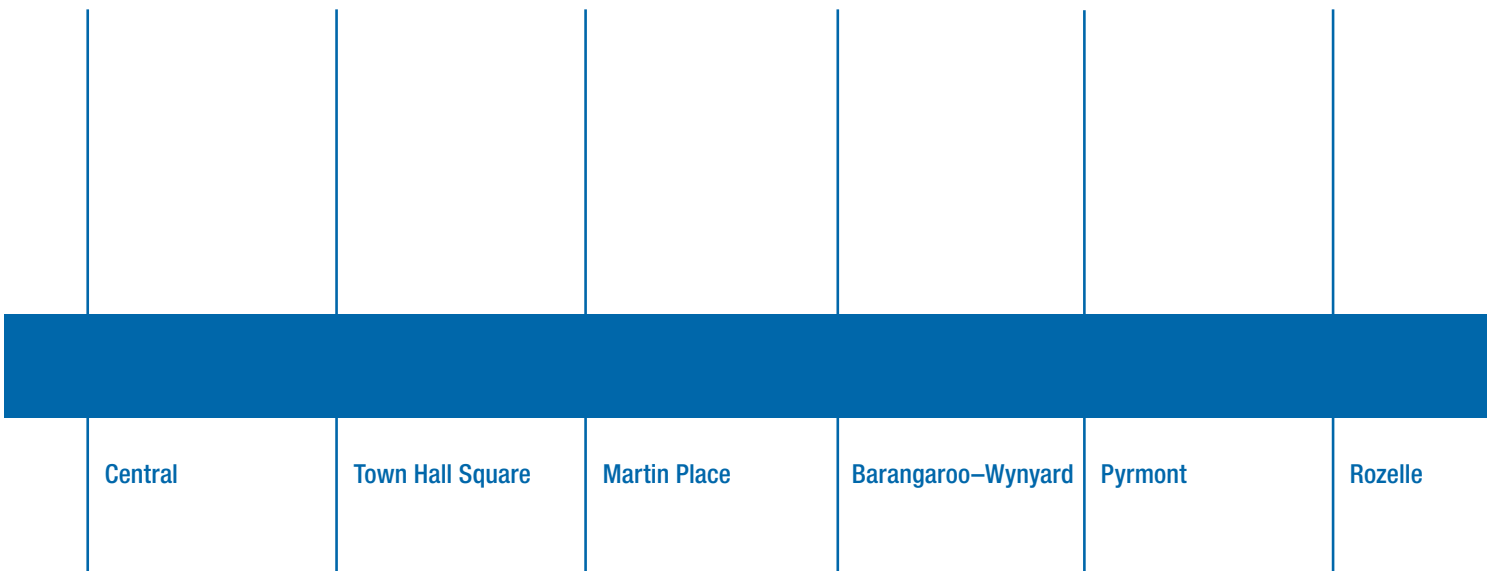




Technical Paper 7

Biodiversity assessment



CBD Metro

Environmental Assessment

Technical Paper 7 – Biodiversity Assessment

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This report is to be read in conjunction with the Environmental Assessment for the Sydney Metro Network Stage 1 (CBD Metro) project dated September 2009.

The project as described within the Environmental Assessment will prevail in the event of any inconsistency with the project as described in the following document.



1 Introduction

1.1 Background

This report provides details of an investigation of the biodiversity (flora and fauna) in the vicinity of the proposed CBD Metro project. The assessment focuses on the proposed surface construction areas associated with the project, as these present potential impacts to flora and fauna. Remaining underground components were not assessed. The three areas subject to detailed investigation (i.e. the study area) include:

- 1) The proposed stabling and maintenance depot located at Rozelle within the former Rozelle Marshalling Yard site.
- 2) The area at White Bay to be used as a construction and spoil removal site for the project. A provision for a future station to be constructed at White Bay has been included in the project.
- 3) The proposed construction area in Belmore Park.

1.2 Objectives

The specific objectives of this assessment were to:

- describe the biological environment at the described sites in relation to flora and fauna
- identify species, ecological communities and populations of local, regional, state and national conservation significance, and their habitats, which are known or considered likely to occur within the described lands affected by the proposal.
- assess the potential impacts of the route infrastructure on the ecological values (i.e. listed species and communities) according to the requirements of the relevant Commonwealth and NSW threatened species legislation.

