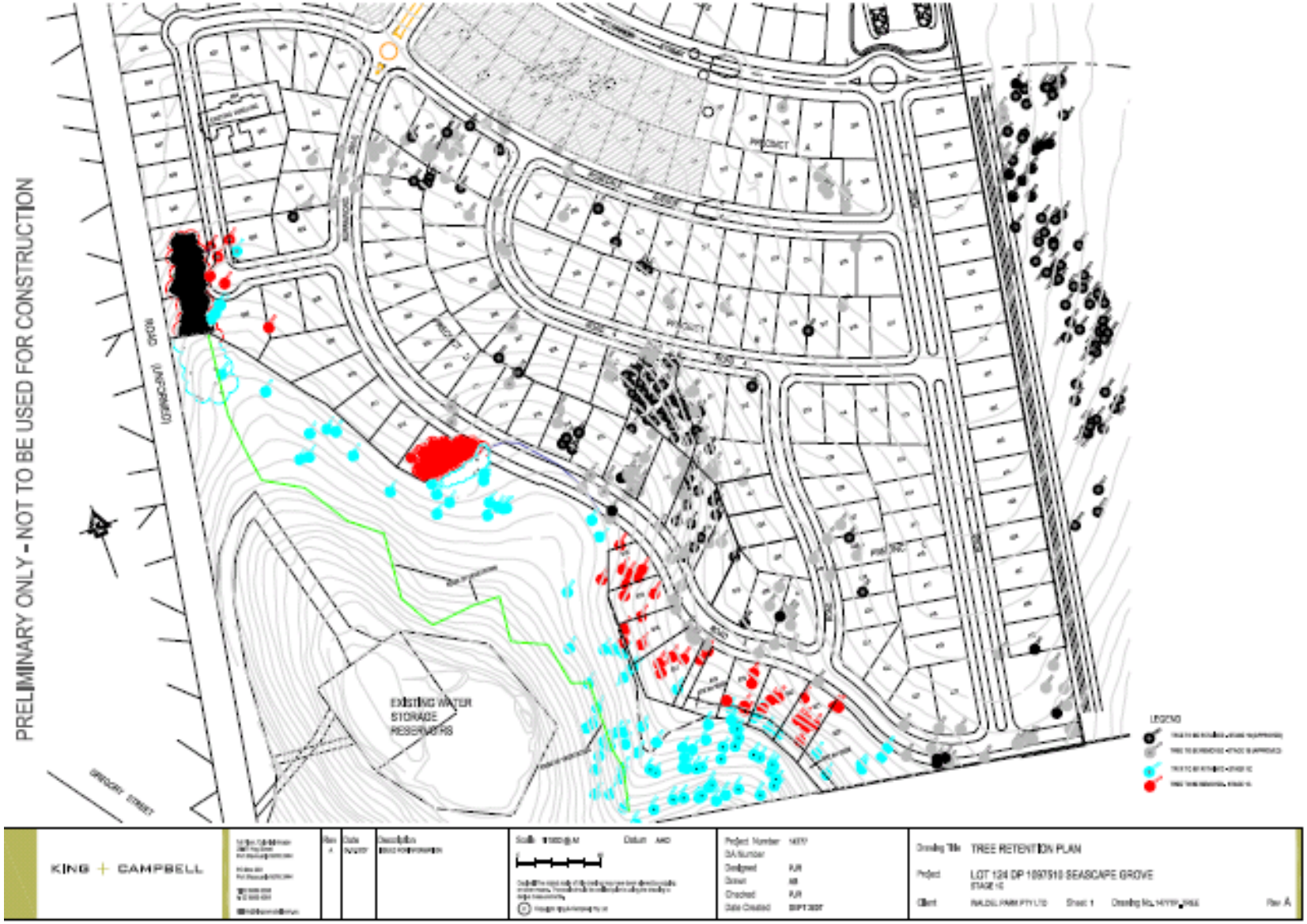
Figure 6: Lot layout and proposed tree removal
(Source: King and Campbell Pty Ltd)



As shown in the figure, the footprint falls over the lawns and gardens around the existing dwelling and over the pasture and agricultural woodlands. Approximately 70 trees will require removal ie 1 Grey Ironbark, 21 Scribbly Gums 17 Needlebark Stringybarks, 25 Blackbutts, 4 Pink Bloodwoods and 2 Tallowwoods. Of these trees, 6 contain actual hollows (suggested by observed opening) or potential hollows as shown in table 11 below:

Table 11: Hollow bearing trees to be removed

TREE NUMBER/SPECIES	LOCATION	NO. OF HOLLOWS
627 Needlebark Stringybark	Boundary of Lot 614	At least 6m with openings ranging from <5 to about 20cm. Hollows potentially suitable for Brushtailed Phascogale, Squirrel Gliders and Microchiropteran bats. This tree is considered structurally unsound due to decayed heartwood with an exposed fire scar at the base.
383 Blackbutt	Lot 617	At least 2 small hollows in crown limbs potentially suitable for Microchiropteran bats.
958 Scribbly Gum	Lot 619	Several upturned knobs with one appearing to have a formed hollow. Others potential hollows. Potentially suitable for Microchiropteran bats.
364 Scribbly Gum	Lot 621	Several upturned knobs with one appearing to have a formed hollow. Others potential hollows. Potentially suitable for Brushtailed Phascogale, Squirrel Gliders and Microchiropteran bats.
339 Pink Bloodwood	Lot 621	Several upturned knobs may have potential hollows. Potentially suitable for Brushtailed Phascogale, Squirrel Gliders and Microchiropteran bats.
340 Scribbly Gum	Lot 621	Several upturned knobs may have potential hollows. Potentially suitable for Brushtailed Phascogale, Squirrel Gliders and Microchiropteran bats.

The dam will also be filled.

6.1.2 APZs

APZs will be formally established in the southwest and south in the rear of residential Lots and/or adjacent edge of the 7(a) zone. No canopy loss is required except on Lots 619-621 (as these trees may pose a falling threat). The adjacent section of woodland is currently slashed hence this will be maintained to achieve fuel loading requirements.

6.2 SECONDARY IMPACTS

The following are impacts are generally associated with rural developments and establishment of dwellings:

1) *Weed invasion*: Lawns and gardens are likely to be established eventually around the established dwellings and it is possible that some plants introduced as garden ornamentals may escape and become weeds. Sedimentation and flow of nutrients could also potentially increase the occurrence of exotic weed species eg from roads. Edge effects may also see extension of weeds in some areas ie into the adjacent 7(a) zone. However, bushfire may curtail such incursions in the 7(a) zone and hence have little effect on the integrity of vegetation communities. Conversely, any planted fruit trees or flowering trees/shrubs may attract flying foxes or provide more structures for Microchiropteran bats to forage around, and passerine birds (potential prey species) to forage on.

2) *Vehicle/wildlife collisions*: Burrawong Drive will separate the 7(a) zone habitat upslope from the retained parkland habitat in the open space on a ridge running towards the centre of the approved subdivision, as will the intervening residential Lots. This will make it difficult for

gliders to reach these trees, and very difficult for the Phascogale. Both species are likely to have to run across open ground to reach these trees (though given their encapsulation within an urban area, there may be limited drive) hence would be at risk of collision.

3) *Introduction of feral/introduced animals*: Development is often associated with the introduction of non-native species, ie rodents, cats and dogs. The latter two may be kept as pets which may roam bushland, or become feral (eg via dumping of unwanted offspring). Cats are significant predators of native species (eg the Squirrel Glider and Phascogale – Dickman 1996, NSWSC 200a, 2000b, NPWS 2000a, 2001), and domestic dogs are significant threats to species such as the Koala (Connell Wagner 1998b, 2000b, Wilkes and Snowden 1998, NPWS 2003, etc). The threats induced by these species presently exists due to their presence in the study area and in the general area (eg on adjacent land to the west), and will be incrementally increased as a result of the proposed development. However given the current risk of the threats induced by these species; and that most pets will be largely restricted to residences due to provisions under the *Companion Animals Act 1997*; the incremental increase of these threats should not be significant. Precautionary ameliorative recommendations are given in section 7.

   Other exotic species such as foxes and rodents are not considered likely to be significantly affected by the proposal (in terms of abundance) as the majority of habitat will remain as is.

4) *Artificial lighting*: Artificial lighting will be provided as typical of a residential subdivision. Lighting may potentially discourage particularly nocturnal native species from foraging near areas of development or emerging from hollows (eg Darkheart 2005i), although wallabies, kangaroos, Tawny Frogmouth Owls, and possums have been noted foraging under artificial lighting in the residential areas of Lake Innes, Port Macquarie, for instance (personal observations). Artificial lighting may also be beneficial to Microchiropteran bats by creating localised aggregation of insects (personal observations). As the habitat remaining in the study site will generally be located behind residential Lots and away from street lighting, impacts should be reduced compared to the hollow-bearing trees retained in the parkland area of the approved stages of the subdivision.

5) *Noise disturbance*: Noise will be typical of a residential development ie peaks in morning and afternoon, with generally low levels at night. Noise effects on fauna in Australia are relatively poorly studied (Clancy 2001, Berrigan 2001d). Most evidence presented is anecdotal, but suggests most fauna have a fair degree of tolerance and adaptation at least to residential noise, with military training grounds proving to be *de facto* nature reserves for some species such as the Powerful Owl, Bush Stone Curlew, Squirrel Glider and Brushtailed Phascogale (Anon 1990, Anderson *et al* 2007). For example, this consultant has observed Glossy Black Cockatoos foraging in a tree within 30m of a person chain-sawing firewood (Berrigan 1998d), and Jabirus foraging by an excavator dredging a dam (pers. obs.). Given the Squirrel Glider and Brushtailed Phascogale have been recorded in urban remnants or on the fringes of urban areas (eg Darkheart 2005a, 2005b, 2005i, 2005m, 2004l, Dobson 2002, Goldingay *et al* 2006, Goldingay and Sharpe 2004a, Murray 2006, Smith and Murray 2003), and on military ranges (Anderson *et al* 2007), they are not likely to be significantly affected. Similarly, most of the other species under consideration have been recorded in urban situations, and are not likely to be significantly adversely affected.

6) *Increased human presence*: Human presence on the site and in the locality will be increased eventually as a result of the proposal. At present, human occurrence is slowly increasing due to the large approved residential subdivision that the proposal forms a small part of, and existing residential land to the west. Residential human presence will increase as the total development

is completed. However given the history of the site, existing human presence in the area and the ability of the recorded species to utilise even urban areas, all of the relevant threatened species are considered unlikely to be significantly affected, especially given the recording of such species in similar circumstances elsewhere (eg Harrington *et al* 2004, Darkheart 2005d, 2005h, 2004q, 2004o, 2004m, 2004l, Gunninah Consultants 1997, Connell Wagner 2000b, Cooke *et al* 2002, NPWS 2003a, etc). Furthermore, most of the threatened species associated with the site are nocturnal and activities will generally be low to nil during this period. Overall this impact is considered unlikely to be significant.

7) *Bushfire risk and alteration to regimes*: Fire is a natural ecological component of the recorded threatened species and EEC's ecology (Lindenmayer 2002, Smith *et al* 2005, NPWS 2004, Catling 1991, Gill *et al* 1999), however, an inappropriate fire regime can have significant negative effects (NSWSC 2004a, 20004b, 2004c, 2004d, 2004e, 2004f, NPWS 2004, Catling 1991, Gill *et al* 1999), potentially including local extinction.

Bushfire may be practised in the 7(a) zone for fuel reduction, or be started via vandals. This is considered a very low potential outcome however due to the relatively minimal fuel in this zone.

The *Rural Fires Act 1997* (RFA 1997) has relevant provisions for controlling the fire regime. Burning for the purpose of hazard reduction appears to require a Bush Fire Hazard Reduction Certificate (BFHRC) to be issued by the Rural Fire Service (RFS). This environmental approval is required under the RFA 1997 if the hazard reduction proposed affects native vegetation; poses a potential threat to threatened species, endangered ecological communities, etc; or could result in air or water pollution, or soil erosion (see sections 86, 89, 100C, 100D and 100G of the RFA 1997). A BFHRC requires legal compliance to the specified conditions which will take into account environmental factors such as:

- Presence of threatened species or EECs.
- Risk of soil erosion or mass movement.
- History and minimum fire frequency intervals for specific vegetation types.
- Location of waterbodies and waterside (riparian) vegetation.

A BFHRC may include measures to protect significant areas eg limiting fire frequency, specifying exclusion areas eg the wetland. The existence of an EEC and known habitat of several threatened species on the site should require specific environmental protection measures to be specified in any BFHRC applied for the site/property.

The guidelines for hazard reduction also recommend use of low intensity fires for hazard reduction to minimise rate of spread (hence allowing fauna to escape), generation of smoke (which may affect arboreal species), and maximises protection of the canopy. The guidelines also recommend use of spot fires which burn patchily, hence this may result in the creation of a complex mosaic of fire histories. The BFHRC also requires landowners to complete a report post-completion of works, hence provides a means of monitoring and compliance to the BFHRC's conditions.

This statutory instrument thus if implemented effectively should protect the 7(a) area's values from an ecologically unsuitable bushfire regime. The RFA 1997 also requires landowners intending to burn to provide at least 24hrs notice to all neighbours, hence this provides an opportunity for monitoring and control of fires.

Council may consider imposing a title covenant requiring the landowner to contact the RFS for a BHFRC application before burning, or to provide this ecological assessment to the RFS with any enquiry for burning to ensure due process is properly implemented.

Provided prescriptions and control measures give due consideration to ecological constraints, regulated bushfire may have more benefits than detrimental impacts compared to extensive wildfire.

8) *Disease*: This threat is relevant to both Koalas and amphibians. Most Koalas are naturally infected with *Chlamydia* pathogens (Sharp and Phillips 1999, Phillips 1997). This and other diseases may develop when Koalas are under stress, of which one cause is habitat disturbance. As no evidence of Koala use was detected, the proposal is not considered likely to substantially increase the risk of stress-induced diseases to Koalas in the general area.

   Other diseases such as Psittacine Circoviral Disease and Chytridiomycosis are not considered likely to be introduced to the site as a result of the proposed development.

9) *Incremental vegetation removal*: Despite restrictions, there is a risk that future owners might incrementally remove vegetation (eg applications under the Tree Preservation Order to remove "threatening trees", etc), thus increasing habitat loss. Given that the habitat on site has values for several threatened fauna species, appropriate recommendations are provided in section 7.

10) *Eutrophication and Pollution*: Given statutory provisions, these potential impacts are not considered an issue for the proposal.

11) *Edge Effects*: The change of landuse from agricultural to residential can also have the following effects which are generally referred to as edge effects (Lindenmayer and Fisher 2006, Andrews 1990, Goosem 2002, May and Norton 1996, Catterall 2004, Dickman 1996, NPWS 2001, Kelly *et al* 2003, Cropper 1993, Downy 2003, Brown *et al* 2003):
    - Increased ingress of feral species such as cats and dogs.
    - Ingress of weeds into areas not previously found.
    - Alterations to microclimate ie drying, altered humidity levels, increases light penetration, etc.
    - Increased exposure to wind.
    - Increased predation, competition and assemblage modifications.

    The relatively minor extent of habitat effected and the disturbed nature of this and adjacent habitat indicates that edge effects are unlikely to be significant.

7.0 AMELIORATIVE MEASURES AND RECOMMENDATIONS

7.1 MAJOR RECOMMENDATIONS

The following major recommendations are made to reduce or avoid potential impacts on threatened fauna either known or considered potential occurrences on the study site/area/property. These are integral to the basis of later assessment and conclusions as it is assumed these recommendations will largely be implemented in some form eg title covenants.

7.1.1 Informed Development Design

These recommendations were made during the preliminary design stage of the proposal to maximise retention of key habitat areas and components, as follows:

- Retain maximum numbers of hollow-bearing trees
- Minimise clearing to that absolutely necessary.

To assist with achieving this recommendation, all trees in the development footprint were located via survey (except the western boundary). This allowed development of a layout which achieved the following:

- Loss of only 6 hollow-bearing trees.
- Tree removal limited to 70 trees.

7.1.2 Clearing Strategy, Pre-Clearing Survey and Hollow Bearing Tree Removal

This measure is required to minimise the risk of hollow-obligate fauna (especially Squirrel Gliders) being killed/injured during removal of hollow-bearing trees.

7.1.2.1 Clearing Strategy

When tree removal is to be programmed, all non-hollow bearing trees are to be removed at least 24hrs (preferably 7 days) before removal of hollow-bearing trees. This is to stimulate any resident animals to abandon the den.

7.1.2.2 Squirrel Glider and Microchiropteran Bat Pre-Clearing Survey

7.1.2.2.1 General Methods

A pre-clearing survey is to be conducted on the night prior to removal of the hollow-bearing trees to help minimise the risk of injury/mortality of arboreal fauna (especially the Squirrel Glider) potentially utilising the subject trees as den-sites.

The pre-clearing survey will consist of:

- Saturated arboreal Elliot B trapping throughout the study site (particularly on and directly adjacent to the hollow bearing trees) to maximise the likelihood of capturing site-dependant animals on the night before clearing; and

- Stag watches on the hollow-bearing trees to see if key roosts (maternity, nursery, hibernation) are present or to identify hollows subject to usage as Squirrel Glider den sites at the time of the clearing.

The Elliot B traps are to be checked and removed at dawn the following morning prior to the commencement of any clearing work. All hollow-bearing tree felling is to be completed on the day following trapping. If all hollow-bearing trees requiring removal are unable to be fallen the day following trapping, further hollow-bearing tree removal may only commence the day after a second night of trapping.

Any captured fauna are to be kept in a shaded area and released after sunset that evening in the retained vegetation.

7.1.2.2.2 Key Bat Roost

If a tree is found to contain a key bat roost, this tree is not to be removed until the bats complete the key lifecycle stage and move on. This will have to be determined via periodic monitoring (ie stag watching and inspection with a remote infrared camera). Once the bats have moved on, the hollow bearing tree removal protocol will apply.

7.1.2.2 Hollow-Bearing Tree Removal Protocol

The X6 hollow bearing trees requiring removal are to be removed in a way that will minimise the risk of injury/mortality of denning/roosting fauna (particularly the Squirrel Glider) within the limitation of Occupational Health and Safety (OH&S) Guidelines.

This is to be achieved by the following procedure:

- Initial bumping of subject hollow-bearing trees to initiate evacuation of any residents (subject to OH&S limits in regard to falling branches). This is to be repeated at least 3 times at about one minute intervals over 5 minutes per tree.
- The hollow-bearing tree is to be removed via a method that does not require traditional felling ie use of a machine with a pincer attachment that can hold the trunk while the tree's base is sawn.
- The subject fallen trees are subsequently to be safely and gently lowered; crown trimmed (if required to allow manoeuvrability); then gently transported to and deposited at the edge of the main areas of retained vegetation where the trees are be left to allow arboreal animals to escape the night following felling. The trees may be only be destroyed after 7 days from felling. If this is not possible, the tree is to be carefully sectioned via chainsaw to allow verification that all hollows are empty, after which the remains may be destroyed/piled.

An ecologist or OH&S certified member of FAWNA/WIRES is to be present during felling of hollow-bearing trees and/or sectioning in case of injury. Hollows are to be inspected once each tree is fallen for injured or abandoned offspring, etc, and appropriate measures undertaken eg transport to vet or care by FAWNA/WIRES at the proponent's expense, or held in a cool, dark place on site. All uninjured rehabilitated animals are to be returned into the retained vegetation on or adjacent to the site at dusk.

A written report is to be provided to Council following the removal of hollow-bearing trees and the pre-clearing survey detailing all results and actions undertaken.

7.1.3 Retained Tree/Habitat Protection During Construction

The following tree/habitat protection measures will be required to be undertaken to protect the retained habitat/trees during construction. These include:

- All trees/habitat to be retained or removed should be clearly mapped on a site plan (ie a clearing plan) and marked on site (eg with a specific coloured flagging tape or fencing off) to ensure construction activities do not result in accidental damage or removal.

- All practical measures possible are to be undertaken to protect retained trees/habitat to maintain long term health eg fencing off temporary fencing during the length of the construction period. Appropriate guards approved by an arborist are to be installed to prevent physical damage to

the trunk where setback via fencing is not practical/possible, and other additional measures (eg mulch placed over roots) are to be implemented to protect the health of the tree. Appropriate measures approved by an arborist are to be taken when roots must be trimmed during any excavation works.

- Machinery and vehicles should avoid being used or parked directly adjacent to trees which are to be retained to avoid soil compaction. If unavoidable, soil compaction and tree protection measures will be required.

- Specific instruction to staff/contractors on what trees and habitat is to be retained, their significance and measures to be undertaken to avoid damage to them. Contracts are to contain clauses for penalty for non-compliance.

- No disposal of cement wastes, construction material or washdown near the retained vegetation.

- Mixing of imported soils with site soils outside the development/dwelling footprint should be avoided to minimise risk of disease and pathogenic fungus transfer.

Contract conditions with contractors are to provide for compliance mechanisms (eg financial penalties) for breeching of the above eg accidental tree removal (including of replacement plantings), and to compensatory measures eg replacement plantings.

7.2 SECONDARY RECOMMENDATIONS

The following are provided for optional consideration by the determining authority for maintaining biodiversity and abating impacts. It is not assumed that these recommendations are adopted conditions of consent or in the conclusions of this report, but it is desired that proponent (and future residents) at least be advised to consider adopting them eg as conditions of consent.

7.2.1 Cats and Dogs and Feral Predator Management

All stray cats and dogs should be reported by residents to Council as applicable under the provisions of the *Companion Animals Act 1997*. Any pet cats and dogs should be restricted to the residential Lots unless on a lead. Cats should be confined to enclosures or indoors during the night. Pets should not to be allowed to roam through the adjacent bushland in the general area.

Residents are to report sightings of foxes, feral cats and wild dogs to the Rural Lands Protection Board and DECC.

7.2.2 General Landscaping

Streetscaping gardens and any other areas which are to be planted for aesthetics should generally include native potential forage species such as eucalypts, banksias, acacias and grevilleas to attract and support fauna. This will not only offer more habitat for species capable of facilitating such areas, but also increase the aesthetics of the area. Use of garden chemicals should be limited a much as possible.

7.2.3 Artificial Lighting

Artificial lighting is considered likely to be typical of residences with lights occurring primarily around the established dwellings. As noted previously, there appears to be varying evidence of artificial

residential lighting having significant detrimental effects on fauna with many native (including threatened) species recorded foraging under or near artificial lighting eg Microchiropteran bats and macropods, unless the light is directly shone onto key habitat areas/components eg tree hollows.

To ensure anthropogenic impacts are minimised, it is recommended that artificial lighting be kept to a minimum and be of a localised and low luminosity, with light directed to the ground and not into vegetation.

7.2.4 Fire Regimes

Any hazard reduction burning should take into consideration the ecological constraints of the site. Proponents must be aware that an excessive fire regime which alters the structure of the site's habitat is a breach of the *Native Vegetation Act 2003*, and offenders are liable for prosecution.

In addition, it is advised that due to the presence of a threatened species on site, any burning for the purpose of hazard reduction should require a Bush Fire Hazard Reduction Certificate (BFHRC) under the RFA 1997 which may include measures to protect the potential habitats of these species. Council may consider issuing a measure which requires owners to consult the RFS prior to conducting any fuel reduction.

7.2.5 Feral Bees and Indian Mynas

Feral bees and Indian Mynas (*Acridotheres tristis*) out-compete native fauna for tree hollows, which are a critical habitat component for many native fauna (Gibbons and Lindenmayer 2002). Feral bees can also invade used hollows and kill native fauna (Gibbons and Lindenmayer 2002). Indian Mynas also predate nestlings (Anon 1990) and hence may be a threat as an edge effect. Both are spreading throughout the country and are having a detrimental on fauna already under pressure from other threats eg habitat loss (Gibbons and Lindenmayer 2002).

Feral bee hives should be exterminated on detection to prevent new hives being established. Indian Mynas should not be encouraged to feed on site (eg by provision of seed, etc by residents), and if detected nesting on-site, they should be reported to the NPWS, the Catchment Management Authority or Council for appropriate action to be undertaken (ie nest destruction).

7.2.6 Removal of Trees Near Retained Habitat Trees

Trees may intertwine and at times even graft their roots with neighbouring trees, and standard removal via heavy excavation equipment can damage roots of trees to be retained, resulting in risk of fatal infections or general impacts on health and longevity (Page 2006).

This is a potential threat to the hollow-bearing trees proposed to be retained on the site. An arboricultural consultant is recommended to advise and if necessary supervise the proper removal method of such trees to avoid this potential impact. Sawing down of trees and stump grinding is considered likely to be the best method where a potential risk is identified (Page 2006).

PART E: STATUTORY CONSIDERATIONS

8.0 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

8.1 GENERAL CONSIDERATION/SUMMARY

The provisions of the EPBCA require determination of whether the proposal has, will or is likely to have a significant impact on a "*matter of national environmental significance*". These matters are listed and addressed as follows:

1. **World Heritage Properties**: The site is not listed as a World Heritage area nor does the proposal affect any such area.

2. **Ramsar Wetlands of International Significance**: No Ramsar wetland occurs on the site, nor does the proposal affect a Ramsar Wetland.

3. **EPBCA listed Threatened Species and Communities**: No EPBCA listed species are likely to be significantly affected (see section 8.2 and Appendix 1).

4. **Migratory Species Protected under International Agreements**: No migratory species is likely to be significantly affected by the proposal (see section 8.3).

5. **Nuclear Actions**: The proposal is not a nuclear action.

6. **The Commonwealth Marine Environment (CME)**: Listed as relevant to the study site though site is not within the CME nor does it affect such.

7. **National Heritage**: The site is not an item of National Heritage.

The proposal thus is not considered to require referral to DEWHA for approval under the EPBCA.

8.2 EPBCA THREATENED SPECIES

8.2.1 Threatened Flora

No EPBCA listed flora species were found or are considered likely potential occurrences on the study site, and thus are not considered further.

