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Biodiversity Impact Assessment

African Savannah – Congo Project

Taronga Zoo

State Significant Development Application (SSD 8008)

June 2017



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- this document has been prepared in accordance with the brief provided by Taronga Zoo and requirements pursuant to the Secretary's Environmental Assessment Requirements as provided by the Department of Planning.
- the information presented in this report is a true and accurate record of the study findings in the opinion of the authors.



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Glossary and abbreviations

Acronym / Term	Meaning
DPE	NSW Department of Planning and Environment
Subject site	The proposed area of the Savannah-Congo Development. Survey Area (Figure 1)
Subject property	The entire grounds of Taronga Zoo
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
IBRA	Interim Bio-regionalisation of Australia
Kopje	A small hill in a generally flat area (South African)
LGA	Local Government Area
LPI	Land and Property Information
OEH	NSW Office of Environment and Heritage
PCT	Plant Community Type
SEARs	Secretary's Environmental Assessment Requirements
SSD	State Significant Development
m	Metres
km	Kilometres
ha	Hectares
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>



1. Introduction

1.1 Project background

This Biodiversity Impact Assessment has been prepared to accompany a development proposal for the 'African Savannah – Congo Project' at Taronga Zoo, Mosman (Lot 22, DP 843294).

The proposed works have been classified as a State Significant Development (SSD), and will be assessed pursuant to the Secretary's Environmental Assessment Requirements (SEARs) provided by the NSW Department of Planning (DPE). The SEARs stipulate that the biodiversity impacts for the proposal are assessed in accordance with *Environmental Planning and Assessment Act 1979* and meet the minimum form and content requirements in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (OEH 2014).

Narla have produced this report in order to assess any potential impacts associated with the proposed development upon terrestrial ecology (biodiversity), particularly threatened species, populations and communities listed under the *Threatened Species Conservation Act 1995* (TSC Act) and recommend appropriate measures to mitigate any potential impacts in line with the requirements of the SEARs, all relevant State Environmental Planning Policies (SEPP) and the Local Environmental Plan (LEP) and Development Control Plan (DCP) of Mosman City Council.

1.2 Proposed development

The proposed development includes:

- the redesign and redevelopment of several existing animal enclosures for the benefit of the captive animals and the patrons of the zoo;
- the construction of new buildings for animal husbandry, staff and zoo patrons; and
- hard and soft landscaping in line with the preliminary landscape plan developed by Green and Dale Associates (2017) that aims to incorporate existing vegetation as well as native and exotic plantings, to compliment the theme of each exhibit.

The proposed development will include the demolition of several existing animal enclosures, select removal and translocation of planted landscape trees, and select clearing and thinning of some small areas of degraded bushland that are dominated by planted, and self-sown regrowth trees and weeds.

Land within the proposed 'African Savannah - Congo' development site (hereafter referred to as 'the subject site') has been designated within 11 'Zones' that will include zone-specific architecture and landscaping pursuant to each captive species' natural habitat.

Proposed exhibits within the subject site have been designated into the following 'Vegetation Zones':

- Zone 1 – Giraffe/Zebra Savannah Grasslands
- Zone 2 – African Waterhole
- Zone 3 – Cliff Edge Village
- Zone 4 – Rocky Hillside
- Zone 5 – Lion Kopje Country
- Zone 6 – Lion Kopje and Woodland Edge
- Zone 7 – Edge of the Forest
- Zone 8 – Central Visitor Path
- Zone 9 – Congo Forest
- Zone 10 – Gorilla Forest
- Zone 11 – Congo Forest Edge

An Arborist Report produced for the 'subject site' and immediate surrounds (EHS 2017) identified 196 trees for removal. These trees will be removed for the following reasons:

- unsuitable species for the intended planting theme; and/or
- the trees are located within the proposed construction footprint or too close to construction to enable successful retention; and/or
- general poor health of the tree.

A further eight trees have been nominated for relocation/transplanting to allow construction to take place or to be incorporated into the proposed enclosure design (G&D 2017).

1.3 Site Description and Site History

The subject site is located within Taronga Zoo on Bradleys Head, New South Wales, Australia (Lot 22/DP843294). It is located entirely within the Mosman Municipal Council Area. Taronga Zoo occupies approximately 28 hectares (ha) of land zoned as 'SP1 - Special Activities: Zoological Gardens'. The subject site itself is delineated by a yellow dashed line in **Figure 1**.

The land occupied by Taronga Zoo was designated as a 'Zoological Gardens' in April 1912 by the NSW Government. Previously the site was occupied by 'Ashton Park'. Aerial surveys taken in 1943 (NSW LIP 2017) depict a landscape that has changed little over the past 74 years. From this it was considered likely that a majority of the 'bushland' which is presently found around the periphery of the zoo (e.g. Sydney harbour National Park) represents remnant native vegetation (**Figure 1**). In contrast, many of the plants found within the boundaries of Taronga Zoo, including the subject site, have been planted for ornamental purposes. This includes native and exotic tree, shrub and groundcover species. All areas of 'bushland' remaining within the boundaries of Taronga Zoo are already fragmented and disturbed by historical land usage including current and former animal exhibits, pedestrian access, weed infestation and infill planting with non-indigenous Australian and exotic flora species for aesthetic purposes.

For the purpose of the Biodiversity Impact Assessment, the subject site has been divided into two portions or 'extents':

- The western extent of the site; encompassing the remnant native bushland (the site of the proposed 'Lion Kopje' [Zone 5 and 6])
- The eastern extent of the site; encompassing the existing fauna enclosures, buildings, hard landscaping and ornamental gardens; (the proposed site of the remaining animal exhibits [Zones 1 – 4 and 7 – 10])

The western extent of the site (the primary focus of this study) encompasses approximately 1,936 m². The eastern extent of the site (landscaped vegetation and enclosures) comprises approximately 35,423 m² (**Figure 5**).

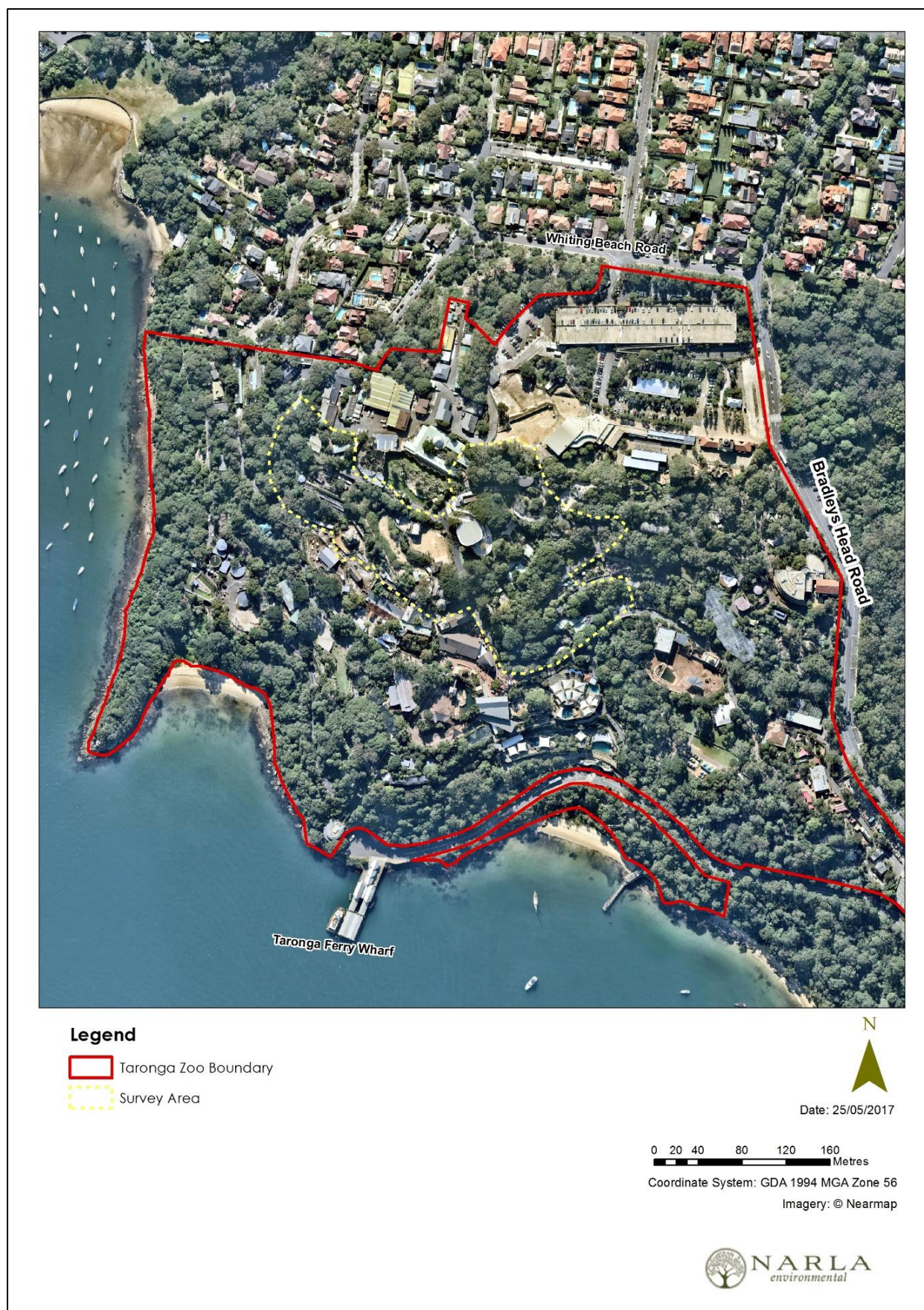


Figure 1: Location map (subject site depicted by yellow dashed polygon)

1.4 Scope of assessment

The objectives of this Biodiversity Impact Assessment were to:

- Establish the likelihood of occurrence of migratory species, threatened species, endangered populations and threatened ecological communities as listed under the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and/or the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and their potential to utilise or occur within the subject site during a point in their lifecycles.
- Assess any potential impacts to species and/ or communities listed under the TSC Act and EPBC Act.
- Address all requirements of the SEARs in relation to the project, biodiversity conservation and management.
- Identify and map the distribution of vegetation communities in the subject area and discuss patch size and condition.
- Record presence and the extent of any noxious or environmental weeds and suggest management recommendations.
- Record presence and the extent of any known or potential fauna habitat features such as nests, drays, caves, crevices, culverts, pools, soaks, flowering trees, fruiting trees, hollow-bearing trees and provide recommendations for on-going management of these habitat features and any fauna present within.
- Determine ecological impacts or risks that may result due to the proposed works.
- Provide recommendation of any controls or additional actions to be taken to ensure Taronga Conservation Society Australia can maintain or enhance environmental outcomes of the subject site through implementation of the proposed works.

1.5 Relevant Legislation and Policy

The following list of legislation and policy are addressed in this report. Relevant planning instruments and policy requiring more detailed address are discussed in the following sections.

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
Environmental Planning and Assessment Act 1979 (EP&A Act)	All features	Yes	This Biodiversity Impact Assessment Report and all subsequent recommendations relevant to the planning process.
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	No EPBC Act (Commonwealth) Threatened Ecological Communities (TEC) are represented within the subject site. A single Narrow-leaved Black Peppermint (<i>Eucalyptus nicholii</i>) was observed within the north-west of the site. This tree was planted. It occurs outside of its natural distribution and has low biodiversity conservation significance. Suitable habitat for several EPBC Act (Commonwealth) threatened fauna species is present within the subject site and immediate surrounds.	Yes	An assessment of significance of impact from the proposed development on Matters of National Environmental Significance (MNES) EPBC Act <i>Assessment of Significant Impact Criteria</i>
Threatened Species Conservation Act 1995 (TSC Act)	No TSC Act (NSW) Threatened Ecological Communities (TEC) are represented within the subject site. A single Narrow-leaved Black Peppermint (<i>Eucalyptus nicholii</i>) was observed within the north-west of the site. This tree was planted. It occurs outside of its natural distribution and has low biodiversity conservation significance. A single Southern Myotis (<i>Myotis macropus</i>) was encountered during survey. The specimen was observed foraging on the southern extent of the subject site. Suitable habitat for several other TSC Act threatened fauna species is present within the subject site and immediate surrounds.	Yes	An assessment of significance of impact from the proposed development on TSC Act listed threatened species (7-part Test of Impact Significance)
Native Vegetation Act 1993 (NV Act)	This Act does not apply to vegetation within the Mosman LGA.	No	This Act does not apply to vegetation the Mosman LGA.
Noxious Weeds Act 1993 (NW Act)	Locally controlled weeds (class 4) identified on site. ▪ <i>Anredera cordifolia</i>; ▪ <i>Asparagus aethiopicus</i>; ▪ <i>Celtis sinensis</i>; ▪ <i>Lantana camara</i>; ▪ <i>Ligustrum lucidum</i>; ▪ <i>Ligustrum sinense</i>;	Yes	Class 4: The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed. The growth of

Legislation/ Policy	Relevant Ecological Feature on Site	Triggered	Action Required
	▪ <i>Ochna serrulata</i>; ▪ <i>Olea europaea subsp. cuspidata</i>; ▪ <i>Phyllostachys spp.</i>; ▪ <i>Ricinus communis</i>; and ▪ <i>Senecio madagascariensis</i>; Regionally controlled (class 3) weed identified on site. ▪ <i>Cestrum parqui</i>		the plant must be managed in a manner that continuously inhibits the ability of the plant to spread. Class 3: The plant must be eradicated from the land and that land must be kept free of the plant.
State Environmental Planning Policy No 19 - Bushland in Urban Areas (SEPP 19)	The Subject Site does not adjoin any Council-mapped Bushland or Reserves. Bradley's Head National Park is located ~200m east of the subject site.	No	None
State Environmental Planning Policy No. 26 - Littoral Rainforest (SEPP 26)	There is no SEPP26 mapped Littoral Rainforest present on the subject site therefore SEPP26 does not apply	No	None
State Environmental Planning Policy No. 44 - Koala Habitat Protection (SEPP 44)	Under Schedule 1 of SEPP 44, Mosman Local Government Area is not included within 'Land to which this policy applies'	No	None

1.6 Mosman Local Environmental Plan 2012

1.6.1 Zoning

The subject site is zoned 'SP1 - Special Activities: Zoological Gardens'. The primary objectives of the zone include:

- To provide for special land uses that are not provided for in other zones;
- To provide for sites within special natural characteristics that are not provided for in other zones; and
- To facilitate development that is in keeping with the special characteristics of the site or its existing or intended special use, and that minimises any adverse impacts on surrounding land.

1.6.2 Preservation of Trees or Vegetation

Section 5.9 'Preservation of trees or vegetation' of the Mosman City Council Local Environmental Plan (MLEP 2012) applies to this proposal. The objective of this clause is to preserve the amenity of the area, including biodiversity values, through the preservation of trees and other vegetation.

This clause applies to species or kinds of trees or other vegetation that are prescribed for the purposes of this clause by a development control plan made by the Council (*Note: A development control plan may prescribe the trees or other vegetation to which this clause applies by reference to species, size, location or other manner.*)

A person must not ringbark, cut down, top, lop, remove, injure or wilfully destroy any tree or other vegetation to which any such development control plan applies without the authority conferred by:

- development consent; or
- a permit granted by the Council.

The refusal by the Council to grant a permit to a person who has duly applied for the grant of the permit is taken for the purposes of the ACT to be a refusal by the Council to grant consent for the carrying out of the activity for which a permit was sought.

This clause does not apply to a tree or other vegetation that the Council is satisfied is dying or dead and is not required as the habitat of native fauna.

A permit under this clause cannot allow any ringbarking, cutting down, topping, lopping, removal, injuring or destruction of a tree or other vegetation:

- that is or forms part of a heritage item or that is within a heritage conservation area;
- that is or forms part of an Aboriginal object or that is within an Aboriginal place of heritage significance, unless the council is satisfied that the proposed activity; and
- is of a minor nature or is for the maintenance of the heritage item, Aboriginal object, Aboriginal place of heritage significance of heritage conservation area.

This clause does not apply to a tree or other vegetation that the Council is satisfied is a risk to human life or property.

This clause does not apply to or in respect of:

- The clearing of native vegetation:
 - that is authorised by a development consent or property vegetation plan under the *Native Vegetation Act 2003*; or
 - that is otherwise permitted under Division 2 or 3 of Part 3 of that Act.
- The clearing of vegetation on State protected land (within the meaning of clause 4 of Schedule 3 to the *Native Vegetation Act 2003*) that is authorised by a development consent under the provisions of the *Native Vegetation Conservation Act 1997* as continued in force by that clause; or
- Trees or other vegetation within a State forest, or land reserved from sale as a timber or forest reserve under the *Forestry Act 1916*; or
- Action required or authorised to be done by or under the *Electricity Supply Act 1995*, the *Roads Act 1993* or the *Surveying and Spatial Information Act 2002*; or
- Plants declared to be noxious weeds under the *Noxious Weeds Act 1993*.

1.7 Mosman Development Control Plan 2012

The development will abide by the environmental objectives of the applicable Mosman Development Control Plan (DCP). Development within land zoned as 'SP1 Special Activities' must abide by the environmental objectives of the *Open Space and Infrastructure Development Control Plan (2012)*, which are to:

- Protect and conserve the natural and built heritage of Mosman;
- Enhance and protect the scenic amenity of Sydney and Middle Harbours;

- Manage change in a way that ensures an ecologically and economically sustainable urban environment in which the needs and aspirations of the community are recognised;
- Ensure development minimises any adverse effect on surrounding land;
- Ensure that the character of an area is a key consideration in the preparation and assessment of development proposals; and
- Set out specific requirements for notifying proposed development and tree removal.

1.7.1 Landscaping

Section 4.9 'Landscaping' of the Mosman DCP (2012) applies to this proposal. The objectives of this clause are:

- To have the existing canopied and vegetated landscaped character of Mosman protected and enhanced;
 - Existing established trees which contribute to the amenity of the area and trees listed on Council's Urban Forest Management Register are to be retained and incorporated into the landscape design;
- To have existing established trees protected;
 - Where trees are to be retained on development sites, they must be protected during construction in accordance with best horticultural practice;
 - Where an existing established tree or trees are approved for removal, adequate space in the landscape design is to be provided for a replacement tree or trees appropriate for the site.
- To have the appearance, amenity and energy efficiency of buildings enhanced through innovative landscape design;
 - Vegetation types and landscaping styles which blend the development into the streetscape and any surrounding bushland or parkland areas, and are complementary to planting identified for the townscape are to be incorporated into the landscape design.
 - Where trees are planted as part of development they should not unreasonably obstruct views from neighbouring properties or public views. Trees within a light open foliage and canopy are preferred which do not obstruct views but do contribute to the wooded landscape of Mosman. Species such as Leyland Cypress (Leighton Green) and its cultivars should not be planted.
 - The landscape design is to consider personal safety by providing landscaping that can be maintained to ensure good visibility along paths and driveways and avoiding shrubby landscaping new thoroughfares, and provide adequate sight lines for vehicles and pedestrians, especially near street corners and intersections. Landscaping should also provide privacy between buildings.
 - Vegetation should not adversely affect the structure or amenity of the proposed buildings or buildings, and should minimise risk or damage to above and below ground powerlines and other services. Regard should be given to bushfire risk in the selection and siting of species.
 - The landscape design is to contribute to energy efficiency and amenity by providing substantial shade in summer. Water conservation should be encouraged through the use of drip irrigation systems and mulch layers, minimising hard surfaces to reduce stormwater runoff and utilise water

absorbent materials, locating/grouping plants appropriately, and utilising native plant species which require less water than non-natives.

- To have indigenous planting used within new landscaping where appropriate.
 - Sites within the Habitat Link identified on the 'Biodiversity Corridor and Habitat Link Map' (**Figure 2**) are to incorporate species which are Australian native, in particular those indigenous to Mosman, are to be incorporated into any landscape design. Applicants must have regard to the retention and where possible extension of habitat for native fauna. Refer to the Building and Sustainability Index (BASIX) Specification 'Indigenous Plant List for Mosman' and Council's 'Guide to Native Plant Species for Mosman Gardens' for a list of appropriate species.
 - The landscape design is to complement any adjoin bushland supporting a wildlife habitat or corridor; retain significant natural features on the site, such as rock outcrops, maintain natural drainage conditions where practicable to prevent degradation of bushland ecosystems, and identify noxious and invasive plants to be removed.
 - For sites adjoining zoned RE1 Public Recreation or E2 Environmental Conservation, refer to State Environmental Planning Policy No. 19 – Bushland in Urban Area for Specific provisions.



Figure 2. Mosman Local Government Area 'Biodiversity Corridor and Habitat Link' Map (Taronga Zoo indicated by red polygon)

1.8 Sydney Regional Environmental Plan 2005

The development will abide by the environmental objectives of the Sydney Regional Environmental Plan (2005) which are to:

- Ensure that the catchment, foreshores, waterways and islands of Sydney Harbour are recognised, protected, enhanced and maintained:
 - As an outstanding natural asset, and
 - As a public asset of national and heritage significance, for existing and future generations
- Ensure a healthy, sustainable environment on land and water;
- Achieve a high quality and ecologically sustainable urban environment
- Ensure a prosperous working harbour and an effective transport corridor;
- Encourage a culturally rich and vibrant place for people;
- Ensure accessibility to and along Sydney Harbour and its foreshores;
- Ensure the protection, maintenance and rehabilitation of watercourse, wetlands, riparian lands, remnant vegetation and ecological connectivity; and
- Provide a consolidated, simplified and updated legislative framework for future planting.

