Assessment of Lot 21/1000643 Campbelltown: koala occupancy and habitat

Report to Travers Bushfire and Ecology

June 2021

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Abbreviations

Abbreviation	Description
APZ	Asset Protection Zone
CCC	Campbelltown City Council
CU	Compensation Units
CKPoM	Comprehensive Koala Plan of Management
DA	Development Application
DBH	Diameter at Breast Height
DPIE	NSW Department of Planning, Industry and Environment
GPS	Global Positioning Service
KAAR	Koala Activity Assessment Report
LGA	Local Government Area
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
PKFT	Preferred Koala Food Tree
PKH	Preferred Koala Habitat
SAT	Spot Assessment Technique
SEPP44	State Environmental Planning Policy No. 44 (Koala Habitat Protection)
SLA	Strategic Linkage Area
VAR	Vegetation Assessment Report

Biolink

Supervising Ecologist	Amanda Lane
Conservation Analyst	Kirsty Wallis
Advising Consultant	Stephen Phillips
Field Survey	Kirsty Wallis, Amanda Lane

Acknowledgements

We thank John Travers of John Travers Bushfire and Ecology.

Summary

In accord with the requirements of the Campbelltown Comprehensive Koala Plan of Management (CKPoM), this report describes fieldwork which resulted in a Vegetation Assessment Report (VAR) and a Koala Activity Assessment Report (KAAR) for a proposed development on Lot 21/1000643 and partial Lot 3/1007066 in Gilead, south west Campbelltown. The VAR included a stadia-metric survey of native trees over 50 mm Diameter at Breast Height (DBH) within the defined study area, that being the primary lot to which the proposed development applies and a small extension into adjoining lot 3/1007066, plus a 20 m buffer. The five most encountered native species were *Eucalyptus tereticornis*, *E. moluccana*, *Acacia implexa*, *E. crebra* and *Corymbia maculata*. Preferred Koala Food Tree (PKFT) species, as defined by the CKPoM (*E. tereticornis*, *E. moluccana* and *E. punctata*), accounted for 78.56% of the tree species present within the study area. The highest density of PKFTs were mapped in the central-north of the study area which supports a large consolidated stand of *E. tereticornis* and *E. moluccana*, the majority of these trees falling into the small (< 100 mm) and medium (> 100 mm < 300 mm) categorisations of the CKPoM. No species which are defined by the CKPoM as koala shelter trees were identified within the study area.

Current vegetation mapping for the site is generally congruent with field survey. Of the three Plant Community Types (PCTs) previously mapped within the study area, one (PCT code 1395) does not match the tallest stratum species composition at this location and may be better described as an extension of one of the other two PCTs (849 or 850) according to underlying soil / topography. There is unmapped native vegetation in the eastern portion of the study area consisting of several single-species stands of trees, set amongst scattered paddock trees and weedy ground cover. Due to the prevalence of *E. tereticornis*, this unmapped vegetation meets the definition of potential koala habitat as outlined in the Campbelltown CKPoM. A gully runs through the central portion of the study area from the west, supporting some disturbed rainforest elements with several large trees (> 1 m DBH) also located therein. It is our understanding that this riparian area is not part of the intended development footprint, but is included within the study area for context.

Spot Assessment Technique (SAT) assessments were undertaken at five survey sites, two of which were found to support high koala activity. Output from a splining process performed with the spatial analyst extension in ArcGIS 10.5 produced an activity contour model delineating the boundaries of core koala habitat. These activity contours indicate that the western section of the study area supports parts of at least one koala home range area that likely extends further to the north and west.

Collectively, the outcomes of the VAR and KAAR indicate that the study area supports a mix of core koala habitat (with contemporaneous koala occupancy) and potential koala habitat, as defined by the Campbelltown CKPoM. The results of this report provide an overlay of ecological data which can work to inform any potential development footprint.

1. Introduction

Koalas (*Phascolarctos cinereus*) inhabiting the Campbelltown Local Government Area (LGA) have long been the focus of scientific and community interest, with available data indicating that the population has undergone a measure of recovery over the last 20 – 30 years (Phillips 2016). The most recent LGA-wide population monitoring indicated an estimated population size of 236 ± 60 (95% CI) koalas, with contemporary range extensions to the north, near the boundary with Liverpool LGA, and in the south-west with koalas now occurring on both sides of Appin Road and the Hume Highway (Biolink 2021). Campbelltown City Council (CCC) requires that developments seeking approval on lands which support native vegetation and / or are > 1 ha, be assessed for koala occupancy and habitat by following the guidelines in the recently approved Campbelltown Comprehensive Koala Plan of Management (CKPoM) (Phillips 2016).

The Campbelltown CKPoM maps core and potential koala habitat and identifies the location of Strategic Linkage Areas (SLA) – these being areas that support major movement corridors for koalas. Council cannot approve a DA that falls within a SLA unless it is satisfied that the proposal will not interfere with the movement of koalas. In addition to this, the requirements for assessment of koala habitat as it pertains to a DA are the establishment of whether the subject land contains any potential koala habitat by way of a Vegetation Assessment Report (VAR). As a minimum this VAR must include:

- A description of the tallest stratum cover and details of species composition of each vegetation community.
- A checklist of native vegetation species occurring in each vegetation patch, including any isolated paddock trees on partially cleared lands.
- A stadia-metric survey that identifies the precise location, taxonomic identity and Diameter at Breast Height (DBH) of all native vegetation proposed to be removed and / or within 20 m of the proposed development footprint, including any proposed infrastructure, easements and Asset Protection Zones.
- A map of where koala food and shelter trees were recorded[1].

[1] The Campbelltown CKPoM is not bound by SEPP44 definitions of Preferred Koala Food Trees (PKFTs). To this end and based on published studies and resource documents, Preferred Koala Food Tree species for koalas in Campbelltown have been identified as Forest red gum (*Eucalyptus tereticornis*), Ribbon gum (*E. viminalis*), Woollybutt (*E. longifolia*), Gum-topped (Grey) box (*E. moluccana*) and Grey gum (*E. punctata*). Shelter trees are those species which are known to be preferentially used by koalas in the Campbelltown LGA for roosting and thermoregulatory purposes and are defined in the CKPoM as Turpentine (*Syncarpia glomulifera*) and Brush box (*Lophostemon confertus*).

