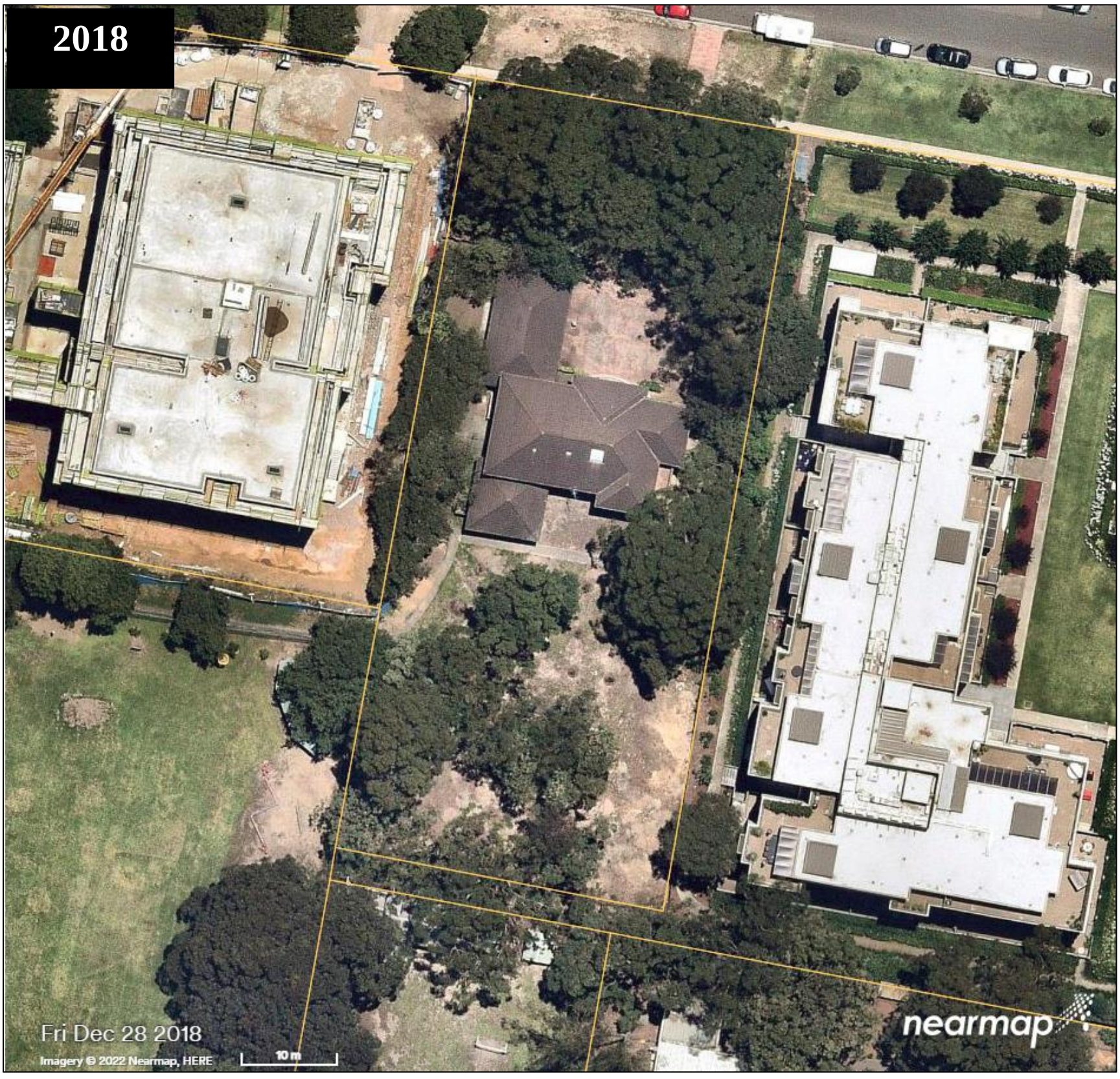

Figure 7C: Historical aerial photography – 2018.

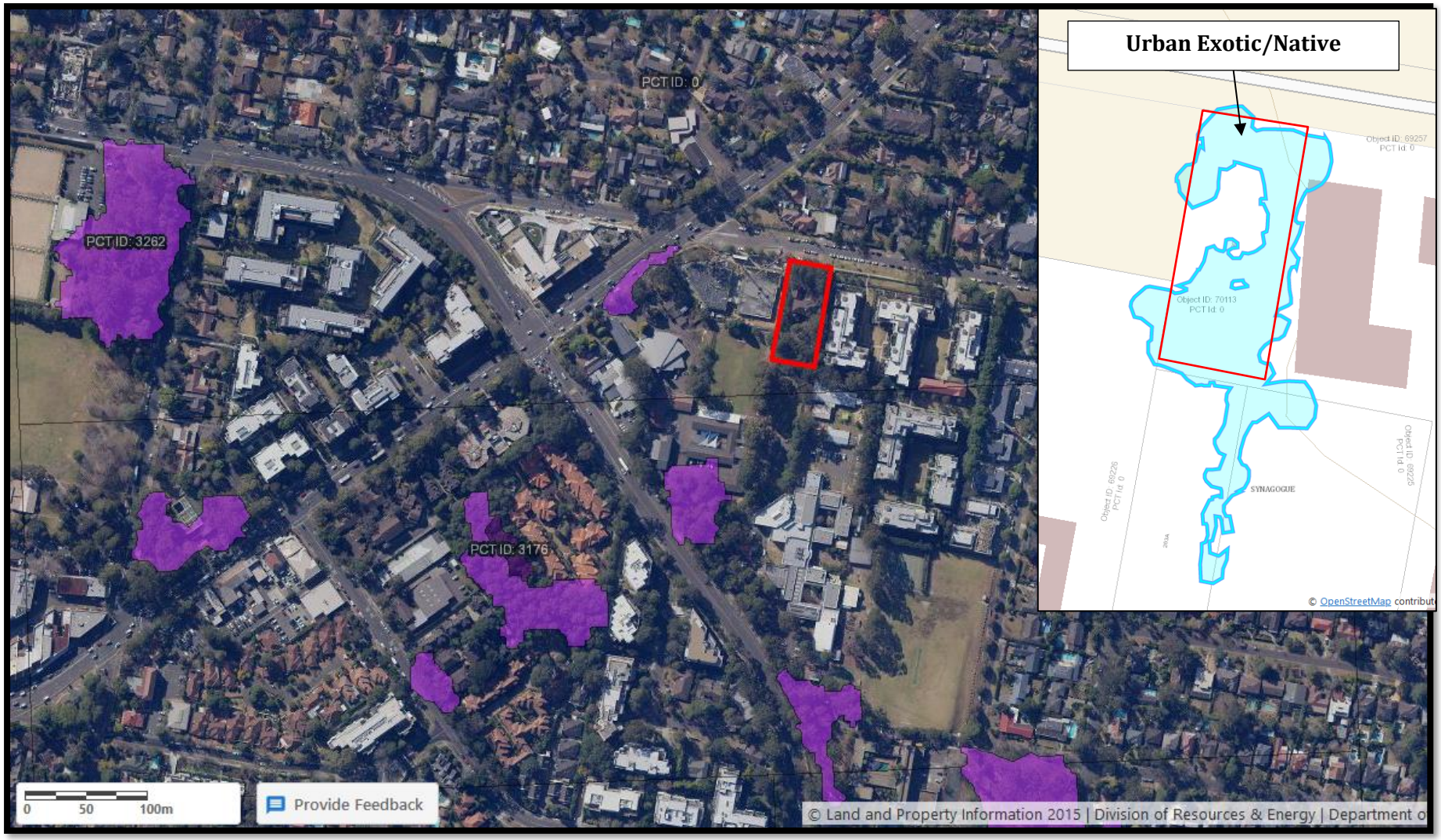

Figure 8: Extant vegetation mapping showing small fragmented patches of PCT 3262 identified near the site (Source: State Vegetation Type Map - Extant), with inset map showing vegetation on site identified as Urban Native/Exotic (Source: OEH 2016).

Figure 9: Extent of STIF on site (creamy pink and red) and impact (red) excluding the TPZs on built form (white).