1.3 Legislation

The information presented in the report is based on a review of available data and site investigations to assess the potential impacts of the proposal in relation to relevant State and Commonwealth environmental and threatened species legislation. Relevant legislation includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *Threatened Species Conservation Act 1995* (TSC Act).
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).



2 Preliminary review

2.1 Existing environment

The study area consists entirely of modified land previously cleared of all remnant vegetation. Some native and non-indigenous flora elements are present consisting of planted species, particularly at Belmore Park and landscaped gardens at the former Rozelle Marshalling Yards. In contrast, White Bay and the majority of the Rozelle site are colonised by exotic flora suited to the disturbed and modified landscape. Natural top soils at these latter sites has been replaced by introduced fill and compacted base materials from the former industrial uses which created an altered micro-environment unsuitable for regrowth of indigenous vegetation. Belmore Park comprises a park landscape with a ground cover of exotic grasses and several mature fig trees (*Ficus* spp) are represented.

2.2 Biodiversity databases

A background review of government maintained databases and other sources of data in relation to known records of threatened species in the study area was conducted prior to the field investigation to identify potential target species. The data used in this review included the:

- Department of Environment and Climate Change Atlas of NSW Wildlife
- database of the Royal Botanic Gardens PlantNET
<http://plantnet.rbgsyd.nsw.gov.au/search/simple.htm>
- records published in scientific journals, reports pertaining to the study area and general flora and fauna distribution texts
- results of local environmental studies, and studies done to support various environmental impact assessments
- other relevant databases including the National Herbarium, Department of Environment, Water, Heritage and the Arts (nationally threatened species, EPBC Act), and records published in the literature.

All of the threatened flora and fauna species, endangered populations and ecological communities known to occur within the study locality (i.e. a 10 kilometre radius of the study area) have been tabulated. This information was used in the preparation of lists of threatened species subject to further investigation as the first stage of the assessment.

2.3 Threatened flora

A total of 53 threatened flora species have been recorded previously in the study locality (defined as 10 kilometre radius of the study area) (refer Table 2.1) and their presence within the study area was investigated during the site surveys. This included an assessment of potential presence based on the known habitat preferences of the species.



Table 2.1 Threatened flora species of the study locality

Threatened flora	Status		
	Cwlth	NSW	RoTAP
<i>Acacia bynoeana</i>	V	E	3VC-
<i>Acacia gordonii</i>	E	E	2K
<i>Acacia pubescens</i>	V	V	3VCa
<i>Acrophyllum austale</i>	V	V	2VCi
<i>Ancistrachne maidenii</i>	-	V	2KC-
<i>Allocasuarina glareicola</i>	E	E	2E
<i>Astrotricha crassifolia</i>	V	V	2VC-
<i>Cynanchum elegans</i>	E	E	3ECi
<i>Darwinia biflora</i>	V	V	2VCa
<i>Darwinia peduncularis</i>	-	V	3RCi
<i>Dillwynia tenuifolia</i>	V	V	2RCa
<i>Diuris aequalis</i>	V	E	3VC-
<i>Epacris purpurascens</i> var. <i>purpurascens</i>	-	V	2KC-
<i>Epacris sparsa</i>	V	V	2VCi
<i>Eucalyptus benthamii</i>	V	V	2VCi
<i>Eucalyptus camfieldii</i>	V	V	2VCi
<i>Eucalyptus</i> spp. <i>cattai</i>	-	E	-
<i>Galium austral</i>	V	V	-
<i>Genoplesium baureri</i>	-	V	3RC-
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	-	V	-
<i>Grevillea parviflora</i> subsp. <i>parviflora</i>	V	V	-
<i>Grevillea parviflora</i> subsp. <i>supplicans</i>	-	E	-
<i>Gyrostemon thesioides</i>	-	E	2KC-
<i>Haloragis exalata</i> subsp. <i>exalata</i>	V	V	3VCa
<i>Hibbertia superans</i>	-	E	-
<i>Hypsela sessiliflora</i>	Ex	E	2X
<i>Kunzea rupestris</i>	V	V	2VCa
<i>Lasiopetalum joyceae</i>	E	E	2RC-
<i>Leptospermum deanei</i>	V	V	2V
<i>Leucopogon exolasius</i>	V	V	2VC-
<i>Leucopogon fletcheri</i> subsp. <i>fletcheri</i>	-	E	2RC-
<i>Melaleuca biconvexa</i>	V	V	-
<i>Melaleuca deanei</i>	V	V	3RC-
<i>Micromyrtus blakelyi</i>	V	V	2VCi