1.8.1 Foreshores and Waterway Areas

The subject site is located within Department of Planning and Environment *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005 Foreshores and Waterways Area Map (Figure 3)*. The planning principles for the land within the Foreshores and Waterways Area are as follows:

- development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores;
- public access to and along the foreshore should be increased, maintained and improved, while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation;
- access to and from the waterways should be increased, maintained and improved for public recreational purposes (such as swimming, fishing and boating), while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation;
- development along the foreshore and waterways should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands and foreshores;
- adequate provision should be made for the retention of foreshore land to meet existing and future demand for working harbour uses;
- public access along foreshore land should be provided on land used for industrial or commercial maritime purposes where such access does not interfere with the use of the land for those purposes;
- the use of foreshore land adjacent to land used for industrial or commercial maritime purposes should be compatible with those purposes;
- water-based public transport (such as ferries) should be encouraged to link with land-based public transport (such as buses and trains) at appropriate public spaces along the waterfront; and
- the provision and use of public boating facilities along the waterfront should be encouraged.

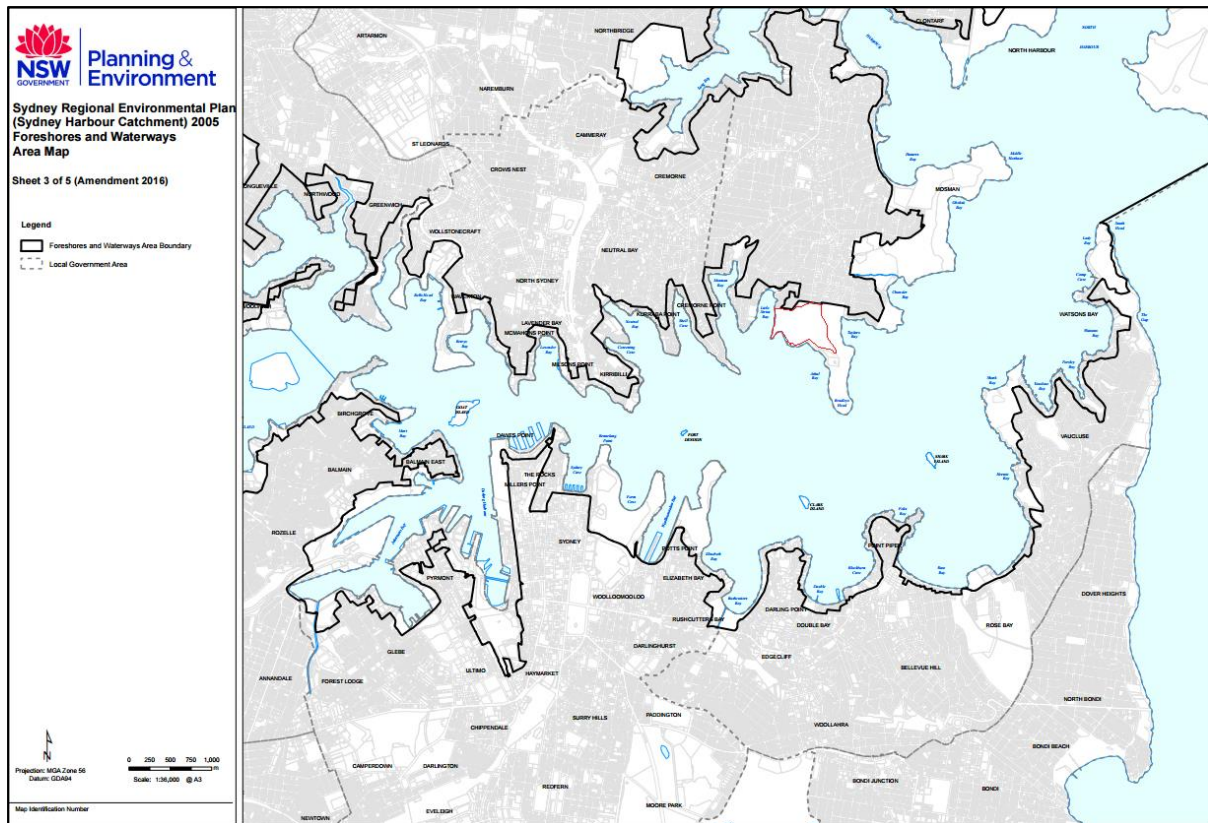


Figure 3. Foreshores and Waterways Area Map (Subject site indicated by red polygon)

1.9 Topography, geology and soils

The subject site occurs on a south facing slope of a sandstone headland. The site varies in elevation from approximately 62 metres above mean sea level (amsl) in the north of the property (bordering the Taronga Zoo staff buildings) to 46 metres at the south-east of the site (at the western extent of the existing Gorilla enclosure).

The subject site lies within the Sydney basin, a region primarily composed of sedimentary rocks and small areas of volcanic intrusions. The distinctive geological features form a close association with vegetation patterns which together underpin the demarcation of the Sydney Basin Bioregion (OEH 2013).

The subject site occurs largely within the 'Hawkesbury Soil Landscape' (Chapman and Murphy 1989). The landscape is rugged, with steep slopes on Hawkesbury Sandstone covered by a shallow (>50cm) layer of discontinuous lithosols/ silicious sands. Rocky outcrops are common. Earthy Sands, Yellow Earths and some Yellow Podzolic Soils also occur, most frequently on inside of benches and along joints and fractures. Less frequent are localised Yellow and Red Podzolic Soils associated with shale lenses and, Siliceous Sands and secondary Yellow Earths along drainage lines.

The 'Gymea Soil Landscape' (Chapman and Murphy 1989) occurs on the higher elevations occurring within Taronga Zoo. Within these areas slopes are gentler, becoming undulating to rolling hills. Hawkesbury Sandstone remains the bed material. Soils are shallow to moderately deep (30-100 cm), made up of Yellow Earths and Earthy Sands on crests and inside of benches; shallow (<20 cm) Siliceous Sands on leading edges of benches; localised Gleyed

Podzolic Soils and Yellow Podzolic Soils on shale lenses; shallow to moderately deep (<100 cm) Siliceous Sands and Leached Sands along drainage lines.

1.10 Hydrology

Overland stormwater flows across the site in a southerly direction into 'Mosman Bay' within Sydney Harbour. Multiple existing pipelines and drainage ditches divert water into stormwater detention systems present throughout Taronga Zoo.

No natural watercourses were observed within the site. Several artificial waterbodies and 'moats' were observed within animal enclosures. These man-made waterbodies may emulate biodiversity values of naturally occurring waterbodies and are likely to provide drinking water for fauna, and prey items for a selection of wild, predatory fauna species that occupy the site.

1.11 Study Limitations

This study was not intended to provide a complete inventory of all flora and fauna species with potential to occur on the subject site. Rather this study was undertaken in order to:

- provide an assessment into the likelihood of occurrence of any significant terrestrial and aquatic ecological features particularly vertebrate fauna and vascular plants or ecological communities listed under state and/or commonwealth legislation (e.g. migratory species, threatened species, threatened ecological communities and endangered populations);
- assess the potential for impacts from the proposed works on any of those ecological features; and
- identify the presence of any habitat features that provide foraging or shelter for threatened or protected fauna.

The species list provided for the site in this report was restricted to what was observed during the site visit by the Narla Ecologists.

The timing of the survey may not have coincided with emergence times of some species of flora and fauna, such as seasonally flowering ground orchids, seasonal migratory fauna or nocturnal fauna.

To account for those species that could not be identified during the field survey, detailed habitat assessments were combined with desktop research and local ecological knowledge to establish an accurate prediction of the potential for such species to occur on or adjacent the subject site.

The subject site has been historically landscaped and planted with trees, shrubs and ground covers from across the world, including different parts of Australia. This study acknowledges the historical planting efforts and diversity of those plantings; however, this study was not meant to provide a detailed list of these plants but rather focus on those that provide habitat for threatened or protected fauna.

2. Methodology

2.1 Desktop Assessment and Literature Review

A thorough literature review of local information relevant to Taronga Zoo and the general Mosman Council area was undertaken. Online databases were searched to obtain threatened species and biodiversity data recorded from, or modelled for the site and its surrounds to an area of approximately 10 km².

Searches utilising NSW Wildlife Atlas (Bionet) and the Commonwealth Protected Matters Search Tool were conducted to identify all current threatened and migratory flora and fauna records within a 10 km² search area centred on the subject site. This data was used to assist in establishing the presence or likelihood of any such ecological values as occurring on or adjacent the subject site, and helped inform our Ecologist on what to look for during the site assessment.

Soil landscape and geological mapping was examined to gain an understanding of the environment on the subject site and assist in determining whether any threatened flora or ecological communities may occur there (Herbert 1983, Chapman and Murphy 1989).

2.2 Ecological Site Assessment

A site assessment was performed by Narla Environmental Ecologists, Kurtis Lindsay on 2nd May 2017 and by Alex Graham on the 18th and 19th May 2017. A total of 17 hours was spent surveying the subject site across its entire area.

A broad assessment of all vegetation was conducted during the site visit. The site survey revealed a single patch of approximately 1,936 m² of remnant vegetation within the west of the site. Survey effort was prioritised within this 'remnant vegetation' as it contained the highest biodiversity values and habitat complexity within the subject site.

A thorough assessment of fauna habitat availability was conducted as a priority. The habitat assessment provided a better understanding of the fauna species that may potentially occur on the subject site during a part of their lifecycle.

All trees and shrubs within the subject site were inspected for their ecological value including foraging and nesting/roosting value, with a particular focus on trees 'to be removed' (as listed in the Arboricultural Assessment Report (EHS 2017)).

During the site assessment, the following activities were undertaken:

- Identifying and recording the vegetation communities present on the subject site, with focus on identifying any threatened ecological communities (TEC);
- Recording a detailed list of flora species encountered on the subject site, with a focus on threatened species, species diagnostic of remnant ecological communities;
- Recording the location and extent of noxious weeds;
- Recording opportunistic sightings of any fauna species seen or heard on or within the immediate surrounds of the subject site;
- Identifying and recording the locations of notable fauna habitat such as important nesting, roosting or foraging microhabitats;

- Targeting the habitat of any threatened and regionally significant fauna including:
 - Tree hollows (habitat for threatened large forest owls, parrots, cockatoos and arboreal mammals)
 - Caves and crevices (habitat for threatened reptiles, small mammals and microbats)
 - Termite mounds (habitat for threatened reptiles and the echidna)
 - Soaks (habitat for threatened frogs and dragonflies)
 - Wetlands (habitat for threatened fish, frogs and water birds)
 - Drainage lines (habitat for threatened fish and frogs)
 - Fruiting trees (food for threatened frugivorous birds and mammals)
 - Flowering trees (food for threatened nectarivorous mammals and birds)
 - Trees and shrubs supporting nest structures (habitat for threatened birds and arboreal mammals), and
 - Any other habitat features that may support fauna (particularly threatened) species.
- Assessing the connectivity and quality of the vegetation within the subject site and surrounding area

2.3 Weather Conditions

A summary of the prevailing weather conditions during the site survey and the lead-up to the survey is presented (**Table 1**). This data was collected from the nearest weather station of 'Sydney'. The weather conditions experienced are considered typical of the conditions experienced during that time of the year. This information is provided by the Bureau of Meteorology (2017).

Table 1. Weather conditions taken from the nearest weather station (Sydney) in the lead up and during the field survey (BOM 2017) (Survey dates in bold)

Survey date	Minimum Temp.	Maximum Temp. °C	Rainfall (mm)
13/05/2017	14.0	21.3	3.2
14/05/2017	14.7	18.7	0
15/05/2017	13.1	20.8	5.2
16/05/2017	11.1	21.9	0
17/05/2017	9.8	20.2	0
18/05/2017	12.6	21.5	0
19/05/2017	14.8	20.4	0

3. Results and Discussion

3.1 Landscape Features

3.1.1 IBRA bioregions, IBRA subregions and Mitchell Landscapes

The subject site is located within the NSW Sydney Basin IBRA region (version 7) and Pittwater (Subregion code: SYB07) IBRA subregion. The development site occurs entirely within the one NSW Mitchell Landscape: 'Belrose Coastal Slopes' (Mitchell Landscapes v 3.1).

3.1.2 Connectivity value - rivers, streams and estuaries

There are no natural rivers, streams or estuaries identified within the development from topographic map that contains the subject site (1: 25,000 scale).

A number of artificial waterways and 'moats', were observed within and surrounding animal enclosures. Several of these waterbodies may emulate biodiversity values of naturally occurring watercourses.

3.1.3 Local and important wetlands

There are no naturally occurring wetlands within the subject site. No local or important wetlands are located adjacent to or downstream from the development site.

3.1.4 State, regional and local biodiversity links

The site does not incorporate a state, regional or local biodiversity link.

3.1.5 Connectivity assessment

Taronga Zoo is bounded to the west by Bradleys Head Road and Athol Wharf Road to the south. While these barriers are not significant barriers to connectivity, the site is located on the southern tip of a headland which is surrounded by harbour on its southern, eastern and western sides. To the north it is bordered by an urban residential landscape.

East of the Taronga Zoo lies Bradleys Head National Park which is zoned *E1 - Environmental Conservation Land*. A narrow corridor of contiguous vegetation connects existing vegetation within the western extent of the subject site with the vegetation within Bradleys Head National Park. This vegetation corridor fringes the boundary of Taronga Zoo along the western and southern boundaries.

In addition to the value for fauna passage and foraging, connectivity of the vegetation on the subject site enables the transfer of genetic material and propagules of locally indigenous flora across the landscape.

3.2 Existing Vegetation Communities

Sydney Metropolitan Vegetation Information System (VIS) Mapping (OEH 2013) designated vegetation within the western extent of the subject site as 'S_DSF06: Coastal Sandstone Foreshores Forest'. Vegetation throughout the remainder of the subject site is designated as 'Weeds and Exotics' (**Figure 4**).

Within the larger landscape, vegetation of Bradleys Head National Park has similarly been mapped as CSFF (OEH 2013).

A patch remnant native bushland of approximately 1,936 m² was identified within the western extent of the subject site. The site assessment conducted by the Narla Environmental Ecologist, confirmed the presence of 'Coastal Sandstone Foreshores Forest' (CSFF) within this area. This determination was based on the number of 'positive diagnostic species for this community (18 species in total) which were represented in assemblages of diagnostic species from each stratum. The condition of the remnant vegetation across the subject site was 'moderate - good' with localised areas of weed infestation.

According to Sydney Metropolitan VIS (OEH 2013) description of CSFF; 'A 0.04-hectare site located in this map unit is expected to contain at least 14 positive diagnostic species provided the total number of native species in the site is 28 or greater'. Within the approximately 0.19 ha subject site, a total of 18 positive diagnostic species were identified. This confirmed the identification of this community. The majority of the native vegetation on the subject site was growing in shallow, sandy soils on Hawkesbury Sandstone. Sandstone was exposed over much of the patch.

Within the western extent of the subject site, remnant Eucalypt canopy with a mesic understorey was identified. The strong presence of mesic elements, are likely due in part to the historical absence of fire. Overstorey species included mature Bangalay (*Eucalyptus botyroides*), and Port-Jackson Fig (*Ficus rubiginosa*), while understorey species comprised Sweet Pittosporum (*Pittosporum undulatum*), Cheese Tree (*Glochidion ferdinandi*), Coffee Bush (*Breynia oblongifolia*), Blueberry Ash (*Eleaocarpus reticulatus*) and Rapanea (*Myrsine variabilis*).

Several self-sown, landscaping species were also identified within patches of native vegetation. These species have been historically planted throughout adjoining landscaped areas, and have likely been spread by native, wild birds and mammals. The most common was Tuckeroo (*Cupaniopsis anacardioides*). Aside from foraging and habitat values, these species contribute little to the biodiversity value of the site.

Four overstorey trees found in the western remnant bushland has been historically planted on site, Tallowwood (*Eucalyptus microcorys*), Narrow-leaved Black Peppermint (*Eucalyptus nicholii*), Maiden's Gum (*Eucalyptus maidenii*) and Tasmanian Blue Gum (*Eucalyptus globulus*). These trees are commonly planted as landscape trees.

Throughout the remainder of the subject site, vegetation was comprised of mature, planted landscaping trees, comprising both locally-indigenous species and ornamental exotic species. A broad range of native and exotic species have been planted throughout the Taronga Zoo and the subject site itself, these are often located within manicured garden beds or within animal enclosures.



Figure 4. NSW OEH mapped vegetation (OEH 2013a; 2013b) (subject site indicated by yellow dashed polygon)

3.2.1 Coastal Sandstone Foreshores Forest

Coastal Sandstone Foreshores Forest (S_DSF06, PCT 1778) was confirmed within the western extent of the site (**Plate 1**). This community was identified by a floristic assemblage dominated by mesic, sheltered sandstone species including Cheese Tree, Sweet Pittosporum, Coffee Bush, Blueberry Ash and Rapanea. These mesic shrubs were dominant across the site and this reflected the low fire frequency, expected in an urban landscape. Ground covers were sparse, reflective of the effects of over-shading from the dense mid and overstorey cover. Three locally-indigenous tree species were identified within the western extent of the subject site, Bangalay (*Eucalyptus botyoides*), Grey Gum (*Eucalyptus punctata*) and Swamp Mahogany (*Eucalyptus robusta*).



Plate 1: Coastal Sandstone Foreshores Forest within the western portion of the subject site

Table 2: Mapped Plant Community Types and other features

Vegetation type (OEH 2013)	Plant community type (Narla Environmental 2017)	Total area (ha)
PCT 1778 – Coastal Sandstone Foreshores Forest	PCT 1778 – Coastal Sandstone Foreshores Forest	0.19
Weeds and Exotics	Native and Exotic Landscaping (including trees, shrubs, existing enclosures, hard landscaping and buildings)	3.54
Total area (ha)		3.73

3.3 Flora

A total of 138 flora species were identified within the subject site, comprising 88 native species and 49 classified as exotic (**Table 5 – Appendix 1**). Nomenclature follows PlantNet (2016).

12 of the identified weeds are classed as noxious within the Mosman City Council LGA. These species must be controlled to prevent their further spread and not propagated or knowingly distributed. This issue is discussed further in **section 3.5**.

3.3.1 Threatened Flora Species

Desktop surveys were conducted to determine the likelihood of threatened flora species occurring within the site. A broad survey was then undertaken across the entire subject site to target these species. Targeted surveys were undertaken within the west of the site, where remnant native vegetation presented the greatest potential for threatened flora to occur.

A single Narrow-leaved Black Peppermint (*Eucalyptus nicholii*) was identified within the north-west of the site growing within a garden bed. The Narrow-leaved Black Peppermint is listed as Vulnerable under the TSC Act (NSW) and the EPBC Act (Commonwealth). This species is commonly planted for landscaping purposes. The specimen has been planted outside of its natural distribution and its removal will have no impact on the survival of this species.

No locally-indigenous TSC Act or EPBC Act listed flora species were confirmed on or immediately adjacent the subject site. This does not rule out the potential for some threatened species to still exist on the subject site in a state of dormancy (e.g. terrestrial orchids which only emerge after suitable rainfall and warmer temperatures). Assessments of Significance (7-part tests and MNES) were conducted on all potentially occurring species (**Table 3**).

Table 3. Threatened flora deemed as having potential to occur on the subject site

Species	TSC Act	EPBC Act	Species Credit (BioBanking & FBA)
<i>Callistemon linearifolius</i>	Vulnerable	-	Yes
<i>Tetradlea glandulosa</i>	Vulnerable	-	Yes
<i>Syzygium paniculatum</i>	Endangered	Vulnerable	Yes
<i>Acacia terminalis</i> subsp. <i>terminalis</i>	Endangered	Endangered	Yes

3.3.2 Weeds

A total of 49 exotic flora species were recorded in the subject site. This high abundance of weeds is reflective of the disturbed and highly modified landscape of the zoo grounds. Self-sown and planted exotic trees and shrubs were observed throughout the native vegetation. It is likely that wild birds and mammals have contributed to the spread of these species into the adjoining bushland.

Twelve noxious weeds were identified within the subject site. 11 of these weeds are listed as 'Class 4 (locally Controlled) Noxious Weeds' in the Mosman Local Government Area under

the NSW Noxious Weeds Act 1993 (NW Act). A single Class 3 (regionally Controlled) weed; Green Cestrum (*Cestrum parqui*) was also identified throughout multiple areas within the site.

Class 3 status requires that “The plant must be fully and continuously suppressed and destroyed”.

Class 4 status requires that “the growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed”.

Class 4 noxious weeds recorded on the subject site were:

- Madeira Vine (*Anredera cordifolia*);
- Ground Asparagus (*Asparagus aethiopicus*);
- Chinese Celtis (*Celtis sinensis*);
- African Olive (*Olea europaea* subsp. *cuspidata*);
- Large-leaf Privet (*Ligustrum lucidum*);
- Small-leaf Privet (*Ligustrum sinense*);
- Castor Oil Plant (*Ricinus communis*);
- Fireweed (*Senecio madagascariensis*);
- Bamboo (*Phyllostachys* spp.);
- Mickey Mouse Plant (*Ochna serrulata*); and
- Lantana (*Lantana camara*).

Bamboo was observed infesting a large area within the north-western extent of the subject site. This is a serious concern to the CSFF, as Bamboo will outcompete and ‘shade’ native groundcovers, shrubs and recruiting canopy species. This infestation should be managed as a priority.

Localised infestations of African Olive were observed throughout several areas of the subject site. Large specimens were observed nearby to African animal enclosures, where they may have been planted as a part of a landscaping theme. This species should be eradicated from the site, including within landscaped areas to prevent its further spread into adjoining bushland.

