E8. Threatened woodland birds

Threatened woodland birds have been assessed together as they generally share similar habitat requirements; threats that affect their recovery; and potential impacts as result of the Proposal. Woodland species of bird considered under the Heads of Consideration for the current Proposal include:

- Brown Treecreeper (*Climacteris picumnus victoriae*).
- Hooded Robin (*Melanodryas cucullata cucullata*).
- Black-chinned Honeyeater (*Melithreptus gularis gularis*).
- Painted Honeyeater (*Grantiella picta*).
- Grey-crowned Babbler (*Pomatostomus temporalis*).
- Speckled Warbler (*Pyrrholaemus sagittatus*).
- Diamond Firetail (*Stagonopleura guttata*).

All seven species are part of a group of woodland birds considered to be declining within Australia (Reid 1999; Trail & Duncan 2000) and are listed as Vulnerable under the *Threatened Species Conservation Act 1995*.

Threats that affect these species include: clearing of woodland resulting in loss and fragmentation of habitat; modification and destruction of ground habitat through heavy grazing and compaction by stock; removal of litter and fallen timber; introduction of exotic pasture grasses; and frequent fire (Department of Environment and Conservation 2006a; Reid 1999; Trail & Duncan 2000).

Habitat for woodland birds within the Proposal study area is shown in Figure E8. Descriptions of each species are presented below.

Brown Treecreeper (eastern subspecies) - *Climacteris picumnus victoriae*

Brown Treecreepers occur in eucalypt woodland and adjoining vegetation. Sometimes this species is recorded in semi-cleared pasture; in grasslands scattered with trees in cleared paddocks outside woodlands or in shelterbelts fringing cleared lands (Higgins *et al.* 2001). It is sedentary and nests in tree hollows (Garnett & Crowley 2000) breeding in pairs or communally in small groups within territories ranging in size up to 11 hectares. The nest is a collection of grasses, feathers and other soft material, placed in a suitable tree hollow or similar site (Higgins *et al.* 2001). Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae (Pizzey & Knight 1997).

This species was recorded within remnant woodland at survey sites 1A, S2 and S3 (refer Figure E8).

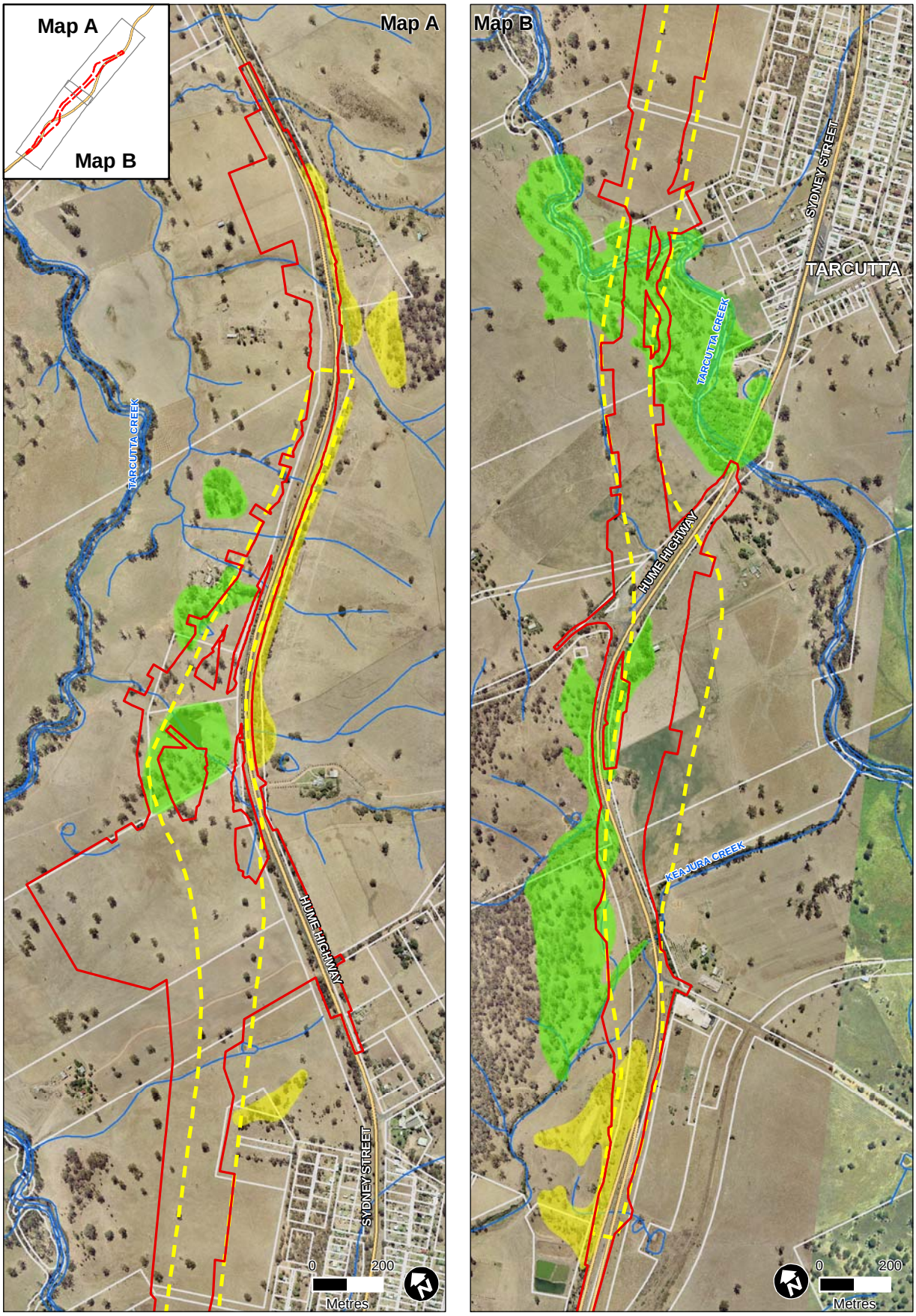

Figure E8 Distribution of potential habitat of Woodland Birds

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Hooded Robin (south-eastern form) - *Melanodryas cucullata cucullata*

Hooded Robins occur in lightly wooded country, usually open eucalypt woodland, mallee and acacia shrublands. Movements are not well known, however, they are thought to be resident or sedentary, but may undertake some local movements (Department of Environment and Conservation 2006a), possibly in response to drought and food availability (Pizzey & Knight 1997). Territories range from around 10 hectares during the breeding season, to 30 hectares in the non-breeding season. The nest is a small, neat cup of bark and grasses bound with webs, in a tree fork or crevice, from less than 1 metre to 5 metres above the ground (Higgins & Peter 2002).

This species was not recorded during surveys.

Black-chinned Honeyeater (eastern subspecies) - *Melithreptus gularis gularis*

This species occupies mostly in upper levels of drier, open forests or woodlands dominated by box and ironbark eucalypts. Its also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees (Department of Environment and Conservation 2006a). It is a gregarious species usually seen in pairs and small groups of up to 12 birds (Higgins & Davies 1996). Feeding territories are large, making the species locally nomadic. Recent studies have found that the Black-chinned Honeyeater tends to occur in the largest woodland patches in the landscape, as birds forage over large home ranges of at least five hectares. Nectar is taken from flowers, and honeydew is gleaned from foliage (Higgins & Davies 1996).

This species was not recorded during surveys.

Painted Honeyeater - *Grantiella picta*

Painted Honeyeaters occur in dry forests and woodlands. The primary food is mistletoes in the genus *Amyema*, although they will take some nectar and insects (Department of Environment and Conservation 2006a). The breeding distribution is dictated by the presence of mistletoes, which are largely restricted to older trees. The species is less likely to be found in strips of remnant box-ironbark woodlands, such as occur along roadsides and in windbreaks, than in wider blocks (Garnett & Crowley 2000).

This species was not recorded during surveys.

Grey-crowned Babbler – *Pomatostomus temporalis*

The Grey-crowned Babbler is found mainly in rural districts where it predominantly lives in roadsides and private land (Schulz 1991). Suitable habitats are usually abundant with leaf-litter and debris; often dominated by eucalypts including box and ironbark species, partly-cleared woodland, acacia shrubland and adjoining farmland (Higgins 1999). Grey-crowned Babblers are unlikely to occur in regrowth forest, large patches of forest or woodland and forest with dense understorey or grassland with few trees (Schulz 1991).

An understorey of young trees and shrubs, in the 10 to 25 centimetre diameter at breast height range, is used for nest sites and shelter, and a relatively sparse ground layer with more litter and less ground cover is preferred by the species (Adam & Robinson 1996). Within that broad habitat category, they prefer sites with large trees, a scattered

understorey of small trees or shrubs, and a sparse ground layer of litter and short grass (Davidson & Robinson 1992). At the local scale, the species is common in edge habitats where there is access to both tree-cover and open ground. Historically this edge habitat would be found near larger trees in mature woodland habitat, but is now largely restricted to roadside vegetation and the edges of remnant patches (Robinson, D. *et al.* 2001). The Grey-crowned Babbler is a prolific nest builder, building nests throughout the year for both breeding and roosting (Counsilman 1979).