8.2.2 Threatened Fauna

8.2.2.1 General Consideration

No EPBCA threatened species were recorded on the site. The Grey-Headed Flying-Fox and to a lesser extent the Spotted-Tail Quoll are considered potential occurrences on or near the site. The Grey-Headed Flying Fox is listed as Vulnerable under the EPBCA, while the Quoll is listed as endangered. These species are dealt with specifically in 8.2.2.2 and 8.2.2.3

Regarding other fauna species, a number of species are known or considered potential occurrences in the locality in terms of potentially suitable habitat. A significant number of others have also been recorded in the region in habitats broadly similar to that occurring in the locality. The following groups of threatened species are not considered further as the proposal has no consequence upon them:

1. **Marine reptiles, fish and mammals** eg Grey Nurse Shark, Great White Shark, Southern Right Whale, Elegant Sea-Snake, Yellow-Bellied Sea-Snake, Loggerhead Turtle, Green Turtle and Leatherback Turtle.

2. **Migratory pelagic/open ocean seabirds** eg Gould's Albatross, Southern Giant Petrel, Blue Petrel, Northern Giant Petrel, Sooty Albatross, Kermadec Petrel, Shy Albatross and Grey-Headed Albatross.

These species were considered likely to be unaffected by the development proposal due to:

- Lack of habitat affected eg pelagic species
- Extremely rare probability of occurrence near site or in locality
- Nesting or foraging habitat not potentially or significantly affected
- No threats to be introduced or enhanced.

The following other threatened species listed under the EPBCA are potential or known occurrences in the locality or regional database, and are considered for potential impacts, risk and significance in the evaluation table in Appendix 1. These species are dually listed under the NSW *Threatened Species Conservation Act 1995*. Species considered are:

1. Birds: Swift, Parrot, Regent Honeyeater, Painted Snipe and Red Goshawk.
2. Mammals: Long-Nosed Potoroo (considered as entire species) and Dwyer's Bat.
3. Frogs: *Litoria olongburensis, L. aurea, Mixophyes balbus, M. iteratus.*

None of these species were considered likely to be significantly affected by the development proposal as:

- Potential habitat does not occur on or near the site.
- Potential habitat is not affected at all or significantly.
- Site has minimal potential to support these species to any significant extent eg key part of migratory range, breeding habitat, refugia, etc; due to:
    i. Extent of habitat modification, ie total clearing to establish orchard.
    ii. Insufficient recovery period for regrowth vegetation
    iii. Presence of more suitable habitat in the general area, ie to the west of the site.
- Lack of records in locality, Shire and catchment
- No significant habitat loss

8.2.2.2 Vulnerable Species: Grey-Headed Flying Fox

8.2.2.2.1 Factors to be Considered for Vulnerable Species

The guidelines to assessment of significance to this Matter, define an action as likely to have a significant impact on a Vulnerable species if it will:

a) Lead to a long-term decrease in the size of an important population of a species, or:
b) Reduce the area of occupancy of an important population, or:
c) Fragment an existing important population into two or more populations, or:
d) Adversely affect habitat critical to the survival of a species, or:

e) Disrupt the breeding cycle of an important population, or:
f) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or:
g) Result in invasive species, that are harmful (by competition, modification of habitat, or predation) to a Vulnerable species, becoming established in the Vulnerable species' habitat , or:
h) Interferes substantially with the recovery of the species.

An *important population* is one that is necessary for a species' long-term recovery. This includes such populations as:

- Key populations either for breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity, and or:
- Populations that are near the limit of the species range:

8.2.2.2.2 Assessment of Significance: Grey-Headed Flying Fox

This section addresses each of the previous points listed.

For the purposes of discussion, the "*important population*" of Grey-Headed Flying Foxes is defined as that population of the species likely to depend on colonial roosts in the locality or within foraging range of the site.

a) *Lead to a long-term decrease in the size of an important population of a species*, or:

In the context of the species ecology, the site/property provides a relatively minor area of potential foraging habitat. It is not known nor considered suitable as roosting habitat for the species, thus no such areas are affected by the proposal.

The proposal will require the removal of a maximum of approximately Xha of pasture, lawns/gardens and agricultural woodland, containing 70 trees. These trees are potential foraging resources for the Grey-Headed Flying Fox and hence the proposed development will reduce the site/propertys's current foraging carrying capacity for the species. However, due to the limited loss, extent of habitat in the study area, and the ecology of the species, the resulting reduction is relatively minute. In addition, alternative known/potential habitat occurs extensively in the locality, and the species readily forages and roosts in human-modified environments eg the Sydney Royal Botanical Gardens (Parry-Jones 2006). Overall, the proposal will not lead to a long-term decrease in the size of an important population.

b) *Reduce the area of occupancy of an important population*, or:

The area of occupancy of the local population of the Grey-Headed Flying Fox would extend well beyond the confines of the site/property (as their ecology indicates an area of occupancy is likely to be tens if not hundreds of thousands of hectares – Eby 2000a, 2000b, Eby and Lunney 2002, Eby 2002). As mentioned previously, establishment of the proposal will require the removal of about Xha of habitat including potential foraging resources for the Grey-Headed Flying Fox which only forms a minor fraction of the potential habitat remaining in the study area and property. In this context, and in the context of the species' area of occupancy as discussed above, the proposal will reduce only a very small portion of the habitat available to an important population. Furthermore, the species is known to readily use habitat within urban areas indicating usage of highly modified habitat and adjustment to high levels of human presence (eg Smith 2002, Eby 2002, Parry-Jones 2006).

c) *Fragment an existing important population into two or more populations*, or:

The Grey-Headed Flying Fox is highly mobile and known to be capable of crossing human-modified habitat (personal observations, Eby 2002, Parry-Jones 2006, Smith 2002). The proposal will thus offer no barrier to movement and hence will not fragment an existing important population.

d) *Adversely affect habitat critical to the survival of a species*, or:

According to the MNES guidelines, "*critical habitat*" refers to areas critical to the survival of a species or ecological community and may include areas that are necessary for/to:

- Activities such as foraging, breeding, roosting or dispersal.
- Succession.
- Maintain genetic diversity and long term evolutionary development, or
- Reintroduction of populations or recovery of the species/community.

As mentioned previously, the study site/property is not known roosting habitat for the Grey-Headed Flying Fox, nor is any significant extent of potential or known foraging habitat affected by the proposal. Post-development, due to the retention of the larger portion of the potential foraging habitat in the study area and remainder of the property, and the demonstrated tolerance of the species to human presence (eg Eby 2002, Smith 2002, Parry-Jones 2006, Eby and Lunney 2002, Richards 2000), the property will readily retain its essential capacity to support foraging by the Grey-Headed Flying Fox, as part of such locally abundant habitat. Hence the proposal is not considered likely to affect the viability of the important population.

e) *Disrupt the breeding cycle of an important population*, or:

The Grey-Headed Flying Fox is dependant on a sufficient extent of reliable sources of nectar, pollen and fruits for successful reproduction, and uses specific maternity roosts (Eby 2000a, 2000b, Eby 2002, Eby and Lunney 2000). The site is not a known maternity roost (Eby 2002). As some of the potential foraging species present flower in Winter-Summer, the Grey-Headed-Flying Fox has potential to forage while lactating on site as part of a wider area fulfilling these requirements (Eby 2000a, 2000b, Eby 2002, Eby and Lunney 2000, Richards 2000). In this context, the losses potentially imposed by the proposed development are thus unlikely to affect the breeding cycle of any important population of the Grey-Headed Flying Fox.

f) *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*, or:

As detailed previously, the degree of possible vegetation loss imposed by the proposed development is not significant enough to affect the local Grey-Headed Flying Fox population to the point that it could cause a decline of the species.

g) *Result in invasive species, that are harmful (by competition, modification of habitat, or predation) to a Vulnerable species, becoming established in the Vulnerable species' habitat*, or:

No new species that affects Grey-Headed Flying Fox will be introduced.

h) *Interferes substantially with the recovery of the species*.

Ideally, the goal in threatened species recovery is to increase the abundance and range of the threatened species, so that it is not in risk of becoming extinct. One major means of achieving this is to avoid

habitat loss which is the principal cause of threatened species decline (Eby and Lunney 2002, Eby 2000a, 2000b, Richards 2000, Smith 2002, DECC 2007a).

While about Xha of habitat may be lost/modified, overwhelming majority of the current potential of the property to support opportunistic foraging by the Grey-Headed Flying Fox will be retained. Given that the site it not critical to the species, the extent of loss in proportion to the species range, the retention of a large portion of the property's potential foraging resources (protected in the 7(a) zone), and the presence of foraging resources adjacent to the site; the proposal is not considered likely to interfere substantially with the recovery of the species.

8.2.2.2.3. Conclusion

The proposal is not considered likely to have a significant impact on any EPBCA listed Vulnerable species.

8.2.2.3 Endangered Species: Spotted-Tail Quoll

For the Quoll, given its large territories, a population for the purpose of the following assessment is difficult to define. Given the extent of available forest habitat west and south of the site, it is considered the local population is those Quolls that reside generally within at least a 10km range which form an interbreeding set of individuals.

8.2.2.3.1 Factors To Be Considered for Endangered Species

The guidelines to assessment of significance to this Matter, define an action is likely to have a significant impact on an Endangered species, if it will:

b) Lead to a long-term decrease in the size of a population of a species, or:
c) Reduce the area of occupancy of the species, or:
d) Fragment an existing population into two or more populations, or:
e) Adversely affect habitat critical to the survival of a species, or:
f) Disrupt the breeding cycle of a population, or:
g) Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or:
h) Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species´ habitat:
i) Interferes substantially with the recovery of the species.

8.2.2.3.2. Assessment of Significance

This section addresses each of the previous points listed.

a) *Lead to a long-term decrease in the size of a population of a species*, or:

The proposal may require the removal of about Xha of pasture, agricultural woodland and lawns/gardens which offer no specific value to this species as it is located beyond the dry sclerophyll which is considered to have some marginal potential as the fringe of the foraging range of the local individual. The loss of this habitat may have some impact on potential prey such as hollow-obligates, but should not significantly affect prey diversity and abundance. The proposal will introduce associated anthropogenic impacts via creation of new residential dwellings ie roads, noise, etc, as well as potentially increase the local population of feral cats which may impact on prey and mortality rates of the Quoll.

However, as all potential habitat and current linkage in the dry sclerophyll will be retained, the net effects of the proposal should not be significantly detrimental to the potential presence of this species.

b) *Reduce the area of occupancy of the species*, or:

The proposal will remove/modify the marginal fringe of low quality potential habitat adjacent to the urban fringe. This loss is only a fraction of a potential territory of a single animal (Belcher 2000, 1994, NPWS 1999a, WWF 2002). Consequently, as the dry sclerophyll forest will retain its potential value, and most of the habitat used by the local population is not affected by this proposal (due to the area required), it is determined that the proposal only represents a minute contraction of the area of occupancy of the important population.

c) *Fragment an existing population into two or more populations*, or:

The Quoll is highly mobile and known to be capable of crossing human-modified habitat (Smith *et al* 1995, Belcher 2000, 1994, NPWS 1999a, WWF 2002). The proposal will offer no barrier to movement to the Spotted Tail Quoll as links have been retained to adjacent habitat. Thus it will not fragment an existing important population.

d) *Adversely affect habitat critical to the survival of a species*, or:

"*Critical habitat*" refers to areas critical to the survival of a species or ecological community may include areas that are necessary for/to:

- Activities such as foraging, breeding, roosting or dispersal.
- Succession.
- Maintain genetic diversity and long term evolutionary development, or
- Reintroduction of populations or recovery of the species/community.

As noted previously, the site/property is also not considered likely to be of any specific significance to the Spotted Tail Quoll due to failure to detect the species by this survey, the low quality of habitat; likely presence of competitors/predators; and it lies near the fringe of a large extent of potential habitat (Hat Head National Park). Hence its modification is considered very unlikely to have any significant detrimental effect on the viability of the Spotted Tail Quoll.

e) *Disrupt the breeding cycle of a population*, or:

In addition to the majority of habitat being retained on the property, the extent of adjacent habitat with much higher potential to support the Spotted Tail Quoll is not affected by the proposal.

Furthermore, the development is not of significant enough scale to affect an important population of the species, given that such populations would range over hundreds to thousands of hectares owing to the ecology of the species.

f) *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*, or:

As detailed previously, the area of the site/property and the degree of vegetation/habitat loss is not significant enough to affect the local population of the Spotted Tail Quoll to the point it could cause a decline of the species.

g) *Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species´ habitat*, or:

No feral species that may affect the Spotted Tail Quoll is likely to be introduced (since foxes and feral cats are likely to already occur on site/property and in the general area). Domestic species such as cats are potential predators, though as they are pets, are not strictly an "invasive" species.

h) *Interferes substantially with the recovery of the species*.

Ideally, the goal in threatened species recovery is to increase the number and extent of the threatened species, so that it is not at risk of becoming extinct.

The proposal will retain the majority of the current potential of the property to support the potential occurrence of the Spotted Tail Quoll. Given that the site/property it not critical to the species, the proposal is not considered likely to interfere substantially with the recovery of the species.

8 .2.2.3.3 Conclusion

While the proposal will see some relatively minute reduction of the potential foraging values of the site/property for this species, the majority of the current potential is considered likely to be retained.

On basis of this and that the site comprises (in a regional context) only a small area of potential foraging habitat, the proposal is considered unlikely to have a significant impact on these species.

8.3 EPBCA MIGRATORY SPECIES

No EPBCA listed migratory species were recorded during the survey. However, a number of other migratory species have been recorded in the locality (DECC 2007a, Birds Australia 2007, Darkheart 2006f, 2004f, Sandpiper Environmental 2005). Of those, the following are considered at least a fair chance of occurrence or directly adjacent to the site:

- Cattle Egret, Rainbow Bee-Eater, White-Throated Needletail and Fork-Tailed Swift.

These species are considered in the following section.

8.3.1 Factors To Be Considered

The guidelines to assessment of significance to this Matter, define an action as likely to have a significant impact on a migratory species, if it will:

a) Substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or;

b) Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat of the migratory species, or;

c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.

An **important area of habitat** is:

1. Habitat used by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or:
2. Habitat utilised by a migratory species which is at the limit of the species range, or;
3. Habitat within an area where the species is declining.

8.3.1.1 Assessment of Significance

This section addresses each of the previous points listed.

The site is not considered likely to constitute an *important area of habitat* on the basis of the following:

1. The site/property is not of sufficient extent to support an ecologically significant proportion of the species (at most, only a small group or transient individuals using the broader locality and region as a range). Thus value of the habitat is as a fraction of a significant extent of similar habitat not only in the LGA, but the North Coast Bioregion.

2. While some migratory species occurring in the locality may be at the limits of their range, no such species were recorded on or near the site. Additionally, similar habitat is known to occur both north and south of the LGA.

3. If the site/property were located at the limits of a species whose abundance and range is declining, it would not be considered significant as such habitat is locally abundant in the area, and habitat with greater capability occurs within 10km eg National Parks, SEPP 14 wetlands and conservation reserves, etc.

In regards to point (a): The proposal does not affect important habitat (as detailed above).

In regards to point (b): An invasive species is one that may become established in the habitat, and harm the migratory species by direct competition, modification of habitat, or predation. The proposal will not introduce any invasive species.

In regards to point (c): No disruption of the lifecycle of any migratory bird is likely as:
- Habitat for the species is largely outside the development area.
- Habitat affected is either only marginally suitable, and/or locally abundant.
- No nesting/breeding habitat is affected.
- Key habitat areas are to be retained.

In view of the above, no migratory bird is considered likely to be significantly affected by the proposal.

9.0 SEVEN PART TESTS OF SIGNIFICANCE

9.1 GENERAL

Section 5A of the *Environmental Protection and Assessment Act 1979*, as amended by the *Threatened Species Conservation Legislation Amendments Act 2002* (Seven Part Test for Significance), lists the factors to be considered in the determination of significant effects of proposed developments on threatened species, populations, communities or their habitats.

The Seven Part Test of Significance is applicable to listed species, populations and communities which are listed under the TSCA when they are recorded during surveys, or if potential habitat that these species could occupy, occurs on the site of the proposed development, or the proposal will have an effect on adjacent habitats which these entities may or do occupy.

No threatened flora species, EECs or populations were detected on the site by the survey, and as detailed in section 3.2.1 and Appendix 1, none are considered likely potential occurrences. Hence no threatened flora, EECs or endangered populations are considered in the Seven Part Tests.

The Squirrel Glider was the only threatened species recorded by the survey on site and hence was automatically subject to the Seven Part Tests. Previous survey of adjacent land also recorded the following species which are highly likely to occur on site due to suitable interconnected habitat. These species were automatically subject to the Seven Part Tests:

- Little Bent-Wing Bat
- Eastern Freetail Bat
- Common Bent-Wing Bat
- Grey Headed Flying Fox

Threatened fauna species recorded in the South West Rocks area, locality or the region and considered to have some potential to occur on the study site or in the locality in broadly similar habitats were listed in section 2.3.1. The likelihood of these species occurring on the study site and their eligibility for consideration under the Seven Part Test is considered in Appendix 1. These species were assessed in terms of records in the region, habitat requirements, availability of habitat on the study site/area, and potential impact significance (eg loss of potential or known habitat, loss of critical habitat components, etc). Of these species the following were considered to be potential occurrences on site and hence were considered to require Seven Part Test Assessment:

- **Mammals**: Black Flying Fox, Greater Broad-Nosed Bat, Yellow-Bellied Sheathtail Bat, Beccari's Freetail Bat, Hoary Bat, Eastern False Pipistrelle, Brushtailed Phascogale, Spotted-Tail Quoll, Koala.

- **Birds**: Glossy Black Cockatoo, Square-Tailed Kite, Barking Owl, Masked Owl, Powerful Owl.

The Seven Part Tests for the threatened fauna are summarised below and detailed in Appendix 2.

For the threatened species other than those considered in the Seven Part Tests, it was considered that the proposed development is unlikely to have any significant impact due to some or all of the following factors:

- Absence of suitable habitat either on the study site or within the locality.
- Absence of records in the locality (or even the local region) and survey failure to detect, strongly suggesting these species do not facilitate the study area.
- Degraded condition of the potential habitats and habitat components in the study area which is likely to preclude these species from the study area or on-site eg lack of undergrowth development/diversity, lack of preferred forage species/prey, etc.
- Absence of some critical habitat components within the study area eg understorey containing suitable species, low abundance or diversity of prey species, absence of large hollows.
- Presence of rival/competitive species or predators eg reptiles, common bats and owls.

- Presence of threatening processes and Key Threatening Processes ie foxes, clearing of native vegetation, frequent fire, etc.
- Low probability of potential recovery due to continuation of degrading processes ie slashing and weed infestation
- Presence of alternative and more optimum habitat in adjacent areas ie Nature Reserves, State Forest, etc.

9.2 SEVEN PART TEST SUMMARY

Given the ecology of the subject species, the habitat on the site/property and the extent of known/potential habitat in the general area, the range of the known/potential local population of the subject species would extend well beyond the confines of the site/study area/property, as detailed in Appendix 1.

The following summarises the findings of the 7 Part Tests:

(h) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed development may see up to approximately Xha of agricultural woodland habitat potentially removed/modified under the proposal from the site. This will remove some 70 trees, including some 6 hollow-bearing trees which have potential as roosts sites for the Microchiropteran bats, Squirrel Glider and Brushtailed Phascogale. About 23 primary preferred Koala browse species will also be removed.

This habitat loss/modification will result in a reduction of the property's carrying capacity for all the subject species. However, given the limited quality of the habitat affected, the extent of more optimum habitat in the 7(a) zone, and mobility and ranges of the majority of the subject species, this would represent a very minor reduction in potential habitat available in the area, as well as locally and regionally.

For the Squirrel Glider which has the smallest range of the subject species, the habitat reduction proposed is also considered relatively insignificant. This is due to the retention of the majority of known or potential habitat together with links to surrounding land; and the retention of most of the key habitat components ie tree hollows are most abundant in the 7(a) zone (ERM 2006b) .

Thus given the site/property's disturbance history, current modified state and records of all of the subject species in/adjacent to urban and rural/rural-residential habitats elsewhere (eg Darkheart 2004b, 2003a, 2006k, 2007d, 2007e, 2006c, 2006i, 2006j, 2005a, 2005b, etc, Dobson *et al* in press, Cooke *et al* 2002, etc); the remaining habitat on the property's current carrying capacity for all of the subject species should largely be retained at sufficient levels to maintain population viability. Other threats to the subject species or their habitat (ie domestic pets, road kill, fire) should not be significantly increased by the proposal beyond current threat status given statutory controls.

Overall following consideration of the above, the proposal is not considered likely to result in an impact that may significantly affect the lifecycle of the local population of any of the subject species to the point of increasing extinction risk, especially given the extent of alternative known/potential (and generally better quality) foraging and/or roosting/nesting habitat available to the local population of the subject species on the property and interlinked to adjacent habitat.

(i) 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,

No relevant populations are currently listed under the TSCA.

(j) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(iii) 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

(iv) 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,

No EECs occur on site or in the study area, hence this question is not relevant.

(k) in relation to the habitat of a threatened species, population or ecological community:

(iv) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(v) 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

(vi) 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,

The proposal will remove/modify about Xha including 70 trees on the property which lies on the fringe of X ha of forest and woodland remaining on the property's southern boundary. For the majority of the subject species, the habitat potentially requiring removal as part of the proposal provides only marginal habitat and/or a minute fraction of their range and the majority of habitat on the property will be retained.

All the subject species are generally at least relatively highly mobile (provided suitable habitat exists eg canopy cover), thus the relatively minor area of habitat loss will not impose any barrier to movement as current linkages to the south and west will remain.

The affected areas of habitat for all the subject species comprises known or potential foraging habitat and potential denning/roosting habitat in tree hollows. While its loss/modification is a negative impact to the carrying capacity of the property, as about Xha of forest and woodland on the property will remain as is, the affected area is not crucial to the long term survival of any threatened species population.

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

No relevant areas of critical habitat have been declared, as yet, under Part 3 of the TSCA.

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

The *Recovery Plan for the Barking Owl* (NPWS 2003e) outlines the loss of native vegetation as a key threatening process for the Barking Owl. While the proposal will remove native vegetation, the extent of clearance is relatively minute compared to remaining habitat in the area and its home range, and will not significantly impact on the species. Hence only via strict definition is the proposal inconsistent with objectives of the plan.

A draft *Recovery Plan for Forest Owls* (DEC 2006b) has been exhibited for the Masked and Powerful Owl. As for the Barking Owl, the proposal will remove a minute area of potential foraging habitat and only via strict definition is the proposal inconsistent with objectives of the plan.

The draft Recovery Plan for Koalas (NPWS 2003a) specifies actions considered to be key threats to Koalas. This plan specifies "*Habitat loss and Fragmentation*" and "*Habitat Degradation*" as "*the most important threats to Koalas throughout their range*". The proposal is thus inconsistent with this plan as it will remove potential browse species and contribute to these threats. Dogs and traffic are also key threats, and the proposal will incrementally add to these impacts. While negative, as no Koala population has an association with the site, the conflict with the objectives of the recovery plan is relatively limited.

At present no recovery/threat abatement plan is in place for the other species. The proposal may remove about Xha of habitat including X trees (and X hollow-bearing trees) which by strict interpretation could be considered as adding to the main threatening process affecting these species (habitat loss), and hence is inconsistent with the recovery of the species. However, given the relatively marginal quality of the habitat to be affected, the minor area of habitat to be removed, the extent of habitat to be retained on the property, and the abundance of similar habitat on adjacent land and in the direct locality; the loss is considered to be insignificant to the long term recovery of these species.

Overall the proposed development is considered unlikely to have a substantial affect on the long-term recovery of any of the subject species.

(n) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSCA defines a "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

"*Clearing of native vegetation*" has been listed as a Key Threatening Process and is a recognised threat to a number of species, communities and populations listed under the TSCA 1995 (NSWSC 2001d). Loss of habitat via development for residential and urban land use is also recognised as a threatening process for all of the subject species (Smith *et al* 1995, NPWS 2003d, DEC 2006b, etc). The proposed development will contribute to this process via the removal/modification of habitat to establish development envelopes. However the majority of the property's forest and woodland vegetation will be retained post-development with protection under statutory instruments.

Human-induced climate change is a Key Threatening Process that the proposed development will contribute to via removal of up to Xha of vegetation and possible burning of this material; and/or establishment of a residential development utilising fossil fuels for energy.

"*Predation by foxes and feral cats"* are other Key Threatening Processes likely to be currently existing on the site, which impose a risk to potential prey, and several potentially occurring threatened species. The increase in human presence on site may see greater controls on these pests. Considering that any potential pet cats and dogs will largely be retained in close vicinity of the dwellings, and that the threat posed by domestic cats and dogs is already high (given the abundance of both species on land to the west) the increase in this threat induced by the proposal is not considered likely to be substantial.

Inappropriate fire regimes are also a threatening process eg by increasing risk of wildfire by poor management; prescription burning of too much habitat at one time (or key areas at a particular time eg

breeding season). The proposal may result in a modified fire regime due to increased frequency of hazard reduction burning to protect assets. This report recommends that future fire regimes consider the ecological constraints of the site. In addition, threatened species have been recorded on the site thus any burning for the purpose of hazard reduction should require a Bush Fire Hazard Reduction Certificate (BFHRC) under the RFA 1997 which may include measures to protect the habitats of the threatened species. Thus the potential for an altered fire regime to reduce the site's carrying capacity for the threatened species should be controlled by the legislation and recommendations discussed above.

A number of other Key Threatening Processes may also be incrementally increased by the proposal via edge effects, eg:

- *Invasion of native plant communities by exotic perennial grasses.*
- *Invasion and establishment of exotic vines and scramblers.*
- *Invasion of native plant communities by Lantana camara.*

These Key Threatening Processes may be exacerbated by the proposal due to edge effects as a result of clearing easements.

10.0 CONCLUSION

This survey and assessment has found that while the site and property overall is generally evident of a substantial disturbance history, it has retained some significant ecological values.