The ‘Class 3’ noxious weed; Green Cestrum was observed in several locations throughout the site, including within remnant bushland in the west of the site. Without proper management, this species will continue to spread throughout the site and into neighbouring bushland. All other weed species were observed in low densities around the site. These species must be managed in accordance with the *Noxious Weeds Act 1993*.

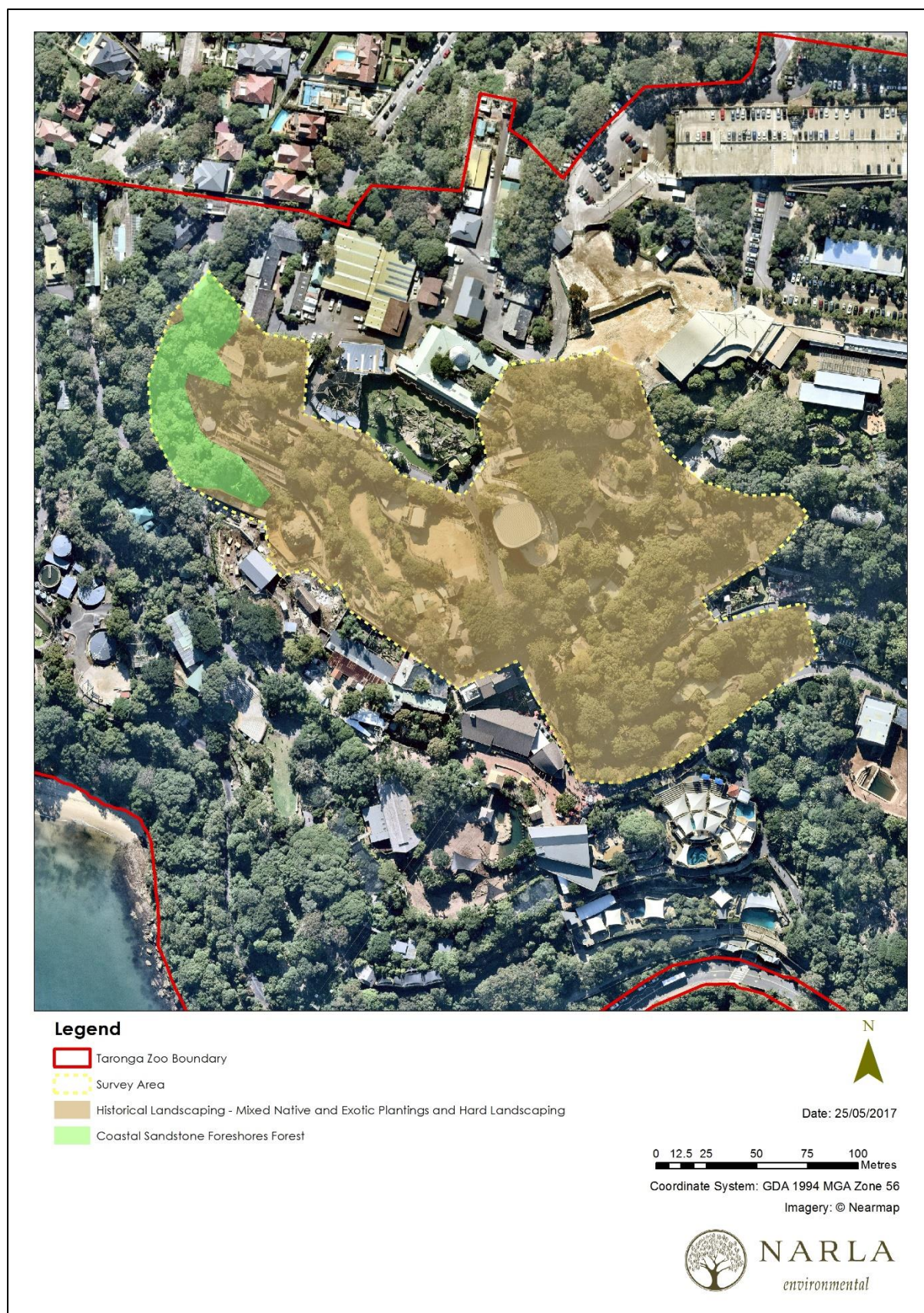


Figure 5: Native vegetation and landscaping areas as validated in the Field by Narla Environmental

3.4 Fauna

A suite of 36 wild fauna species were encountered on the subject site during site assessment. Of these a total of 29 fauna species encountered were listed as 'protected' under the NSW *National Parks and Wildlife Act 1974*. Two species encountered were listed as Vulnerable under the TSC Act (NSW). One of these was also listed vulnerable under the EPBC Act. Two exotic bird species, common in the area, were also encountered during survey.

Fauna encountered during survey comprised primarily of diurnal birds. 28 species of bird were identified within the subject site, including 26 native species. Species encountered were considered common in the area, and reflective of a typical transition zone between urban landscapes and bushland in eastern Sydney. Significant observations included sensitive insectivorous birds including Spotted Pardalote (*Pardalotus punctatus*), Eastern Whipbird (*Psophodes olivaceus*) and White-browed Scrubwren (*Sericornis frontalis*). Although fairly common in suitable habitat, these species have declined as a result of competition and harassment by the overabundant, and aggressive Noisy Miner (*Manorina melanocephala*) and other aggressive birds.

The population of wild Australian Brush Turkey (*Alectura lathami*) in Taronga Zoo has exploded in recent years. This is likely to have resulted from effective control of foxes in surrounding areas. Including Bradley's Head. The maximum number of Brush Turkey counted in Taronga Zoo by Nara staff in 2017 was 50 birds. This may be one of the largest local aggregations of Brush Turkey in the Sydney area. Breeding success within the zoo grounds appears high.

Six mammal species were recorded within the site. Diggings of the long-nosed Bandicoot (*Perameles nasuta*) were identified within bushland in the west of the site. Scat belonging to the Common Brushtail Possum (*Trichosurus vulpecula*) was observed, while several 'dreys' belonging to the Common Ringtail Possum (*Pseudocheirus peregrinus*) were identified throughout bushland and landscaped areas of the site. Possums often inhabit urban areas, including cavities within buildings and infrastructure.

Two Grey-headed Flying Foxes (*Pteropus poliocephalus*) were observed flying into a fig tree in the evening. The remnants of abundant 'chewings' by Grey-headed Flying Fox were also observed throughout the subject site and the remaining parts of the zoo grounds. It is expected that fruiting native and exotic trees within the subject site and the remainder of Taronga Zoo provide a regular foraging resource for Grey-headed Flying Fox.

Two species of microbat were observed within the south-east of the subject site during survey (**Figure 6**). Species encountered included a Freetail Bat (*Mormopterus* spp.) and a Southern Myotis (*Myotis macropus*). A single Southern Myotis was observed roosting in the existing, artificial cave that forms part of the Gorilla enclosures (**Plate 2**). The part of the cave where the bat was observed is regularly attended by zoo patrons who enter the caves to view the Gorillas through a window into the exhibit. The Freetail Bat was observed foraging and intermittently drinking from water within the Asiatic Elephant enclosure. This was located outside of the subject site, but worth noting considering microbats are highly mobile.



Plate 2. Southern Myotis (*Myotis macropus*) listed vulnerable under the Threatened Species Conservation Act 1995 found roosting in an artificial cave associated with the Gorilla exhibit.

Two reptile species were encountered during survey. The Elegant Snake-eyed Skink (*Cryptoblepharus pulcher*) was observed foraging within thick leaf litter inside areas of remnant bushland and five Eastern Water Dragon (*Physignathus lesueurii*) were seen sheltering within sandstone escarpments (**Plate 3**). These locally common native reptile species often inhabit areas with significant disturbance. During the survey, both species were observed basking within animal enclosures and within high-traffic areas.



Plate 3. Eastern Water Dragon (*Intellagama leseurii*) sheltering in a natural sandstone crevice in the western portion of the subject site

No frogs were recorded during the survey. This was expected, owing to the cool weather conditions.

The list of fauna species recorded during the site visit was produced opportunistically and thus only represents a subset of the species that may occur on the subject site at any one time. The full list of fauna recorded on site is presented in **Appendix 2**.

3.4.1 Fauna Habitat

The subject site provided some potential foraging, nesting and roosting habitat for a diverse suite of birds, mammals, reptiles, frogs and invertebrates.

Four prominent, natural sandstone benches occurred within the west of the site (**Figure 6**). These sandstone outcrops create a distinct gradient in elevation and associated ecological microhabitats. Crevices present within these outcrops provide potential habitat for reptiles, small terrestrial mammals and cave-roosting microbats. At the time of survey five Eastern Water Dragons were observed sheltering within crevices of the outcrop (**Plate 3**).

Sheaths of bush rock and fallen woody debris provided suitable shelter for small mammals, reptiles, tree frogs and invertebrates. Deep leaf litter provided shelter for invertebrates and small reptiles, as well as foraging habitat for the Long-nosed Bandicoot (*Perameles nasuta*).

Seventeen hollow-bearing trees provided a suite of different sized hollows that provide potential habitat for roosting microbats, tree frogs, small reptiles, small arboreal mammals, and birds (**Figure 7**). A total of 34 tree-hollows were identified during survey; 14 small hollows (2.5-5 cm), 11 medium hollows (5-10 cm) and nine large hollows (>10).

Artificial caves have been constructed within several animal exhibits throughout the site. These caves were found to provide suitable habitat for cave-roosting microbat species including the Southern Myotis that was observed roosting in the Gorilla enclosure. Similarly, stormwater drains/culverts and buildings throughout the site also provided potential roosting habitat for several specialists, cave-roosting microbat species.

Waterbodies, constructed within animal enclosures may be inhabited by wild frogs, turtles, dragonflies, eels and other native fish.

Abundant native and exotic fleshy fruit-bearing plants provided foraging habitat for parrots, bowerbirds, honeyeaters and pigeons throughout vegetated areas of the site.

Nectar and fruit-bearing trees and shrubs were abundant throughout the subject site. The most significant locally-indigenous, nectar-producing plant on the subject site were mature Grey Gum and the Bangalay trees. When flowering occurs, these remnant trees may attract mobile, nectar-foraging fauna species into the area including birds and mammals. Abundant *Eucalyptus* spp., *Banksia* spp. and *Melaleuca* spp. have been planted as components of landscaping throughout the subject site, these smaller trees and shrubs may also provide foraging resources.

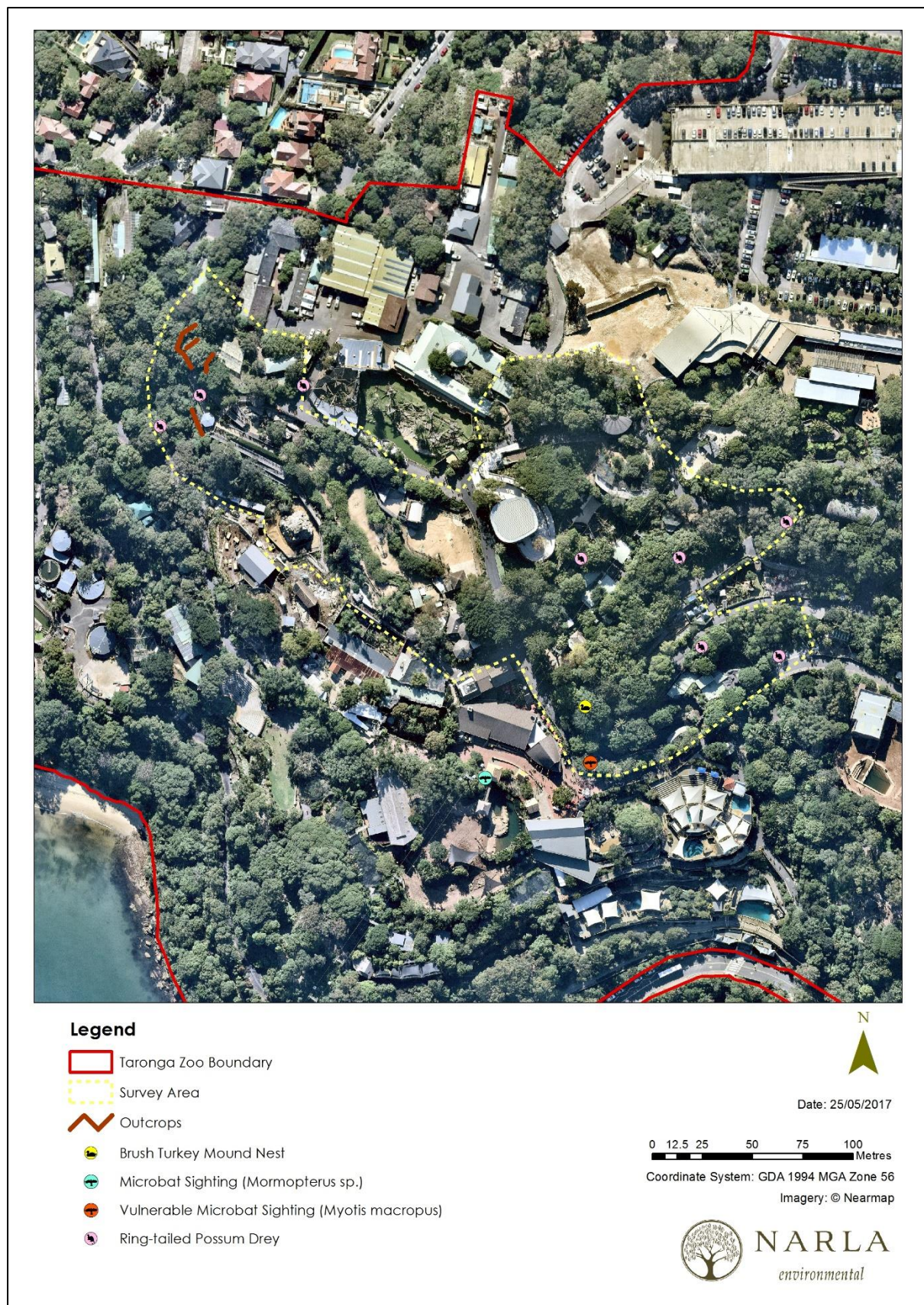


Figure 6. Fauna encountered during site assessment

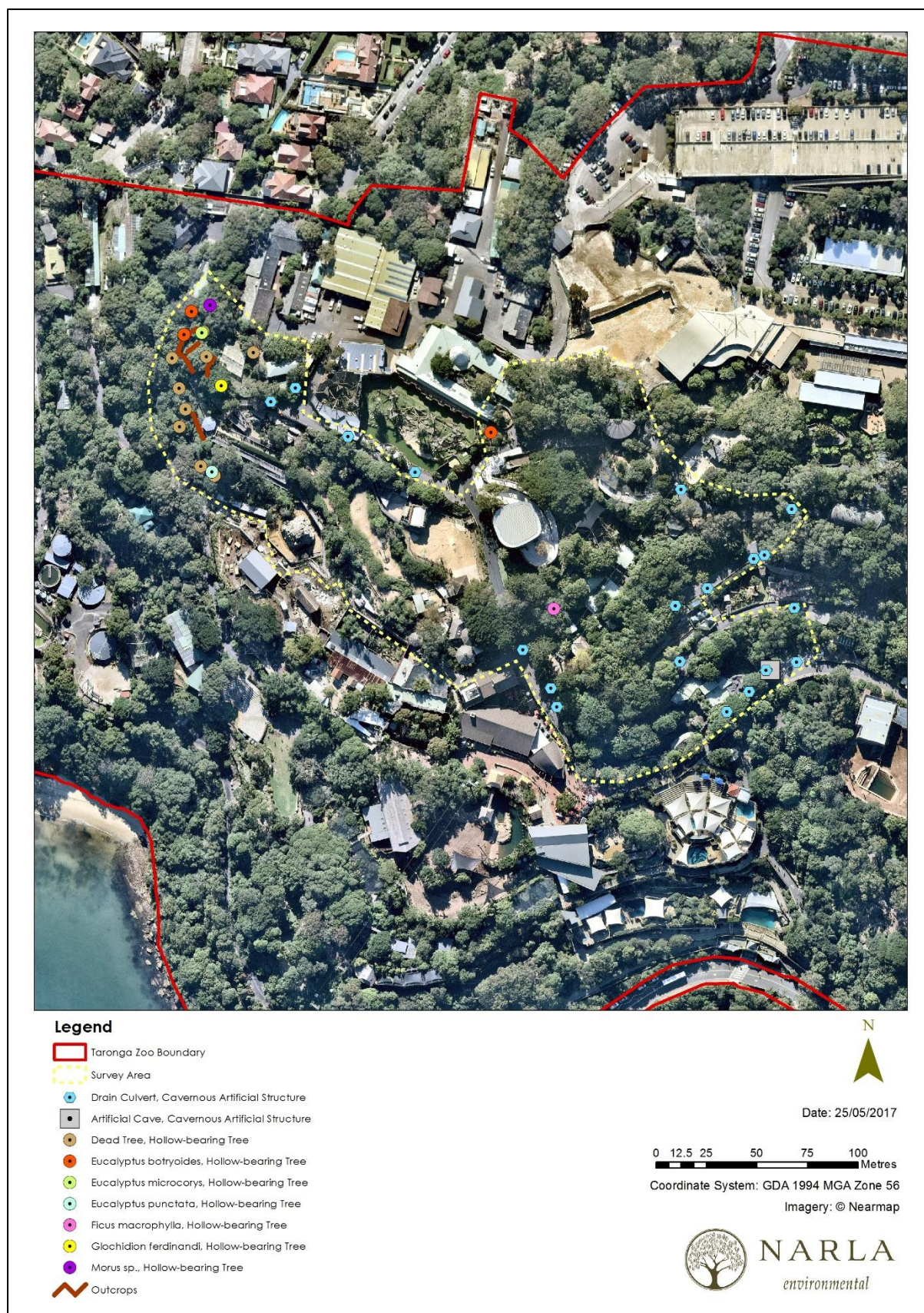


Figure 7. Fauna habitat trees and structures recorded within the subject site.

3.4.2 Threatened Fauna Species

The desktop analysis and site habitat assessment revealed 17 threatened fauna species (**Table 4**) had potential to utilise habitat on the subject site during part of their lifecycles. This included the two-threatened species that were found on the subject site during the site assessments, Southern Myotis and Grey-headed Flying Fox.

Mammals

Both native and exotic fruit-bearing trees within the site provide suitable foraging habitat for the vulnerable Grey-headed Flying Fox which were observed on site by Narla Ecologists. Suitable foraging trees include Port Jackson Fig, Grey Gum and Bangalay and to a lesser extent Cheese Tree, Blueberry Ash and Sweet Pittosporum. Grey-headed Flying Fox are also likely to forage on the fruit of weeds and exotic planted, including planted figs, privet and camphor. The subject site provided limited suitable roosting habitat for the Grey-headed Flying Fox. The closest known Flying Fox camp is located within the Sydney Royal Botanical Gardens approximately 2.5 km from the subject site across Sydney Harbour.

In addition to Southern Myotis, it is possible that the subject site may be utilised by a number of threatened insectivorous micro bats. Multiple hollow-bearing trees were identified within the subject site, these provided suitable habitat for seven threatened hollow-roosting micro bats including;

- Eastern Freetail-bat (*Mormopterus norfolkensis*);
- Yellow-bellied Sheath-tail-bat (*Saccolaimus flaviventris*);
- Eastern False Pipistrelle (*Falsistrellus tasmaniensis*);
- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*);

During survey a single Southern Myotis was identified roosting within the artificial Gorilla viewing 'cave' (**Figure 6**). The Southern Myotis is listed as Vulnerable under the TSC Act (NSW). This species is known to roost 'close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage' (OEH 2016b). The single individual was located within an area subject to high levels of human traffic that is unlikely to be a permanent roosting site for the species, however other artificial caves and more natural caves present in the subject area that are subject to less human foot traffic may provide more permanent roosting habitat for this species. It is possible that the suite of habitat identified throughout the site could be utilised as foraging and breeding habitat for the Southern Myotis. The following additional vulnerable, cave-roosting microbats may also shelter within caves, crevices or culverts within the subject site:

- Large-eared Pied Bat (*Chalinolobus dwyeri*); and
- Southern Myotis (*Myotis macropus*).
- Little Bentwing-bat (*Miniopterus australis*);
- Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*);

Birds

A small flock of Musk Lorikeets (*Glossopsitta concinna*) were observed flying over the north-west of the subject site during the survey period. The presence of foraging, small lorikeets is notable as it indicates that habitat within the subject site may continue to support foraging by other nectivorous parrots, including the vulnerable Little Lorikeet (*Glossopsitta pusilla*) and the critically endangered Swift Parrot (*Lathamus discolor*). These two birds may forage within the subject site when Bangalay, Swamp Mahogany and Grey Gum are in flower. Two historical records of the Swift Parrot foraging in Taronga Zoo were found during the literature search. Both of these records entailed Swift Parrot foraging in flowering Swamp Mahogany or Bangalay. The most recent record was of 14 Swift Parrots in trees lining the Taronga Zoo carpark in April 2014 by experienced bird observer, Joshua Bergmark (eBird 2017). In May 1998, up to 20 Swift Parrot were seen with Little Lorikeet, Musk Lorikeet, Rainbow Lorikeet (*Trichoglossus haematodus*) and Scaly-breasted Lorikeet (*Trichoglossus chlorolepidotus*) by experienced bird observer, Tony Palliser (Birding-aus 1998). An earlier sightings Swift Parrot from Taronga Zoo (July 1973) was found in the NSW Wildlife Atlas. The Swift Parrot only breeds in Tasmania; however, the Taronga Zoo grounds appear to provide intermittent foraging habitat (at least every ten or more years). A suite of small – medium sized hollows provide suitable nesting habitat for the Little Lorikeet.