This species was not recorded during surveys.

Speckled Warbler - *Pyrrholaemus sagittatus*

Speckled Warblers prefers eucalypt dominated vegetation that has a grassy understorey, often on rocky ridges or in gullies (NSW Scientific Committee 2001). The bird is a sedentary species that breeds in pairs and trios, and feeds on seeds and insects on the ground and in understorey vegetation and builds domed nests on the ground in grass tussocks, dense leaf litter and fallen branches (Reid 1999). Speckled Warblers occur at low densities (0.19 to 0.54 per hectare) and have relatively large home ranges of 6 to 12 hectares for pairs or trios of birds (Higgins & Peter 2002).

This species was recorded within remnant woodland at survey site S3.

Diamond Firetail - *Stagonopleura guttata*

Diamond Firetails are found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Woodlands. They occur also in open forest, mallee, native grasslands, and in secondary grasslands derived from other communities (Trail & Duncan 2000). They feed exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season). They are usually encountered in flocks of between 5 and 40 birds, with groups separating into small colonies to breed between August and January (Department of Environment and Conservation 2006a). Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. The species appears to be sedentary, although some populations move locally (Higgins & Peter 2002).

This species was not recorded during surveys.

E8.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

Of the Threatened woodland birds, the Brown Treecreeper and Speckled Warbler were recorded within the study area during recent field surveys. It is assumed that approximately 11 hectares of potential habitat for these species would be removed (Figure E8).

The majority of vegetation likely to be affected occurs as small remnant stands and paddock trees. However, moderate condition Riparian Woodland occurring to the west of the township of Tarcutta is likely to be fragmented by the Proposal.

Generally this habitat is unlikely to be core habitat for woodland species of bird, in that the majority of species require habitat patches greater than 100 hectares in order to maintain viable populations (Reid 1999, 2000). The vegetation and habitats to be removed are generally moderately to highly disturbed, isolated from other woodland fragments at the landscape scale and are already subject to edge effects.

However, this habitat will play a role in connecting larger patches of vegetation that may contain resident populations and the study area contains mature habitat trees and hollows of a size suitable to this guild. In general, however, important resources necessary for the life cycle of these species are not likely to be significantly affected by the Proposal.

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

The Proposal would remove approximately eleven hectares of vegetation occurring as small remnant stands and paddock trees, which provide foraging and potential breeding habitat for Threatened woodland birds. A further three hectares (approximately) of moderate condition Riparian Woodland occurring to the west of the township of Tarcutta is likely to be affected by the Proposal.

The habitat to be removed would include specific habitat features such as tree hollows, mature trees with mistletoe used for foraging by Painted Honeyeaters, and down timber for Speckled Warblers. Given the mobility of these species, it is not likely that the removal of 11 hectares would significantly reduce the availability of habitat for these species in the wider landscape and nor is the Proposal likely to significantly contribute to the degradation of habitat quality or significant features used by these species in the wider area.

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

Woodland species of bird are commonly found within eucalyptus forests throughout NSW and Victoria. Therefore, no threatened species of woodland birds that occur or have the potential to occur within the study area are at the limit of their known distribution.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood, hollow-bearing trees and edge effects.

Most remnants of vegetation in the study area occur within relatively small, fragmented patches and as such, already consist of edge affected habitats. However, using the estimate of 50 metres proposed by Bali (2005), it is likely that new edge effects would be introduced into the larger remnants of vegetation, such as survey site S2 and S3. It is estimated that edge effects will be introduced into approximately six hectares of previously ‘core’ areas of habitat.

How is the proposal likely to affect habitat connectivity?

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintain connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife Service 2003a).

The Proposal would involve the removal of approximately eleven hectares of habitat for these species, which occurs predominantly as small remnant stands of vegetation and paddock trees. A further three hectares (approximately) of Riparian Woodland along Tarcutta Creek would be affected, which would effectively fragment remaining Riparian Woodland on either side of the Proposal.

Due to the relatively large home range and mobility of each of these species, this loss of vegetation is unlikely to result in isolation of habitat for Threatened woodland birds. The ability to access adjacent habitat on opposite sides of the Proposal will remain. Therefore, it is unlikely that local populations of these species would become fragmented or isolated from other areas of habitat anymore than currently occurs within the study area as a result of the Proposal.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. The Proposal study area is not listed as a critical habitat and it is not considered critical to the survival of any Threatened woodland bird.

Conclusion

Although the Brown Treecreeper and Speckled Warbler were recorded in the Proposal study area during recent field surveys, the Proposal is not likely to have a significant effect on Threatened woodland birds through the removal of approximately eleven hectares of habitat. While approximately three hectares of Riparian Woodland habitat occurring on Tarcutta Creek would be affected, foraging and breeding resources would still remain in the Proposal study area. However, with appropriate mitigation measures, as outlined in Section 7 and Appendix F, these impacts are not considered to be significant.

E9. Barking Owl – *Ninox connivens*

The Barking Owl is listed as Vulnerable under Schedule 2 of the *Threatened Species Conservation Act*. This species was recorded during field surveys at survey site S3 (refer Figure 2-2). Box-Gum Woodland, roadside vegetation and Riparian Woodland along water courses that occur in the Proposal study area, contain foraging resources and suitable tree hollows for breeding.

Barking Owls inhabit eucalypt woodland, open forest, swamp woodlands, and especially in inland areas, timber along watercourses (Pizzey & Knight 1997). Denser vegetation is used occasionally for roosting. During the day this species roosts along creek lines, usually in tall understorey trees with dense foliage such as Acacia and Casuarina species, or the dense clumps of canopy leaves in large Eucalypts (Higgins 1999).

Barking Owls feed on a variety of prey, with invertebrates predominant for most of the year, and birds and mammals, such as smaller gliders, possums, rodents and rabbits, becoming important during breeding. Territories range from 30 hectares to 200 hectares and hunt 5 kilometres from roosts (Higgins 1999).

Eggs are laid in nests in hollows of large, old eucalypts including River Red Gum (*Eucalyptus camaldulensis*), White Box (*Eucalyptus albens*), Red Box (*Eucalyptus polyanthemos*) and Blakely's Red Gum (*Eucalyptus blakelyi*). Nest-hollow entrances are 2 to 35 metres above the ground with a diameter of 20 to 46 centimetres and depth of 20 to 300 centimetres. Breeding occurs during late winter and early spring (NSW National Parks and Wildlife Service 2003a).

E9.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

Approximately 11 hectares of habitat for Barking Owls would be affected (Figure E9). The majority of vegetation likely to be affected occurs as small remnant stands and paddock trees. However, moderate condition Riparian Woodland occurring to the west of the township of Tarcutta is likely to be fragmented by the Proposal. Habitat in the study area contained approximately greater than 10 trees considered suitable for breeding. These trees were restricted to the Riparian Woodland occurring to the west of the township of Tarcutta.

Vegetation within the subject site is likely to be used predominately for foraging, and would generally exist as part of a larger home range. Barking Owls are mobile and occupy large territories (30 to 200 hectares) likely to extend well beyond the study area. As such, this species is not likely to be dependent on foraging or breeding resources available in the study area.

