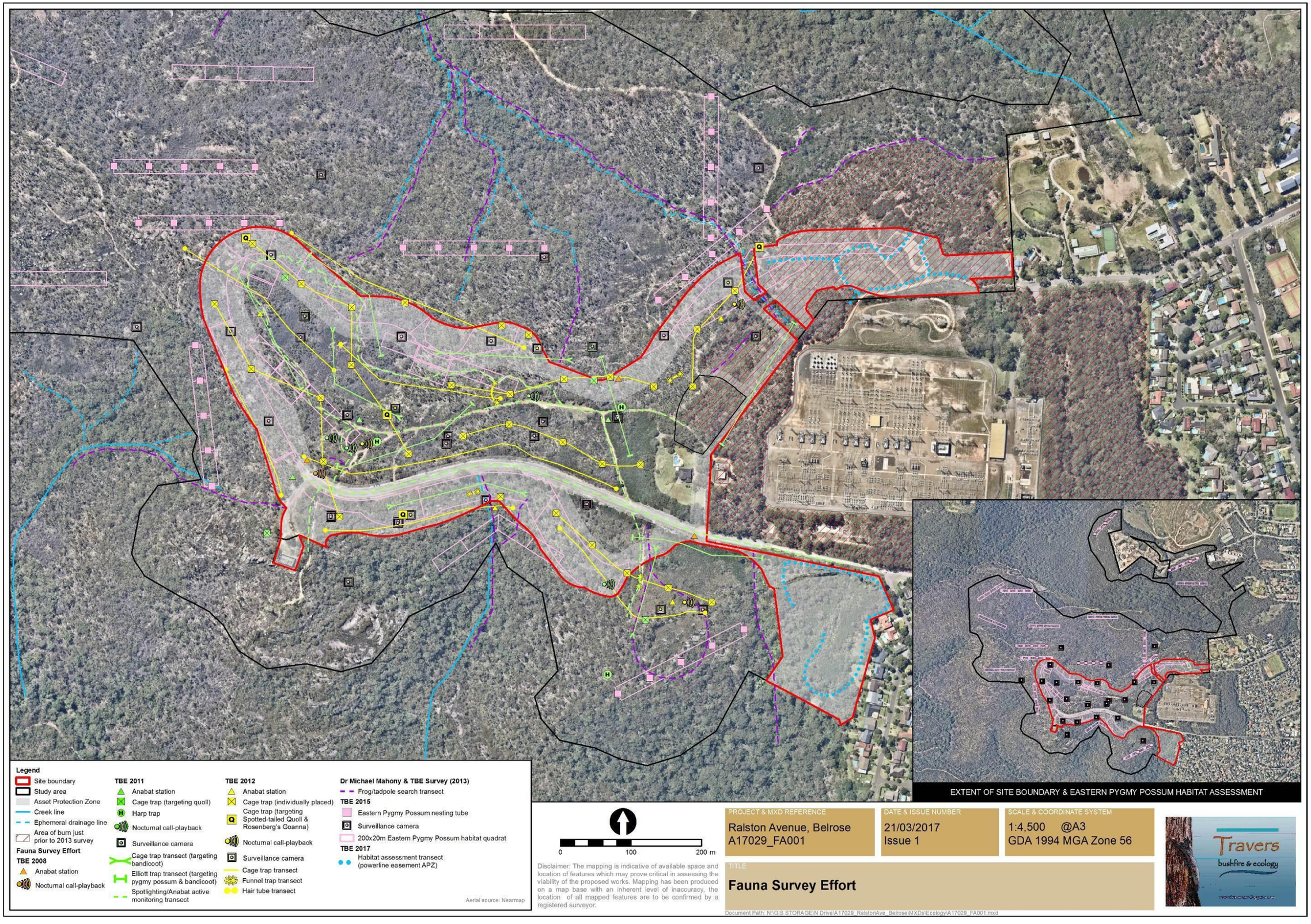

Figure 4a – Fauna survey effort within the subject site

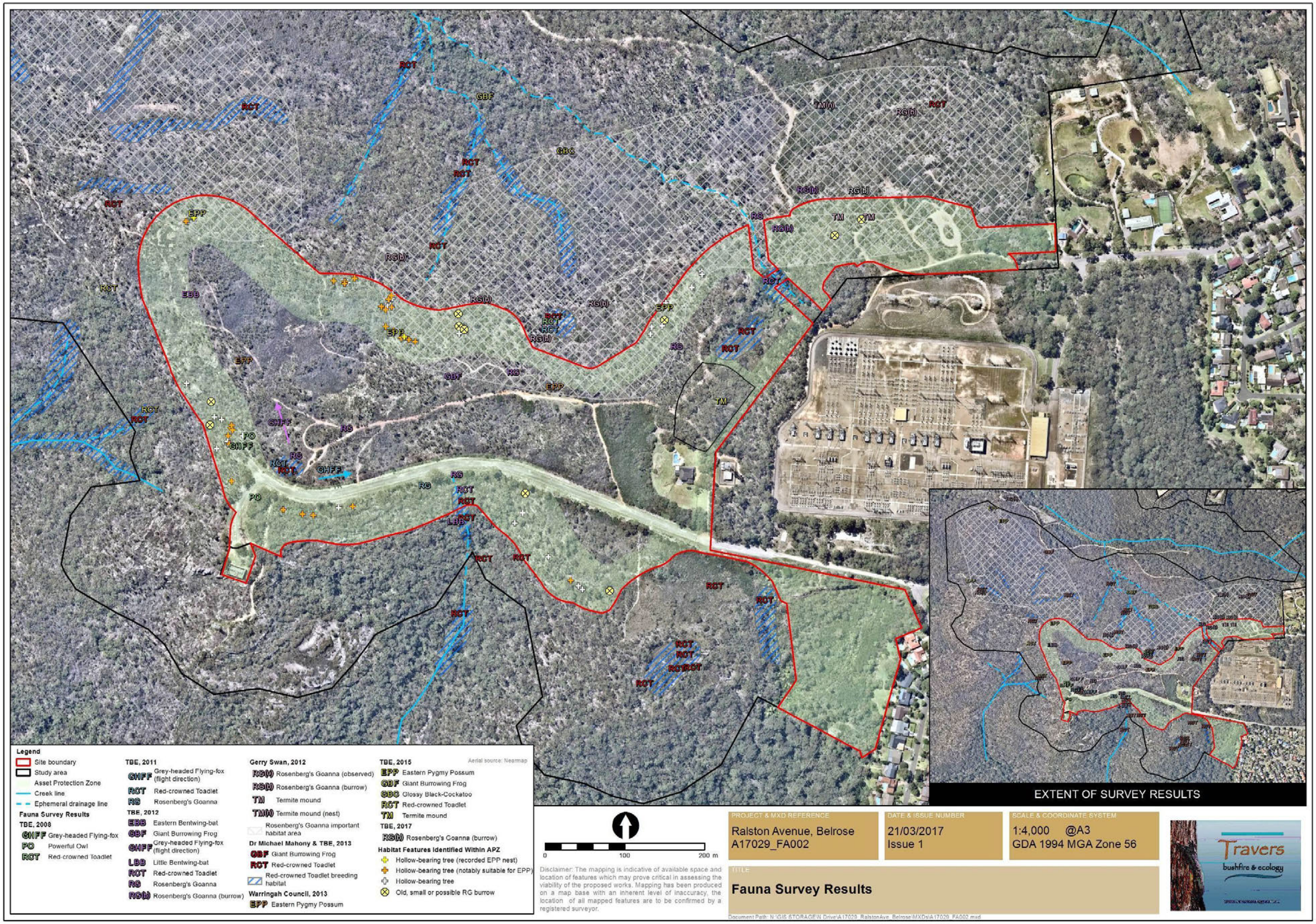

Figure 4b – Fauna survey results within the subject site

Ecological Assessment 4

4.1 Previous surveys reviewed

The following regional vegetation mapping was examined to identify the potential vegetation communities' onsite.

Ecological mapping of the local area was obtained from *Northern Beaches Council* (Smith and Smith 2000) that identified much of the land near the centre of the subject site as Coastal Sandstone Heath. The vegetation nearer the perimeter of the subject site was recognised as Sydney Sandstone Ridgetop Woodland. The vegetation mapping performed by Smith and Smith (2000) did not identify any Duffys Forest EEC vegetation within the subdivision boundary area, however adjoining lands to the east and a small patch to the south of the adjoining Sydney East Substation were identified as containing Duffys Forest vegetation. Vegetation downslope of the proposed development area was largely mapped as Sydney Sandstone Gully Forest.

4.2 Flora

Generally, only species observed within the subject site are listed in Table 3.1. The number of observed native species is high indicating species richness is good. The number of exotic species observed is very low with only a few quadrats recording more than 5% exotic species make up. Largely, the exotic species are confined to the edges of roads and around existing infrastructure.

Two (2) endangered species were observed, including *Tetratheca glandulosa* and *Grevillea caleyi.* Two (2) ROTAP species were also observed, *Eucalyptus luehmanniana* and *Angophora crassifolia.* Both species were observed in both the development area and the offset area.

4.2.1 Local / regional flora matters

Eucalyptus luehmanniana

Eucalyptus luehmanniana is also a rare plant (ROTAP) species which was found in the tall heath and Low Open Forest on south east to south west facing slopes on or near sandstone benches near the top of the ridge. The population within the southern portion of the proposed development area continues to the south until the edge of the gully forest vegetation. All individual specimens within and immediately adjoining the proposed development were identified by GPS (Figures 3a/b).