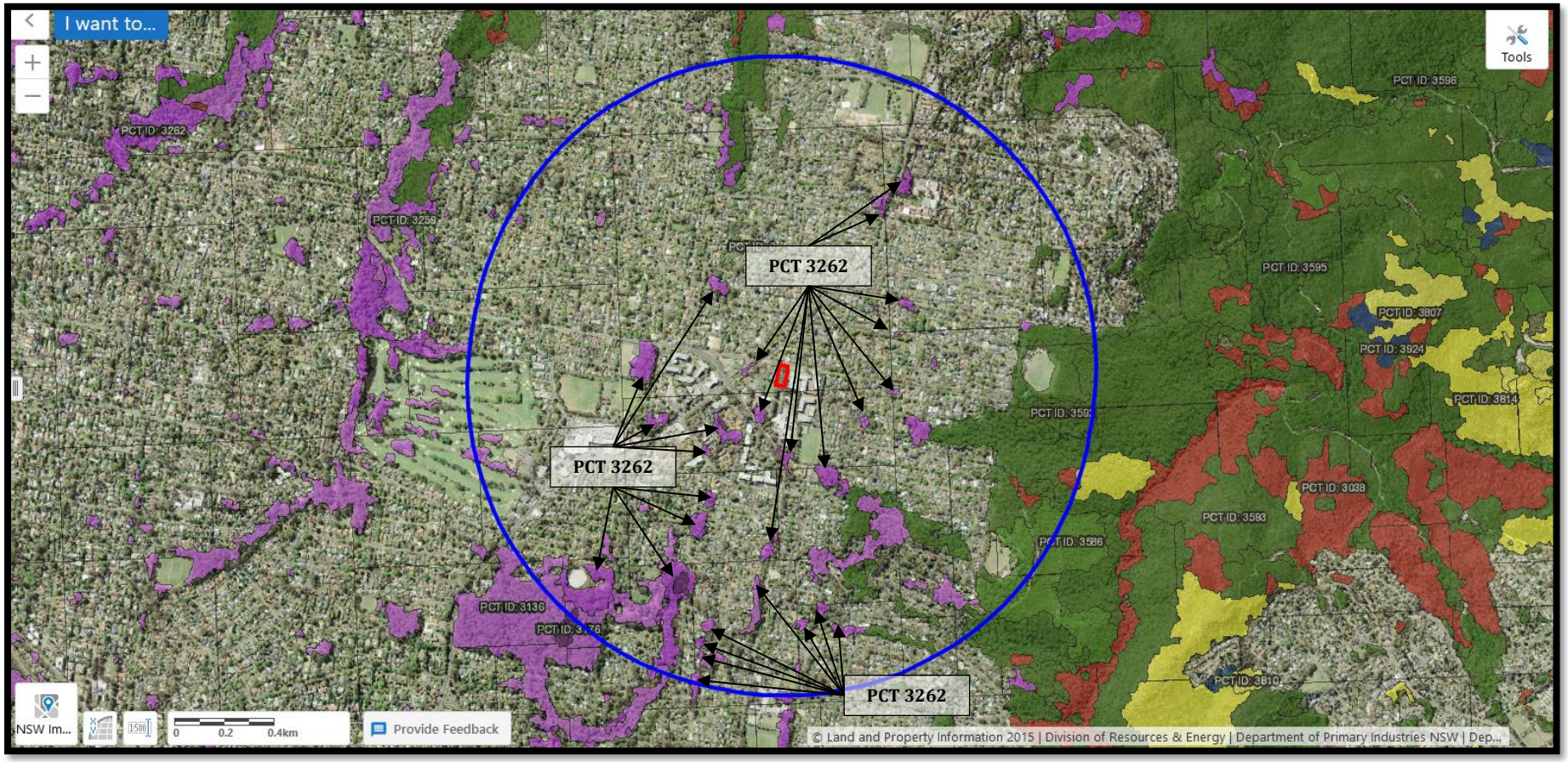

Figure 10: Extent of the local occurrence of STIF (PCT 3262, mid purple polygons, indicated) in 1500m buffer (buffer) in relation to the subject site (red).

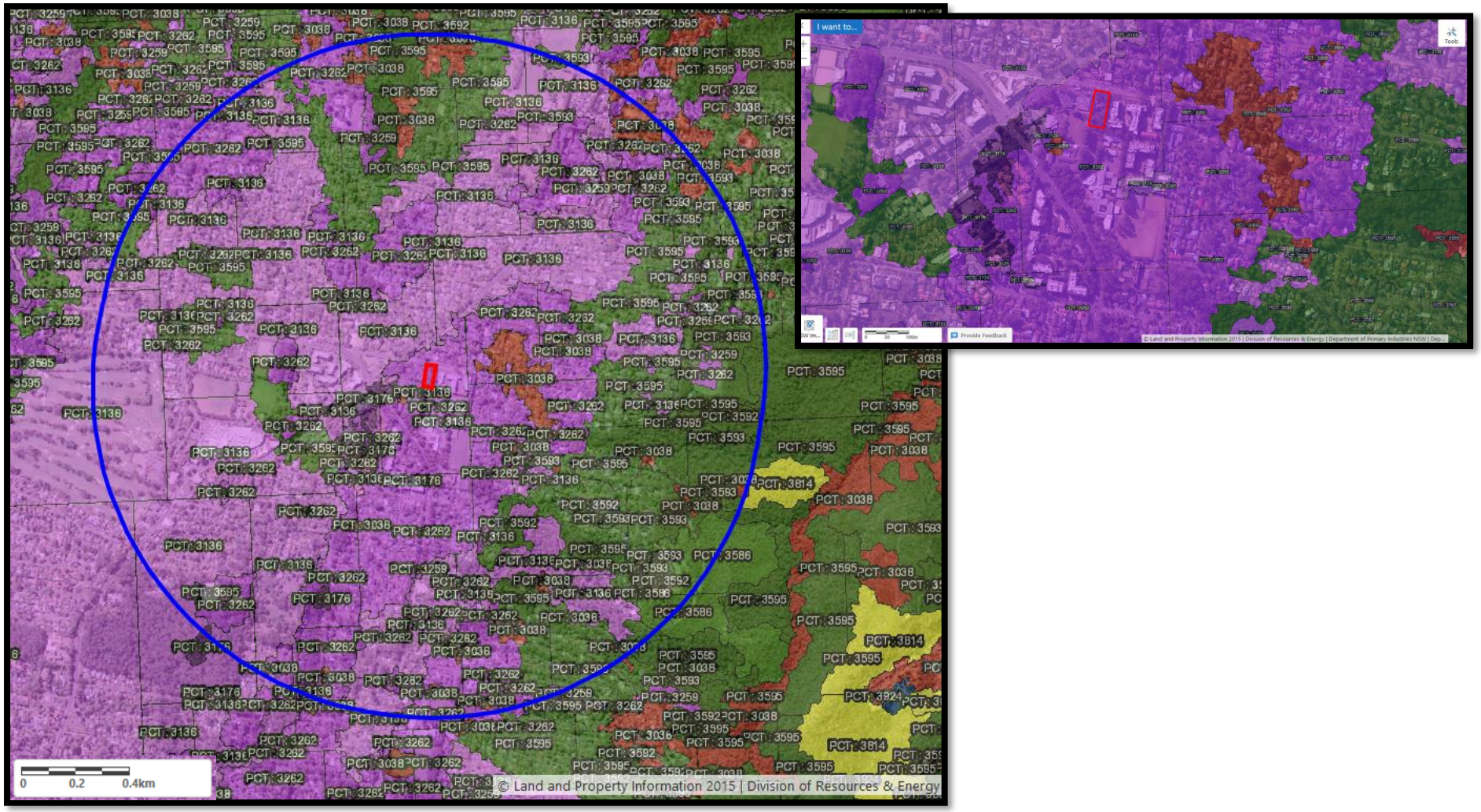

Figure 11: The occurrence of natural vegetation in 1750 prior to European clearing on and around the site and in the buffer area, as modelled for the State Vegetation Type Map. Inset shows a closer view. Source: SEED, available at https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU.

APPENDIX 2

PHOTOGRAPHS

Photograph 1: Rows of trees planted in rear garden. Note the fruit trees planted in a grid pattern in the background.

Photograph 2: Avenue of Bottlebrush planted along the western boundary.

Photograph 3: Anabat ultrasonic call recorder on Tree 1.

Photograph 4: Audio recorder on Tree 16.

Photograph 5: Turpentines in adjacent school grounds, planted sometime between 1943 and 1970.

Photograph 6: Large Sydney Blue Gum on eastern boundary (Tree 96).

Photograph 7: Looking north west diagonally across Quadrat 1. Note black weed mat.

Photograph 8: Occasional dense patches of native ground covers occur under the native trees.

APPENDIX 3

TABLES

Table 1: Threatened flora species recorded within 1.5 kilometres of the site. Source BioNet, 28th September 2023.