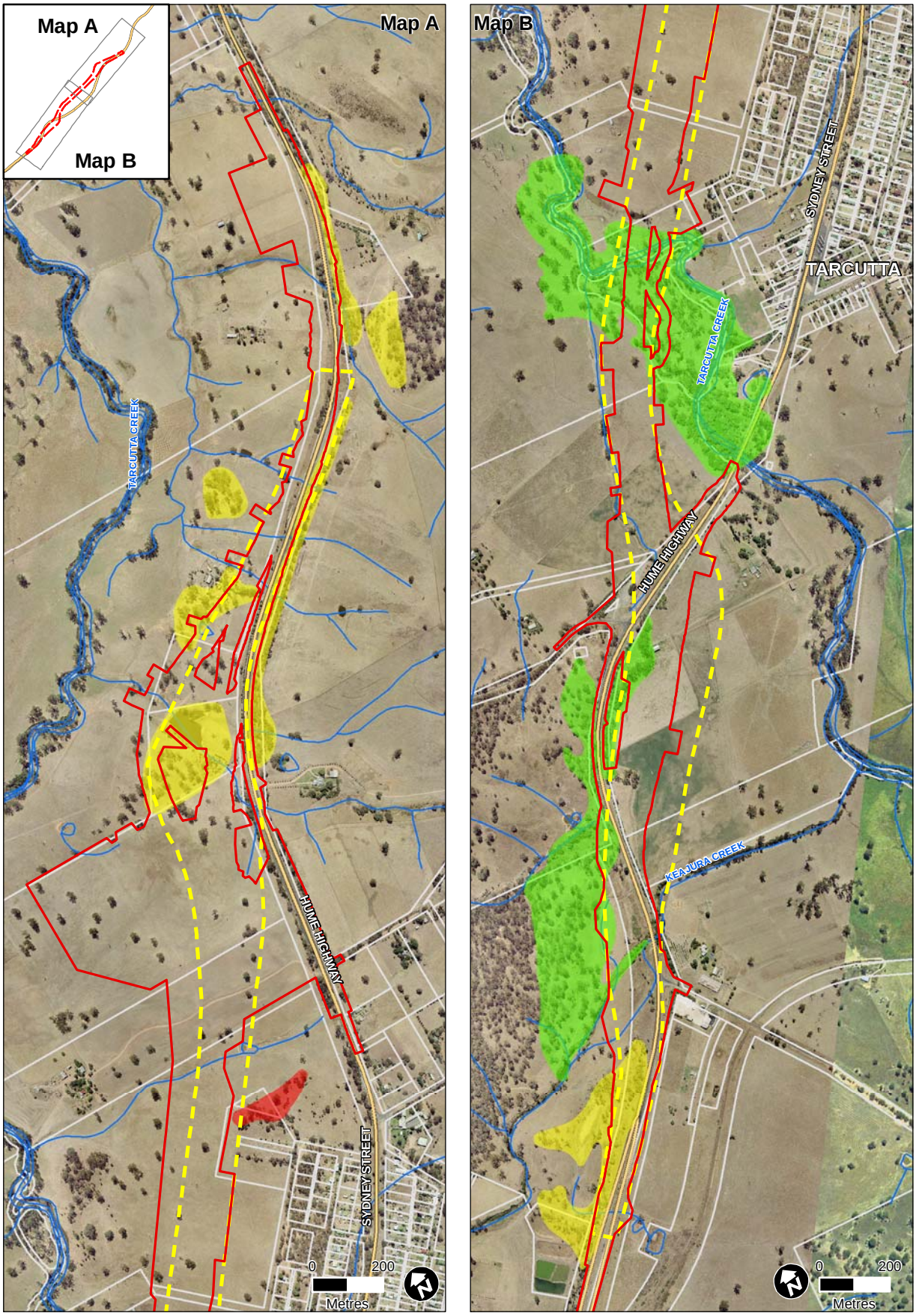

Figure E9 Distribution of potential habitat of the Barking Owl - *Ninox conniven*

Although breeding resources are available in the form of nest sites in large hollows in large live trees, breeding sites need to be supported by an adequate prey supply (NSW National Parks and Wildlife Service 2003a). Substantial-sized forest and woodland blocks and smaller forest fragments within a few kilometres of such blocks are essential for breeding. It is essential to have very extensive areas of tree cover with an abundance of hollows to support adequate populations of prey (NSW National Parks and Wildlife Service 2003a). It is likely that vegetation within the study area and periphery would constitute significant breeding habitat. However, as the relatively large Box-Gum Woodland block located in Southern Travelling Stock Reserve (where a Barking Owl was recorded) near survey site S3 would largely remain unaffected by the Proposal, it is not likely that the life cycle of this species would be affected.

As such, the removal of approximately 11 hectares of largely moderate condition foraging/breeding habitat is not likely to significantly affect the life cycle of this species.

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

The Proposal would remove approximately eleven hectares of vegetation occurring as small remnant stands and paddock trees, which provide foraging and potential breeding habitat for the Barking Owl. Moderate condition Riparian Woodland occurring to the west of the township of Tarcutta is likely to be fragmented by the Proposal with approximately three hectares of this community affected.

Breeding territories of the Barking Owl range from 30 hectares up to 200 hectares and they hunt five kilometres from roost sites (Higgins 1999). As such, it is unlikely that the removal of 11 hectares would significantly reduce the availability of habitat for this species in the wider landscape nor would it significantly reduce prey availability.

The Proposal is not likely to significantly contribute to the degradation of habitat quality and significant features used by this species in the wider area.

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

The Barking Owl is found throughout Australia except for the central arid regions and Tasmania (Department of Environment and Conservation 2007). Therefore, the study area is not at the distributional limit for the Barking Owl.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes including, loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintaining connectivity across the landscape, to facilitate hunting for the Barking Owl and to maintain populations of its prey (NSW National Parks and Wildlife Service 2003a).

The Proposal would involve the removal of approximately eleven hectares of habitat for this species, which occurs predominantly as small remnant stands of vegetation and paddock trees. Three hectares (approximately) of Riparian Woodland would be affected, which would effectively fragment remaining Riparian Woodland on either side of the Proposal.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. The land within the Proposal study area is not listed as a critical habitat. The draft recovery plan for the Barking Owl (NSW National Parks and Wildlife Service 2003a) has, however, identified a number of features of significant habit that include:

- Mature forest and woodland habitat, in particular forest and woodland near rivers, streams, drainage lines and swamps. Mature forests contain a high percentage of large diameter trees and a high density of tree hollows of all sizes, including the size range used by the owls and their prey.
- Substantial-sized forest and woodland blocks and smaller forest fragments within a few kilometres of such blocks are essential for breeding. It is essential to have very extensive areas of tree cover with an abundance of hollows to support adequate populations of prey.
- Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintaining connectivity across the landscape, to facilitate hunting for the Barking Owl and to maintain populations of its prey.

The Proposal will essentially result in a reduction in a number of these habitat aspects that are considered significant habitat in the draft recovery plan for the Barking Owl (NSW National Parks and Wildlife Service 2003a), as the study area essentially contains mature woodland (including large old trees) that provide foraging and potential breeding resources.

While large hollow-bearing trees, with hollows suitable for breeding, were recorded within survey sites S2 and S3 (particularly along the flats of Keajura Creek and lower slopes of the Southern Travelling Stock Reserve); River Red Gums located along Tarcutta Creek (survey site S2) contained a greater extent. Riparian Woodland located along Tarcutta Creek will essentially be fragmented by the Proposal with large hollow-bearing trees being affected in the process. However, while River Red Gums (amongst others) will be impacted by the Proposal, habitat attributes considered significant for this species will still occur within the study area and locality. Furthermore, the large Box-Gum Woodland habitat associated with the Southern Travelling Stock Reserve (where Barking Owl was recorded) near survey site S3 would largely remain unaffected by the Proposal.

Therefore, while the Proposal will reduce the amount of habitat features considered significant for this species in the study area, it is not likely that the Barking Owl would be affected. Mitigation measures provided in Section 7 and Appendix F should ameliorate any impact.

Conclusion

Although the Barking Owl was recorded in the study area, the Proposal is not likely to have a significant effect on this species through the removal of approximately 11 hectares of small remnant stands of vegetation and paddock trees, which potentially occur as part of a larger home range. While potentially significant breeding habitat within tree hollows along Tarcutta Creek (survey site S2) would be affected, breeding resources would still remain in Riparian Woodland located along Tarcutta Creek and Box-Gum Woodland occurring on Southern Travelling Stock Reserve in the southern portion of the project study area.

E10. Bush Stone-curlew - *Burhinus grallarius*

The Bush Stone-curlew is listed as Endangered under the *Threatened Species Conservation Act 1995.*

This species requires sparsely grassed, lightly timbered, open forest or woodland. In southern Australia they often occur where there is a well structured litter layer and fallen timber debris. They feed on a range of invertebrates and small vertebrates, as well as seeds and shoots (NSW National Parks and Wildlife Service 1999a, 2003b). West of the Great Dividing Range, this species generally occurs to the 300 millimetre isohyet, before becoming more scarce and associated with Riparian Woodlands (Robinson 1994).

This species was not recorded during surveys and has not been recorded within 10 kilometres of the study area. However, it has the potential to occur within Box-Gum Woodland.

E10.1 Significance assessment – Environmental Planning and Assessment Act 1979

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

The majority of vegetation likely to be impacted occurs as small remnant stands and paddock trees. While Riparian Woodland occurring to the west of Tarcutta was not considered primary habitat, it is likely to be fragmented by the Proposal with approximately three hectares affected.

Potential habitat within the subject site in not likely to be used by this species due to past and present disturbances; primarily grazing, where little structure remains apart from the upper canopy. However, Box-Gum Woodland located in the Southern Travelling Stock Reserve (survey site S3) provides potentially suitable habitat. Bush Stone-curlews are mobile and occupy relatively large territories, ranging from 26 hectares to 64 hectares for resident breeding birds. Birds remain with their partner and in their home range year round, and as such, territories are likely to extend well beyond the Proposal study area (NSW National Parks and Wildlife Service 2003b). While Box-Gum Woodland located at survey site S3 would largely remain unaffected by the Proposal, habitat within the study area could play a role in connecting larger patches of vegetation that may contain resident populations. In general, however, important resources necessary for the life cycle of this species are not likely to be significantly affected by the Proposal.

