APPENDIX 3

SECTION 5A ASSESSMENTS
"SEVEN PART TESTS"

Swamp Sclerophyll Forest

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions is listed as an Endangered Ecological Community under the NSW Threatened Species Conservation Act (1995). It is not listed under the schedules of the Commonwealth Environmental Protection and Biodiversity Conservation Act (1999).

Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions includes and replaces Sydney Coastal Estuary Swamp Forest in the Sydney Basin bioregion Endangered Ecological Community.

This community is associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains (NSW Scientific Committee 2011). It occurs typically as open forests to woodlands, although partial clearing may have reduced the canopy to scattered trees or scrub. The understorey may contain areas of fernland and tall reedland or sedgeland which in turn may also form mosaics with other floodplain communities and often fringe wetlands with semi-permanent standing water (NSW Scientific Committee 2011).

Swamp Sclerophyll Forest on Coastal Floodplains generally occurs below 20 metres ASL, often on small floodplains or where the larger floodplains adjoin lithic substrates or coastal sand plains (NSW Scientific Committee 2011).

The species composition of Swamp Sclerophyll Forest is primarily determined by the frequency and duration of waterlogging and the texture, salinity nutrient and moisture content of the soil. The species composition of the trees varies considerably, but the most widespread and abundant dominant trees include *Eucalyptus robusta* Swamp Mahogany, *Melaleuca quinquenervia* and, south from Sydney, *Eucalyptus botryoides* Bangalay and *Eucalyptus longifolia* Woollybutt (OEH 2015a).

Other trees may be scattered throughout at low abundance or may be locally common at few sites, including *Callistemon salignus* Sweet Willow Bottlebrush, *Casuarina glauca* Swamp Oak and *Eucalyptus resinifera* subsp. *hemilampra* Red Mahogany, *Livistona australis* Cabbage Palm and *Lophostemon suaveolens* Swamp Turpentine (OEH 2015a).

A layer of small trees may be present, including *Acacia irrorata* Green Wattle, *Acmena smithii* Lilly Pilly, *Elaeocarpus reticulatus* Blueberry Ash, *Glochidion ferdinandi* Cheese Tree, *Melaleuca linariifolia* and *M. styphelioides*. Shrubs include *Acacia longifolia, Dodonaea triquetra, Ficus coronata, Leptospermum polygalifolium* subsp. *polygalifolium* and other *Melaleuca* species. Occasional vines include *Parsonsia straminea, Morinda jasminoides* and *Stephania japonica* var. *discolor*.

The groundcover is composed of abundant sedges, ferns, forbs, and grasses including *Gahnia clarkei, Pteridium esculentum, Hypolepis muelleri, Calochlaena dubia, Dianella caerulea, Viola hederacea, Lomandra longifolia, Entolasia marginata* and *Imperata cylindrica* (OEH 2015a).

Swamp Sclerophyll Forest has been extensively cleared and modified. Large areas that formerly supported this community are occupied by exotic pastures grazed by cattle, market gardens, other cropping enterprises and, on the far north coast, canefields. The remaining area of Swamp Sclerophyll Forest on Coastal Floodplains is likely to represent much less than 30% of its original range (NSW Scientific Committee 2011).

A small minority of the remaining area occurs on public land and the remaining stands are severely fragmented by past clearing and further threatened by continuing fragmentation and degradation, flood mitigation and drainage works, landfilling and earthworks associated with urban and industrial development, pollution from urban and agricultural runoff, weed invasion, overgrazing, trampling and other soil disturbance by domestic livestock and feral animals including pigs, activation of 'acid sulfate soils', removal of dead wood and rubbish dumping. Relatively few examples of Swamp Sclerophyll Forest on Coastal Floodplains remain unaffected by weeds.

Small areas of Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions are contained within existing conservation reserves, including Bungawalbin, Tuckean and Moonee Beach Nature Reserves, and Hat Head, Crowdy Bay, Wallingat, Myall Lakes and Garigal National Parks (NSW Scientific Committee 2011).

This vegetation type occurs in the intact swales at the western edge of the 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,

Response:

This question is not relevant to an endangered ecological community.

(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,

Response:

This question is not relevant to an endangered ecological community.

(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

Response:

The proposed works will not remove any of this community or its habitat on site. It is to be retained in its entirety and be subject to conservation management, with an emphasis on weed control. It will be further protected from edge effects by the presence of a substantial buffer of Low Acacia Woodland.

The proposal is unlikely to place the local occurrence of this community at risk of extinction.

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

Response:

No works are to occur in or close to the footprint with this vegetation community remaining intact. Sediment and stormwater controls will also prevent degradation of its habitat.

(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

Response:

The proposed works will not remove or modify any of the extent of this community on site.

(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

Response:

In the local area the connectivity of this vegetation will be maintained.

(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,

Response:

The proposed works will not remove or modify or fragment any of the extent of this community on site therefore, will not impact on the long-term survival of this community.

(e) whether the action proposed is likely to have an adverse effect on critical habitat

(either directly or indirectly),

Response:

No critical habitat has been declared for this endangered ecological community.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

OEH is currently developing a targeted approach for managing Ecological Communities. In the interim, the following management actions have been identified for this community (OEH 2015b):

1. Undertake research to determine minimum fire frequency.
2. Collate existing information on vegetation mapping and associated data for this EEC and identify gaps in knowledge. Conduct targeted field surveys and ground truthing to fill data gaps and clarify condition of remnants.
3. Prepare identification and impact assessment guidelines and distribute to consent and determining authorities.
4. Use mechanisms such as Voluntary Conservation Agreements to promote the protection of this EEC on private land.
5. Liaise with landholders and undertake and promote programs that ameliorate threats such as grazing and human disturbance.
6. Enhance the capacity of persons involved in the assessment of impacts on this EEC to ensure the best informed decisions are made.
7. Undertake weed control for Bitou Bush and Boneseed at priority sites in accordance with the approved Threat Abatement Plan and associated PAS actions.
8. Identify and prioritise other specific threats and undertake appropriate on-ground site management strategies where required.
9. Investigate the ecology of Swamp sclerophyll forest species with particular emphasis on the importance of drying and wetting cycles in maintaining ecosystem health.
10. Determine location, species composition and threats to remaining remnants to assist with prioritising restoration works.
11. Collect seed for NSW Seedbank. Develop collection program in collaboration with Botanic Gardens Trust - all known provenances (conservation collection).
12. Investigate seed viability, germination, dormancy and longevity (in natural environment and in storage).

A number of specific recovery activities have also been identified (OEH 2015a):

1. Instigate pig, deer and goat control programs;
2. Ensure that the fire sensitivity of the community is considered when planning hazard reduction and asset management burning;
3. Protect habitat by minimising further clearing of the community. This requires

recognition of the values of all remnants in the land use planning process, particularly development consents, rezonings and regional planning;
4. Promote regeneration by avoiding prolonged or heavy grazing; and
5. Undertake restoration including bush regeneration, revegetation and weed control, and promote public involvement in this restoration.

The entire occurrence of this community and surrounding vegetation on site will be retained.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation", but not within the habitat of this community.

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Phaius australis Lesser Swamp Orchid

Phaius australis is listed as Endangered under Schedule 2 of the Threatened Species Conservation Act (1995). This species is listed as Endangered under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

Phaius australis is one of the largest species of ground orchids in Australia (NSW Scientific Committee 1998). Its flower stems can grow up to 2 metres tall and has large broad leaves with a pleated like appearance (OEH 2015a).

It has had a problematic taxonomic history with the use of several names and the mixing up of at least three taxa. A full account of the resolution of its taxonomy is provided by the Commonwealth Department of the Environment (2015). All *Phaius* species in NSW are now considered to be *Phaius australis* and probably occurs as far south as Lake Cathie (DE 2015).

Since European settlement, 95% of the original populations of this species in north east NSW and south east Queensland have become extinct. Large populations persisted until the mid 1970s on the Gold Coast and until the mid 1980s on the Sunshine Coast (Benwell 1994b, quoted in DE 2015). At the time of listing, there were approximately 180 individuals known to occur in the wild in SNW (NSW Scientific Committee 1998). In NSW, populations are reserved in Broadwater, Yuraygir, and Bundjalung National Parks and in an area zoned for environmental protection in the Ballina LGA.

This species occurs in swampy grasslands or swampy forest, including rainforest, and typically at the margins (DE 2015). In NSW it is particularly known to grow in *Melaleuca quinquenervia* swamps (PlantNet 2015), where it can form dense colonies (Jones et al. 2010). Other than *Melaleuca quinquenervia* Broad-leaved Paperbark, associated species often include *Corymbia intermedia* Pink Bloodwood, *Lophostemon confertus* Brush Box, *Callitris columellaris* and *Banksia* species (Redland City Council, no date) or rainforest elements such as *Archontophoenix cunninghamiana* Bangalow Palm and *Livistona australis* Cabbage Tree Palm (DE 2015).

It occurs on a range of soils, from acidic waterlogged peat (pH 4.2) to peaty-sand (pH 7.0) (DE 2015). Soil parent materials include marine aeolian sand (most common), alluvium, granite, metasediments, hailstone gravel and sandstone. Soil types on sand range from shallow peat to humus/groundwater podzol (DE 2015).

It is thought that species in this genus are pollinated by bees but this species may also self-pollinate (DE 2015). All orchids require a highly specialized fungal association to germinate in the wild but nothing is yet known of the specific orchid mycorrhizal fungi involved in this association (DE 2015).

In areas where other member of the *Phaius* genus occur (such as in south east Queensland), survey must be conducted in the flowering season (spring) as they are only distinguishable by characteristics of the flower (DE 2015).

The most significant threat to this species is the illegal collection for horticulture or cut flowers as orchid enthusiasts regard the species as being one of the most desirable for collection. The threat of land clearing remains a major threat to the small population (OEH 2015a) as do fire and weed infestations (particularly *Lantana camara* Lantana) (DE 2015).

This species was not recorded on the subject site but was recorded from swamp forest directly to the north by Fitzgerald (2005). Potential habitat for this species occurs on the subject site in the Swamp Sclerophyll Forest along its western boundary.

(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,

Response:

Important aspects of the life cycle for this species are associated with the presence of appropriate habitat and soil fungi. The presence of pollinators is not critical. Past lands uses on this site have likely alienated all but the uncleared intact dune-swale sequence at the western boundary where remnant Swamp Sclerophyll Forest persists. The high intensity fires have also probably rendered much of the potential habitat on site unsuitable.

The proposal is restricted to the highly modified parts, distant from the area of potential habitat and so will not alter the life cycle triggers for this 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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

The potential habitat on site is within the remnant swamp forest vegetation on the western boundary. This area will be wholly retained and managed for conservation purposes. No area of suitable potential habitat will be removed or modified on site.

(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

Response:

The proposed works will retain the area of potential habitat and its connectivity to realised habitat to the north will be maintained. Therefore the proposed works will not fragment or isolate habitat for this species.

(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,

Response:

The proposed works will not remove or modify or fragment any of the extent of habitat for this species on site. The proposal is unlikely to result in a significant adverse impact to the long term survival of this threatened species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

There has been no critical habitat declared for this species in NSW.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

This species has been addressed in a Recovery Plan (Benwell 1994) but due to it containing information that may aid in its illegal collection, it is generally unavailable.

This species has been assigned to the "site-managed" management stream by the Office of Environment and Heritage, as it is considered that this species can be successfully secured by carrying out targeted conservation projects on specific sites. OEH have nominated 5 such sites, the closest being on public land at Iluka (OEH 2015b), which is probably the population in Bundjalung National Park.