One existing record of Glossy Black Cockatoo was found for the subject site (eBird 2017) however the accuracy of this record is not confirmed. During the site survey, the Narla Ecologist undertaking a survey on the subject site heard what sounded like Glossy Black Cockatoo contact calls, however, insufficient evidence was available to determine if the calls were coming from wild or captive stock. The paucity of confirmed records of wild Glossy Black Cockatoo from the subject site and surrounds, and the lack of suitable numbers of foraging trees (*Allocasurina* spp./*Casuarina* spp.) suggests that the presence of Glossy Black Cockatoo as a wild population within Taronga Zoo or the immediate surrounds has low likelihood. The nearest known population is located in Garigal National Park which is over 10 km north of the subject site. A number of large-sized tree hollows were observed during the survey, however due to historical disturbance it is unlikely that these hollows would be utilised as breeding habitat by Glossy Black Cockatoo.

Suitable foraging habitat for the Powerful Owl (*Ninox strenua*) was present within the western extent of the subject site, where small-medium mammals likely breed and forage among fruit-bearing trees. Dense tree canopies present throughout the subject site in remnant bushland and landscaped areas, provide suitable roosting habitat for Powerful Owl. No suitable nesting habitat occurs for this species in the subject site. The Powerful Owl requires large tree hollows in undisturbed locations for nesting.

The subject site provided foraging habitat for three large raptors, including; Square-tailed Kite (*Lophoictinia isura*), Little Eagle (*Hieraaetus morphnoides*) and White-bellied Sea Eagle (*Haliaeetus leucogaster*). These large carnivorous birds may intermittently hunt small birds and mammals within vegetated areas across the subject site. Due to the disturbed landscape, it is considered unlikely that these species will nest within the site.

Frogs

Sheaths of bushrock and woody debris provided suitable sheltering habitat for the Red-crowned Toadlet (*Pseudophryne australis*) within the west of the site. No natural soaks or drainage lines suitable for breeding habitat were observed within the site.

The total list of threatened species deemed as having potential to occur in the subject site is presented (**Table 4**).

Table 4. Threatened fauna deemed as having potential to occur on the subject site during part of their lifecycles

Species	TSC Act	EPBC Act	Likelihood of occurrence
Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>)	Vulnerable	Vulnerable	Confirmed
Southern Myotis (<i>Myotis macropus</i>)	Vulnerable		Confirmed
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Vulnerable	-	Potential
Yellow-bellied Sheath-tail-bat (<i>Saccolaimus flaviventris</i>)	Vulnerable	-	Potential
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	Vulnerable	-	Potential
Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Vulnerable	-	Likely
Eastern Free-tailed Bat (<i>Mormopterus nufroloensis</i>)	Vulnerable	-	Potential
Little Bent-wing Bat (<i>Miniopterus australis</i>)	Vulnerable	-	Potential
Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable	Vulnerable	Potential
Powerful Owl (<i>Ninox stenua</i>)	Vulnerable	-	Likely
Little Lorikeet (<i>Glossopsitta pusilla</i>)	Vulnerable	-	Likely
Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)	Vulnerable	-	Potential
Red-crowned Toadlet (<i>Pseudophryne australis</i>)	Vulnerable	-	Potential
Square-tailed Kite (<i>Lophoictinia isura</i>)	Vulnerable	-	Potential
Little Eagle (<i>Hieraaetus morphnoides</i>)	Vulnerable	-	Potential
White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>)	Vulnerable	Marine/Migratory	Likely
Swift Parrot (<i>Lathamus discolor</i>)	Endangered	Critically Endangered	Likely

The potential for significant impact upon all potentially occurring TSC Act listed threatened species was assessed against under the '7-Part Test Assessment of Significance'.

The potential for significant impact upon all potentially occurring EPBC Act listed threatened species was assessed against under the 'EPBC Act Significant Guidelines'.

It was deemed that the proposed works will have no significant impact such that a local viable population of a species will be placed at risk of extinction. Therefore, no SIS or EPBC Act Referral to Commonwealth are required for the proposed development.

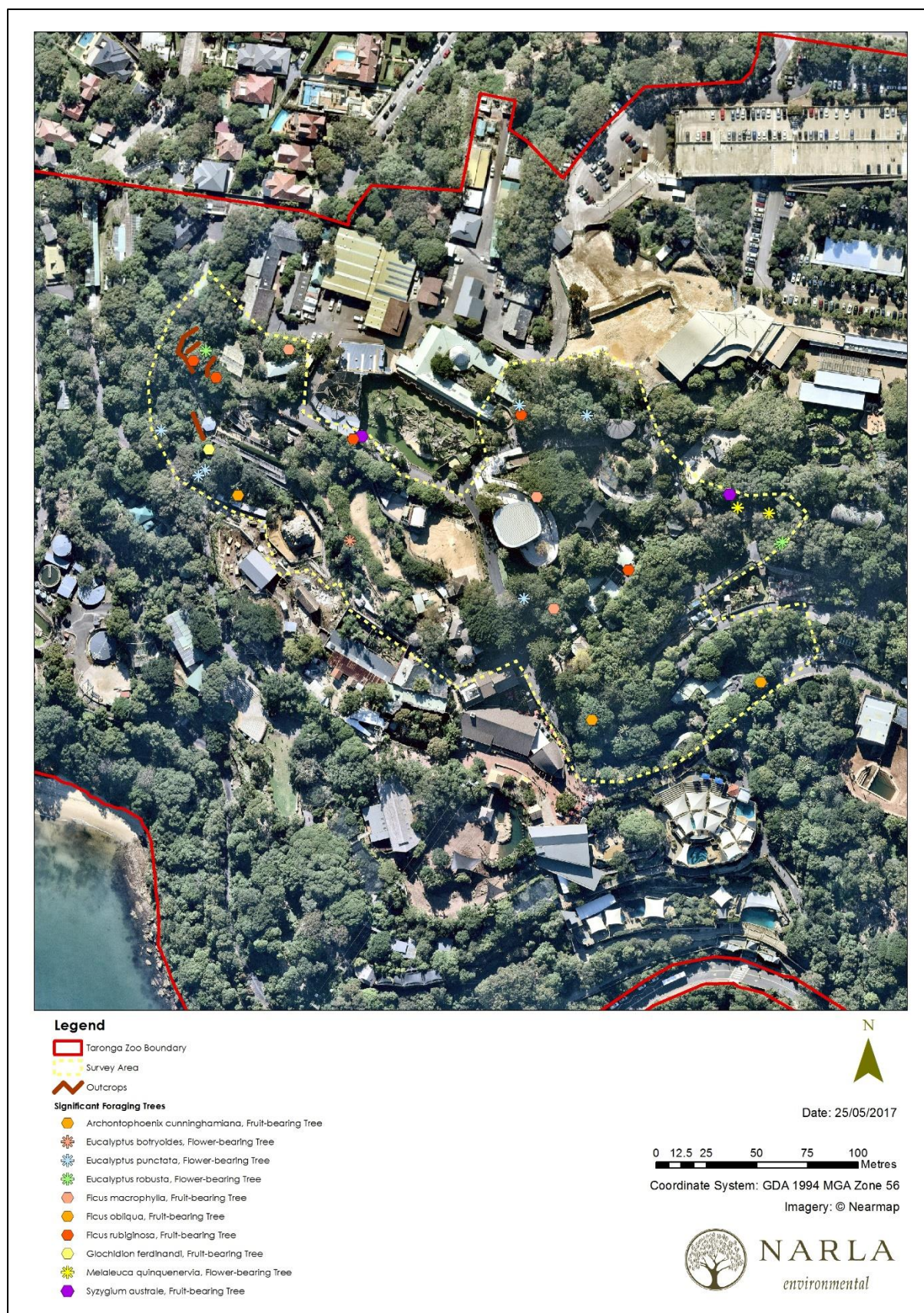


Figure 8. Nectar and fruit-bearing foraging Trees within the subject site

3.4.3 Migratory Fauna Species

A list of five EPBC Act listed migratory fauna species were considered likely to occasionally use habitat within the subject site for foraging or passage, these were:

- White-throated Needletail (*Hirundapus caudacutus*);
- Fork-tailed Swift (*Apus pacificus*);
- Satin Flycatcher (*Myiagra cyanoleuca*);
- Black-faced Monarch (*Monarcha melanopsis*); and
- Rufous Fantail (*Rhipidura rufifrons*).

It was deemed that the proposed works will have no significant impact on these species. Therefore, an EPBC Act Referral to Commonwealth is not required.

3.5 Landscaping

The landscape design, created by Green and Dale Associates (2017), seeks to integrate realistic village architecture with an African Savannah and Congo Rainforest landscape.

Site-specific planting will be undertaken across each zone (1 – 10). Proposed plantings include non-invasive Australian and African species suitable for the Savannah or Congo themed exhibit.

Zone 5 (Lion Kopje Country) and Zone 6 (Lion Kopje and Woodland Edge) exist partially or fully within areas of mapped CSFF. Within Zone 6, "vegetation will be retained and enhanced as part of the lion exhibit". Zone 5 will incorporate existing native vegetation with a variety of native/exotic plantings. Proposed plantings will include a balance between native species such as Grey Gum and Kangaroo Grass (*Themeda triandra*) and exotic ornamental trees and shrubs including Jackalberry Tree (*Diospyros mespiliformis*) and African Aloe (*Aloe africana*).

All native plants used in plantings should be sourced from a local provenance nursery. Effort should be taken to ensure flora species will provide the same or increased optimal habitat functions as locally indigenous fauna.

3.6 Arboriculture

The Arboricultural Assessment Report; prepared by Earthscape Horticultural Services (2017) has identified and mapped all trees present within the project site.

196 trees have been nominated for removal due to the following:

- Being an unsuitable species for the intended planting theme.
- A majority of the trees are within the construction footprint or too close to construction to enable successful retention.
- Poor Health.

All remaining trees have been nominated for retention due to the following:

- They are suitable for the African theme, being tropical Australian or African species.
- These trees will be subject to tree protection measures to ensure they remain viable during construction and beyond.

9 trees have been nominated for relocation/transplanting:

- To allow construction to take place;
- These trees are to be incorporated into the proposed design;
- Other trees that can be transplanted, but unsuitable for use in the proposed design will be relocated to a designated location within Taronga Zoo, to confirmed by the Taronga Zoo Horticultural Department.

3.7 Impact Mitigation Recommendations

3.7.1 Key Threatening Processes

The proposed development may introduce or exacerbate the following seven Key Threatening Processes (KTP) (as listed under the TSC Act). The latter seven KTP are already action within the subject site:

1. Clearing of native vegetation;
2. Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants;
3. Removal of dead wood and dead trees;
4. Loss of hollow-bearing trees;
5. Invasion of native plant communities by exotic perennial grasses;
6. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*);
7. Predation by the European red fox; and
8. Invasion of native plant communities by exotic perennial grasses.

Bushland restoration (weed removal) efforts proposed to be undertaken across the subject site post construction works will aim to control all relevant KTP involving weed infestation and proliferation. These efforts will be directed to restore native vegetation communities as effectively as possible. Exotic and landscape plants that are known to act as environmental or noxious weeds in the Sydney area will not be planted within the subject site.

Effort will be made by the proponent to retain all dead wood and dead trees in situ, or relocate elsewhere on the subject site so they can continue to provide habitat for wild fauna.

Native vegetation will be protected and maintained as much as possible. Effort will be made to protect all mature Bangalay, Swamp Mahogany, Grey Gum or Port Jackson Fig as well as all native shrubs and small trees within remnant bushland areas. If individual trees must be removed, suitable replacement plantings will be undertaken elsewhere within Taronga Zoo. Maintaining dense tree canopies and shrub layers across the subject site will help prevent the aggressive exclusion of native birds by Noisy Miner.

Effort will be made to prevent removal of any hollow-bearing trees. In the unlikely event that individual hollow-bearing trees must be removed, suitable replacement hollow augmentation or nest box installation will take place.

Taronga Zoo is in partnership with adjoining property owners and authorities in the control of European Red Fox (*Vulpes vulpes*). The proposed development will have no influence on

Red Fox populations provided this pest is continually managed as at the time of preparing this report.

3.7.2 Predation by Captive Fauna

One of the more unusual threats to biodiversity that exists within a zoo is the issue of direct predation by captive predatory fauna. This phenomenon is considered to occur infrequently and at low levels in zoos throughout the world, however it is important to note that wild fauna have the potential to unknowingly enter captive predatory animal enclosures and subsequently succumb to predation. This issue is unlikely to have any significant impacts on any threatened or protected fauna populations that inhabit the grounds of Taronga Zoo. It is expected to have occurred in the past and will in all likelihood continue to occur, however efforts will be made to prevent its occurrence.

The proposed Lion Kopje exists in an area within extensive sandstone outcropping, and several hollow-bearing trees. No fauna shelter habitat in the form of bush rock or hollow-bearing trees are proposed to be removed, however, when predatory captive fauna such as lion are introduced to a location that contains these habitat features, it is considered likely these habitat features will become less suitable for occupancy by many species of wild, native fauna such as Brush Turkey, Brush-tail Possum (*Trichosurus vulpecula*), Ring-tailed Possum and Eastern Water Dragon.

Roosting and nesting habitat within hollow-bearing trees within the exhibit will continue to be available to highly mobile birds and bats. An example of this was observed with a pair of Rainbow Lorikeets observed nesting in a tree hollow located within the Red Panda enclosure during the site assessment period.

Prior to constructing of any enclosures, one or more qualified Ecologists with wildlife handling experience will be engaged to capture and relocate any fauna from within the area of the proposed enclosure. This will include checking of all caves, crevices, tree hollows, nests, shrubs, pipelines and culverts for fauna hiding in situ. It is also advised that up to a week of targeted fauna trapping is undertaking in order to capture any native fauna (e.g. possums) traversing the site of the proposed enclosure. This effort will be repeated prior to the final release of any predatory fauna within a new exhibit.

3.7.3 Clearing of Vegetation

The majority of the proposed development will be located within areas of historically cleared or planted vegetation. The Arboricultural Assessment Report (EHS 2017); indicates the proposed development will require the removal of approximately 196 trees throughout the subject site, comprising both native and exotic species (G&D 2017). Assessment of each tree revealed trees that are currently located within manicured garden beds and are likely to have been historically planted.

Individual assessment of these trees, revealed the presence of foraging habitat for locally-indigenous fauna. No hollows were observed within 'trees to be removed', however, prior to removal, all trees to be removed should be reassessed by a suitably qualified ecologist, to determine the presence of new nests and drey not present during May 2017 surveys. The loss of foraging resources will be mitigated by the planting of locally-indigenous fruit and nectar-producing trees and shrubs within the proposed landscape plan (G&D 2017).

The construction of the proposed Lion exhibit located within approximately 1,936 m² of vegetation mapped as PCT 1778: Coastal Sandstone Foreshores Forest (**Figure 5**) will not significant impact upon biodiversity values of the patch. The removal of five trees considered to form a part of the CSFF assemblage will be required as a part of the development (EHS 2016). The following locally indigenous, naturally occurring species are proposed to be removed:

- Reference no. - T424 – Bangalay (*Eucalyptus botryoides*);
- Reference no. – T300b, T301, T302, T336c, T337, T369, T359, T371, T393 and T395 – Sweet Pittosporum (*Pittosporum undulatum*);
- Reference no. – T390, T392, T422 – Grey Gum (*Eucalyptus punctata*);
- Reference no. – T361 and T362 – Coast Banksia (*Banksia integrifolia*);
- Reference no. – T396 – Christmas Bush (*Cerapetalum gummiiferum*);
- Reference no. – T429b – Port Jackson Fig (*Ficus rubiginosa*);
- Reference no. – T430 and T431 – Willow-leaved Hakea (*Hakea salicifolia*);
- Reference no. – T354, T383a, T385 and T397 – Cheese Tree (*Glochidion ferdinandi*); and
- Reference no. – T431a – Celery Wood (*Polyscias elegans*).

No hollows were observed in these trees; however, they currently provide potential foraging habitat for nectivorous and frugivorous birds and mammals. At the time of survey, these species were in close proximity to high-traffic walkways, that limit their suitability as a foraging resource for local fauna. The removal of these trees and the loss of foraging resources will be mitigated by the planting of locally-indigenous species, representative of the CSFF community assemblage as a part of the Landscape Plan (G&D 2017). The removal of four of these trees (Coast Banksia, Port Jackson Fig, Cheese Tree and Grey Gum) will be mitigated by planting of these species as a part of the planting design of Zone 5 – 6. Sweet Pittosporum is an invasive native that occurs in high frequency throughout the area, the removal of this species will not significantly alter the assemblage of the CSFF.

The proposed Lion exhibit may also require the removal or pruning of native shrubbery such as small Sweet Pittosporum, that may block patron's views of fauna in the exhibit or prevent zoo staff from entering the enclosure safely. The removal of weed species will be prioritised in this circumstance, and if the removal or modification of native shrubs or trees is required, a qualified Ecologist will advise on an appropriate course of action. Where possible, no native tree or shrub species should be removed.

A qualified Project Ecologist with experience in handling wildlife should be present on the subject site during all vegetation removal/clearing in order to capture and relocate any displaced, healthy animals, or care for / rehabilitate any injured or orphaned animals.

Any non-flying fauna present will be relocated outside the subject site into neighbouring bushland by a suitably qualified Ecologist, where similar sheltering and roosting habitat is located; including within the adjoining Bradley's Head National Park. The findings of the pre-clearing survey should be compiled in a short report and provided to the proponent before any clearing works commence in this area.

All trees (including dead trees) should be felled by qualified Arborists using chainsaw and pulleys. No heavy machinery should be used for vegetation removal.

3.7.1 Demolition of Artificial Habitat Structures

Man-made structures including buildings, culverts, drains and zoo animal enclosures and shelters may provide potential roosting and breeding habitat for specialist cave-roosting microbat species. Microbats often utilise man-made structures including buildings and infrastructure for roosting habitat. Small cavities that provide similar protection to that provided by natural tree hollows will be utilised by microbats where shortages of natural roosting habitat exist, or may even be used in preference (ABS 2017). Two species of microbat were identified during survey, within or immediately adjacent to the south-eastern border of the subject site. A single Freetail Bat was observed foraging within the Elephant enclosure, while a single Southern Myotis (*Myotis macropus*) was observed roosting within an artificial structure outside the Gorilla enclosure. Both of these species are known to roost within man-made structures.

Prior to removal of man-made structures that provide suitable roosting habitat for microbats, a pre-clearing ecological assessment will be undertaken by a suitably qualified ecologist to determine the presence or suitability of the artificial habitat for roosting microbats. An ecologist will then be on site during demolition works to capture and relocate any displaced fauna including bats.

3.7.2 Targeted Survey for Southern Myotis (*Myotis macropus*)

Desktop searches (Bionet 2017) revealed 484 records of the Southern Myotis within a 10km radius of the subject site. The site assessment revealed a suite of suitable habitat for hollow-roosting and cave-roosting microbats. During site assessment, a single Southern Myotis was observed roosting within the man-made cave attached to the Gorilla enclosure. With the high number of proximal records from the locality, and the incidental sighting of a single individual Southern Myotis during the site survey, it is possible that Southern Myotis may be utilising buildings, infrastructure, man-made caves and/or natural sandstone outcrops within the subject site as roosting and/or breeding habitat.

Owing to the confirmed presence of the vulnerable Southern Myotis within the subject site, it is recommended that a targeted survey of the subject site is undertaken to determine the presence of potential roosts used by this threatened species prior to development taking place. The targeted survey should be undertaken by skilled and qualified ecologist and where possible should include Harp-trapping and acoustic detection. This survey will assist in identifying any roosts used by this species that could possibly be impacted by the proposed development. If Southern Myotis are identified within the site, a suitably qualified Ecologist should be consulted to determine best course of action for on-going management and to prevent harm or disturbance to this threatened species.

3.7.3 Managing Noxious Weeds and Exotic Flora

All weed removal works should be implemented by a fully qualified and experienced Bush Regeneration Professional. The optimal Bush Regeneration Professional selected to complete the project works should:

- Provide a statutory declaration stating their compliance with provisions of the National Gardening and Landscaping Services Award 2010;

- Provide completed and signed Subcontractor Statement regarding payment of worker's compensations, payroll tax and remuneration;
- Provide established Workplace Health and Safety and Environmental Management Systems. Preferably the company has third-party accredited systems in place;
- Demonstrate implementation of safe workplace and appropriate environmental management practices and procedures (e.g. appropriate transport and management of herbicides);
- Provide Public Liability (min \$10M) and Workers Compensation Insurance;
- Have previous experience undertaking bushland restoration works within Western Sydney. Contractor references are to be contacted;
- Provide supervisor with minimum qualifications and experience including Certificate III Conservation and Land Management and two years full-time equivalent experience as a trained bush regenerator;
- Provide a minimum of one trained bush regenerator per team of four (minimum qualifications and experience including Certificate III Conservation and Land Management and one year full -time equivalent experience as a bush regenerator.
- Provide a minimum of two trained bush regenerators per team of five/six (minimum qualifications and experience including Certificate III Conservation and Land Management and one year full – time equivalent experience as a trained bush regenerator);
- Schedule appropriately resourced regular site visits for the duration of the contract period;
- All herbicide usage, including storage and transport, to be in accordance with the *NSW Pesticides Act 1999*, *WorkCover NSW (2006)* and all other relevant legislation;
- All bush regeneration crew members undertaking herbicide spray applications must hold a current chemicals application training certificate to AQF level III.

Some weeds on the subject site may currently provide prey, nectar, fruit or shelter for fauna such as small birds. Examples of such weeds include African Olive, Lantana, Small-leaved Privet, Large-leaved Privet, Mickey Mouse Plant and Celtis. Since they are noxious weeds, these plants should still be removed from the subject site. In order to reduce any potential negative influence on fauna, weeds should be progressively removed and replaced with ecological-equivalent indigenous native indigenous flora species known to occur naturally on the subject site.