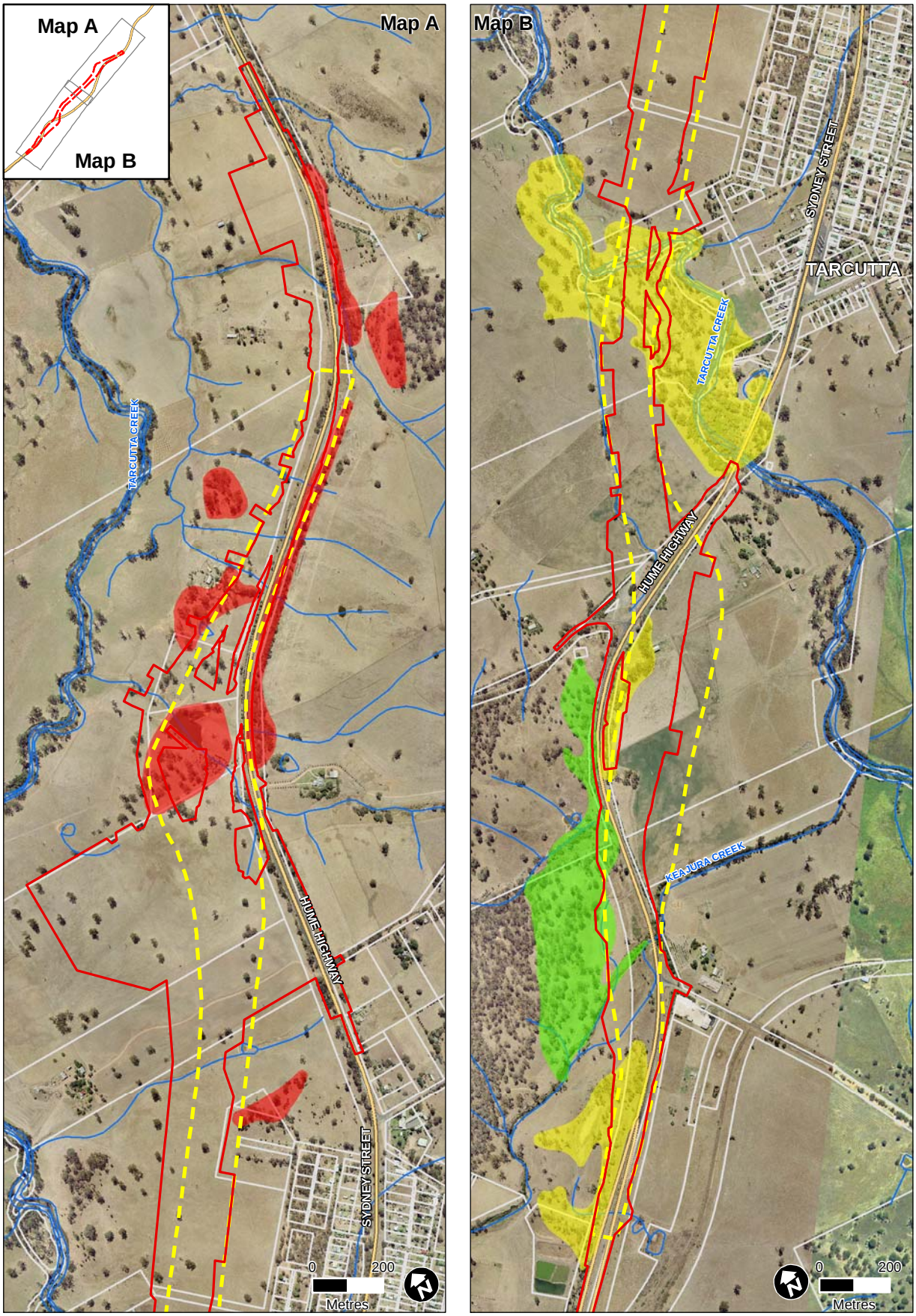

Figure E10 Distribution of potential habitat of the *Bush Stone-curlew*

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

The Proposal would remove approximately eleven hectares of Box-Gum Woodland occurring as small remnant stands and paddock trees, which potentially provide foraging and breeding habitat, as part of a larger home range, for the Bush Stone-curlew. Moderate condition Riparian Woodland occurring to the west of the township of Tarcutta is likely to be fragmented by the Proposal with approximately three hectares of this community affected.

Breeding territories for this species range from 26 hectares to 64 hectares, and as such it is not likely that the removal of 11 hectares would significantly reduce that availability of habitat for this species in the wider landscape.

The Proposal is not likely to significantly contribute to the degradation of habitat quality and significant features used by this species in the wider area.

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

The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania (Department of Environment and Conservation 2007). The site is not at the distributional limit of this species.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features anymore than currently occurs within the study area. However, the Proposal would increase several disturbance regimes including loss of native vegetation and dead wood.

How is the proposal likely to affect habitat connectivity?

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintaining connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife Service 2003a).

The Proposal would involve the removal of approximately eleven hectares of habitat for this species, which occurs predominantly as small remnant stands of vegetation and paddock trees. A further three hectares (approximately) of Riparian Woodland would be affected, which will effectively fragment the remaining Riparian Woodland on either side of the Proposal.

The loss of vegetation, particularly Riparian Woodland, is not likely to result in isolation of habitat for Bush Stone-curlew. As this species is mobile, and occupies relatively large home ranges, the ability to access adjacent habitat on opposite sides of the Proposal would remain. Therefore, it is not likely that local populations of this species would

become fragmented or isolated from other areas of habitat any more than currently occurs within the Proposal study area.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. No critical habitat has been listed for this species given its sparse and widespread distribution (NSW National Parks and Wildlife Service 1999a) Therefore, land within the Proposal study area is not listed as a critical habitat and it is not considered critical to the survival of the Bush Stone-curlew.

Conclusion

The Proposal would remove approximately 11 hectares of potential habitat for the Bush Stone-curlew. This clearing would also reduce the extent of cover within the wider landscape. However, given the extent of vegetation that would be affected and the marginal quality therein, it is unlikely that the Proposal would have a significant impact on this species.

E11. Regent Honeyeater - *Xanthomyza phrygia*

The Regent Honeyeater is listed as Endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* and the *Threatened Species Conservation Act 1999* as well as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999*.

Under the *Environment Protection and Biodiversity Conservation Act 1999* important habitat for migratory species includes areas where the species is declining. Given that the species is Endangered, it can be considered to be declining within the study area and the wider locality. This species is therefore assessed using the threatened species criteria of the *Principal Significance Guidelines 1.1* (Department of the Environment and Heritage 2006a).

Regent Honeyeaters inhabit dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She-oak (Department of Environment and Conservation 2006a). The woodlands they inhabit support a significantly high abundance and species richness of bird. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes (Higgins *et al.* 2001).

In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodland tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago (Department of Environment and Conservation 2006a).

The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Nectar and fruit from the mistletoes *Amyema miquelii, A. pendula* and *A. cambagei* are also eaten during the breeding season (Oliver 2000). When nectar is scarce, lerps and honeydew comprise a large proportion of the diet. Insects make up about 15 per cent of the total diet and are important components of the diet of nestlings (Higgins *et al.* 2001). A shrubby understorey is an important source of insects and nesting material (Oliver *et al.* 1998).

Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres (Higgins *et al.* 2001). However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. To successfully manage the recovery of this species a full understanding of the habitats used in the non-breeding season is critical (Department of Environment and Conservation 2006a).

There are three known key breeding areas, two of them in NSW — Capertee Valley and Bundarra-Barraba regions (Geering & French 1998). The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River She-oak. Regent Honeyeaters usually nest in horizontal branches or forks in tall, mature eucalypts and She-oaks (Oliver 2000). An open cup-shaped nest is constructed of bark, grass, twigs and wool (Oliver *et al.* 1998).

Threats to this species include:

- Historical loss, fragmentation and degradation of habitat from clearing for agricultural and residential development, particularly fertile Yellow Box-White Box-Blakely's Red Gum woodlands.
- Continuing loss of key habitat tree species and remnant woodlands from strategic agricultural developments, timber gathering and residential developments.
- Suppression of natural regeneration of overstorey tree species and shrub species from overgrazing. Riparian gallery forests have been particularly affected by overgrazing.
- Inappropriate forestry management practices that remove large, mature resource-abundant trees. Firewood harvesting in Box-Ironbark woodlands can also remove important habitat components.
- Competition from larger aggressive honeyeaters, particularly Noisy Miners, Noisy Friarbirds and Red Wattlebirds.
- Egg and nest predation by native birds (Department of Environment and Conservation 2006a).

This species was not recorded during the current survey, but is considered likely to occur based on the suitability of habitat.

E11.1 Significance assessment – *Environment Protection and Biodiversity Conservation Act 1999*

Will the action lead to a long-term decrease in the size of a population of a species?

Approximately 11 hectares of potential habitat for this species, including foraging and potential nesting resources, would be affected by the Proposal (Figure E11). It is unlikely, however, that an established breeding population of Regent Honeyeater is present in the study area. Any unidentified populations of Regent Honeyeater that forage in the area would not be restricted to the habitat within the site due to the species' large home range.