The proposal may see a relatively minute reduction in the foraging capacity of the property and will result in an incremental contraction of habitat extent to the south and southwest; increase some existing threats eg pets; and introduce a higher human presence with its associated impacts eg noise and lighting. However the majority of habitat, including the overwhelming majority of key habitat components will be retained and overall the property's current connectivity and carrying capacity for all of the known/potentially occurring threatened species should be largely retained.

This conclusion is made on the provision that the final design and implementation of the proposed development is in accordance with the recommendations and ameliorative measures proposed in this assessment (for the express purpose of ensuring ecological impacts are significantly reduced if not avoided), that the proposed development is not considered likely to significantly adversely affect any threatened species, endangered population or EEC.

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APPENDIX 1: *Eligibility for 7-Part Tests*

The following tables are used as a summary to address threatened species (as detailed below) in terms of potential occurrence, and likelihood of being significantly affected by the proposal, and hence requiring formal 7 Part Test assessment. Threatened species have been assessed if it is:

a) Recorded on-site;

b) Not recorded on site, but recorded within a 10km radius (the locality), and may occur to some degree on-site or in the study area (land within 100m of site) due to potential habitat, key habitat component, etc;

c) Not recorded in the locality as yet, but recorded in the bioregion, and thus may occur in the locality, and possibly to some extent, may occur on the site, due to potential habitat.

The "*habitat requirements*" column is derived from the previously listed references. Likelihood of occurrence is based on the probability of occurrence in terms of:

- Habitat extent (eg sufficient to support an individual or the local population; comprises all of home range; forms part of larger territory, etc); quality (ie condition, including an assessment of threats, historical land uses on and off-site, and future pressures); interconnectivity to other habitat; and ability to provide all the species life-cycle requirements (either the site alone, or other habitat within its range);

And:

- Occurrence frequency (ie on-site resident; portion of larger territory; seasonal migrant or transitory opportunist and thus when and how often, etc)

And:

- Usage ie breeding or non-breeding; opportunistic foraging (eg seasonal, migratory or opportunistic); marginal fringe of core range; refuge; roosts; etc.

A scale used by the author to indicate the likelihood of the species to potentially occur in the habitat on the study sites (if they have not been recorded in the locality) is as follows:

- *unlikely* (<1% probability) - no potentially suitable habitat; too disturbed; or habitat is very poor. No or few records in region or records/site very isolated eg by pastoral land, urbanisation, etc.

- *low* (1-10%)- few minor areas of potential habitat; highly modified site/habitat; or few habitat parameters present, but others absent or relatively insignificant (sub-optimum habitat). Usually very few records in locality.

- *fair* (11-25%) - some significant areas of potential habitat, but some habitat parameters limited. Potential for occasional foraging eg from nearby more optimal areas or known habitat. Records at least within 10-15km radius of site.

- *good* (26-50%) - significant abundance of habitat parameters/areas of habitat, and more locally eg adjacent. Potential part of larger territory, but probably unable to support breeding in isolation. Recorded within 10km in similar habitat/environs.

- *Moderate* (51-75%) - quite good potentially suitable habitat on and adjacent to the site, and/or good quality and abundance of some vital habitat parameters. Records within <10km, or adjacent to site, or adjacent to high quality habitat where species likely to occur.

- *high* (>75%) - very good to optimum habitat occurring on or adjacent to the site (support breeding pair or population). Recorded within 5-10km of site in same or similar habitat.

The "*Assessment of Significance*" column is based on consideration of the habitat on-site, likelihood of occurrence, and consideration of the DEC guidelines for assessment under the 7 Part Tests (DEC 2005). Recognising that some species with very large ranges or varying tolerances to habitat modification, some species which may have low potential to occur in the study area and will obviously not be significantly affected by the proposal will not be formally assessed to avoid production of superfluous information. Rather these species are assessed in the final column with justification for this assessment. However, recognising that significance is open to interpretation, the decision on whether a species is formally assessed or not by the 7 Part Tests in this assessment is based on the following rules:

a) If there is *any* justifiable risk, based on consideration, of a significant impact as a result of direct or indirect impacts, a 7 Part Test is required (ie the Principle of Uncertainty is applied).

b) Any threatened species recorded on-site or in the study area, or of at least fair chance of occurrence on-site in terms of potential habitat, is **automatically** selected for the 7 part Tests, unless the proposal has no effect (justification provided).

Table 12 : Eligibility for Seven Part Tests - Flora

SPECIES	HABITAT REQUIREMENT	LIKELIHOOD OF OCCURRENCE	SIGNIFICANCE OF IMPACTS
Acacia courtii	A localised species, found only on Middle and North Brother Mountains. It grows on steep, dry rocky slopes in mixed dry forest on shallow soils, often under a canopy of White Mahogany and Grey Gum. Several populations are known to occur on North Brother South Brother and Middle Brother Mountains. In Dooragan National Park, *A. courtii* occurs on dry locations on the midslopes of the mountain and has been recorded in association with the stringybark forest and white mahogany/ironbark associations on skeletal soils on western and northern side of the Mountains.	Not recorded on site or in locality. Considered unlikely to occur due to lack of suitable habitat on site and site is well outside known range.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
A. chrysotricha	A small to medium tree restricted to wet sclerophyll and rainforest in steep, narrow gullies on quartzite soil. The nearest records were previously north of Nambucca Heads however new record near Frederickton.	Not recorded on site or in locality. Considered unlikely to occur due to lack of suitable habitat on site.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
A. ruppii	An erect or spreading shrub with smooth grey bark, found in dry sclerophyll forest and shrubland on sand. It is reportedly confined to the Grafton-Coaldale area. Recorded on Grafton database.	Not recorded on site or in locality. Site is located well south of this species known range. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Acalypha eremorum	A new species. This shrub is found in dry rainforest near Lismore. Recorded on Grafton database.	Not recorded on site or in locality. No suitable habitat on the site which is located well south of this species known range. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Acronychia littoralis	An understorey tree found in littoral rainforest on sand. This species has been recorded in littoral rainforest at Big Hill. Recorded on Bare Point, Port Macquarie-Hastings LGA, Kempsey, Nambucca, Macksville LGA and Coffs Harbour databases.	Not recorded on site but has been recorded in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Alexfloydia repens	A creeping grass found in moist Casuarina forest and above the king tide zone above mangrove forest in the Coffs Harbour district. It is known from only 10 locations south of Coffs Harbour.	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Allocasuarina defungens	A straggly oak about 2m high with blue-green foliage found in heath on sand (sometimes clay and sandstone soils), and swamp sclerophyll forest margins. This plant has been recorded. Recorded on Port Macquarie-Hastings LGA, Kempsey, Bare Point, Coffs Harbour, Greater Taree City Council LGA, Bulahdelah and Camden Haven databases	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Allocasuarina simulans	A she-oak found in heath on sand from Nabiac to Forster, with another population in the Grafton LGA. Recorded on Bare Point database.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Amorphospermum whitei	An understorey tree found in littoral and warm temperate rainforest, and also wet sclerophyll forest along riparian zones.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Angophora robur	A small tree found on sandy soils derived from sandstone, and is mainly found northwest of Coffs Harbour and Grafton.	Site contains sandy soils but not derived from correct parent material. Also located south of the species known range. No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Arthraxon hispidus	A grass found in (or is likely to occur in) littoral rainforest, dry rainforest, subtropical rainforest, warm-temperate rainforest, cool-temperate rainforest, wet sclerophyll forest and riparian forests (including gallery rainforests) at no particular altitude. Variable geology and various, mainly richer loams soils are favoured. Recorded on Coffs Harbour database.	Not recorded on site or in locality. The area lacks potential habitat. Site and general area has been subject to an extensive disturbance history. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Arthropteris palisotii	A small fern that grows in rainforest, mainly on tree trunks and north from Comboyne (Harden 1993). Recorded near Comboyne in Port Macquarie-Hastings LGA.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Asperula asthenes	An herb found in damp sites along riverbanks and similar areas, typically from Taree to Bulahdelah, but has been recently found in the Kempsey LGA. Recorded in Bulahdelah, Great Lakes, Greater Taree, Kempsey and Port Macquarie-Hastings (in State Forest near Wilson River) LGA databases.	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Babingtonia prominens	A shrub discovered in 1997. It is only known from two locations in the Nymboida area. It grows in sclerophyll forest, on steep hillsides, on shallow sandy soil derived from sandstone or granite. Recorded on Grafton database. One population is reserved in Nymboi-Binderay National Park; the other is on private land.	No suitable habitat on site. Not recorded on site or in the locality. Site is outside the range of this species which has a very localised distribution. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Babingtonia silvestris	A shrub found in only 3 localities (Dorrigo National Park, Mt Neville Nature Reserve and a State Forest). It grows on granite and rhyolite rock outcrops in mixed shrublands. Recorded on Dorrigo database.	No suitable habitat on site. Not recorded on site or in the locality. Site is outside the range of this species which has a very localised distribution. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Bertya sp. Cobar-Coolabah	A shrub to small tree found from Cobar to Coolabah in shallow soils with mallee.	No suitable habitat on site. Not recorded on site or in the locality. Site is located outside the species range. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Boronia umbellata	A shrub recorded in "scrub" in the Coffs Harbour locality.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Callistemon linearifolius	A shrub to 4m high with red flowers in Spring-Summer. It typically occurs in dry sclerophyll forest on the central coast and ranges (Georges R. to Hawkesbury R.), but is also recorded from Broken Bago SF in Port Macquarie-Hastings LGA and in Great Lakes LGA.	Not recorded on site or in the locality. The site is located beyond this species range. While structurally suitable habitat in general terms may be present, given the site's disturbance history and the previously mentioned points this species is not considered likely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Chamaesyce psammogeton	An herb that grows on fore dunes and exposed sites on headlands. Recorded on Bare Point, Kempsey, Port Macquarie-Hastings, Nambucca, Coffs Harbour and Bulahdelah LGA databases.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Chiloglottis anaticeps	A terrestrial orchid that typically occurs in tall sclerophyll forest, often along streams or around fringes of low sandstone outcrops in high country west of Wauchope (Harden 1993). Flowers Dec-Feb. Recorded in Werrikimbee NP, Port Macquarie-Hastings LGA and Kempsey LGA databases.	No suitable habitat on site. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Cryptostylis hunteriana (Leafless Tongue Orchid)	A leafless saprophytic terrestrial orchid with a poorly developed root system. This orchid is only detectable during the flowering period of Nov-Feb (Bell 2001). It has been described from isolated records as occurring in a variety of habitats from swamp fringes to bare hillsides in eucalypt forest, with favoured soils being sandy but with records in clay (Bishop 1996). However, the habitats of known populations in Victoria and the NSW central coast were described as being either coastal plains woodland/forest with heathy understorey; heathland; or grasstree plains, all on sandy soils (Bell 2001). Flowering is inconsistent, but has been recorded 18 months to 5 years following fire (Bell 2001). Recorded on Great Lakes (Bulahdelah), Coffs Harbour and Clarence LGA databases.	Dry sclerophyll forest in very broad terms may be structurally suitable given the soils. However, the extensive disturbance history of the site is likely to have excluded the species. Not recorded on site or in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Cynanchum elegans	A twiner occurring predominately in dry rainforest, littoral rainforest and the ecotone between dry rainforest and open forest, however it has been found in the Manning Valley and Port Macquarie-Hastings in Open Forest types on specific geologies eg limestone and serpentine respectively (Garry Germon pers. comm. 2004, personal observations). It occurs on a variety of lithology's and soil types. It has been found between the altitudinal ranges of 0 to 600 metres ASL and rainfall >760mm annually (NPWS 1999). Common associated species include Geijera parviflora, Notelaea microcarpa, Banksia integrifolia, Ficus spp., Guioa semiglauca, Melia azedarach, Streblus brunonianus and Pittosporum revolutum. Recorded in Camden Haven, Port Macquarie-Hastings LGA, Grafton, Kempsey, Wingham, and Bulahdelah databases.	No suitable habitat on site. Not recorded on site but recorded in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Cyperus aquatilis	A small annual sedge found in open ephemerally wet sites north of the Evans Head area. Recorded on Grafton database.	Not recorded on site or in locality. Site is located well outside species known range. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Dendrobium melaleucaphyllum	An epiphyte on *Melaleuca stypheloides*, rainforest trees or rocks in coastal districts north from the Blue Mountains. It has square stems, similar to *D. tetragonum* and it flowers Jul.-Oct.	Not recorded on site or in locality. Given lack of potential host trees and the site's disturbance history this species is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Diuris disposita	A terrestrial orchid found in moist grassland within sclerophyll forest only within 3 populations in the Kempsey Area.	Suitable habitat does not occur on the site and the species was not detected by the survey. No local records exist and the species is considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
D. pedunculata	A terrestrial orchid found in moist grassland within sclerophyll forest, grassy sclerophyll forest/woodland, grasslands (including pastures), riparian forests (including gallery rainforests), and swamp forests at no particular altitude and with variable geology and soils. Ranges from Port Jackson to Tenterfield and flowers Aug-Sept. Recorded near Werrikimbee NP in Port Macquarie-Hastings LGA, Great Lakes LGA and reported to occur in Kempsey LGA.	Not recorded on site or in the locality. While the vegetation present may provide marginally structurally suitable habitat in general terms, given the site's disturbance history and the previously mentioned points this species is not considered likely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
D. venosa	A terrestrial orchid found in moist grassy sites at approx. 1100m altitudes.	The site is well below the required altitude; hence no suitable habitat occurs on site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
D. praecox *(The Newcastle Doubletail Orchid)*	A terrestrial orchid in sclerophyll forest of the coast and near coastal districts, previously known only from Ourimbah to Nelson Bay on the Central Coast and flowers July-September. Recorded on Coffs Harbour and Great Lakes LGA database.	At best in broad structural terms marginal potential habitat may exist on-site but it was not found. Due to the disturbance history of the site and the lack of local records this plant is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

D. sp. aff. chrysantha	A terrestrial orchid previously only known from a single population of 100 plants at Byron Bay (NSWSC 2000b), but also recorded from Christmas Bells Plain at Port Macquarie (DEH 2005). Recorded on Coffs Harbour and Port Macquarie-Hastings LGA databases.	Suitable habitat does not exist on site. It is not considered a likely occurrence due to the above, the disturbance history of the site and lack of local records.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Dillwynia tenuifolia	A shrub up to 1m high found in dry sclerophyll woodland on sandstone, shale or laterite, mainly in the southern portion of the North Coast bioregion, into the central coast and tablelands.	Not potential habitat and due to the disturbance history of the site and the lack of local records this plant is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Eleocharis tetraquetra	A spikerush found in swampy areas that has been recorded in the Boambee area, south of Coffs Harbour.	The site is beyond the species known range and was not detected by survey. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Eucalyptus tetrapleura	A tall ironbark tree found in wet sclerophyll forest on moderately fertile soil, dry sclerophyll forest, grassy sclerophyll forest, riparian forests (including gallery rainforests), at no particular altitude and with variable geology and soils. Recorded on Kempsey, Coffs Harbour and Grafton databases.	No potential habitat and it was not found by the survey and has not been recorded in the locality. Due to this and the disturbance history of the site, this species is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Galium australe (Tangled Bedstraw)	A very rare straggling or intertwining perennial herb found in a range of habitats in NSW including a valley floor, alluvial soil beside a creek, heathland in a rocky gully, and the top of an escarpment above a creek. In New South Wales it is currently known from 13 locations between Sydney and Eden, with an outlying record to the north from near Byabarra on the north coast. Recorded on Port Macquarie-Hastings LGA database.	At best marginal potential habitat may exist in the study area, but it was not found by the survey, has not been recorded in the locality and the site is located beyond the species range. Due to this and the disturbance history of the site, this species is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Grammitis stenophylla	A fern often found on mossy wet sandstone walls in rainforest and gallery forest. Recorded on the Dorrigo database.	Not recorded during the survey. The species is considered an unlikely occurrence as the site is outside the species known range and does not contain suitable habitat.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Grevillea beadleana	A spreading shrub up to 3m high found on granite scarps and exposures, and is confined to the catchments of the Mole and Guy Fawkes River, and possibly Apsley River (generally Northern Tablelands region). Recorded on Grafton database.	Not recorded during the survey. Considered an unlikely occurrence on site due to the lack of suitable habitat, absence of local records and site's location outside known range of the species.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Grevillea caleyi	A spreading shrub usually found in woodland or open forest dominated by *Eucalyptus capitellata*, *Corymbia gummifera* and *E. sieberi* with an understorey dominated by plants of Proteaceae and Fabaceae families, on lateritised sandstone ridge tops in Central Coast Botanical region, but has also been recorded on North Brother near Laurieton. Recorded on Port Macquarie-Hastings LGA and Camden Haven database.	Not recorded during the survey. Not recorded in the locality. While structurally suitable habitat may occur on site, the preferred geology is absent. Hence the species is considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Grevillea guthrieana	A spreading shrub known from only two locations – Booral near Bulahdelah and on the Carrai Plateau south west of Kempsey. It grows in sandy loams on creek lines in moist eucalypt forest and also along cliff lines with granitic or sedimentary soils (Plantnet 2004). Recorded on Bulahdelah and Kempsey databases.	Not recorded during the survey. Not recorded in the locality. The site does not contain strictly suitable habitat. Given this and the disturbance history of the site, the species is considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
G. quadricuada	A shrub usually found in gravelly loam or in sand as an undershrub in Eucalypt woodland mostly along creeks and drainage lines. It has a northern NSW-Southern Qld distribution. Recorded northwest of Whiporie.	Not recorded during the survey. Not recorded in the locality. The site does not contain strictly suitable habitat. Given this and the disturbance history of the site, the species is considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Hakea archaeoides	A woody shrub found on steep, rocky, sheltered slopes and deep gullies in open eucalypt forest. It is restricted to hinterland around Mt Boss, Broken Bago State Forest and Landsdowne. Recorded on Camden Haven and Kempsey LGA databases.	Site does not contain suitable habitat and the species was not detected by the survey or recorded in the locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Haloragis exalata *subsp.* ***velutina.***	A shrub found in damp places along watercourses, and this subspecies also occurs in woodland on steep rocky slopes of gorges, particularly in the upper Macleay River (NPWS 2000). Recorded in Kippara SF in Port Macquarie-Hastings LGA and in Kempsey LGA database.	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Harnieria hygrophiloides.	Was formerly known as *Justica* or *Calaphanoides hygrophiloides.* This is a glabrescent shrub growing in rainforest or adjacent wet sclerophyll only from Brunswick Heads to Hortons Creek in far northeastern NSW. Recorded on Grafton database.	Not recorded during the survey. Not recorded in the locality. Site is well outside species known range. No suitable habitat on site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Hibbertia hexandra	A tall shrub or small tree, which occurs mainly in heath, open forest and rainforest around Mt. Warning (Harden 1993). A separate population in the Wauchope-Kendall area has plants with smaller leaves that are found in crevices and gullies in rocky terrain (NPWS 2000). Recorded on Camden Haven and Kempsey databases.	Suitable habitat does not exist on site, and the plant was not found, nor is it likely to occur due to the lack of local records and the disturbance history of the site.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Lindsaea incisa	A ground fern found in damp sandy places and open forest. Recorded on Coffs Harbour database.	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Macrozamia johnsonii.	A cycad known only from a small area in the Dalmorton district in northern coastal NSW. It grows in wet to dry sclerophyll forest, on shallow, rocky, usually steeply sloping and poor soils, and is also occasionally cultivated as an ornamental. Recorded on Grafton database.	Site does not contain the recognised habitat. This, the location of the site well south of this species known range, as well as the disturbance history of the site suggest the species is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Marsdenia longilobia	A slender climber with clear, watery latex (sap). Occurs in rainforest and moist eucalypt forest adjoining rainforest, at no particular altitude, sometimes in areas with rock outcrops. Found at scattered sites from Barrington Tops to SE Queensland (NPWS 2000). Recorded northeast of Byabarra in the Port Macquarie-Hastings LGA and also recorded on Kempsey, Macksville, Coffs Harbour, Grafton and Bare Point databases.	Suitable habitat does not exist on-site and the plant was not found, nor is it likely to occur due to lack of suitable habitat.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Maundia triglochinoides	An aquatic herbaceous plant found in swamps or shallow fresh water on heavy clay on the north and central NSW coast. Recorded on Port Macquarie-Hastings and Kempsey databases.	No suitable aquatic habitat present on site and no local records. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Melaleuca biconvexa	A paperbark shrub/small tree found in damp places, often near streams, on the coast and adjacent tablelands from Jervis Bay to Port Macquarie. Recorded on Bulahdelah, Kempsey, Port Macquarie-Hastings and Camden Haven databases.	Suitable habitat does not exist on-site and the plant was not found, nor is it likely to occur due to lack of suitable habitat.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Melaleuca groveana	A paperbark shrub/small tree that grows in dry sclerophyll, heath and exposed sites generally at higher elevations, though this consultant has recorded it in dry sclerophyll forest on a basalt ridge about 50m asl at Scotts Head (pers. obs.). Recorded on Bulahdelah, Camden Haven, Port Macquarie-Hastings, Kempsey and Macksville databases.	Suitable habitat does not exist on-site and the plant was not found, nor is it likely to occur due to lack of suitable habitat. Recorded in locality	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Melaleuca tamariscina ssp irbyana	A paperbark shrub or small tree up to 8m high, found in open eucalypt forest on poorly drained sites north from the Casino District. Recorded on Grafton database.	Suitable habitat in marginal form may exist on-site but the plant was not found, nor is it likely to occur due to lack of suitable habitat and the location south of the species known range.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Melichrus hirsutus	A spreading shrub on sandstone, found near Glenreagh and the upper Clarence Valley. Recorded on Grafton and Bare Part databases.	Not recorded on site or in locality. Site is located outside species known range. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Neoastelia spectabilis	A tufted herb found in rock crevices near waterfalls and seepage lines on rocky slopes within Nothofagus forest 900-1150m alt. Previously only known from New England National Park, but now recorded in the Kempsey and Nambucca LGA.	Suitable habitat does not occur on site and the plant was not found. This and the lack of local records suggest the plant is not a likely potential occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Oberonia titania	An epiphytic orchid that grows in a tight clump in a variety of habitats from subtropical to littoral rainforest, *Melaleuca* swamps, and gorges within dry sclerophyll forest. It occurs north of Kendall. Recorded on Coffs Harbour database	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Olax angulata	A shrub up to 1m high known only from Minnie Waters on sandy soils and woodland near swamps. Recorded on Bare Part database.	Site is outside known range and lacks suitable habitat. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Olearia flocktoniae	A short-lived shrub found in recently disturbed sites in wet sclerophyll and warm temperate rainforest essentially in the Dorrigo area.	The site did not contain potential habitat for this species and it was not found. Given this, the sites disturbance history and lack of proximate records, the species is not considered to be a potential occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Parsonsia dorrigoensis	A climber found in sub-tropical and warm temperate rainforest, and sclerophyll forest often on brown clay soils on the north coast south to the Hastings River. It is associated with Blackbutt, Tallowwood, Brush Box, Crabapple, Lilly Pilly, Tree Heath and Water Gum. It may favour some disturbance, including fire. Recorded on Macksville, Kempsey, Coffs Harbour, Grafton and Camden Haven databases.	The site did not contain potential habitat for this species and it was not found. Given this, the site's disturbance history and lack of proximate records, the species is not considered to be a potential occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Peristeranthus hillii	An epiphytic orchid restricted to coastal and near-coastal environments, particularly remnants of littoral rainforest growing on Aeolian sands and lowland subtropical rainforest on floodplains. Recorded at Sea Acres Nature Reserve (NPWS 1995), and reaching its southern limit in the Port Macquarie-Hastings Shire.	Suitable habitat does not occur on site and the plant was not found. This, the lack of local records and the site's disturbance history suggest the plant is not a likely potential occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Phaius tankervilliae *(recorded on Port Macquarie-Hastings LGA database)* *and* ***P. australis*** *(Bare Point, Coffs Harbour)*	Are orchids that generally grow in *Melaleuca quinquenervia* swamps on the coast or at sea level, as well as littoral rainforest, dunes (including stabilised dunes), riparian forests (including gallery rainforests), swamp forests, swamps (including marshes and intermittent wetlands), mainly at low altitudes. Sandy alluvium is the favoured geology and sandy, damp to humic soils are favoured.	Not recorded on site or in locality. No suitable habitat on the site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Philotheca myoporoides spp obovatifolia	A shrub found at only one NSW location: Werrikimbee National Park.	Suitable habitat does not occur on site and the species was not recorded. Unlikely to occur given its restricted distribution.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Pimelea spicata	A herb until recently thought to only occur on the central coast. It occurs on clay or shale soils in grassland or open woodland. It is typically associated with *Bursaria spinosa* and *Themeda australis*. Recorded in Port Macquarie-Hastings LGA.	The site does not offer structurally suitable habitat due to the absence of suitable soils. Given this, the lack of local records and the disturbance history of the site, the species is considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Pomaderris queenslandica	A shrub 2-3m high, found in moist sclerophyll forest with shrubby understorey and occasionally along creeks. Recorded on Wingham database.	No suitable habitat occurs on the site and the species is not considered likely to occur due to the lack of local records and the failure to detect the species.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Psilotum complanatum	An endangered epiphytic fern found in rainforest, often on other epiphytes such as Elkhorns. This fern reaches its southern limit in the Hastings Valley, and has been recorded in Sea Acres Nature Reserve (NPWS 1995).	Species is unlikely to occur on site due to the absence of suitable habitat. Not recorded on site or in the locality.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Quassia sp. Moonee Creek	A shrub found in dry rainforest in a relatively localised area northwest of Coffs Harbour. Recorded on Coffs Harbour, Grafton and Bare Point databases.	No suitable habitat on site. Given this, the lack of local records and the site's location outside the species known distribution it is considered an unlikely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Rutidosis heterogama	A perennial herb, to 30cm high, with yellow everlasting flowers, usually found in heath, often along disturbed roadsides mainly on the coast from Maclean to Hunter Valley, and inland to Torrington. Recorded on Bare Point database.	No potential habitat occurs on site. Lack of local records and failure to detect the species indicate it is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Sarcochilus dilatatus	A semi-pendant epiphyte found on trees in rainforest in coastal ranges up to 400m asl.	No potential habitat occurs on site. Lack of local records and failure to detect the species indicate it is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
S. fitzgeraldii	A semi-pendant epilith (rarely an epiphyte) orchid found on rocks or tree bases in subtropical rainforest usually near trees from 500-700m asl.	No potential habitat occurs on site. Lack of local records and failure to detect the species indicate it is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
S. hartmannii	A semi-erect epilithic or terrestrial herb usually found on volcanic rocks often in shallow soil in dry rainforest, subtropical rainforest, wet sclerophyll forest, dry sclerophyll forest, grassy sclerophyll forest, riparian forests (including gallery rainforests), rocky crevices and scree or exposed sites 500-1000m alt., previously north from the Richmond River, but recently recorded in the Kempsey LGA. Preferred geology is mainly volcanics and various (mainly skeletal and poor) soils are favoured. Recorded on Coffs Harbour, Wingham LGA and Kempsey LGA database.	Not recorded on site or in locality. Due to the site occurring below the altitudinal range of the species no potential habitat occurs, hence the species is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Senna acclinis	A shrub found in or on the edges of subtropical and dry rainforest. Variable geology and soils are favoured. Recorded in Kerewong SF and Lorne SF in the Port Macquarie-Hastings LGA and also in Bulahdelah, Great Lakes, and Coffs Harbour LGA databases.	No potential habitat on site and not recorded on site or in locality. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Sophora tomentosa subsp. australis	A coastal shrub that occurs on recent sands on frontal coastal dunes northwards from Port Stephens. Port Macquarie has the largest known population eg Shelley and Nobby's Beaches. Recorded on Kempsey, Port Macquarie-Hastings LGA, and Bare Point databases.	Not recorded on site or in locality. No suitable habitat occurs on site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Syzygium paniculatum	A type of Lilly Pilly, which has a shrub to small tree habit and grows in subtropical and littoral rainforest on sandy soils or stabilised dunes on the coast. It is also widely cultivated as an ornamental.	Not recorded on site or in locality. No suitable habitat on site. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Tetratheca juncea	A small shrub that grows in sandy, sometimes swampy heath, and also dry sclerophyll forest mainly along the lower end of the region around Bulahdelah.	At best the site may contain marginally structurally suitable habitat. However, the disturbance of history of the site, lack of local records and failure to detect the species indicate it is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Thesium australe	A parasitic herb commonly associated with Kangaroo Grass, and has been recorded on coastal headlands at Coffs Harbour, Hat Head, Crescent Head, Diamond Head and Perpendicular Point in Kangaroo Grass areas. Recorded on Port Macquarie-Hastings LGA, Kempsey, Bare Point, Coffs Harbour, Korogoro and Camden Haven databases.	Kangaroo grass is present, though the disturbance of the site indicates the species is not a likely occurrence. Not recorded locally.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Tinospora smilacina	A twiner found in dry subtropical rainforest. Recorded on Coffs Harbour and Grafton databases.	No suitable habitat on the site which is located outside the species known range. Therefore, species is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Tinospora tinosporoides	A woody climber found in wetter subtropical rainforest. Recorded on Coffs Harbour database.	No suitable habitat on the site which is located outside the species known range. Therefore, species is not considered a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Triplarina imbricata *(formerly Baeckea camphorata)*	A shrub occurring mainly in sheltered positions on shady slopes, gorges or creek banks, within about 80km of the coast (Australian Plants Online website). This species is also commonly cultivated. Recorded on Dorrigo database.	Strictly suitable habitat does on not occur on site and lack of proximate records, the disturbance history and failure to detect this species suggest it is not a likely occurrence.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Tylophora woolsii	A twiner found in wet sclerophyll and rainforest in the northern ranges and slopes of NSW from Barrington Tops NP to southern Queensland (NPWS 1999). It has also been recorded within in the Bonville-Archville area and along disturbed roadside verges (NPWS 1999). Associated species include: *Acacia melanoxylon, A. binervata, Caldcluvia, Ehretia, Schizomera, Syncarpia, Eucalyptus microcorys and E. saligna*. Recorded on Coffs Harbour database.	Site does not contain suitable habitat and is located outside the species known range. These factors along with the lack of local records and failure to detect the species indicate it is unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Typhonium sp. aff. brownii	A perennial deciduous tuberous geophyte found on rainforest margins, sheltered gullies and along creek banks. It appears to be confined to the ranges up to 30km west of Woolgoolga and Coffs Harbour.	Not recorded on site or in locality. Site does not contain suitable habitat and is located outside the apparent distribution range of the species. Considered unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Zieria lasiocaulis	A tall shrub to small tree usually found on rocky escarpments and scree slopes, in clearings or along margins of *Nothofagus* rainforest. Previously found only at the headwaters of the Wilson River in Mt Boss State Forest, but recently found in the Kempsey and Port Macquarie-Hastings LGA.	No suitable habitat on site. Not recorded locally or detected by the survey. Unlikely to occur on site.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.
Z. prostrata	A shrub restricted to low coastal heath in the Coffs Harbour area.	Not recorded on site or in locality. Site is outside known range and does not contain suitable habitat. Unlikely to occur.	Unlikely to occur thus no significant impact likely. Seven Part Test not required.