Family	Species	Status		Number of records within 1.5km	Closest		Most recent		Habitat requirements	Suitable habitat on site	Likelihood to occur	Further impact assessment required
		BC Act 2016	*EPBC Act 1999*		Year	Location	Year	Location				
Elaeocarpaceae	*Tetratheca glandulosa*	V	-	5	1996	St Ives, in bushland near Showground	1996	Belrose	Occurs in shale-sandstone transition habitat on shallow soils associated with Lucas Heights, Gymea, Lambert and Faulconbridge soil landscapes. Usually found on ridgetops to mid slopes in heath, scrub, woodland to open forest.	No	Very low	No
Haloragaceae	*Haloragodendron lucasii*	V	-	1	1988	St Ives, in bushland near Cowan Creek	1988	St Ives, in bushland near Cowan Creek	Grows on Hawkesbury Sandstone in low open woodland on moist sandy loam in sheltered aspects or on gentle slopes below cliff lines near creeks. Associated species *Eucalyptus piperita, Corymbia gummifera, Banksia ericifolia, Callicoma serratifolia*, with ferns and sedges.	No	Very low	No
Myrtaceae	*Darwinia biflora*	V	V	1	2018	St Ives, bushland in Dingley Dell Reserve	2018	St Ives, bushland in Dingley Dell Reserve	Occurs in scrub-heath on sandstone or in the understorey of woodland/open forest on shale capped ridges intergraded with Hawkesbury sandstone. Associated with overstorey species *Eucalyptus haemastoma, Corymbia gummifera and/or Eucalyptus squamosa*.	No	Very low	No
Myrtaceae	*Rhodamnia rubescens* Scrub Turpentine	CE	CE	1	2003	St Ives, Dalrymple-Hay NR	2003	St Ives, Dalrymple-Hay NR	Found in littoral, warm temperate and subtropical rainforest and wet sclerophyll forest usually on volcanic and sedimentary soils.	No	Very low	No
Myrtaceae	*Syzygium paniculatum* Magenta Lilly Pilly	E	V	4	2017	St Ives, horticultural specimen in a garden	2023	St Ives, horticultural specimen in a garden	Occurs in littoral or riverside gallery rainforests..	No	Low Very common in cultivation. Local records are likely to be all planted specimens in gardens	No
Proteaceae	*Grevillea caleyi* Caley's Grevillea	CE	CE	3	1897	Sensitive species, location withheld	1990	Sensitive species, location withheld	Known only from the Terrey Hills area in ridge top open forest dominated by *Eucalyptus sieberi* and *Corymbia gummifera*. Records outside of this area are of planted specimens.	No	Low	No
Proteaceae	*Grevillea juniperina* subsp. *juniperina* Juniper-leaved Grevillea	V	-	1	2003	St Ives, horticultural specimen in a garden	2003	St Ives, horticultural specimen in a garden	Endemic to Western Sydney centred on an area bounded by Blacktown, Erskine Park, Londonderry, and Windsor with outlier populations at Kemps Creek and Pitt Town.	No	Low	No
Proteaceae	*Macadamia integrifolia* Macadamia Nut	-	V	4	2023	St Ives, horticultural specimen in a garden	2023	St Ives, horticultural specimen in a garden	Probably extinct in the Sydney area if it occurred naturally that far south.	No	Low Very common in cultivation. Local records are likely to be all planted specimens in gardens	No

Table 2: Threatened fauna species recorded within 1.5 kilometres and 10 kilometres of the site. Source BioNet, 28th September 2023.

Fauna Group	Species	Status		Number of records within 1.5km	Closest		Most recent		Habitat requirements	Suitable habitat on site	Likelihood to occur	Further impact assessment required
		BC Act 2016	*EPBC Act 1999*		Year	Location	Year	Location				
Amphibian	*Pseudophryne australis* Red-crowned Toadlet	V	-	16	2018	St Ives, bushland in Dingley Dell Reserve	2022	Garigal NP	Restricted to heads of periodically wet drainage lines below sandstone ridges that often have shale caps. Needs rocks and dense vegetation or litter for shelter.	No	None	No
Reptile	*Varanus rosenbergi* Rosenberg's Goanna	V	-	3	2015	Garigal NP	2021	St Ives, bushland in Surgeon White Reserve	Found in heath, open forest and woodland; termite mounds are a critical habitat component for nesting. Shelters in hollow logs, rock crevices and in burrows.	No	None	No
Bird	*Ptilinopus superbus* Superb Fruit-dove	V	-	1	1984	St Ives	1984	St Ives	Occurs in rainforest.	No	Low	No
Bird	*Hirundapus caudacutus* White-throated Needletail	-	V,M	2	2001	St Ives, bushland in Ku-ring-gai Creek Reserve	2001	St Ives, bushland in Ku-ring-gai Creek Reserve	Non-breeding population migrates from Asia in spring and departs autumn along either side of the Great Dividing Range. Most of its time spent feeding on the wing, high along storm fronts. Roosts infrequently in terrestrial habitats and terrestrial habitat largely irrelevant.	No	Low	No
Bird	*Lophoictinia isura* Square-tailed Kite	V	-	1	2009	Location withheld	2020	Location withheld	Found in timbered habitats with a particular preference for timbered watercourses.	No	Low	No
Bird	*Glossopsitta pusilla* Little Lorikeet	V	-	3	2018	St Ives, Hassell Park	2021	St Ives	Mostly in dry open eucalypt forests and woodlands. Feeds on tree nectar and pollen, particularly profusely-flowering eucalypts, but also melaleucas and mistletoes and mistletoe fruit. Nomadic, movements probably related to food availability.	Yes (marginal foraging)	Low	No
Bird	*Ninox strenua* Powerful Owl	V	-	26	2021	Location withheld	2023	Location withheld	Usually roosts in dense vegetation and hunts for arboreal mammals, flying-foxes, and birds across large home range. Breeds in large hollow trees in gullies.	Yes (marginal foraging)	Low	No
Bird	*Tyto novaehollandiae* Masked Owl	V	-	1	2023	Location withheld	2023	Location withheld	Occurs in forests, but often hunts along forest edges such as roadsides.	No	Low	No
Bird	*Artamus cyanopterus cyanopterus* Dusky Woodswallow	V	-	1	1999	St Ives, over Dalrymple Hay Nature Reserve	1999	St Ives, over Dalrymple Hay Nature Reserve	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Occasionally non-breeding flocks forage in Swamp Mahogany and Spotted Gum forests on central and north coast and rarely on the south coast.	No	Low	No
Mammal	*Cercartetus nanus* Eastern Pygmy-possum	V	-	32	2019	Ku-ring-gai Chase NP	2023	Surgeon White Reserve	Mostly found in woodland and heath with dense cover of flowering plants such as Banksia, Eucalyptus and Callistemon.	No	Low	No
Mammal	*Pteropus poliocephalus* Grey-headed Flying-fox	V	V	44	2020	St Ives	2021	St Ives	Foraging habitat in flowering eucalypts, particularly winter-flowering species; camps in dense wet forest or rainforest gullies.	Yes (foraging)	High	Yes
Mammal	*Saccolaimus flaviventris* Yellow-bellied Sheathtail-bat	V	-	3	2004	St Ives, Dalrymple Hay Nature Reserve	2005	St Ives, Dalrymple Hay Nature Reserve	Roosts in tree hollows, buildings or terrestrial burrows in treeless areas. Forages high over forest canopy for insects.	Yes (foraging)	Low	No
Mammal	*Micronomus norfolkensis*	V	-	5	2011	St Ives,	2018	Wahroonga	Occurs in dry sclerophyll forest and	Yes	Recorded foraging on site	Yes

Fauna Group	Species	Status		Number of records within 1.5km	Closest		Most recent		Habitat requirements	Suitable habitat on site	Likelihood to occur	Further impact assessment required
		BC Act 2016	*EPBC Act 1999*		Year	Location	Year	Location				
	Eastern Coastal Free-tailed Bat					Browns Reserve			woodland, roosts in hollows and man-made structures.		during survey	
Mammal	*Chalinolobus dwyeri* Large-eared Pied Bat	V	-	2	2018	St Ives, bushland in Douglas Street Reserve	2018	St Ives, bushland in Douglas Street Reserve	Roosts in caves and found mainly in areas with extensive cliffs and caves. Generally rare with a very patchy distribution in NSW. Found in well-timbered areas containing gullies.	No	Low	No
Mammal	*Falsistrellus tasmaniensis* Eastern False Pipistrelle	V	-	2	2018	St Ives, in bushland adjacent to Dalrymple Hay Nature Reserve	2018	St Ives, in bushland adjacent to Dalrymple Hay Nature Reserve	Absent from small remnant patches. Prefers continuous tall wet forests (trees >20m tall, dense u/storey) where they forage along tracks, creeks, rivers. Roosts in colonies (3-80 individuals) usually in hollows and changes roosts daily. Home range >100ha.	No	Low	No
Mammal	*Miniopterus australis* Little Bent-winged Bat	V	-	6	2018	St Ives	2021	St Ives	Roosts in caves and forages beneath tree canopies.	Yes (foraging)	Low	No
Mammal	*Miniopterus orianae oceanensis* Large Bent-winged Bat	V	-	10	2019	St Ives	2022	St Ives	Roosts in caves and forages above tree canopies.	Yes (foraging)	Recorded foraging on site during survey	Yes

Table 3: Tree details, their fate, and their ecological value. All of the *Eucalyptus saligna* and *Eucalyptus grandis* trees were re-inspected on 21st December 2022 in order to confirm their identification. Note that the individuals marked with superscript 'A' (trees 50, 55, 59, 68) were not confirmed by the inspection of fruits, as the ground layer had been scraped clean by raking.