The objectives of the management actions to be undertaken in this population are:

1. Minimise illegal collection;
2. Maintain appropriate fire regime;
3. Reduce and maintain weed densities at low levels;
4. Reduce and maintain feral pig densities at low levels; and
5. Track species abundance and condition over time.

The following recovery activities have also been identified for this species (OEH 2015a)

1. View and photograph native orchids but leave them in the wild;
2. Buy plants only from licensed nurseries;
3. Assist with the control feral pigs;
4. Protect areas of habitat from frequent fire;
5. Protect areas of habitat from pollution;
6. Fence off swampy areas to exclude stock;
7. Control weeds;
8. Protect areas of habitat from clearing, draining or development; and
9. Report any records to the DEC.

The proposal retains the area of potential habitat with a vegetated buffer between it and the proposed development. The proposal will remove weeds in the areas to eb cleared and the retained vegetation is to be managed for conservation. These actions are consistent with these recovery strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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Acronychia littoralis Scented Acronychia

Achronychia littoralis is listed as Endangered under Schedule 2 of the Threatened Species Conservation Act (1995). This species is also listed as Endangered under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

This species is a small tree growing to 6 metres tall with four-petalled yellowish flowers produced in summer growing from the leaf and stem junction (OEH 2015a). Fruits that are produced during summer have a flattened oval shape and are a creamy lemon colour up to 20 millimetres in diameter, with four lobes separated by shallow fissures (Commonwealth Conservation Advice 2008).

It occurs within 2 kilometres of the coast from Port Macquarie in the south to Fraser Island in the north, on sand in humid areas with rainfall greater than 1,600 millimetres (Commonwealth Conservation Advice 2008). This species is found in transition zones between littoral rainforest and swamp sclerophyll forest; littoral and coastal cypress pine communities and margins of littoral forest (Department of the Environment 2015). Over 40% of the known populations are in national parks and nature reserves (Department of the Environment 2015), including the nearby Bundjalung National Park. The population within the park near the Esk River is a proposed key site for the conservation of this species (OEH 2015b).

There are two forms of this species, with one producing viable seeds and one that reproduces vegetatively (OEH 2015a). All known populations of this species occur in fragmented habitats susceptible to disturbance and are facing threats from development, weeds (particularly *Lantana camara* Lantana), salt-laden wind burn and fires (NSW Department of the Environment 2015).

This species was not recorded on the subject site during this or previous surveys. Potential habitat for this species occurs on the subject site in the Open Forest and Woodland and Low Acacia Woodland. This species was not recorded from the site and the its potential habitat is within the most highly modified areas, being cleared in the past, probably sand mined, repeatedly burnt in very hot fires and subsequently infested by transformer weeds, particularly *Lantana camara* Lantana.

(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,

Response:

Little is known about the life cycle triggers for this species. It is very difficult to propagate from seed and it is mooted that it may need to pass through the gut of a bird to trigger germination (Erskine 2013). This species is also known to sucker, which may be a survival mechanism after fire. The closely related *Acronychia imperforata* is known to resprout after fire (NSW NPWS 2002).

The known (presumably viable) local population occurs further north at the Esk River in Bundjalung National Park.

The proposed development will remove most of the poor quality marginal habitat on site while retaining the intact remnant vegetation and rehabilitating some of the other vegetation in Parks 1, 2 and 3.

The proposal is not considered likely to significantly alter either of the factors identified as having a likely impact on the life cycle of this species - fire and frugivores.

(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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Poor quality marginal potential habitat occurs on site in the 16.71 hectares to be cleared.

(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

Response:

The pattern of fragmentation of habitat will be marginally altered. Connectivity of habitat within the site and with adjacent areas of bushland will be maintained by the retention and conservation management of Parks 1, 2 and 3. The regional wildlife corridor is located outside of the subject site and will not be impacted by the proposal. It is therefore considered that the degree of increased fragmentation is not significant, particularly considering that the site provides only potential habitat in a highly modified state.

(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,

Response:

The habitat on site cannot be considered to be important for the long term survival of a local viable population as it provides potential habitat only and of highly modified, poor quality bushland. The known local population occurs to the north near the Esk River in Bundjalung National Park distant from the subject site.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "site managed species" management stream under the NSW Office of Environment and Heritage (OEH 2015b), as it is considered that this species can be successfully secured by carrying out targeted conservation projects on specific sites. Eight such sites have been identified for this species, none of which include the subject site (OEH 2015b).

The nearest management site is the Esk River site, and its management and the objectives of the management actions to be undertaken in this population are:

1. Reduce and maintain weed densities at low levels (particularly Bitou Bush);
2. Exclude fire;
3. Minimise accidental damage on road / track edges;
4. Determine the area of occupancy; and

5. Track species abundance and condition over time.

The following recovery activities have also been identified for this species (OEH 2015a):

1. Protect areas of known habitat from disturbance;
2. Protect remaining areas of habitat from clearing and development;
3. Control weeds in areas of known habitat;
4. Always stay on designated four-wheel drive tracks;
5. Regenerate areas of known habitat, including planting of local rainforest species to protect Scented Acronychia from exposure to salt-laden winds;
6. Monitor population dynamics and threats of known populations;
7. Exclude domestic stock from known habitat;
8. Implement appropriate fire regime for habitat in which the species occurs;
9. Provide advice to consent and planning authorities about the location and ecological requirements of the species; and
10. Maintain viable ex-situ collection.

The proposal is largely consistent with these recovery strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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***Dromaius novaehollandiae* Emu**

The Emu population in the NSW North Coast Bioregion and Port Stephens LGA is listed as Endangered under Schedule 1 of the Threatened Species Conservation Act (1995). This species or population is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Emu is a large flightless bird that stands up to 1.9 m tall, with long legs and neck and shaggy grey-brown to dark-brown or grey-black plumage on the upperparts and usually paler underparts. This species can be seen singly, in pairs or in loose groups, some of which consist of family groups (OEH 2015a).

This species formerly occurred throughout mainland Australia but is now generally absent from densely settled regions, particularly the coastal regions (OEH 2015a). The population is disjunct from other populations in the Sydney Basin and New England Tableland Bioregion and represents the north-eastern limit of the species in NSW (NSW Scientific Committee 2002). At the time of listing, the majority of the more recent records were concentrated between Coffs Harbour and Ballina (NSW Scientific Committee 2002) with occasional records inland of the coastal ranges.

Habitat modelling by DECCW (2010) shows that high quality habitat for this species occurs north from Arrawarra to Yamba and inland to Grafton. Annual surveys conducted by OEH have confirmed its range has continued to contract and it is now considered to be absent from Broadwater National Park (after extensive fires) and restricted to three areas: Yuraygir National Park south of the Clarence River, Bundjalung National Park north of the Clarence River and in the Richmond River floodplain about 10 to 30 kilometres inland of the coast in the Bungawalbin area (OEH 2015a). It is not known whether a natural population continues to persist in the Port Stephens area (OEH 2015a).

On the NSW north coast, Emus occur in a range of predominantly open lowland habitats, including grasslands, heathland, shrubland, open and shrubby woodlands, forest, and swamp and sedgeland communities, as well as the ecotones between these habitats. They also occur in plantations of tea-tree and open farmland, and occasionally in littoral rainforest (OEH 2015a).

It is an omnivorous species, eating a wide range of seeds, fruits, other plant material and insects (OEH 2015a). Their home ranges are very large, being from 5 to 10 square kilometres (Blakers et al. 1984). These wide-ranging habits may play an important role in dispersal of large seed (McGrath and Bass 1999).

Eggs are laid in late autumn and winter on a small platform of nesting material on the ground, often at the base of some vegetation with good views to watch for predators (OEH 2015a). Parental care is exclusively provided by the male.

Major threats to this endangered population species arise from their low numbers and isolation. Their habitat has been reduced and fragmented by agricultural and rural and urban development and degraded by inappropriate fire regimes. Fires pose a direct risk

to Emus during nesting season and predation by Foxes, Pigs and Dogs are also important threats to chicks. Negative interactions with humans (hit by vehicles, poisoning and shooting) also contribute to the endangered status of this species in this area (OEH 2015a).

The community survey of Iluka residents undertaken by OEH in the 1990s uncovered many records of this species, including three from the subject site, the sightings dating from the 1980s and 1990s. This species was recorded on site by the presence of a number of scats. These were collected from the eastern and western ends of the site, the largest concentration being in the remnant vegetation that is to be retained in Park 2.

(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,

Response:

This question is not relevant to an endangered population.

(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,

Response:

Threats to this population include loss of habitat, inappropriate fire, predation and road trauma. The proposal will remove 16.71 hectares of potential habitat, but the majority of it is in very poor condition, being dominated by dense thickets of *Lantana camara* Lantana; this is not good habitat for Emus. The highly modified poor condition habitat to be removed represents less than 2% of its home range. Being nomadic, the majority of the home range of the animals using the subject site would be reserved in Iluka Nature Reserve and Bundjalung National Park.

Elements of the proposal will be of assistance to this species. This survey has established the presence of important fauna in this area; and this has resulted in the local brigade of the Rural Fire Service reviewing their plan to burn the site for hazard reduction. Fire suppression will continue to be a high priority after residents move in. The conservation management of the retained patches of bushland will provide improved habitat for this species. Also, the retained parks have been sited so that they provide north-south and east-west connectivity to other surrounding habitat.

(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

Response:

This question is not relevant to an endangered population.

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

Response:

This question is not relevant to an endangered population.

(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

Response:

Approximately 16.71 hectares of poor quality potential habitat will be removed.

(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

Response:

The proposal includes retained vegetation specifically to act as wildlife corridors as well as wide landscaped verges that can also serve as wildlife corridors.

(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,

Response:

The areas of poor quality habitat to be removed would represent less than 2% of a 10 square kilometre home range. Also, the home range of the animal(s) that use the site would encompass the reserved habitats in Iluka Nature Reserve and Bundjalung National Park.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

No critical habitat has been declared for this endangered population.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

Response:

A Priority Action Statement (PAS) has been prepared for this endangered population (OEH 2015b). The PAS identifies 20 broad strategies to help recover this species:

1. Prepare a recovery plan due to high local cultural significance and icon status;
2. Incorporate information provided through Aboriginal community consultation;
3. Protect areas of known habitat from clearing or development;
4. Protect emu habitat on private land;
5. Discuss options with landholders for mitigating crop damage by emus;
6. Provide map of known occurrences to Rural Fire Service and seek inclusion of mitigative measures on Bush Fire Risk Management Plan(s), risk register and/or operation map(s);
7. Seek advice from local Aboriginal community elders on appropriate site management regimes based on indigenous knowledge;
8. Control feral predators where predation has been identified as a problem and encourage the restraint of domestic dogs in areas supporting emus;
9. Increase road signage and reduce speed limits in areas where emus routinely cross roads;
10. Involve local Aboriginal communities in on-ground management activities;
11. Report any instances of illegal killing of emus to DEC;
12. Maintain annual emu surveys;
13. Investigate the causal relationship between identified threats and emu decline and identify mitigation measures;
14. Involve local Aboriginal communities in surveys and monitoring programs;
15. Determine whether emus are still located in the Port Stephens LGA through targeted surveys;
16. Report to DEC NEB any records of nesting emus or emus with chicks to DEC;
17. Report any sightings of emus outside the area between Evans Head and Red Rock and the Bungawalbin area to DEC;
18. In the event of an emu sub-population being identified at Port Stephens, implement relevant management actions;
19. Research genetic variation of these populations from other populations of the Emu; and
20. Conduct public awareness campaigns to increase community participation in reporting and protection of Emu population.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Take care when driving through areas of known habitat to avoid collision with birds, and use signage to notify drivers of the presence and risk of harm to Emus;
2. Control feral predators, and restrain domestic Dogs;

3. Protect known and potential habitat from frequent fires, and protect nesting birds from fire;
4. Protect areas of known and potential habitat from clearing or development;
5. Report records of Emus, especially nesting birds or chicks to the OEH; and
6. Report illegal killing of Emus to the OEH.