Threatened flora	Status		
	Cwlth	NSW	RoTAP
<i>Micromyrtus minutiflora</i>	V	E	2V
<i>Persicaria elatior</i>	V	V	3V
<i>Persoonia acerosa</i>	V	V	2VC-
<i>Persoonia bargoensis</i>	V	E	2V
<i>Persoonia hirsuta</i>	E	E	3KCi
<i>Persoonia mollis subsp. maxima</i>	E	E	2E
<i>Persoonia nutans</i>	E	E	2ECi
<i>Pilularia novae-hollandiae</i>	-	E	-
<i>Pimelea curviflora var. curviflora</i>	V	V	-
<i>Pimelea spicata</i>	E	E	3ECi
<i>Pomaderis brunnea</i>	V	V	2VC-
<i>Pterostylis saxicola</i>	E	E	-
<i>Pultenaea parviflora</i>	V	E	2E
<i>Pultenaea pedunculata</i>	-	V	-
<i>Rulingia prostrata</i>	E	E	2ECi
<i>Syzygium paniculatum</i>	V	V	3VCi
<i>Tetradlea glandulosa</i>	V	V	2VC-
<i>Wilsonia backhousei</i>	-	V	-
<i>Zieria involucrate</i>	E	V	2VCa

E – Endangered

V - Vulnerable

RoTAP – Rare or Threatened Australian Plants

2 – Restricted distribution – range extending over less than 100km

3 – Range more than 100km but in small populations

X – Presumed extinct – not collected for 50 years or the only known populations destroyed

R – Rare but with no current identifiable threat

K – Poorly known species suspected of risk

C – Species is known to occur within a proclaimed reserve

a – Species is considered to be adequately reserved. 1000 or more plants occur within a proclaimed reserve

i – Species is considered to be inadequately reserved. Less than 1000 plants occur within a proclaimed reserve

– Species is recorded from a reserve but the population size is unknown

2.4 Endangered ecological communities

A number of endangered ecological communities (EECs) listed under the TSC Act and EPBC Act are represented within the Sydney Basin. The presence of these within the three study areas was investigated during the site surveys and the results documented in the following chapter.

2.5 Threatened fauna

A total of 35 threatened fauna species have been recorded previously in the study locality (within a 10 kilometre radius of the study area) (refer Table 2.2). An assessment of the potential for these species to occur was conducted during the site survey. This was based on comparison of the habitats present.

Table 2.2 Threatened fauna species in the study locality

Threatened fauna	Status	
	NSW	C'wlth
Green and Golden Bell Frog <i>Litoria aurea</i>	E	V
Regent Honeyeater <i>Xanthomyza phrygia</i>	E	E
Swift Parrot <i>Lathamus discolor</i>	E	E
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	V	V
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	V	V
Cumberland Land Snail <i>Meridolum corneovirens</i>	E	
Koala <i>Phascolarctos cinereus</i>	V	
Eastern Pygmy-possum <i>Cercartetus nanus</i>	V	
Yellow-bellied Glider <i>Petaurus australis</i>	V	
Squirrel Glider <i>Petaurus norfolcensis</i>	V	
East Coast Freetail-bat <i>Mormopterus norfolcensis</i>	V	
Large Bent-wing Bat <i>Miniopterus schreibersii</i>	V	
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	V	
Large-footed Myotis <i>Myotis macropus</i>	V	
Eastern False Pipistrelle <i>Falsistrellus tasmaniensis</i>	V	
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	V	
Giant Burrowing Frog <i>Heleioporus australiacus</i>	V	
Red-crowned Toadlet <i>Pseudophryne australis</i>	V	
Freckled Duck <i>Stictonetta naevosa</i>	V	
Blue-billed Duck <i>Oxyura australis</i>	V	
Australasian Bittern <i>Botaurus poiciloptilus</i>	V	
Black Bittern <i>Ixobrychus flavicollis</i>	V	
Square-tailed Kite <i>Lophoictinia isura</i>	V	
Grey Falcon <i>Falco hypoleucos</i>	V	
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	V	
Superb Parrot <i>Polytelis swainsonii</i>	V	
Turquoise Parrot <i>Neophema pulchella</i>	V	
Barking Owl <i>Ninox connivens</i>	V	
Masked Owl <i>Tyto novaehollandiae</i>	V	