Table 13: Eligibility for Seven Part Tests - Fauna

NAME	HABITAT REQUIREMENTS	LIKELIHOOD OF OCCURRENCE	SIGNIFICANCE OF IMPACTS
Glossy Black Cockatoo (*Calyptorhynchus lathamii*)	Dry sclerophyll forest and woodland containing Allocasuarina and Casuarina, and large tree hollows. Preferred regional forage species are *A. littoralis* and *A. torulosa*. Requires sufficient extent of forage within home range to support breeding. Breeds Mar-Aug, takes 90 days to hatch and fledge (Lindsey 1992).	A few trees in the 7(a) zone have hollows with opening apertures and potential internal dimensions which may be suitable for nesting by this species. Forage potential is relatively minor with rather small Black Oaks occurring in a thin ribbon in the 7(a) zone, with few cones noted – at best marginal foraging habitat. No chewed cones found. Low to fair potential to occur.	No evidence of foraging by the species on detected on site. Potential nest trees retained. Given records foraging and nesting in remnant forest within and adjacent to urban fringe, impacts associated with proposal considered minor and no risk of significant impact, however as fair potential to occur, Seven Part Test required to justify.
Swift Parrot (*Lathumus discolor*)	Breeds in Tasmania and winters on mainland, from Victoria to southern Queensland. Feeds mostly on pollen and nectar of winter flowering eucalypts and banksias, but also on fruit, seeds, lerps and insect larvae (Schodde and Tideman 1990). Favoured species are *E. robusta, Corymbia gummifera, E. globulus, E. sideroxylon, E. leucoxylon, E. labens, E. ovata, E. maculata, Banksia serrata* and *B. integrifolia.* In coastal NSW, Swamp Mahogany, Spotted Gum and Bloodwood forests are important foraging habitats and larger trees may be selected. Disperse according to changing local food resources.	No preferred foraging resources present on the site. Pink Bloodwood may offer some potential if flowering coincides with mainland occurrence in Autumn but is rare overall. Overall unlikely to be key or critical habitat and only offers opportunistic foraging if flowering coincides with local occurrence – abundant alternative and more optimal habitat in locality including extensive Banksia and swamp forest in Hat Head NP. Considered to have low chance of occurrence on site as seasonal transient forager.	Potential foraging on site will be largely retained. No barriers to access or movements. No risk of significant impact. Seven part test not required.
Powerful Owl (*Ninox strenua*)	Wet and dry sclerophyll forests. Nests in tree hollows. Requires high diversity and abundance of medium-sized arboreal prey. Very large territory (500-5000ha).	Few trees in the 7(a) zone have hollows with opening apertures and potential internal dimensions which may be suitable for nesting by this species. Forage potential is likely to be good with range of arboreal mammals and woodland birds. Overall site would form small part of very large territory extending over Arakoon, western SWR and north Hat Head NP. Recorded in SWR area. Low to fair chance of occurrence.	Considered fair chance to occur due to presence of suitable prey and abundance of potential habitat in the locality with a record <5km southwest. Proposal unlikely to result in a significant impact, however **Seven Part Test required** as a fair chance to occur.

Barking Owl (*Ninox connivens*)	Well-forested hills and flats, eucalypt savannah (especially), and riverine woodland in coastal and subcoastal areas. Prefers hunting in more open country for mammals (rabbits, rats, mice, small bats and small marsupials) and birds (small up to Frogmouths and Magpies). Large territories. Nest in hollows.	As for Powerful Owl but not recorded by survey or in locality. Considered an unlikely to marginally fair potential occurrence given suitable habitat and large range.	As for Powerful Owl. **Seven Part Test required** as a fair chance to occur.
Masked Owl (*Tyto novaehollandiae*)	Eucalypt forest and woodlands with sparse understorey. Nests in tree hollows. Requires high diversity and abundance of prey 200-600g weight. Large territory.	As for Powerful Owl but not found by survey. Considered low to fair chance of occurrence on site.	As for Powerful Owl. **Seven Part Test required**.
Sooty Owl (*Tyto tenebricosa*)	Rainforest and tall, moist, diverse eucalypt forest. Roosts in dense foliage, tree hollows & caves/overhangs. Nests in hollow in tall forest tree. Requires high diversity and abundance of medium-sized arboreal and/or terrestrial prey. Large territory.	Few trees in the 7(a) zone have hollows with opening apertures and potential internal dimensions which may be suitable for nesting by this species. Site vegetation however not preferred structure/type and not part of a mosaic of such vegetation. Potential foraging resources include gliders and possums. Recorded in locality, but not found by survey or in SWR area. Considered unlikely occurrence due to absence of suitable habitat in SWR area.	Seven Part Test not required as no potential habitat affected and not a potential occurrence.
Eastern Grass Owl (*Tyto capensis*)	Eastern population occurs on coastal floodplains in a variety of wet & dry heath, tall grass, swamps and sedgeland which may have common structure rather than floristics. Records in Port Macquarie area are all near wet sedgelands. Breeds year round. Known to nest near or surrounded by water. Forage near nest site. (summary in Redpath 2002) Dependant on good numbers of rodent prey, with possible nomadic link (NSW NPWS 2000).	No suitable habitat and not recorded by survey. Recorded in locality, considered unlikely chance of occurrence on site.	No suitable habitat affected. No risk of significant impact. Seven Part Test not required.
Marbled Frogmouth (*Podargus ocellatus*)	Restricted to rainforest. Sedentary and pairing permanently and holding a small territory. Roost on low branches or amongst leafy vegetation. Nocturnal, feeding on large, hard-shelled insects (ie beetles), grasshoppers and frogs from the ground or tree trunks.	No potential habitat on or adjacent to the site. Not recorded in locality or on site. Unlikely to occur.	No impact on known or potential habitat, hence no significant impact likely. Seven Part Test not required.

Red Goshawk (*Erythrotriorchis radiatus*)	Found in tropical open woodland, taller woodland, open forests, rainforest edges and dense riparian vegetation of coastal and subcoastal drainages. Territorial and utilise same nest. Breeding territories estimated 50-220km^2. Preys on birds, especially Honeyeaters, parrots, kookaburras and slight waterbirds, as well as some mammals, reptiles and large insects. Solitary, secretive, forages from concealed tree perches, by quartering low over canopy or by high transects. Nest is large stick platform in exposed fork of emergent tree. 1-2 eggs laid May-Oct with 90 days to fledging. (Debus 1998)	Recorded in Kempsey Shire historically but recent records south of far north coast of NSW very rare (Birds Australia 2007). General locality is potentially suitable. Not recorded in locality or by survey. Site may form part of larger territory. Very low to unlikely potential to occur due to sparseness of records – possibly only as extremely rare occurrence.	Potential habitat on site will be largely retained and hence so will potential to support rare occurrence. No risk of significant impact. Seven Part Test not required.
Square-Tailed Kite (*Lophoictinia isura*)	Open forests and woodlands in coastal and subcoastal areas. Forages low over, or in, canopy for eggs, nestlings, passerines, small vertebrates and invertebrates. Large home range (>100km^2). Observed foraging in residential areas of Port Macquarie. Large stick nest in high fork of living tree. Breeds July-December. Lays 2-3 eggs with 1-2 birds fledging after 100days. Appears to be adapting to an abundance of passerines in well-vegetated outer fringes of cities. Probably migrates to northern Australia in winter. (Debus 1998, NSW NPWS 2000)	General area and site considered structurally suitable. Passerines in forest offer potential foraging habitat. Recorded in South West Rocks. Moderate chance of occurrence, foraging on site as part of much larger home range.	Only very small area of potential foraging habitat likely to be affected. Site expected to retain potential support for infrequent foraging occurrence. No barrier to access. No risk of significant impact. However **Seven part test required** as a moderate chance to occur.
Osprey (*Pandion haliaetus*)	Fish (mostly Mullet) and carrion eater. Forages along coastal rivers, lakes, beaches, creeks and inlets. Tall, dead tree for staging or feeding roost. Nests on exposed tree within 2km of water, but rarely adjacent, and with access to Paperbark or Swamp Oak for nest material. Breeds April-Sept. (Clancy, 1991)	Recorded in locality but not on site. No nest on site and minimal potential to nest on site given nest in Country Club carpark <1km north of site. Unlikely to occur other than in transit fly over.	Highly likely to occur in study area. Proposal has minimal if any potential to impact upon this bird eg incremental addition to human activities in river. Species known to occur in highly used waterways and even nest in urban areas eg active nest on artificial nest pole in carpark of South West Rocks Country Club. Overall thus no risk of significant impact as no impact on prey, nest sites or other known threats. Seven Part Tests undertaken although superfluous as high potential to occur.
Bush Stone-Curlew (*Burchinus grallaris)*	Nocturnal, sedentary and territorial (when breeding) species generally roosting in open grassy woodlands with few or no shrubs, but with abundant leaf litter and fallen tree debris (ie >10% cover) which is key roosting habitat. Nests in more open areas with very little groundcover (even recorded on mown lawns and golf courses). Nest abandoned if disturbed. Coastally, often associated with Swamp Oak groves, saltmarsh, mangroves, *Melaleuca quinquenervia* woodlands and even golf courses, etc. May travel as far as 3km from roost site to foraging grounds. (NSW NPWS 2003b). Recorded near Kempsey and in Crowdy Bay NP (NPWS Atlas 2004).	In broad terms all of site is generally suitable for foraging and perhaps nesting, however, site disturbance history, likely presence of foxes and cats and increasing levels of human presence render potential occurrence as unlikely, especially given lack of records in locality, relative scarcity of regional records and current conservation status.	Majority of potential habitat to be retained, thus site expected to retain potential support. No risk of significant impact. Seven Part Test not required.

Beach-Stone Curlew (*Esacus neglectus*)	Open, undisturbed beaches, reefs, estuarine sand and mudflats with mangroves nearby. Forages on intertidal flats. Nest in mangroves or Swamp Oak near tidal flats. Sedentary, sensitive to disturbance. (Smith 1991)	Potential habitat occurs in the locality but not in study area. Recorded in locality but unlikely chance of occurrence on site.	Potential habitat not affected. No risk of significant impact. Seven Part Test not required.
Barred Cuckoo Shrike (*Coracina lineata*)	Gregarious rainforest/moist forest (especially creek gullies) species feeding mainly on fruit, especially figs, on tall rainforest trees and shrubs, but also on insects. Nomadic, generally moving with fruiting patterns. (Lindsey 1992) Has been recorded in swamp sclerophyll with rainforest understorey in Port Macquarie (NPWS Atlas of Wildlife).	No suitable habitat occurs on site. Recorded in locality. Considered at best a very low chance of transient occurrence due to absence of preferred habitat.	No preferred habitat on site, thus no significant impact likely. Seven Part Test not required.
Wompoo Fruit Dove (*Ptilinopus magnificus*)	Sub-tropical, littoral, warm temperate and dry rainforest, and wet sclerophyll with rainforest understorey. Preference for large areas of undisturbed forest. Feeds on fruit, usually high in canopy. Locally nomadic following fruit resource. Nests in rainforest, 3-10m above ground. Known to feed on Camphor Laurel and Lantana.	No suitable habitat occurs on site. Recorded in locality. Considered at best a very low chance of transient occurrence due to absence of preferred habitat.	No potential habitat on site, thus no significant impact likely. Seven Part Test not required.
Rose-Crowned Fruit Dove (*P. regina*)	Inhabits dense rainforest or vegetation containing fruit bearing trees, feeding on fruit. Recorded in small areas of habitat (2ha). Locally nomadic and migratory, following fruiting patterns, with northward movement in winter.	As for Wompoo Fruit Dove.	As for Wompoo Fruit Dove. Seven Part Test not required.
Regent Honeyeater (*Xanthomyza phrygia*)	Nomadic, may move coastwards in late summer. Inhabits temperate eucalypt woodlands and open forest, including forest edges, woodland remnants on farmland and urban areas. Also uses *Casuarina cunninghamiana* gallery forests. Requires reliable and ample nectar supplies to support semi-permanent (core breeding) habitat. Favoured nectar sources are *E. sideroxylon, E. albens, E. melliodora, E. leucoxylon, E. robusta, E. planchoniana*, and heavy infestations of mistletoe. Also take insects and orchard fruits. Coastal forests of Swamp Mahogany or Spotted Gum an important drought refuge. Preference for large emergent trees. Breeds in pairs or small colonies in open woodland/forest and occasionally more disturbed woodland near housing and farmland, depending on food availability, from August-January. Breeding less likely to occur if nectar flows are low or unreliable, or heavy competition with more aggressive honeyeaters eg Noisy Miner, Red Wattlebirds and Noisy Friarbirds. (Menkhorst *et al* 1999)	No mistletoe present on site and no preferred forage species. Recorded regionally but not recorded in locality. Not detected on site by survey. Considered very low to unlikely chance of occurrence as rare transient using flowering trees on site opportunistically.	No loss of key or significant habitat. Site will retain potential to support rare transient occurrences. No risk of significant impact. Seven Part Test not required.

Painted Honeyeater (*Grantiella picta*)	Dry, mistletoe-laden, open forest and woodland, mostly on inland slopes of Great Dividing Range. Specialist feeder on mistletoe, particularly *Amyema* sp on Acacia and Eucalypts (Garnett, 1993). Breeding areas have high levels of mistletoe infestation. Possibly being displaced by Mistletoebird which feeds on broader range of species (Garnett, 1993). Locally nomadic. Breeds in SE Australia from Oct-Mar, migrates north into Q, NT in winter (Lindsey, 1992). "Cannot effectively be conserved in reserves.." and dependent of private land (Garnett, 1993).	Mistletoe absent hence site considered to be generally unsuitable. Recorded south of Kempsey, but not recorded in locality. Not detected by survey. Considered very low to unlikely chance of occurrence as rare transient.	No loss of key or significant potential habitat. Site will retain potential to support rare transient occurrences. No risk of significant impact. Seven Part Test not required.
Mangrove Honeyeater (*Lichenostomus fasciogularis*)	Similar to Varied Honeyeater. In NE NSW scattered colonies occur in Mangroves, coastal Casuarina & Melaleuca forest, Banksia shrubland, gardens. Forages in small groups in lower foliage or on ground for nectar, fruit, insects, marine invertebrates (eg crabs). Breeds Aug-Dec, with nest low in Mangroves. Record at Stuarts Point. (Lindsey 1992, DEC 2005a)	No mangroves occur on site and limited dry sclerophyll understorey offers marginal foraging potential. Occurrence is likely to be limited by low diversity of flowering species on site. Not listed on Bionet (2007) or Atlas of Wildlife (2007) as local occurrence, however consultant is aware of a record at Stuarts Point. Unlikely to very low chance of occurrence on site.	Unlikely to very low chance of occurrence and no significant impact likely as no significant type or extent of potential habitat affected. Seven Part Test not required.
Brown Treecreeper (*Climacteris pciumnus*) eastern subspecies	Medium-sized insectivorous bird occupying eucalypt woodlands, particularly open woodland lacking a dense understorey. Sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups (Noske 1991). Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Noske 1979). Distributed through central NSW on the western side of the Great Dividing Range and sparsely scattered to the east of the Divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys, Coffs Harbour and Great Lakes Shire.	Site's forest may be broadly potentially suitable habitat for the species in the dry sclerophyll forest, with potential nest sites in hollows. Recorded west of Kempsey, but not in locality and not detected on site. Considered unlikely to very low occur.	Unlikely to very low chance to occur. No risk of significant impact as potential too occur and even breed retained. Seven Part Test not required.
Grey-Crowned Babbler (*Pomatostomus temporalis temporalis*) eastern subspecies	Occupies open woodlands dominated by mature eucalypts, with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. Builds conspicuous dome-shaped nests and breeds co-operatively in sedentary family groups of 2-13 birds (Davidson and Robinson 1992). Insectivorous and forage in leaf litter and on bark of trees. Occurs on the western slopes and plains but less common at the higher altitudes of the tablelands. Isolated populations are known from coastal woodlands on the North Coast, in the Hunter Valley and from the South Coast near Nowra (Blakers *et al.* 1984, Schodde & Mason 1999).	As for Brown Treecreeper but not recorded in locality.	As for Brown Treecreeper. Seven Part Test not required.

Diamond Firetail (*Stagonopleura guttata*)	Occupies eucalypt woodlands, forests and mallee where there is a grassy understorey. Build bottle-shaped nests in trees and bushes, and forages on the ground, largely for grass seeds and other plant material, but also for insects (Blakers *et al.* 1984, Read 1994). Distributed through central and eastern NSW, extending north into southern and central Queensland and south through Victoria to the Eyre Peninsula, South Australia. In NSW, the species occurs predominantly west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain of western Sydney and the Hunter, Clarence, Richmond and Snowy River valleys (Blakers *et al.* 1984, Schodde & Mason 1999).	As for Brown Treecreeper but not recorded in locality.	As for Brown Treecreeper. Seven Part Test not required
Speckled Warbler (*Pyrrholaemus sagittata*)	Inhabits mostly inland woodlands (some drier coastal areas) with grassy understorey often on ridges and gullies. Sedentary in pairs or trios, and nests on ground in grass tussocks, dense litter and fallen branches. Forages on ground or understorey for arthropods and seeds within home range of 6-12ha. Remnants <100ha not suitable.	Given the species preference for inland habitats the site is considered to be unsuitable. Recorded in Kempsey LGA, but not in locality and not detected on site. Considered unlikely to occur.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.
Black-Necked Stork/Jabiru (*Ephippiorhynchus asiaticus*)	Wetlands, mudflats, mangroves, floodplains, irrigated fields, farm dams. Forages in shallow water for small vertebrates. Shuns cover, prefers extensive open shallows. Nests in a tree, often above water in a secluded swamp. Eggs laid Aug-Nov in NSW. Adults resident, juveniles dispersive (DEC 2005a, Lindsey 1992).	Not foraging (dam too small and no prey potential) and nesting habitat occurs. Overall unlikely potential occurrence on site.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.
Brolga (*Grus rubicunda*)	Inhabits coastal and inland wetlands, shallow lakes, grassland, saltmarsh, farm and dry open land. Forages for large invertebrates, frogs, fish, seeds, green shoots and bulbs. Breeding occurs predominantly in tropical wetland and large inland swamps and irrigated grasslands at inland and central northern Australia (eg Queensland and Northern Territory), though has been recorded in the northwest and north-eastern corner of NSW and Victoria.	As for Jabiru. Recorded in locality.	As for Jabiru.
Magpie Goose (*Anseranas semipalmata*)	Shallow freshwater in large swamps and dams, with dense rushes, sedges and nearby permanent lagoons, grasslands. Diet of bulbs, roots, seeds of sedges, rushes, rice. Nomadic, migratory, northern species, generally rare vagrant to NSW. Gregarious. Colonial roosting & nesting. Breeding influenced by water level. (NSW NPWS 2000, Lindsey 1992)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Blue-Billed Duck (*Oxyura australis*)	Deep, densely vegetated freshwater wetlands. Rarely comes ashore. Nests in vegetation over water. Nocturnal. Mainly inland. (Lindsey 1992)	Site does not contain suitable habitat. Recorded in Kempsey LGA, but not in locality and not by survey. Unlikely to occur on site.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.

Black Bittern (*Dupetor flavicollis*)	Coastal waterways, estuaries, swamps with densely wooded edges, Swamp Oak, Mangroves. Secretive, partly nocturnal. Roosts in trees overhanging water or in dense reeds. Critical breeding habitat is mangrove belts (Lindsey 1992). Breeds Dec-Mar, nests in trees over water. (NSW NPWS 2000, DEC 2007b)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Australasian Bittern (*Botaurus poiciloptilus*)	Wetlands, preferably with dense sedges, rushes, reeds. Prefers freshwater, but also uses densely vegetated saltmarsh and flooded grasslands. Roosts on the ground, forages in shallow water from a platform of trampled vegetation, nests above water on similar platform. Single or groups to 12. Usually sedentary, but nomadic in response to flood, drought. (DEC 2007b)	As for Black Bittern.	As for Black Bittern. **Seven Part Test required**.
Little Tern (*Sterna albifrons*)	Summer migrant from Asia. Coastal waters, bays, inlets. Nests in colonies on beaches, shingle pits near mouth of estuaries or coastal lagoons. Sensitive to disturbance. Feeds on wing, taking small fish and invertebrates in estuaries and surf. (DEC 2007b)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Pied Oystercatcher (*Haematopus longirostris*)	Ocean beaches, estuarine sand and mudflats. Forage on exposed sand or mud chiefly for molluscs, but also worms, crabs and small fish. Nest on coastal or estuarine beaches, occasionally in saltmarsh or grassland. Eggs laid Aug-Jan. (NPWS 2000, Smith 1991)	As for Little Tern.	As for Little Tern. Seven Part Test
Sooty Oystercatcher (*H. fuliginosus*)	Mainly forages on rocky foreshores, reefs, wave-cut platforms, coral reefs and stony beaches, occasionally on sandy beaches and estuarine flats. Diet of molluscs, crustaceans. Breeds on off-shore islands or on sand amongst vegetation. (NSW NPWS 2000, Smith 1991).	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Painted Snipe (*Rostratula benghalensis*)	Apparently migratory, breeding Oct-Feb. in southern Australia, but also nomadic, responding to conditions (Smith 1991). Favours shallow, densely vegetated freshwater wetland, feeds on mudflats, but also mangroves and open areas. Solitary, secretive, feeds at dusk. Seldom stays in an area long. Nests in dense cover above water level (Lindsey 1992, Smith 1991).	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Comb-Crested Jacana (*Irediparra gallinacean)*	Deep, permanent freshwater with surface/floating vegetation (eg Water Lily). Sedentary or locally nomadic. Forages on surface. Nest a raft in screened, emergent vegetation. Sensitive to water level changes and to disturbance. Breeds in response to rising water level Sep-Jan (Lindsey 1992).	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Black-Tailed Godwit (*Limosa limosa*)	Non-breeding summer migrant, sporadically occurring in NSW. Occurs on estuarine sand, lagoons and mudflats, also large shallow, muddy inland wetlands with receding water, and wet meadows. Feed in shallow water or soft mud, often in flocks. (Smith 1991, DEC 2005a)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.