The proposal is largely consistent with the recovery actions for this endangered population.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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Lophoictinia isura Square-tailed Kite

The Square-tailed Kite is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Square-tailed Kite is a medium sized raptor with long wings and tail which is often seen soaring along treetops in open woodland areas throughout most of Australia (NSW NPWS 1999). Records of the species throughout the state indicate that it is a regular resident in the north, north east and along the major west-flowing river systems. It is a summer breeding migrant to the south east, including the NSW south coast, arriving in September and leaving by March (OEH 2015a).

It is found in a variety of habitats but shows a preference for timbered watercourses (OEH 2015a). Habitats include coastal forests and wooded lands of tropical and temperate Australia (NSW NPWS 1999), but records also exist from along vegetated watercourses and stony open country with chenopod shrubland further inland (OEH 2015a).

Sightings of Square-tailed Kites are almost always solitary and usually over forest or woodlands, rarely over completely open country (Hollands 2003). This species is a specialist canopy hunter, regularly taking passerines (particularly honeyeaters and nestlings) and large insects from the outer foliage (NSW NPWS 1999). It forages over coastal and subcoastal, eucalypt dominated forest and woodlands and inland riparian woodland (NSW Scientific Committee 2009) and mallee communities that are rich in passerines, as well as over adjacent heaths and other low scrubby habitats and in wooded towns and appears to prefer a landscape that is structurally diverse (Garnett and Crowley 2000).

This species forms monogamous lifelong pairs and occupy huge territories of well over 100 square kilometres (Slater et al. 1995). Breeding is from July to February, and nests are usually located in a fork or on a horizontal limb in a tree along or near a watercourse. During winter, it often moves to coastal plains, where they feed on waterbirds on and around permanent wetlands (Garnett and Crowley 2000).

Breeding is from July to February, with nest sites generally located along or near watercourses, in a fork or on large horizontal limbs (OEH 2015a). It is known to tolerate routine human activity, even when nesting (Bischoff et al. 2000).

Threats to this species include activities that reduce their prey (such as clearing, burning and grazing), loss of nest sites, illegal egg collecting and shooting (OEH 2015a). However, there is little evidence of a decline, with anecdotal reports of the reverse trend (Garnett and Crowley 2000). The only documented evidence of decline is from the edge of its range in South Australia (Garnett and Crowley 2000). Much of the native vegetation in the south and east of the species' range has been cleared for agriculture and while this is still considered to be the major threat, in places, the species may have benefited from partial clearance (Garnett and Crowley 2000).

This species was recorded near the subject site. Potential foraging habitat occurs across the subject site but it is generally unsuitable for nesting.

(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,

Response:

Important habitat features include the availability of prey and nest sites. The site is unsuitable for breeding but potentially provides prey species (particularly small birds) in the tree canopies. While most of the potential foraging habitat will be removed, it is in very poor condition and would represent a small fraction of what is available to this highly mobile species in its large home range.

(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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

16.71 hectares of highly modified bushland will be removed.

(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

Response:

This is a highly mobile species that can exploit widely-separated resources. The proposed works will not significantly fragment the potential habitat for this species in the local area.

(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,

Response:

The habitat in which this species has been recorded is very common in the local area and is also very common in nearby reserves. The area of potential habitat to be disrupted by the proposed works is minor in this context.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

There is no recovery plan or threat abatement plan for this species. However, it has been assigned to the 'Landscape species' management stream under the NSW Office of Environment and Heritage as it is distributed across a large area, is highly mobile and threatened across the landscape by habitat loss and degradation (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Ensure implementation of management strategies that reduce disturbance of riparian areas.
2. Identify and protect nest trees, and monitor reproduction.
3. Liaise with local field ornithologist to obtain data on the Square-tailed Kite in the area.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Protect known habitat from fires of a frequency greater than that recommended for the retention of biodiversity;
2. Retain and protect nesting and foraging habitat, particularly along watercourses; and
3. Report suspected illegal bird shooting and egg-collecting to DEC.

The proposal is largely consistent with these recovery strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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***Ptilinopus regina* Rose-crowned Fruit-Dove**

The Rose-crowned Fruit-Dove is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Rose-crowned Fruit-Dove is a small and colourful (adult) or plain green pigeon (juvenile) with a yellow belly and tail tip in adults (Slater et al. 1995). Males and females have a rose crown with grey/lavender on the remainder of the head and breast. Females are slightly paler in colour (Flegg 2002). This species is a common to rare resident in rainforest, forest, mangroves and melaleuca forests from Cape Leveque in Western Australia south to Newcastle in New South Wales (Slater et al. 1995). This species then becomes rare further south (Flegg 2002). This species is notoriously difficult to sight in the forest canopy, and is often located from falling fruit (Slater et al. 1995). This species is less wary than other similar species (Flegg 2002). Nests consist of a flimsy twig platform, often in a bush or low tree (Slater et al. 1995).

This species was heard calling once from the eastern end of the subject site during survey and observed foraging in the adjacent Iluka Nature Reserve. Potential foraging habitat occurs on the subject site in the soft-fruited trees that are scattered throughout the vegetation at low densities.

(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,

Response:

Critical habitat features for this species include foraging resources and breeding sites. The habitat on site is of poor quality, given the infestations of weeds and the low numbers of food trees compared with the overwhelmingly dominant *Acacia disparrima* subsp. *disparrima* Salwood. Given the proximity of good and reserved habitat in Iluka Nature reserve, the loss of poor quality habitat on the subject site is unlikely to significantly disrupt the life cycle of this 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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Potential habitat of poor quality will be removed over 16.741 hectares.

(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

Response:

The habitat in the development area and its connection with other suitable habitat will remain essentially unchanged for this highly mobile species.

(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,

Response:

The subject site provides poor quality habitat and as such cannot be regarded as important to the long-term survival of a local population, as it represents a small fraction of what is available in the home range of this highly mobile species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

There is no recovery plan or threat abatement plan for this species. However, it has been assigned to the "landscape-managed" management stream by the Office of Environment and Heritage, as it is distributed across a large area, is highly mobile and threatened across the landscape by habitat loss and degradation (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Encourage landholders with littoral and floodplain rainforest remnants on their property to enter into land management agreements (preferably in-perpetuity covenants or stewardship agreements) that protect these areas from clearing, grazing or other disturbances;
2. Implement bush regeneration within patches of rainforest habitat to remove invasive weeds, taking particular care to compensate for camphor laurel removal by planting winter-fruiting native laurels, figs and Elaeocarpaceae to avoid significant reduction of existing food resources; and
3. Liaise with land managers with rainforest habitat to raise awareness about the species' likely presence and sensitivity to disturbance (e.g. from timber harvesting or hazard reduction burning).

The following recovery activities have also been identified for this species (OEH 2015a):

1. Support local Landcare groups;
2. Protect remnant rainforest patches during burning off activities;
3. Retain forested corridors that link north-south and east-west migration routes;
4. Encourage and initiate weed control programs;
5. Ensure Camphor Laurel removal is accompanied by replacement with local native laurel species;
6. Protect known and potential food trees;
7. Protect remnant stands of rainforest and moist forest from clearing or development; and
8. Initiate and support rainforest regeneration projects.

The exclusion of works from the Rainforest on the site satisfies a number of those actions, namely 3, 6 and 7.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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***Calyptorhynchus lathami* Glossy Black-Cockatoo**

The Glossy Black-Cockatoo is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999). A population of this species in the Riverina has been listed as an Endangered Population (NSW Scientific Committee 1999) under the TSC Act (10995) due to considerable pressure form a number of identified threats.

The Glossy Black-Cockatoo is the smallest of the black cockatoo species in Australia. This species is usually seen in pairs or sometimes with a single young. It breeds in autumn and winter and requires large hollows for nesting.

It is reported to prefer dry forest types in intact, less rugged landscapes (NSW NPWS 1999) and is distributed mainly along the eastern half of NSW and the south eastern corner of Queensland (Slater et al. 1995). In NSW, this species is recorded in highest densities to the east of the Great Dividing range, however scattered records exist as far west as the Riverina and Pilliga Scrub (Garnett and Crowley 2000).

It is a highly specialised feeder, requiring cones from specific *Allocasuarina*, including *Allocasuarina littoralis* Black Sheoak and *Allocasuarina torulosa* Forest Sheoak (OEH 2015a) and *Casuarina* species (Garnett and Crowley 2000) and so impacts on these food resources (such as from inappropriate fire regimes) may threaten this species. However this species is well protected across the sandstone environments of the Sydney Basin and no management actions are recommended within the Yengo and Parr areas (DECC 2008). The Glossy Black Cockatoo is dependent on large hollow bearing eucalypts for nesting and lay a single egg between March and May (OEH 2015a).

The presence of this species was inferred by the characteristically-chewed cones along the northern boundary of the site in 2005. There was no evidence of this species on site during the recent comprehensive survey.

(a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction

Response:

Critical habitat features for this species include foraging resources and breeding hollows. Its preferred feeding tree (female *Allocasuarina* trees) were rarely observed. Therefore only a relatively small area of foraging habitat will be disrupted and the hollow-bearing trees are likely to be unsuitable. Therefore it is judged that the proposal is unlikely to significantly disrupt the life cycle of this 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,

Response:

An Endangered population of this species has been listed for the Riverina Local Government Area. This does not coincide with Clarence Valley Local Government Area.

(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 it's local occurrence is likely to be placed at risk of extinction,

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Approximately 16.71 hectares of bushland is to be removed. However, suitable foraging trees were rare. For example, of the 420 trees sampled for the Koala scat survey, none were *Allocasuarina* 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,

Response:

The connectivity of the vegetation and habitats on site with off-site habitats will only be minimally diminished. The regional wildlife corridor occurs to eth east of the site. The development configuration will not significantly fragment or isolate potential habitat for such a highly mobile species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to

the long-term survival of the species, population or ecological community in the locality

Response:

Foraging resources such as provided in the subject site are probably more common in bushland areas with a across the subject site and in local bushland. The small area to be disturbed by the proposal does not constitute important habitat.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "Landscape species" management stream under the NSW Office of Environment and Heritage. A number of recovery strategies have been identified (OEH 2015b).

1. Identify and map key breeding and foraging habitat, similar to the mapping done at St Georges Basin.
2. Provide incentives for landholders to fence and manage key sites.
3. Assist landholders who wish to enter into voluntary conservation agreements at key sites.
4. Prepare and distribute EIA guidelines to decision makers.
5. Periodically review IFOA prescriptions to ensure adequate protection of nesting and foraging habitat.
6. Develop/encourage strategic planning approach for Glossy Black Cockatoo at the local and regional level.
7. Encourage the restoration of foraging habitat that has been cleared or degraded by previous impacts.
8. Increase landholder and public awareness and interest in Glossy Black Cockatoo conservation and habitat management.
9. Utilise the Glossy Black Cockatoo as a flagship threatened species for woodland and forest conservation education and awareness programs.
10. Continue existing monitoring programs (e.g. Goonoo population) and encourage other community groups to develop a monitoring program of local populations.