If the land which is the subject of the DA is determined to be potential koala habitat, then a DA must include a Koala Activity Assessment Report (KAAR) for that land. Council may also require a KAAR to be prepared for any development within mapped core koala habitat where detailed information on the distribution of koala activity and movement is required to assist in the evaluation of development design. The appropriate methodological approach for the preparation of a KAAR is outlined in Appendix B of the Campbelltown CKPoM. With regard to the potential development on Lot 21/1000643, this involves following Regularised Grid-based SAT (RG-bSAT) sampling protocols at 250 m intervals (initial sampling intensity) or 125 m intervals (high sampling intensity) for DA lands < 15 ha. If High[2] koala activity is recorded at any of the initial sampling sites, then the surrounding high sampling intensity sites are also to be assessed.

The current project was initiated to assess Lot 21/1000643 and part of Lot 3/1007066 (Gilead, Campbelltown, NSW) for the possible occurrence of koalas and koala habitat in accord with the Campbelltown CKPoM, and so provide information of relevance to a potential Development Application (DA).

[2] As defined for East Coast Low Density populations by Table 2 in Phillips and Callaghan (2011)

2. Methodology

The primary lot to which the proposed development applies (Lot 21/1000643) plus a small extension into Lot 3/1007066 which represents an asset protection zone, all with a 20 m buffer, is hereafter referred to as the study area.

2.1. Vegetation Assessment Report

2.1.1. Stadia-metric tree survey

Across the study area, all native trees with a DBH greater than 50 mm were measured[3] and identified to species level (where possible), and their location recorded using a hand-held GPS. Each tree was then classified as either a Preferred Koala Food Tree (PKFT), shelter tree or other native species as prescribed by Phillips (2016). PKFTs were grouped into size classes in accordance with the Campbelltown CKPoM categorisations of small (DBH < 100 mm), medium (DBH > 100 < 300 mm) and large (DBH > 300 mm) (Phillips 2016).

2.1.2. Vegetation communities / species composition

The tallest stratum cover and details of species composition were recorded for each vegetation community present in the study area. A checklist of native vegetation species, including any isolated paddock trees on partially cleared lands, was generated.

2.2. Koala Activity Assessment Report

2.2.1. Field Survey

The study area was overlain with a 125 m grid with grid-cell intersections becoming potential survey points where they occurred in areas of native vegetation, *as per* the high sampling intensity requirement prescribed in the Campbelltown CKPoM. Sites could be moved up to 12 m if they did not intersect with the vegetation of ESRI Basemap satellite imagery. Universal Transverse Mercator coordinates were determined for each corresponding point and uploaded into hand-held Global Positioning System (GPS) to enable location in the field. Koala activity at each field site was assessed using the Spot Assessment Technique (SAT) of Phillips & Callaghan (2011).

The study area, and Gilead more broadly, has a widespread occurrence of grey gums and gum-topped (grey) box, species which are indicative of low nutrient soils and hence low koala carrying capacity

[3] 50 mm DBH is the minimum size class for a 'tree' when implementing the Biodiversity Assessment Method (OEH 2018).

landscapes. In accord with this, koala activity across the site was interpreted in terms of the east coast (low) as defined by Phillips & Callaghan (2011). **Table 1** details the koala activity threshold parameters that are applicable, with medium (normal) use and high use sites indicative of the presence of resident animals (*i.e.*, Core Koala Habitat).

Table 1. Categorisations of koala activity based on use of mean activity level ± 99% confidence intervals. Activity levels in the medium (normal) and high use range for east coast (low) activity categories indicates occupancy levels by resident koala populations (Source: modified from Table 2 in Phillips and Callaghan 2011).

Activity category	Low use	Medium (normal) use	High use
East Coast (low)	< 9.97%[1]	≥ 9.97% but ≤ 12.59%	> 12.59%

[1] Koala activity (%) is determined based on the number of trees with faecal pellets and the number of trees sampled at each site. For example, three positive trees of 30 trees would yield a 10% activity level.

2.2.2. Data analysis

Using the satellite imagery from ESRI Basemap World Imagery (2020) the locations of null sites were designated at 62.5 m intervals along dispersal barriers (*e.g.,* the aqueduct) and regularly spaced within large expanses of land devoid of trees. Null sites and koala activity data from all surveyed sites were then interpolated using regularised, thin-plate splining techniques using the spatial analyst extension in ArcGIS 10.5. Output from the splining process was utilised to produce an activity contour model to delineate areas occupied by resident koala populations by identifying contours with the 10% and 13% significant activity thresholds as previously detailed in **Table 1**. Lower activity contours were included in the activity model to assist with interpretation of connectivity. This process produces a meta-population model (or contour map) that delineates important 'source' areas supporting established resident koala populations.

3. Results

3.1. Study area

The study area totals 7.80 ha and consists of the primary lot to which the proposed development potentially applies (Lot 21/1000643) plus a small extension into Lot 3/1007066 which represents an asset protection zone, all with a 20 m buffer. The land parcel is located at 70 Glendower Street, Gilead, NSW, 2560 and is situated directly north of the Estia Health Kilbride Retirement facility. The eastern border adjoins Rosemeadow and is in the south-west of Campbelltown LGA. Using the Southern Sydney Vegetation Mapping layer, 4.02 ha (51.54%) is mapped as vegetation and comprises three Plant Community Types (PCTs); 849 Gum-topped/Grey Box-Forest Red Gum Grassy Woodland on Flats of the Cumberland Plain, Sydney Basin (0.64 ha), 850 Grey Box-Forest Red Gum Grassy Woodland on Shale of the southern Cumberland, Sydney Basin (2.61 ha) and 1395 Narrow-leaved Ironbark-Broad-leaved Ironbark-Grey Gum Open Forest of the Edges of Cumberland Plain, Sydney Basin (0.77 ha) (**Figure 1**). All mapped vegetation within the study area is considered as potential koala habitat due to the presence of PKFTs within these PCTs and is mapped as potential koala habitat for the purposes of the Campbelltown CKPoM. The study area is located directly adjacent to mapped core koala habitat to the east. The study area does not intersect any Strategic Linkage Areas (SLA) as mapped by the CKPoM, the nearest SLA being located to the south of the Estia Health Kilbride Retirement facility (**Figure 2**).