Terek Sandpiper (*Xenus cinereus)*	Non-breeding Summer migrant, with small numbers reaching southern coasts. Forages on intertidal sand and mudflats, often near mangroves or in tidal creeks. Also ocean beaches, rocky shores. Roosts on/in mangroves, also on beaches. Feed over soft, wet mud. (Smith 1991)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Mongolian Plover/Lesser Sand Plover (*Charadrius mongolus*)	Non-breeding Summer migrant. Forages chiefly on estuarine tidal sand and mudflats and mangroves. Roosts on sandy beaches or rocky shores at high tide. Forage in loose flocks on wet flats, above water's edge. (Smith 1991)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Large/Greater Sand Plover (*Charadrius leschenaulti*)	Non-breeding Summer migrant. Entirely coastal in NSW. Forages on undisturbed beaches, estuarine tidal sand and mudflats, mangroves, saltmarsh above water's edge. Roost on sandy beaches and rocky shores at high tide. (Smith 1991, NSW NPWS 2000)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Great Knot (*Calidris tenuirostris*)	Non-breeding Summer migrant. Occur on tidal mudflats, sandy ocean shores and occasionally inland freshwater or salt lakes. Forage on soft wet mud or in shallow water, usually in small flocks, often with other waders. (NSW NPWS 2000, Smith 1991).	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Sanderling (*Calidris alba*)	Non-breeding Summer migrant, some birds remain over Winter. Occurs on sandy ocean beaches, usually near estuaries. Forage at water's edge at low tide. Roost at high tide on beaches or rocky shores, occasionally roost or shelter in estuaries, but do not feed there. (Smith 1991)	No suitable habitat on site. Recorded in locality but considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.
Eastern Chestnut Mouse (*Pseudomys gracilicaudatus*)	Appears to prefer heathland especially dense wet heath and swampy areas usually occupied by Swamp Rat (AMBS,1996). Also recorded from mid-elevation grasslands, open dry and wet sclerophyll woodland. In the Port Macquarie area, associated with heathland with dense shrub layer of *Banksia ericifolia, B. serratifolia, Xanthorrhoea* spp, *Dillwynia floribunda, Boronia spp, Leptospermum flavescens* and *Melaleuca nodosa*. Requires specific fire regime, greatest density 3-4 years after fire. Omnivorous, seeds, fungi, green stem, arthropods. Home range <0.5ha (NSW NPWS 2000).	No suitable habitat on site. Not recorded in locality and considered unlikely chance occurrence on site.	No loss of key or significant habitat components. No barriers to movements. No risk of significant impact. Seven Part Test not required.

Long-Nosed Potoroo (*Potorous tridactylus*)	Coastal heath and shrublands; paperbark forest; woodland with dry heathy understorey; high elevation rainforest or moist hardwood forest; moist shrublands with dense or moderately dense understoreys and sedge-dominated groundcover; wet or dry sclerophyll forests where average annual precipitation exceeds 760mm. Requires thick groundcover for refuge, while foraging in open areas on ridges, slopes or gullies, typically on ecotones, and prefers sandy soils for digging. Eats roots, tubers, fungi, fleshy fruits, leaves, insects and other soil invertebrates. Optimum habitat generally considered a mosaic of regenerating dense understorey vegetation as result of patchwork of periodic low to medium intensity fires. Home range of 2-5ha (NPWS 2000).	Site contains no suitable habitat due to lack of cover. Presence of predators such as foxes and cats also limits the species potential to occur. Not recorded in the locality or by survey on site. Considered unlikely to occur.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.
Koala (*Phascolarctos cinereus*)	Areas where preferred food species occur in sufficient concentrations and diversity.	Recorded in the locality. Site offers area of potential foraging. No evidence of past (old scats/scratches) or current (fresh scats or sightings) usage was detected. Considered very low to unlikely potential occurrence as extensive studies of SWR have found limited occurrence.	No risk of significant impact as not Core Koala Habitat and foraging habitat is largely retained as overwhelming majority of potential habitat retained. However, proposal will result in net increase in barriers to movement, threats (dogs, traffic) to potential recovery of the species hence **Seven Part Test required.**
Common Planigale (*Planigale maculata*)	Wide variety of habitats. Preference for areas of dense groundcover due to heat/dehydration problems. May prefer ecotones of dry/wet habitats (Denny 1982). Preys on arthropods, small vertebrates, shelters in nest under/in fallen timber or rock (Strahan 1995). Home range about 0.5ha. Breeds Oct-Jan (NSW NPWS 2000).	Dry sclerophyll offers potential habitat in broad terms but has limited refugia (eg rocky outcroppings). Lack of dense groundcover suggests potential to occur very limited, as does lack of local records (nearest record is at Gumma -Berrigan 2002a). Considered unlikely to low chance occurrence.	No loss of key or significant habitat components. No barriers to movements between currently interconnected habitat. No risk of significant impact. Seven Part Test not required.
Brushtailed Phascogale (*Phascogale tapoatafa*)	Range of forest habitats but prefers drier sclerophyll forest with sparse ground cover. Forages on large rough-barked trees for small fauna, also utilises eucalypt nectar. Rests in tree hollows, stumps, bird nests. Requires tree hollows for nesting. (NPWS, 2000) Breeds May-July. Occupies territory of 20-100ha. Has been recorded in swamp forest.	Site offers key habitat components (hollow trees) and suitable habitat structure. Recorded in the SWR area and locality in identical habitat and overall considered at least moderate to high chance to occur on site.	At least moderate chance to occur. **Seven Part Test required**.

Spotted-Tail Quoll (*Dasyurus maculatus*)	Various forested habitats with preference for dense forests. Requires tree hollows, hollow logs or caves for nesting. Large home range (>500ha) and may move over several kilometres in a few days. Tends to follow drainage lines.	Site offers potential shelter in hollow trees. Prey limited due to modification however. Competitors likely to be present on site (ie cats, foxes). Given large home range considered at best marginal fair chance to occur using site as fringe of range. Not detected by survey. Not recorded in locality.	No loss of key or significant habitat components. No barriers to movements between currently interconnected habitat. Increase in potential competition from cats and risk of collision with traffic. **Seven Part Test required** as fair potential to occur.
Yellow-Bellied Glider (*Petaurus australis*)	Moist and dry tall mature eucalypt forest and woodland. Requires mature hollow-bearing trees, winter-flowering eucalypts, suitable sap-feeding eucalypt species and a mosaic of forest types (NPWS 1999). Sap trees utilised include: *E. propinqua, E. tereticornis, E. microcorys, & E. resinifera* (NPWS 2000). Home range of 30-65ha (NPWS 1999).	Not detected on site despite being targeted. Potential foraging habitat present though low abundance of Winter flowering species. Number of suitable large present in 7(a) zone. Recorded in locality (but not in SWR area or Hat Head NP), but no evidence of use observed on site and not detected; considered unlikely to occur.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.
Squirrel Glider (*P. norfolcensis*)	Dry, open forest and woodland, and occasionally wet eucalypt and rainforest. Most common in floriferous sub-coastal and coastal forests with winter flowering trees and shrubs and some smooth barked eucalypts. Most commonly recorded along the coastal margin where Banksias dominate the understorey. Home range 0.6-9ha, family groups of 2-10 (NSW NPWS 1999).	**Recorded** on site.	Recorded on site, thus **Seven Part Test required**.
Eastern Pygmy Possum (*Cercartetus nanus*)	Found in rainforest, sclerophyll forest, woodland and tree heath. Predominantly nectarivorous (opportunistically insectivorous and also eats fruits during flowering lulls) feeding on Banksias, Leptospermum, Melaleucas, Eucalypts and Callistemons. Nest in very small hollows, or within bark/leaf nests in tree forks (eg Melaleucas and Banksias), Myrtaceous shrubs, abandoned bird nests or under loose eucalypt bark. Often Winters in torpor.	Dry sclerophyll contains some potential foraging resources and tree hollows are present, however lacks preferred range of food resources in understorey and shrub layer ie banksias, melaleucas, etc. Not recorded by survey on site or by others in locality in similar and identical habitat. Overall, the lack of local records, marginal habitat quality and the failure to detect on site indicate the species is unlikely to occur.	Unlikely to occur. No risk of significant impact as potential to occur retained as >90% habitat retained. Seven Part Test not required.

Grey-Headed Flying Fox (*Pteropus poliocephalus*)	Nomadic frugivore and nectarivore on rainforest, eucalypt, melaleuca and Banksia. Recorded flying up to 45km from roost (generally max. of 20km). Roosts colonially with short term individual or small groups, mostly near watercourses. Spring or Summer roosts are maternity sites. Dependant on winter flowering species eg *E. robusta* and *E. tereticornis.*	Recorded in the locality but not on site. **Recorded directly adjacent to site**. Potential foraging habitat is abundant due to the extent of eucalypts and Bloodwoods available. Overall, considered a high chance to occur on site and in the general area.	High chance to occur. Proposal will remove some potential foraging resources. **Seven Part Test required**.
Black Flying Fox (*Pteropus alecto*)	Generally as for Grey-Headed Flying Fox. Range moving south. Nearest known breeding colony at Bellingen, and recent record of young at South West Rocks.	As for Grey-Headed Flying Fox. Recorded in SWR. Fair to moderate chance of occurrence.	As for Grey-Headed Flying Fox. **Seven Part Test required**.
Eastern Blossom Bat (*Syconycteris australis*)	Found in well timbered habitats. Roosts in rainforest and wet sclerophyll forest. Feeds in heathlands and paperbark swamps up to 4km from roost. Key food species include Banksia, Melaleucas, Callistemons and Bloodwoods.	Potential foraging resources limited to Bloodwoods and perhaps Blackbutts in dry sclerophyll. Recorded in the locality but site habitat considered marginal compared to habitat in Hat Head NP where banksias abundant, hence only low chance to forage on site at some point. No suitable roosting habitat on site.	Low chance to occur and this potential will be retained post-development, hence no risk of significant impact. Seven Part Test not required.
Greater Broad Nosed Bat (*Nycticeius rueppellii*)	Forages over range of habitats including rainforests and moist forests, but prefers ecotones between riparian forest, woodland and cleared land. Requires sparse understorey and will forage over water. Roosts in tree hollows. Feeds on larger insects, small vertebrates and perhaps other bats.	May forage along tracks, and ecotone of dry sclerophyll and cleared pasture land. Potential roosting habitat is present on site. Recorded in the locality and SWR, and considered at least moderate chance to occur.	Moderate chance of occurrence. **Seven Part Test re**quired.
Common Bent-Wing Bat (*Miniopterus schreibersii*)	Habitat generalist - forages above well-forested areas. Roosts in old buildings, caves, mines etc. Dependant on nursery caves and communal roosts.	Not recorded on site but recorded in directly adjacent land, hence highly likely to occur on site. Site has suitable foraging potential but limited potential for roosting (not breeding or key lifecycle roosts). Recorded within 10km radius.	High potential occurrence. **Seven Part Test required.**
Little Bent-Wing Bat (*M. australis*)	Forages above and below canopy of well-forested areas. Roosts in old buildings, caves, mines etc. Dependant on nursery caves and communal roosts.	As for Common Bent-Wing	High potential occurrence. **Seven Part Test required.**
Southern Myotis (*Myotis macropus*)	Roost in groups of 10-15 in caves, bridges, mines, buildings, tree hollows and dense foliage. Prefers riparian habitat over 500m long with nearby roosting habitat. Key habitats are streams, rivers, creeks, lagoons, lakes and other water bodies. Also captured in mangroves, paperbark swamps and rainforest. Feeds on aquatic insects and small fish, also aerial prey. (Churchill 1998)	No foraging habitat present on site Potential roosting habitat present in tree hollows. Recorded in locality but considered very low to unlikely potential to occur on site as hollows near foraging areas likely to occur.	Very low chance to occur and this potential will be retained post-development, hence no risk of significant impact. Seven Part Test not required.

Yellow-Bellied Sheathtail Bat (*Saccolaimus flaviventris*)	Ecology poorly known. Found in almost all habitats, particularly wet and dry sclerophyll forests and woodlands below 500m altitude, and also open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts mainly in tree hollows, but also under bark, under roof eaves and in other artificial structures. Fast flying species, believed to forage above the canopy or closer to the ground in open areas. Insectivorous. May be Summer migrant.	Forest on site offers potential foraging habitat. Potential roosts in hollow-bearing trees. Recorded at Stuarts Point, but not by survey on site. Low to fair chance of occasional occurrence.	Some loss of marginal habitat including potential roosts, however majority retained. Fair chance of occurrence. **Seven Part Test required.**
Hoary Bat (*Chalinolobus nigrogriseus*)	Occurs in a range of habitats, such as monsoon forest, tall open forest, open woodland, vine thickets, coastal scrub, sand dunes, grasslands, floodplains, watercourses and dams. Roosts in eucalypt tree hollows, as well as rock crevices. Breeding colonies have been recorded in roofs of buildings. Preferred prey is beetles and moths, but also spiders, mantids, crickets, grasshoppers, cicadas, bugs, diving beetles, flies and ants (thus may land and forage).	Site habitats may provide potential foraging and tree hollows offer potential roosting sites. Not recorded on site by survey, but recorded near site in locality. Considered low to fair chance of occurrence on site.	Some loss of marginal habitat including potential roosts, however majority retained. Fair chance of occurrence. **Seven Part Test required.**
Eastern False Pipistrelle (Falsistrellus tasmaniensis)	A large vespertilionid which feeds on moths and insects. Known to roost in caves, abandoned buildings, but mostly in trees hollows higher rainfall forested areas. It is suspected that some populations migrate in Winter from higher altitudes to coastal areas, or may simply enter torpor. Prefers tall forests (>20m high) and extensive movements (eg 12km recorded between foraging and roost sites). Recently recorded in Thrumster west of Port Macquarie.	Site's vegetation is considered only marginally potentially suitable as foraging habitat while tree hollows may be suitable for roosting. Not recorded during the survey or in the locality. Overall considered a low to marginally fair potential occurrence.	Greater portion of habitat and at least majority of hollow bearing trees will be retained post development, thus potential to occur should be largely retained. No significant impact likely, however considered a fair chance to occur and habitat lost thus **Seven Part Test required.**
Northern Long-Eared Bat (*Nyctophilus bifax*)	In northern NSW, generally restricted to rainforest. Elsewhere, forest dweller preferring wetter habitats (ie rainforest to monsoon forest, riverine paperbark forests) but also found in open woodland, tall open forest and dry sclerophyll woodland. Roosts in tree hollows (especially lactating females) under peeling bark, among epiphytes, in strangler fig roots, dense foliage and dead fronds. Feed on moths, ants and beetles. Tend to forage on edges of tree canopy rather than within foliage. (Churchill 1998)	Dry sclerophyll offers very marginal potential habitat. Overall, site considered to be generally not preferred structure. Potential roosts in tree hollows and marginal potential foraging along forest ecotones. Recorded in locality at Smokey Cape, but not by survey on site and considered very low to unlikely chance of occurrence.	Potential roosting habitat not affected and only small area of potential foraging habitat in area proposed for development. No critical habitat modified. No barriers to access. Site expected to retain potential support for rare occurrences. No risk of significant impact. Seven Part Test not required.
Eastern Cave Bat (*Vespadelus troughtoni*)	Rare and poorly known bat. Cave dwelling bat roosting in small (5-50) to large (500) groups in sandstone overhang caves, boulder piles, mines, tunnels and sometimes buildings. Tend to roost in well lit portions of caves in avons, domes, cracks and crevices. Occasionally found along cliff lines in wet eucalypt forest and rainforest on the coast and dividing range, but extend into drier forest on western slopes. (Churchill 1998, DEC 2005a)	Site lacks caves for roosting. Site habitats considered to be generally not preferred structure, but forests may offer marginal foraging. Recorded <5km in Hat Head NP hence low to fair potential to occur.	Potential foraging habitat on site to be largely retained. **Seven Part Test required** as precaution due to loss of possible habitat and fair potential to occur.

East Coast Freetail Bat or Eastern Freetail Bat (*Mormopterus norfolkensis*)	Specific habitat requirements of this species are poorly known. Has been recorded in habitats ranging from rainforest to dry sclerophyll and woodland, with most recorded in the latter (State Forests 1994). Roosts in small colonies under tree hollows and under loose bark; has been found under house eaves, in roofs and metal caps on telegraph poles. Recorded roosting in roof in Hat Head village. Probably forages above forest or woodland canopy, and in clearings adjacent to forest. Most records are of single individuals, and it is likely to occur at low densities over its range.	Not recorded on site but recorded in directly adjacent land, hence highly likely to occur on site. Site has suitable foraging and roosting (including breeding and key lifecycle roosts) potential. Recorded within 10km radius.	High potential occurrence. **Seven Part Test required.**
Beccari's Freetail Bat (*M. beccarii*)	Wide range of habitats from rainforest, floodplains, tall open forest, savannah woodlands, arid shrublands and grasslands. Commonly caught along watercourses, over water and over canopy, typically in areas free of obstructions due to low manoeuvrability. Feeds above canopy in fast flight but agility on ground suggests ability to forage on flightless insects. Roosts in tree hollows, caves, buildings. (Churchill 1998) Very few records in NSW – sporadic and possibly Summer nomadic.	Potential roosts in tree hollows on site. Parkland and forest may be suitable foraging structure. Not detected by survey. "*Possible*" record in South West Rocks and "*probable*" record at Gumma in identical habitat suggests possible non-breeding occurrence. Considered very low to marginally fair chance of occurrence.	Site expected to retain potential support for rare occurrences. No barriers to access. No risk of significant impact. **Seven Part Test required** however on precautionary basis as fair potential to occur.
Dwyer's Bat/Large Eared Pied Bat (*Chalinobus dwyeri*)	Found in moderately wooded habitats such as dry sclerophyll forest, tall open eucalypt forests, woodlands, sub-alpine woodlands, edge of rainforest and wet sclerophyll forest. Roosts in caves, mines and abandoned bottle-shaped mud nests of Fairy Martins. In caves and mines, tend to roost in twilight sections near entrance. Insectivorous but habits poorly known. Fly relatively slowly, direct and manoeuvrable, low to ground or 6-10m above ground. (Churchill 1998).	General foraging preferences of this poorly known species suggests site and locality potentially structurally suitable foraging habitat. No cave, mines, etc on or near site for roosting. Not recorded in locality of site (or Shire, and very few regional records). Not recorded by survey. Considered very low to unlikely chance of occurrence on site.	Site expected to retain potential support for rare occurrences. No barriers to access. No risk of significant impact. Seven Part Test not required.
Three-Toed Snake-Tooth Skink (*Coeranoscincus reticulatus*)	Poorly known ecology. Found in moist layered forest, closed forest and tall open forest (Cogger 1992). Soil type appears important – rich dark or loamy basaltic soils (SFNSW 1994). Also recorded in closed forest on silica dunes, coastal eucalypt woodlands on sand, and in logged forest with tall softwood regrowth. Usually found under leaf litter, moist rotting logs, or loose friable soil.	Site not considered to offer suitable habitat. Not recorded locally or by the survey. Overall, considered unlikely to occur due to sparse records and evident disturbance history of site.	Unlikely to occur, Seven Part test not required.
Pale-Headed Snake (*Hoplocephalus bitorquatus*)	Wet and dry sclerophyll, preferring those with *Callitrus* spp, riparian vegetation, and occasionally rainforest. Terrestrial and semi-arboreal predator of small vertebrates (mainly lizards and frogs, small mammals and probably co-habitating bats). Shelters under decorticating bark and within hollows especially close to watercourses.	Dry sclerophyll with tree hollows may be potentially suitable in broad sense, however lack of local records, scant LGA records and site's disturbance history suggests not a likely potential occurrence.	Unlikely to occur. No risk of significant impact. Seven Part Test not required.

Stephen's Banded Snake (*H. stephensii)*	Inhabits variety of habitats including dry rainforest, sub-tropical rainforest, wet and dry sclerophyll, rocky outcrops (especially granite and sandstone) - requires close proximity to variety of vegetation formations. Nocturnal and primarily arboreal - sheltering under decorticating bark, within tree scars, hollows, logs, rock crevices and slabs. Active predator of variety of vertebrates including geckos, skinks, frogs, small mammals, bats, birds	As for Pale Headed Snake	Unlikely to occur. No risk of significant impact. Seven Part Test not required.
Wallum Froglet (*Crinia tinnula)*	Predominantly confined to acidic paperbark swamps of coastal areas (Cogger 1992). Also found in wet heathland and Melaleuca sedgelands. Recorded breeding in flooded pasture adjacent to paperbark swamps.	No suitable habitat on site. Recorded in locality. Unlikely to occur on site.	Unlikely to occur, Seven part Test not required.
Giant Barred Frog (*M. iteratus)*	Moist hardwood forest, Antarctic Beech and rainforest near flowing streams. May also occur in coastal riverine rainforest and riparian vegetation. Forages in areas adjacent to riparian zones. Males call from under leaf litter or rocks by flowing streams. Eggs laid at streamside to await washing into stream by rainfall.	No suitable breeding or foraging habitat on site. Recorded in locality. Not detected by survey. Unlikely to occur.	No significant impact as no suitable habitat affected by proposal. No risk of significant impact. Seven Point Tests not required.
Stuttering Barred Frog *(Mixophyes balbus)*	Generally as for *M. iteratus*.	As for *M. iteratus*. Recorded in Yarrahappini State Forest just outside locality.	As for *M. iteratus*.
Green and Golden Bell Frog (*Litoria aurea*)	Found in permanent swamps and ponds. Prefers water bodies which are: still; shallow; unshaded; ephemeral; unpolluted; generally isolated; and free of native fish species or Plague Minnow (*Gambusia holbrooki)* and little macro-algae. Requires emergent vegetation, grass tussocks or rocks for shelter. May use disturbed sites opportunistically - may depend on seral stages. Eats insects and other frogs. Summer breeder. (Hero *et al* 2004).	No suitable habitat on site. Recorded in locality but not detected on site by survey. Considered unlikely to occur.	No loss of suitable habitat. No risk of significant impact. Seven Part Test not required.
Green Thighed Frog (*Litoria brevipalmata*)	Poorly known. Found in range of habitats such as warm temperate open forest, rainforest, and forestry dams in dry, open forest; breeding aggregations around oxbow lakes, ditches, flooded paddocks, overflows and grassy semi-permanent ponds. Males call only for few days after spring and early summer rains. Possibly a lowland forest ground-dweller.	Despite broad range of potential habitats the site is not considered to offer any structurally suitable habitat. Not recorded in locality or by survey on site. Considered very low to unlikely chance of occurrence on site.	No loss of suitable habitat. No risk of significant impact. Seven Part Test not required.
Olongburra Sedge Frog (*Litoria olongburensis*)	Apparently restricted to wallum habitats in coastal lowlands and sand islands with tannin-stained acidic freshwater and sandy heath. Generally north from Woolgoolga to Fraser Island. Breeds following heavy rainfall in warmer months, calling from emergent sedges, grasses or ferns. Fish are largely absent from the habitats used. Can disperse into new habitats given suitable corridors. (Hero *et al* 2004).	No suitable habitat on site. Not recorded in locality or on-site. Unlikely to occur.	No loss of suitable habitat. No risk of significant impact. Seven Part Test not required.

Giant Dragonfly (*Petalura gigantea*)	Large dragonfly which occurs in permanent swamps and bogs with some free water and open vegetation. Larvae occupy long burrows under the swamp and feed nocturnally on invertebrates on the surface or underwater. Larval stage up to 10 years. Adults live 1 year, remain at the swamp. Females lay eggs in soft vegetation at edge of swamp. (DECC 2007b)	Recorded in locality at South West Rocks, but not detected on site and no potential habitat present. Considered unlikely chance of occurrence.	No loss of suitable habitat. No risk of significant impact. Seven Part Test not required.

APPENDIX 2: SEVEN PART TESTS

A2.1 Preliminary Information

The 7-Part Tests are used to determine whether a proposed development is likely to have a significant effect on a threatened species, Endangered Ecological Communities, Endangered Populations and Critical Habitat listed under schedules of the *Threatened Species Conservation Act 1995*. Considerations must be given to the possible significant impacts a proposed development may have on threatened species, populations, ecological communities and their habitats.

The 7-Parts of Consideration are described by Section 5A of the *Environmental Planning and Assessment Act 1979*, as amended by the *Threatened Species Act 1995* which in turn has been amended by the *Threatened Species Conservation Amendments Act 2002*, are listed in each of the following 7-Part Tests.