The following recovery activities have also been identified for this species (OEH 2015a):

1. Reduce the impact of burning to retain diverse understorey species and in

particular to permit the regeneration of she-oaks.
2. Protect existing and future hollow-bearing trees for nest sites.
3. Retain and protect areas of native forest and woodland containing she-oaks.
4. Establish forested corridors linking remnant areas of habitat; include local she-oak species in bush revegetation works.
5. Report suspected illegal bird trapping and egg-collecting to the OEH.

The proposal will not interfere with these strategies.

(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.

Response:

The proposal contributes to the relevant Key Threatening Processes "Clearing of Native Vegetation" and "Loss of Hollow-Bering Trees".

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Glossopsitta pusilla Little Lorikeet

The Little Lorikeet is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Little Lorikeet is the smallest of the Lorikeets, with a black bill, bright green body and red forehead and throat (Pizzey and Knight 1997). It may be confused with other small lorikeets such as the Purple-crowned Lorikeet, but makes a distinctively lower-pitched and buzzing call in flight (Higgins 1999).

It is known from coast and south eastern Australia from near Cairns in far north Queensland to Adelaide (Pizzey and Knight 1997). In New South Wales it occurs in forests and woodlands from the coast to the western slopes of the Great Dividing Range, extending westwards to the vicinity of Albury, Parkes, Dubbo and Narrabri (Barrett *et al.* 2003). They occur mostly in dry open eucalypt forests and woodlands in old growth and logged forest as well as in remnant patches and roadside vegetation (NSW Scientific Committee 2009).

This species is generally considered to be nomadic, moving in response to flowering eucalypts (NSW Scientific Committee 2009). A long term study of a population on the north western slopes revealed that they are resident from April to December and may return to the nest area if some trees are flowering in the vicinity (Courtney and Debus 2006).

They usually forage in the tree canopies in small flocks and sometimes in the company of other lorikeet species (Readers Digest 2002). Profusely-flowering eucalypts are favoured, such as box species on the slopes and tablelands (Courtney and Debus 2006) and in *Eucalyptus robusta* Swamp Mahogany and *Eucalyptus pilularis* Blackbutt on the Central Coast (pers obs). Blossom of other trees are also used (e.g. *Melaleuca* species) and the fruits of mistletoes are also sometimes eaten (NSW Scientific Committee 2009).

This species is an obligate hollow nester (Gibbons and Lindenmayer 2002) that are usually located high in the trees (Pizzey 1980) but sometimes as low as 2 metres (Courtney and Debus 2006) in living smooth-barked eucalypts. The entrances to these nests are small (approximately 3 centimetres in diameter) and are kept open by the lorikeets chewing at the growing bark (NSW Scientific Committee 2009). Hollows are known to be used continuously, with one used for at least 29 years (Courtney and Debus 2006). The breeding season extends from May to September (Higgins 1999) or July to January with a peak in October (Barrett et al. 2003).

Population trends are uncertain with evidence of decline in part of its range (e.g. in South Australia, south west slopes and south coast of NSW) (NSW Scientific Committee 2009) but there appeared to be a small increase across NSW according to latest Bird Atlas (Barrett et al. 2003). The NSW Scientific Committee (2009) considers that the data indicate a moderate state-wide reduction in population size over the past 15 years or three generation lengths, a time frame equivalent to the life cycle of the species. Also,

there are many examples of bird species that are threatened nationally whose initial decline was first apparent in South Australia (Horton and Black 2006).

Threats to this species include loss of breeding sites and foraging resources due to land clearing which is particularly relevant in the western districts where road-widening has removed important patches of remnant woodland (NSW Scientific Committee 2009). Observations of 50 nest hollows over 43 years noted a 40% loss (the majority caused by humans) without a commensurate rate of hollow replacement (Courtney and Debus 2006).

This species was not recorded on the subject site during survey. However, it is known form the local area and potential foraging habitat for this species is common across the site, particularly in the high nectar-producing plants such as *Banksia integrifolia* Coast Banksia. The hollow-bearing trees also provide potential nesting sites.

(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,

Response:

Losses of potential foraging habitat will be partially mitigated by the retention and conservation management of the vegetation in the parks as well as by the use of native trees in the streetscape. The loss of hollow-bearing trees will be offset by the installation of nest boxes.

It is important to note that most of the hollow-bearing trees are dead trees and were presumably killed by the same hot fire. Therefore, they are deteriorating at a similar rate and are likely to fall at a similar time. In the absence of the development proposal, this inevitable and sudden loss would not be ameliorated.

(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,

Response:

This question is not relevant to a threatened species

(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

Response:

This question is not relevant to a threatened species

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Potential foraging habitat (particularly trees that produce copious nectar, such as *Banksia integrifolia* Coast Banksia) in the 16.71 hectares of generally poor quality bushland will be removed.

(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

Response:

It is a highly mobile species and its ability to move through the landscape will not be altered by the proposal.

(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,

Response:

As potential habitat, the site cannot be considered important to the long term survival of a local population.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "landscape species" management stream by the NSW Office of Environment and Heritage. The interim management actions identified for this species include:

1. Encourage retention of old-growth and hollow-bearing trees through community engagement and other mechanisms including PVPs, BioBanking and EIA; and
2. Avoid burning woodland with old-growth and hollow-bearing trees.

A number of recovery strategies have been identified (OEH 2015):

1. Retain large old trees, especially those that are hollow-bearing;
2. 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;
3. Protect large flowering Eucalyptus trees throughout the habitats frequented by this species. Manage remnant woodlands and forest for recovery of old-growth characteristics;
4. Where natural tree recruitment is inadequate, replant local species to maintain foraging habitat and breeding sites;
5. 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); and
6. Document nest sites and ensure their protection.

The proposal is largely consistent with these recovery strategies – it will retain the remnant forest, manage retained areas for conservation and replace lost hollows with nest boxes.

(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.

Response:

The proposal contributes to the relevant Key Threatening Processes "Clearing of Native Vegetation" and "Loss of Hollow-bearing Trees".

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***Coracina lineata* Barred Cuckoo-shrike**

The Barred Cuckoo-shrike is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Barred Cuckoo-shrike (previously known as Yellow-eyed Cuckoo-shrike) is a dark grey cuckoo-shrike with a yellow eye and heavily banded belly (Slater et al. 1995). This species has a distributional range from Cape York to north east New South Wales (September to March) and is a rare vagrant to Sydney (Slater et al. 1995). It is generally uncommon in its range and rare in New South Wales (OEH 2015a).

It occurs in a variety of habitats including rainforest, eucalypt forests and woodlands, clearings in secondary growth, swamp woodlands and timber along watercourses (OEH 2015a). Foraging habitat is defined as fruiting tree species in rainforest, wet sclerophyll forest, vegetation remnants or isolated trees (OEH 2015a).

They are active birds, frequently moving from tree to tree (OEH 2015a). They are usually seen in pairs or small flocks (Simpson and Day 1999) foraging among foliage of trees for insects and fruit. This species is mostly seen in native small-fruited fig trees (Slater et al. 1995).

This species was recorded foraging in the nearby Iluka Nature Reserve, and thus the habitat features of the subject site are within its home range.

(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,

Response:

Important habitat features include forging and breeding habitat. The proposal will remove some areas of potential foraging habitat, but in very poor condition with only scattered fruiting rainforest trees. The reserved habitats managed for conservation purposes within Iluka Nature Reserve and Bundjalung National Park are likely to be more important for this species than the private lands in poor condition adjacent to them.

(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,

Response:

This question is not relevant to a threatened species

(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

Response:

This question is not relevant to a threatened species

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

Response:

This question is not relevant to a threatened species

(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

Response:

Scattered elements of foraging habitat are contained within the 16.71 hectares of highly modified bushland to be removed or the proposal.

(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

Response:

The proposal specifically contains retained vegetation located so that both north-south and east-west connectivity of habitat is maintained. Moreover, this is a highly mobile species that is unlikely to be prevented from accessing habitat within its home range by the advent of the proposal.

(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,

Response:

The habitat within the subject site is of poor quality, being highly modified, infested by weeds and supporting only scattered individual rainforest trees, and most of a young age.

(e) whether the action proposed is likely to have an adverse effect on critical habitat

(either directly or indirectly),

Response:

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,

Response:

There is no recovery plan or threat abatement plan for this species. However, it has been assigned to the "landscape-managed" management stream by the Office of Environment and Heritage, as it is distributed across a large area, is highly mobile and threatened across the landscape by habitat loss and degradation (OEH 2015b). The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease.

The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Encourage landholders to enter land management agreements that promote the retention of native forest, particularly along roads and watercourses, where the species is known to occur; and
2. Conduct rainforest regeneration and restoration, specifically retaining and planting individual native fruit-bearing trees, including figs and other rainforest fruit trees, in habitat where the species is known to occur.

The following recovery activities have also been identified for this species (OEH 2015a):

1. Retain areas of native forest;
2. Retain forest corridors particularly along roads and watercourses;
3. Retain individual native fruit-bearing trees as feed trees;
4. Initiate and support rainforest regeneration; and
5. Plant feed trees, including figs and other rainforest fruit trees.

This proposal is consistent with all of these strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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Carterornis leucotis White-eared Monarch

The White-eared Monarch is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The white-eared Monarch is a small, distinctively pied monarch-flycatcher that is approximately the same size as *Rhipidura fuliginosa* Grey Fantail (OEH 2015a). They are largely black above and pale grey below with a distinctive black and white face (OEH 2015a).

This species is endemic to coastal lowlands and the eastern slopes of the Great Dividing Range of eastern Australia known to occur from the Cape York Peninsula to north eastern NSW (OEH 2015a). The White-eared Monarch lives in a variety of habitats including broadleaved thicket, shrubland (NSW Department of the Environment 2013), littoral rainforest, dry sclerophyll forest, wet sclerophyll forest, as well as swamp forest (NSW NPWS 2002). They appear to prefer the ecotone between rainforest and open vegetation such as along roads (OEH 2015a).

They are observed high in the canopy and are highly active when foraging for insects, characteristically fluttering around the outer foliage of rainforest trees (OEH 2015a). The White-eared Monarch breeds from September to March nesting along the edge of patches of rainforest, high in the canopy (Conole et al. 1995).

Recognised threats to this species include (OEH 2015a):

- Clearing and increasing fragmentation and isolation of habitat, especially low-elevation subtropical rainforest, littoral rainforest and wet sclerophyll forest, through agricultural, tourist and residential development or forestry activities;
- Forest management that results in conversion of multi-aged forests to young, even-aged stands;
- Invasion of forests by weeds;
- Inappropriate fire regimes that degrade habitat or allow invasion by weeds; and
- Degradation or loss of habitat through grazing of stock.

This species was not recorded on the subject site during survey. Favoured habitat is the ecotone from rainforest or swamp forest to adjacent open areas. The best potential habitat for this species on site occurs in the swamp forest to be retained and managed for conservation along the site's western edge.

(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,

Response:

The best area of potential foraging habitat for this species on the subject site will not be impacted by the proposal and in fact may be enhanced by rehabilitation and weed management of the remnant and regrowth vegetation.

(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,

Response:

This question is not relevant to a threatened species

(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

Response:

This question is not relevant to a threatened species

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

Response:

This question is not relevant to a threatened species.

(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

Response:

No potential habitat for this species will be removed for the proposed development.