Figure 1. The study area, inclusive of lot 21/1000643 and a small part of lot 3/1007066 (grey line) plus a 20 m buffer (dashed grey line). Three mapped vegetation communities are within the study area and two are outside. For descriptions of Plant Community Type (PCT) codes, refer to Section 3.1 above.

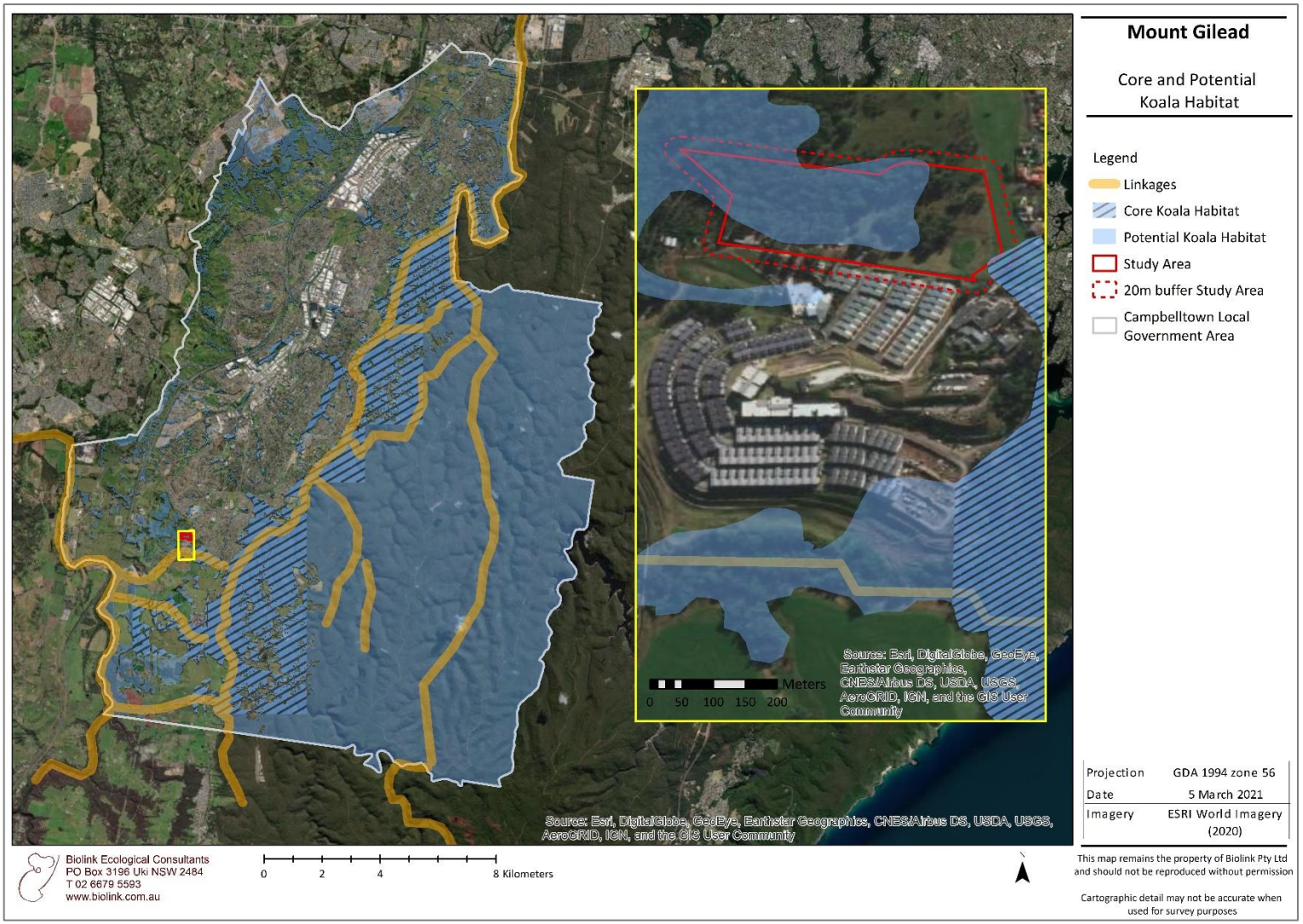

Figure 2. Core and potential koala habitat, and Strategic Linkage Areas (SLAs) as mapped for the Campbelltown LGA by the Campbelltown CKPoM, intersected with the study area. Inset shows more detail of the study area.

3.2. Vegetation Assessment Report

3.2.1. Stadia-metric tree survey

The stadia-metric survey of native trees ≥ 50 mm DBH was undertaken 21st – 23rd February 2021, during which time 1,814 trees were identified, measured, and mapped (**Figure 3**). Of these 1,814 trees, 78.56% were species identified as PKFTs by the CKPoM (*n* = 1,425). This consisted of three species; *E. tereticornis* (*n* = 1,077), *E. moluccana* (*n* = 343) and *E. punctata* (*n* = 5) (**Appendix A**). *Eucalyptus tereticornis* was widely distributed across the study area with the highest density in the north west (**Figure 4**). *Eucalyptus moluccana* was restricted to the western two-thirds of the study area (**Figure 5**). *Eucalyptus punctata* was restricted to a localised small stand in the central portion of the study area, directly north of the Estia Retirement Village swimming pool (**Figure 6**). The remaining trees (*n* = 389) were classified as 'Other' and consisted of *Acacia decurrens* (*n* = 6), *A. implexa* (*n* = 191), *Allocasurina littoralis* (*n* = 1), *Corymbia gummifera* (*n* = 4), *C. maculata* (*n* = 41), *E. crebra* (*n* = 141), *E. pilularis* (*n* = 1), *Melaleuca* sp. (*n* = 3) and *Ficus* sp. (*n* = 1) (**Figure 3**, **Appendix A**). There were no shelter trees (*Syncarpia glomulifera, Lophostemon confertus*) identified within the study area.