Large numbers of this species have been recorded within the proposed development area and within the proposed offset lands. The extent and size of the existing population was considered too large and too time consuming to map as individual records outside of the proposed development area. Therefore the exact population is unknown and the mapped distribution may not reflect the full extent of the species. However, observed habitat areas were mapped and the population size has been estimated on the basis of recorded

densities. Approximately 70% of the estimated population will be retained within the proposed offset lands.

The proposed development will likely remove all specimens of *Eucalyptus luehmanniana* on the northern side of Ralston Avenue. Specimens located on the southern side of Ralston Avenue fall within a proposed APZ. Whilst there is no assurity of their retention, there are excellent opportunities to retain further trees and still comply with the standards for APZs. The fuel management plan aims to protect as many of them as possible.

Angophora crassifolia, listed as a rare Australian plant (ROTAP species) has been observed broadly across the proposed development area and continues into the broader study area. This is a rare species due to its geographical range, occurring primarily in the northern suburbs of Sydney in near coastal locations, predominantly within the former Warringah LGA. This species was located sporadically in clumps throughout the proposed development area, typically more so on the outskirts in the taller vegetation communities such as Low Open Forest and Open Forest and occasionally in the Tall Heath. Some large clumps were also located within the offset area and it is likely that the population is more extensive than mapped. Approximately 76% of the estimated population will be retained within the proposed offset lands. All specimens observed within and immediately adjoining the proposed development have been identified by GPS. (Figures 3a/b).

4.2.2 State legislative flora matters

(a) Threatened flora species (NSW)

TSC Act – A search of the *Atlas of NSW Wildlife* (OEH 2017) indicated a list of species that have been recorded within a 10 km radius of the study area. Those species are considered for suitable habitat and potential to occur in Table A2.1 (Appendix 2).