(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

Response:

This is a highly mobile species able to exploit widely separated resources. The proposal is unlikely to prevent this species from accessing local habitat,

(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,

Response:

As potential habitat only, it cannot be regarded as important for the long term survival of a local population of this species.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "Partnership species" management stream under the NSW Office of Environment and Heritage. These are species that have less than 10% of their distribution in NSW and so conservation may depend on partnership programs with other states or territories. The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Monitor population;
2. Determine non-breeding seasonal movements and food requirements;
3. Ensure that Camphor Laurel removal is compensated for by replacement with rainforest species;
4. Ensure protection of rainforest, wet and swamp sclerophyll forest is included in fire planning and hazard reduction guidelines;
5. Exclude stock from lowland rainforest, wet sclerophyll and swamp sclerophyll forest;
6. Develop local government biodiversity conservation strategies;
7. Prevent lowland rainforest, wet and swamp sclerophyll forest habitat loss and fragmentation. Expand and reconnect habitat. Exclude grazing;
8. Address threats including loss of habitat, fragmentation and degradation; and
9. Liaise with relevant landholders and managers to protect, rehabilitate, enlarge and reconnect habitat. Raise awareness of weed threats and need for compensatory plantings.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Plant locally occurring trees and shrubs in gardens or other land adjacent to areas

of known or potential habitat;
2. Control weeds in areas of known and potential habitat or on land bordering such habitat;
3. Protect areas of known and potential habitat from clearing and further fragmentation and isolation, including patches on private land in collaboration with landholders;
4. Reconnect or enlarge patches of known and potential habitat, particularly using corridors along rivers and creeks;
5. Protect habitat from inappropriate fire regimes and ensure habitat is protected in during fire planning and in hazard reduction guidelines;
6. Report all records south of the Clarence River to the OEH;
7. Monitor populations and determine seasonal movements, if any, the food requirements of the species and other basic aspects of ecology and biology to better manage the species in NSW; and
8. Exclude stock from areas of potential and known habitat.

(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.

Response:

The proposed works will contribute to the Relevant Key Threatening Process "Clearing of Native Vegetation".

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***Daphoenositta chrysoptera* Varied Sittella**

The Varied Sittella is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Environment Protection and Biodiversity Conservation Act (1999).

It is a small songbird with a distinctive upturned bill. It is an active and acrobatic bird, probing crevices in rough or decorticating bark, dead branches, standing dead trees, small branches and twigs in the tree canopy for arthropods (NSW Scientific Committee 2010).

It is sedentary and found across most of mainland Australia (Higgins and Peter 2002; Barrett *et al.* 2003). Habitats occupied include all but the treeless deserts and open grasslands (NSW Scientific Committee 2010).

It builds a cup-shaped nest of plant fibres and cobwebs in an upright tree fork high in the living tree canopy, and often re-uses the same fork or tree in successive years (NSW Scientific Committee 2010).

The Varied Sittella's population size in NSW is uncertain but is believed to have undergone a moderate reduction in population size on the basis of comparative atlas surveys over the past several decades (NSW Scientific Committee 2010).

The apparent decline has been attributed to declining habitat cover and quality and its sedentary nature makes cleared agricultural land a potential barrier to movement (NSW Scientific Committee 2010).

Survival and population viability are sensitive to habitat isolation, reduced patch size and habitat simplification, including reductions in tree species diversity, tree canopy cover, shrub cover, ground cover, logs, fallen branches and litter (Watson et al. 2001; Seddon et al. 2003). The Varied Sittella is also adversely affected by the dominance of *Manorina melanocephala* Noisy Miner in woodland patches (Olsen et al. 2005).

Current threats include habitat degradation through small-scale clearing for fence lines and road verges, rural tree decline, loss of paddock trees and connectivity, 'tidying up' on farms, and firewood collection. “Clearing of native vegetation”, “Loss of hollow-bearing trees”, and Removal of dead wood and dead trees” are relevant listed Key Threatening Processes.

This species was observed during survey, foraging on tree trunks in the area to be retained in Park 1.

(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,

Response:

This species requires well connected expanses of habitat with fallen and dead timber and a complex understorey. The subject site provides such habitat features and can continue to do so in the post-development landscape outside of the development footprint.

(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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Poor quality habitat across 16.71 hectares will be removed.

(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

Response:

While this species is sedentary, it is highly mobile and its ability to move through the landscape will not be altered by the proposal.

(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,

Response:

This species is regularly recorded in the expanses of reserved lands in the local area – Iluka Nature Reserve and Bundjalung National Park. These areas are well-connected and managed for conservation, while the land of the subject site is in poor condition and generally neglected. Recent research has established that individuals of this species move over areas of at least 100 hectares during a 10 day period (Lindenmayer et al. 2010) and so the vast majority of the habitat for the observed group of birds is within the reserved lands.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

There is no recovery plan or threat abatement plan for this species. This species has been assigned to the "landscape species" management stream by the Office of Environment and Heritage, as it is distributed across a large area, is highly mobile and threatened across the landscape by habitat loss and degradation (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Encourage habitat linkages through PVP process; and
2. Raise awareness about importance of microhabitats. Encourage retention of intact foraging and breeding habitat through PVP process.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Retain existing vegetation and remnant stands along roadsides and in paddocks;
2. Increase the size of existing remnants by planting trees and establishing buffer zones;
3. Where remnants have lost connective links, re-establish links by revegetating corridors or stepping stones;
4. Limit firewood collection and retain dead timber in open forest and woodland areas;
5. Encourage regeneration of habitat by fencing remnant stands and managing the

intensity and duration of grazing; and
6. Control weeds in areas of known habitat.

The proposal retains most of the area that provides potential habitat for this species and fallen timber will be retained. The proposal is largely consistent with these recovery strategies.

(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.

Response:

The proposal contributes to the Key Threatening Process "Clearing of Native Vegetation".

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***Phascolarctos cinereus* Koala**

The Koala is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is also listed as Vulnerable under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999). Specific populations of Koalas in the Pittwater area of Warringah local government area and as well for the Hawks Nest and Tea Gardens area of Great Lakes local government area have been declared as endangered populations under the TSC Act (1995).

Controls are also in place under the Native Vegetation Act 2003 and the Environment Planning and Assessment Act (1979), including the subordinate planning instrument State Environmental Planning Policy No. 44— Koala Habitat Protection.

The Koala is a medium sized marsupial with large rounded ears, dense woolly coat, long limbs with strong claws and a very short tail (Martin et al. 2008). It spends majority of its time in tress only coming to the ground to move between trees (Smith 1979a). They can gallop swiftly across the ground and, are also excellent swimmers (Martin 1995). This species has an extensive, but disjunct distribution ranging from north-eastern Queensland to the south-east corner of South Australia (Department of the Environment 2015, ANZECC 1998).

With very specific dietary ranges, Koalas are restricted to eucalypt forests and woodland bearing certain favoured feed tree species (Martin 1995). They feed on foliage of more than 70 species of eucalypt and 30 non-eucalypt species with preferred species selected (OEH 2015a). In south eastern Australia, up to 24 species of Eucalyptus are known to be eaten by Koalas (Lee and Carrick 1989) with regional preferences apparent. In the south, preferred species include *Eucalyptus viminalis* Manna Gum, *Eucalyptus ovatus* Swamp Gum and *Eucalyptus globulus* Tasmanian Blue Gum while in the north, red gums (*Eucalyptus tereticornis* Forest Red Gum and *Eucalyptus camaldulensis* River Red Gum), Grey Gums (*Eucalyptus punctata* Grey Gum and *Eucalyptus propinqua* Small-fruited Grey Gum) and *Eucalyptus microcorys* Tallowwood are important (Martin et al. 2008).

The suitability of habitat for Koalas is highly influenced by a number of variables including the size and species of trees, soil nutrients, climate, rainfall and disturbance history (NSW NPWS 2003). There is considerable local and regional variation in preferences for feed tree species (Martin and Handasyde 1995) and the food preferences may also change with season (Lee and Carrick 1989).

A study by Lunney et al. (2002) identified a decline in the population of Koalas at Iluka in the Clarence Valley LGA. The study identified major causes for the decline in the species with threats of habitat loss, traffic and dogs being significantly due to urban development. Other threats included fire, feral pigs and disease which causes low fertility within the species (Lunney et al. 2002).

Due to the low nutritional value of their diet, Koalas are inactive for up to 20 hours a day (Menkhorst and Knight 2001). They spend most of the day resting in trees and are most active in the late afternoon and at night, which coincides with a peak in feeding behaviour

(Hindell et al. 1985). They usually rest low in the fork of a tree and climb to the canopy at night to feed (Martin et al. 2008).

Breeding occurs between October and May with females potentially producing one offspring each year (McLean 2003). Cubs remain dependent on their mother until they become independent at 12 months of age (Department of the Environment 2015) but will still associate with her (such as feeding in the same tree) until dispersing to their own territory (Martin et al. 2008). Males may not set up a new territory until 2 or 3 years of age and females often breed in a home range adjacent to their natal site (Martin et al. 2008). Juveniles may continue to wander until up to 5 years of age (Eberhard 1978 quoted in Lee and Carrick 1989).

Studies of Koalas on Kangaroo Island, South Australia, revealed that adults were generally sedentary, using about 15 trees within a largely exclusive home range of 1 – 2.5 hectares. However, home ranges may be much larger (up to 100 hectares) in poorer habitat such as in semi-arid areas (Martin et al. 2008). The home ranges of some males may spatially overlap those of females and they may also share some trees. Males do not defend territories but males act aggressively to other males during the breeding season (Martin et al. 2008). Adult males bellow loudly at this time to advertise their presence to other males and receptive females in the vicinity (Martin et al. 2008).

The effects of disease on Koalas are of growing concern with Chlamydia being the most well-known disease present in Koalas (Department of the Environment, 2015). Chlamydia may limit the reproductive potential of Koala populations and in turn can cause decline in the population. Other diseases that afflict this species include anaemia, tick infections, malignant blood disease and pneumonia (Dickens 1978, quoted in Lee and Carrick 1989). A new disease has also been recently discovered with Koala Retrovirus (KoRV) thought to be responsible for numerous conditions including leukaemia and an immunodeficiency syndrome (Tarlinton et al. 2005).

Historically, the principal predators of Koalas were likely to have been Aborigines and the dingo (Lee and Carrick 1989). Today, the only known predators are *Aquila audax* Wedge-tailed Eagle and *Ninox strenua* Powerful Owl, both of which are known to take juveniles (Eberhard 1978, quoted in Lee and Carrick 1989).

Threats to the conservation of this species (in order of their general importance throughout NSW) include habitat loss and fragmentation, habitat degradation, road kills, dog attacks, fire, logging, disease, severe weather conditions, swimming pools and overbrowsing (NSW NPWS 2003, DECC 2008a). Surveys across NSW indicate that, since 1949, Koala populations have been lost from many areas, particularly on the southern and western edges of their distribution (Reed et al. 1990, quoted in NSW NPWS 2003). Despite the presence of suitable habitat, Koalas still occur in fragmented populations perhaps demonstrating the difficulty of recovery of populations in fragmented habitats suffering ongoing threats (NSW NPWS 2003, DECC 2008a).

Food trees have been categorised as primary, secondary and supplementary based on the measured level of use by Koalas (NSW NPWS 2003, DECC 2008a). Further, the potential

value of habitat to Koalas has been determined by the relative abundance of primary, secondary and supplementary food trees (NSW NPWS 2003, DECC 2008a).

This species was recorded in a single image from a terrestrial camera trap. The animal was photographed moving across the ground in a northerly direction across the centre of the site. As it was not in the canopy, it was not foraging. The head only was evident in the photograph, so there is no information regarding the presence or absence of a joey. This result prompted further comprehensive survey to be undertaken, but it was not recorded otherwise during this survey, but scats of this species were identified by Fitzgerald (2005) somewhere on site.