Number	Species	Affiliation with STIF CEEC	Geographic provenance	Fate	Reason for Removal	Ecological Value		
						Part of EEC	Fauna roosting / denning / breeding habitat	Fauna foraging habitat (flowers / fruits)
1	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
2	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
3	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
4	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
5	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
6	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
7	*Corymbia maculata* Spotted Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers autumn-winter, but sporadic Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
8	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
9	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
10	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
11	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
12	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
13	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
14	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
15	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
16	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
17	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
18	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
19	*Ligustrum lucidum* Large-leaved Privet		Exotic	Remove	High threat weed			
20	*Eucalyptus pilularis* Blackbutt		Locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
21	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
22	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
23	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
24	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
25	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
26	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
27	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov
28	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov

Number	Species	Affiliation with STIF CEEC	Geographic provenance	Fate	Reason for Removal	Ecological Value		
						Part of EEC	Fauna roosting / denning / breeding habitat	Fauna foraging habitat (flowers / fruits)
29	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
30	*Eucalyptus pilularis* Blackbutt		Locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
31	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
32	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
33	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
34	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
35	*Angophora costata* Smooth-barked Apple	Characteristic	Locally native	Remove	Within footprint	✓		Low-medium value nectar/pollen, flowers Oct-Dec Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
36	*Angophora floribunda* Rough-barked Apple		Locally native	Remove	Within footprint			Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
37	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
38	*Callistemon viminalis* Weeping Bottlebrush		Not locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Nov
39	*Angophora costata* Smooth-barked Apple	Characteristic	Locally native	Remove	Within footprint	✓		Low-medium value nectar/pollen, flowers Oct-Dec Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
40	*Angophora floribunda* Rough-barked Apple		Locally native	Remove	Failed VTA			Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
41	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
42	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
43	*Eucalyptus pilularis* Blackbutt		Locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
44	*Eucalyptus pilularis* Blackbutt		Locally native	Remove	Within footprint			Medium value nectar/pollen, flowers Oct-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
45	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Within footprint	✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
46	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
47	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
48	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
49	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Within footprint	✓		Females produce seeds that provide forage for threatened Glossy Black-Cockatoo
50	*Eucalyptus saligna* [A] Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
51	*Syncarpia glomulifera* Turpentine	Characteristic	Locally native	Remove	Within footprint	✓		Medium value nectar/pollen, flowers Sep-Nov Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
52	*Corymbia maculata* Spotted Gum		Locally native	Retain and protect				High value nectar/pollen, flowers autumn-winter, but sporadic Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
53	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
54	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
55	*Eucalyptus saligna* [A] Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
56	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
57	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
58	*Grevillea robusta* Silky Oak		Not locally native	Retain and protect				Medium value nectar/pollen, flowers Oct-Nov

Number	Species	Affiliation with STIF CEEC	Geographic provenance	Fate	Reason for Removal	Ecological Value		
						Part of EEC	Fauna roosting / denning / breeding habitat	Fauna foraging habitat (flowers / fruits)
59	*Eucalyptus saligna* [A] Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
60	*Syncarpia glomulifera* Turpentine	Characteristic	Locally native	Remove	Within footprint	✓		Medium value nectar/pollen, flowers Sep-Nov
61	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
62	*Syncarpia glomulifera* Turpentine	Characteristic	Locally native	Remove	Within footprint	✓		Medium value nectar/pollen, flowers Sep-Nov
63	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
64	*Celtis sinensis* Chinese Hackberry		Exotic	Remove	High threat weed			
65	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Failed VTA	✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
66	*Eucalyptus pilularis* Blackbutt		Locally native	Remove	Within footprint Failed VTA			Medium value nectar/pollen, flowers Oct-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
67	*Syncarpia glomulifera* Turpentine	Characteristic	Locally native	Remove	Within footprint	✓		Medium value nectar/pollen, flowers Sep-Nov Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
68	*Eucalyptus saligna* [A] Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
69	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
70	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
71	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Retain and protect		✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
72	*Angophora floribunda* Rough-barked Apple		Locally native	Remove	Within footprint Failed VTA			Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
73	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
74	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint Failed VTA			High value nectar/pollen, flowers spring
75	*Ficus rubiginosa* Port Jackson Fig		Locally native	Retain and protect				Soft fruits available in autumn Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
76	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
77	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint Failed VTA			High value nectar/pollen, flowers spring
78	*Angophora floribunda* Rough-barked Apple		Locally native	Retain and protect				Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
79	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Unsustainable impact to TPZ			High value nectar/pollen, flowers spring
80	*Eucalyptus punctata* Grey Gum	Characteristic	Locally native	Retain and protect		✓		Medium-high value nectar/pollen, flowers Jan-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
81	*Angophora floribunda* Rough-barked Apple		Locally native	Remove	Failed VTA		Empty stick nest in canopy – probably Australian Magpie	Low-medium value nectar/pollen, flowers Jan-Feb Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
82	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Retain and protect		✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
83	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
84	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
85	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Failed VTA			High value nectar/pollen, flowers Dec-Mar in Sydney area
86	*Eucalyptus punctata Grey Gum*	Characteristic	Locally native	Retain and protect		✓		Medium-high value nectar/pollen, flowers Jan-Mar Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
87	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area

Number	Species	Affiliation with STIF CEEC	Geographic provenance	Fate	Reason for Removal	Ecological Value		
						Part of EEC	Fauna roosting / denning / breeding habitat	Fauna foraging habitat (flowers / fruits)
88	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
89	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Failed VTA			High value nectar/pollen, flowers Dec-Mar in Sydney area
90	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
91	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
92	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
93	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
94	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
95	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
96	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Retain and protect				High value nectar/pollen, flowers Dec-Mar in Sydney area
97	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
98	*Pinus radiata* Radiata Pine		Exotic	Retain and protect				
99	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
100	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
101	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
102	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
103	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
104	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Within footprint	✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
105	*Melaleuca quinquenervia* Broad-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
106	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint Failed VTA			High value nectar/pollen, flowers Dec-Mar in Sydney area
107	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
108	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Retain and protect				High value nectar/pollen, flowers spring
109	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
110	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
111	*Eucalyptus paniculata* Grey Ironbark	Characteristic	Locally native	Remove	Within footprint	✓		High value nectar, flowers in summer Recognised as a diet species of Grey-headed Flying-fox in Ku-ring-gai
112	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Unsustainable impact to TPZ	✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
113	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Remove	Unsustainable impact to TPZ	✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
114	*Pittosporum undulatum* Sweet Pittosporum	Characteristic	Locally native	Retain and protect		✓		
115	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area
116	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
117	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint			High value nectar/pollen, flowers Dec-Mar in Sydney area

Number	Species	Affiliation with STIF CEEC	Geographic provenance	Fate	Reason for Removal	Ecological Value		
						Part of EEC	Fauna roosting / denning / breeding habitat	Fauna foraging habitat (flowers / fruits)
118	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint Failed VTA			High value nectar/pollen, flowers Dec-Mar in Sydney area
119	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Retain and protect		✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
120	*Allocasuarina torulosa* Forest Oak	Characteristic	Locally native	Retain and protect		✓		Females produce seeds that provide forage for Glossy Black-Cockatoo
121	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Unsustainable impact to TPZ			High value nectar/pollen, flowers Dec-Mar in Sydney area
122	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Unsustainable impact to TPZ			High value nectar/pollen, flowers Dec-Mar in Sydney area
123	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Within footprint			High value nectar/pollen, flowers spring
124	*Eucalyptus saligna* Sydney Blue Gum		Locally native	Remove	Within footprint Failed VTA			High value nectar/pollen, flowers Dec-Mar in Sydney area
125	*Melaleuca styphelioides* Prickly-leaved Paperbark		Locally native	Remove	Unsustainable impact to TPZ			High value nectar/pollen, flowers spring
126	*Eucalyptus grandis* Flooded Gum		Not locally native	Remove	Unsustainable impact to TPZ			Medium value nectar/pollen, flowers Apr-Aug

Table 4: Flora species recorded on site. Locally-native species indicated by coloured cells. **STIF affinity:** Characteristic per NSW Scientific Committee Final Determination (2019), BGHF affinity: Characteristic per NSW Scientific Committee Final Determination (2011). **Weed status:** High Threat Weed per BAM (2020), WONS = Weed of National Significance per Weeds Australia (2022).