From the above table, it is considered that the Seven Part Test is required of the following species ([#] denotes recorded by survey on site):

- **Mammals**: Grey-Headed Flying Fox, Squirrel Glider[#], Little Bent-Wing Bat, Common Bent-Wing Bat, Greater Broad-Nosed Bat, Eastern Freetail Bat, Eastern Cave Bat, Yellow-Bellied Sheathtail Bat, Hoary Bat, Beccari's Freetail Bat, Eastern False Pipistrelle, Black Flying Fox, Brushtailed Phascogale, Spotted-Tail Quoll, Koala.

- **Birds**: Glossy Black Cockatoo, Square-Tailed Kite, Powerful Owl, Masked Owl, Barking Owl,

A2.2 Seven Part Tests Structure

To minimise repetition and superfluous information, the responses to the 7 Part Tests are structured as follows:

A.2.2.1 Threatened Species

Part (a) is generally answered per species in a dedicated section if impacts are more acute and require more detailed evaluation. For less affected species, species are grouped together based on broadly common ecology (ie mobile bird species such as the owls or species with similar habitats such as the Microchiropteran bats) or similar impacts, and subject to a common 7 Part Test response to part (a).

Parts (d) and (f) are answered per species or collectively depending on the nature of impacts. Part (b) deals with Endangered Populations of which none are relevant to the proposed development. Part (c) applies specifically to EECs, hence is not relevant as no EECs occur on site or are affected by the proposal. Part (e) deals with Critical Habitat which is not relevant to the subject proposed development.

A2.3 Seven Part Test Responses

A.2.3.1 Threatened Species

A.2.3.1.1 Species Profiles and Extent of Local Population

SQUIRREL GLIDER *(Petaurus norf*olcensis*)*

ECOLOGICAL PROFILE:

Refer to section 3.7.3.1

HABITAT ON SITE AND EXTENT OF LOCAL POPULATION:

Refer to section 3.7.3.2.

GREY-HEADED FLYING FOX (*Pteropus poliocephalus*)
BLACK FLYING FOX (*P. alecto*)

ECOLOGICAL PROFILE:

(a) Grey-Headed Flying Fox/Fruit-Bat

The Grey-Headed Flying Fox (hereon abbreviated to GHFF) is an obligate nectarivore and frugivore, generally depending on a continuous nectar flow from *Eucalyptus, Melaleuca* and related genera, and fruits mainly from rainforest trees and vines (Eby 2000a, 2000b). In NSW, its diet is mainly flowers of Eucalypt, Melaleucas and Banksias which have more regular flowering patterns, hence the preference for these groups (Eby 2000a). Feeding on introduced flowers and fruits eg orchards mainly occurs during periods of poor native production (Eby 2000a).

The GHFF travels long distances (generally within 20km but sometimes 50km) between roosts and foraging areas. Social roosts/camps are used daily, and locations are generally stable over many years. Roosts vary with function, with many forming an interrelated network. Roost selection is not fully understood. In NSW, they mostly occur next to a watercourse, with the dominant vegetation usually being rainforest, wet sclerophyll, Melaleucas, Casuarinas or mangroves (Eby 2000a). A very large important roost occurs near Wingham. Another reportedly occurs near Bowraville. Periodic major roosts occur in the Port Macquarie area in Kooloonbung Creek Nature Reserve and Sea Acres Nature Reserve (personal observations). The latter appear to depend on local food supply.

Numbers of animals utilising a roost varies with season. In NSW, roosts are classified as occupied continuously (key colonial roosts); occupied annually in certain seasons; or irregularly. During poor seasons, individuals or small groups may occupy temporary roosts often within or close to the food source plants. Spring-Summer roosts are considered maternity sites (Eby 2001a).

The GHFF is highly nomadic following fruiting seasons, with only a small portion being sedentary. Migratory movements are in order of hundreds of kilometres (Eby 2000a, 2000b). It is also a slow breeder, long lived, and has no physiological ability to withstand food shortages. The latter results in a high mortality especially of young if shortages occur during Spring, and also reduced reproductive success (Eby 2000b). Food shortages often force GHFF to forage in orchards, particularly lactating females (Eby 2000a, Tideman et al 1997).

(b) Black Flying Fox:

The Black Flying Fox (hereon abbreviated to BFF) is considered a dietary generalist, utilising fruit, nectar and pollen according to their availability (Richards 1995). The species moves seasonally according to food availability between broad vegetation types, selecting sites richer in resources. Long migrations have not been observed in the BFF and while cultivated fruit is not a preferred food source they are eaten during seasonal shortages. The BFF (and GHFF) also demonstrate some site fidelity, returning to feed in a general area in various seasons (Palmer *et al* 2000), and also moves roosts to reduce travelling distances to main areas of current foraging habitat. Nightly foraging movements from roosts can be as little as a few hundred metres to at least several kilometres to about 15km (Palmer *et al* 2000), with movements up to 50km also recorded (Hall 1995). Females especially when lactating appear to forage further if required to meet physiological requirements (Markus and Hall 2005).

Preferred forage species are nectar producing natives eg *Grevillea, Syzygium, Eucalyptus, Syncarpia, Corymbia* and *Callistemon*, but exotics such as Cocos Palms are also fed on. Native fruits such as figs are also a significant part of the diet (Markus and Hall 2005). The diversity of natives and exotics within the urban landscape has been shown to support a more sedentary lifestyle for flying foxes (Markus and Hall 2005).

Roosts mainly occur in mangrove swamps as well as paperbark forests, monsoon forest and rainforests, though the BFF also roosts with other flying foxes (Hall 1995). Large camps mostly form in Summer containing tens to thousands of individuals.

Mating occurs from March-April with births from August to November (mainly October) in the southern end of their range, peaking in Summer in the north (Churchill 1998). Independent young can leave the camp at about 3 months (Hall 1995).

HABITAT ON SITE AND EXTENT OF LOCAL POPULATION:

These species were not recorded on site, although as detailed in section 3.7.3.3, the GHFF was recorded by Umwelt (2004) on land directly adjacent. The BFF has been recorded in the South West Rocks area (Kempsey Argus 2004) as a female with young. Given the presence of known forage species on and adjacent to the site and local records, both species are considered moderate to very highly likely to occur on site as seasonal foragers. The site is not considered to offer potential for roosting habitat.

In total the site and study area contains an area of potential foraging habitat for these species, forming a small portion of the locally abundant extent of potential foraging habitat in the area. Given the local extent of habitat and ecology of the species (eg lack of roosts), the local population of these species would extend well beyond the site/study area.

EASTERN CAVE BAT (*Vespadelus troughtoni*)
HOARY BAT (*Chalinolobus nigrogriseus*)
EASTERN FALSE PIPISTRELLE *(Falsistrellus tasmaniensis)*
SOUTHERN MYOTIS (*Myotis macropus*)
LITTLE BENT-WING BAT (*Miniopterus australis*)
COMMON BENT-WING BAT (*M. schreibersii*)
EASTERN FREETAIL BAT (*Mormopterus norfolkensis*)
BECCARI'S FREETAIL BAT (*M. beccarii*)
YELLOW-BELLIED SHEATHTAIL BAT (*Saccolaimus flaviventris*)
GREATER BROAD-NOSED BAT (*Scoteanax rueppellii*)

ECOLOGICAL PROFILE:

(a) Common Bent-Wing and Little Bent-Wing Bats:

See section 3.7.3.2 Heron abbreviated as CBWB and LBWB.

(b) Eastern Freetail Bat:

See section 3.7.3.2. Heron abbreviated as EFB.

(c) Greater Broad-Nosed Bat:

In NSW, this bat occurs in habitats generally below 500m altitude, ranging from woodland to moist and dry eucalypt forest, and rainforest, with a preference for moist gullies in mature coastal forest or rainforest on the eastern side of the Great Dividing Range (Churchill 1998, Smith *et al* 1995). It mostly roosts and nests in tree hollows in trunks and branches but will use old buildings. It generally forages at a height of 3-6m in rainforest but prefers the edges/ecotones between woodland, cleared land and riparian forest ie along gullies, creeks and small rivers (NPWS 1994b, Hoye and Richards 1995, Richards 1991, Smith *et al* 1995). It requires a sparse understorey to forage on large insects (moths, beetles and chafers) and small vertebrates possibly including other bats.

This consultant has recorded this species foraging on the edge of recently underscrubbed dry sclerophyll forest at Arakoon (Berrigan 2000c) and on the edge of rural-residential land and forest near Harrington (Berrigan 2001f).

(d) Yellow-Bellied Sheathtail Bat:

The ecology of this species is poorly known. Found in almost all habitats, particularly wet and dry sclerophyll forests and woodlands below 500m altitude, and also open woodland, Acacia shrubland, mallee, grasslands and desert. Roosts mainly in tree hollows, but also under bark, under roof eaves and in other artificial structures. Found also in abandoned Sugar Glider nests, and in northern parts of its range cracks in clay and animal burrows.

Fast flying species, believed to forage above the canopy or closer to the ground in open areas. Insectivorous - known to prey on grasshoppers, chafers and shield bugs.

Found in southern half of its range mainly January to June, with a patchy distribution. May migrate to occupy southern area during warmer months. Usually solitary, but found in groups of up to 10 (commonly 2-6) in late Winter to Spring, and may be territorial. Breeds twice early-late Summer (AMBS 1995a, Richards 1991, Smith et al 1995, Churchill 1998).

(e) Eastern Cave Bat

A particularly rare and poorly known bat, with populations in the southern part of its range appearing to be localised (Parnaby 2000). It is a cave dwelling bat roosting in small (5) to large (500) groups in sandstone overhangs, caves, boulder piles, mines, tunnels and sometimes buildings. It tends to roost in well lit portions of caves in avons, domes, cracks and crevices. Typically, it inhabits warm temperate to tropical mixed woodland and wet sclerophyll forest on the coast and dividing range, but extends into drier forest on western slopes and inland areas (Churchill 1998, Parnaby 2000). It hunts below the canopy down to about 2m above the ground for insects such as mosquitoes, flies and moths (Smith *et al* 1995). Heron abbreviated as ECB.

(f) Hoary Bat

The Hoary Bat (hereon referred to as HB) is reportedly a habitat generalist, being found throughout its range in monsoon forest, tall open forest, open woodland, vine thickets, coastal scrub, sand dunes, grasslands, floodplains, along watercourses, swamps and around dams (Churchill 1998). Considered uncommon and likely to occur in low densities in specific areas, with extremely limited distribution in the region, and reaching its southernmost limits in the Macleay. NSW records of this species have been in dry open eucalypt forest dominated by *E. maculata, E. moluccana* and *E. siderophloia*, and woodland dominated by *E. signata* and *E. intermedia*. This species has been locally recorded at Clybucca where *E. signata* occurred (ERM Resource Planning 1995); in the Yarrahapinni-Broadwater area; in *E. pilularis* forest near Byron Bay (Smith *et al* 1995); *probably* recorded by echolocation in Blackbutt-dominated forest at Crottys Lane Kempsey (Berrigan 1999); and *confidently* recorded in recently underscrubbed Blackbutt forest in South Kempsey (Berrigan 2001f).

The Hoary Bat is primarily a tree-hollow roosting species, although it has been recorded in rock crevices (Allison 1991b referred to in Smith *et al* 1995, Churchill 1998). It is often one of the first bats on the wing after dusk.

The Hoary Bat prefers moths and beetles, but also recorded feeding on spiders, mantids, earwigs, crickets, grasshoppers, cicadas, bugs, diving beetles, scarabs, click beetles, leaf beetles, weevils, flies, moths and ants. This diet suggests that the species may land and forage.

(o) **Beccari's Freetail Bat**:

This poorly known bat appears to occupy a broad range of habitats ie rainforest, floodplains, tall open forest savannah woodlands, arid shrublands and grasslands. It is commonly caught along watercourses or over water bodies, or detected in rainforest gaps and dry eucalypt forest/woodlands. It roosts in tree hollows but has also been found in house roofs (commonly found in urban environments within main range) and caves, in colonies of up to 50 animals. It is a fast flyer with low manoeuvrability hence it has a preference for few obstructions. It mainly feeds above the canopy on moths and beetles, but also eats chafers, short-horned grasshoppers, plant-bugs, leaf-hoppers, chafer beetles, weevils and flies. Diet also includes flightless insects, which suggests may land and scurry along ground (Churchill 1998, Hoye 1995, Allison 1991). It apparently breeds from mid Spring to mid-Summer (Allison 1991, Churchill 1998).

This species mainly occurs in northern Australia, and is very infrequently recorded in NSW. The southernmost record appears to be around Herons Creek (Ecopro 1997). Murwillumbah was the previous confirmed record of this species (apart from an unconfirmed record at Alstonville (Parnaby 1992, Hoye 1995 and pers. comm.), at Gumma (Berrigan 2002c), and a tentative call identification at South West Rocks (Darkheart 2004f).

(p) Eastern False Pipistrelle:

This large vespertilionid feeds on moths and insects. It is known to roost in caves, abandoned buildings, but mostly in trees hollows in higher rainfall forested areas. It is suspected that some populations migrate in Winter from higher altitudes to coastal areas, or may simply enter torpor. Prefers wet tall forests (>20m high) (Churchill 1998) and extensive movements (eg 12km recorded between foraging and roost sites).

HABITAT ON SITE AND EXTENT OF LOCAL POPULATION:

The site and adjacent habitat provide a range of potential foraging structures for the subject species ie over the canopy in the more wooded areas, amongst the open structured vegetation, along tracks under the canopy, and along the interface between cleared/open areas and wooded areas.

There are no caves, cliffs, or overhangs on or directly adjacent to the site, which precludes species depending on such resources to breed or roost in, unless they are known to forage widely from such habitat components, or utilise alternative roosts (eg tree hollows) during non-breeding stages. Sea caves occur along the headlands to the east (personal observation), hence the locally recorded ECB may use these as roosts. Hollow bearing trees are abundant in the 7(a) zone with some also occurring in the 2(a) zone on and adjacent to the site. Many of these considered potentially structurally suitable as roosting habitat for hollow-obligate bats (depending on a complex interaction of factors such as hollow microclimate, season, sex and life cycle stage of the bat species as well predation risk and competition with other species – Churchill 1998, Smith *et al* 1995, Ms Anna Lloyd - Eco-Location, pers. comm.). The trees with decorticating bark (ie Blackbutt and Scribbly Gum) may also provide marginal temporary roosting opportunities for species capable of utilising such substrate (NPWS 2000a, Churchill 1998, Smith *et al* 1995).

Call recording and identification was not able to be employed due to weather in this survey, however Umwelt (2004) recorded the LBWB, EFB and CBWB adjacent to the site in similar habitat. The remaining species are all considered

potential occurrences given the presence of suitable habitat and local records (DECC Atlas of Wildlife 2007, Bionet 2007, Darkheart 2006f, 2004f, 2004j, Berrigan 2000a, 2000b, 2000c, O'Neil and Williams 2003, etc) – many <1km away. Given the ecology of these species, their mobility and the extent of alternative known/potential habitat in the locality (eg Hat Head National Park etc), the local population of all of the subject species would extend well beyond the confines of the study site and area.

SQUARE-TAILED KITE *(Lophoictinia isura)*

ECOLOGICAL PROFILE:

The Square-Tailed Kite (hereon referred to as STK) has an Australian population size of approximately 7000 breeding pairs (low reliability) and stable (low reliability), and it is classed as Least Concern in The Action Plan for Australian Birds (Garnett and Crowley 2000).

It typically inhabits coastal forested and wooded areas primarily within 250km of coast and rarely inland along wooded watercourses and in central Australia (Blakers *et al* 1984, Debus and Czechura 1989). Often associated with ridge and gully forests, STK usually prefers open eucalypt forest and woodland and will forage in open country or partially cleared pastoral country. It is never abundant anywhere, occurring as solitary birds or dispersed pairs. The STK has a marked preference for continuous stands of open forest/woodland. It may forage over mallee, heath and shrubs, and in wooded urban areas particularly if passerine birds present.

The STK is a specialist hunter of passerine birds, especially honeyeaters and nestlings, but also takes eggs, reptiles, rabbits and insects. It prefers to take prey from the outer foliage of the canopy; hunting in the morning and afternoon.
The home range of a pair is reportedly at least 100km^2 with ranges up to 1700km^2 being reported (AMBS 1996, Garnett 1993, State Forests 1995, NPWS 2000).

Nests are constructed in mature, living trees in the fork or large horizontal limb of a tall eucalypt or angophora within forest, often near water. Breeding occurs in July to February (Debus and Czechura 1989). In southeast and southwest Australia, there is a recorded seasonal dispersal of this species north in the Winter and south in the Summer. This is more pronounced in the southwest (State Forests 1995).

In recent years, breeding has been recorded in Kempsey-Wauchope Forestry Management Area and at Port Macquarie, where it is also known to tolerate human activity, even when nesting (Bischoff *et al* 2000). The STK may be adapting to well-vegetated outer fringes of cities in northern NSW, feeding on the plentiful introduced and native passerine birds there (Debus 1998).

HABITAT ON SITE AND EXTENT OF LOCAL POPULATION:

The Square-Tailed Kite (hereon abbreviated to STK) was not recorded on the site but has been recorded in the locality (<1km). The site and study area offers a reasonable area of potential foraging habitat for the species in the forested habitats, forming a small part of locally extensive potential habitat in the locality. The site and study area possibly has some generic potential for nesting though no aspect of it distinguishes it from being more suitable than other habitat in the locality. A limited abundance of passerine birds were observed, indicating the site could form a relatively marginal part of the large home range of this species. Due to the ecology of the species, the local population would extend well beyond the confines of the site/study area.

BRUSHTAILED PHASCOGALE (*Phascogale tapoatafa*)

ECOLOGY/HABITAT REQUIREMENTS:

The Brushtailed Phascogale (hereon abbreviated to BTP) is predominantly arboreal, requiring tree hollows for nests and shelter; preferring 25-40mm wide openings, territorially marked with scats (Ayers *et al* 1996), in trees with trunk DBH as little as 14cm, but a preference for larger trees eg >40cm DBH (possibly due to trees this age being more likely to develop or contain suitable hollows) (Rhind 1996) and possibly more likely with rough bark (Soderquist *et al* 1996). Large trees offer more microhabitat opportunities which may support a higher abundance and diversity of invertebrates, and appear to be preferentially selected for foraging, which may also reduce the need to cross along the ground and hence reduce predation risk (van der Ree *et al* 2001, Rhind 1998).

The BTP has also been recorded using isolated trees for denning (Rhind 1996), as well as tree stumps (Soderquist 1993b, Trail and Coates 1993) and bird nests (Trail and Coates 1993). It can survive in areas with few hollows (eg paddock trees and immature regrowth forest) and will use alternative nest sites such as the rooves of houses within rural-residential areas and nest boxes even for breeding (Soderquist 1993b, Traill 1995, Law *et al* 2000, Dashper and Myers 2003). It will also

cross cleared paddocks with distances of 20-285m recorded by van der Ree *et al* (2001) by females in Victoria.

The BTP uses many different hollows over a short time (ie den-swapping), with males recorded using 27 and females to 38 different hollows in a year (Rhind 1998) due to lifecycle requirements and seasonal variations. For example, nesting females preferred deep cavities with narrow entrances, while non-breeding hollows were less protected from weather and predators (Soderquist 1993a). It has also been recorded sharing non-breeding nests with Sugar Gliders simultaneously (Dashper and Myers 2003, 1997). In areas where hollows are limited, single den site may be used more often which may increase predation risk (Dashper and Myers 2003). It has also been recorded denning in small groups of 4-6 animals even at times of year when mature and normally solitary (Dashper and Myers 2003).

Recorded in a variety of habitats including rainforest, wet sclerophyll, coastal swamp forests, swamp forests, *Leptospermum* heaths, open woodland, eg 30-80% canopy cover dominated by box, stringybark and ironbark (Soderquist 1995; personal observations in eucalypt parkland) and narrow road reserve remnants (van der Ree *et al* 2001), but reportedly prefers open dry sclerophyll forest with a sparse shrub/ground layer varying between scleromorphic shrubs, grasses, low herbs or leaf litter (Soderquist 1995). Also uses forest edges and transitory area between vegetation communities. It forages over the tree trunk and large branches (but rarely uses saplings or branches <10cm diameter), and will feed on the ground and on fallen logs. Foraging occurs over the surface and under bark, with teeth used to prise off material, and forepaws used to reach into crevices (Trail and Coates 1993). Ants, beetles and spiders are common food items (Trail and Coates 1993).

Recorded by the author in White Mahogany dominated dry sclerophyll with sparse groundcover, minimal to dense shrub layer and understorey (Berrigan 1999a, Darkheart 2004a) near Kempsey; at South West Rocks in numerous locations in Blackbutt-Scribbly Gum dry sclerophyll forest (Berrigan 2002d, Berrigan 2000d, 2000e, Darkheart 2004f, O'Neil and Williams 2003); in a 33ha patch of mostly regrowth dry sclerophyll forest tentatively linked to a larger remnant at Minimbah (Berrigan 2003c); and in a 20ha patch of Tallowwood and Grey Ironbark/Cabbage Gum regrowth at Aldavilla with minimal hollows separated from proximate habitat by rural-residential subdivision (Darkheart 2004d)

A primarily (80-90% nocturnal predator (but also forages on the ground), it preys mostly on arthropods and small vertebrates (eg centipedes and spiders) but also eats small mammals (eg Sugar Gliders and House Mice), reptiles and birds (Myers and Dashper 1997, 2003, Soderquist 1994), and may forage for nectar on flowering eucalypts such as ironbarks and boxes (WWF 2002), preferring larger, rough-barked trees of >25cm DBH (Soderquist 1995). It has also been recorded on roadsides feeding on carrion (WWF 2002).

Reportedly solitary with a large home range. Females reportedly generally occupy on average 20-70ha exclusively (with females acting aggressively to other females, and home range size possibly also reflecting the strain of lactation), while males overlap >100ha with both sexes (Traill and Coates 1993, Soderquist and Ealey 1994, Soderquist 1995, 1994), although known to share nest with several others, particularly juveniles which share the maternal nest until they reach sexual maturity (next breeding season). Home range size may be a reflection of habitat quality with very small home ranges recorded in some areas (van der Ree *et al* 2001), as further detailed. There also appears to be a tendency for groups of females to be surrounded by extensive vacant habitat due to their ecology, which reduces their density, as well as breeding and colonising potential (Dashper and Myers 2003). Females appear to be able to survive harsher seasons better than males due to less food requirements (Clutton-Brock 1985).

Mating occurs May-July, followed by the death of the males (usually by the end of July) (Rhind 2002), though September births recorded in Western Australia suggest sperm storage may also occur (Rhind 2003). Nest hollows appear to be selected as large internal cavities (about 9000cm^3) with small entrances to exclude predators (24-55mm diameter entrance) and have been recorded in live and dead trees, and even stumps (where hollows rare). Height of dens has been recorded from ground level to 11m (Soderquist 1993b). Maternal home range of females with young is 4-6ha, occupied exclusively (Cuttle 1982). Births occur after about a 30 day gestation period, with most births in eastern Australia occurring July-August (Dashper and Myers 2003, Soderquist 1993a). Litter size ranges from 1-13, with females attempting to raise as many young as they have teats, though accidental loss and sometimes infanticide reduces numbers. Females have been recorded losing entire litters within the first two weeks, but at the same time, survival of the entire litter to weaning is also common (Soderquist 1993a). Sex ratio may be influenced by season with Rhind (2002) recording more females produced in drought, although Soderquist (1993a) also found 2nd year females produced more males. Young are carried in the pouch while the mother forages and does not return to the nest at this time. Young release the teat at about 48 days and are left in the nest while the mother forages (over 40-60ha if prey is sparse, as typical of the Winter season) in short bouts of <1hr for only a few hours per night. Maternal attendance is frequent in the early stages, and declines as young gain fur and the mother forages for longer periods (presumedly to meet higher lactation demands). Nests are built out of interwoven bark (preferably stringybark or similar material), fur and feathers (but not leaves) for insulation, with a tunnel leading into a chamber (Soderquist 1993b). Young are weaned around 20 weeks and begin foraging outside the nest at this time. Dispersal occurs in early Summer (mid December-early January (162-171 days old), sometimes later in poorer seasons. Mothers appear to abandon their young prior to this period at the earliest around 140 days, though lactation is still heavy to at least 150 days

(Soderquist 1993a). Females appear to disperse a short distance adjacent to or replace the mother, though females have also been recorded making larger dispersals, eg 6km (Rhind 2002). Juvenile males disperse much further with studies showing movement of at least 3km away (Cuttle 1982, Soderquist 1995, Soderquist and Ealey 1994, WWF 2002, Rhind 2002). The generally limited dispersal of females may limit colonisation of potentially suitable habitat outside the former maternal range, hence reducing recovery potential of this species from areas where it has been previously displaced (Dashper and Myers 2003). Dispersal may also be delayed during drought seasons (Rhind 2003).

Home range sizes appear to vary with habitat quality and extent, with extensive foraging area required especially by lactating females (van deer Ree *et al* 2001, Soderquist 1993b) as noted previously. Hence larger home ranges are seen to occur in more marginal areas. However, there are recorded instances of very small home ranges in highly productive but limited extent areas, eg van der Ree *et al* (2001) found BTPs using roadside remnants in Victoria using home ranges of 2.3-8ha (females, with average of 5ha; whiles males were >20ha). Home range size in regrowth forest in northern NSW is reported to be around 15ha (Williams, in prep), and O'Neil and Williams (2003) suggested home range in the South West Rocks area may be around 5ha. Rhind (2002) recorded female home ranges of 10ha in rich gully habitats and 17ha in continuous forest (Rhind 1998).

Mortality rates are high, with Phascogales often using vulnerable nest sites (Soderquist 1994). Monitors are a particular threat especially of hollows holding young (Soderquist 1994). Drought and condition also have impacts on breeding success (Rhind 2003). Females may live for a second year, with captive animals living up to 3 years. Second season and even a third breeding season has been recorded (Rhind 2003, Soderquist 1993a). Females also have a high mortality (40-50%) rate during lactation primarily due to predation (predominantly foxes and cats), and less so to accidents (eg road kill or drowning) or other reasons due to poor health/condition (Soderquist 1993a). In addition to high mortality, predation and drought effects, the high risk breeding strategy also predisposes the species to risk of loss of isolated populations that fail to successfully breed in one year.