The leaves of some of the other canopy species on site are recognised food tree species for *Phascolarctos cinereus* Koala, namely *Eucalyptus tereticornis* Forest Red Gum*, Eucalyptus propinqua* Small-fruited Grey Gum and *Corymbia intermedia* Pink Bloodwood. However, such a tree composition is defined as relatively low quality Koala habitat and is probably only capable of supporting low density Koala populations (DECC 2008).

The Iluka Koalas were strongly associated with *Eucalyptus tereticornis* Forest Red Gum, but this species of tree has not regenerated in the sand mining areas. The very low numbers of this species on the subject site is further testament to that observation.

A modelling study of the Iluka population (Lunney et al. 2002) concluded that the decline and eventual extinction of the Iluka population was inexorable, unless there was a major influx of migrating Koalas and significant alterations to the factors influencing disease and mortality. Thus, the provisions of corridors to and from known populations is important, as are improvements in the condition of their habitat, and control of causes of mortality.

(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,

Response:

The development proposal will remove a substantial area of vegetation, but this is demonstrably very poor habitat. The evidence indicates that the animal recorded on site was moving through the site (and not foraging on the site), presumably to better habitat to the north, where there is no evidence of sand mining and primary Koala food trees are present. For example, both *Eucalyptus tereticornis* Forest Red Gum and *Eucalyptus robusta* Swamp Mahogany (another primary food tree) occur on the golf course.

All possible design elements have been incorporated into the layout of the proposal in order to accommodate this species. The best habitat (in Park 2) has been retained in its entirety. This will also facilitate north-south movements – as was observed on site. Other potential habitat where *Eucalyptus tereticornis* Forest Red Gum was observed on site is to be retained and rehabilitated in Park 1. This will also facilitate east-west movements.

The streetscapes are to be landscaped for Koalas in particular (using food trees and

planted at intervals recommended by expert panel) and other threatening processes are to be controlled (such as traffic and dogs). Thus, it is considered unlikely that the proposal will place a viable local population 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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Very poor quality habitat in 16.71 hectares is to be removed.

(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

Response:

The configuration of retained and rehabilitated vegetation will facilitate the movements of Koalas across the site and in the local area.

(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,

Response:

The habitat on site can be classified as of a relatively low grade; such habitat is regarded as able to support only low density populations of Koalas.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

A number of objectives and strategies for this species have been detailed in the Recovery Plan for the Koala (DECC 2008a). Of relevance to this proposal are the following recovery actions:

- Implement the objectives of SEPP 44 and the National Koala Conservation Strategy for the conservation of koalas and koala habitat in NSW;
- DECCW, together with DoP, will work with councils and catchment management authorities to assist them in developing koala habitat protection measures for incorporation in relevant local environmental plans (LEPs), and regional natural resource and vegetation management plans;
- Assess koala population dynamics and habitat use across the NSW range; and
- DECCW, through collaboration with a wide range of researchers and conservation partners, will coordinate and promote implementation of the recovery plan, with a focus on using the NSW Priorities Action Statement as the primary information and coordination tool.

Other recovery strategies identified by OEH (2015a) include:

- Undertake feral predator control;
- Apply low intensity, mosaic pattern fuel reduction burns in or adjacent to Koala habitat;
- Retain suitable habitat, especially areas dominated by preferred feed-tree species;
- Identify road-kill blackspots and erect warning signs, reduce speed limits or provide safe crossing points to reduce Koala fatalities;

- Protect populations close to urban areas from attacks by domestic dogs; and
- Revegetate with suitable feed tree species and develop habitat corridors between populations.

These objectives and strategies are served by this assessment process with survey conducted for this species and recommendations made for minimisation of potential impact and conservation of important habitat features. They are also partly satisfied by the provision of survey data to the relevant authorities.

(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.

Response:

The proposal will contribute to the Key Threatening Process "Clearing of Native Vegetation".

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Pteropus poliocephalus Grey-headed Flying-fox

The Grey-headed Flying-fox is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is listed as Vulnerable under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Grey-headed Flying-fox is a large flying-fox with a white or greyish head, reddish mantle around the neck and thick, shaggy fur extending to the ankles (Strahan 1995). This species has a distribution along eastern coastal Australia from Rockhampton in Queensland to western Victoria (Churchill 2008). The Grey-headed Flying-fox occurs in a variety of habitats including subtropical and temperate rainforests, sclerophyll forests, woodlands, as well as urban areas (OEH 2015a). It also frequents mangroves, paperbark swamps and cultivated areas (Churchill 1998). It is usually seen in large, noisy colonies, or in day 'camps' usually placed close to water in gullies with dense forest canopies (Tidemann 1995). This is a highly mobile species, and camps are regularly moved in response to local food availability (Churchill 1998). Most births occur around October (Strahan 1995).

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

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

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

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

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

This winter convergence makes the species vulnerable to changes in these coastal

communities, particularly as it coincides with the areas of greatest development. High rates of mortality can result from result from losses of small areas of key winter habitat (Eby and Lunney 2002). These losses are compounded by removal and fragmentation of other resource patches used at other times.

Even in areas of remaining forest, nectar flow itself is impacted upon by dieback, drought, fire, and local fluctuations in temperature and rainfall (Eby and Lunney 2002).

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

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

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

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

This species was not observed during survey but is likely to occur on site when appropriate feed trees are in flower or fruit. The site is 50 kilometres straight-line distance from the nearest large colony on Susan Island at Grafton. The large areas of vegetated coastal dunes dominated by *Banksia* are recognised important foraging habitat for this species, particularly in the winter months. The potential habitat on site is likely to be of lesser importance but may still be exploited.

(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,

Response:

No critical life cycle features for this species were observed on or near the subject – no camps have been recorded from this area nor is there habitat on the site suitable for one.

The proposal will remove potential food trees, but similar and better foraging opportunities exist for this species in adjacent habitat, most of which is reserved. Therefore it is unlikely the proposal will place a viable local population 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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Poor quality habitat in 16.71 hectares will be removed.

(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

Response:

This is a highly mobile species, able to exploit widely separated resources and known to feed in highly urbanised areas. The proposal is unlikely to interfere with its ability to move through the landscape and / or access suitable habitat.

(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,

Response:

As potential habitat only, it cannot be regarded as important habitat. Key winter habitat occurs in the coastal Banksia communities of Iluka Nature Reserve and Bundjalung National Park.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

A draft recovery plan for this species has been released (DECCW 2009) within which 10 major recovery actions have been identified:

- Identify and protect foraging habitat critical to the survival of Grey-headed Flying-foxes across their range;
- Enhance winter and spring foraging habitat for Grey-headed Flying-foxes;
- Identify, protect and enhance roosting habitat critical to the survival of Grey-headed Flying-foxes;
- Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture;
- Provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps;
- Produce and circulate educational resources to improve public attitudes toward Grey-headed Flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions;
- Monitor population trends for the Grey-headed Flying-fox;
- Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts;
- Oversee a program of research to improve knowledge of the demographics and population structure of the Grey-headed Flying-fox; and
- Maintain a National Recovery Team to oversee the implementation of the Grey-headed Flying-fox National Recovery Plan

This species has been assigned to the "landscape species" management stream under the NSW Office of Environment and Heritage. The following management actions have been identified for this species as part of that process (OEH 2015b):

- Set priorities for protecting foraging habitat critical to the survival of Grey-headed Flying-foxes and generate maps of priority foraging habitat.
- Protect and enhance priority foraging habitat for Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land.
- Increase the extent and viability of foraging habitat for Grey-headed Flying-foxes that is productive during winter and spring (generally times of food shortage), including habitat restoration/rehabilitation works.
- Establish and maintain a range-wide database of Grey-headed Flying-fox camps, including information on location, tenure, zoning and history of use, for distribution to land management/planning authorities, researchers and interested public.
- Improve knowledge of Grey-headed Flying-fox camp locations, targeting regional areas and seasons where information is notably incomplete, such as inland areas during spring and summer.
- Protect roosting habitat critical to the survival of Grey-headed Flying-foxes, for example through management plans, local environmental plans and development assessments, and through volunteer conservation programs for privately owned land.
- Determine characteristics of roosting habitat for Grey-headed Flying-foxes, exploring the roles of floristic composition, vegetation structure, microclimate and landscape features, and assess the status of camps.
- Enhance and sustain the vegetation of camps critical to the survival of Grey-headed Flying-foxes.
- Develop and promote incentives to reduce killing of flying-foxes in commercial fruit crops.
- Identify the commercial fruit industries that are impacted by Grey-headed Flying-foxes, to provide an information base for use by the various stakeholders.
- Systematically document the levels of flying-fox damage to the horticulture industry within the range of the Grey-headed Flying-fox.
- Develop methods for rapid estimates of flying-fox damage on commercial crops, allowing the long-term monitoring of industry-wide levels and patterns of flying-fox damage.
- Develop and implement a grower-based program to monitor trends in damage to commercial fruit crops by flying-foxes, and use the results to monitor the performance of actions to reduce crop damage.
- Develop methods to monitor landscape scale nectar availability trends, to explain/potentially predict crop damage trends where crop protection is absent, and promote importance of foraging habitat productive in seasons critical to the horticulture industry.
- Describe the species, age structure and demographics of flying-foxes killed in fruit

crops to improve the understanding of the impact by assessing trends in the species, sex, age and reproductive status of animals killed on crops.

- Review and evaluate camp site management activities, summarising outcomes of past experiences at controversial camps. Noise impacts on neighbours of camps to be considered. For use in managing future conflicts with humans at flying-fox camps.
- Develop guidelines to assist land managers dealing with controversial flying-fox camps.
- Develop materials for public education and provide them to land managers and local community groups working with controversial flying-fox camps, highlighting species status, reasons for being in urban areas, reasons for decline etc.
- Assess the impacts Grey-headed Flying-fox camps have on water quality, and publish results in a peer-reviewed journal.
- Provide educational resources to improve public attitudes toward Grey-headed Flying-foxes.
- Monitor public attitudes towards flying-foxes.
- Review and improve methods used to assess population size of Grey-headed Flying-foxes.
- Conduct periodic range-wide assessments of the population size of Grey-headed Flying-foxes to monitor population trends.
- Assess the impacts on Grey-headed Flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts.
- Investigate the differences in genetic relatedness, sex, age etc. between sedentary and transient Grey-headed Flying-foxes.
- Investigate between-year fidelity of Grey-headed Flying-fox individuals to seasonal camps.
- Investigate the genetic structure within Grey-headed Flying-fox camps, including levels of relatedness within and between members of adult groups, occupants of individual trees etc.
- Investigate the patterns of juvenile Grey-headed Flying-fox dispersal and mortality, allowing identification of the specific habitat requirements of juveniles.
- Investigate the age structure and longevity of Grey-headed Flying-foxes.
- Complete national recovery plan.
- Grey-headed Flying-fox National Recovery Team to undertake an annual review of the national recovery plan's implementation.
-

A number of specific recovery activities aim to recover the species through (OEH 2015a):

- Protect roost sites, particularly avoid disturbance September through November.
- Identify and protect key foraging areas.
- Manage and enforce licensed shooting.
- Investigate and promote alternative non-lethal crop protection mechanisms.
- Identify powerline blackspots and implement measures to reduce deaths; implement measures to reduce deaths from entanglement in netting and on

barbed-wire.