3.7.4 Storage, Stockpiling and Laydown Construction

It is recommended that the proponent allocates all storage, stockpile and laydown sites away from any native vegetation that is planned to be retained. All laydown areas should occur in the east of the subject site.

All areas of topsoil that exist under the proposed development, associated landscaping and construction footprint, should be stripped and stockpiled following best practice methodology (Landcom 2004) to ensure the seed bank and biology of the topsoil remains viable, stockpile all topsoil away from subsoil and fill, and minimise duration of stockpiling.

Topsoil should be spread back on the subject site, or 'donated' to a 'recipient site' for use in bushland restoration. A topsoil 'recipient site' may be organised with the assistance of Council and a qualified Bush Regeneration Professional. The proposed 'recipient site' must

be considered as being likely to support the flora species assemblage present on the subject site.

Avoid importing any soil from outside the site as this can introduce weeds and pathogens to the site.

4. Conclusion

The proposed redevelopment approximately 3.8 ha of Taronga Zoo for the 'African Savannah – Congo Project' construction will involve the demolition of several buildings and enclosures and the construction new exhibits. The proposed construction will mostly be located within developed and highly-modified areas within the east of the subject site.

A total of 196 trees native and exotic trees are proposed to be removed in order to enable construction (EHS 2017). This will result in the loss of minor foraging habitat for nectivorous and frugivorous fauna, however, this impact will be mitigated by the planting of ecologically equivalent foraging trees as a part of the landscape plan (G&D 2017). No hollow-bearing trees will be removed as a result of the proposed development.

Proposed works within Zone 5 - 6 encompassing remnant vegetation in the west of the site will be limited to select clearing / thinning of some small areas of degraded bushland that are dominated by planted, and self-sown regrowth trees and weeds. No major earthworks will be required in areas of CSFF and all sandstone cropping is to be retained.

Where possible, within the lion enclosure (Zones 5 – 6) all vegetation will be retained and incorporated into the proposed exhibit; this will help to minimise the environmental impact of the development.

In summary, proposed development will require the:

- Demolition of existing buildings to make way for the proposed redevelopment and associated facilities;
- The removal of 196 trees for the redevelopment of the subject site;
- Removal of all noxious and environmental weeds species from the subject site.

After carrying-out a 7-part Test Assessment of Significance under the EP&A Act for any potential impacts to TSC Act listed threatened species, ecological communities and populations it was deemed the proposed works will have no significant impact on any threatened species, ecological communities or populations such that a viable local population will be placed at risk of extinction.

Similarly, after carrying out an Impact Assessment under the EPBC Act Significant Impact Guidelines, it was determined that the proposed works will have no significant impact on any MNES (threatened and migratory species).

A detailed suite of impact mitigation recommendations has been provided to ensure that the findings of the Impact Assessment process remain correct.

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Appendix

Appendix 1 – Site Flora List

Appendix 2 – Site Fauna List

Appendix 3 - EP&A Act/ TSC Act Assessment of Significance (7-part Test)

Appendix 4 - EPBC Act Significant Impact Guidelines Assessment

Appendix 1 – Site Flora List

Table 5. Flora recorded in the subject site during the site assessment

Scientific Name	Common Name	Exotic	Status	Remnant Native Vegetation (CSFF)	Planted Vegetation
<i>Acacia decurrens</i>	Black Wattle				
<i>Acacia floribunda</i>	White Sally Wattle				
<i>Acacia longifolia</i>					
<i>Acacia parramattensis</i>	Parramatta wattle				
<i>Acmena smithii</i>	Lilly Pilly				
<i>Adiantum hispidulum</i>	Rough Maidenhair Fern				
<i>Agapanthus praecox</i>	Agapanthus	*			
<i>Ageratina adenophora</i>	Crofton Weed	*			
<i>Allocasuarina littoralis</i>	Black She-oak				
<i>Alphitonia excelsa</i>	Red Ash				
<i>Anredera cordifolia</i>	Madeira Vine	*	Class 4		
<i>Araucaria cunninghamii</i>	Hoop Pine				
<i>Archontophoenix cunninghamiana</i>	Bangalow Palm				
<i>Asparagus aethiopicus</i>	Ground Asparagus	*	Class 4		
<i>Asplenium australasicum</i>	Bird's Nest Fern				
<i>Auranticarpa rhombifolia</i>	Diamond-leaf Pittosporum				
<i>Backhousia myrtifolia</i>	Grey Myrtle				
<i>Banksia ericifolia</i>	Heath-leaved Banksia				
<i>Banksia integrifolia</i>	Coast Banksia				
<i>Banksia spinulosa</i>	Hairpin Banksia				
<i>Beaucarnea recurvata</i>	Ponytail Palm	*			
<i>Billardiera scandens</i>	Hairy Apple Berry				
<i>Blechnum minus</i>	Soft Water Fern				
<i>Brachychiton acerifolius</i>	Illawarra Flame Tree				
<i>Breynia oblongifolia</i>	Coffee Bush				
<i>Bursaria spinosa</i>	Blackthorn				
<i>Callistemon salignus</i>	Willow Bottlebrush				
<i>Callistemon salignus</i>	Willow Bottlebrush				
<i>Calochlaena dubia</i>	Rainbow Fern				
<i>Camellia sasanqua</i>	Camellia	*			
<i>Castanospermum australe</i>	Blackbean				
<i>Casuarina cunninghamiana</i>	River Oak				

Scientific Name	Common Name	Exotic	Status	Remnant Native Vegetation (CSFF)	Planted Vegetation
<i>Casuarina glauca</i>	Swamp Oak				
<i>Cayratia clematidea</i>	Native Grape				
<i>Celtis australis</i>		*			
<i>Celtis sinensis</i>	Chinese Celtis	*	Class 4		
<i>Cerapetalum gummiferum</i>	Christmas Bush				
<i>Cestrum parqui</i>	Green Cestrum	*	Class 3		
<i>Chenopodium album</i>	Fat Hen	*			
<i>Cisium vulgare</i>	Spear Thistle	*			
<i>Clerodendrum tomentosum</i>	Hairy Clerodendrum				
<i>Commelina cyanea</i>					
<i>Conyza bonariensis</i>	Fleabane	*			
<i>Cordyline stricta</i>	Cordyline				
<i>Cotoneaster glaucophyllus</i>	Cotoneaster	*			
<i>Cupaniopsis anacardioides</i>	Tuckeroo				
<i>Cyathea australis</i>	Black Tree-fern				
<i>Cyperus albobstriatus</i>		*			
<i>Dendrobium speciosum</i>	Sydney Rock Orchid				
<i>Dianella caerulea</i>	Blue-flax Lily				
<i>Dianella longifolia</i>	Blue-Flax Lily				
<i>Dodonaea viscosa</i>	Sticky Hop Bush				
<i>Doryanthes excelsa</i>	Gynea Lily				
<i>Dracaena draco</i>	Dragon Tree	*			
<i>Ehrharta erecta</i>	Panic Veldtgrass	*			
<i>Elaeocarpus reticulatus</i>	Blueberry Ash				
<i>Entolasia marginata</i>	Wiry Panic				
<i>Entolasia stricta</i>	Bordered Panic				
<i>Eriobotrya japonica</i>	Loquat	*			
<i>Eucalyptus botryoides</i>	Bangalay				
<i>Eucalyptus maidenii</i>	Maiden's Gum				
<i>Eucalyptus microcorys</i>	Tallowwood				
<i>Eucalyptus nicholii</i>	Narrow-leaved Black Peppermint		TSC and EPBC: Vulnerable		
<i>Eucalyptus punctata</i>	Grey Gum				
<i>Eucalyptus robusta</i>	Swamp Mahogany				
<i>Eucalyptus globulus</i>	Tasmanian Blue Gum				
<i>Eustrephus latifolius</i>	Wombat Berry				
<i>Ficinia nodosa</i>	Knobby Club-Rush				

Scientific Name	Common Name	Exotic	Status	Remnant Native Vegetation (CSFF)	Planted Vegetation
<i>Ficus macrophylla</i>	Moreton Bay Fig				
<i>Ficus obliqua</i>	Small-leaved Fig				
<i>Ficus rubiginosa</i>	Port Jackson Fig				
<i>Flindersia australis</i>	Crows Ash				
<i>Gahnia erythrocarpa</i>					
<i>Glochidion ferdinandi</i>	Cheese Tree				
<i>Grevillea buxifolia</i>	Grey Spider Flower				
<i>Grevillea speciosa</i>	Red Spider Flower				
<i>Hakea dactyloides</i>	Broad-leaved Hakea				
<i>Hakea salicifolia</i>	Willow-leaved Hakea				
<i>Hakea sericea</i>	Needlebush				
<i>Hibbertia scandens</i>	Climbing Guinea Flower				
<i>Hibiscus</i> sp.	Hibiscus	*			
<i>Histiopteris incisa</i>	Bat's Wing Fern				
<i>Homalanthus populifolius</i>	Bleeding Heart				
<i>Howea forsteriana</i>	Kentia Palm				
<i>Howea forsteriana</i>	Kentia Palm				
<i>Imperata cylindrica</i>	Blady Grass				
<i>Kennedia prostrata</i>	Running Postman				
<i>Lachnagrostis aemula</i>	Blown Grass				
<i>Lantana camara</i>	Lantana	*	Class 4		
<i>Leptospermum polygalifolium</i>	Tantoon				
<i>Ligustrum lucidum</i>	Broad-leaf Privet	*	Class 4		
<i>Ligustrum sinense</i>	Small-leaf Privet	*	Class 4		
<i>Liriope muscari</i>	Lily Turf	*			
<i>Livistona australis</i>	Cabbage Palm				
<i>Livistona chinensis</i>	Chinese Fan Palm	*			
<i>Lomandra longifolia</i>	Spiny-headed Mat-Rush				
<i>Lomandra multiflora</i>	Many-flowered Mat-rush				
<i>Lophostemon confertus</i>	Brush Box				
<i>Melaleuca decora</i>	White Feather Honey-myrtle				
<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark				
<i>Monstera deliciosa</i>	Fruit Salad Plant	*			
<i>Musa</i> sp	Banana	*			
<i>Myrsine variabilis</i>					
<i>Nephrolepis cordiflora</i>	Fishbone Fern	*			
<i>Ochna serrulata</i>	Mickey Mouse Plant	*	Class 4		

Scientific Name	Common Name	Exotic	Status	Remnant Native Vegetation (CSFF)	Planted Vegetation
<i>Olea europaea</i> subsp. <i>Cuspidata</i>	African Olive	*	Class 4		
<i>Oplismenus aemulus</i>	Australian Basket Grass				
<i>Oxalis perennans</i>					
<i>Parietaria judaica</i>	Asthma Weed	x			
<i>Parthenocissus quinquefolia</i>	Virginia Creeper	*			
<i>Passiflora edulis</i>	Common Passionfruit	*			
<i>Pennisetum clandestinum</i>	Kikuyu	*			
<i>Petrophile pulchella</i>	Conesticks				
<i>Phoenix canariensis</i>	Canary Island Date Palm	*			
<i>Phyllostachys</i> spp.	Bamboo	*	Class 4		
<i>Pittosporum undulatum</i>	Native Daphne				
<i>Platycerium superbum</i>	Staghorn Fern				
<i>Plectranthus ecklonii</i>	Blue Spurr Flower	*			
<i>Podocarpus elatus</i>	Plum Pine				
<i>Polyscias elegans</i>	Celery Wood				
<i>Pteridium esculentum</i>	Common Bracken				
<i>Ravenala madagascariensis</i>	Traveller's Palm	*			
<i>Ricinus communis</i>	Castor-oil Plant	*	Class 4		
<i>Schefflera actinophylla</i>	Umbrella Tree	*			
<i>Senecio madagascariensis</i>	Fireweed	*	Class 4		
<i>Sida rhombifolia</i>	Paddy's Lucerne	*			
<i>Solanum lycopersicum</i>	Tomato	*			
<i>Solanum mauritianum</i>	Tobacco Bush	*			
<i>Solanum nigrum</i>	Black-berry Nightshade	*			
<i>Sonchus oleraceus</i>	Common Sowthistle	*			
<i>Strelitzia reginae</i>	Bird of Paradise Plant	*			
<i>Syagrus romanzoffiana</i>	Cocos Palm	*			
<i>Syzygium australe</i>	Brush Cherry				
<i>Tecoma capensis</i>	Tecoma	*			
<i>Urtica dioica</i>	Stinging Nettle	*			
<i>Vachellia tortilis</i>	Umbrella Thorn	*			
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly				
<i>Westringia fruticosa</i>	Coastal Rosemary				

Appendix 2 - Site Fauna List

Table 6. Fauna recorded within the subject site during site assessment

Class	Scientific Name	Common Name	Exotic	Status
Aves	<i>Acridotheres tristis</i>	Common Myna	*	
Aves	<i>Alectura lathamii</i>	Australian Brush-Turkey		
Aves	<i>Alisterus scapularis</i>	Australian King Parrot		
Aves	<i>Anas superciliosa</i>	Pacific Black Duck		
Aves	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo		
Aves	<i>Calyptorhynchus funereus</i>	Yellow-tailed Black-cockatoo		
Aves	<i>Chenonetta jubata</i>	Australian Wood Duck		
Aves	<i>Chroicocephalus novaehollandiae</i>	Silver Gull		
Aves	<i>Columba livia</i>	Rock Dove	*	
Aves	<i>Corvus coronoides</i>	Australian Raven		
Aves	<i>Cracticus tibicen</i>	Australian Magpie		
Aves	<i>Cracticus torquatus</i>	Grey Butcherbird		
Aves	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike		
Aves	<i>Dacelo novaehollandiae</i>	Laughing Kookaburra		
Aves	<i>Fulica atra</i>	Eurasian Coot		
Aves	<i>Glossopsitta concinna</i>	Musk Lorikeet		
Aves	<i>Grallina cyanoleuca</i>	Magpie-lark		
Aves	<i>Hirundo neoxena</i>	Welcome Swallow		
Aves	<i>Manorina melanocephala</i>	Noisy Miner		
Aves	<i>Ocyphaps lophotes</i>	Crested Pigeon		
Aves	<i>Pardalotus punctatus</i>	Spotted Pardalote		
Aves	<i>Platycercus elegans</i>	Crimson Rosella		
Aves	<i>Psophodes olivaceus</i>	Eastern Whipbird		
Aves	<i>Sericornis frontalis</i>	White-browed Scrubwren		
Aves	<i>Strepera graculina</i>	Pied Currawong		
Aves	<i>Threskiornis molucca</i>	Australian White Ibis		
Aves	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet		
Aves	<i>Zosterops lateralis</i>	Silvereye		
Mammalia	<i>Myotis macropus</i>	Southern Myotis		Vulnerable
Mammalia	<i>Mormopterus sp.</i>	Freetail-bat		
Mammalia	<i>Perameles nasuta</i>	Long-nosed Bandicoot		
Mammalia	<i>Pseudocheirus peregrinus</i>	Common Ringtail Possum		
Mammalia	<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox		Vulnerable
Mammalia	<i>Trichosurus vulpecula</i>	Common Brushtail Possum		
Reptilia	<i>Cryptoblepharus pulcher</i>	Elegant Snake-eyed Skink		
Reptilia	<i>Intellagama lesueurii</i>	Eastern Water Dragon		

**Appendix 3 - Environmental Planning and Assessment Act 1979 and Threatened Species
Conservation Act 1995**

Assessment of Significance (7-part Test)

	Species	TSC Act Status
Fauna	Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	Vulnerable
	Red-crowned Toadlet (<i>Pseudophryne australis</i>)	Vulnerable
	Regent Honeyeater (<i>Anthochaera phrygia</i>)	Critically Endangered
	Swift Parrot (<i>Lathamus discolor</i>)	Endangered
	Little Lorikeet (<i>Glossopsitta pusilla</i>)	Vulnerable
	Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Vulnerable
	Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	Vulnerable
	Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>)	Vulnerable
	Eastern Free-tailed Bat (<i>Mormopterus nofolkensis</i>)	Vulnerable
	Little Bent-wing Bat (<i>Miniopterus australis</i>)	Vulnerable
	Southern Myotis (<i>Myotis macropus</i>)	Vulnerable
	Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable
	Yellow-bellied Sheath-tail Bat (<i>Saccolaimus flaviventris</i>)	Vulnerable
	Powerful Owl (<i>Ninox stenua</i>)	Vulnerable
	Barking Owl (<i>N. connivens</i>)	Vulnerable
	Glossy Black-Cockatoo (<i>Calyptrorhynchus lathamii</i>)	Vulnerable
	Square-tailed Kite (<i>Lophoictinia isura</i>)	Vulnerable
	White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>)	Vulnerable
	Little Eagle (<i>Hieraaetus morphnoides</i>)	Vulnerable
Flora	Netted Bottle Brush (<i>Callistemon linearifolius</i>)	Vulnerable
	<i>Tetralthea glandulosa</i>	Vulnerable
	Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	Endangered
	Sunshine Wattle (<i>Acacia terminalis</i> subsp. <i>terminalis</i>)	Endangered

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995 – Assessment of Significance (7-part Test) for Grey-headed Flying-Fox (<i>Pteropus poliocephalus</i>)	
TSC Act Status: Vulnerable	
	
Species Ecology	Grey-headed Flying-fox forage opportunistically, often at distances up to 30 km from camps, and occasionally up to 60-70 km per night, in response to patchy food resources. This species is a canopy-feeding frugivore, blossom-eater and nectarivore of rainforests, open forests, woodlands, Melaleuca swamps and Banksia woodlands. As such, the species contributes important ecosystem function by providing a means of seed dispersal and pollination for many indigenous tree species. Grey-headed Flying-foxes feed on introduced trees including commercial fruit crops. Grey-headed Flying-foxes congregate in large numbers at roosting sites (camps) that may be found in rainforest patches, Melaleuca stands, mangroves, riparian woodland or modified vegetation in urban areas. Individuals generally exhibit a high fidelity to traditional camps and return annually to give birth and rear offspring. The Grey-headed Flying-fox show a regular pattern of seasonal movement. Much of the population concentrates in May and June in northern NSW and Queensland where animals exploit winter-flowering trees such as Swamp Mahogany <i>Eucalyptus robusta</i>, Forest Red Gum <i>E. tereticornis</i> and Paperbark <i>Melaleuca quinquenervia</i>.
(a) in the case of a threatened species, whether the action proposed 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,	The proposed action is unlikely to adversely effect upon the life cycle of the species. At the time of preparing this report there were no known roosts or camps of Grey-headed Flying-fox within the subject site or in the surrounding area. However, the subject site may provide intermittent potential foraging habitat to this species when habitat trees are flowering and fruiting. Based on the Taronga Zoo development concept plan, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995 – Assessment of Significance (7-part Test) for Grey-headed Flying-Fox (<i>Pteropus poliocephalus</i>)		
TSC Act Status: Vulnerable		
	The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable –species does not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – this species does not constitute an Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) Based on the Taronga Zoo concept plan, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995 – Assessment of Significance (7-part Test) for Grey-headed Flying-Fox (<i>Pteropus poliocephalus</i>)		
TSC Act Status: Vulnerable		
		adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head. iii) The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan		OEH (2006) has listed priority actions to help recover the Grey-headed Flying-fox. Including the following: ▪ Increase the extent and viability of foraging habitat for the Grey-headed Flying-fox that is productive during winter and spring through dedicated habitat creation and restoration using guides published by OEH (in preparation). ▪ Planting new roost trees, managing understorey vegetation to maintain suitable microclimate conditions, establishing buffers between roost camps and nearby human settlements to minimise conflict Where possible, the proposed action will protect large foraging trees that have the potential to support the species. In the event that any flowering and fruit-bearing trees are lost as a result of the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.		The following Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act are relevant to the protection of potential habitat within the subject site for these species: ▪ Clearing of native vegetation ▪ Predation by the European Red Fox <i>Vulpes Vulpes</i> (Linnaeus, 1758) ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Invasion of native plant communities by African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. ex G. Don) Cif. ▪ Invasion and establishment of exotic vines and scramblers ▪ Predation by the Feral Cat <i>Felis catus</i> All foraging and habitat trees will be replaced after removal. The ratio of replacement trees will be quantified after the pre-clearing survey. Replacement trees suitable to the foraging of the

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995 – Assessment of Significance (7-part Test) for Grey-headed Flying-Fox (<i>Pteropus poliocephalus</i>)	
TSC Act Status: Vulnerable	
	species will be considered and addressed in the landscaping plan. All environmental and noxious weed species present within the subject will be removed and replaced with native flora. Fox baiting will continue to occur across suitable parts of Taronga Zoo in combination with efforts from surrounding land managers. Feral cats will be trapped and destroyed if recorded within the subject site.
Conclusion There will be no significant effect on the Grey-headed Flying Fox, therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References NSW Office of Environment and Heritage (2017) Grey-headed Flying-fox (<i>Pteropus poliocephalus</i>) – Species Conservation Project http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10697 NSW Government (2017) NSW Legislation: Threatened Species Conservation act 1995 No 101, Section 3: Key Threatening Processes http://www.legislation.nsw.gov.au/#/view/act/1995/101/full	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Red-crowned Toadlet <i>(Pseudophryne australis)</i>	
TSC Act Status: Vulnerable	
	