Considering only PKFTs, approximately 30.03% of the trees sampled fall into the CKPoM categorisation for small (< 100 mm DBH), 55.30% are categorised as medium (> 100 mm < 300 mm DBH) and 14.67% are categorised as large (> 300 mm DBH). A break-down of this by species is presented in **Table 2**.

Table 2. The number of PKFTs, grouped by the small, medium and large categories as prescribed by the Campbelltown CKPoM.

	E. tereticornis	***E. moluccana***	***E. punctata***
Small (< 100 mm DBH)	301	129	1
Medium (> 100 mm < 300 mm DBH)	608	176	4
Large (> 300 mm)	168	38	0

Figure 3. Distribution of 1,184 native trees over the study site with PKFTs (orange) and Other trees (blue). Tree size category (DBH) is indicated by circle size.

Figure 4. The distribution of 1, 077 *E. tereticornis* across the study area with size class defined by small (light green small circles), medium (green medium circles) and large (dark green large circles).

Figure 5. The distribution of 343 *E. moluccana* across the study area with size class defined by small (light red small circles), medium (red medium circles) and large (dark red large circles).

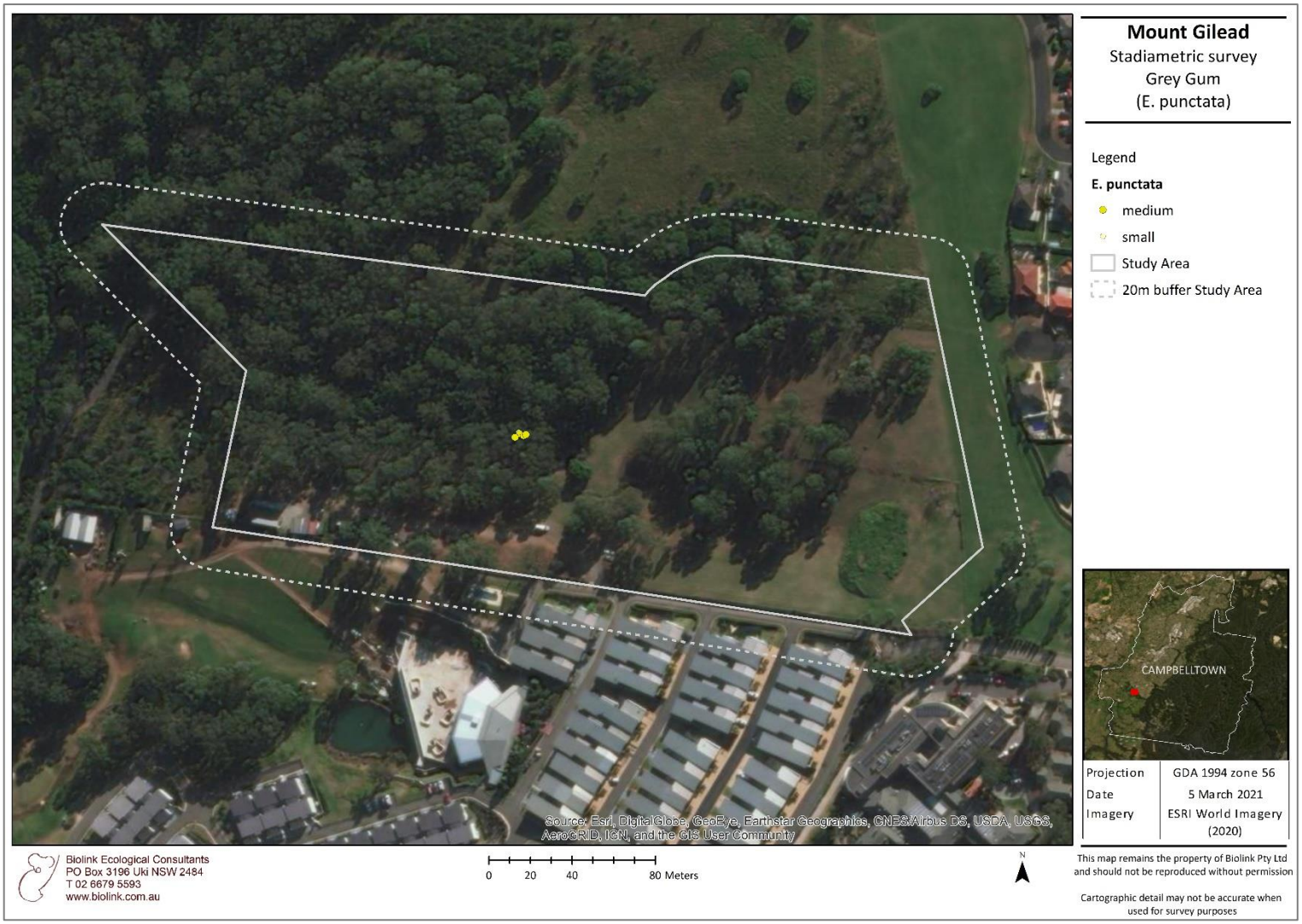

Figure 6. The distribution of five *E. punctata* across the study area with size class defined by small (light yellow small circles) and medium (yellow medium circles).