The areas proposed for vegetation removal is not considered to be a significant amount in relation to the amount of similar habitat that would remain unaffected in the wider local area. Furthermore, the relatively large Box-Gum Woodland that occurs in the Southern Travelling Stock Reserve (survey site S3) would largely remain unaffected by the Proposal. This species is highly mobile and similar foraging and roosting habitat can be accessed in the local area. Although the Proposal may temporarily affect the dynamics of the local population, it is not likely to result in a decline in the local population.

Will the action reduce the area of occupancy of the species?

A local population of Regent Honeyeater would not be restricted to habitat resources in the study area. This species is highly mobile and has a large foraging range that would allow it to use similar habitat resources in the study area and locality.

The action would not reduce the area of occupancy for the Regent Honeyeater.

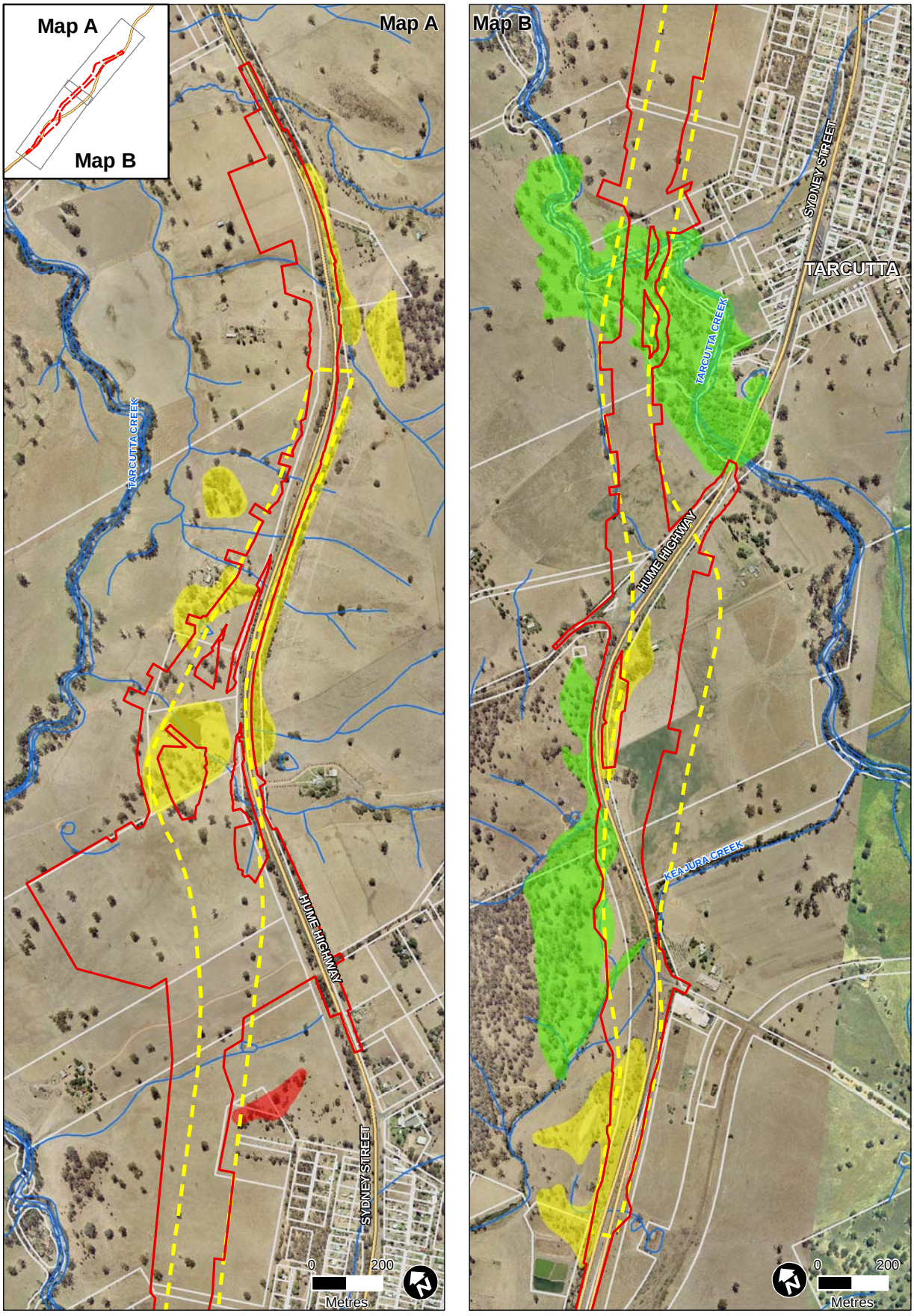

Figure E11 Distribution of potential habitat of the Regent Honeyeater *Xanthomyza phrygia*

Will the action fragment an existing population into two or more populations?

Regent Honeyeaters are highly mobile and have a large foraging range that allows them to use similar habitat resources in the study area and locality. Therefore, it is not likely that the Proposal would isolate habitat and fragment an existing population into two or more populations.

Will the action adversely affect habitat critical to the survival of a species?

It is unlikely that there is an established breeding population of Regent Honeyeater within the study area. Any unidentified populations of Regent Honeyeater that forage in the area would not be restricted to the habitat within the site, due to their large home range.

Therefore, the habitat in the study area is not considered critical to the survival of the species.

Will the action disrupt the breeding cycle of a population?

The Proposal would remove approximately 11 hectares of habitat for this species, including foraging and potential nesting resources. It is unlikely, however, that an established breeding population of Regent Honeyeater is present in the study area.

It is, therefore, unlikely that the Proposal would disrupt the breeding cycle of a local population of Regent Honeyeater.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Proposal study area contains foraging resources for Regent Honeyeater that range in conditions from moderate to good. While the Proposal would impact vegetation within the study area, it is unlikely to significantly decrease the availability of foraging habitat in the locality. The large home range of the species allows offsite foraging resources to be accessed and isolation of habitat would not result from the Proposal.

It is not likely that the action would isolate or decrease the availability of quality habitat to the extent that the species is likely to decline.

Will the action result in invasive species that are harmful to an endangered species becoming established in the endangered species´ habitat?

It is not likely that invasive species (such as introduced predators) that are harmful to the Regent Honeyeater would become further established as a result of the Proposal.

Will the action introduce disease that may cause the species to decline?

No. It is not likely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

The *Action Plan for Australian Birds* (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Specific objectives of the Regent Honeyeater recovery plan (Menkhorst *et al.* 1999) include:

- Maintain and enhance the value of Regent Honeyeater habitat at the key sites and throughout the former range, by active participation in land-use planning processes and by active vegetation rehabilitation at strategic sites.
- Monitor trends in the Regent Honeyeater population size and dispersion across its range to allow assessment of the efficacy of management actions.
- Facilitate research on strategic questions that will enhance the capacity to achieve the long-term objectives. In particular, determine the whereabouts of Regent Honeyeaters during the non-breeding season and during breeding season absences from known sites. Identify important sites and habitat requirements at these times.
- Maintain and increase community awareness, understanding and involvement in the recovery effort.
- Maintain the captive population of Regent Honeyeaters at a size that will provide adequate stock to: provide insurance against the demise of the wild population; continuously improve captive-breeding and husbandry techniques; provide adequate stock for trials of release strategies; and maintain 90 per cent of the wild heterozygosity in the captive population.

Based on the potential ecological impacts of the Proposal on the species as discussed above, it is not likely that the action would interfere with the recovery of this species.

E11.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

Approximately 11 hectares of potential foraging habitat for this species would be affected by the Proposal (Figure E11). While suitable foraging and nesting resources are present in the Proposal study area, it is not likely that an established breeding population of Regent Honeyeater is present in the study area. Moreover, Capertee Valley and Barraba are generally recognised as the only breeding areas in NSW (Geering & French 1998).

The majority of vegetation likely to be affected occurs as small remnant stands and paddock trees. However, moderate condition Riparian Woodland occurring to the west of Tarcutta is likely to be fragmented by the Proposal.

In general, however, important resources necessary for the life cycle of these species are not likely to be significantly affected by the Proposal.

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

The Proposal would remove approximately eleven hectares of vegetation occurring as small remnant stands and paddock trees that provide foraging habitat for Regent Honeyeater. A further three hectares (approximately) of moderate condition Riparian Woodland occurring to the west of Tarcutta is likely to be affected and fragmented by the Proposal.

The habitat to be removed would include specific habitat features, including mature trees with Mistletoe. Given the mobility of this species, it is not likely that the removal of 11 hectares would significantly reduce the availability of habitat for this species in the wider landscape, nor is the Proposal likely to significantly contribute to the degradation of habitat quality or significant features used by this species in the wider area.