Species Ecology	The Red-crowned Toadlet has a restricted distribution. It is confined to the Sydney Basin, from Pokolbin in the north, the Nowra area to the south, and west to Mt Victoria in the Blue Mountains. It occurs in open forests, mostly on Hawkesbury and Narrabeen Sandstones. Within these areas, it inhabits periodically wet drainage lines below sandstone ridges that often have shale lenses or capping. It shelters under rocks and amongst masses of dense vegetation or thick piles of leaf litter. Breeding congregations occur in dense vegetation and debris beside ephemeral creeks and gutters. Red-crowned Toadlet has not been recorded breeding in waters that are even mildly polluted or with a pH outside the range 5.5 to 6.5. Eggs are laid in moist leaf litter, from where they are washed by heavy rain; a large proportion of the development of the tadpoles takes place in the egg. Disperses outside the breeding period, when they are found under rocks and logs on sandstone ridges and forage amongst leaf-litter. Red-crowned Toadlet is usually found in small colonies scattered along ridges coinciding with the positions of suitable refuges near breeding sites. Due to this tendency for discrete populations to concentrate at particular sites, a relatively small localised disturbance may have a significant effect on a local population if it occurs on a favoured breeding or refuge site.
(a) in the case of a threatened species, whether the action proposed 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,	Although no Red-Crowned Toadlets were observed on the subject site, there have been a large number of records within a 10km radius of the site including a high number of records lie within Bradleys Head. No potential foraging and sheltering habitat for Red-Crowned Toadlet present within the remnant vegetation of the Coastal Sandstone Foreshores Forest, will be removed for the proposed development. At the time of the survey there were no records to indicate the species use within this area or the broader subject site. It is considered unlikely that this species would be located within the site, however if an individual of this species is found during the pre-clearing survey, the supervising Ecologist will advise best course of action which may include capture and relocation. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. As no population is likely to currently inhabit the subject site and existing habitat is to be retained, protected and ideally enhanced the proposed development is not anticipated to cause an adverse effect upon the viability of this species in the locality.
(b) in the case of an endangered population, whether the action proposed is	Not applicable – this species does not belong to an Endangered Population

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Red-crowned Toadlet (<i>Pseudophryne australis</i>)		
TSC Act Status: Vulnerable		
likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,		
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – this species does not constitute an Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) No potential foraging and sheltering habitat for Red-Crowned Toadlets within the remnant vegetation of the Coastal Sandstone Foreshores Forest, will be removed for the proposed development. At the time of the survey there were no records to indicate the species use within this area or the broader subject site. It is considered unlikely that this species would be located within the site, however if an individual of this species is found during the pre-clearing survey, the supervising Ecologist will advise best course of action which may include capture and relocation. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. This area is on the edge of the subject site and is directly connecting the wider Coastal Sandstone Foreshores Forest. Thus, habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head. iii) The proposed development will be situated periphery of a predominantly disturbed and altered landscape. The subject site has no confirmed records of this species and is considered insignificant in comparison with the suitable habitat provided within the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the 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 action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Red-crowned Toadlet (<i>Pseudophryne australis</i>)	
TSC Act Status: Vulnerable	
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	OEH (2012) outlines the following conservation actions relevant to the species within the subject site: ▪ Retain and protect habitat and buffers around habitat, particularly vegetation on upper slopes and ridges. ▪ Protect water quality and maintain natural water flows in drainage lines below developed ridges. ▪ Do not remove sandstone rock from bushland in escarpment areas This report outlines impact mitigation methods in relation to the above conservation actions. Sandstone rock outcrops will not be removed from within the Coastal Sandstone Foreshores Forest area. No drainage lines will be impacted.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act are relevant to the protection of Red-crowned Toadlets within the subject site: ▪ Clearing of native vegetation ▪ Infection of frogs by amphibian chytrid causing the disease <i>chytridiomycosis</i> ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plant ▪ Predation by the European Red Fox <i>Vulpes vulpes</i> ▪ Predation by the Feral Cat <i>Felis catus</i> ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Invasion of native plant communities by African Olive <i>Olea europaea</i> subsp. <i>cuspidata</i> (Wall. ex G. Don) Cif. ▪ Invasion and establishment of exotic vines and scramblers Appropriate hygiene protocol will be used by all people handling frogs on site. Only experienced and licensed fauna handlers will be permitted to capture and relocate frogs. All trees and shrubs lost will be replaced by the proponent as a part of the landscape plan. Fox baiting will continue to occur across suitable parts of Taronga Zoo in combination with efforts from surrounding land managers. Feral cats will be trapped and destroyed if recorded within the subject site.
Conclusion There will be no significant effect on the Red-crowned Toadlet (<i>Pseudophryne australis</i>) therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References: NSW Government (2017) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full NSW Office of Environment and Heritage (2012) Red-crowned Toadlet (<i>Pseudophryne australis</i>)– Conservation Projects and Species Profile http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10692 [July 2017]	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test)
for

Nomadic Nectivorous Birds
Swift Parrot (*Lathamus discolor*)²
Little Lorikeet (*Glossopsitta pusilla*)³

TSC Act Status: ²Endangered, ³Vulnerable

Species Ecology	The Swift Parrot breeds in tree hollows in Tasmanian Blue Gum forest on Tasmania and migrates to the NSW coast for the autumn and winter each year. During this time flocks of Swift Parrot become nomadic as they follow irruptions of food resources, including flowering trees including <i>Eucalyptus</i>, <i>Angophora</i>, <i>Corymbia</i>, Mistletoes and lerp (leaf psyllid insect exudate). Every few years non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Swift Parrot has been recorded throughout the Sydney region wherever suitable food sources are present. It forages predominantly on lerps on all <i>Eucalyptus</i> and <i>Angophora</i> that grow in this area. The Little Lorikeet mostly occurs in dry, open eucalyptus forests and woodlands. The species does not undergo regular migration, but instead is considered nomadic with irregular large or small influxes of individuals occurring at any time of year. This is usually in response to seasonal variations in food supply. Little Lorikeets often forage in small groups with other species of lorikeet, feeding primarily on nectar and pollen from tall eucalyptus species. The Little Lorikeet may also forage within melaleucas and mistletoes. Breeding activity is largely known from the western slopes, where birds utilise small hollows (~3cm) within living smooth barked trees.
(a) in the case of a threatened species, whether the action proposed 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,	The proposed action is unlikely to adversely effect upon the life cycle of the species. Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees suitable for nesting by Little Lorikeet will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Swift Parrot does not nest in mainland Australia. Relative to the broader landscape, a small number of flowering and fruit-bearing trees and shrubs may be removed for the proposed development. While these trees provide potential foraging and shelter for the species, the number of suitable trees is low and insignificant to the habitat available for these highly mobile birds. Many of these trees have been planted and all are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to these species. A detailed pre-clearing survey and assessment will be undertaken to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test)
for

Nomadic Nectivorous Birds
Swift Parrot (*Lathamus discolor*)²
Little Lorikeet (*Glossopsitta pusilla*)³

TSC Act Status: ²Endangered, ³Vulnerable

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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 (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,	Not applicable – these species do not constitute an Endangered Ecological Community
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	i) Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Relative to the broader landscape, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of hollows and fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30 ha of suitable potential habitat for the species. ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head. iii) The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Nomadic Nectivorous Birds Swift Parrot (<i>Lathamus discolor</i>)² Little Lorikeet (<i>Glossopsitta pusilla</i>)³	
TSC Act Status: ² Endangered, ³ Vulnerable	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The following conservation activities were taken from the Regent Honeyeater recovery plan (OEH 2017), however are relevant supporting the recovery of all three species. ▪ Retain large old trees, especially those that are hollow-bearing ▪ Ensure recruitment of trees into the mature age class so that there is not a lag period of decades between the death of old trees and hollow formation in younger trees. ▪ Protect large flowering Eucalyptus trees throughout the habitats frequented by this species. Manage remnant woodlands and forest for recovery of old-growth characteristics. ▪ Where natural tree recruitment is inadequate, replant local species to maintain foraging habitat and breeding sites. ▪ Reduce the abundance of feral Honeybees and limit the exploitation of nectar by domestic bees where resources are spatially or temporally sparse (e.g. in years of drought) Although the proposed development has not identified the required removal of any hollow bearing trees, any hollow bearing trees lost will be replaced by augmented hollows. The number of replacement habitat features required will be determined by the pre-clearing survey. Where possible, the proposed action will protect large foraging trees that have the potential to support the species. In the event that any flowering and fruit-bearing trees are lost as a result of the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act are relevant to the protection of potential habitat within the subject site for these species: ▪ Clearing of native vegetation ▪ Competition from feral honey bees, <i>Apis mellifera</i> L. ▪ Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i> ▪ Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations ▪ Invasion and establishment of exotic vines and scramblers

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test)
for

Nomadic Nectivorous Birds
Swift Parrot (*Lathamus discolor*)²
Little Lorikeet (*Glossopsitta pusilla*)³

TSC Act Status: ²Endangered, ³Vulnerable

- Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.
- Predation by the Feral Cat *Felis catus* (Linnaeus, 1758)

The proposed action is considered unlikely to result in a significant increase to KTP.

There will be no significant effect to these species, under the provision that the mitigation recommendations outlined in this report are followed. These mitigations include retaining all hollow-bearing trees, and replacing lost foraging trees.

Proposed planting strategies will provide maintained or improved foraging habitat for these birds.

All environmental and noxious weeds will be removed and replaced with habitat-providing locally indigenous flora where possible.

Existing hygiene protocol within the zoo focused on bird hygiene is conducted to a high standard. It is unlikely that the proposed works will promote the increased rate of infection by Psittacine Circoviral disease and other parrot diseases.

Feral bee hives within the subject site will be removed.

Feral cats will be trapped and destroyed if recorded within the subject site.

Conclusion

There will be no significant effect on the Swift Parrot (*Lathamus discolor*) or Little Lorikeet (*Glossopsitta pusilla*) therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).

References:

Commonwealth of Australia Department of the Environment (DoE) (2015) Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Conservation Advice *Anthochaera phrygia* regent honeyeater

Commonwealth of Australia Department of the Environment (DoE) (2017) Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s266B) Approved Conservation Advice (including listing advice) for Conservation Advice *Lathamus discolor* swift parrot

NSW Office of Environment and Heritage (2017) Regent Honeyeater (*Anthochaera phrygia*)- Conservation Projects <http://www.environment.nsw.gov.au/savingourspeciesapp/ViewFile.aspx?ReportProjectID=148> [July 2017]

NSW Office of Environment and Heritage (2017) Saving our Species. Regent Honeyeater (*Anthochaera phrygia*) <http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10841> [May 2017]

NSW Office of Environment and Heritage (2017a) Saving our Species. Swift Parrot (*Lathamus discolor*) <http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10455> [May 2017]

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of
Significance (7-part Test)
for

Cave Roosting Microbats
Southern Myotis (*Myotis macropus*)
Large-eared Pied Bat (*Chalinolobus dwyeri*)
Little Bent-wing Bat (*Miniopterus australis*)
Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*)

TSC Act Status: Vulnerable



Species Ecology

The Eastern Bentwing-Bat primary roosting habitat is caves; however, they also use derelict mines, storm-water tunnels, buildings and other man-made structures. This is the most common cave-roosting species in the area.

The Large-eared Pied Bat is found in well-timbered areas containing gullies. The species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features.

The Little Bent-wing has highest potential to utilise the subject site as it is known from habitat not dissimilar to that that occurs in the locality, and has previously been recorded within both Kur-ring-gai and Garigal National Parks.

The Southern Myotis generally roosts in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.

All species are most frequently found within well-timbered habitat which contains caves. Only a single record of the Large-eared Pied bat occurs within the study area approximately 4km south within Garigal National Park.

(a) in the case of a threatened species, whether the action proposed 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,

During the site survey, one Southern Myotis (*Myotis macropus*) was observed in an artificial cave within the subject site by the surveying Narla Ecologist. The Southern Myotis was observed in a man-made cave within the subject site. Given its proximity to natural sandstone outcropping in the Lion enclosure, the precautionary principal was applied and it was assumed this habitat feature supported the species for roosting purposes.

The proposed action is unlikely to adversely effect upon the life cycle of these species. Sandstone outcropping will be retained within the proposed Lion enclosure within the subject site. The presence of large carnivores within the enclosure is likely to reduce the sandstone outcrop as suitable habitat for the species.

The physical removal of any natural or man-made caves suitable for cave roosting microbats will be mitigated through replacement of suitable cavernous habitat elsewhere in the subject site. This may include custom designed 'bat caves'. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. No man-made caves or naturally occurring sandstone outcrops are to be removed. At least one week prior to, and during construction of the Lion enclosure a qualified ecologist must be on site to conduct a thorough check of any suitable habitat for cave roosting microbats within the proposed enclosure. During the construction of the Lion enclosure a qualified ecologist must be on site to conduct a thorough check of any suitable habitat for cave roosting microbats within the proposed enclosure.

In the event of the removal of man-made caves, a suitable replacement will be erected within the subject site. A qualified ecologist will be on site to assess any potential habitat for cave roosting microbats. In the event of any culvert drain

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Cave Roosting Microbats Southern Myotis (<i>Myotis macropus</i>) Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) Little Bent-wing Bat (<i>Miniopterus australis</i>) Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>)		
TSC Act Status: Vulnerable		
	removal, such culverts should be checked by a qualified ecologist prior to removal to check for cave roosting microbats. In the event of the location of any cave roosting microbats during pre-clearing surveys, an ecologist must be on site to provide the best course of action, which may include capture and relocation. The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – these species do not constitute an Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) The proposed action is unlikely to adversely effect upon the life cycle of these species. Sandstone caves will be retained within the proposed Lion enclosure within the subject site, However, the presence of carnivores within the enclosure may reduce the potential for the sandstone caves to form suitable habitat for these species. The physical removal of any natural or man-made caves suitable for cave roosting microbats is to be replaced elsewhere in the subject site. Extensive suitable potential habitat for the bat species will remain available within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Cave Roosting Microbats Southern Myotis (<i>Myotis macropus</i>) Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) Little Bent-wing Bat (<i>Miniopterus australis</i>) Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>)		
TSC Act Status: Vulnerable		
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	provides approximately 30ha of suitable potential habitat for the species. ii) The habitat available on the subject site for these species will not become fragmented from other areas as a result of the proposed development. As the species are highly mobile, minor loss of the available use of the sandstone caves within the Lion enclosure from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head, where extensive suitable habitat is available. iii) The proposed development will be situated predominantly in lands that are highly disturbed with a large amount of human activity. This level of activity may already reduce suitable habitat within the subject site. Extensive potential roosting habitat is available in the adjacent Sydney Harbour National Park in Bradleys Head.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,		The mitigation measures outlined have been developed in line with conservation actions as relevant to all species. These include: ▪ Protect known and potential forest and woodland habitat around cliffs, rock overhangs and old mine workings from clearing and isolation ▪ Revegetation which focuses on expanding existing smaller areas of suitable habitat and connecting areas of suitable habitat to create corridors for movement. ▪ Retention of stands of native vegetation, that which is floristically and structurally diverse ▪ Minimizing the use of pesticides within the subject site ▪ Reducing the occurrence of foxes and cats within the subject site. ▪ Limiting access to caves which may cause an increase in disturbance to fauna roosting within. This report provides recommendation for site management aimed at achieving all give of these actions. ▪ No removal of man-made caves or naturally occurring sandstone outcrops is proposed for this development. In the event that habitat suitable to these species is removed, suitable replacement habitat will be installed elsewhere within the zoo grounds.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Cave Roosting Microbats Southern Myotis (<i>Myotis macropus</i>) Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) Little Bent-wing Bat (<i>Miniopterus australis</i>) Eastern Bent-wing Bat (<i>Miniopterus schreibersii oceanensis</i>)	
TSC Act Status: Vulnerable	
	If any trees and shrubs are removed for the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act are relevant to the protection of potential habitat within the subject site for these species: - Bushrock removal - Clearing of native vegetation - Competition from feral honey bees, <i>Apis mellifera</i> L. Under the provision that the mitigation recommendations outlined in this report are followed, the proposed action is considered unlikely to cause a significant adverse effect on the listed bats. No man-made caves or naturally occurring sandstone outcrops are to be removed. During the construction of the Lion enclosure a qualified ecologist must be on site to conduct a thorough check of any suitable habitat for cave roosting microbats within the proposed enclosure. In the event of the removal of man-made caves, a suitable replacement must be erected within the subject site. As above, a qualified ecologist must be on site to assess any potential habitat for cave roosting microbats. In the event of any culvert drain removal, such culverts should be checked by a qualified ecologist prior to removal to check for cave roosting microbats. In the event of the location of any cave roosting microbats during pre-clearing surveys, an ecologist will be on site to provide the best course of action, which may include capture and relocation. All feral bee hives will be removed.
Conclusion There will be no significant effect on any of the listed cave roosting bats therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References: NSW Office of Environment and Heritage (2017) Eastern Cave Bat (<i>Vespadelus troughtoni</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10829 NSW Office of Environment and Heritage (2017) Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10157 NSW Office of Environment and Heritage (2014) Little Bent-wing Bat (<i>Miniopterus australis</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10533 NSW Office of Environment and Heritage (2017) Southern Myotis (<i>Myotis macropus</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10549 NSW Government (2017) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Tree Roosting Microbats Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>) Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>) Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>) Yellow-bellied Sheath-tail Bat (<i>Saccolaimus flaviventris</i>)	
TSC Act Status: Vulnerable	
Species Ecology	The Eastern False Pipistrelle is found on the south-east coast and ranges of Australia, from southern Queensland to Victoria and Tasmania. Prefers moist habitats, with trees taller than 20 m. The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Usually solitary but also recorded roosting communally. The Greater Broad-nosed Bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. It utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Forages after sunset, flying slowly and directly along creek and river corridors at an altitude of 3 - 6 m. Open woodland habitat and dry open forest suits the direct flight of this species. The Yellow-bellied Sheath-tail Bat roosts singly or in groups of up to six, in tree hollows and buildings; in treeless areas, they are known to utilise mammal burrows. When foraging for insects, flies high and fast over the forest canopy, but lower in more open country. Forages in most habitats across its very wide range, with and without trees; appears to defend an aerial territory. Breeding has been recorded from December to mid-March, when a single young is born. All species generally roosts in eucalypt hollows, but have been found under loose bark on trees or in the crevices of buildings. All species are largely insectivorous, however Greater Broad-nosed bats have been known to eat other smaller bats.
(a) in the case of a threatened species, whether the action proposed 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,	An unconfirmed sighting of a single Eastern Freetail Bat (<i>Mormopterus norfolkensis</i>) was made by the surveying Nara Ecologist during the site survey. Given this uncertain identification, the precautionary principal applied and this species was assumed present. The proposed action is unlikely to adversely effect upon the life cycle of these tree roosting microbats. Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. In addition, if hollow-bearing trees are required for removal, a qualified Ecologist must be on site to conduct a pre-clearing survey to check for any tree-roosting microbats that may be inhabiting a hollow tree. If any microbats are located, the supervising Ecologist will advise the best course of action which may include capture and relocation. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population

**Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of
Significance (7-part Test)
for**

Tree Roosting Microbats

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

Eastern Freetail-bat (*Mormopterus norfolkensis*)

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*)

TSC Act Status: Vulnerable

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – these species do not constitute an Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of the available use of some trees and shrubs for foraging within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head, where extensive suitable habitat is available. iii) No hollow-bearing trees are to be removed from the subject site. The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Tree Roosting Microbats Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>) Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>) Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>) Yellow-bellied Sheath-tail Bat (<i>Saccolaimus flaviventris</i>)	
TSC Act Status: Vulnerable	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	Mitigation measures have been development in line with conservation actions as relevant to all species. These include: - Revegetation which focuses on expanding existing smaller areas of suitable habitat and connecting areas of suitable habitat to create corridors for movement. - Retention of stands of native vegetation, especially those with hollow-bearing trees (including dead trees), or which is floristically and structurally diverse - Retain a buffer of vegetation around potential roost sites - Minimizing the use of pesticides within the subject site - Encourage regeneration and replanting of local flora species to maintain bat foraging habitat. This report provides recommendation for site management aimed at achieving all give of these actions. - No hollow-bearing trees will be removed from the subject site as a result of the proposed development. In the even that hollow-bearing trees are removed as a result of the development, these habitat values will be replaced with augmented hollows. - If any trees and shrubs are removed for the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The Key Threatening Processes relevant to the survival of these hollow-roosting bats in NSW are the following:- - Clearing of native vegetation - Loss of hollow-bearing trees - Infection of native plants by <i>Phytophthora cinnamomi</i> - Invasion, establishment and spread of <i>Lantana camara</i> - Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants - Removal of dead wood and dead trees - Predation by the European Red Fox <i>Vulpes vulpes</i> - Predation by the Feral Cat <i>Felis catus</i>

**Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of
Significance (7-part Test)
for**

Tree Roosting Microbats

Eastern False Pipistrelle (*Falsistrellus tasmaniensis*)

Eastern Freetail-bat (*Mormopterus norfolkensis*)

Greater Broad-nosed Bat (*Scoteanax rueppellii*)

Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*)

TSC Act Status: Vulnerable

Under the provision that the mitigation recommendations outlined in this report are followed, the proposed action is considered unlikely to cause a significant adverse effect on the listed hollow-roosting bats. These mitigation actions include hygiene protocols, habitat protection via maximum tree/ native vegetation retention and bush management, no loss of hollow bearing trees.

Conclusion

There will be no significant effect on any of these vulnerable tree roosting bats therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).