Family	Species	Provenance	STIF affinity	BGHF affinity	Weed status	Q1	RM
Anacardiaceae	*Toxicodendron succedaneum* * Rhus Tree	Exotic					x
Apiaceae	*Centella asiatica* Swamp Pennywort	Locally native Naturally occurring	Characteristic				x
Araceae	*Monstera deliciosa** Fruit-salad Plant	Exotic					x
Arecaceae	*Syagrus romanzoffiana** Cocos Palm	Exotic					x
Asparagaceae	*Asparagus aethiopicus** Ground Asparagus	Exotic			High Threat Weed WONS		x
Asteraceae	*Conyza* sp.* Fleabane	Exotic				x	
Asteraceae	*Taraxacum officinale** Dandelion	Exotic					x
Cannabaceae	*Celtis sinensis** Japanese Hackberry	Exotic					x
Cannabaceae	*Trema tomentosa* var. *aspera* Native Peach	Locally native Naturally occurring	Characteristic				x
Casuarinaceae	*Allocasuarina torulosa* Forest Oak	Locally native	Characteristic	Characteristic		x	
Commelinaceae	*Commelina cyanea* Native Scurvy Weed	Locally native Naturally occurring	Characteristic			x	
Commelinaceae	*Tradescantia fluminensis** Trad	Exotic			High Threat Weed	x	
Convolvulaceae	*Dichondra repens* Kidney Weed	Locally native Naturally occurring	Characteristic			x	
Cyperaceae	*Cyperus gracilis*	Locally native Naturally occurring				x	

Family	Species	Provenance	STIF affinity	BGHF affinity	Weed status	Q1	RM
Fabaceae	*Glycine clandestina* Twining Glycine	Locally native Naturally occurring	Characteristic	Characteristic		x	
Fumariaceae	*Fumaria muralis** Wall Fumitory	Exotic					
Lamiaceae	*Clerodendrum tomentosum* Hairy Clerodendrum	Locally native Naturally occurring	Characteristic	Characteristic		x	
Lamiaceae	*Plectranthus parviflorus* Cockspur Flower	Locally native				x	
Malaceae	*Eriobotrya japonica** Loquat	Exotic					x
Malaceae	*Photinia serratifolia** Chinese Photinia	Exotic					x
Malvaceae	*Modiola caroliniana** Red-flowered Mallow	Exotic				x	
Malvaceae	*Sida rhombifolia** Paddy's Lucerne	Exotic				x	
Moraceae	*Ficus rubiginosa* Port Jackson Fig	Locally native Naturally occurring					x
Myrtaceae	*Angophora costata* Smooth-barked Apple	Locally native	Characteristic	Characteristic		x	
Myrtaceae	*Angophora floribunda* Rough-barked Apple	Locally native		Characteristic		x	
Myrtaceae	*Callistemon viminalis* Weeping Bottlebrush	Not locally native					x
Myrtaceae	*Corymbia maculata* Spotted Gum	Locally native				x	
Myrtaceae	*Eucalyptus grandis* Flooded Gum	Not locally native					x
Myrtaceae	*Eucalyptus paniculata* Grey Ironbark	Locally native	Characteristic				x
Myrtaceae	*Eucalyptus pilularis* Blackbutt	Locally native	Characteristic	Characteristic		x	
Myrtaceae	*Eucalyptus punctata*	Locally native	Characteristic				x

Family	Species	Provenance	STIF affinity	BGHF affinity	Weed status	Q1	RM
	Grey Gum						
Myrtaceae	*Eucalyptus saligna* Sydney Blue Gum	Locally native		Characteristic			x
Myrtaceae	*Melaleuca quinquenervia* Broad-leaved Paperbark	Locally native					x
Myrtaceae	*Melaleuca styphelioides* Prickly-leaved Tea Tree	Locally native				x	
Myrtaceae	*Syncarpia glomulifera* Turpentine	Locally native Naturally occurring?	Characteristic				x
Oleaceae	*Ligustrum lucidum** Large-leaved Privet	Exotic			High Threat Weed		x
Oleaceae	*Ligustrum sinense** Small-leaved Privet	Exotic			High Threat Weed	x	
Oxalidaceae	*Oxalis corniculata** Yellow Wood Sorrel	Exotic					x
Oxalidaceae	*Oxalis perennans*	Locally native Naturally occurring		Characteristic		x	
Passifloraceae	*Passiflora edulis** Common Passionfruit	Exotic				x	
Pinaceae	*Pinus radiata** Radiata Pine	Exotic			High Threat Weed		x
Pittosporaceae	*Pittosporum undulatum* Sweet Pittosporum	Locally native	Characteristic	Characteristic			x
Plantaginaceae	*Plantago lanceolata** Ribwort	Exotic					x
Poaceae	*Ehrharta calycina** Perennial Veldtgrass	Exotic			High Threat Weed	x	
Poaceae	*Microlaena stipoides* var. *stipoides* Weeping Rice Grass	Locally native Naturally occurring	Characteristic				x
Poaceae	*Oplismenus aemulus* Basket Grass	Locally native Naturally occurring	Characteristic			x	
Poaceae	*Paspalum dilatatum** Paspalum	Exotic			High Threat Weed		x

Family	Species	Provenance	STIF affinity	BGHF affinity	Weed status	Q1	RM
Polygonaceae	*Rumex sagittatus** Turkey Rhubarb	Exotic			High Threat Weed	x	
Proteaceae	*Grevillea robusta* Silky Oak	Not locally native					x
Rosaceae	*Potentilla indica** Wild Strawberry	Exotic				x	
Rosaceae	*Prunus persica** Peach Tree	Exotic					x
Rosaceae	*Spirea cantoniensis** May Bush	Exotic				x	
Rubiaceae	*Richardia brasiliensis** White Eye	Exotic				x	
Rutaceae	*Citrus limon** Lemon Tree	Exotic				x	
Rutaceae	*Citrus reticulatus** Mandarin Tree	Exotic				x	
Solanaceae	*Solanum mauritianum** Wild Tobacco Bush	Exotic					x
Violaceae	*Viola hederacea* Ivy-leaved Violet	Locally native Naturally occurring?		Characteristic			x

Table 5: Fauna species recorded during survey.

Fauna Group	Species	Type of Record
Bird	*Vanellus miles* Masked Lapwing	Call recorded
Bird	*Cacatua galerita* Sulphur-crested Cockatoo	Observed
Bird	*Alisterus scapularis* Australian King Parrot	Call recorded
Bird	*Trichoglossus haematodus* Rainbow Lorikeet	Observed
Bird	*Podargus strigoides* Tawny Frogmouth	Call recorded
Bird	*Dacelo novaeguineae* Laughing Kookaburra	Call recorded
Bird	*Manorina melanocephala* Noisy Miner	Observed
Bird	*Cracticus torquatus* Grey Butcherbird	Call recorded
Bird	*Cracticus tibicen* Australian Magpie	Abandoned stick nest in tree 81 near rear boundary
Bird	*Strepera graculina* Pied Currawong	Heard
Mammal	*Pseudocheirus peregrinus* Common Ringtail Possum	Call recorded
Mammal	*Trichosurus vulpecula* Common Brushtail Possum	Scats
Mammal	***Micronomus norfolkensis*** **Vul (BC Act)** **Eastern Coastal Free-tailed Bat**	**Call recorded - definite**
Mammal	***Miniopterus orianae oceanensis*** **Vul (BC Act)** **Large Bent-winged Bat**	**Call recorded - probable**
Mammal	*Ozimops ridei* Ride's Free-tailed Bat	Call recorded - definite

APPENDIX 4

TESTS OF SIGNIFICANCE

Sydney Turpentine Ironbark Forest

Sydney Turpentine Ironbark Forest (STIF) is listed as a Critically Endangered Ecological Community (CEEC) under the schedules of the *BC Act 2016*. It is also listed as a CEEC under the schedules of the *EPBC Act 1999*.