HABITAT ON SITE/EXTENT OF LOCAL POPULATION:

The site is mainly agricultural woodland and pasture that lies on the fringe of a body of fragmented forest that extends from Hat Head National Park in the west (connectivity broken by roads and rural-residential Lots), running east-west across the southern boundary of the property, and extending to the south to again interconnect with the National Park. Connectivity to the west with known BTP habitat (Darkheart 2004f, Berrigan 2000a, 2000b, O'Neil and Williams 2003) is broken by extensive relatively recent residential development (<15yrs). However, the forest to the south is known to support the species (Berrigan 2003a).

Given the extent of suitable habitat in the 7(a) zone suitable for this species, and that it has also been recorded in agricultural woodlands (Darkheart 2005n), the BTP is considered highly likely to occur in the 7(a) zone, with potential periodic foraging forays into parts of the adjacent woodland. Given the abundance of suitable hollows and extent of habitat, breeding may potentially occur in the 7(a) zone.

Given the species ecology and the relatively low quality of the habitat on site, it is considered that the local population would extend beyond the confines of the site/study area onto adjacent land to the south and west.

SPOTTED-TAIL QUOLL (*Dasyurus maculatus*)

ECOLOGY/HABITAT REQUIREMENTS: The Spotted-Tail Quoll is semi-arboreal, but mostly a ground-dweller in moister sclerophyll forests and rainforests, although also known from woodland, coastal heathlands, rocky areas and semi-agricultural areas (WWF 2002, AMBS 1996b, NPWS 1999). Critical habitat features are not known, with certain areas of apparently suitable habitat not occupied. It has most commonly been found along escarpments, gullies, saddles and riparian zones. The Quoll appears most likely to be found on the most productive sites, irrespective of forest type (eg dense leaf litter, large diameter trees, dense understorey, thick scrub cover and logs). It is often found associated with rocky areas which are important for den sites (WWF 2002).

The Quoll is primarily solitary, and normally nocturnal, resting in caves, rocks, underground burrows, rock crevices, fallen logs and tree hollows (at base of trees and branches several metres above ground), but also leaf litter, grass tussocks and dense brambles of lantana and blackberry – the latter in cleared farmland (Kortner *et al* 2004, WWF 2002, Smith *et al* 1995). Dens do not normally appear to be used on consecutive nights (denswapping) except for lactating females (Kortner *et al* 2004), and animals appear to flee from more unprotected den sites when approached (Kortner *et al* 2004).

Males (maximum about 4.2kg) are significantly larger than females (about 2.15kg) almost twice as heavy, but appear to grow slower (Kortner *et al* 2004). The male may vocalise more frequently during the breeding season. Adults begin breeding at about 2 yrs old with breeding once a year, and mating occurs in April to July, with young becoming independent

from August to November (Smith *et al* 1995). Quolls appear to live for about 5yrs (WWF 2002) with high mortality rates (often due to predation by canids and quolls especially of females and juveniles, and starvation again especially of females and juveniles) and turnover (Kortner *et al* 2004).

The Quoll preys opportunistically on birds, reptiles, arthropods and mammals (terrestrial and arboreal) eg rabbits, small macropods, gliders and possums, with about 70% of the diet primarily being medium sized mammals. It generally requires a large extent of intact vegetation to forage in. It has been known to take nestling birds, bats, Ringtail Possums, Yellow-Bellied Gliders and Sugar Gliders from hollows (Belcher 1995). It also scavenges carrion (which makes it vulnerable to automobile collision) and preys on domestic poultry (NPWS 1999, Smith *et al* 1995). Small mammals, reptiles and invertebrates are only a small part of the diet – more so for juveniles.

Home range estimates range from 500-800ha on average (AMBS 1996), but varies with habitat quality, sex and season. Generally, females may range over 600-1000ha, while males may move over 1000-5000ha (WWF 2002), however with varies predominantly with habitat quality (measured in terms of prey abundance and habitat complexity) rather than moisture/habitat types (Claridge *et al* 2005). For instance, Claridge *et al* (2005) recorded males ranging from 621-2561ha for males and 88ha to >653ha for females in dry rainshadow woodland in southern NSW (Claridge *et al* considers these sizes equivalent to home range estimates in other habitat types especially tall wet sclerophyll forest). Home range overlaps of males and females overlaps considerably, but females seldom overlap (Claridge *et al* 2005, Kortner *et al* 2004). Females appear to tolerate juvenile and sub adult offspring within their range for some time, but in areas where resources are more sparse, animals in general appear to defend (ie express territorialism) home ranges. Females also appear to be more sedentary with males having large home ranges or transient (Kortner *et al* 2004). Juvenile females also appear to stay close to their mothers home range with males apparently more likely to disperse (Kortner *et al* 2004).

This species has been recorded foraging over 2-6km in a night, with males shown by Claridge *et al* (2005) to move (in maximum straight line distances) 2529-4430m over a 24 hour to 48hgr period, and females 1865-3085m, with males also moving further over time. Kortner *et al* (2004) recorded males moving 8.1km and females 3.9km on the New England Tablelands.

Latrines are used, but by only by a single female, though several males may also visit. These appear to be important in communicating breeding status of females. Indicated by an accumulation of scats, these latrines are usually located on high points (eg rock piles, large rocks within a stream, or on top of a large log), or within a significant landscape feature eg exposed rock formations (WWF 2002).

The Quoll is also considered likely to be in direct competition with foxes and feral cats (Smith *et al* 1995).

HABITAT ON SITE: The Spotted-Tail Quoll (STQ) was not recorded by the survey, but it been recorded at Yarrahappini, and is likely to occur in Hat Head National Park (Campbell 1997). The dry sclerophyll in the 7(a) zone on the southern end of the property and interconnected to similar habitat to the south and west, and ultimately the National Park are considered to offer some potential habitat values for the species. Hollows in trees which may be structurally suitable for the STQ, are present in the 7(a) zone. Hollows range throughout the spectrum of size ranges which is ideal for potential prey species.

Arboreal prey abundance is likely to be reasonable with Squirrel Gliders being recorded by this survey, and Ringtail Possums, Sugar Gliders and Brushtail Possums recorded in interconnected vegetation. Terrestrially, foraging potential appears to be limited on both the site and study area. Birds were similarly limited, though this would vary with season eg flowering periods. Other groups such as frogs and reptiles are poorly represented, though the seasonal conditions may have affected detectability. Overall though, the site could support foraging by the Quoll as a minute part of its large territory.

Potential occurrence of the Quoll is significantly reduced by the presence of dogs and cats in residential areas adjacent, and likely presence of foxes. In addition to the fact that the study area habitat forms a spur off a large area of intact habitat to the west and south, the likelihood of the species to occur on the study site/area is overall considered low to marginally fair, with the approximately site/study area at most forming part of a wider range of at least one Quoll including habitat to the south and west.

POWERFUL OWL (*Ninox strenua*)
BARKING OWL (*Ninox connivens*)
MASKED OWL (*Tyto novaehollandiae*)

POPULATION SIZES/ECOLOGY/HABITAT REQUIREMENTS:

1. Powerful Owl

Australian population is possibly about 7000 breeding birds (stable) classed as Least Concern under The Action Plan for Australian Birds (Garnett and Crowley 2000). The Powerful Owl attains its greatest relative abundance in northeastern NSW (Kavanagh 2000b).

The Powerful Owl (hereon abbreviated to PO) inhabits open *Eucalypt*, *Casuarina* or *Callitris* pine forest and woodland, and may forage along the forest's edge, although it may prefer gullies in coastal forests (below 1500m asl), but is generally found where prey densities and roost densities are sufficiently high. It has also been recorded breeding and foraging successfully within forests and woodlands within metropolitan areas of large cities provided suitable prey species and nesting cavities are available, however, is sensitive to disturbance of nests and thus has lower breeding success (Cooke *et al* 2000). Hence overall, it is regarded as a habitat generalist (Kavanagh 2000b).

The PO preys opportunistically on large arboreal mammals such as the Yellow-Bellied Glider, Sugar/Squirrel Gliders, Common-Ringtail Possum, Greater Glider (high populations of the latter species is often linked with the occurrence of the PO) and even smaller Koalas, supplemented with terrestrial mammals (eg rats, bandicoots and juvenile wallabies), birds (eg galahs, currawongs, rosellas, lorikeets, cockatoos), fruit bats (especially if camps are nearby) and even insects (eg Christmas Beetles and large Ghost Moths), depending on abundance of prey (eg other species may be taken where mammals populations are low, though this is seen as less sustainable) (Debus 1995, Soderquist *et al* 2000, Kavanagh 2000a). Birds tend to be taken in more fragmented habitats where density and abundance of arboreal prey is lower (Kavanagh 2000a). The PO requires the equivalent of a small possum every two nights to maintain physiological demands (Garnett 1993, Schode and Tideman 1990). Hunting may be concentrated in part of the territory for some time, resulting in local declines in abundance and diversity (Kavanagh 1988), but also sees the entire home range being used regularly (Soderquist *et al* 2000).

The PO is sedentary, and solitary or in pairs occupying permanent territories of 300-5000ha (average 800-1000ha), depending on the quality of habitat (Debus 1995, Soderquist *et al* 2000, Kavanagh 2000b). Favoured roosts are on a branch within dense foliage of a tall understorey or sub-storey tree in moist, tall forest, rainforest or open forest. Recorded roost species include Forest Oak (*Allocasuarina torulosa*), Lilly Pilly *(Acmena smithii*), *Leptospermum* spp, *Acacia* spp. and Turpentine (*Syncarpia glomulifera*). The PO has also been recorded roosting in pine plantations near eucalypt forest.

Nests are usually located in large (30 to >150cm DBH, average 77-180cm DBH; with minimum 10cm wide apertures), deep (1-3m) hollows in trunks of trees, or horizontal and sloping spouts, 9-37m above ground (Debus 1995, Kavanagh 1997). These trees are often the largest and oldest tree (150-500 years) within a forest patch (eg an emergent), and are generally located at the head of a minor drainage line or upslope of streams (Soderquist *et al* 2000, Smith *et al* 1995, Gibbons and Lindenmayer 2002).

Breeding mainly occurs in Winter (Kavanagh 2000a), and nest fidelity is usually high, though some pairs have been recorded selecting new sites on average every two years (Kavanagh 2000b). Two eggs are laid per year, with most pairs able to raise at least one young (Kavanagh 2000b). Siblicide is not unknown.

2. The Masked Owl

Southern Australia subspecies estimated to number about 7000 breeding birds (stable), and is classed as Near Threatened under *The Action Plan for Australian Birds* (Garnett and Crowley 2000). The Masked Owl attains its greatest relative abundance in northeastern NSW (Kavanagh 2000b).

The Masked Owl (hereon abbreviated to MO) prefers eucalypt forest and woodland with a sparse understorey, and appears to require partial clearing/open areas or forest edges for foraging, hence it is regarded as habitat generalist (Kavanagh 2000b). They also inhabit more open areas eg farmland. It appears to avoid wetter and denser forest (Kavanagh 2000a) and is least common in forested environments with a denser understorey and/or dense groundcover, including early stages of forest regrowth (Kavanagh 2000b).

The MO is solitary, and sedentary, occupying a large permanent territory about 500-1000ha/5-10km^2 (average 800-1200ha) (Debus 1995, Kavanagh 2000b). It preys closer to the ground than the other owls, and appears to be more of a specialised predator on small terrestrial, scansorial (climbing) and arboreal mammals in the 200-600g range (eg rats, antechinuses,

Sugar Gliders, Common Ringtails, bandicoots and rabbits), birds (eg Tawny Frogmouth Owl), domestic poultry and even insects (Garnett 1993, Schode and Tideman 1990, Debus 1995, Mt King 1993, Kavanagh 2000). The Masked Owl appears to predate more on introduced species in highly disturbed environments, and native species in more natural habitats (Kavanagh 2000).

The MO roosts in tree hollows in eucalypts, and also in lilly pillys and some rainforest trees, dense foliage (infrequent), caves and crevices. Nest are located in tree hollows or cliffs. Tree hollow nests are generally in vertical trunk or spout hollows 10-30 high, 0.5-5m deep and 0.5m wide, in or near eucalypt forest or woodland (Debus 1995). Selected trees are usually 100-191cm DBH (Kavanagh 1997).

3. The Barking Owl

The Barking Owl (hereon abbreviated to BO) shows a preference for more open country ie savannah woodland, woodland, as well as forest. It is widespread on the foothills and coastal plain, to the inland slopes and plains, and rare or absent in dense, wet forests on the eastern fall of the Great Dividing Range. It has been recorded roosting in rainforest, but prefers to forage in more open country including farmland. Its preferred habitat is usually dominated by eucalypts and paperbarks (NPWS 2003c), and has even been recorded in remnants of forests and woodland, and in tree copses on farmland, in towns and golf courses. Roosts are normally in dense foliage of large trees (including rainforest species) such as streamside gallery forests, River She-Oak, Casuarinas, Allocasuarinas, eucalypts, Angophoras and Acacias. Roosts are not necessarily hidden (NPWS 2003c).

Nesting occurs in hollow trees, mainly eucalypts or paperbarks, usually near watercourses or wetlands. Nest is a large open hollow often vertical or sloping in a trunk or spout of a live or dead tree, 2-35m above ground, with an opening of 20-46cm and depth of 20-300cm. Breeding is in permanent territories, and is strictly seasonal with eggs laid in late Winter or Spring (August-October in NSW). Fledglings are seen with their parents about October to January, and disperse at the end of Summer (NPWS 2003a).

Population densities are not well known for the species, though some studies have recorded breeding pairs spaced <1-10km apart. Large territories (probably at least 200ha, but more likely up to 6000ha) are maintained with territorial calls at dusk and dawn.

Least nocturnal of Australian owls, hunting before dusk for small to medium prey such as birds, large insects and mammals. Tends to eat more birds than other forest owls such as rosellas, starlings and magpies, with a concentration on mammals during breeding and Winter; and often a lot more insects post-breeding in warmer months. Common prey include rabbits, hares, smaller marsupials, possums, Sugar Gliders, Squirrel Gliders, Brushtailed Phascogale, rats mice, and a variety of birds (NPWS 2003c).

HABITAT ON SITE/EXTENT OF LOCAL POPULATION:

This survey failed to record the subject owl species on site, though the PO has been recorded within 5km (Darkheart 2006f).

The approximately Xha subject site and more so the 7(a) zone contains potential foraging habitat for these species in the dry sclerophyll forest and woodland. Potential foraging resources in the study area are likely to include Squirrel Gliders, possums, bandicoots, rodents and birds. The potential for roosting is somewhat limited due to the absence of dense foliage due to the disturbance history and forest types. Some large hollows were noted to occur in the 7(a) zone which were considered generically potentially suitable as nest sites ie large trees with large hollows. Such trees also occur in more protected parts of the area however (eg Berrigan 2000c, Darkheart 2004f), and the proximity to residences may be a deterrent to this activity occurring on site or in the study area

Given the extent of the site/study area and the ecology of these species, the local viable population obviously extends well beyond the confines of the site/study area.

KOALA (*Phascolarctos cinereus*)

HABITAT REQUIREMENTS: Koalas feed primarily but not exclusively on selected species of Eucalypts. In the Hastings and Macleay regions, eucalypt species that are known to be used by Koalas include: Tallowwood, Swamp Mahogany, Forest Red Gum, and Small-Fruited Grey Gum (Standing 1990, Connell Wagner 2000). The first two species occur on the study site.

A Koala food tree is usually identified by a significant number of scats at its base, though such trees may also be used for roosting. Koalas may often be observed during the day resting in a tree in which they either fed on the night before, or will that night. Koalas appear to prefer young leaves rather than mature leaves and nutritional quality of individual trees may

also be a factor (Braithwaite, Turner and Kelly 1983, Sarre 1999). Usage may also be determined by site-dependant edaphic factors eg soil type (Sharp and Phillips 1999), which affects the nutrient quality of forage. A gradient in nutrient concentration in soils and foliage is a major determinant of the distribution of arboreal fauna (Sarre 1999, Gibbons and Lindenmayer 2002). Forests consisting of primary browse species associations located on deep, fertile soils on floodplains, in gullies and along watercourses are generally considered preferred habitat. This may be a reflection of the nutritional value of the foliage. The preferred tree size varies according to the site, but is in the range 20-100cm DBH typical of medium to large trees.

Koalas are solitary, and territorial (particularly males), yet live in established, sedentary polygynous breeding aggregates arranged in matrix of overlapping home ranges, whose size varies according to sex (males tend to be larger so that they overlap the ranges of several females), and carrying capacity of the habitat (usually measured in terms of density of primary browse species) (Phillips and Callaghan 1995). These aggregates basically consist of an alpha (dominant) male, with his harem of at least 2-4 females and their offspring (juveniles and/or sub-adult Koalas) of varying stages of maturity and independency (Phillips 1997). Home range size also varies according to quality of the habitat and ranges from a hectare to hundreds of hectares (see Jurskis and Potter 1997).

In the initial stages of independence, a young female Koala usually remains within its mother's home range for about a year, until they establish their own, often overlapping with their mother's, or dispersing to other aggregates. In contrast, a young male is often turned out of the maternal home range (usually around 2 years of age), and becomes nomadic. These males may be forced into marginal habitats, and become more generalist in their dietary intake. Koalas may travel substantial distances and movements of up to 50km have been observed over a period of months.

Within a home range, a few specific trees (*home range trees*) are used by Koalas to mark territories and identify individual Koalas. Such trees are recognisable by heavy scratching and collections of scats close to the tree base, and may also have significant forage value (Phillips and Callaghan 1995, Hume 1989). Such trees are very important as they maintain social cohesion through identification of population members and assist geographical location (Phillips 1997, Sharp and Phillips 1999).

POTENTIAL HABITAT ON SITE: The site and study area contains Scribbly Gums and Tallowwoods which are listed in SEPP 44 as primary preferred forage species. These occur in sufficient abundance to qualify the site as Potential Koala Habitat. This survey and previous survey of most of the remainder of the property however failed to detect Koalas.

Presently, there appears to be only one confirmed Koala breeding aggregate in the South West Rocks area, which is located around the Smokey Cape area (Kempsey Argus 2002, DECC 2007a, Bionet 2007a). An article in the Kempsey Argus (23/7/02) reported the existence of a small colony of Koalas in the Smokey Cape-South Smokey Beach area. Koalas are also reported to occur in Hat Head National Park (Campbell 1997), and this is likely to be this colony given no other records are known for the reserve (DECC 2007a, Bionet 2007). There are also unconfirmed reports of Koalas in western South West Rocks (Darkheart 2004f). Standing (1990) in "*A Study of Koalas in the Macleay Valley*" reports only one unconfirmed koala sighting for the South West Rocks area (in the vicinity of Smoky Cape). This sighting was in 1983, and no further sightings or scats were detected in the area by her field survey in 1989-1990.

The site is about 3km from the known record of Koalas in Smokey Cape, separated by extensive area of other Potential Koala Habitat, Arakoon Rd and rural-residential subdivisions. The unconfirmed record of Koalas in western South West Rocks is almost effectively (as Koalas can move through residential areas – Connell Wagner 2000b, Wilkes and Snowden 1998, NPWS 2003a, etc) isolated from the site via relatively recent residential development. Hence the actual current potential for the Koala to occur on site/study area is at best very low (eg a wandering sub-adult).

Given this, it is readily apparent that site/study area does not contain a local population, but provides potential habitat in which a recovering local population could potentially expand into.

GLOSSY BLACK COCKATOO (*Calyptorhynchus lathamii*)

ECOLOGY/HABITAT REQUIREMENTS:

The Glossy Black Cockatoo has a restricted diet of large-coned Casuarina and Allocasuarina eg *A. littoralis* and *A. torulosa* are the preferred coastal species. Food trees generally have large cone crops (eg >200 cones) and young cones (easier to open and the seeds have higher protein content). Cones are not selected on size but on number of seeds per cone (to maximise foraging effort), thus a tree with a large crop is not necessarily a preferred food tree (Clout 1989). Trees may require at least 10 years of growth before being potentially utilised (Mt King Ecological Surveys 1993).

This species lives in loose groups ranging from 2-20 individuals, occupying a permanent area (range over 100km), following the fruiting pattern of its preferred food tree species. A Winter breeder, perhaps linked to the phenology of its food, it requires nesting hollows, around the mid canopy, in dead limbs or trunks approximately 18cm in diameter with very

wide bottoms, usually in dead trees (Schode and Tideman 1990). It appears to have a preference for tracts of undisturbed or minimally disturbed woodland (Smith *et al* 1995).

HABITAT ON STUDY SITE/EXTENT OF LOCAL POPULATION:

This species or chewed seed cones indicative of foraging by the Glossy Black Cockatoo were not recorded on the property. However, this bird has been recorded in numerous occasions in the locality (DECC 2007a, Bionet 2007, 2004f, 2000a, 2000b, 2000c, 2002a, O'Neil and Williams 2003), including habitat within 1km (Darkheart 2004f, Berrigan 2003a).

Overall, the site offers no foraging or nesting potential for this species. A few large trees with large hollows occur in the 7(a) zone and these offer some marginal potential as nest sites (Cameron 2006), though more optimal potential hollows have been observed in other locations (eg Darkheart 2004f). Similarly, forage is limited to rather stringy Black Oaks in a limited abundance in the uppermost portions of the dry sclerophyll forest. Given the ecology of the species, and the limited extent of foraging habitat, the property may only form a relatively minute fraction of the foraging and breeding range of a viable local population.

A.2.3.1.2 Part (a)

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposed development is a 70 Lot residential subdivision that will see removal of Xha of agricultural woodland including about 70 trees for residential Lots and APZs. The subject development proposal represents the final stages of previously approved residential development on the remainder of the property zoned 2(a) to the north (ERM 2006a), hence impacts are incrementally cumulative the impacts associated with the total proposal.

SQUIRREL GLIDER

Recording of a Squirrel Glider (hereon abbreviated to SG) in the dry sclerophyll forest in the 7(a) zone confirmed the expected presence of this species given local records in identical habitat (eg Darkheart 2004f). The extent of habitat provided by woodland and more so the forest combined with a relative abundance of tree hollows provides habitat suitable for foraging and breeding by at least one colony, with adjacent habitat to the west and south likely and known to support other colonies (eg Berrigan 2003a), in total forming the local population.

The SG is sensitive to the loss of tree hollows (ie nests and shelter), and key food plants, eg Winter-flowering Banksias and gum-producing Acacias (Smith *et al* 1995). Loss of sap species is also likely to be significant. The SG also has a high level of site fidelity, and is unlikely to disperse successfully once habitat is lost (Gibbons and Lindenmayer 2002).

As detailed above, the proposal may modify/remove about Xha of agricultural woodland via continuance of slashing to prevent regeneration of undergrowth. This will remove about 6 hollow bearing trees (and at least 8 potential hollows) as well as foraging habitat provided by flowering trees, decorticating bark, etc. While this is a negative impact, it is unlikely to result in any significant detrimental impacts capable of placing the dependant colony/colonies at risk of extinction due to:

- The area of detected SG activity on the site will be largely retained, as will the overwhelming majority of potential habitat.
- The habitat loss essentially constitutes a contraction of the marginal fringe on the core area of habitat.
- Relative to the abundance of hollows in the 7(a) zone, the loss of 6 hollow bearing trees is not critical,
- Relatively poor quality of habitat to be removed in comparison to that retained.

SGs have been detected on a number of occasions in traps located within 20m of existing dwellings (Darkheart 2007g, 2004f, 2005a, 2005b), and also within urban remnants (Smith and Murray 2003, Murray 2006, Darkheart 2005d, 2005o). These areas contained outdoor lighting and noise levels typical of residential/rural-residential dwellings. This supports other anecdotal evidence that the species has the capacity and even a willingness to forage within urban, rural and rural-residential development where habitat is retained (Smith and Murray 2003, Murray 2006, Dobson *et al in press*, Darkheart 2004l, 2004n, 2004o, 2004q, 2004u, 2005a, 2005d, 2005h, 2006i, pers. obs). Thus the location of dwellings adjacent to the retained habitat in the 7(a) zone should not significantly affect habitat usage.

Establishment of an additional 70 residential Lots will incrementally and cumulatively increase the threat posed by cats. Dependence is placed on owners and Council to employ provisions of the *Companion Animals Act 1998*.

With consideration of the above, the proposed development is not considered likely to result in an impact that may significantly affect the lifecycle of the local SG population to the point of increasing extinction risk, especially given the retention of the overwhelming majority of habitat and the abundance of directly connected potential SG habitat to the south

and west which will remain to support the population.

MICROCHIROPERAN BATS

As noted above, while not bats were able to be recorded on site, previous survey of other portions of the property recorded the LBWB, EFB and CBWB. The remaining species are all considered potential occurrences given the presence of suitable habitat and local records (DECC Atlas of Wildlife 2007, Bionet 2007, Darkheart 2006f, 2006j, 2006k, 2004f, 2004j, 2004x, Berrigan 2000a, 2000b, 2000c, 2002a, 2003a, Parker 1996, SWC 1997, O'Neil and Williams 2003)

The major threat to the life cycle of the LBWB, CBWB and EFB is disturbance of nursery and communal roosting sites, particularly during Winter or reproductive periods. Modification of extensive tracts of foraging habitat by timber harvesting, fire and grazing may also be threatening (Smith e*t al* 1995).

The sensitive habitat components of the GBNB and HB are tree hollows, foraging habitat and riparian corridors (Smith *et al* 1995). Retention of a sufficient density of tree hollows appears to be a key determinant for the species to remain (Smith *et al* 1995). The dominant threats to critical habitat are cited to be extensive development of the coastal zone, particularly for residential and industrial uses, though clearing, grazing and past forestry practices have also reduced the extent of available habitat (Smith *et al* 1995).