Based on the habitat assessment within Appendix 2, it is considered that the subject site provides varying levels of potential habitat for the following state listed threatened flora species:

Table 4.1 – State listed threatened flora species with suitable habitat present

Scientific name	TSC Act	Potential to occur
Acacia bynoeana	E1	Low
Callistemon linearifolius	V	Low
Epacris purpurascens var. purpurascens	V	Low - Moderate
Eucalyptus camfieldii	V	Moderate
Grevillea caleyi	E1	Recorded
Haloragodendron lucasii	E1	Very low
Lasiopetalum joyceae	V	Low
Melaleuca deanei	V	Low-moderate
Microtis angusii	E1	Very low
Persoonia hirsuta	E1	Low
Pimelea curviflora var. curviflora	V	Moderate
Tetratheca glandulosa	V	Recorded

Note: Full habitat descriptions for these species are provided in Appendix 2

Two (2) state listed threatened flora species, *Tetratheca glandulosa* and *Grevillea caleyi* were recorded during survey(s) undertaken. These species has have been assessed in detail within Appendix 3.

The following is a summary of our current knowledge of the threatened flora populations within and surrounding the site and the estimated impacts as a result of the proposed development area.

Grevillea caleyi

In the previous reports, the number of *Grevillea caleyi* has fluctuated because of either new findings, fire or predation. The current population within the development area is four (4) individuals, all located on the fence line of the Wyatt Avenue road corridor near the north-western corner of the substation. The specimens may be impacted by a future road extension of Wyatt Avenue, thus the planning proposal has altered the road alignment to ensure the specimens are outside of the proposed development. A singular individual was observed within the main development area approximately 150m from the existing residential dwelling and would be directly impacted, however since the burn off in spring 2012, the specimen has not resprouted. The habitat of this previously recorded *Grevillea caleyi* has now be protected in the proposed Duffys Forest Conservation Area.

A historical record is also located within the proposed offset lands within Open Forest vegetation but, due to the age and inaccuracy of the record (year 1892 – 10km accuracy), it is not a reliable and may no longer be present. The same applies for the second record within the proposed development area which was recorded in 1930 with 4km accuracy. The remainder of the development area has been searched thoroughly with no specimens recorded within that vicinity.

Survey on the substation lands in 2013 located thirty eight (38) specimens, all of which are approximately 400m away from the outer edge of the proposed development. At that time most of the mature trees were still standing although dead, therefore the number of specimens related directly to seedlings. Survey in 2015 located only thirteen (13) specimens in the same area.

Target searches for *Grevillea caleyi* have been undertaken within most of the offset areas with potential habitat, however no specimens have been noted to date. The threatened species profile also notes that *Grevillea caleyi* is known to occur at an altitude of between 170-240m ASL. Given that parts of the development area and offset lands have appropriate topography, we expect that the ridge line areas with Open Forest provide the most likely potential habitat.

On the assumption that the old OEH database records are inaccurate, then the population within the study area is four (4) individuals.

The current (September 2015) local population for *Grevillea caleyi* is seventeen (17) based on the assumption that those individuals 400m away form part of the same population.

No individuals are expected to be impacted by the proposal. The proposed road along the Wyatt Road corridor has been shifted to avoid impacts, and the previous location of the individual burnt by fire is within the proposed Duffys Forest protection area. A significant impact upon this species is not considered likely.

Tetratheca glandulosa

Several clumps of this species have been recorded throughout the proposed development area during the ideal survey period of spring 2012. Some specimens were previously recorded in December 2011 at the very end of the flowering period, with many at that time holding on to senescing flowers or flowers that had recently fallen from the plant and were still visible on the ground.

The majority of observed clumps of *Tetratheca glandulosa* were located in the Low Open Forest vegetation community. It was thought that the dense nature of the short heath would be unlikely to host the species except on the edges as it intergrades with other taller vegetation types. The potential habitat within the Tall Heath is considered to be low overall (although variable) because of the dense nature of the Banksia / Leptospermum / Hakea / Allocasuarina association, so if it does occur, the density of *Tetratheca glandulosa* is not expected to be high. The Sandstone Gully Forest is likely to provide only marginal potential habitat or low potential habitat as the gully vegetation is not on the ridge line which the species favours.

The potential habitat of the species is moderate to high in the Low Open Forest and Open Forest communities. Throughout the proposed development area, large numbers of other *Tetratheca* species were sighted, notably *Tetratheca ericifolia* and *Tetratheca thymifolia,* however, there were not large numbers of *Tetratheca glandulosa* recorded despite the good habitat potential.

Intensive target searches for *Tetratheca glandulosa* have not been undertaken within the whole of the offset area. Target searches have been undertaken within the quadrats, on the meander between quadrats and along existing walking track edges, however, only one (1) additional patch has been identified outside of the proposed development area. High numbers of *Tetratheca ericifolia* and *Tetratheca thymifolia* were also observed in the offset areas and it is believed that if target survey was undertaken in the offset areas, many clumps of *Tetratheca glandulosa* would be observed.

On 6 August 2013, target survey was undertaken for this species within parts of the offset area. Given that the survey has been undertaken at the beginning of the known flowering period, it has only produced limited observations of thirteen (13) specimens.

Further target surveys were undertaken in September 2015, resulting in only an extra three (3) specimens, however one (1) appears to be a double up from previous sightings, bringing the total to one hundred and fifty one (151).

It is expected that the offset area would provide many more specimens but due to limited access, very few have been observed.

(b) Endangered flora populations (NSW)

No endangered flora populations occur within a 10km radius of the proposed development area.

(c) Endangered ecological communities (NSW)

The vegetation mapping performed by Smith and Smith (2000) did not identify any Duffys Forest EEC vegetation within the proposed development area, however, adjoining lands to the east and a small patch to the south of the adjoining Sydney East Substation were identified as containing Duffys Forest vegetation.

Duffys Forest

All 2008 and 2011 quadrats have been compared against the Scientific Committee's determination to assess whether or not Duffys Forest EEC is present or absent within the study area. Whilst a number of quadrats appeared to have a number of Duffys Forest species present, when using the Duffys Forest Index as derived by *P & J Smith Ecological Consultants* (2000), the index was high for Sydney Sandstone Ridgetop Woodland as opposed to Duffys Forest. As such, the vegetation within the study area is not considered to be representative of the EEC, Duffys Forest. The Council mapped EEC, Duffys Forest is not present within the site. It was observed just outside of the proposed development area on the south eastern side of the substation.