Threatened fauna	Status	
	NSW	C'wlth
Powerful Owl <i>Ninox strenua</i>	V	
Grass Owl <i>Tyto capensis</i>	V	
Sooty Owl <i>Tyto tenebricosa</i>	V	
Black-chinned Honeyeater <i>Melithreptus gularis</i>	V	

E – Endangered

V - Vulnerable



3 Site assessment

3.1 Methods

Inspections and surveys of the three study areas were conducted on the 5 March and 17-18 March 2009 to identify the extent and quality of any flora and fauna habitats and species present. The survey aimed to identify the presence of listed threatened species or their habitat potentially affected by the proposal, in addition to any listed Endangered Ecological Communities as identified in section 2 of the report.

The condition of any vegetation within the study area was noted, including the extent of modification and weed invasion. The field surveys were based on precautionary habitat assessment and the adoption of protective strategies for features deemed likely to be critical habitat for threatened flora and fauna species known from the region. During the survey, all opportunistic sightings of fauna species were recorded.

3.2 Results

3.2.1 Belmore Park

Belmore Park is a heavily used public area and is landscaped with planted trees, lawn and paths. Mature trees mostly include London Plane (*Platanus x hispanica*), Cabbage Palm (*Livistona australis*), Brush Box (*Lophostemon confertus*), Morton Bay Fig (*Ficus macrophylla*) and Port Jackson Fig (*Ficus rubiginosa*). Some exotic shrubs occur in the central and western garden beds and the remaining areas are lawn or pavement (Plates 3.1- 3.6).

Beneath each Morton Bay Fig a large number of chewed fruit were observed (Plate 3.4). These were most likely discarded by Grey-headed Flying-fox (*Pteropus poliocephalus*), listed as Vulnerable under both the TSC Act and EPBC Act. The species is known to forage in the area and maintains a seasonal roosting camp in the nearby Royal Botanic Gardens. No other trees were considered likely to provide foraging resources at the time of the survey, as few were fruiting. Figs are a favoured fruit resource for the Grey-headed Flying-fox, and Belmore Park contains a total of five (5) mature trees and two (2) juvenile trees.

Other fauna species observed during the site visit included the introduced Rock Dove (*Columba livia*), native Silver Gull (*Larus novaehollandiae*) and Australian White Ibis (*Threskiornis molucca*) (Plate 3.6). These bird species are adapted to urban environments and are recognised as pest species when existing in concentrated areas such as parks.





Plate 3.1 Western garden bed



Plate 3.2 London Plane Trees



Plate 3.3 Port Jackson Figs



Plate 3.4 Chewed fig fruits



Plate 3.5 Morton Bay Fig



Plate 3.6 Common birds flocking around a bin



3.2.2 White Bay and Rozelle sites

Both sites are completely modified landscapes consisting of formerly cleared land and occupied by industrial or transport infrastructure. No natural habitats or remnant vegetation is present and the flora is dominated by exotic species and a suite of weed species mainly Blackberry (*Rubus fruticosus*), Lantana (*Lantana camara*), Bamboo (*Phyllostachys aurea*) and various exotic grasses and groundcovers (Plates 3.7-3.10).

Fauna habitats are completely modified and urban in nature consisting of piles of construction rubble and decommissioned rail infrastructure with some fringing exotic vegetation. There is no surface water (ponds or creeks) in the construction areas, and hence no potential habitat for aquatic species such as the Green and Golden Bell Frog (*Litoria aurea*) which is listed as endangered on both the EPBC Act and TSC Act.

A subterranean tunnel used for cabling (Plate 3.11) was observed to be partially open revealing a large and partly flooded tunnel which could potentially provide roosting habitat for microchiropteran bat species (referred to as microbats). A number of species roost in caves or artificial structures which substitute for this habitat type in urban areas. One such bat species the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*), listed as Vulnerable under the TSC Act has been recorded in several Local Government Areas in Sydney and is known to roost in drains and tunnels.