3.2.2. Vegetation communities / species composition

The mapped PCTs as presented in **Figure 1** are broadly reflective of the species composition across the study area, with some caveats. PCTs 849 (*Grey Box-Forest Red Gum Grassy Woodland on Flats of the Cumberland Plain, Sydney Basin*) and 850 (*Grey Box-Forest Red Gum Grassy Woodland on Shale of the southern Cumberland, Sydney Basin*) have attributes in common, including substantial overlap in their tallest stratum composition of *E. moluccana, E. tereticornis* and *E. crebra*, with PCT 849 also typically supporting *E. eugeniodes* and *E. fibrosa*, neither of which were recorded during by this survey. The mapped distribution of tallest stratum species across the study area shows dominance of *E. moluccana* and *E. tereticornis*, with a lesser number of *E. crebra* across both PCT 849 and 850 (**Figure 7**). PCTs 849 and 850 are also typified by smaller trees, *A. implexa* and in the case of PCT 849, *A. decurrens*. This was generally reflected in data from the stadia-metric survey with *A. implexa* mapped in PCT 850, but not PCT 849 (**Figure 7**). The only *A. decurrens* mapped across the study area were outside these two PCTs. Shrub cover of *Bursaria spinosa* was widespread across lands mapped as PCT 849 and 850 and indeed across the entire study area. Additional native species noted across the lands mapped as PCT 849 and 850 were *Glycine tabacina*, *Dichondra repens, Entolasia stricta* and *Oxalis* sp. Widespread infestations of African olive (*Olea europaea*) and broad-leaved privet (*Ligustrum lucidum*) occurred across these PCTs, as did many ground-cover weed species.

Not reflected in the current vegetation mapping is a change in species composition surrounding a riparian area which originates in the west and runs centrally through the study area (**Figure 7**). It is our understanding that this area is to be excluded from any development footprint but is documented in this report to give context. This gully area was heavily infested with broad-leaved privet, likely shading out native species - a notion supported by a lack of recent recruitment with only large native trees present. Rainforest elements present in this area include common maidenhair (*Adiantum aethiopicum*) and wombat berry (*Eustrephus latifolius*) as well as previously listed *T. tabacina* and *D. repens* and a non-native vine common on rainforest margins (*Anredera cordifolia*).

Mapped in the north-western corner of the study area is a third PCT 1395 - *Narrow-leaved Ironbark-Broad-leaved Ironbark-Grey Gum Open Forest of the Edges of Cumberland Plain, Sydney Basin*. This PCT is typified by a tallest stratum of *E. crebra*, *E. fibrosa* and *E. punctata*, however stadia-metric survey revealed no *E. fibrosa* or *E. punctata* within the bounds of this mapped area. A single *E. crebra* was present, with larger numbers of *E. tereticornis* and *E. moluccana* (**Figure 7**). The lands mapped as PCT 1395 may be better described as an extension of one of the other two PCTs, either 849 or 850, depending on the underlying soil / topography.

Vegetation on the eastern third of the study area is currently unmapped, with no PCT designation. A substantial portion of this area is cleared / devoid of trees, however there are several single-species stands, with five stands of *A. implexa*, two stands of *A. decurrens*, one stand of *C. maculata* and one dispersed stand of *E. tereticornis* associated with *A. implexa* and *E. crebra* (**Figure 8**). Scattered paddock trees, primarily *E. tereticornis* and to a lesser extent *E. crebra*, are set amongst grassy ground cover, highly infested with weeds including scotch thistle (*Onopordum acanthium*), dallis grass (*Paspalum dilatatum*) and farmers friend (*Bidens pilosa*).

A check-list of native species documented across the study area is in **Appendix B**.