Sydney Metro Catchment Management Authority remapped vegetation in 2013 which we consider is more accurate with further ground-truthing than the P & J Smith mapping. This mapping shows Duffys Forest vegetation located on the southern side of the substation near the intersection of Ralston Avenue and Elm Avenue. No Duffys Forest had been mapped in the development site or offset area.

Further quadrat sampling was undertaken in 2015 and compared against the Duffys Forest Index as well as with Tozer (2010) methodology for testing quadrat samples against selected vegetation communities around the Sydney area. The Duffys Forest Index sampling came back with very even results between Sydney Sandstone Ridgetop Woodland and Duffys Forest. Vegetation within this area was re-mapped with the assistance of Jennie Powell of *EcoLogical Australia* which locates the presence of areas considered to be Duffys Forest.

Duffys Forest was mapped as occurring over 1.24 ha of land within the subject site adjacent to the substation. Approximately 0.63 ha in total will be conserved as a result of the proposed Duffys Forest protection area, and retention area along the site boundary edge near the patch of *Grevillea caleyi*.

Coastal Upland Swamp

The Coastal Upland Swamp is representative of the EEC, Coastal Upland Swamp of the Sydney Basin Bioregion. The Damp Tall Heath vegetation community has some floristic similarities compared to the listed indicative species described in the final determinations of the EEC.

Coastal Upland Swamp is a relatively new EEC, gazetted in March 2012. There has been a number of fires across the site where these damp tall heath communities occur, making it somewhat difficult to determine the full swath of flora species present. Further surveys in 2013 and 2015 have determined small areas of Coastal Upland Swamp to be present, both within the development and within the offset areas. In reference to the appropriate biometric vegetation unit, damp tall heath and coastal upland swamp are essentially the same. The damp tall heath community appeared to have more Eucalypts present and a deeper substrate. The coastal upland swamp areas are lower in vegetation height and the substrate is shallow.

Impacts to this community are over 0.89 ha or approximately 25% of the EEC. This is exacerbated as parts of the EEC are under powerline easements which may be designated asset protection zones. They currently cannot be considered fully conserved as the acting electrical company has the right to trim or curtail the vegetation under the wires.

These communities have been assessed in detail within Appendix 3.

(d) Significant ecological communities

The EEC, Coastal Upland Swamp occurs at locations within the proposed development area that are on the southern side of Ralston Avenue, just to the west of the substation and to the north of Wyatt Avenue. In early due diligence studies, this community was identified as Sandstone Hanging Swamp over a smaller area. The EEC determination for Coastal Upland Swamp effectively expands the areas of this sensitive community, based on a broader floristic assemblage.

Coastal Upland Swamps are recognised groundwater dependent ecosystems which are generally to be protected under the NSW groundwater dependent ecosystem policy. The impact of surface and subsurface drainage within its catchment is also considered, typically resulting in an ecological buffer to be established. A buffer of 30m has been provided in addition to separation created by APZs.

The vegetation that contains *Eucalyptus luehmanniana* as a dominant species was considered by Smith and Smith (2005) to be a rare vegetation community in Australia. The current development layout protects a large portion of this species within the proposed offset area.

4.2.3 Matters of national environmental significance - flora

(a) Threatened flora species (national)

A review of the schedules of the *EPBC Act* indicated the potential for a list of threatened flora species to occur within a 10km radius of the site. These species have been considered for habitat presence and potential to occur within Appendix 2.1.

Based on the habitat assessment within Appendix 2.1, it is considered that the subject site provides varying levels of potential habitat for the following nationally listed threatened flora species:

Table 4.2 – Nationally listed threatened flora species with suitable habitat present

Scientific name	**EPBC Act**	**Potential to occur**
Acacia bynoeana	V	Low
Eucalyptus camfieldii	V	Moderate
Grevillea caleyi	E	Recorded
Haloragodendron lucasii	E	Very low
Lasiopetalum joyceae	V	Low
Melaleuca deanei	V	Low-moderate
Microtis angusii	E	Very low
Persoonia hirsuta	E	Low
Pimelea curviflora var. curviflora	V	Moderate

One (1) nationally listed threatened flora species, *Grevillea caleyi* was recorded within the study area. *Tetratheca glandulosa* was delisted in December 2013.

The proposal will not require the removal of any *Grevillea caleyi* specimens therefore not impacting upon matters of national significance requiring alternative assessment.

(b) Endangered ecological communities (national)

There are no nationally listed EECs present within the study area or affected by the proposal.

4.2.4 Conserved and impacted vegetation within study area

Table 4.3 provides the estimated loss and gain of each biometric vegetation types.

Table 4.3 – Biometric vegetation types conserved and impacted

Zone	PCTID	BVTID	Biometric Vegetation Type	Area	Expected impact	% impact	% conserved
1	1250	ME012	Sydney Peppermint - Smooth-barked Apple - Red Bloodwood shrubby open forest on slopes of moist sandstone gullies, eastern Sydney Basin Bioregion	17.79 ha	0.35 ha	2.0%	98.0%
2	1083	ME014	Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion	74.75 ha	12.33 ha	16.5%	83.5%
3	881	ME008	Hairpin Banksia - Kunzea ambigua - Allocasuarina distyla heath on coastal sandstone plateaux, Sydney Basin Bioregion	8.69 ha	1.12 ha	12.9%	87.1%
4	978	ME015	Needlebush - banksia wet heath on sandstone plateaux of the Sydney Basin Bioregion	3.60 ha	0.89 ha	24.7%	75.3%
5	882	ME013	Hairpin Banksia - Slender Tea-tree heath on coastal sandstone plateaux, Sydney Basin Bioregion	25.07 ha	10.04 ha	41.9%	58.1%
6	1085	ME039	Red Bloodwood - Smooth-barked Apple shrubby forest on shale or ironstone of coastal plateaux, Sydney Basin Bioregion	1.24 ha	0.61 ha	49.2%	50.8%
-	-	-	Cleared Lands	8.19 ha	3.57 ha	43.6%	56.4%
Total				**138.26 ha**	**28.91 ha**	**20.9%**	**79.1%**