Additional targeted surveys were conducted to confirm the presence or absence of this bat species by watching the entrance to the tunnel from before sunset to one hour after dark on two separate evenings (17-18 March). Surveys were conducted in the appropriate time of year for detection of the species. Additionally an audio bat detector (Anabat unit) was also placed at the entrance to the tunnel to record the calls of any bats which emerged so that the species could be identified through analysis of the call frequency.

No bats were detected from within the tunnel and it is considered unlikely to be currently used as a roost site. A Grey-headed Flying-fox was observed foraging in the fruit trees within a residence to the north-west of the site.



Plate 3.7 White Bay



Plate 3.8 White Bay





Plate 3.9 Former Rozelle marshalling yards



Plate 3.10 Former Rozelle marshalling yards



Plate 3.11 Subterranean tunnel

3.3 Threatened species

The presence of the listed Grey-headed Flying Fox (*Pteropus poliocephalus*) was identified at Belmore Park through evidence of occasional foraging use of the planted figs in the park.

No other threatened flora and fauna species were identified from the site surveys. All three sites are considered highly unlikely to provide potential habitat for listed flora species due to the highly altered state of these sites.

Apart from the Grey-headed Flying-fox, any use of the study sites by threatened fauna would be restricted to possible foraging activities by insectivorous and urban dwelling bats such as the Eastern Bent-wing Bat (*M. schreibersii*). Within the Sydney area this species has adapted to foraging in urban areas and these sites do not present any particularly unique characteristics that would attract them to the site, other than a large open expanse which is common in the locality.

None of the three sites surveyed was considered to provide potential habitat for the endangered Green and Golden Bell Frog (*Litoria aurea*).



3.4 Endangered ecological communities

No listed endangered ecological communities are represented at the three study sites which are completely devoid of remnant vegetation.

3.5 Conservation values

The three study areas are completely modified with a notable absence of native flora and vegetation types, dominance by weeds and very limited fauna habitat. All fauna observed and considered to occur are urban dwelling species or populations adapted to the modified landscape including the listed Grey-headed Flying-fox.

As a result these sites are not considered to present any unique or significant conservation values for listed flora and fauna.



4 Impact assessment

4.1 General impacts

The lack of native flora and fauna, vegetation and habitats in the three study areas is reflective of the extent of modification to the urban landscape at these locations and suggests that any impact to flora and fauna would be localised and short-term. In particular the sites at White Bay and Rozelle provide little to no value for native flora and fauna, having been completely modified in terms of resource availability. A survey of these sites identified an absence of listed species and communities and no conservation value.

The impacts at Belmore Park would be associated with the loss of a few planted and mature fig trees to accommodate the construction site. No other native flora is present. These trees are likely to provide roosting and refuge habitat for a range of common urbanised bird populations and a seasonal food source for the Grey-headed Flying-fox population known from a roost site in the Royal Botanic Gardens in Sydney.

Grey-headed Flying-foxes, particularly urban populations, are threatened by loss of foraging habitat and destruction of roost sites (Tidemann 1995; NSW Scientific Committee 2001). Habitat loss has resulted in a decrease in the variety of flowering and fruiting tree species thus reducing food plants that may be able to tolerate changing weather patterns and those that usually have a high nectar output (Birt 2000).

Flying-foxes are able to use blossom, fruit and leaf from a variety of native and introduced plants. An observational study and survey of foraging activity in suburban Sydney (Parry-Jones and Augee 1991) identified plants from the native families Myrtaceae and Proteaceae as the most commonly reported nectar and blossom source, while native figs were the most frequent fruit consumed. These authors also reported that a large number of plant species provide food sources where urbanisation has led to replacement of original forest with a variety of species both exotic and native. Species such as figs which have been planted in urban areas are important because of the extent of clearing of native forest which has occurred.

Apart from the Grey-headed Flying-fox, any use of the three study areas by threatened fauna would be restricted to possible foraging activities by insectivorous and urban dwelling listed bats such as the Eastern Bent-wing Bat (*Miniopterus schreibersii oceanensis*). Within the Sydney area this species has adapted to foraging in urban areas (Hoye and Spence 2004). The study areas do not appear to present any particularly unique characteristics that would attract microbats to the site other than a large open expanse encouraging a density of flying insects (potential prey) which is common in the locality. A potentially roosting opportunity for this species was investigated and found not to be in occupation.