Importantly, the Turpentine-Ironbark Forest ecological community listed under the *EPBC Act 1999* is narrower in scope than that listed under the *BC Act 2016* as it includes only remnant patches that meet specific condition criteria, including patch size and canopy cover (Department of the Environment 2015). The Threatened Species Scientific Committee (2005) has determined that only high quality remnant patches which contain some characteristic native plant species present in all structural layers and that have:

- Tree canopy cover of more than 10% in a patch of at least 1 hectare (type 1) or,
- Tree canopy of less than 10% in a patch greater than 1 hectare if the patch is located within native vegetation with an overall area of more than 5 hectares (type 2).

are part of the Turpentine-Ironbark Forest ecological community listed under the *EPBC Act 1999*.

The type 1 patches have the greatest conservation value and their size and high quality generally make them most resilient to disturbance (Threatened Species Scientific Committee 2005). The type 2 patches enhance the potential for connectivity and the viability of the ecological community, act as a buffer against disturbance and support gene flow in the plant and animal species associated with the listed ecological community (Threatened Species Scientific Committee 2005).

This endangered ecological community now occurs predominantly as scattered remnants on shale derived soils on the rim of the Cumberland Plain and in the lower Blue Mountains (Tozer et al. 2010), particularly near the shale / sandstone boundary in higher rainfall areas and on the shale ridge caps of sandstone plateaus of the Hornsby Plateau (NSW Scientific Committee 2012, NSW NPWS 2004, OEH 2019a). This endangered ecological community is found in low lying areas with elevation between 10and 180 metres above sea level (OEH 2013). Local concentrations remain near Thirlmere, Oakdale, Kurrajong, Dural and Pennant Hills (Tozer et al. 2010).

Given its coincidence with urbanisation, it is highly fragmented with less than 10% (or 2,300 hectares) of its original extent estimated remaining prior to 2010 (Tozer et al. 2010). Small areas are reserved in Wallumatta and Newington Nature Reserves (NSW NPWS 2004), with 250 hectares in total in reserves (Tozer et al. 2010). Remnants mostly occur in the Baulkham Hills, Hawkesbury, Hornsby, Ku-ring-gai, Parramatta, Ryde, Sutherland and Wollondilly local government areas (OEH 2019a).

In its natural state, it is typically a diverse open eucalypt forest community with an open shrub layer and grassy ground cover (Tozer et al. 2010). It shares many species with adjoining stands of Blue Gum High Forest (another endangered ecological community)

(Tozer et al. 2010), and is considered to be a transitional community between Cumberland Plain Woodland in drier areas and Blue Gum High Forest on adjacent higher rainfall ridges (EOH 2019a). Dominant canopy trees include *Syncarpia glomulifera* Turpentine, *Eucalyptus punctata* Grey Gum, *Eucalyptus paniculata* Grey Ironbark, and *Eucalyptus eugenioides* Thin-leaved Stringybark (OEH 2019a). In areas of high rainfall (over 1050 mm per annum), *Eucalyptus saligna* Sydney Blue Gum is more dominant. The shrub stratum is usually sparse and may contain mesic species such as *Pittosporum undulatum* Sweet Pittosporum and *Polyscias sambucifolia* Elderberry Panax, particularly as fire is now largely excluded (NSW NPWS 2004).

Threats to this community include clearing for urban development, impacts from fragmentation, mowing (which stops regrowth), recreational disturbances (such as 4WD tracks), grazing, urban run-off that leads to increased nutrients and sedimentation, weeds and their inappropriate management, and inappropriate fire regimes (OEH 2019a).

It is known to support foraging resources that are exploited by the threatened fauna species *Calyptorhynchus lathami* Glossy Black-Cockatoo, *Ninox strenua* Powerful Owl, and *Pteropus poliocephalus* Grey-headed Flying-fox. Hollow-bearing trees may also provide nest sites for these and other bird species.

The modelled vegetation occurring in 1750 (prior to European clearing) in this area shows an uninterrupted band of STIF on the east facing slope between the broad shale ridge to the west and the incised sandstone gullies to the east (see Figure 11). The subject site is within this band of STIF.

The historical record demonstrates that, other than one tree in the rear yard (*Syncarpia glomulifera* Turpentine, tree 51), the trees evident on the subject site today were planted between

However, now STIF *sensu* the *BC Act 2016* occurs as canopy trees within the front and rear gardens of the site, comprising at least 29 planted trees, 1 tree that may be old natural regrowth dating prior to 1943, and recent understorey species growing beneath the tree canopies.

The lack of diverse native understorey of all structural layers precludes it from being recognised under and protected by the *EPBC Act 1999*.

The area occupied by STIF on site by this definition is 365 square metres and the proposal will directly impact on 287 square metres.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

This question is not relevant to a CEEC.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Response:

The local occurrence of an endangered ecological community is defined as the extent within the study area, with the "study area" being the subject site (the area directly impacted by the proposal) plus any additional areas likely to be affected. Note that "the local occurrence may include adjacent areas if the ecological community in the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated" (OEH 2018). The subject site supports approximately 365 square metres of STIF, taking into account areas already alienated by hardstand, in the TPZs of trees. The local occurrence of this community is considered to be made up of a number of small patches within the buffer area, and these total 21.97 hectares based on the State Vegetation Type Map. This represents only 0.17% of the STIF's local occurrence.

The impact area of 287 square metres represents 0.13% of the local occurrence and as such is considered unlikely to place the local occurrence at risk of extinction.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Response:

The existing patch of STIF is depauperate, represented by planted trees and some ground covers. The works will not otherwise alter the understorey of the retained areas to any significant degree.

This action is not considered likely to alter the composition of the community such that its local occurrence will be placed at risk of extinction.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Response:

The site contains 365 square metres of STIF on natural ground within the TPZs of the characteristic trees and approximately 287 square metres will be directly impacted.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Response:

The level of fragmentation of STIF in the local area is already significant, being broken up by residential and commercial areas and roads. However, the patches of this vegetation community are functionally connected by wide-ranging mobile pollinators such as Rainbow Lorikeets and Grey-headed Flying-foxes. Such functional connections will continue in the post development landscape.

The small scale of the loss of vegetation for the proposal will contribute to further fragmentation and isolation of this community, but it is unlikely to do so to any significant degree at the local or regional scale.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Response:

The area of habitat occupied by this community on site is small and is comprised primarily of planted trees of unknown provenance. As such, it cannot be regarded as important for the persistence of this community in the local area.

The subject site is not strategically located so that its contribution to local connectivity is critical for any plant or animal species.

However, it is part of a CEEC, is close to Garigal National Park and other reserves, and functionally connected to other large areas of bushland. Thus, the vegetation on site is an important area in that it contributes to the long term viability of other areas.

Nevertheless, the loss of such a small area of garden trees is unlikely to threaten the long term survival of the community in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

Response:

At the time of writing, declared Areas of Outstanding Biodiversity Values (AOBVs) are confined to those already declared as Critical Habitat under the *Threatened Species Conservation Act 1995*, being:

- Cabbage Tree Island, critical breeding habitat for Gould's Petrel near Port Stephens;
- Nesting habitat and a marine buffer, critical breeding habitat for Little Penguins at Manly Cove;
- Stotts Island Nature Reserve, critical habitat for Mitchell's Rainforest Snail near Murwillumbah; and
- All known extant areas of the Wollemi Pine and the surrounding habitat in the catchment, occupying some 5,000 hectares within Wollemi National Park.

No lands declared as an AOBV occur on or near the subject lot and will not be impacted either directly or indirectly by the proposal.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Response:

The proposal will contribute to the Key Threatening Process "Clearing of native vegetation".

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Pteropus poliocephalus Grey-headed Flying-fox

The Grey-headed Flying-fox is listed as Vulnerable under Schedule 1 of the *Biodiversity Conservation Act 2016* and the schedules of the *Environment Protection and Biodiversity Conservation Act 1999*.

The Grey-headed Flying-fox is a large flying-fox with a white or greyish head, reddish mantle around the neck and thick, shaggy fur extending to the ankles (Strahan 1995). This species has a distribution along eastern coastal Australia from Rockhampton in Queensland to western Victoria (Churchill 2008). The Grey-headed Flying-fox occurs in a variety of habitats including subtropical and temperate rainforests, sclerophyll forests, woodlands, as well as urban areas (OEH 2019). It also frequents mangroves, paperbark swamps and cultivated areas (Churchill 1998). It is usually seen in large, noisy colonies, or in day 'camps' usually placed close to water in gullies with dense forest canopies (Tidemann 1995). This is a highly mobile species, and camps are regularly moved in response to local food availability (Churchill 1998). Most births occur around October (Strahan 1995).

They forage widely at night mainly for rainforest fruits and native blossoms (Strahan 1995), and this species is likely to be an important pollinator for many native species (Tidemann 1995). Seventy-five percent of foraging forays are within 20 kilometres of the camp but some individuals may commute 50 kilometres to a productive food sources (Tidemann et al. 2008).