In the above table the relationship between EEC and biometric type is as follows:

- EEC - Coastal Upland Swamp (equivalent to ME015 in Table 4.3) occurs mostly within the conserved lands or lands within existing easements. There is no assurity for protection of EECs under the powerlines as they may be managed by Transgrid.
- EEC - Duffys Forest (equivalent to ME039 in Table 4.3) adjacent to the substation which will be partly protected in a 'Duffys Forest protection area'.

The EEC, Coastal Upland Swamp occurs on the southern aspect of Ralston Avenue, as some small patches near the electrical substation, and to the north of the development area near a riparian zone. The area of EEC is estimated as covering a total area of 3.6 ha. Approximately 2.71 ha will be in the proposed conservation lands with 0.89 ha impacted or located within existing infrastructure easements. Noting that vegetation under electrical easements would be potentially subject to management by Transgrid, these should be discounted from the totality of impacts upon this EEC. 0.59 ha of the EEC will be affected by APZs whilst 0.30 ha will be affected by electrical easements. That is, 16.4% is affected by APZs whilst 8.3% is affected by the easements.

A total of 1.24 ha of Duffys Forest EEC occurs within the study area of which a total of 0.61 ha or 49% will be impacted by residential lots. The remaining 0.63 ha will be retained in conservation lands and other retained lands. The majority of the retained land will be within a Duffys Forest protection area. Whilst not all of this protection area is Duffys Forest, it does contain some cleared lands, and former cleared lands along the Wyatt Av road corridor that may be utilised for future restoration to provide a larger remnant of Duffys Forest. There will be asset protection zones and development surrounding the protection area, however the asset protection zone on the eastern boundary is very narrow, allowing for genetic flow into and out of the protection area.

The site is being formally assessed in accordance with the Biodiversity Certification Assessment Methodology (BCAM), and the relative adequacy is assessed by the modelled credit loss and credit gain of the planning proposal. The outcomes of the Biodiversity certification assessment is addressed by *EcoLogical Australia* (2015).

Flora and EEC assessment conclusions

In summary the impacts on EECs, threatened and rare flora species include:

Duffys Forest - 0.61 ha or 49.2% will be impacted by the proposed rezoning

Coastal Upland Swamp - 0.59 ha or 16.4% will be impacted by the proposed rezoning with an addition 0.3 ha or 8.3% being impacted by the electrical easement

Grevillea caleyi – 4 specimens recorded (1 additional by not seen since 2013), no direct impacts expected (100% conservation of observed specimens)

Tetratheca glandulosa – 151 specimens recorded, 138 likely to be impacted through development or by APZ management (91.4% loss within subject site to be offset, 0.01% of the regional population)

Eucalyptus luehmanniana – Estimated population is 3796, 1100 will be impacted by the development and APZ (approximately 29.0% loss)

Angophora crassifolia – Estimated population is 1208, 286 will be impacted by the development and APZ (approximately 23.7% loss)

It is estimated that close to 60% of *Tetratheca glandulosa* habitat is being retained within the proposed offset areas. Based upon the current known population, the direct impact is upon 138/151 specimens, or 91%, although some additional specimens (approximately 10 specimens) may be retained within APZ. However the impact represents only 0.01% of the estimated regional population. Downslope specimens may be impacted indirectly though changes to hydrological regimes, and changes to fire regimes where located very close to proposed dwellings.

A Species Impact Statement is not likely required for threatened flora, endangered ecological communities or populations.

The proposed development was not considered to have a significant impact on matters of NES listed under the *EPBC Act.* As such, a referral to the Department of Environment should not be required in respect to flora.

Mitigation measures and recommendations have been provided to reduce direct and indirect impacts in section 7.

4.3 Fauna

All fauna species recorded during survey(s) are listed in Table 3.2.

4.3.1 Fauna habitat

The extent of the offset area surrounding the proposed development area is the only remaining locally undeveloped area of the Lambert soil type within the connective natural landscape to the south of Mona Vale Road and west of Forest Way. The proposed development area covers the plateau area within this soil landscape. Habitat features of the Lambert soil type include:

- Presence of greater than 50% rock outcrops
- Open and closed heathland and scrubland
- Broad ridges, wide benches with low broken scarps
- Small hanging valleys and poor drainage areas

Alternatively, the highly developed Somersby soil type on remaining local plateau areas is characterised by low open woodland and scrubland typically with less rock outcropping. The remaining surrounding, mostly uncleared, Hawkesbury sandstone within lower slopes to the north, west and south, and predominantly within Garigal N.P, whilst providing similar rocky features, provides slopes in excess of 25% and is characterised by open woodland and Tall Open Forest.

The fauna habitats present throughout the proposed development area include:

- Vegetated areas of Short Heath, Tall Heath, Wet Heath, Hanging Swamp and Low Open Forest with a heath to scrub understorey
- Nectar producing *Eucalyptus* trees providing foraging resources for all seasons excluding winter
- Other nectar producing resources, principally *Angophora*, *Melaleuca, Banksia* and *Acacia* species providing year round-foraging opportunities. *Banksia ericifolia* in particular is represented in extensive presence in tall heath areas.
- Variations in habitat structure of the understorey and canopy between the heath and open forest communities and their associations with other habitat features.
- Sandstone rock outcrops, crevices, overhangs and small caves at various aspects

- Sparse to dense shrub layers, ground covers and leaf litter.
- Small to medium sized hollows in low density only within the Low Open Forest Community
- Fallen branches
- Loose sandy soil suitable for digging, burrowing and foraging
- Moist soil within hanging swamps
- Depressions providing temporary soaks after heavy rainfall
- Ephemeral drainage lines off a heath-land plateau into sandstone rocky slopes
- Artificial debris and refuse

4.3.2 Habitat trees

The available size, range and quality of hollows were noted during site visits with no large (30cm+), and limited medium (10-30cm), hollows present. The recorded Powerful Owl and Glossy Black-Cockatoo as well as potentially ocuring Barking Owl all utilise large tree hollows for nesting so therefore it can be concluded that the subject site and its immediate surrounds does not provide suitable breeding habitat for these species. Rosenberg's Goanna may occasionally utilise terrestrial / fallen hollows for shelter.