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

In eastern Australia the Regent Honeyeater is distributed from north-east Victoria to south-east Queensland. In NSW the distribution is patchy and mainly confined to two main breeding areas — the Capertee Valley and Bundarra-Barraba region of NSW (Geering & French 1998). Therefore, the Proposal study area is not at the distributional limit of this species

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintaining connectivity across the landscape, to facilitate dispersal and to maintain foraging and potential breeding resources (NSW National Parks and Wildlife Service 2003a).

The Proposal would involve the removal of approximately eleven hectares of habitat for this species, which occurs predominantly as small remnant stands of vegetation and paddock trees. A further three hectares (approximately) of Riparian Woodland would be affected, which would effectively fragment remaining Riparian Woodland on either side of the Proposal.

Due to the large home range and nomadic nature of this species, this loss of vegetation is unlikely to result in isolation of habitat for the Regent Honeyeater. The ability to access adjacent habitat on opposite sides of the Proposal would remain. Therefore, it is unlikely that local populations of this species would become fragmented or isolated from other areas of habitat any more than currently occurs within the study area.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species, although known breeding sites are likely to be important. The site is not likely to be critical to the survival of the species.

Conclusion

The Regent Honeyeater is not likely to be significantly affected by the Proposal.

E12. Superb Parrot - *Polytelis swainsonii*

The Superb Parrot is listed as Vulnerable under both the *Environment Protection and Biodiversity Conservation Act 1999* and *Threatened Species Conservation Act 1999.*

Superb Parrots inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. On the South-west Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box (Higgins 1999). This species nests in small colonies, often with more than one nest in a single tree, and breed between September and January (Department of Environment and Conservation 2006a).

Superb Parrots may forage up to 10 kilometres from nesting sites, primarily in grassy box woodland. They feed in trees and understorey shrubs and on the ground; their diet consists mainly of grass seeds and herbaceous plants. The parrots also eat fruits, berries, nectar, buds, flowers, insects and grain (Higgins 1999).

Although surveys for the Superb Parrot were completed during the right season, this species was not recorded during current surveys.

Threats to this species include:

- Poor regeneration of nesting trees and food resources.
- Removal of hollow-bearing trees.
- Clearing of woodland remnants.
- Feeding on grain spills and subsequently being struck by vehicles.
- Loss of hollows to feral bees and native and exotic hollow-nesting birds.
- Illegal trapping which can also result in the destruction of hollows (Department of Environment and Conservation 2006a).

E12.1 Significance assessment – *Environment Protection and Biodiversity Conservation Act 1999*

The Superb Parrot is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*. The following assessment has been undertaken following the *Principal Significant Impact Guidelines 1.1* (Department of the Environment and Heritage 2006a). Under the Act, important populations are:

- likely to be key source populations either for breeding or dispersal
- likely to be necessary for maintaining genetic diversity, and/or
- at or near the limit of the species range.

The population of Superb Parrot in the study area, if present, is not considered to be important.

Will the action lead to a long-term decrease in the size of an important population of a species?

The population of Superb Parrot in the study area is not considered to be an important population.

The Proposal would remove approximately 11 hectares of potential habitat for this species, including foraging and nesting resources (refer Figure E12). This area is not considered to be significant for this species and with the adoption of suitable mitigation measures, such as clearing protocols, it is unlikely to result in the long-term decline of a local population.

The areas proposed for vegetation removal are not considered to be a significant amount in relation to the amount of similar habitat that would remain unaffected in the wider local area. Furthermore, the relatively large Box-Gum Woodland that occurs in the Southern Travelling Stock Reserve (survey site S3) would largely remain unaffected by the Proposal. Any population of Superb Parrot that forages in the area would not be restricted to habitat within the study area due to the species' mobility and large home range; similar foraging and nesting habitat can be accessed in the local area. Although the Proposal may temporarily affect the dynamics of the local population, the Proposal is unlikely to result in a decline in the local population.

Will the action reduce the area of occupancy of an important population of the species?

The population of Superb Parrot in the study area is not considered to be an important population.

A local population of Superb Parrot would not be restricted to habitat resources in the study area. This species is highly mobile (Higgins 1999) and has a large foraging range that would allow it to use similar habitat resources in the study area and locality.

While most woodland birds show a positive correlation with vegetation cover, the Superb Parrot was one of a few species in the NSW Wheat belt that showed a negative correlation (non-significant) with vegetation cover (Reid 2000). As such the reduction in cover as a result of the Proposal is unlikely to reduce the population size.

The Proposal would not reduce the area of occupancy of an important population of Superb Parrots.

Will the action fragment an existing important population into two or more populations?

Superb Parrots are highly mobile and have a large foraging range that would allow them to use similar habitat resources in the Proposal study area and locality. Therefore, it is not likely that the Proposal would isolate habitat or fragment an existing population into two or more populations.

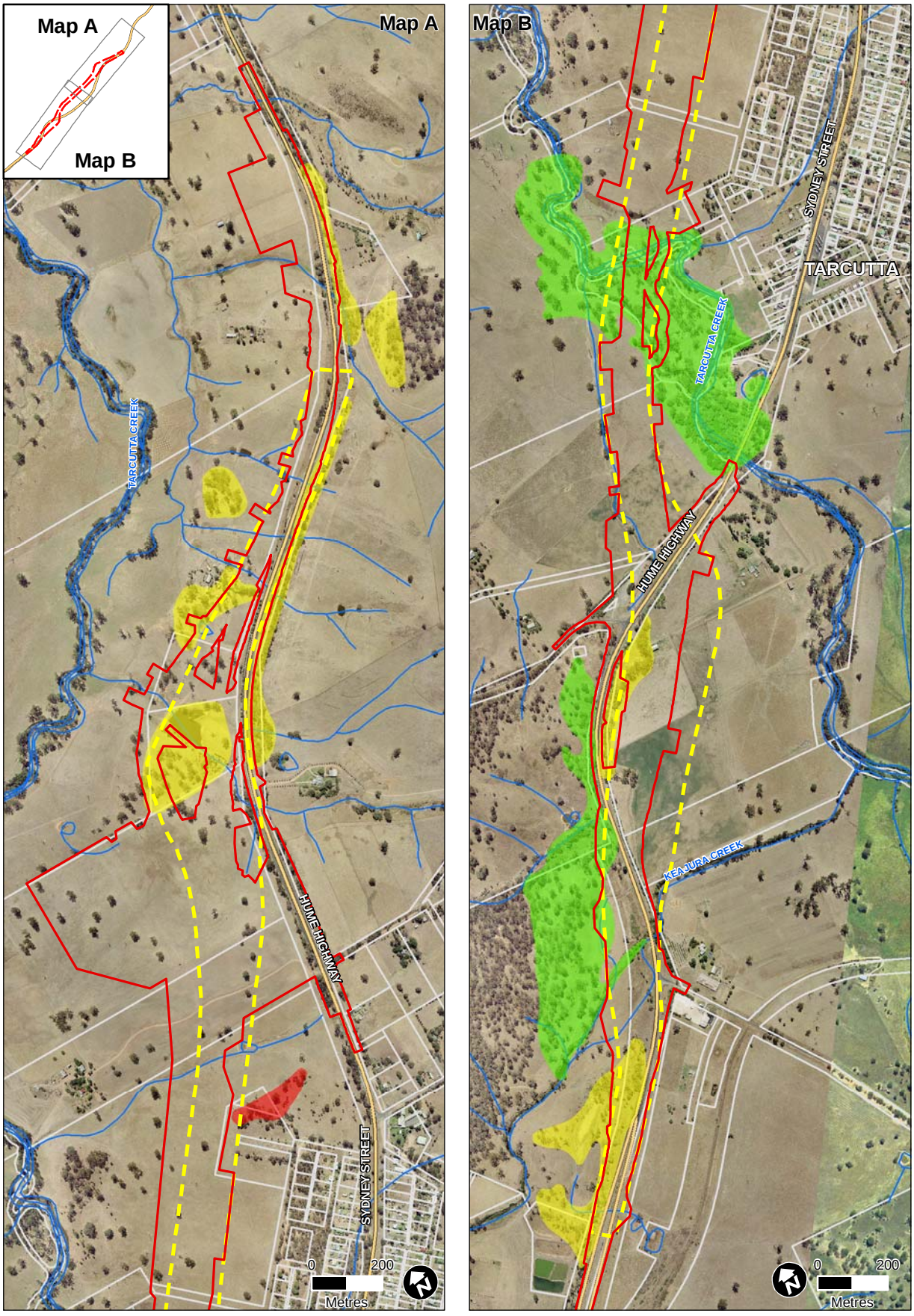

Figure E12 Distribution of potential habitat of the Superb Parrot - *Polytelis swainsonii*

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat is listed for this species under the *Environment Protection and Biodiversity Conservation Act 1999*.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The Proposal will essentially result in a reduction in a number of habitat attributes, such as foraging and breeding resources, that could be considered significant habitat. The study area essentially contains mature woodland (including large old trees) that provides foraging and potential breeding resources.