References:

NSW Office of Environment and Heritage (2017) Eastern False Pipistrelle (*Falsistrellus tasmaniensis*) – Conservation Projects and Species Profile <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10331>
 NSW Office of Environment and Heritage (2017) Eastern Free-tailed Bat (*Mormopterus norfolkensis*) – Conservation Projects and Species Profile <http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10544>
 NSW Office of Environment and Heritage (2017) Greater Broad-nosed Bat (*Scoteanax rueppellii*) – Conservation Projects and Species Profile <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748>
 NSW Office of Environment and Heritage (2017) Yellow-bellied Sheath-tail Bat (*Saccolaimus flaviventris*) – Conservation Projects and Species Profile <http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10748>
 NSW Government (2017) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation <http://www.legislation.nsw.gov.au/#/view/act/1995/101/full>

**Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of
Significance (7-part Test)
for
Powerful Owl (*Ninox strenua*)**

TSC Act Status: Vulnerable



Species Ecology

The Powerful Owl is found in tall forests across eastern Australia, south of the tropics. It is mostly found east of the Great Dividing Range. The species is not common but it is widespread in NSW. Multiple breeding pairs exist in Sydney. The Species usually requires large hollows to nest in. The Powerful Owl nests in large tree hollows (at least 0.5 m deep), in large eucalypts (diameter at breast height of 80-240 cm) that are at least 150 years old. While the female and young are in the nest hollow the male Powerful Owl roosts nearby (10-200 m) guarding them, often choosing a dense "grove" of trees that provide concealment from other birds that harass him. Pairs of Powerful Owls demonstrate high fidelity to a large territory, the size of which varies with habitat quality and thus prey densities. In good habitats, a mere 400 ha can support a pair; where hollow trees and prey have been depleted the owls need up to 4000 ha.

(a) in the case of a threatened species, whether the action proposed 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,

No Powerful Owls were recorded on the subject site during the site survey. However, this species may occur intermittently on the subject site. Use of the subject site would mainly be for intermittent hunting and temporary roosting. Breeding is unlikely to take place on the subject site, owing to the high level of human traffic and disturbance within the subject site.

The proposed action is unlikely to adversely effect upon the life cycle of the species. Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows.

A small number of trees and shrubs suitable for intermittent roosting by this species are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacements required within the landscaping plan for those lost due to the proposed development.

Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.

No effects to the movement of this highly mobile species across the subject site, and between the subject property and adjoining National Park outside of the subject site will occur.

The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Powerful Owl (<i>Ninox strenua</i>)		
TSC Act Status: Vulnerable		
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – these species do not belong to an Endangered Ecological Community or Critically Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. ii) The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head. iii) The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Powerful Owl (<i>Ninox strenua</i>)	
TSC Act Status: Vulnerable	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),	Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	OEH has listed priority actions to help recover the Powerful Owl. The following actions are relevant to the subject site and proposed development project. • Retain large stands of native vegetation, especially those containing hollow-bearing trees. • Protect hollow-bearing trees for nest sites. Younger recruitment trees should also be retained to replace older trees in the long-term. • Retain at least a 200 metre buffer of native vegetation around known nesting sites. Recommendations have been put forward to adhere to the proposed actions to minimise the effect of development on this species. No hollow-bearing trees will be removed as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Prior to works detailed preclearing must also be carried out. An important mitigation measure is the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any birds directly affected.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The main key threatening processes to Powerful Owls include the following: ▪ Clearing of native vegetation ▪ Removal of hollow-bearing trees ▪ Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i> Potential effects are to be mitigated through the measures outlined in this report including the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any Powerful Owl directly affected (e.g. displaced). No hollow-bearing trees are proposed for removal. In the event that any native vegetation is lost as a result of the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values. Additional Powerful Owl nesting boxes or hollow augmentation may be undertaken within the zoo grounds.
Conclusion There will be no significant effect on the Powerful Owl (<i>Ninox strenua</i>) therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References NSW Office of Environment and Heritage (2017) Saving Our Species. Powerful Owl (<i>Ninox strenua</i>) (Profile) http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10562 [April 2017]	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Threatened Birds of Prey Square-tailed Kite (<i>Lophoictinia isura</i>) White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) Little Eagle (<i>Hieraaetus morphnoides</i>)	
TSC Act Status: Vulnerable	
Species Ecology	The Square-tailed Kite is found in a range of timbered habitats including dry woodlands and open forests, displaying a particular preference for watercourses with dense tree cover. Its range includes coastal and subcoastal areas from south-western to northern Australia, NSW, Queensland and Victoria. In NSW scattered records suggest the species is a consistent resident; however, in other areas further south it is migratory returning to areas for summer breeding. The Square-tailed Kite is a specialist hunter of passerines, especially honeyeaters, and most particularly nestlings, and insects in the tree canopy, picking most prey items from the outer foliage. Likely because of this prey specialisation, individuals will often occupy large hunting ranges of more than 100m². Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs. The White-bellied Sea Eagle's habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, and forest (including rainforest). Breeding habitat consists of mature tall open forest, open forest, tall woodland, and swamp sclerophyll forest close to foraging habitat. Nest trees are typically large emergent eucalypts and often have emergent dead branches or large dead trees nearby which are used as 'guard roosts'. Nests are large structures built from sticks and lined with leaves or grass. There are abundant local records of the White-bellied Sea Eagle from within Taronga Zoo and surrounds. However there are no confirmed breeding records. The Little Eagle occupies open eucalypt forest, woodland or open woodland. Sheoak or Acacia woodlands and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.
(a) in the case of a threatened species, whether the action proposed 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,	Although no individuals of either species were recorded on the subject site on the day of the site survey, the subject site does provide some intermittent foraging and nesting habitat for these species. There are abundant local records of the White-bellied Sea Eagle from within Taronga Zoo and surrounds. However there are no confirmed breeding records. The proposed action is unlikely to adversely effect upon the life cycle of the species. Based on the Taronga Zoo concept plan, it is predicted that few suitable large nesting trees will be lost as a result of the proposed development. Existing nesting trees on the subject site are considered to hold sub-optimal habitat for these species due to the high disturbance to the site, and high level of human traffic, which is likely to reduce the likelihood of the species to use such hollows. Extensive suitable potential nesting habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Threatened Birds of Prey Square-tailed Kite (<i>Lophoictinia isura</i>) White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) Little Eagle (<i>Hieraaetus morphnoides</i>)		
TSC Act Status: Vulnerable		
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – these species do not constitute an Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) The proposed action is unlikely to adversely effect upon the life cycle of the species. Based on the Taronga Zoo concept plan, it is predicted that few suitable large nesting trees will be lost as a result of the proposed development. Existing trees on the subject site are considered to hold sub-optimal nesting habitat for these species due to the high-levels of historical disturbance to the site, and high level of human traffic, which is likely to reduce the likelihood of the species to use such hollows. Extensive suitable potential nesting habitat for the species will remain within the broader subject site

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Threatened Birds of Prey Square-tailed Kite (<i>Lophoictinia isura</i>) White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) Little Eagle (<i>Hieraaetus morphnoides</i>)		
TSC Act Status: Vulnerable		
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential nesting and foraging habitat for the species. ii) The habitat available on the subject site for these species will not become fragmented from other areas as a result of the proposed development. As these species are highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head. iii) The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging and breeding habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,		The relevant recovery objectives for these species include the following: - Protect known habitat from fires of a frequency greater than that recommended for the retention of biodiversity. - Retain and protect nesting and foraging habitat, particularly along watercourses. Recommendations have been put forward to adhere to the proposed actions to minimise the effect of development on these species. Nesting habitat quality within the subject site is considered sub-optimal due to the disturbance and the high-level of human traffic within the subject site. Prior to works detailed preclearing must also be carried out. An important mitigation measure is the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any birds directly affected.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Threatened Birds of Prey Square-tailed Kite (<i>Lophoictinia isura</i>) White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) Little Eagle (<i>Hieraaetus morphnoides</i>)	
TSC Act Status: Vulnerable	
	No burning of habitat will be permitted on the subject site.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The following Key Threatening Processes (KTPs) listed under Schedule 3 of the TSC Act are relevant to the protection of potential Bird of Prey habitat within the subject site: ▪ Clearing of native vegetation ▪ Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations ▪ Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanoccephala</i> Existing hygiene protocol within the zoo focused on bird hygiene is conducted to a high standard. It is unlikely that the proposed works will promote the increased rate of infection by Psittacine Circoviral disease and other parrot diseases. Limited clearing of native vegetation will occur, and any confirmed nests will be protected. Few (if any) trees suitable for nesting will be removed. Potential effects are to be mitigated through the measures outlined in this report including the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any bird directly affected (e.g. displaced). In the event that any native vegetation is lost as a result of the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
Conclusion There will be no significant impact on the Square-tailed Kite (<i>Lophoictinia isura</i>), White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) or Little Eagle (<i>Hieraaetus morphnoides</i>) therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References: NSW Office of Environment and Heritage (2014) Square-tailed Kite (<i>Lophoictinia isura</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10495 NSW Government (2017) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full NSW Office of Environment and Heritage (2015) Little Eagle (<i>Hieraaetus morphnoides</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=20131 NSW Office of Environment and Heritage (2017) White-bellied Sea Eagle (<i>Haliaeetus leucogaster</i>) – Conservation Projects and Species Profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20322	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)		
TSC Act Status: Vulnerable		
Species Ecology	The Glossy Black Cockatoo is uncommon although widely distributed in open forest and woodlands from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW. Feeds almost exclusively on <i>Casuarina</i> spp. and <i>Allocasuarina</i> spp. seeds, with Swamp Oak (<i>Casuarina glauca</i>), Black Sheoak (<i>Allocasuarina littoralis</i>) and Forest She-oak (<i>A. torulosa</i>) particularly important are important food sources in the Sydney coastal regions. This species, like many large cockatoos requires large hollow-bearing eucalyptus trees within which it nests. In order to be suitable for breeding sites, hollows must have a diameter of >15cm. Breeding takes place between March and May, when a single egg is laid. Glossy Black Cockatoo have not been confirmed as occurring within the subject site or adjoining Bradley's Head National Park within the last 30 years. The nearest confirmed population is at Garigal National Park approximately 10km north of the subject site.	
(a) in the case of a threatened species, whether the action proposed 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,	The proposed action is unlikely to adversely effect upon the life cycle of the species. Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. Only a small number of scattered <i>Casuarina</i> spp./<i>Allocasuarina</i> spp. are located within the subject site. Most of these trees have been planted. These trees were observed to have a low fruiting capability. Seven of these trees are proposed for removal. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. The proposed action will not cause a net loss in habitat resources and therefore will not have an adverse effect such that will be likely to reduce the viability of a local population, such that the species is likely to be placed at risk of extinction.	
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable – these species do not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community,	(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	Not applicable – this species does not constitute an Endangered Ecological Community

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)		
TSC Act Status: Vulnerable		
whether the action proposed:	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. As these trees are located in a highly-disturbed area with high human activity, it is unlikely these hollows are suitable for the species to use as nesting hollows. Only a small number of scattered <i>Casuarina</i> spp. are located within the subject site. These trees were observed to have a low fruiting capability. Seven of these trees are proposed for removal. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the 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 action, and	ii) The habitat available on the subject site for these species will not become fragmented from other areas as a result of the proposed development. Seven feed trees for this species (<i>Casuarina</i> spp.) are proposed for removal. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head.
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	iii) The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging and breeding habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for these species.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Glossy Black-Cockatoo (<i>Calyptorhynchus lathami</i>)	
TSC Act Status: Vulnerable	
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,	The Glossy Black-Cockatoo Recovery Plan (OEH, 2017) identified seven recovery objectives. Of these three were relevant to the subject site: ▪ Protect large old trees and smaller trees that contain large hollows, including from the effects of fire. Ensure the recruitment of large old trees by retaining medium-sized trees, facilitating regeneration, and undertaking replanting. ▪ Identify sites where hollows are limiting and develop and implement strategies to increase hollow availability that have clear objectives and include monitoring, maintenance, and reporting requirements. Actions include nest box installation, the humane control of introduced species, and the protection of trees having the potential to develop hollows. ▪ Increase the quality and extent of foraging habitat within a region. This report provides recommendation for site management aimed at achieving these actions. No hollow bearing trees will be removed.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the effect of, a key threatening process.	The Key Threatening Processes relevant to the Glossy Black-Cockatoo within NSW are the following: ▪ Clearing of native vegetation ▪ Loss of hollow-bearing trees ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Infection by Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species and populations ▪ Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanoccephala</i> Existing hygiene protocol within the zoo focused on bird hygiene is conducted to a high standard. It is unlikely that the proposed works will promote the increased rate of infection by Psittacine Circoviral disease and other parrot diseases. Limited clearing of native vegetation will occur, and any confirmed nests will be protected. Few (if any) trees suitable for nesting will be removed. Potential effects are to be mitigated through the measures outlined in this report including the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any bird directly affected (e.g. displaced). No hollow-bearing trees suitable for nesting by Glossy Black Cockatoo will be removed. In the event that any native vegetation is lost as a result of the proposed development, the proponent will replace all trees lost with a suitable

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Glossy Black-Cockatoo (<i>Calyptrorhynchus lathami</i>)	
TSC Act Status: Vulnerable	
	replacement that provides the same habitat values. This report addresses all KTPs in detail, ensuring there is no increase in their effect which may result for the proposed development works. No hollow-bearing trees will be removed.
Conclusion There will be no significant impact on the Glossy Black-Cockatoo (<i>Calyptrorhynchus lathami</i>) therefore no Species Impact Statement (SIS) is warranted for this species.	
References: NSW Office of Environment and Heritage (2017) Glossy Black-Cockatoo (<i>Calyptrorhynchus lathami</i>)– Conservation Projects and Species Profile http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10140 NSW Government (2017) Threatened Species Conservation Act 1995 101- Schedule 3: Key Threatening Processes, NSW Legislation http://www.legislation.nsw.gov.au/#/view/act/1995/101/full	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Netted Bottle Brush (<i>Callistemon linearifolius</i>) <i>Tetratheca glandulosa</i> Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	
TSC Act Status: Vulnerable	
Species Ecology	Netted Bottle Brush grows in dry sclerophyll forest on the coast and adjacent ranges. Flowers spring – summer. Known within the Sydney Metro areas the species is associated with a range of vegetation formations, of most relevance to the subject site is the Sydney Coastal Heaths. Recorded from the Georges River to Hawkesbury River in the Sydney area, and north to the Nelson Bay area of NSW. Recorded in 2000 at Coalcliff in the northern Illawarra. For the Sydney area, recent records are limited to the Hornsby Plateau area near the Hawkesbury River. The species was more widespread in the past, and there are currently only 5-6 populations remaining from the 22 populations historically recorded in the Sydney area. Three of the remaining populations are reserved in Ku-ring-gai Chase National Park, Lion Island Nature Reserve and Spectacle Island Nature Reserve. The species has also been recorded from Yengo National Park. <i>Tetratheca glandulosa</i> is a small, spreading shrub which grows 20 - 50cm in height. Stems often become entwined among other small shrubs, sedges and grasses. Leaves are opposite 5 - 10 mm long and 1 mm wide with recurved (rolled under) margins. Leaf margins have small stiff hairs that give them a "toothed" appearance. Restricted to the following Local Government Areas: Baulkham Hills, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Pittwater, Ryde, Warringah, and Wyong. There are approximately 150 populations of this plant ranging from Sampons Pass (Yengo NP) in the north to West Pymble (Lane Cove NP) in the south. The eastern limit is at Ingleside (Pittwater LGA) and the western limit is at East Kurrajong (Wollemi NP). The current north-south range is approximately 65km. Associated with shale-sandstone transition habitat where shale-capping occur over sandstone, with associated soil landscapes such as Lucas Heights, Gynea, Lambert and Faulconbridge. Topographically, the plant occupies ridgetops, upper-slopes and to a lesser extent mid-slope sandstone benches. Soils are generally shallow, consisting of a yellow, clayey/sandy loam. Stony lateritic fragments are also common in the soil profile on many of these ridgetops. Flowers July-November however residual flowers may persist until late December. Flowering influenced by seasonal weather conditions and/or the microclimate effects (e.g. exposure) of each particular site. The Magenta Lilly Pilly is found only in NSW, in a narrow, linear coastal strip from Upper Lansdowne to Conjola State Forest. On the south coast the Magenta Lilly Pilly occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest. On the central coast, Magenta Lilly Pilly occurs on gravels, sands, silts and clays in riverside gallery rainforests and remnant littoral rainforest communities. In the Sydney Metropolitan area, it is known to be associated with the following potentially relevant vegetation communities: Coastal Swamp Forests; Coastal Headland Heath; Littoral Rainforest.
(a) in the case of a threatened species, whether the action proposed 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,	The proposed actions were considered to have low risk to adversely affecting the life cycle of these plant in a way that could increase risk to the viability of any local populations. Targeted searches of the species within the subject site were performed by the Narla Ecologist during the site survey and found no individuals of these species within the subject site. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. Other areas within the subject site were landscaped and contained mostly planted with landscaped areas, reducing the suitability and likelihood of these species occurring in these areas. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Netted Bottle Brush (<i>Callistemon linearifolius</i>) <i>Tetratheca glandulosa</i> Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)		
TSC Act Status: Vulnerable		
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not applicable –species does not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – species does not belong to an Endangered Ecological Community or Critically Endangered Ecological Community
	(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,	
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If any individuals of the species are found during the pre-clearing survey, they will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. Alternatively, they will be relocated elsewhere within the zoo grounds and then subsequently protected. The modification of this small area is considered insignificant as extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park. ii) The proposed action was considered unlikely to further fragment or isolated from other areas of habitat. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. This will reduce the suitability of the habitat for this species, however as no individuals of the species occurred within the subject site, the species will not become fragmented or isolated. The modification of this
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Netted Bottle Brush (<i>Callistemon linearifolius</i>) <i>Tetratheca glandulosa</i> Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)		
TSC Act Status: Vulnerable		
		small area is considered insignificant as extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park. iii) The habitat on the subject site is not considered important to these plants, as the species has never been recorded on the subject site. The habitat to be affected by the proposed works will only be the small area (1500m²) used for the construction of the Lion Enclosure. The modification of this small area is considered insignificant as extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan		The OEH (2017) lists a major issue concerning effective conservation of the Netted Bottle Brush is insufficient data. For this reason, the listed priority actions largely refer to specific research targets which are beyond the scope of the current Flora Fauna Assessment Despite this the more general objectives of similar species recovery plans may equally apply, including: ▪ Minimise impacts of recreational activities ▪ Prevent weed invasion of the site ▪ Minimise impacts of development The proposed works are considered unlikely to result in an increased impact, under the provision that the mitigation recommendations outlined in this report are followed, particularly the mitigation that an Ecologist is able to conduct a pre-clearing assessment of the site. If any specimens are located during the pre-clearing assessment, they will be retained and protected.
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.		The main Key Threatening Processes (KTP) of relevance to <i>Acacia terminalis</i> are: ▪ Clearing of native vegetation ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Invasion of native plant communities by exotic perennial grasses ▪ Invasion, establishment and spread of <i>Lantana camara</i> All weeds within the subject site will be removed and replaced with locally indigenous native flora. Weeds will be continually suppressed. No clearing of any habitat that contains Sunshine Wattle will take place. The proposed works are considered unlikely to result in an increased impact, under the provision that the mitigation recommendations outlined in this report are followed, particularly the mitigation that an Ecologist is able to conduct a pre-clearing assessment of the site. If any specimens are located

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Netted Bottle Brush (<i>Callistemon linearifolius</i>) <i>Tetratheca glandulosa</i> Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	
TSC Act Status: Vulnerable	
	during the pre-clearing assessment, they will be retained and protected.
Conclusion There will be no significant impact on the Netted Bottle Brush (<i>Callistemon linearifolius</i>), <i>Tetratheca glandulosa</i> or Magenta Lilly Pilly (<i>Syzygium paniculatum</i>), therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References NSW Office of Environment and Heritage (2017a) Netted Bottle Brush (<i>Callistemon linearifolius</i>) – profile http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10129 [July 2017] NSW Office of Environment and Heritage (2017b) Magenta Lilly Pilly – profile http://www.environment.nsw.gov.au/savingourspeciesapp/project.aspx?ProfileID=10129 [July 2017] NSW Office of Environment and Heritage (2017c) <i>Tetratheca glandulosa</i> - profile http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10798 NSW Office of Environment and Heritage (2017) List of Key Threatening Processes http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm [May 2017]	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Sunshine Wattle (<i>Acacia terminalis</i>)		
TSC Act Status: Endangered		
Species Ecology	Sunshine Wattle (<i>Acacia terminalis</i>) has a very limited distribution, mainly in near-coastal areas from the northern shores of Sydney Harbour south to Botany Bay, with most records from the Port Jackson area and the eastern suburbs of Sydney. Recent collections have mainly been made from the Quarantine Station, Clifton Gardens, Dover Heights, Parsely Bay, Nielson Park, Cooper Park, Chifley and Watsons Bays. Habitat is coastal scrub and dry sclerophyll woodland on sandy soils. Most areas of habitat or potential habitat are small and isolated. Most sites are highly modified or disturbed due to surrounding urban development. The species flowers in autumn. Seeds mature in November and are dispersed by ants. Seed viability is high and recruitment occurs mainly after fire. A fire temperature of 60 degrees is required for optimum germination. Although plants are killed by fire, they have been recorded sprouting from the base. No individuals of this species were recorded within the subject site, despite thorough targeted searches.	
(a) in the case of a threatened species, whether the action proposed 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,	The proposed actions were considered to have low risk to adversely affecting the life cycle of this plant in a way that could increase risk to the viability of any local populations. Targeted searches of the species within the subject site were performed by the Narla Ecologist during the site survey and found no individuals of this species within the subject site, despite a number of records located within a close proximity to the subject site. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. Other areas within the subject site were landscaped and contained mostly planted and self-sewn plants, reducing the suitability and likelihood of the species occurring in these areas. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected <i>in situ</i> within the subject site by the use of appropriate fencing around any individuals of the species. Alternatively, it will be relocated elsewhere within the zoo grounds and subsequently protected.	
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,	Not applicable –species does not belong to an Endangered Population	
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:	(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	Not applicable – species does not belong to an Endangered Ecological Community or Critically Endangered Ecological Community
	(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,	

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Sunshine Wattle (<i>Acacia terminalis</i>)		
TSC Act Status: Endangered		
(d) in relation to the habitat of a threatened species, population or ecological community:	(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and	i) A small area of low-quality potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. ii) The proposed action was considered unlikely to further fragment or isolated from other areas of habitat. A small area of low-quality potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. This will reduce the suitability of the habitat for this species, however as no individuals of the species occurred within the subject site, the species will not become fragmented or isolated. iii) The habitat on the subject site is not considered important to the Sunshine Wattle, as the species was not recorded in the subject site. The habitat to be affected by the proposed works will only be the small area (1500m²) used for the construction of the Lion Enclosure. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
	(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and	
	(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),		Under the TSC Act, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for the species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan		The OEH (2017) lists a number of activities to assist in the conservation of the species. Those relevant include the following: ▪ Undertake appropriate weed control activities when necessary. ▪ Protect known sites from clearing and degradation. The proposed works are considered unlikely to result in an increased impact, under the provision that the mitigation recommendations outlined in this report are followed An Ecologist will be available to conduct a pre-clearing assessment of the site. If any specimens are located during the pre-clearing assessment, they will be retained and protected <i>in situ</i> or relocated and protected elsewhere within the zoo grounds.