Generally, eucalypt tree species present within the proposed development area are of a low, stunted or mallee type growth nature. This means that they have multiple growth stems from a base root. Some small hollows providing quality refuge were noted within vegetation communities C and D with some trees found to be utilised by Eastern Pygmy Possum (see Figure 4b).

A detailed hollow bearing tree survey is recommended within the R2 zoned lands as well as recent additional APZ extents as a condition of consent to ensure that all hollow dependent fauna species are removed without harm prior to vegetation clearance

4.3.3 Local fauna matters

The Northern Beaches Council website was reviewed for a list of non-threatened fauna species of local significance. The rare and endangered animals' page for the area covered by the previous Warringah LGA only provides links to lists of threatened species of concern.

The Fauna Management Plan for the old Pittwater LGA identifies locally significant fauna species however it is not expected that this should be applied to the site. Species listed as locally significant within this plan and recorded in the study area include Australian Owlet Nightjar, Australian Brush-turkey, Yellow-tailed Black-Cockatoo, White-throated Nightjar, Superb Fairy-wren, Variegated Fairy-wren, Freycinet's Frog, Brown Antechinus, Sugar Glider, Bush Rat, Long-nosed Bandicoot, Short-beaked Echidna, Swamp Wallaby, Mainland Tiger Snake, Eastern Brown Snake, Eastern Bearded Dragon, Eastern Blue-tongue Lizard, Lace Monitor, Yellow-faced Whip Snake an Diamond Python.

4.3.4 State legislative fauna matters

(a) Threatened species (NSW)

TSC Act – A search of the *Atlas of NSW Wildlife* (OEH, 2017) provided a list of threatened fauna species previously recorded within a 10km radius of the subject site. These species are listed in Table A2.2 (Appendix 2) and are considered for potential habitat within the subject site. Strictly estuarine and oceanic threatened species found within 10km have not been included as no marine / aquatic habitats occur within the subject site.

Based on the habitat assessment within Appendix 2, it is considered that the subject site provides varying levels of potential habitat for the following state listed threatened fauna species. Ten (10) threatened fauna species have been recorded to date with potential for others to occur as indicated below. Such potential is also based on the presence of nearby recent records in similar habitat.

Table 4.4 – State listed threatened fauna species with suitable habitat present

Common name	TSC Act	Potential to occur
Giant Burrowing Frog	V	recorded
Red-crowned Toadlet	V	recorded
Rosenberg's Goanna	V	recorded
Little Lorikeet	V	recorded
Glossy Black-Cockatoo	V	recorded
Powerful Owl	V	recorded
Grey-headed Flying-fox	V	recorded
Little Bentwing-bat	V	recorded
Eastern Bentwing-bat	V	recorded
Eastern Pygmy Possum	V	recorded
Swift Parrot	E	possible
Barking Owl	V	possible
Spotted-tailed Quoll	V	possible
Southern Brown Bandicoot	E	possible
Little Eagle	V	low
Square-tailed Kite	V	low
Varied Sittella	V	low
Dusky Woodswallow	V	low
Scarlet Robin	V	low
East-coast Freetail Bat	V	low
Greater Broad-nosed Bat	V	low
Large-eared Pied Bat	V	low
Gang-gang Cockatoo	V	unlikely
Masked Owl	V	unlikely
Koala	V	unlikely
Yellow-bellied Sheathtail-bat	V	unlikely
Eastern Falsistrelle	V	unlikely

Note: Full habitat descriptions for these species are provided in Appendix 2.

Threatened species recorded or with considered potential to occur have been assessed in detail within Appendix 3. Following specialist reports prepared specifically for Giant Burrowing Frog, Red-crowned Toadlet, Rosenberg's Goanna and Eastern Pygmy Possum and in consideration to the suitability of remaining habitat within the offset and adjacent Garigal N.P. it has been concluded that there will not be any likely significant impact on state listed threatened fauna species.

Figures 5, 6 & 7 show important habitat and observations in respect to Giant Burrowing Frog, Red-crowned Toadlet, Rosenberg's Goanna and Eastern Pygmy Possum and further discussion is provided in Section 5.3.2. These figures were prepared for habitat assessment by engaged specialists whom each reviewed the habitat impacts from the May 2016 proposal. The slightly extended APZ by 0.82 ha as part of the current proposal has been review by reptile specialist Gerry Swan in respect to the Rosenberg's Goanna. This is given that the extensions impacted on identified important habitat only for this species. The slight

modifications have not been reviewed by the frog and mammal specialists. Both the old and new APZ extents are nonetheless shown on Figures 5, 6 & 7 for comparison and it is considered that their difference does not warrant further specialist review.

A detailed assessment for all state listed species recorded or with considered potential to occur is provided in Appendix 3.

FM Act – No habitats suitable for threatened aquatic species were observed within the subject site and, as such, the provisions of this act do not require any further consideration.

(b) Endangered populations (NSW)

There are no listed endangered fauna population within the old Warringah portion of the Northern Beaches LGA.

There is an endangered Gang-gang Cockatoo population listed in the Hornsby and Ku-ring-gai LGAs and a Koala population is located in the Pittwater LGA. The geographical extent of these populations does not include the study area or suburbs immediately adjacent; therefore, this matter requires no further consideration.