While large hollow-bearing trees, with hollows suitable for breeding, were recorded within survey sites S2 and S3, River Red Gums located along Tarcutta Creek (survey site S2) contained a greater extent. Riparian Woodland located along Tarcutta Creek will essentially be fragmented by the Proposal with large hollow-bearing trees being removed in the process. However, while River Red Gums (amongst others) will be impacted by the Proposal, habitat attributes considered significant for this species will still occur within the study area and locality. Furthermore, the large Box-Gum Woodland habitat associated with the Southern Travelling Stock Reserve near survey site S3 would largely remain unaffected by the Proposal. Box-Gum Woodland occurring in the Southern Travelling Stock Reserve provides potential foraging and breeding resources for this species in the study area.

Therefore, while the Proposal will reduce the amount of habitat features considered significant for this species in the study area, it is not likely that the area to be removed (approximately 11 hectares) would be would be critical to the survival of this species. Mitigation measures provided in Section 7 and Appendix F should ameliorate any impact.

Will the action disrupt the breeding cycle of an important population?

The population of Superb Parrot in the study area is not considered an important population. While breeding resources, such as hollow-bearing trees, would be affected as a result of habitat clearing, similar resources would be available in the study area and locality.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Proposal would remove approximately 11 hectares of habitat for this species, including foraging and nesting resources. This area is not considered to be significant for

this species and with the adoption of suitable mitigation measures, such as clearing protocols, it is not likely to result in the decline of a local population.

The Proposal is not likely to increase the degree of fragmentation or isolation for this species (habitat within the study area is already highly fragmented), which can forage over long distances.

Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species´ habitat?

It is not likely that invasive species (such as introduced predators) that are harmful to the Superb Parrot would become further established as a result of the Proposal.

Will the action introduce disease that may cause the species to decline?

No. It is not likely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

The *Action Plan for Australian Birds* (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of foraging and breeding habitat and identification of specific breeding requirements.

However, based on the potential ecological impacts of the Proposal on the species, as discussed above, it is not likely that the Proposal would interfere with the recovery of this species.

Conclusion

The population of Superb Parrot potentially occurring in the Proposal study area is not considered an important population. Based on the above assessment, the Superb Parrot is not likely to be significantly affected by the Proposal.

E12.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

While some nesting and roosting resources would be affected as a result of vegetation clearing (11 hectares), similar resources would be available in the wider region. The majority of vegetation in the study area likely to be cleared occurs as small remnant stands and paddock trees.

It is, therefore, unlikely that the action would disrupt the breeding and lifecycle of a local population of the Superb Parrot.

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

The Proposal would remove approximately 11 hectares of habitat for this species, including foraging and nesting resources. Suitable Habitat for the Superb Parrot is already highly fragmented within the study area. The Proposal is, therefore, unlikely to affect the availability of habitat for this species, which can forage over long distances.

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

The Superb Parrot is found throughout all regions of eastern inland NSW. Breeding sites are known to occur in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round (Department of Environment and Conservation 2006b). Therefore, the study area is not at the distributional limit of the Superb Parrot.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is not likely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

The study area contains moderate to good habitat and foraging resources for the Superb Parrot. Furthermore, Superb Parrots are highly mobile and have a large foraging range that allows them to use similar habitat resources in the study area and locality.

Therefore, it is highly unlikely that the Proposal would affect connectivity between suitable habitats for the Superb Parrot.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species. The site is unlikely to be critical to the survival of the species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The Proposal will essentially result in a reduction in a number of habitat attributes, such as foraging and breeding resources, that could be considered significant habitat. The study area essentially contains mature woodland (including large old trees) that provides foraging and potential breeding resources.

While large hollow-bearing trees, with hollows suitable for breeding, were recorded within survey sites S2 and S3, River Red Gums located along Tarcutta Creek (survey site S2) contained a greater extent. Riparian Woodland located along Tarcutta Creek will essentially be fragmented by the Proposal with large hollow-bearing trees being removed in the process. However, while River Red Gums (amongst others) will be impacted by the Proposal, habitat attributes considered significant for this species will still occur within the study area and locality. Furthermore, the large Box-Gum Woodland habitat associated with the Southern Travelling Stock Reserve near survey site S3 would largely remain unaffected by the Proposal. Box-Gum Woodland occurring in the Southern Travelling Stock Reserve provides potential foraging and breeding resources for this species in the study area.

Therefore, while the Proposal will reduce the amount of habitat features considered significant for this species in the study area, it is not likely that the area to be removed (approximately 11 hectares) would be would be critical to the survival of this species. Mitigation measures provided in Section 7 and Appendix F should ameliorate any impact.

Conclusion

A population of Superb Parrot in the study area is not considered an important population. Based on the above assessment, the Superb Parrot is not likely to be significantly affected by the Proposal.

E13. Swift Parrot - *Lathamus discolour*

The Swift Parrot is listed as Endangered under both the *Environment Protection and Biodiversity Conservation Act 1999* and the *Threatened Species Conservation Act 1999*.

Swift Parrots migrate to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp infestations (Department of Environment and Conservation 2006a). Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens* (Higgins 1999). The parrots return to home foraging sites on a cyclic basis depending on food availability (Department of Environment and Conservation 2006a). Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *E. globulus* (Webster 1988).

Threats

- On the mainland the main threat is loss of habitat through clearing for agriculture, and urban and industrial development.
- Collisions with wire netting fences, windows and cars, during the breeding season and winter migration — especially where such obstacles are in close proximity to suitable habitat (Department of Environment and Conservation 2006a).

This species was not recorded on site, although the current survey was not conducted during the season when this species is on mainland Australia. However, this species has previously been recorded in Mates Gully Travelling Stock Reserve and Tarcutta Hills Nature Reserve, located approximately four and 15 kilometres to the east and south of Tarcutta respectively. Box-Gum Woodland in the study area contains similar habitat to Mates Gully Travelling Stock Reserve and as such, this species may utilise resources within the study area.

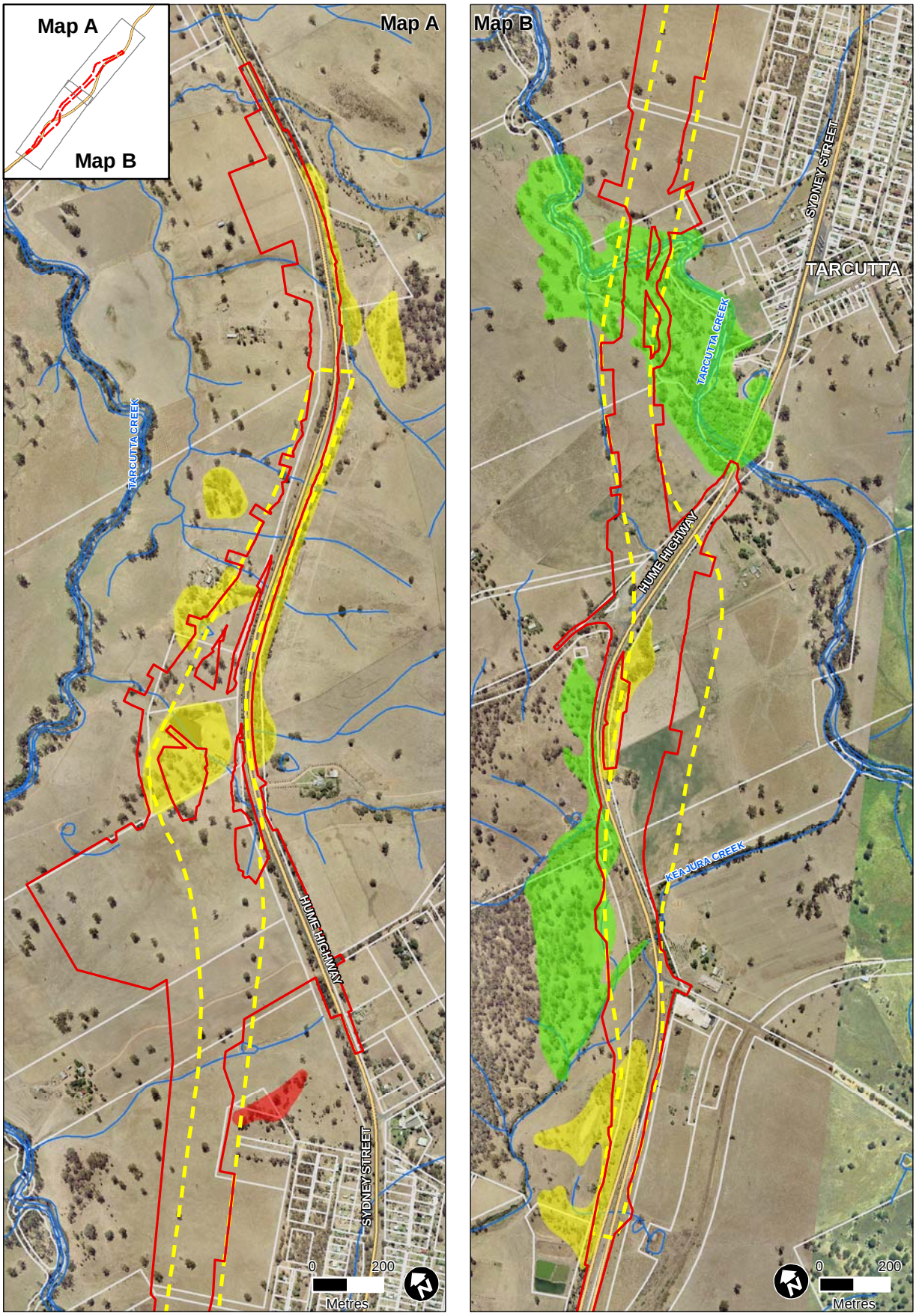

Figure E13 Distribution of potential habitat of the Swift Parrot - *Lathamus discolour*

E13.1 Significance assessment – *Environment Protection and Biodiversity Conservation Act 1999*

Will the action lead to a long-term decrease in the size of a population of a species?