Environmental Planning and Assessment Act 1979 and Threatened Species Conservation Act 1995– Assessment of Significance (7-part Test) for Sunshine Wattle (<i>Acacia terminalis</i>)	
TSC Act Status: Endangered	
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.	The main Key Threatening Processes (KTP) of relevance to <i>Acacia terminalis</i> are: ▪ Clearing of native vegetation ▪ Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants ▪ Invasion of native plant communities by exotic perennial grasses ▪ Invasion, establishment and spread of <i>Lantana camara</i> All weeds within the subject site will be removed and replaced with locally indigenous native flora. Weeds will be continually suppressed. No clearing of any habitat that contains Sunshine Wattle will take place. The proposed works are considered unlikely to result in an increased impact, under the provision that the mitigation recommendations outlined in this report are followed, particularly the mitigation that an Ecologist is able to conduct a pre-clearing assessment of the site. If any specimens are located during the pre-clearing assessment, they will be retained and protected.
Conclusion There will be no significant impact on The Sunshine Wattle (<i>Acacia terminalis</i>), therefore the proposed action should not warrant the producing of a Species Impact Statement (SIS).	
References NSW Office of Environment and Heritage (2017) Sunshine Wattle (<i>Acacia terminalis</i>) – Recovery Plan NSW Office of Environment and Heritage (2017) Sunshine Wattle – <i>Acacia terminalis</i> Profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10028 [May 2017] NSW Office of Environment and Heritage (2017) List of Key threatening Processes http://www.environment.nsw.gov.au/threatenedspecies/KeyThreateningProcessesByDoctype.htm [May 2017]	

**Appendix 4 - Commonwealth
Environment Protection and Biodiversity Conservation Act 1999
Significant Impact Criteria**

	Species	TSC Act Status
Fauna	Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	Vulnerable
	Swift Parrot (<i>Lathamus discolor</i>)	Critically Endangered
	Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	Vulnerable
Flora	Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	Vulnerable
	Sunshine Wattle (<i>Acacia terminalis</i> subsp. <i>terminalis</i>)	Endangered

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Grey-headed Flying Fox <i>(Pteropus poliocephalus)</i>	
EPBC Act Status: Vulnerable	
Significant Impact criteria An action is likely to have a significant Impact on a vulnerable species if there is a real chance or possibility that it will:	
• lead to a long-term decrease in the size of a population	The proposed action is not likely to lead to a long-term decrease in the size of a population. No known camps or roosts occur within the subject site. It is considered that the species have potential to utilise the subject site as an intermittent foraging resource. Based on the Taronga Zoo development concept plan, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be undertaken to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.
• reduce the area of occupancy of the species	The proposed action is unlikely to adversely impact upon the area of occupancy of the species. Based on the Taronga Zoo concept plan, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.
• fragment an existing population into two or more populations	The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	
EPBC Act Status: Vulnerable	
	connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head.
• adversely affect habitat critical to the survival of a species	The action will not adversely affect habitat critical to the survival of this species. No existing roost camps exist within the subject site or in the immediately surrounding area. As the subject site only provides limited and intermittent foraging resources, it is not considered critical habitat for the survival of the species.
• disrupt the breeding cycle of a population	There will be no disruption to the breeding cycle of a population as these species do not breed locally.
• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action is unlikely to adversely impact upon the life cycle of the Grey-headed Flying-fox. Based on the Taronga Zoo development concept plan, a small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.
• result in invasive species that are harmful to the species becoming established in species' habitat	It is unlikely that the proposed action will result in invasive species that are harmful to the species becoming established in species' habitat.
• introduce disease that may cause the species to decline, or	The proposed action presents a very low risk of introducing a novel disease which will affect the Grey-headed Flying-fox. Taronga zoo holds industry leading standards in quarantine and zoonotic disease management.
• interfere with the recovery of the species.	OEH (2006) has listed priority actions to help recover the Grey-headed Flying-fox. Including the following: ▪ Increase the extent and viability of foraging habitat for the Grey-headed Flying-fox that is productive during winter and spring through dedicated habitat creation and restoration using guides published by OEH (in preparation). ▪ Negotiate agreements with landholders, particularly in-perpetuity covenants or stewardship agreements that promote the protection and retention of high quality foraging habitat and roost sites for grey-headed flying-foxes. ▪ Planting new roost trees, managing understorey vegetation to maintain suitable microclimate conditions, establishing buffers between roost camps and nearby human settlements to minimise conflict.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>)	
EPBC Act Status: Vulnerable	
	Where possible, the proposed action will protect large foraging trees that have the potential to support the species. In the event that any flowering and fruit-bearing trees are lost as a result of the proposed development, the proponent will replace all trees lost with a suitable replacement that provides the same habitat values.
Conclusion There will be no significant Impact on Grey-headed Flying Fox (<i>Pteropus poliocephalus</i>) therefore, the proposed action should not warrant a Commonwealth EPBC Act Referral.	
References Commonwealth Department of Environment (DoE) (2001) Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the list of Threatened Species under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) NSW Department of Environment, Climate Change and Water (NSW DECCW) (2010). Draft National Recovery Plan for the Grey-headed Flying-fox <i>Pteropus poliocephalus</i>. [Online]. Prepared by Woodhead, A. and P. Eby. Sydney: NSW DECCW. Available from: http://www.environment.nsw.gov.au/resources/threatenedspecies/08214dnrpflyingfox.pdf. NSW Office of Environment and Heritage (OEH) (2014). Grey-headed Flying-fox - profile. [Online]. Available from: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10697. NSW Scientific Committee (2001). Grey-headed Flying-fox vulnerable species listing, final determination. [Online]. Available from: http://www.environment.nsw.gov.au/determinations/GreyheadedFlyingFoxVulSpListing.htm.	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Assessment of Significant Impact Criteria
for the
Large-eared Pied Bat
(*Chalinolobus dwyeri*)

EPBC Act Status: Vulnerable

Significant Impact criteria

An action is likely to have a significant Impact on a vulnerable species if there is a real chance or possibility that it will:

▪ Lead to a long-term decrease in the size of a population	The proposed development is not likely to lead to a long-term decrease in the size of a population. Large-eared pied bats were not recorded on the subject site. The proposed action is unlikely to adversely impact upon the life cycle of these species. Sandstone outcropping will be retained within the proposed Lion enclosure within the subject site, however, the presence of large carnivores within the enclosure is likely to reduce the sandstone outcrop as suitable habitat for these species. The physical removal of any natural or man-made caves suitable for cave roosting microbats is to be replaced elsewhere in the subject site. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. During the construction of the Lion enclosure a qualified ecologist must be on site to conduct a thorough check of any suitable habitat for cave roosting microbats within the proposed enclosure.
▪ Reduce the area of occupancy of the species	Sandstone outcropping will be retained within the proposed Lion enclosure within the subject site. However, the presence of carnivores within the enclosure may reduce the sandstone outcrop as suitable habitat for these species. The physical removal of any natural or man-made caves should be avoided, but if it does occur, suitable cave habitat will be recreated elsewhere in the subject site.
▪ Fragment an existing population into two or more populations	The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of the available use of the sandstone caves within the Lion enclosure from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head, where extensive suitable habitat is available.
▪ Adversely affect habitat critical to the survival of a species	The proposed action is unlikely to adversely impact upon the life cycle of the species. Sandstone outcropping will be retained within the proposed Lion enclosure within the subject site. However, the presence of carnivores within the enclosure may reduce the sandstone outcrop as suitable habitat for these species. The physical removal of any natural or man-made caves should be avoided, but if it does occur, suitable cave habitat will be recreated elsewhere in the subject site. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species. During the construction of the Lion enclosure a qualified Ecologist will be on site to conduct a thorough check of any suitable habitat for cave roosting microbats within the proposed enclosure. In the event of the removal of man-made caves, a suitable replacement must be erected within the subject site.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	
EPBC Act Status: Vulnerable	
	In the event of any culvert drain removal, such culverts should be checked by a qualified ecologist prior to removal to check for cave roosting microbats. In the event of the location of any cave roosting microbats during pre-clearing surveys, an ecologist must be on site to provide the best course of action, which may include capture and relocation.
▪ Disrupt the breeding cycle of a population	There will be no disruption to the breeding cycle of a population. No suitable breeding habitat will be impacted by the proposed action (either through direct loss of cave/crevice habitat, nor through indirect impacts such as vibration). Suitable breeding habitats are limited in the local area. The nearest suitable habitat occurs in the Sea Cliffs of Sydney Harbour National Park. Extensive suitable foraging habitat will remain on the subject site and within the adjoining Sydney Harbour National Park during and post the proposed action.
▪ Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposed action is unlikely to adversely effect upon the life cycle of these species. Sandstone caves will be retained. The physical removal of any natural or man-made caves suitable for the species will be avoided. If any cave or cavernous habitat is removed, suitable bat roosting habitat will be recreated elsewhere within the zoo grounds.
▪ Result in invasive species that are harmful to the species becoming established in species' habitat	It is unlikely that the proposed action will result in invasive species that are harmful to the species becoming established in species' habitat.
▪ Introduce disease that may cause the species to decline, or	The proposed action will not introduce disease that may cause the species to decline.
▪ Interfere with the recovery of the species.	The proposed development is not likely to interfere with the recovery of the species. OEH (2006) has listed priority actions to help recover the species, including the following: ▪ Protect known and potential forest and woodland habitat around cliffs, rock overhangs and old mine workings from clearing and isolation ▪ Revegetation which focuses on expanding existing smaller areas of suitable habitat and connecting areas of suitable habitat to create corridors for movement. ▪ Retention of stands of native vegetation, that which is floristically and structurally diverse ▪ Minimizing the use of pesticides within the subject site ▪ Reducing the occurrence of foxes and cats within the subject site. ▪ Limiting access to caves which may cause an increase in disturbance to fauna roosting within. This report provides recommendation for site management aimed at achieving all give of these actions. ▪ No removal of man-made caves or naturally occurring sandstone outcrops is proposed for this development. In the event that habitat suitable to these species is removed, suitable replacement habitat will be installed within the subject site. ▪ If any trees and shrubs are removed for the proposed development, the proponent will

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>)	
EPBC Act Status: Vulnerable	
	replace all trees lost with a suitable replacement that provides the same habitat values.
Conclusion There will be no significant Impact on Large-eared Pied Bat (<i>Chalinolobus dwyeri</i>) therefore the proposed action should not warrant a Commonwealth EPBC Act Referral.	
References NSW Office of Environment and Heritage (OEH) (2014). Large-eared Pied Bat- profile. [Online]. Available from: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10157. [April 2017]	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Assessment of Significant Impact Criteria
for the
Swift Parrot (*Lathamus discolor*)

EPBC Act Status: Critically Endangered

Significant Impact criteria

An action is likely to have a significant Impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

▪ Lead to a long-term decrease in the size of a population	The proposed action is not likely to lead to a long-term decrease in the size of a population. Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. A small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development. Extensive suitable potential habitat for the species will remain within the broader subject site and in the adjacent Sydney Harbour National Park located in Bradleys Head, which provides approximately 30ha of suitable potential habitat for the species.
▪ Reduce the area of occupancy of the species	Based on the Taronga Zoo concept plan, it is predicted that no hollow-bearing trees will be lost as a result of the proposed development. In the unlikely event of the removal of a hollow-bearing tree, lost hollows will be replaced by augmented hollows. A small number of flowering and fruit-bearing trees and shrubs are predicted to be removed for the proposed development, however the exact number has not been identified. While these trees provide potential foraging and shelter for the species, many of these trees have been planted and are located in highly-disturbed areas with a high level of human traffic. As a result, it is likely that these trees provide sub-optimal ecological value to the species. A detailed pre-clearing survey and assessment will be required to quantify the exact number of fruit-bearing and flowering trees lost. Pre-clearing data will be maintained in a database and used to inform the proponent on the number of appropriate habitat replacement plantings required within the landscaping plan for those lost due to the proposed development.
▪ Fragment an existing population into two or more populations	The habitat available on the subject site for this species will not become fragmented from other areas as a result of the proposed development. As the species is highly mobile, minor loss of select trees and shrubs from within the subject site is not considered likely to significantly affect the species. Habitat connectivity will continue to occur in the adjoining section of the adjacent Sydney Harbour National Park in Bradleys Head.
▪ Adversely affect habitat critical to the survival of a species	The action will not adversely affect habitat critical to the survival of either of these species.
▪ Disrupt the breeding cycle of a population	There will be no disruption to the breeding cycle of a population. Although no individuals were observed on

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Swift Parrot (<i>Lathamus discolor</i>)	
EPBC Act Status: Critically Endangered	
	the site during field surveys, if the species were to pass through or utilise the subject site for breeding, extensive suitable breeding and foraging habitat will remain on the subject site and within the National Park post-development.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The action will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. The proposed development will be situated predominantly in a disturbed and altered landscape containing a large proportion of planted and self-sown trees which provide sub-optimal foraging habitat for the species in comparison to the extensive potential foraging habitat provided by the adjacent Sydney Harbour National Park in Bradleys Head.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	It is unlikely that the proposed action will result in invasive species that are harmful to the species becoming established in species' habitat.
Introduce disease that may cause the species to decline, or	The proposed action will not introduce disease that may cause the species to decline.
Interfere with the recovery of the species.	While some potential habitat trees may be removed as a result of the proposed action, it is not deemed that this removal of minor, intermittent habitat will interfere with the recovery of the species which roam over most of eastern and central NSW in search of optimal food resources. Potential Impacts are to be mitigated through the measures outlined in this report including the replacement of all potential feed trees removed, and the requirement for a qualified Ecologist to be present on site during tree removal to supervise works and provide assistance to any birds directly Impacted.
Conclusion There will be no significant Impact on Swift Parrot (<i>Lathamus discolor</i>) therefore the proposed action should not warrant a Commonwealth EPBC Act Referral.	
References NSW Office of Environment and Heritage (2017) Regent Honeyeater – profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10841 [May 017] NSW Office of Environment and Heritage (2017) Swift Parrot– profile http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10455 [May 2017]	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999
Assessment of Significant Impact Criteria
for the
Magenta Lilly Pilly (*Syzygium paniculatum*)

EPBC Act Status: Vulnerable

Significant impact criteria

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

• lead to a long-term decrease in the size of a population	The proposal will not lead to a long-term decrease in the size of a population. No individuals were found within the subject site, and no important local populations are known from the area. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
• reduce the area of occupancy of the species	The proposal will not reduce the area of occupancy of the species. No individuals were found within the subject site, and no important local populations are known from the area. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
• fragment an existing population into two or more populations	The proposed action will not fragment an existing population into two or more populations. No individuals were found within the subject site, and no important local populations are known from the area. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
• adversely affect habitat critical to the survival of a species	The proposal will not adversely affect habitat critical to the survival of a species. The habitat to be affected by the proposed works will only be the small area (1500m²) used for the construction of the Lion Enclosure.
• disrupt the breeding cycle of a population	There will be no disruption to the breeding cycle of a population. The works should have no impact.
• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. A pre-clearing survey

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Magenta Lilly Pilly (<i>Syzygium paniculatum</i>)	
EPBC Act Status: Vulnerable	
	should be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected within the subject site by the use of appropriate fencing around any individuals of the species. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
• result in invasive species that are harmful to a vulnerable species becoming established in the endangered or critically endangered species' habitat	It is unlikely that the proposed action will result in invasive species that are harmful to the species becoming established in species' habitat. No invasive species will be planted. Existing weeds will be managed and removed.
• introduce disease that may cause the species to decline, or	The proposed action presents a very low risk of introducing a novel disease which will affect the Magenta Lilly Pilly.
• interfere with the recovery of the species.	No actions associated with the proposed works or landscape plan will interfere with the recovery of the species.
Conclusion There will be no significant impact on Magenta Lilly Pilly therefore, the proposed action should not warrant a Commonwealth EPBC Act Referral.	
References Department of the Environment (2017). <i>Syzygium paniculatum</i> in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat . [May 2017]	

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Sunshine Wattle (<i>Acacia Terminalis</i>)	
EPBC Act Status: Endangered	
Significant impact criteria An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
• lead to a long-term decrease in the size of a population	The proposed action will not lead to a lead to a long-term decrease in the size of a population. The species has not been recorded in the subject site. Targeted searches of the species within the subject site were performed by the Nara Ecologist during the site survey and found no individuals of this species within the subject site, despite a number of records located within a close proximity to the subject site. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. Other areas within the subject site were landscaped and of reduced the suitability for the species to occur in. A pre-clearing survey will be undertaken by a qualified ecologist prior to any construction works within this area as well as the wider subject site. If the species is found during the pre-clearing survey, it will be retained and protected in situ within the subject site by the use of appropriate fencing around any individuals of the species. Alternatively, the individuals will be relocated elsewhere within the zoo grounds.
• reduce the area of occupancy of the species	The species has not been recorded within the subject site. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. Other areas within the subject site were landscaped and of reduced suitability and likelihood for species.
• fragment an existing population into two or more populations	The proposed action was considered unlikely to further fragment or isolated from other areas of habitat. A small area of potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. This will reduce the suitability of the habitat for this species, however as no individuals of the species occurred within the subject site, the species will not become fragmented or isolated.
• adversely affect habitat critical to the survival of a species	The action will not adversely affect habitat critical to the survival of this species. The habitat on the subject site is not considered important to the Netted Bottle Brush, as the species has never been recorded on the subject site. The habitat to be affected by the proposed works will only be the small area (1500m²) used for the construction of the Lion Enclosure.
• disrupt the breeding cycle of a population	There will be no disruption to the breeding cycle of a population. The works should have no impact.
• modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline A small area of low-quality potential habitat for the species (approximately 1500m²) will be modified for the construction of the Lion Enclosure. Surrounding areas of will be managed of weeds and replanted with locally

Commonwealth Environment Protection and Biodiversity Conservation Act 1999 Assessment of Significant Impact Criteria for the Sunshine Wattle (<i>Acacia Terminalis</i>)	
EPBC Act Status: Endangered	
	indigenous flora. This may improve habitat for the species. Extensive suitable habitat remains available for the species within the adjoining Sydney Harbour National Park.
• result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	It is unlikely that the proposed action will result in invasive species that are harmful to the species becoming established in species' habitat. No invasive species will be planted. Existing weeds will be managed and removed.
• introduce disease that may cause the species to decline, or	The proposed action presents a very low risk of introducing a novel disease which will affect the Sunshine Wattle.
• interfere with the recovery of the species.	The OEH (2017) lists a number of activities to assist in the conservation of the species. Those relevant include the following: ▪ Undertake appropriate weed control activities when necessary. ▪ Protect known sites from clearing and degradation. The proposed works are considered unlikely to result in an increased impact, under the provision that the mitigation recommendations outlined in this report are followed, particularly the mitigation that an Ecologist is able to conduct a pre-clearing assessment of the site. If any specimens are located during the pre-clearing assessment, they will be retained and protected in situ, or relocated elsewhere within the zoo grounds where they will be protected.
Conclusion There will be no significant impact on the Sunshine Wattle (<i>Acacia terminalis</i>) therefore, the proposed action should not warrant a Commonwealth EPBC Act Referral.	
References Department of the Environment (2017). <i>Acacia terminalis</i> in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: http://www.environment.nsw.gov.au/threatenedspeciesapp/profile.aspx?id=10028 [May 2017]	

**Commonwealth Environment Protection and Biodiversity Conservation Act 1999
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for the**

White-throated Needletail (*Hirundapus caudacutus*)

Fork-tailed Swift (*Apus pacificus*)

Satin Flycatcher (*Myiagra cyanoleuca*)

Rufous Fantail (*Rhipidura rufifrons*)

Black-faced Monarch (*Monarcha melanopsis*)

EPBC Act Status: Migratory

Given these birds have widespread distributions and occupancy of relatively broad habitats, these species or their habitats are often detected during surveys for environmental Impact assessments. Guidelines were developed to outline those circumstances where a significant Impact on one or more of these species is likely. In most cases, significant Impacts on these five birds are unlikely to occur and consideration for them in a referral is not required (Commonwealth of Australia 2015).

Urban areas are unlikely to contain important habitat or ecologically significant proportions of the population for any of the species (Commonwealth of Australia 2015).

References

Commonwealth of Australia (2015) 'Draft referral guideline for 14 birds listed as migratory species under the EPBC Act'