4.2 NSW Threatened Species Assessment

An assessment of the impacts of this proposal on the Grey-headed Flying-fox (Schedule 2 Vulnerable Species: TSC Act) has been undertaken. The proposal is to be assessed under Part 3A of the EP&A Act and consequently this impact assessment was undertaken in accordance with the Draft Guidelines for Threatened Species Assessment (DEC 2005) (refer Appendix A).

The assessment concluded that the proposed removal of fig trees from Belmore Park is likely to result in the loss of a portion of the seasonal food resources available to the Botanic Gardens population.



However sufficient food resources are widely available and distributed through the locality (including large numbers of fig trees) such that the proposal is not considered to present a significant impact to the population. The planting of mature fig trees as an additional food resource, in any nearby landscaping proposed or in any site rehabilitation required at Belmore Park and/or Rozelle and White Bay would be beneficial for the Grey-headed Flying-fox,

The proposal would not impose a significant impact on threatened insectivorous bats.

4.3 Commonwealth Threatened Species Assessment

The project has a statutory responsibility to comply with the requirements and intent of the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) in relation to the protection and management of listed threatened species. This assessment deals specifically with the significance of impacts from the proposed project on the Nationally threatened Grey-headed Flying-fox.

The assessment concluded that the proposed removal of fig trees from Belmore Park is likely to result in the loss of a portion of the seasonal food resources available to the Botanic Gardens population. However sufficient food resources are widely available and distributed through the locality (including large numbers of fig trees) such that the proposal is not considered to present a significant impact on this population. The planting of mature fig trees as an additional food resource in any nearby landscaping proposed or in any site rehabilitation required at Belmore Park and/or Rozelle and White Bay would be beneficial for the Grey-headed Flying-fox,



5 Recommendations

5.1 Avoidance

Construction of the proposed tunnelling infrastructure at Belmore Park should restrict vegetation clearance wherever possible, particularly the removal of large fig trees. Pruning of such trees is preferred over total removal where this is applicable. Lopping and direct avoidance should always be used to protect trees wherever possible.

Where a trees' presence is problematic, consideration should be given to the use of smaller, more manoeuvrable equipment to minimise the disturbance necessary and protect trees. Smaller equipment should be available during all stages of the construction and be utilised in all areas where a minimised disturbance area is required to preserve trees adjacent to the construction site.

5.2 Mitigation

The planting of mature fig trees as an additional food resource, in any nearby landscaping proposed or in any site rehabilitation required at Belmore Park and/or Rozelle and White Bay would be beneficial for the Grey-headed Flying-fox.



6 Conclusions

The information presented in this report has utilised site investigations and a review of available data and literature to assess the potential impacts of the proposed surface works associated with the CBD Metro project in relation to relevant NSW and Commonwealth threatened species legislation.

The assessment has addressed the potential impacts on the Grey-headed Flying fox and insectivorous bats as the only threatened flora or fauna species considered to potentially utilise the three study areas. The assessment has concluded that the proposed project is unlikely to impose a 'significant impact' on local populations of these threatened species.

Methods to avoid and minimise tree loss are provided in the report along with the suggestion of replacement of trees to be removed and should be considered in the final design and construction phases of the project.