The YBSB, BFB and EFP are likely to be sensitive to the loss of roosting resources, and habitat modifications which affect their prey or ability to forage over the area (Smith *et al* 1995).

As a colonial species, the ECB is sensitive to any disturbance of roosting or breeding sites if a significant proportion of the local population is concentrated. Disturbance would be most significant in Winter or breeding season. Processes that alter habitat complexity such as grazing, logging and fire would also be detrimental (Smith *et al* 1995).

Suitable key roosting or nursery habitat does not exist on the site or in close proximity for the ECB, LBWB or CBWB, though sea caves to the far east may provide this habitat component. Maternity caves are located west of Kempsey, and a key colony roost is known for the LBWB and CBWB at Big Hill (Dwyer 1964, 1965). Hollow bearing trees in the study area are likely to be suitable at least for roosting, and perhaps for breeding of the other bats (Churchill 1998, Smith *et al* 1995, DECC 2007b, Strahan 2000, Hulm 1997).

The site offers potential foraging habitat for all the subject species of varying quality. These foraging habitats include habitat above and below the canopy, and at the fringe of forest habitat and pastoral land. As detailed above, the proposal may modify/remove about Xha of woodland and the fringe of the adjacent 7(a) zone for the APZ. This habitat loss is likely to result in a slight reduction in foraging habitat present on site. Regardless, this impact is unlikely to impact upon the site's carrying capacity given the relatively minor extent of habitat loss, the mostly low quality state of the subject habitat, and the retention of majority of the potential foraging habitat.

Location of the development envelopes have been selected so as to minimise the loss of hollow bearing trees, with only 6 to be removed. A felling protocol will minimise risk of any roosting bats being injured. As demonstrated by ERM (2006b), more than sufficient hollows occur in the 7(a) zone, hence roosting potential will be retained. Consequently potential roosts for the main hollow roosting species including the HB, EFB, BFB, GBNB, EFP and YBSB should not be affected. The site does not contain caves on-site or similar structures, thus breeding or key roosts by dependant bats (ie ECB, LBWB and CBWB) do not occur on the site.

All of the subject species have been recorded in rural, urban and/or rural-residential areas (Churchill 1998, Smith *et al* 1995, Darkheart 2005h, 2004l, 2004p, Berrigan 2003b, 2001d, 1998d) and given consideration to the factors discussed above, the site/study area's potential to support the subject species should largely be retained post development. Consequently, it is considered that the proposal is unlikely to have a significant impact on the local population of any of the subject bat species.

GREY-HEADED FLYING FOX AND BLACK FLYING FOX

None of the subject species were detected by the survey, however all are considered potential occurrences on site/study area due to the presence of suitable foraging habitat, especially the GHFF which has been recorded by Umwelt (2004) on other portions of the property..

The GHFF and BFF are sensitive to the loss of key roosting resources, and loss/modification of foraging habitat by forest clearance, degradation, dieback, drought and fire (Eby 2000b, DECC 2007b, NPWS 2000a, 1999b, Smith *et al* 1995).

The GHFF and BFF do not roost on the site, nor is potential roosting habitat present, and hence known/potential roosting habitat will not be affected.

As detailed above, the proposal may modify/remove about 70 trees over Xha. In the context of the habitat available in the study area, locally, regionally and the species ecology; this represents a very minor contraction in potential foraging habitat. In addition, the majority of the potential foraging habitat in the study area will be retained; therefore while any habitat loss is via definition adverse to the recovery of the species, the extent of habitat remaining is expected to see retention of the potential for the BFF and GHFF to occur post-development. Furthermore, there are other higher quality areas of foraging habitat within range of the site/property (the bat has been recorded flying up to 50km from roosts) such as in Hat Head National Park and on habitat to the south of the site, and given the ecology of the species, the local populations are not restricted to the site (Strahan 2000, Smith *et al* 1995, Churchill 1998, Eby 2000a, 2000b, DECC 2007b).

Hence overall, while the proposal will relatively minutely reduce some of the potential foraging capacity of the site/study area, it is very unlikely to lead to an impact that may significantly affect the lifecycle of a local EBB, BFF or GHFF population, to the point of increasing extinction risk.

POWERFUL OWL, MASKED OWL, BARKING OWL, SQUARE TAILED KITE

None of the subject species were recorded on site/study area during the survey. However, potential foraging and nesting/roosting for all the subject species occurs on the site/study area. The site/study area/property would form only a small portion of a much larger home range for a single pair of all the subject species.

The major threats to the life cycle of the PO and MO is generally the loss of suitable nesting and roosting hollows, and similar habitat alterations that lead to a reduction in prey density and diversity (Soderquist *et al* 2000, Kavanagh 2000b, Smith *et al* 1995). Habitat loss and degradation is considered the major threat to the BO (NPWS 2003b). The BO is also considered to be threatened by fox predation on fledglings, goanna predation of nests, increased mortality via collision with fences, overhead wires and vehicles; and direct/indirect poisoning from agricultural pest control (NPWS 2003b).

The STK is highly sensitive to the removal or disturbance of critical habitat components ie tall eucalypts, shrub layers and requires a passerine prey base of sufficient density and consistent availability. It is also sensitive to pesticide contamination of its lifecycle and feral carnivores that impact upon the availability of passerine birds (Smith *et al* 1995, DECC 2007b, NPWS 2000a, 1999a).

As detailed above, the proposal may modify/remove about Xha of agricultural woodland. The best foraging area occurs in the forest and woodland in the 7(a) zone where gliders and most birds were recorded. This area will be retained post-development and thus the current foraging potential will be largely retained. The presence of residential and rural-residential developments adjacent to the site indicates that indirect impacts of the proposal (ie increased anthropocentric activity) are unlikely to significantly reduce the levels of prey on site due to their demonstrated tolerance and extent of habitat retained. In addition, the PO, BO, MO and STK have all been recorded in modified (including rural and urban) habitats (Kavanagh and Stanton 2000, Hastings Birdwatchers, pers. comm.; Darkheart 2007d, pers. obs.). As the majority of the habitat will be retained post-development including all potential nest sites, nesting potential and foraging potential will be retained.

With consideration of the above, the proposed development is not considered likely to result in an impact that may significantly affect the lifecycle of the local population of any of the subject species to the point of increasing extinction risk, especially given the extent of alternative known/potential foraging and/or roosting/nesting habitat available to the local population of the subject species and their high mobility (eg Hat Head National Park/SRA, etc).

BRUSH TAILED PHASCOGALE AND SPOTTED TAILED QUOLL

Neither the BTP or STQ were recorded on the site/study area during this or previous surveys, though the BTP has been recorded within 1km and in the locality and in habitat identical to that on site (Darkheart 2004f, 2004j, Berrigan 2000a, 2000b, 2000c, 2002a, 2003a, O'Neil and Williams 2003). Potential foraging and nesting/den habitat is considered to occur on site and in the 7(a) area, and is locally abundant. The STQ has been recorded at Yarrahapinni and is considered a potential occurrence due to the connectivity of the site with extensive forested habitat in Hat Head National Park and the species large range. Due to this habitat connectivity and ecology of these species, the range of the species and hence the local population would extend beyond the confines of the site/property, though breeding of the BTP could occur on the property.

The sensitive habitat components of the STQ are tree hollows and hollow logs required for refuge and nests, and impacts which affect the diversity and abundance of its prey species eg removal of groundcover and understorey eg clearing, logging and frequent burning (Smith *et al* 1995, WWF 2002, DECC 2007b). Cats are also a potential predator mainly of young (WWF 2002). The STQ has been recorded in rural-residential and agricultural areas, usually fringing areas of more extensive habitat (eg State Forest), and may be regarded as a pest to poultry (DECC 2007b). The study area has competitive predators in the form of wild dogs, foxes, cats and laced monitors.

The BTP is generally considered sensitive to the loss of critical nest, shelter and feeding habitat via logging, clearing, urban development and inappropriate fire management (Smith *et al* 1995, NPWS 1999b, DECC 2007b). Other threats are high predation (eg from natural and exotic predators), accidental drowning in water tanks, and automobile collision (NPWS 1999, WWF 2002).

As detailed above, the proposal may modify/remove about Xha of woodland rest. This habitat loss does not include any hollow logs but will remove 6 hollow-bearing trees which may be potentially suitable for the BTP. The retention of the majority of the best habitat and overwhelming majority of hollows plus connectivity to adjacent habitat is considered sufficient to maintain the potential presence of these species and the ecological values of the property overall.

Cats and dogs are likely to incrementally increase on site as domestic pets. This may result predation on the BTP (May 1997, Grayson and Calver 2004, NSWSC 2000a, 2000b). However, as a large number of domestic cats and dogs may potentially occur in existing and future development north and west, the potential for the proposal to result in increased competition/predation is low.

Overall thus the proposal is considered extremely unlikely to disrupt the life cycle of the subject species such that a viable population is likely to be placed at risk of extinction.

KOALA

The Koala does not have a demonstrated association with the site, however, the forest on the property is potential Koala habitat, and has to be considered in terms of supporting a potentially recovering local population (DECC 2007c).

The main threats to Koalas are loss of habitat, increased mortality from automobile collision, dog attack/predation, fire and disease (Wilkes and Snowden 1998, State Forests 2000, Lunney *et al* 1999, Port Stephens Council 2001, Connell Wagner 2000).

The proposal will remove 2 Tallowwoods and 21 Scribbly Gums. This constitutes a marginal reduction of the local abundance of these preferred browse species on the property and locality, however, relative to the extent retained on the property, this loss is insignificant as the potential to support a recovering population will be retained in the 7(a) zone.

The proposal will also incrementally and cumulatively contribute to other threats such as dog attack via keeping of pets, and vehicle collision via increasing traffic on site and on local roads. However, as no population is dependant on the site/property at this time, this is not significant.

Overall thus the potential for the Koala to occur in the retained habitat on the property will be retained in the long term. Hence the proposal has no potential to place a local viable population at risk of extinction.

Glossy Black Cockatoo

The GBC was not recorded on the property, and is only considered a marginal potential occurrence using the dry sclerophyll for opportunistic foraging forays as part of its very large range.

The GBC is dependant on suitably sized tree hollows for nesting, and is very dependant on the presence of a sufficient number of cone-bearing trees of suitable age and size to possess high quantities of cones, and suitably sized cones to support breeding. Threats thus include clearing for development, logging, inappropriate fire regimes and firewood collection (NPWS 1999b, 2000a, DECC 2007b, Birds Australia 2007).

The proposal will have relatively minimal impact on this species as no potential nest hollows or any foraging habitat will be removed. The main impact will the increased anthropogenic presence, however as this bird has been recorded in the area and other locations foraging and breeding in urban remnants, on the urban fringe and in rural-residential areas, its potential to occur will be retained.

Given this and the ecology of the species thus, it is readily apparent that the proposal will have no significant impact on this species.

A.2.3.2.3 Part (b)

(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,

No relevant populations are currently listed under the TSCA.

A.2.3.2.4 Part (c)

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
- **(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
- **(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,**

No EECs occur on site or in the study area, hence this question is not relevant.

A.2.3.2.5 Part (d)

(d) in relation to the habitat of a threatened species, population or ecological community:
- **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
- **(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
- **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,**

The proposed development will see approximately Xha of mostly agricultural woodland modified into a 70 Lot residential estate and APZ. This will removes some 70 trees including 6 hollow-bearing trees.

MICROCHIROPTERAN BATS

The loss/modification of approximately Xha of habitat is likely to include potential foraging substrates for all the subject species and potential roost trees for all the subject species (with the exception of the ECB). However, no maternity caves suitable for the CBWB, LBWB or ECB occur on site/property. This habitat loss while negative however only forms a fraction of the potential habitat provided by the remaining forested sections of the property.

All of the subject species are highly mobile, and several are known to move significant distances throughout their lifecycle eg during breeding (eg Dwyer 1968). Given that the proposal does not involve removal of a significant portion of vegetation; in the context of habitat remaining on the site/property and in the direct locality, and the lack of creation of any barriers to their movements, the proposed works are not considered likely to isolate or fragment currently interconnecting or proximate habitat.

These species occupy large areas and the regional distribution of habitat available to the subject species encompasses a large area of potential habitat in Nature Reserves, State Forests, and private land. All the subject species (except perhaps the ECB and EFP) have been recorded in human-modified habitats, or adjacent to large patches of relatively intact forest (Churchill 1998, Smith *et al* 1995, Berrigan 2001f, Darkheart 2004a, ERM 2003, Umwelt 2004). The vegetation to be removed is unlikely to be considered a significant area in the local or regional context due to the relatively large area of potential habitat elsewhere in the study area and in the locality. Therefore it is considered that site/property is not considered of any specifically critical importance and the potential modification of up to Xha of habitat within an area where suitable habitat is locally abundant is unlikely to have a significant impact on the long-term survival of the species.

GREY-HEADED FLYING FOX AND BLACK FLYING FOX

The loss/modification of about 70 trees is highly likely to include potential foraging habitat for the subject species. However no known or potential roosting habitat will be affected. The vast majority of potential foraging habitat will be retained on the property post development.

The GHFF and BFF are flying mammals that migrate hundreds of kilometres annually, and fly 20-50km a night between roosts and foraging areas. They are often observed flying over cleared land and foraging in highly urbanised habitats, demonstrating they have no physical barriers to movement (other than weather or perhaps altitude). Given the minor extent

of the site, the retention of the majority of the habitat on the property and in adjacent forests, and the mobility of the species, the proposal is not considered likely to result in the isolation of known or interconnected habitat for either species. The regional distribution of habitat available to the GHFF and the BFF encompasses a massive amount of potential habitat in National Parks, conservation areas and private land.

The loss of approximately 70 potential foraging trees from the site/property represents a relatively minute fraction of the potential habitat available locally (eg Hat Head National Park, State Conservation Areas etc) and it is not considered to be a significant area relative to either the local or regional distribution of potential and known habitat.

SQUIRREL GLIDER

The loss/modification of Xha of habitat will include several dozen potential foraging species (both sap and nectar) and 6 hollow-bearing trees. Foraging habitat which may be lost is considered to represent a secondary resource with the major area of activity (the 7(a) zone where hollows are also abundant) to be retained. In addition, habitat potentially lost represents a small fraction of the potential habitat within the range of the dependant colony with the majority being retained. Thus, relative to the extent of habitat retained, the superior quality of the retained habitat and the extent of habitat available on adjacent land, the loss is considered insignificant.

The site/property's vegetation links directly to forest on adjacent land to the west and south. Connectivity to the north/northeast is negated by existing cleared land and future residential development, while relatively recent development to the west has effectively isolated a large remnant known to support this and other threatened species from Hat Head National Park. The proposal will result in a contraction of the modified fringe of a body of habitat in southwest of the village of South West Rocks. Linkage will be retained to the south and west, hence no fragmentation or isolation of habitat will occur.

The ecology of the subject species, retention of almost all the key areas of habitat and interconnectivity with adjoining habitat, local abundance of such habitat, and particularly considering the mobility of the SG; indicates that modification of habitat on site, while adverse and incremental to the cumulative loss of habitat in the area, will not significantly impact on the long-term survival of the species. Land to the south and west provides additional potential habitat in conjunction with the habitat remaining on site; therefore, the removal/modification of potential habitat will not significantly affect the population in the locality.

POWERFUL OWL, MASKED OWL, BARKING OWL, SQUARE-TAILED KITE

The Xha of habitat which may potentially be removed under the proposal will reduce the extent of prey habitat and marginal roosting points a relatively minute fraction, essentially constituting a contraction on the marginal fringe of the most optimum habitat. It will not remove any known nest sites, and overall should have relatively negligible effects on prey abundance and diversity.

These birds forage over large areas and the have even been recorded in urban areas, thus it is reasonable to assume the proposal will form no barrier to these large flying birds. Hence the proposal will not result in isolation of proximate or currently interconnecting habitat.

The site/property may at most comprise a very minor fraction of the home range of the subject species, and the majority of its potential for the species will be retained post development.

BRUSHTAILED PHASCOGALE AND SPOTTED-TAIL QUOLL

Neither the BTP nor the STQ was detected during the survey, though they are considered to have fair potential to occur at least in proximity to the study area at some time due to local records and the extensive area of suitable habitat in the area which is linked to the site. Habitat for the two species is present in the study area in the form of potential den sites and foraging habitat, though the study area itself would at most form a fraction of a much larger range of one to two animals (especially STQ).

The majority of habitat on the property overall will be retained and no effective barrier will be created to forest on adjacent land to the south and west. Both species have a demonstrated ability to move through rural and rural residential land, even persisting in fragmented landscapes within urbanised areas. Hence, the proposal will not isolate any currently interconnecting or proximate areas of potential habitat for either the BTP or the STQ.

Overall the loss/modification of approximately Xha may see a relatively minute reduction in foraging and denning habitat on the marginal fringe of the key area of potential habitat. The site/property may at most comprise a minor fraction of the home range of the subject species, and the majority of its potential for the species will be retained post development. Given the minor area of potential habitat affected, the retention of the majority of the habitat on the property and the extent of potential

habitat occurring in the direct locality, the loss is considered insignificant to the long term viability of local populations of these species.

GLOSSY BLACK COCKATOO

The proposal will not remove any habitat for this species, and the habitat on the property is potentially only marginal foraging and breeding habitat. This species readily flies over agricultural and urban landscapes hence the proposal will not result in any isolation or fragmentation of habitat

A.2.3.2.6 Part (e)

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

No relevant areas of critical habitat have been declared, as yet, under Part 3 of the TSCA.

A.2.3.2.7 Part (f)

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

The *Recovery Plan for the Barking Owl* (NPWS 2003e) outlines the loss of native vegetation as a key threatening process for the Barking Owl. While the proposal will remove native vegetation, the extent of clearance is relatively minute compared to remaining habitat in the area and its home range, and will not significantly impact on the species. Hence only via strict definition is the proposal inconsistent with objectives of the plan.

A draft *Recovery Plan for Forest Owls* (DEC 2006b) has been exhibited for the Masked and Powerful Owl. As for the Barking Owl, the proposal will remove a minute area of potential foraging habitat and only via strict definition is the proposal inconsistent with objectives of the plan.

The draft Recovery Plan for Koalas (NPWS 2003a) specifies actions considered to be key threats to Koalas. This plan specifies "*Habitat loss and Fragmentation*" and "*Habitat Degradation*" as "*the most important threats to Koalas throughout their range*". The proposal is thus inconsistent with this plan as it will remove potential browse species and contribute to these threats. Dogs and traffic are also key threats, and the proposal will incrementally add to these impacts. While negative, as no Koala population has an association with the site, the conflict with the objectives of the recovery plan is relatively limited.

At present no recovery/threat abatement plan is in place for the other species. The proposal will remove up to Xha of habitat from the site which by strict interpretation could be considered as adding to the main threatening process affecting these species, and hence is inconsistent with the recovery of the species. However, given the marginal quality of the habitat to be affected, the minor area of habitat to be removed, the extent of habitat to be retained on the property and the abundance of similar habitat on adjacent land and in the direct locality; the loss is considered to be insignificant to the long term recovery of these species. Overall the proposed development is considered unlikely to have a substantial affect on the long-term recovery of any of the subject species.

A.2.3.2.8 Part (g)

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The TSCA defines a "*threatening process*" as "*a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities*".

"*Clearing of native vegetation*" has been listed as a Key Threatening Process and is a recognised threat to a number of species, communities and populations listed under the Threatened Species Act 1995 (Threatened Species Conservation Act – Final Determination p001117b). Loss of habitat via development for residential and urban land use is also recognised as a threatening process for all of the subject species (Smith *et al* 1995, NPWS 2003d, DEC 2006b, etc). The proposed development will contribute to this process via the removal of habitat. However the majority of the forest vegetation will be retained post-development.

Inappropriate fire regimes are also a threatening process eg by increasing risk of wildfire by poor management; prescription burning of too much habitat at one time (or key areas at a particular time eg breeding season). The proposal may result in a modified fire regime due to increased frequency of hazard reduction burning to protect assets. This report recommends that

future fire regimes consider the ecological constraints of the site. In addition, threatened species have been recorded on the site thus any burning for the purpose of hazard reduction should require a Bush Fire Hazard Reduction Certificate (BFHRC) under the RFA 1997 which may include measures to protect the habitats of the threatened species. Thus the potential for an altered fire regime to reduce the site's carrying capacity for the threatened species should be controlled by the legislation and recommendations discussed above.

Human-induced climate change is a Key Threatening Process that the proposed development will contribute to via removal of up to Xha of vegetation and possible burning of this material; and/or establishment of a residential development utilising fossil fuels for energy.

"Predation by foxes and feral cats" are other Key Threatening Processes likely to be currently existing on the site, which impose a risk to potential prey, and several potentially occurring threatened species. The increase in human presence on site may see greater controls on these pests. Considering that any potential pet cats and dogs will largely be retained in close vicinity of the dwellings, and that the threat posed by domestic cats and dogs is already high (given the abundance of both species on land to the west) the increase in this threat induced by the proposal is not considered likely to be substantial.

A number of other Key Threatening Processes may also be incrementally increased by the proposal via edge effects:

- *Invasion of native plant communities by exotic perennial grasses.*
- *Invasion and establishment of exotic vines and scramblers.*
- *Invasion of native plant communities by Lantana camara.*

The proposal is not considered likely to significantly increase the level of these processes.

APPENDIX 3: Plant Species List

COMMON NAME	SCIENTIFIC NAME
Canopy Trees	
Pink Bloodwood	*Corymbia intermedia*
Tallowwood	*Eucalyptus microcorys*
Scribbly Gum	*E. signata*
Needlebark Stringybark	*E. planchoniana*
Blackbutt	*E. pilularis*
Understorey Trees	
Hickory Wattle	*Acacia implexa*
Port Jackson Pine	*Callitrus rhomboidea*
Corkwood	*Dubosia myopoides*
Cherry Ballart	*Exocarpus cupressiformis*
Black Oak	*Allocasuarina littoralis*
Dogwood	*Jacksonia scoparia*
Hard Quandong	*Elaeocarpus obovatus*
Cheese Tree	*Glochidion ferdinandi*
Weeping Bottlebrush	*Callistemon saligna*
Geebung	*Persoonia conjuncta*
Geebung	*P. levis.*
Shrubs and Young Trees	
Elderberry Pomax	*Polyscias sambucifolia*
Slender Riceflower	*Pimelea linifolia*
a hopbush	*Dodonaea triquetra*
Dogwood	*Jacksonia scoparia*
Narrow-Leaved Palm Lily	*Cordyline stricta*
White Banksia	*B. integrifolia*
-	*Hibbertia aspera*
-	*H. obtusifolia*
-	*Leucopogon ericoides*
Coral Heath	*Epacris pulchella*
a pea	*Pultenaea retusa*
-	*A. longifolia*
Sweet-Scented Wattle	*A. suaveolens*
Prickly Moses	*A. ulicifolia*
Coastal Wattle	*A. sophorae*
Myrtle Wattle	*A. myrtifolia*
Crinklebush	*Lomatia silaifolia*
Breynia	*Breynia oblongata*
Maidens Wattle	*Acacia maidenii*
-	*Daviesia genistifolia*
-	*D. squarrosa*
Ferns and Mosses	
Cartilage Fern	*Blechnum cartilagineum*
False Bracken	*Calochlaena dubia*
Bracken Fern	*Pteridium esculentum*
Grasses	
Paspalum	*Paspalum dilatatum*
Wiry Panic	*Entolasia stricta*
Bladey Grass	*Imperata cylindrica*
Carpet Grass	*Axonopus affinis*
Kangaroo Grass	*Themeda australis*
Couch	*Cynodon dactylon*
Barbed-Wire Grass	*Cymbrogen refractus*
-	*Ottochloa gracillima*
-	*Oplismenus aemulus*
a finger grass	*Digitaria breviglumis*
Groundcovers and herbs	

A saw sedge	*Gahnia aspera*
Spiny Mat Rush	*Lomandra longifolia*
Pastel Flower	*Pseuderanthemum variabile*
Purple Flag	*Patersonia glabrata*
-	*Lepidosperma laterale*
-	*Centella asiatica*
-	*Oxalis corniculata*
-	*Gonocarpus micranthus ssp ramosissimus*
Blue Flax Lilly	*Dianella caerulea*
Handsome Flat Pea	*Platylobium formosum*
Cudweed	*Gnaphalium gymnocephalum*
Violet-leaved Goodenia	*Goodenia hederacea*
a goodenia	*G. heterophylla*
Violet	*Viola hederacea*
White Root	*Pratia purpurascens*
Wetland species	
sedge	*Isolepis spp*
sedge	*Juncus pp*
Tussock Rush	*Juncus usitatus*
Lianas and Scramblers	
Wombat Berry	*Eustrephus latifolius*
Climbing Guinea Flower	*Hibbertia scandens*
Scrambling Lily	*Geitonoplesium cymosum*
False Sarsaparilla	*Hardenbergia violacea*
Glycine	*Glycine microphylla*
Wonga Wonga Vine	*Pandorea pandorana*
Dusky Coral Pea	*Kennedia rubicunda*
Kangaroo Grape	*Cissus antarctica*
Native Sarsaparilla	*Smilax glyciphylla*
-	*S. australis*
Exotics	
Penny Wort	*Hydrocotyle bonariensis*
Purpletop	*Verbena spp*
Fireweed	*Senecio madagascariensis*
Black Berry	*Rubus ulmifolius*
Paddy's Lucerne	*Sida rhombifolia*
Lantana	*Lantana camara*
Bitou Bush	*Chrysanthemoides monilifera*
Farmers Friend	*Bidens Pilosa*
Cottonbush	*Gomphocarpus physocarpus*
Parasites and Epiphytes	
Snake Orchid	*Cymbidium suave*
Devils Twine	*Cassytha glabella*

APPENDIX 4: Site Photos

Series 1: View west to north of the clump of trees where the dam is. Photo taken from APZ

Series 2: View northeast to east from APZ in 7(a) zone over rear of Lots 614, etc. Band of forest on left is the parkland area to be retained as open space in current approved stages