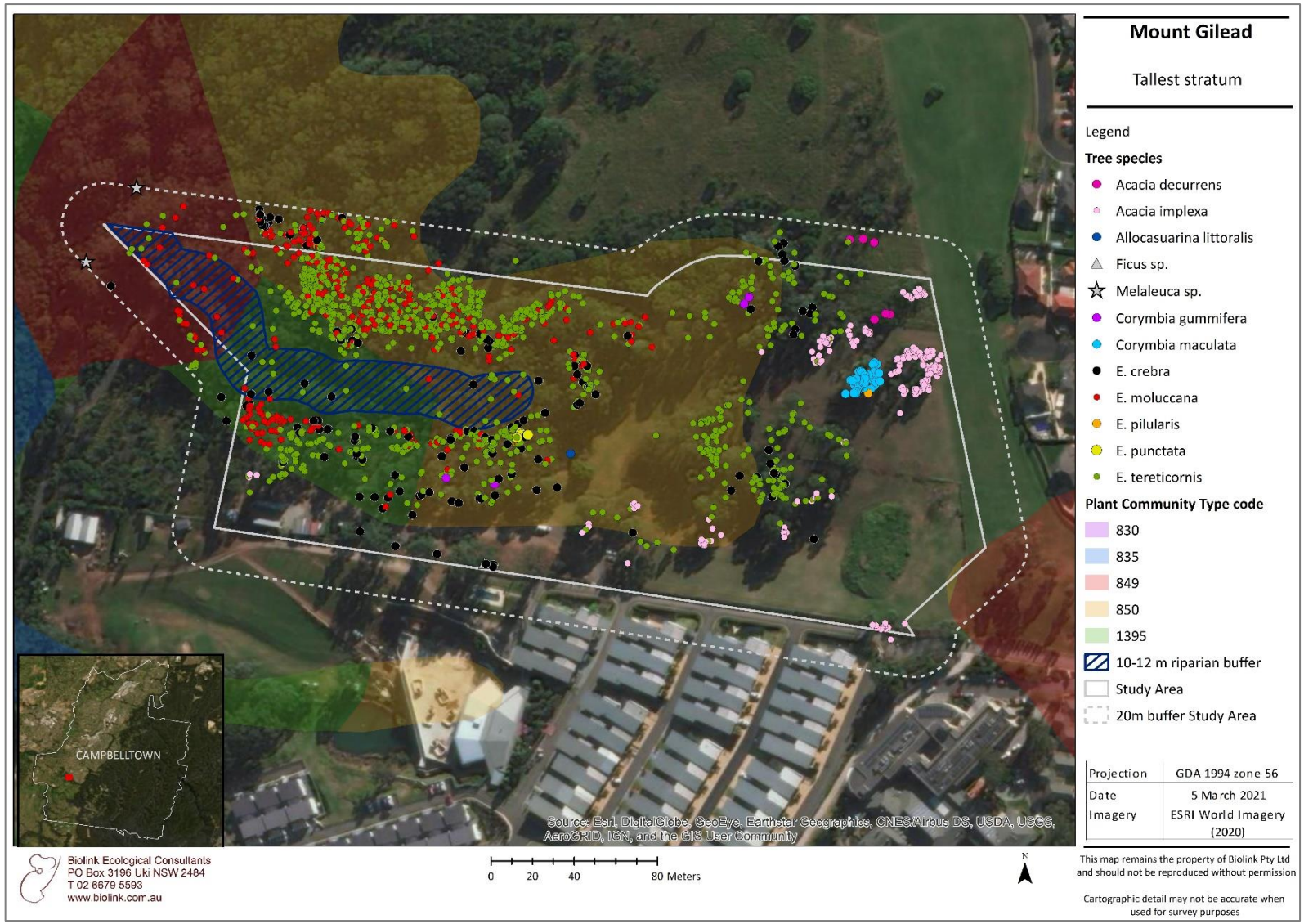

Figure 7. Tallest stratum tree species cover across the study area, overlaid on Plant Community Type (PCT) mapping. Riparian area shown in blue hatch.

Figure 8. Higher resolution of unmapped vegetation in the eastern portion of the study area, showing tallest stratum tree species.

3.3. Koala Activity Assessment Report

3.3.1. Field survey

Spot Assessment Technique (SAT) field survey assessments were undertaken on the 21st February 2021, resulting in five SAT sites being assessed. The distribution of these sites is illustrated in **Figure 9**, with a summary of associated data supplied in **Appendix C**. Evidence of koalas in the form of diagnostic faecal pellets was recorded at three of the five sampled field sites resulting in a habitat utilisation estimate of approximately 60% of the otherwise available habitat. Of the three active sites, two returned significant koala activity levels > 10% (see **Appendix C**, **Figure 9**). The activity contour analysis shows that the study area is likely to support a portion of a single koala home range area, and it is probable that this home range extends to the north-west.

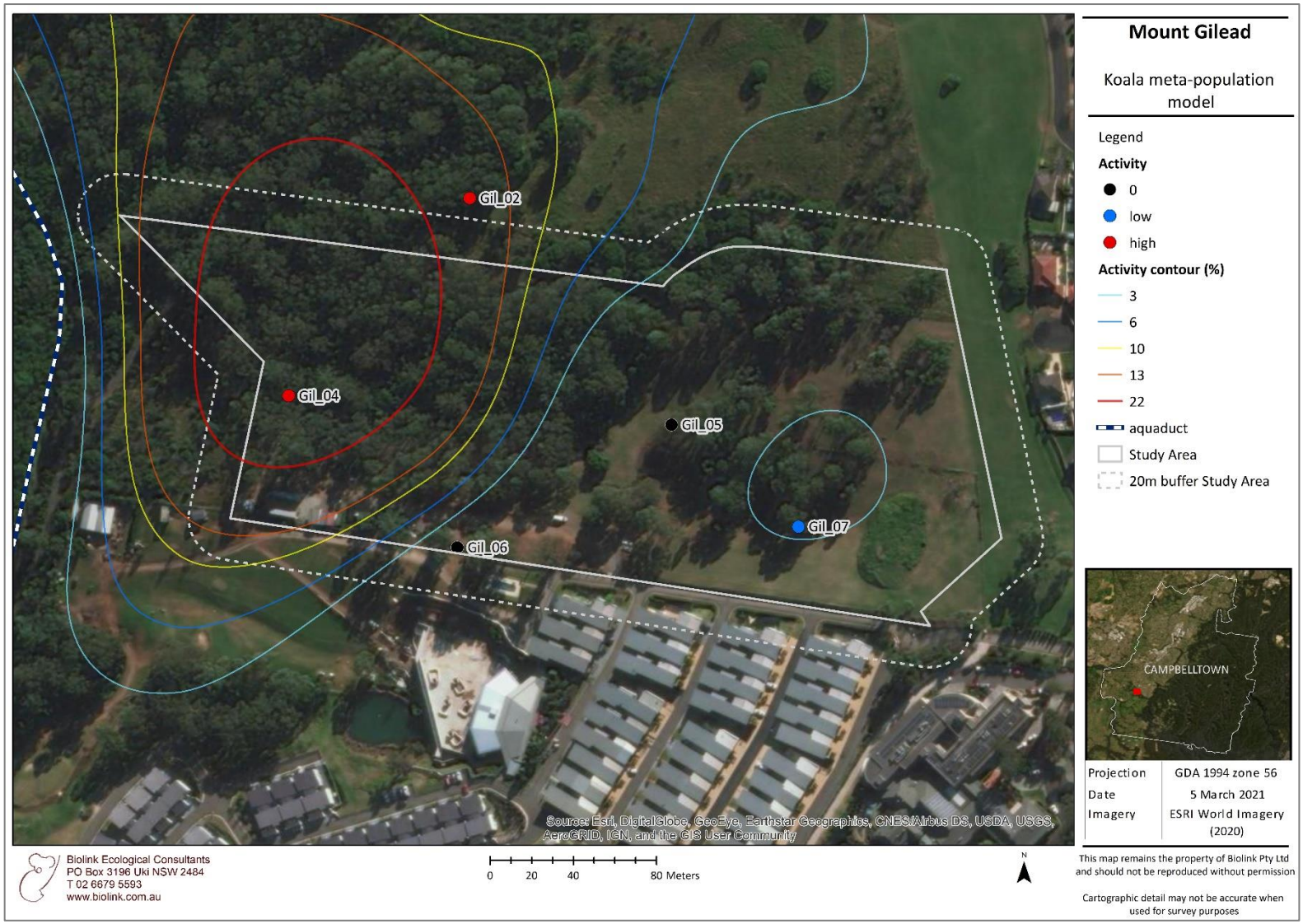

Figure 9. Koala activity model illustrating distribution of significant koala activity (yellow, orange and red lines) resulting from a five-site assessment.