(c) SEPP 44 Koala habitat protection

SEPP 44 Koala Habitat Protection applies to land within LGAs listed under Schedule 1 of the Policy. In addition, Part 2 of the Policy outlines a three (3) step process to assess the likelihood of the land in question being potential Koala habitat (PKH) or core koala habitat (CKH). Part 2 applies to land which has an area of greater than 1ha or has, together with any adjoining land in the same ownership, an area of more than 1ha.

The subject site is required to be considered under SEPP 44 as it falls within the Warringah (now Northern Beaches) LGA, which is listed on Schedule 1 of this policy. In addition, the total area of the subject site is greater than 1ha, hence Part 2 – *Development Control of Koala Habitats* of the policy applies.

Potential Koala Habitat (PKH) is defined as land where at least 15% of the total number of trees in the upper or lower strata constitutes any of the tree species listed in Schedule 2 of the policy. Core Koala habitat (CKH) is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (i.e. females with young) and recent sightings of and historical records of a population.

Step 1 – Is the land PKH?

Two (2) Koala food tree species (*Eucalyptus punctata* and *Eucalyptus haemastoma*) listed on Schedule 2 of State Environmental Planning Policy No. 44 - Koala Habitat Protection, were observed within the proposed development area. These trees comprised of greater than 15% of the total number of trees within the Low Open Forest (Sydney Sandstone Ridge-top Woodland) and Open Forest (Sydney Sandstone Ridge-top Woodland) vegetation communities and therefore are classified under SEPP 44 as PKH.

Step 2 – Is the land CKH?

Despite the presence of PKH, Koala habitation of the Open Forest habitat of the proposed development area is considered unlikely based on existing records. A search of the *Atlas of NSW Wildlife* (OEH 2015) found one-hundred and forty-nine (149) records of Koala habitation within a 10km radius from the proposed development area since 1940. The

majority of these records are located within Ku-ring-gai National Park and Berowra Valley and Berowra Valley Regional Park, further north.

Only four (4) Koala records exist in the nearby locality. Three (3) of these records are located on the other side of Forest Way from 1940, 1994 and 1997. The only likely route of passage from these areas to the site is across the northern portion of Forest Way, north of Bundaleer Street. Roadside signage indicating possible Koala passage along this road portion is present, however, there are no Koala records within 3km of this road section. The only remaining Koala record is located within the connective bushland areas to the site approximately 5km to the south of Davidson in 1940.

Call playback techniques did not evoke a male response and spotlighting did not observe any Koalas present within or surrounding the subject site during surveys to date. No scat searches, however, have been conducted within the Open Forest vegetation communities to date. The proposed development area is not considered to comprise CKH as defined under SEPP 44.

4.3.5 National environmental significance - fauna

(a) Threatened species (National)

EPBC Act – A review of the schedules of the *EPBC Act* identified a list of threatened fauna species or species habitat likely to occur within a 10km radius of the subject site. These species have been listed in Table A2.2 (Appendix 2), and those with potential habitat within the subject site are considered in the 7 part test of significance within Appendix 3.

Based on the habitat assessment within Appendix 2, it is considered that the subject site provides varying levels of potential habitat for the following nationally listed threatened fauna species:

Table 4.5 – Nationally listed threatened fauna species with suitable habitat present

Common name	EPBC Act	Potential to occur
Giant Burrowing Frog	V	recorded
Grey-headed Flying-fox	V	recorded
Swift Parrot	E	possible
Spotted-tailed Quoll	E	possible
Southern Brown Bandicoot	E	possible
New Holland Mouse	V	possible
Large-eared Pied Bat	V	low
Eastern Bristlebird	E	low

Two (2) nationally listed threatened fauna species, Giant Burrowing Frog (*Helioporus australiacus*) Grey-headed Flying-fox (*Pteropus poliocephalus*), were recorded within the subject site during surveys undertaken. These are also state listed fauna species and a detailed assessment under state legislation *(EPA Act)* is undertaken within the 7 part test of significance (Appendix 3).

The significant impact criteria for vulnerable species listed under the *EPBC Act* (Appendix 4) was reviewed to assess the impacts on these species as a result of the proposed subdivision layout within the subject site. Given the absence of any suitable breeding habitat

within the subject site and that foraging habitat is otherwise well represented in the locality, there will not be any likely significant impact on the Grey-headed Flying-fox. Following a site review by specialist Prof Michael Mahony (see Appendix 6), it is concluded that there will also not be any significant impact on the Giant Burrowing Frog as a result of the subdivision proposal.

Southern Brown Bandicoot

Target survey effort in 2015 did not record presence of Southern Brown Bandicoot. This effort was undertaken using detailed surveillance camera survey across the subject site in accordance with the Draft Referral Guidelines for this species (SEWPAC 2011). This effort is in combination with previous extensive cage trapping, surveillance camera and hair tube effort. Given no recorded presence of Southern Brown Bandicoot to date no further assessment of this species is considered to be required and no referral under the EPBC Act is required.

New Holland Mouse

Across the species' range, the New Holland Mouse is known to inhabit open heathland, open woodland with a heathland understorey and vegetated sand dunes (Fox & Fox (1978); Fox & Mckay (1981); Hocking (1980); Keith & Calaby (1968); Lazenby et al. (2008); Norton (1987); Posamentier & Recher (1974); Pye (1991); Wilson (1991)). Sites where the New Holland Mouse is found are often high in floristic diversity, especially leguminous perennials (Haering & Fox (1997); Kemper & Wilson (2008)). The species has been found to peak in abundance during the early to mid-stages of vegetation succession three to five years after fire (Braithwaite & Gullan (1978); Fox & Fox (1978); Fox & Mckay (1981); Posamentier & Recher (1974)).