They have been recorded as feeding on 201 plant species of 50 families, with almost half of these in the Myrtaceae (Churchill 2008) but the pollen and nectar of *Eucalyptus, Melaleuca* and *Banksia* (Eby 2000) are their principal foods. Native figs are also important, and they also appear to eat the salt glands from mangrove trees (Churchill 2008).

The availability of native fruits, nectar and pollen varies over time and throughout the range of the species. This species is highly nomadic in response to the uneven distribution of their food plants, sometimes travelling hundreds of kilometres to find suitable resources and / or feeding in domestic gardens, parks, and orchards. Such characteristics make it very difficult to define key habitat areas (Eby and Lunney 2002). Also, the areas that offer foraging resources at any time are small and vary in location between years (Eby and Lunney 2002).

Although variable, a general pattern of movement can be discerned. Almost half of the eucalypt species used by the Grey-headed Flying-fox flower in summer and such summer-flowering species are distributed throughout their range. Thus, in summer, this species is generally widely dispersed.

However, the winter-flowering species they use are largely restricted to the woodlands of the western slopes or the lowland coastal communities (Eby and Lunney 2002). Thus, they are usually highly aggregated in winter, depending on where the nectar is flowing.

This winter convergence makes the species vulnerable to changes in these coastal communities, particularly as it coincides with the areas of greatest development. High

rates of mortality can result from result from losses of small areas of key winter habitat (Eby and Lunney 2002). These losses are compounded by removal and fragmentation of other resource patches used at other times. Even in areas of remaining forest, nectar flow itself is impacted upon by dieback, drought, fire, and local fluctuations in temperature and rainfall (Eby and Lunney 2002).

The spring also presents potential bottlenecks for this species as several key spring-flowering trees are primarily confined to relatively flat and fertile land such as has already been extensively cleared and is still favoured by development (Eby and Lunney 2002). This also coincides with the time of birth of young when there is an added nutritional requirement and the females do not venture far from the maternity camp to feed.

These camps may contain tens of thousands of animals, depending upon the abundance of locally available food sources. They are generally located in close proximity (20 km or less) to a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest (Eby 1995). Site fidelity is high and some camps in NSW have been used for over a century (Eby 2000). Such a long term camp is located at Gordon, approximately 2.7 kilometres to the south east of the development site.

Being so highly mobile, connectivity of forest patches is not critical for this species to be able to exploit different areas of vegetation. However, they are impacted by direct loss of habitat as well as via long term changes on critical features such as nectar flow wrought by dieback and other consequences of forest fragmentation.

The number of species of fruits and flowers exploited by this species is large, as befitting its extraordinarily broad distribution along the east coast of Australia.

A recent study of threatened nomadic pollinators in NSW (Eby 2016) has concluded that a resource bottleneck for vertebrate pollinators occurs in winter and early spring. The tree species relied upon by the Grey-headed Flying-fox at that time in coastal habitats is *Banksia integrifolia* Coast Banksia, *Corymbia maculata* Spotted Gum, *Eucalyptus robusta* Swamp Mahogany, *Eucalyptus sideroxylon* Mugga Ironbark, and *Melaleuca quinquenervia* Broad-leaved Paperbark; and the early spring flowering *Eucalyptus siderophloia* Northern Grey Ironbark.

This species is regularly recorded in the local area, with over 2,000 records in the broader study area, and 44 records within 1.5 kilometres of the site. It is commonly observed foraging in backyard trees, street trees, and in local reserves, but also unfortunately also as victims of roadkill and electrocution on power lines. This high number of records is unsurprising due to the site's proximity to the significant maternity camp in the Ku-ring-gai Flying-fox Reserve in the Stoney Creek gully in Gordon, approximately 4 kilometres to the south west. At the census of this camp in December 2019, 43,000 individuals were estimated to be in residence.

This species is likely to forage on the blossom available in the trees on site, but particularly in the high value nectar and pollen available throughout the year, but primarily in the spring and summer. Given the subject site's proximity to the Gordon colony, it is likely that any animals foraging on site would be dominant females and their young, and so are potentially

important to the survival of the local population.

The following tree species recorded on site are reportedly diet species in the Ku-ring-gai area:

- *Angophora costata*
- *Angophora floribunda*
- *Corymbia maculata*
- *Eucalyptus paniculata*
- *Eucalyptus pilularis*
- *Eucalyptus punctata*
- *Eucalyptus saligna*
- *Ficus rubiginosa*
- *Melaleuca quinquenervia*
- *Syncarpia glomulifera*

There are 55 individual trees on site that are representative of this group of forage trees, and they provide potential foraging resources predominantly in the summer (46 or 84% of forage trees potentially in flower in that season), and autumn (37 or 67% of forage trees potentially in flower or fruit in that season). Only 2 individual trees are species that are known to flower in the winter (4% of trees in that season), and 12 individual trees in the spring (22% in that season).

The proposal will remove 32 and retain 23 of the 55 potential forage trees. The impact on availability of foraging resources is restricted to the quantum of forage, with seasonal forage availability in the post-development landscape a reflection of that in the pre-development landscape. The majority of foraging resources remaining will be potentially available in the summer (20 or 87% of remaining forage trees potentially in flower) and autumn (16 or 70% of forage trees potentially in flower or fruit). One of the 3 winter-flowering trees will remain, and the 4 potentially spring-flowering trees represent 17% of the retained set of trees.

The proposal therefore will not impose a foraging bottleneck or greatly exacerbate the existing winter forage bottleneck for this threatened species.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

Critical habitat elements for the life cycle of this species are those associated with maternity camps and winter forage. The development site does not contribute to camps, and provides little winter forage.

Therefore, it is unlikely the proposal will place a viable local population at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Response:

This question is not relevant to a threatened species.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Response:

The proposal will remove 32 trees that are recognised as providing foraging resources to the Grey-headed Flying-fox in the Ku-ring-gai area. The proposal will also retain 23 such trees with a similar seasonality.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Response:

This species is highly mobile and impacts of the proposal will not interfere with its capacity to move through the landscape.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Response:

Potential foraging resources for this species are common on the subject lot, in nearby reserves, and in the surrounding urban landscape. The potential foraging habitat to be removed is therefore considered to be unimportant to this species due to its small scale in that context.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

Response:

At the time of writing, declared Areas of Outstanding Biodiversity Values (AOBVs) are confined to those already declared as Critical Habitat under the *Threatened Species Conservation Act 1995*, being:

- Cabbage Tree Island, critical breeding habitat for Gould's Petrel near Port Stephens;
- Nesting habitat and a marine buffer, critical breeding habitat for Little Penguins at Manly Cove;
- Stotts Island Nature Reserve, critical habitat for Mitchell's Rainforest Snail near Murwillumbah; and
- All known extant areas of the Wollemi Pine and the surrounding habitat in the catchment, occupying some 5,000 hectares within Wollemi National Park.

No lands declared as an AOBV occur on or near the subject lot and will not be impacted either directly or indirectly by the proposal.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Response:

The proposed works will contribute to the Key Threatening Process "Clearing of native vegetation".

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Micronomus norfolkensis Eastern Coastal Free-tailed Bat

Micronomus (was *Mormopterus*) *norfolkensis* Eastern Coastal Free-tailed Bat is listed as Vulnerable under Schedule 1 of the *Biodiversity Conservation Act 2016*. Note that it was listed under its previous taxonomic name, *Mormopterus norfolkensis.* This species is not listed under the Schedules of the *Environment Protection and Biodiversity Conservation Act 1999*.

This species has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane (OEH 2019). It is an insectivore but nothing specific is known about its diet (Churchill 1998, 2008).

It is found along the east coast from south eastern Queensland to southern NSW (OEH 2019). Most records are from dry eucalypt forest and woodland, although a number have been caught flying low over a rocky river through rainforest and wet sclerophyll forest (Hoye et al. 2008). Research in coastal forests near Coffs Harbour have shown that it is more active on upper slopes where the flyways are open and uncluttered, rather than along creeks (Hoye et al. 2008).

Recent research (McConville and Law 2013) suggests that it is adapted to open landscapes and that they do not move far (only up to 2 kilometres) from roost sites to foraging areas. While longer range movements have been recorded (e.g. 5 kilometres at Urbenville - McConville and Law 2013), the data suggest this species has a smaller foraging range than other *Micronomus* species (e.g. 12 kilometres by *Micronomus* species 4 – Lumsden et al. 2008).