- Increase public awareness/understanding about flying-foxes, and their involvement in flying-fox conservation.
- Monitor the national population's status and distribution.
- Improve knowledge on demographics and population structure to better understand ecological requirements of the species.

The survey and assessment process has identified that the site supports very little habitat for this species and none of a critical nature. The proposal is largely consistent with these recovery strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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Syconycteris australis Common Blossom Bat

The Common Blossom Bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

Common Blossom bats are small megachiropteran bats with a specialised diet of nectar and pollen (OEH 2015a). They can grow up to 6cm long (Australian Museum Online 2014) and weigh approximately 19 grams (Nelson 1989). They have long muzzles and brush like tongues (OEH 2015a) and commonly feed on the nectar and pollen of bottlebrush, paperbark, banksia and gum tree blossoms (Australian Museum Online 2014).

They are found along coastal areas of eastern Australia from Hawks Nest NSW to Cape York Peninsula in Queensland (OEH 2015a), roosting in Rainforest, wet eucalypt forest and paperbark swamps (Australian Museum Online 2014). They roost solitarily from tree branches, hidden by leaves (Australian Museum Online 2014).

This species shows strong fidelity to feeding sites, travelling up to 4 kilometres between rainforest roosts and heathland feeding grounds on the NSW North Coast (Law and Spencer 1995). Where the roosting habitat was more fragmented, commuting distances were greater (Law and Spencer 1995). Roost sites shifted seasonally, from the more exposed edges in spring and autumn to the protected rainforest interior in winter, presumably as a response to cold (Law and Spencer 1995).

They are probably important pollinators, hovering like a hummingbird in front of flowers when feeding (Australian Museum Online 2014).

This species is threatened by fragmentation and loss of feeding and roosting habitat and weeds that suppress the regeneration of key food trees, such as coastal Banksias (OEH 2015a).

This species was not observed during survey but a breeding population is known to occur in the adjacent Iluka Nature Reserve. It is a specialist feeder of nectar and pollen and therefore requires high quality foraging habitat such as occurs in the *Banksia*-dominated coastal dunes of the nearby reserves. It roosts hanging from tree branches, near to foraging habitat.

(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,

Response:

The subject site provides potential habitat of lesser value than is available in the nearby reserves, but the best potential habitat on site is within the swamp forest in the western end of the site. This will be entirely retained and managed for conservation purposes.

(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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Poor quality potential foraging habitat will be removed across 16.71 hectares.

(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

Response:

This is a highly mobile species able to traverse gaps in their habitat, travelling up to 4 kilometres to favoured feeding areas. The proposal is unlikely to prevent this species from moving through the landscape. Also, the proposal specifically includes habitat retention in a configuration such that retains north-south and east-west connectivity of habitat.

(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,

Response:

The habitats within Iluka Nature Reserve and Bundjalung National Park are likely to be of more importance top this species as they are in better condition, occur over a larger area and are managed for conservation.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "Partnership species" management stream under the NSW Office of Environment and Heritage. These are species that have less than 10% of their distribution in NSW and so conservation may depend on partnership programs with other states or territories. The following management actions have been identified for this species as part of that process (OEH 2015b):

1. Ensure a mosaic of nectar-producing trees and shrubs, esp. in coastal heath paperbark swamp as well as rainforest roost habitat. Give high priority in PVP assessments, or other assessment tools.
2. Prepare EIA guidelines which address the retention of a mosaic of nectar-producing trees and rainforest roost habitat.
3. Determine the effectiveness of PVP assessment, offsets and actions for bats.
4. Identify areas of private land that contain patches (including small) of littoral rainforest as areas of HCV in planning instruments and land management tools (e.g. LEP, Catchment Action Plans, PVPs).
5. Promote the conservation of these areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means. .
6. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
7. Control coastal weed species eg Bitou Bush, but avoid aerial spraying during the flowering season of important heath species as herbicides can directly collect in flowers that are fed upon at night.
8. Initiate and support rainforest and heath regeneration projects where coastal habitat has been cleared and fragmented.
9. Determine the extent of use of revegetation in development areas that are subject

to high ambient light levels. .
10. Identify critical foraging habitat in November when bats are breeding, but when few heath species are flowering. .
11. Identify the impact on bats of weed-spraying at different times of the year.
12. Develop burning strategies that reduce impacts on preferred habitat in known foraging areas.
13. Undertake long-term monitoring of select populations cross tenure.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Control of serious coastal weed species such as Bitou Bush;
2. Protect areas of littoral rainforest, coastal heath and paperbark swamp;
3. Plant Common Blossom-bat feed trees such as local species of banksia, bottlebrush and paperbark; and
4. Initiate and support rainforest and heath regeneration projects.

The proposal does not impinge on roost sites or key foraging areas for this species. Thus the proposal is largely consistent with the recovery actions for this species.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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***Mormopterus norfolkensis* Eastern Freetail-bat**

The Eastern Freetail-bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Eastern Freetail-bat has dark brown to reddish brown fur on the back and is slightly paler below. Like other freetail-bats it has a long (3 - 4 cm) bare tail protruding from the tail membrane (OEH 2015a).

The Eastern Freetail-bat is an insectivore but nothing specific is known about its diet (Churchill 1998, 2008). It is thought that they forage within a few kilometres of their roost (Churchill 2008, Hoye et al. 2008).

It is found along the east coast from south eastern Queensland to southern NSW (OEH 2015a). Most records are from dry eucalypt forest and woodland, although a number have been caught flying low over a rocky river through rainforest and wet sclerophyll forest (Hoye et al. 2008). Research in coastal forests near Coffs Harbour have shown that it is more active on upper slopes where the flyways are open and uncluttered, rather than along creeks (Hoye et al. 2008).

Although it has been recorded roosting in the roof of a hut, under bark and the caps of telegraph poles, it is more usually found in hollows in large mature trees (Churchill 2008). All natural roost sites have been found in large mature eucalypts and they will use paddock trees and remnant vegetation in farmland (Hoye et al. 2008). They will also roost in artificial roosts, with a colony in NSW known to use the same boxes for over 5 years (Churchill 2008).

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

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

This species was recorded foraging on the subject site during survey.

(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,

Response*:*

The subject site provides both foraging habitat for this species and potential breeding sites (hollow-bearing trees). Suitable hollows to be removed will be compensated for with replacement nest boxes. The potential and realised habitat on site would only represent

a very small proportion of what is available locally and regionally as this species is highly mobile, able to exploit widely separated resources.

(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,

Response*:*

This question is not relevant to a threatened species.

(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

Response*:*

This question is not relevant to a threatened species.

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

Response*:*

This question is not relevant to a threatened species.

(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

Response*:*

Approximately 16.71 hectares of poor quality, cluttered foraging habitat will be removed, as well as 14 dead hollow-bearing trees. The loss of potential roosting habitat will be compensated for by the installation of replacement nest boxes.

(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

Response*:*

This is a highly mobile species able to exploit widely separated resources. The proposal is

unlikely to prevent this species from moving around the landscape or accessing required resources. Moreover, the proposal has been designed specifically so that north-south and east-west wildlife corridors will remain.

(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,

Response*:*

It is unlikely that the poor quality foraging habitat on site is an important resource for a local population of this species. However, the loss of hollow-bearing trees has a greater chance of adverse impact, although a study of roost sites used by this species found all in living healthy trees (McConville and Law 2013). In the absence of the proposal, the inevitable collapse of the dead standing hollow-bearing trees will result in a restriction of roosting habitat on site. Thus, the proposed replacement strategy (enabled by the proposal) may be essential for the long-term persistence of this species on site.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response*:*

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,

Response*:*

The Department of Environment and Conservation has a prepared Priority Action Statement to promote the recovery of the species. A total of 19 priority actions have been identified and dividing into priorities of High, medium and Low (OEH 2015b).

The following Priority Actions have been classified as being of high priority (OEH 2015b):

1. Ensure the largest hollow bearing trees, inc. dead trees and paddock trees, are given highest priority for retention in PVP assessments. Offsets should include remnants in high productivity.
2. Research the roosting ecology of tree-roosting bats. For example identifying the attributes of key roosts.
3. Research the degree of long-term fidelity to roost trees and roosting areas in order to assess their importance and the effects of their removal.
4. Prepare EIA guidelines which address the retention of hollow bearing trees maintaining diversity of age groups, species diversity, structural diversity. Give priority to largest hollow bearing trees.
5. Identify the effects of fragmentation in a range of fragmented landscapes i.e. the

farmland/forest interface and the urban/forest interface e.g. movement and persistence across a range of fragment sizes.
6. Identify areas of private land that contain high densities of large hollow-bearing trees as areas of high conservation value planning instruments and land management negotiations e.g. LEP, CAPs, PVPs.
7. Promote the conservation of these private land areas using measures such as incentive funding to landholders, off-setting and biobanking, acquisition for reserve establishment or other means.

The following Priority Actions have been classified as being of medium and low priority (OEH 2015b):

1. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
2. Develop and promote State-wide bat awareness programs for schools, CMAs, landholders and industry groups etc.
3. Ensure the Code of Practice for private native forestry includes adequate measures to protect large, hollow-bearing trees and viable numbers of recruit trees.
4. Identify important foraging range and key habitat components for this species.
5. Identify the susceptibility of the species to pesticides.
6. Better define species distribution through survey in coastal lowlands on- and off-reserve.
7. Research the effect of different burning regimes.
8. Investigate the effectiveness of logging prescriptions.
9. Undertake long-term monitoring of populations cross tenure in conjunction with other bat species to document changes.
10. Study the ecology, habitat requirements and susceptibility to logging and other forestry practices of this little-known species.
11. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Retain hollow-bearing trees and provide for hollow tree recruitment.\;
2. Retain foraging habitat; and
3. Minimise the use of pesticides in foraging areas.

The 14 dead standing hollow-bearing trees identified in the development footprint cannot be retained. However, all such trees can be retained within the Parks 1, 2 and 3. These stags have a short life expectancy and the proposal allows for the replacement of the roosting resource, thus addressing an inevitable but otherwise ignored problem. The proposal therefore is largely consistent with the recovery strategies.

(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.

Response*:*

The proposal contributes to the relevant Key Threatening Processes "Clearing of Native Vegetation" and "Loss of Hollow-Bering Trees".

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NSW Scientific Committee (No Date) Eastern Freetail-bat – Vulnerable Species Listing. Final Determination

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***Nyctophilus bifax* Eastern Long-eared Bat**

Nyctophilus bifax is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

It is a small to medium-sized long-eared bat that can be distinguished from the common species by its fur colour, nose and penis morphology and ear size (OEH 2015a).

It occurs from Cape York south to northern NSW, and in NSW appears to be confined to the coastal plain and adjacent ranges (OEH 2015a). Its southern limit is typically around the Clarence River area, with some records as far south as Coffs Harbour (OEH 2015a). Although restricted in its range, it can be locally common (OEH 2015a).

It has been found in lowland subtropical rainforest, as well as wet and swamp eucalypt forest and adjacent moist eucalypt forests. A large number of records come from coastal rainforest and patches of coastal scrub (OEH 2015a). Foraging habitat is listed as wet forest types including rainforest, monsoon forest, riverine forests of paperbark, sometimes in tall open forest, dry sclerophyll forest and woodlands.

It roosts in a number of microhabitats: tree hollows, the hanging foliage of palms, in dense clumps of foliage of rainforest trees, under bark and in shallow depressions on trunks and branches, among epiphytes, in the roots of strangler figs, among dead fronds of tree ferns and less often in buildings (OEH 2015a).