The proposed development area provides suitable habitat for the New Holland Mouse based on the sandy substrate, presence of heath and high floristic diversity. Not many records are known of this species in Northern Sydney, however, two (2) record exists within the adjacent Garigal N.P. to the nearby south west in 2001. These records were at the same reference location and on consecutive days so may have been the same individual.

This species has not been confirmed present during survey undertaken to date including hair tubes and Elliott trapping. Mouse activity was recorded at three locations within the central portions of the subject site during recent 2015 surveillance camera survey targeting bandicoot activity. The photographic images did not allow positive identification of the mouse species.

The New Holland Mouse is listed as vulnerable under national legislation; EPBC assessment criteria for a vulnerable species is outlined in Appendix 4. Extensive areas of habitat including sandy soils, heath vegetation, diverse floristics and foraging opportunities will be conserved within the proposed offset areas.

In the confirmed presence of New Holland Mouse an assessment of significance is likely to conclude a not significant impact based on the extent of suitable habitat provided within the offset area, the adjacent Garigal National Park and also with consideration to the adjacent records confirming historical presence in the connective landscape.

It is recommended that further survey is undertaken for New Holland Mouse for the purposes of assessment under the EPBC Act, in order to confirm presence and accompany any potential future referral information to DOEE. Such survey should include Elliott trapping targeting recorded mouse activity locations until a confirmed identification of the mouse species can be obtained.

A referral is not likely to be required for any remaining nationally listed threatened fauna species recorded or with potential to occur.

(b) Protected migratory species (national)

The EPBC Act Protected Matters Report provides additionally listed terrestrial, wetland and marine migratory species of national significance likely to occur, or with habitat for these species likely to occur, within a 10km radius of the subject site. These migratory species are considered for habitat suitability in Table A2.3 (Appendix 2). Threatened migratory species are assessed for habitat suitability in Table A2.2 (Appendix 2). No nationally protected migratory bird species were recorded present during surveys or are considered likely to be significantly impacted by the proposal.

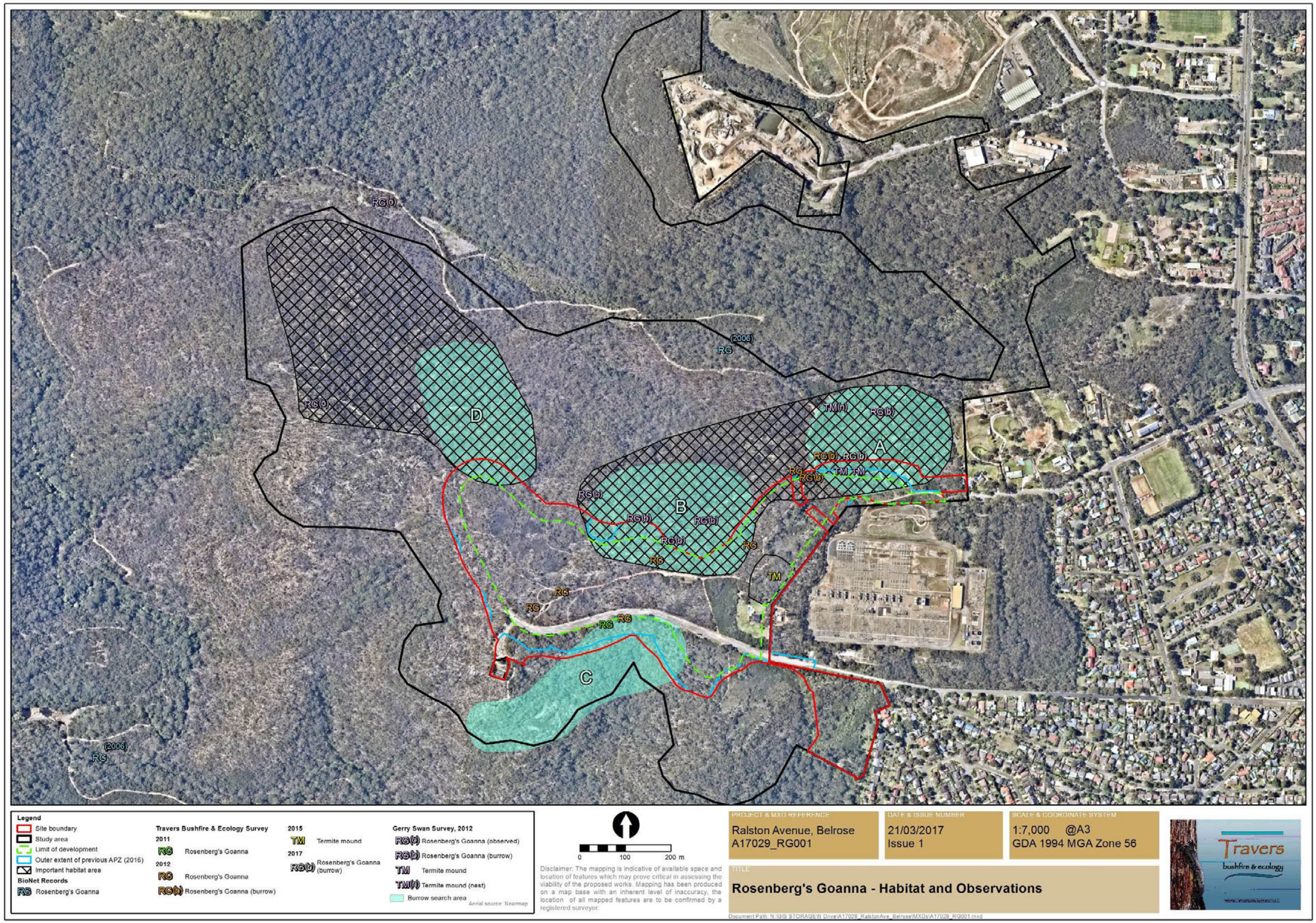

Figure 5 - Rosenberg's Goanna – Important habitat and observations (Gerry Swan)