They occur in small colonies (sometimes perhaps only 2 bats), and roosts have been recorded in the roof of a hut, under bark and the caps of telegraph poles. However, it is more usually found in hollows in large mature trees (Churchill 2008). All natural roost sites have been found in large mature eucalypts and they will use paddock trees and remnant vegetation in farmland (Hoye et al. 2008). In agricultural landscapes, trees in roadside reserves may provide critical for this species (McConville and Law 2013). They will also roost in artificial roosts, with a colony in NSW known to use the same boxes for over 5 years (Churchill 2008).

Young are born in late November or early December and are free-flying by late January (Hoye et al. 2008).

A survey of the fauna of the large sandstone-based reserves around the northern Sydney fringe found that this species was infrequently recorded within these reserves. In this area, it is thought that they may prefer the larger alluvial valleys and coastal plains (DEC 2005, DECC 2008).

This species is reliably recorded in bushland in the local area, with 5 recent records within 1.5 kilometres of the site. It was recorded on site during survey, foraging throughout the evening, but most notably just before dawn. This indicates that there is a roosting site near the Anabat recorder, which was placed in the south western corner of the site. There

are no hollow-bearing trees on the subject site, but there may be suitable roosting habitat off site nearby. Alternatively, this species is known to exploit man-made structures as roosting habitat and so may be using such habitats on or off site.

The subject site provides potential foraging habitat below the native tree canopies.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

Habitat features critical to this species include roosting and breeding sites in hollow-bearing trees. While no hollows occur on site, this species could be roosting in man-made structures. The proposal will remove some foraging habitat and potentially a roost site.

Such losses are small and not considered likely to place a local population at risk of extinction.

The proposal is unlikely to place a viable local population at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Response:

This question is not relevant to a threatened species.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Response:

Area currently occupied by garden that will be developed for the new building represents a loss of approximately 455 square metres of foraging habitat for this species.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Response:

This is a highly mobile species able to exploit widely separated resources. The proposal is unlikely to prevent this species from moving around the landscape or accessing required resources.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Response:

It is unlikely that the small area of foraging habitat on site to be impacted is an important resource for the local occurrence of this species. No hollow-bearing trees will be removed, and it is recommended that the habitat is enriched for this species with installation of artificial roosts and conservation management of the retained vegetation.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

Response:

At the time of writing, declared Areas of Outstanding Biodiversity Values (AOBVs) are confined to those already declared as Critical Habitat under the *Threatened Species Conservation Act 1995*, being:

- Cabbage Tree Island, critical breeding habitat for Gould's Petrel near Port Stephens;
- Nesting habitat and a marine buffer, critical breeding habitat for Little Penguins at Manly Cove;
- Stotts Island Nature Reserve, critical habitat for Mitchell's Rainforest Snail near Murwillumbah; and
- All known extant areas of the Wollemi Pine and the surrounding habitat in the catchment, occupying some 5,000 hectares within Wollemi National Park.

No lands declared as an AOBV occur on or near the subject lot and will not be impacted either directly or indirectly by the proposal.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Response:

The proposed works will contribute to the Key Threatening Process "Clearing of native vegetation".

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Miniopterus orianae oceanensis Eastern Bent-winged Bat

The Eastern Bent-wing Bat is listed as Vulnerable under Schedule 1 of the *Biodiversity Conservation Act 2016*. This species is not listed under the Schedules of the *Environment Protection and Biodiversity Conservation Act 1999*.

The Eastern Bent-winged Bat has been identified as a result of revision to the taxonomy of the Common Bent-wing Bat (*Miniopterus schreibersii*) and was, until recently, referred to as *Miniopterus schreibersii oceanensis*. The Eastern Bent-winged Bat closely resembles the Little Bent-winged Bat, but is larger (Strahan 1995). This species is distributed along the east and North West coasts of Australia (OEH 2021). Its range extends along the entire east coast of Australia, with a gap forming along the Gulf of Carpentaria, where records begin again in the Kimberley (Churchill 1998).

Primary roost sites include caves with colonies reaching thousands in number (Strahan 1995), however they also use other man-made structures such as abandoned mines and road culverts (Churchill 2008). The 12 maternity roosts that are known throughout the range of this species are located in limestone and sandstone caves, abandoned gold mines, concrete bunkers and lava tubes (Hoye and Hall 2008).

In the southern, non-tropical parts of its range mating occurs in early winter but implantation is delayed until August. After mating and with the onset of spring, adult females move from numerous widely scattered roosts to specific nursery caves where the young are born and reared to independence. Here they form discrete populations of pregnant females, non-breeding females and juvenile males at a maternity cave in the spring and summer (Hoye and Hall 2008).

Particular nursery caves will be used repeatedly year after year and may number from 100 to 150,000 individuals (OEH 2021). Nursery colonies disband between February and March, adults and juveniles going separate ways, and will disperse up to 300 kilometres from the maternity cave (OEH 2021). These bats are strong fliers and often travel long distances, with one individual recorded moving 1,300 km (Dwyer 1969).

Overwintering roosts depend on the sex and age of individuals with bats often selecting cool areas located within caves, mines, tunnels, drains and bridges during the colder months of the year when insects are few (Hoye and Hall 2008). In such sites they may enter periodic torpor as an energy-saving strategy, reducing their metabolic temperatures and prolong fat reserves over winter (Churchill 1998). In the tropical areas, however, diurnal shelter sites may be found in roofs of buildings (Hoye and Hall 2008). This species is known to roost with *Miniopterus australis* Little Bent-winged Bat (Hoye and Hall 2008).

It has a fast and direct flight (Hoye and Hall 2008) and can reportedly travel up to 65 kilometres in a night (Dwyer 1966). It forages principally on moths, usually snatched high above the forest canopy, although it can also forage low to the ground over open grassy areas (Churchill 1998, 2008) and along waterways and tracks (Hoye and Hall 2008). It also regularly forages around street lights and may be active throughout winter in coastal locations (Hoye and Hall 2008).

This species is vulnerable to losses of maternity sites and increased mortality is observed at overwintering roosts that are frequently disturbed (Hoye and Hall 2008). Foxes and cats are major predators (Hoye and Hall 2008), and bats overwintering in urban areas show high levels of injury from collisions with cars and trains, flooding and other urban hazards (Hoye and Spence 2004).

In northern Sydney, this species is known to occur regularly in St Michaels Cave, North Avalon (Smith and Smith 2000). While this is clearly an important roosting site for the species in the Sydney region, the bats are unlikely to breed in this cave and there are no known nursery caves in the vicinity of Sydney, the nearest being at Bungonia (Dwyer 1969). Unidentified bats that may be this species have been reported roosting elsewhere in Pittwater at Careel Cave and in a culvert at the Bilgola Bends (Smith and Smith 2000).

This species is reliably recorded in bushland and urban situations in the local area, with 10 recent records within 1.5 kilometres of the site. It was recorded on site during survey, foraging for a brief period during the middle part of the night. This indicates that there its roosting site is probably not close, which is unsurprising as it roosts in caves and tunnels. In the local area, such habitat is probably available in the sandstone gullies in Garigal National Park but not on the St Ives ridgetop.

The site provides potential foraging habitat above the tree canopies. As it roosts in caves and tunnels, no suitable roosting habitat occurs on site.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

Response:

Critical habitat features for this species are the caves used for roosting and breeding. There are no such features on or near the site. The proposal will not impact important habitat features.

Therefore, the proposal will not adversely affect the long-term viability of this species.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

Response:

This question is not relevant to a threatened species.

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Response:

The proposal will require the removal of approximately 455 square metres of urban garden.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Response:

This is a highly mobile species that can exploit widely separated resources. The proposal will retain canopy trees on site and will plant additional trees and improve the understorey.

The level of fragmentation of habitat in the local area is unlikely to be exacerbated by the proposal, particularly for such a highly mobile species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Response:

Important habitat for this species is either close to maternity caves or contain non-breeding roost sites. The subject site does not fulfil these criteria.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

Response:

At the time of writing, declared Areas of Outstanding Biodiversity Values (AOBVs) are confined to those already declared as Critical Habitat under the *Threatened Species Conservation Act 1995*, being:

- Cabbage Tree Island, critical breeding habitat for Gould's Petrel near Port Stephens;
- Nesting habitat and a marine buffer, critical breeding habitat for Little Penguins at Manly Cove;

- Stotts Island Nature Reserve, critical habitat for Mitchell's Rainforest Snail near Murwillumbah; and
- All known extant areas of the Wollemi Pine and the surrounding habitat in the catchment, occupying some 5,000 hectares within Wollemi National Park.

No lands declared as an AOBV occur on or near the subject lot and will not be impacted either directly or indirectly by the proposal.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

Response:

The proposed works will contribute to the Key Threatening Process "Clearing of native vegetation".

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