7 References

- Auld, B.A. & Medd, R. W., 1987, *Weeds - An illustrated botanical guide to the weeds of Australia*. Dept. of Agriculture, Inkata Press, Melbourne.
- Benson, D and Howell, J. 1994. *The natural vegetation of the Sydney 1:100 000 mapsheet*. *Cunninghamia* 3(4): 677-729.
- Birt, P. (2000). Summary Information on the Status of the Grey-headed (*Pteropus poliocephalus*) and Black (*P. alecto*) Flying-fox in New South Wales. **In:** *Proceedings of a Workshop to Assess the Status of the Grey-headed Flying-fox in New South Wales, Unpublished report to the NSW Threatened Scientific Committee*.
- Dickman, C. 1991, Use of trees by ground-dwelling mammals: implications for management, pp. 125 - 136 in *Conservation of Australia's Forest Fauna*, Ed. Lunney, D. Royal Zoological Society of NSW and Surrey Beatty and Sons, Mosman.
- Eby, P. (1995). The biology and management of flying foxes in NSW. **In:** *Species Management Report*, No 18. Hurstville : NSW parks and Wildlife Service.
- Harden, G. J. (Ed). 2000, *Flora of New South Wales Vol 1 (Revised)*. Royal Botanic Gardens, Sydney.
- Harden, G. J. (Ed). 2002, *Flora of New South Wales Vol 2 (Revised)*. Royal Botanic Gardens, Sydney.
- Harden, G. J. (Ed). 1992, *Flora of New South Wales Vol 3*. Royal Botanic Gardens, Sydney.
- Harden, G. J. (Ed). 1993, *Flora of New South Wales Vol 4*. Royal Botanic Gardens, Sydney.
- Hoye, G. and Spence, J. 2004. *The Large Bent-wing Bat *Miniopterus schreibersii* in Urban Environments: A survivor*. In D.Lunney and S.Burgin (2004). *Urban Wildlife: more than meets the eye*. Pp 138-147. Royal Zoological Society of New South Wales, Mosman, NSW.
- James, T., McDougall, L. and Benson, D. 1999. *Rare Bushland Plants of Western Sydney*, Royal Botanic Gardens, Sydney.
- Lazarides M., Cowley K. & Hohnen P. 1997, *CSIRO Handbook of Australian Weeds*. CSIRO Publishing , Collingwood Victoria.
- NPWS, 2000. *Vegetation of the Cumberland Plain, Western Sydney*. NPWS, Hurstville, NSW.
- NSW Scientific Committee 2001. Grey-headed flying fox - Vulnerable species determination - final. DEC (NSW), Sydney.
- Pizzey, G. & Knight, F. 1997, *Field Guide to the Birds of Australia*. Angus & Robertson, Sydney.
- Robinson, L. 1991, *Field Guide to the Native Plants of Sydney*. Kangaroo Press, NSW.



Tidemann, C.R. 1995. Grey-headed Flying-fox *Pteropus poliocephalus* Temminck, 1925. In The Australian Museum Complete Book of Australian Mammals. Strahan, R. (ed.) Reed Books, Sydney.

Urban Bushland Biodiversity Survey 1996, *Significant or Poorly Known Plant Species of Western Sydney*, (Unpub.), National Parks and Wildlife Service.



Appendix A Assessment of Significance (Part 3A EP&A Act 1979)

A.1 Grey-headed Flying-fox

How is the proposal likely to affect the life-cycle of a threatened species and/or population?

There would be no direct or indirect impact on the roosting and breeding activities of the species as a result of the proposal. The removal of fig trees at Belmore Park is likely to result in the loss of a proportion of the seasonal food resources available to the Botanic Gardens population.

Flying-foxes are able to use blossom, fruit and leaf from a variety of native and introduced plants. An observational study and survey of foraging activity in suburban Sydney (Parry-Jones and Augee 1991) identified plants from the native families Myrtaceae and Proteaceae as the most commonly reported nectar and blossom source while native figs were the most frequent fruit consumed. These authors also reported that a large number of plant species provide food sources where urbanisation has led to replacement of original forest with a variety of species both exotic and native. Species such as figs which have been planted in urban areas are important because of the extent of clearing of native forest which has occurred.

While there is no data available on the number of mature fig trees and other known food plants present in gardens and parks throughout the range of the local population, this collective resource is considered to be sufficiently large to accommodate the small loss associated with this project. This loss of tree is not expected to significantly affect the seasonal foraging requirements of the local population.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The removal of fig trees at Belmore Park is likely to result in the loss of a proportion of the seasonal food resources available to the Botanic Gardens population. While there is no data available on the number of mature fig trees and other known food plants present in gardens and parks throughout the range of the local population, this collective resource is considered to be sufficiently large to accommodate the small loss associated with this project. This loss of tree is not expected to significantly affect the seasonal foraging requirements of the local population.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Grey-headed Flying-fox occurs along the east coast of Australia from Rockhampton in Queensland to western Victoria (Churchill 1998) and is not at the limit of its known distribution in the Sydney CBD area.