4. Discussion

The outcomes of the VAR confirmed the current mapping of the study area by Campbelltown CKPoM as potential koala habitat. Vegetation in the eastern portion of the study area is currently unmapped but represents an extension of potential koala habitat by virtue of the numbers of *E. tereticornis* that are present. The presence of potential koala habitat necessitated the preparation of a KAAR, which identified koala activity levels > 10% at two of the five SAT sites which were assessed. The study area is therefore considered to currently support a mix of core and potential koala habitat, the boundaries of which were delineated by way of a splining process in the spatial analyst extension of ArcGIS 10.5 (**Figure 10).**

Development controls in core koala habitat depend on whether the DA is considered to represent a 'minor' or 'major' development. Minor development is a DA that relates to the construction of a single residential dwelling and / or the subdivision of land into ≤ two lots and / or requires the removal or no more than two PKFTs for each hectare of assessable land to which the DA relates. Without knowing the precise details of the proposed DA which is the subject of this report, it is probable that it warrants assessment as a major development, that being a DA that relates to the subdivision of a single lot of land into ≥ three lots, and / or requires the removal of ≥ three PKFTs for each hectare of assessable land to which the DA relates. Development controls in core koala habitat relate to the retention of PKFTs and shelter trees, swimming pool design, the keeping of domestic dogs, appropriate fencing, road design and protection of koalas from disturbance. In areas of potential koala habitat, Council may exercise discretion subject to the DA demonstrating that retention of PKFTs $\geq$ 200 mm DBH has been maximised and that the proposed tree removal will not prejudice the overall vision, aims and objectives of the CKPoM.

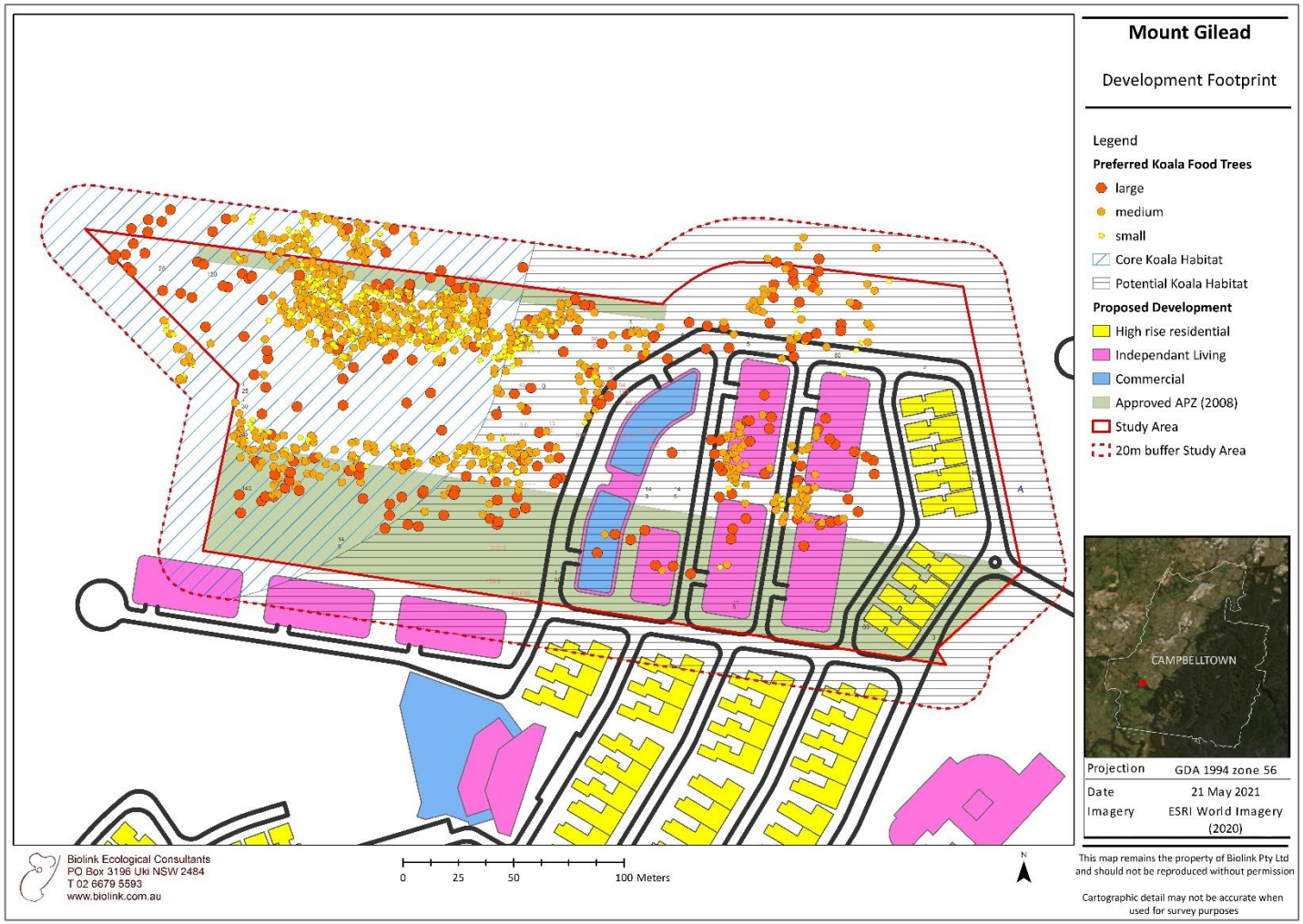

Figure 10. The study area, showing delineation of core (blue diagonal lines) *versus* potential (black horizontal lines) koala habitat, as calculated by activity contour analysis based on the outcomes of SAT survey. A potential development footprint (CAD drawing), and previously approved APZs (green). Note: the footprint was georeferenced from a pdf document and consequently there may be some slight discrepancies in its true intended size / location. The location of PKTFs is shown, categorised by size classes; small (yellow), medium (orange) and large (dark orange).