Breeding habitat is more restricted, with maternity sites known only in tree hollows (OEH 2015a). A study on the population in Iluka Nature Reserve concluded that they do not travel far and that the animals captured within the Nature Reserve probably do not venture outside of it for is foraging or roosting needs (Lunney et al. 1995). Further study of the thermal characteristics of roosts and hibernation in this same population in winter revealed large individual differences in roost site selection, doubtless reflecting very different microclimates (Stawski et al. 2009) and perhaps explaining different individual daily torpor patterns.

It is not known to exhibit any migratory behaviour and is detectable all year (OEH 2015a).

Recognised threats to this species include land clearing, loss of breeding and roosting sites, invasion of its habitat by weeds (particularly Bitou Bush) and the use of pesticides (OEH 2015a).

Foraging calls of a *Nyctophilus* – possibly this species – were recorded foraging in the moist forest of the western boundary. As it is known to forage in close proximity to roost sites (particularly when breeding in the spring), the roost sites are also likely to be within the moist forest of the western boundary.

(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,

Response:

The high quality vegetation at the western end of the subject site provides both foraging habitat for this species and potential breeding sites (hollow-bearing trees). No hollow-bearing trees will be removed from the habitat used by this species on site: this area will be entirely retained and protected. In order to compensate for the loss of hollow-bearing trees elsewhere on site in poor quality habitat, Parks 1, 2 and 3 will be enriched with bat nest boxes, which may also be of advantage to this 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,

Response:

This question is not relevant to a threatened species

(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

Response:

This question is not relevant to a threatened species

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

Response:

This question is not relevant to a threatened species.

(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

Response:

This species was only recorded foraging in the forest of the western boundary, which will be entirely retained and protected in Park 2. As it is known to roost and forage within

relatively small areas, it is likely that the population is restricted to the high quality vegetation that occurs at the western boundary and beyond to the west.

(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

Response:

The extent and configuration of the vegetation used by this species will remain essentially unchanged.

(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,

Response:

No habitat for this species will be removed or modified.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the 'Partnership species' management stream by the NSW Office of Environment and Heritage. A number of recovery strategies have been identified (OEH 2015b):

1. Ensure the largest hollow bearing trees are given highest priority for retention in PVP assessments (offsets should include remnants in high productivity) and other or other land assessment tools.
2. Prepare EIA guidelines that include retention of hollow bearing trees, maintain diversity of age groups, species and structural diversity. Give priority to largest hollow bearing trees and remnants on high productivity soils.
3. Protect and enhance areas of low elevation rainforest, wet eucalypt forest and coastal scrub across the species' range.
4. Investigate the effectiveness of logging prescriptions.
5. Determine the effectiveness of PVP assessment, offsets and actions for bats.
6. Control of rainforest/edge weed species, particularly Bitou Bush in coastal areas as provided for in the approved TAP.

7. Initiate and support rainforest and wet eucalypt forest regeneration projects. .
8. Identify the effects of fragmentation on the species. For example, movement and persistence across a range of fragment sizes.
9. Determine the viability of populations and extent of use of remnant vegetation and revegetation in areas abutting coastal developments.
10. Assess the habitat requirements and susceptibility to logging and other forestry practices.
11. Undertake long-term monitoring of populations cross tenure in conjunction with other forest bat species to document changes.
12. Identify areas of private land that contain key habitat for the species (e.g. low elevation rainforest and coastal scrub) as areas of High Conservation Value (HCV) in planning instruments and land management negotiations.
13. Promote the conservation of these HCV private land areas using measures such as incentive funding to landholders, off-setting and BioBanking, acquisition for reserve establishment or other means.
14. Develop and promote bat awareness programs for schools, CMAs, landholders and industry groups etc.
15. Quantify any benefits of local bat populations to reducing the impact of insect pests on commercial crops.
16. Ensure the Code of Practice for private native forestry has adequate measures to protect large, hollow-bearing trees, viable numbers of recruit trees and provide protection for streamside vegetation. .
17. Identify important foraging range and key habitat components for this species.
18. Undertake a systematic survey of productive coastal river valleys to quantify the importance of private land relative to public lands.
19. Identify the susceptibility of the species to pesticides.
20. Research the effect of different burning regimes in coastal scrub and wet eucalypt forest inhabited by the species.

A number of specific recovery activities have also been identified (OEH 2015a):

1. Protect hollow-bearing trees and patches of rainforest and other dense vegetation.
2. Reduce the use of pesticides and consider alternatives where available.
3. Assist with removal of weeds, particularly with Bitou Bush control in coastal areas.
4. Protect known and potential habitat, particularly low elevation rainforest and coastal scrub from clearing, fragmentation and isolation.
5. Reconnect and rehabilitate patches of known and potential habitat.

The proposal is consistent with recovery strategies for this species.

(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.

Response:

The proposal contributes to the relevant Key Threatening Processes "Clearing of Native Vegetation" and "Loss of Hollow-Bering Trees", but not the habitat of this threatened species.

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***Miniopterus australis* Little Bentwing-bat**

The Little Bentwing-bat is listed as Vulnerable under Schedule 2 of the Threatened Species Conservation Act (1995). This species is not listed under the Schedules of the Environment Protection and Biodiversity Conservation Act (1999).

The Little Bentwing-bat is distinguished from other bentwing-bats by its small size and very long terminal joint in the third digit of the forelimb (Strahan 1995). This species has a distinctively short muzzle and a domed head (Churchill 1998).

These bats have a distribution running along the east coast of Australia from Cape York to northern New South Wales (Churchill 1998). In tropical areas, it ranges from the coast to higher elevations but further south it is largely restricted to the coast (Hoye and Hall 2008).

In the southern part of their range, Little Bentwing-bats may hibernate during winter months (Churchill 1998) but are known to remain active through much of winter, emerging to feed on many nights (Hoye and Hall 2008). It forages via aerial pursuit of small insects (moths, wasps and ants) beneath the canopy of densely-vegetated habitats including rainforest, paperbark swamps and wet and dry sclerophyll forest (Hoye and Hall 2008).

This species roosts communally in caves or similar suitable spaces, often with Miniopterus schreibersii oceanensis Eastern Bentwing-bat (Hoye and Hall 2008) and may form mixed clusters in winter (OEH 2015a). Females gather in large maternity colonies in summer (Menkhorst and Knight 2001), and only five such sites are known across Australia (OEH 2015a). A single young is born in December (Strahan 1995) and males and juveniles disperse in summer (OEH 2015a).

Non-breeding roost sites have included one observation of use of a tree hollow, but it is not known whether this occurs regularly (Hoye and Hall 2008).

This species was recorded foraging on the subject site during survey. Foraging habitat for this species occurs beneath the tree canopies in the less cluttered areas, along the tracks and at the edges of the bushland-grassland interface.

(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,

Response:

Critical habitat features for this species are the caves used for roosting and breeding. There are no such features on the subject site, the closest known nursery site being in the coastal ranges west of Grafton. The area of potential foraging habitat to be removed si relatively small in the context of what is available to this highly mobile 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,

Response:

This question is not relevant to a threatened species.

(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

Response:

This question is not relevant to a threatened species.

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

Response:

This question is not relevant to a threatened species.

(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

Response:

Poor quality foraging habitat will be removed in 16.71 hectares of weed-infested cluttered regrowth.

(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

Response:

This is a highly mobile species able to exploit widely separated resources. The proposal is unlikely to prevent this species from moving around the landscape or accessing required resources. Moreover, the proposal has been designed specifically so that north-south and east-west wildlife corridors will remain.

(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,

Response:

Important habitat to this species supports breeding habitat; no such habitat occurs within 50 kilometres of the site.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

Response:

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,

Response:

This species has been assigned to the "Landscape species" management stream under the NSW Office of Environment and Heritage as it is distributed across relatively large areas and is subject to threatening processes that generally act at the landscape scale (e.g. habitat loss or degradation) rather than at distinct, definable locations (OEH 2015b). The following management actions have been identified for this species as part of that process (OEH 2015b):

- Promote bats throughout the rural community as ecologically interesting and important, but sensitive to disturbance at caves/disused mine tunnels.
- Control foxes and feral cats around roosting sites, particularly maternity caves and hibernation sites.
- Prepare fire management plans for significant roost caves, disused mines, culverts, especially maternity and winter roosts.
- Exclude prescription burns from 100m from cave entrance, ensure smoke/flames of fires do not enter caves/roosts in artificial structures.
- Protect significant roosts and forest habitat within 10 km of roosts in PVP assessments (offsets should include nearby remnants in high productivity) and other environmental planning instruments.
- Promote the conservation of these significant roost areas using measures such as incentive funding to landholders, offseting and biobanking, acquisition for reserve establishment or other means.
- Determine the effectiveness of PVP assessment, offsets and actions for bats.
- Prepare management plans for significant bat roosts especially all known maternity colonies and winter colonies.
- Identify and protect significant roost habitat in artificial structures (eg culverts,

old buildings and derelict mines).
- Identify the susceptibility of the species to pesticides.
- Undertake non-chemical removal of weeds (e.g. lantana, blackberry) to prevent obstruction of cave entrances.
- Establish a gateing design for disused mines across species range that will not adversely impact species.
- Restrict caving activity during critical times of year in important roosts used by species, particularly maternity and hibernation roosts.
- Restrict access where possible to known maternity sites. (e.g: signs).
- Monitor the breeding success of maternity colonies in cave roosts over a number of years to determine the viability of regional populations.
- Undertake a regular census of maternity colonies (e.g. Willi Willi) and other key roosts in network, especially where there are population estimates from banding in the 1960s.
- For roost caves vulnerable to human disturbance, monitor their visitation by people, particularly during winter and spring/summer maternity season and in school holidays.
- Measure genetic population structure among cave roosts of maternity colonies to estimate dispersal and genetic isolation, and vulnerability to regional population extinction.
- Study the effect of different burning regimes on cave disturbance and surrounding foraging habitat.
- Study the ecological requirements of maternity colonies and their environs and migratory patterns.
- Identify important foraging range and key habitat components around significant roosts.
- Identify types of winter roosts used by species. Winter roosts suspected to be banana palms and tree hollows.
- Search for significant roost sites and restrict access where possible. (e.g. gating of caves). Significant includes maternity, hibernation and transient sites including in artificial structures.
- Compile register of all known roost sites in natural and artificial structures including current and historical data and identify significance of roost, e.g. maternity, hibernation, transient roost.
- Control goats around roosting sites, particularly maternity caves and hibernation sites.

A number of specific recovery activities have also been identified (OEH 2015a):

- Protect known roosting and nursery sites and surrounding forest from disturbance by restricting and/or monitoring access.
- Retain stands of native vegetation, particularly within 10km of roosts.
- Reduce use of pesticides within breeding and foraging habitat.
- Undertake non-chemical weed control to prevent obstruction of maternity cave and other roost entrances.
- Exclude fire from 100m of maternity cave, winter roost or other significant roost

entrances and ensure smoke/flames do not enter these roosts.
- Control foxes, feral cats and goats around maternity caves, winter roosts and other significant roost sites.
- Ensure any fencing and gating of roosts is done in a bat friendly manner allowing adequate entrance and exit space for all species using the roost.
- Check with OEH before undertaking recreational caving activities.
- Ensure adequate foraging habitat is retained when undertaking hazard reduction activities, particularly during the breeding/reproduction season.
- Ensure appropriate hygiene protocols are implemented when undertaking research and survey work.

The proposal is unlikely to interfere with the success of these recovery strategies.

(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.

Response:

The proposed works contribute to the Key Threatening Process "Clearing of Native Vegetation".

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