How is the proposal likely to affect current disturbance regimes?

All three study areas are characterised by completely modified and disturbed habitat. Further disturbance to natural regimes is not possible.

How is the proposal likely to affect habitat connectivity?

The Grey-headed Flying-fox is a highly mobile species capable of flying considerable distances to access seasonal food resources. The proposal would not impact on habitat connectivity or the movements of this species.



How is the proposal likely to affect critical habitat?

The small loss of fig trees associated with the proposed works at Belmore Park is not considered critical habitat for the local population.

A.2 Microchiropteran Bats

How is the proposal likely to affect the life-cycle of a threatened species and/or population?

Any use of the three study areas by insectivorous bats would be for occasional hunting / foraging of insect prey and could be reasonably expected given the large open expanse and presence of artificial lighting in the vicinity of these sites which would act as an attractant. The construction activities associated with the project would not remove the current potential for insectivorous bats to forage over the site.

An inspection and nocturnal survey of these areas identified an absence of roosting habitat (i.e. tree hollows or artificial tunnels / caves) indicating there would be no impacts to roosting / refuge or breeding events which are dependent on roosting habitat.

How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

An inspection and nocturnal survey of the three study areas identified an absence of roosting habitat (i.e. tree hollows or artificial tunnels / caves). The site provide potential foraging habitat, which would remain post construction.

Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

The Sydney CBD area does not represent the limit of distribution for any listed insectivorous bat species.

How is the proposal likely to affect current disturbance regimes?

All three study areas are characterised by completely modified and disturbed habitat, further disturbance to natural regimes is not possible.

How is the proposal likely to affect habitat connectivity?

Insectivorous bats are highly mobile species capable of flying considerable distances to access preferred habitats and foraging areas. The proposal would not impact on habitat connectivity or the movements of these species.

How is the proposal likely to affect critical habitat?

There would be no impact on critical habitat on the basis that the three study areas provide only marginal and locally common potential foraging habitat. No known roost sites were identified and roosting habitat is absent.



Appendix B Assessment of Significance on MNES (EPBC Act)

B.1 Grey-headed flying-fox

Lead to a long-term decrease in the size of an important population;

The urban population residing in the Royal Botanic Gardens may be considered an important population given the locality and profile. Given the existing modified condition of the habitats in the Belmore Park study area, the planted trees to be removed are considered to only provide low to moderate value for the Grey-headed Flying-fox population and represent a small proportion of the food resource accessed by this population. Any use of the site habitats is likely to be sporadic. The assessment concludes that the site habitats to be disturbed are considered too small and modified to sustain an ecologically significant proportion of the population.

Reduce the area of occupancy of an important population;

The assessment concludes that the site habitats to be disturbed are considered too small and modified to sustain an ecologically significant proportion of the local population of Grey-headed Flying Fox. These highly mobile species would range over a considerable portion of urban Sydney and the proposal would not reduce this area of occupancy.

Fragment an existing important population into two or more populations;

The three study areas do not appear to form part of a continuous corridor or provide a strategic connection linking other isolated fragments of habitat in the locality and the proposal would not isolate habitat for this species or fragment the population. There would be no direct impacts to known roosting habitat.

Adversely affect habitat critical to the survival of a species;

Critical habitat includes breeding, sheltering and movement habitats. Although a small area of known foraging habitat would need to be removed for the proposal, extensive areas of potential foraging habitat for this species are present throughout the locality. It is unlikely that habitat critical to the survival of this species would be adversely affected as a consequence of the proposal.

Disrupt the breeding cycle of an important population;

The site does not provide breeding habitat for this species, for example no roosting sites for the Grey-headed Flying-fox were identified.

Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;

The assessment concludes that the site habitats to be disturbed are considered too small and modified to sustain an ecologically significant proportion of the local population of Grey-headed Flying-fox.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;

It is considered unlikely that the proposal would increase the potential for exotic species to become established at Belmore Park. The use of figs in any rehabilitation of the site post-construction would be beneficial for the Grey-headed Flying-fox.



Introduce disease that may cause the species to decline; or

It is considered unlikely that the proposal would introduce any diseases.

Interfere with the recovery of the species.

It unlikely that the proposed removal of a small number of fig trees would interfere with the recovery of this species nationally.