Where the proponent chooses to seek the removal of PKFTs in accordance with a major development, provision must be made to compensate for the loss of associated habitat as outlined in Part 7 of the Campbelltown CKPoM. In brief, the proponent must enter into a legally binding agreement with Council to either a) make a monetary contribution towards the Koala Habitat Rehabilitation Program (Part 8, CKPoM), or b) undertake rehabilitation works in areas identified by the Koala Rehabilitation Program (Part 8, CKPoM), including the payment of a Compensation Guarantee. The amount of money referred to in both a) and b) above, is based on the value of the required Compensation Units (CU), which is enumerated according to the number and size of PKFTs that will be removed. As a guide, at the commencement of the CKPoM, the value of a CU was $1, which was to be applied as follows;

Small (DBH < 100 mm)	8 CU / mm DBH
Medium (DBH > 100 < 300 mm	15 CU/ mm DBH
Large (DBH > 300 mm)	25 CU / mm DBH

To give some meaning to these numbers in the context of the potential DA which is the subject of this report, **Table 3** shows the numbers of PKFTs, organised by species and size class, which are located within the potential development footprint (taken from the georeferenced CAD drawing), the Asset Protection Zone (APZ) approved in 2018, and the study area more broadly. **Figure 10** also shows the location and size class of PKFTs across the potential development footprint and Approved APZ.

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Table 3. The number and size class classifications of Preferred Koala Food Trees that fall within an indicative development footprint, Approved APZ (top), Approved APZ (bottom), and the remainder of the study area.

		Development footprint		Approved APZ bottom		Approved APZ top		Remainder of study area	
Tree species	Tree size	Core	Potential	Core	Potential	Core	Potential	Core	Potential
E. moluccana	large		2	2	1	1		24	8
	medium		5	8	1	15		133	14
	small			2		5		111	11
E. punctata	large								
	medium								4
	small								1
E. tereticornis	large		61	20	22	7	3	39	16
	medium		118	31	9	19	4	316	111
	small		14	3	1	10		220	53
Total			**200**	**66**	**34**	**57**	**7**	**843**	**218**

This report does not present a figure of exactly how many trees will be removed as a result of the development, as the exact development footprint indicated in **Figure 10** may be subject to refinement and the associated APZs are not required to be completely cleared (they may instead be kept to a sparse woodland standard). Instead, we provide information on where PKFTs are currently located in the landscape and allow the Client to specify which of these will be removed once the footprint is finalised. In terms of calculating the compensatory requirements for any associated tree removal, in accordance with Parts 7 and 8 of the Campbelltown CKPoM, the Client has indicated interest in undertaking rehabilitation works.

To our knowledge there are no areas currently identified by the Koala Rehabilitation Program which might be the subject lands of such activities. In the absence of such defined areas, we suggest that the site directly to the north of the development would be an appropriate location for such activities, given its proximity to the trees which will be removed and the fact that the koala activity contours identified by this study extend into this site. Rehabilitation works on this site may therefore act to ameliorate the impacts on koala habitat connectivity resulting from the development itself. We also note that nothing in the CKPoM prohibits the proponent from undertaking rehabilitation measures on lands being the subject of the DA. The exact nature of these rehabilitation works will be subject to Council's discretion as the compensatory planting obligations outlined in the Campbelltown CKPoM apply only to minor developments.

Lastly, we note that if a DA does not conform to the defined compensatory measures set out by the CKPoM, it can be sent to the Koala Management Committee for independent assessment. A non-conforming DA may be considered and subsequently modified by Council such that the development does not compromise long-term koala management objectives. This may involve enclaving of developments in non-core koala habitat. Alternatively, the applicant may opt to prepare an Independent Koala Plan of Management under the provisions of SEPP44.

4.1. Recommendations

- In the absence of any areas currently identified by the Koala Rehabilitation Program as a site for compensatory activities, the proponent should consider rehabilitation works undertaken on the site directly to the north of the development site, assuming that these lands have secure conservation tenure.
- If the aforementioned site is deemed suitable by Council it should be formerly identified as lands with a program of habitat restoration and / or rehabilitation being undertaken as a

consequence of Part 8 of the CKPoM and listed by the Register of Development, and thereafter provided to the Koala Management Committee.

- A Vegetation Management Plan that meets the requirements set out in Council's VMP Guidelines (2016) and is formally approved by Council, should be used to guide compensatory plantings and other rehabilitation works, inclusive of supervision to ensure that any compensatory plantings succeed over time. As a guide, compensatory plantings of PKFTs should reflect locally abundant PKFT species.
- A Compensation Guarantee be paid according to the exact number of PKFTs removed as a result of this development, this number feeding into the calculation provided on page 25 of this report. This will be released once the required works have been implemented and in accord with a legally binding agreement with Council.
- Given the proximity of the development footprint to at least one koala home range and evidence of transitory PKFT use within the development footprint, the recommendations for protection of koalas from disturbance, as outlined in Part 6 of the Campbelltown CKPoM, should be considered.
- Enclaving should be considered as a means of permanently excluding koalas from the development by way of fencing, koala-grids and gateways that do not allow koalas to enter.

References

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Appendix A

Due to the large file size, the results of stadia-metric tree survey can be provided in a separate PDF by request.

Appendix B

Check list of native species documented across the study area.

Trees

Corymbia gummifera

C. maculata

Eucalyptus crebra

E. molucanna

E. pilularis

E. punctata

E. tereticornis

Ficus sp.

Melaleuca sp.

Small trees

Acacia decurrens

A. implexa

Allocasurina littoralis

Shrubs

Bursaria spinosa

Ground covers

Dichondra repens

Entolasia stricta

Oxalis sp

Adiantum aethiopicum

Vines and Climbers

Glycine tabacina

Eustrephus latifolius

Appendix C

Location of SAT sites.

Site	Date	Easting	Northing	Activity	Location notes
Gil_02	21/02/2021	295557	6223553	16.67	
Gil_04	21/02/2021	295470	6223458	30.00	
Gil_05	21/02/2021	295654	6223444	0	Half of site is paddock trees, other half is olive forest.
Gil_06	21/02/2021	295551	6223385	0	Edge of development site/fencing onto shared residential swimming pool. Disturbed / weedy
Gil_07	21/02/2021	295715	6223395	3.33	Disturbed / weedy.