The Proposal would remove approximately 11 hectares of foraging habitat for this species (Figure E13). This area is not considered to be significant in terms of the similar habitat available in the wider locality. Breeding takes place in Tasmania, and as such, breeding resources would not be affected by the Proposal.

Will the action reduce the area of occupancy of the species?

The Proposal would remove approximately 11 hectares of habitat for this species, primarily foraging resources. This area is not, however, considered to be significant in terms of the available habitat in the wider locality. Furthermore, Box-Gum Woodland occurring in the Southern Travelling Stock Reserve, which provides potential foraging resources, will largely remain unaffected by the Proposal.

Will the action fragment an existing population into two or more populations?

Swift Parrots are highly mobile and have a large foraging range that allows them to use similar habitat resources in the wider study area and locality. Therefore, it is highly unlikely that the Proposal would isolate habitat and fragment an existing population into two or more populations.

Will the action adversely affect habitat critical to the survival of a species?

No critical habitat is listed for this species under the *Environment Protection and Biodiversity Conservation Act 1999* or the *Threatened Species Conservation Act 1995*.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The Proposal will essentially result in a relatively small reduction in potential foraging resources for this species. However, while Swift Parrot has been recorded in two conservation areas in the locality, Box-Gum Woodland occurring in the Southern Travelling Stock Reserve near survey site S3, which provides potential foraging resources, will largely remain unaffected by the Proposal.

Therefore, while the Proposal will reduce the amount of habitat features considered significant for this species in the study area, it is not likely that the area to be removed (approximately 11 hectares) would be would be critical to the survival of this species. Mitigation measures provided in Section 7 and Appendix F should ameliorate any impact.

Will the action disrupt the breeding cycle of a population?

Swift Parrots breed in Tasmania during spring and summer, migrating to south-eastern Australia during autumn and winter (Department of Environment and Conservation 2006a). While Swift Parrots are dependent on flowering resources across a wide range of habitats (woodlands and forests) in its wintering grounds in NSW, the removal of approximately 11 hectares of potential habitat is not likely to disrupt their migratory patterns. As such it is not likely to affect their breeding cycle.

Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

Approximately 11 hectares of moderate foraging resources for Swift Parrots would be affected by the Proposal. This habitat occurs as fragmented remnants. It is not likely that the Proposal would further isolate or decrease the availability of this habitat so that the species declines.

Will the action result in invasive species that are harmful to an endangered species becoming established in the endangered species´ habitat?

It is unlikely that invasive species (such as introduced predators) that are harmful to the Swift Parrot would become further established as a result of the action.

Will the action introduce disease that may cause the species to decline?

No. It is not likely that disease would be increased by the action.

Will the action interfere with the recovery of the species?

The *Action Plan for Australian Birds* (Garnett & Crowley 2000) addresses the need for further ecological research on the species and the conservation and protection of roosting habitat and identification of specific breeding requirements.

Specific objectives of the Swift Parrot Recovery Plan (Swift Parrot Recovery Team 2001) include:

- Identify priority habitats and sites across the range of the swift parrot.
- Implement management strategies to protect and improve priority habitats and sites resulting in a sustained improvement in carrying capacity.
- Reduce the incidence of collisions with man-made structures.
- Determine population trends within the breeding range.
- Quantify improvements in carrying capacity by monitoring changes in extent and quality of habitat.
- Increase public awareness about the recovery program and to involve the community in the recovery.

Based on the potential ecological impacts of the Proposal on the species, as discussed above, it is unlikely that the action would interfere with the recovery of this species.

E13.2 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

Swift Parrots migrate to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp infestations (Department of Environment and Conservation 2006a).The parrots return to home foraging sites on a cyclic basis depending on food availability (Department of Environment and Conservation 2006a). Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum *E. globulus* (Webster 1988).

The Swift Parrot has previously been recorded in Mates Gully Travelling Stock Reserve and Tarcutta Hills Nature Reserve, located approximately XX and XX kilometres to the north east and south of the Proposal respectively. Box-Gum Woodland in the study area contains similar habitat to Mates Gully Travelling Stock Reserve and as such, this species may utilise resources within the study area. However, as Box-Gum Woodland occurring in the Southern Travelling Stock Reserve near survey site S3, which provides potential foraging resources, will largely remain unaffected by the Proposal, it is unlikely to affect the lifecycle of this species

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

The study area contains moderate quality foraging resources for the Swift Parrot. The Proposal would remove approximately 11 hectares of habitat for this species. This habitat occurs as highly fragmented remnants and it is not likely that the Proposal would further isolate or decrease the availability of this habitat so that the species declines.

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

During winter the Swift Parrot migrates throughout eastern Australia from Victoria to the eastern parts of South Australia and north to south-east Queensland. In NSW the Swift Parrot is found in coastal regions and along the western slopes. Therefore, the study area is not at the distributional limit of the species.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation.

How is the proposal likely to affect habitat connectivity?

Swift Parrots are highly mobile and have a large foraging range that allows them to use similar habitat resources in the wider study area and locality. The Proposal would remove approximately 11 hectares of suitable foraging resources, however, it is not likely that this action would isolate habitat and fragment an existing population into two or more populations.

How is the proposal likely to affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations and ecological communities. Under the *Threatened Species Conservation Act 1995*, the Director-General maintains a register of critical habitat. To date, no critical habitat has been declared for this species. The site is unlikely to be critical to the survival of the species.

Habitat critical to the survival of a species may also include areas that are not listed on the Register of Critical Habitat if they are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long-term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community (Department of the Environment and Heritage 2006a).

The Proposal will essentially result in a relatively small reduction in potential foraging resources for this species. However, while Swift Parrot has been recorded in two conservation areas in the locality, Box-Gum Woodland occurring in the Southern Travelling Stock Reserve near survey site S3, which provides potential foraging resources, will largely remain unaffected by the Proposal.

Therefore, while the Proposal will reduce the amount of habitat features considered significant for this species in the study area, it is not likely that the area to be removed (approximately 11 hectares) would be would be critical to the survival of this species. Mitigation measures provided in Section 7 and Appendix F should ameliorate any impact.

Conclusion

The Swift Parrot is not likely to be significantly affected by the Proposal.

E14. Turquoise Parrot - *Neophema pulchella*

The Turquoise Parrot is listed as Vulnerable under Schedule 2 of the *Threatened Species Conservation Act 1995*. This species was not recorded during field surveys, although suitable habitat exists in Box-Gum Woodlands in the study area.

Turquoise Parrots occur in the foothills of the Great Dividing Range in eucalypt woodlands and forests with a grassy or sparsely shrubby understorey, often in the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland (Department of Environment and Conservation 2006a). They nest in tree hollows, stumps or even fence posts, from August to December, laying four or five eggs on a nest of decayed wood dust. This species is usually seen in pairs or small, possibly family, groups and has also been reported in flocks of up to 30 individuals (Higgins 1999). The parrots spend most of the day on the ground and feed on seeds of both native and introduced grass and herb species. They forage quietly and may be quite tolerant of disturbance (Garnett & Crowley 2000).

This species was not recorded during current field surveys.

E14.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

The Proposal will involve the removal of approximately 11 hectares of habitat adjacent to previously cleared areas. While this habitat is largely edge affected, this species is known to forage in agricultural landscapes next to woodland patches. Habitats in the study area provided marginal foraging ground and/ or as breeding habitat provided by hollow-bearing trees.

With the implementation of appropriate mitigation measures and given the number of potential breeding hollows that would remain unaffected, it is not likely that the lifecycle of Turquoise Parrot would be significantly affected by the Proposal.

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

The Proposal will involve the removal of approximately 11 hectares of Box-Gum and Riparian Woodland adjacent to previously cleared areas. While this habitat is largely edge affected, this species is known to forage in agricultural landscapes next to woodland patches. Habitats in the study area provided marginal foraging ground and/ or breeding habitat provided by hollow-bearing trees.

Given the tolerance of this species to disturbance and their preference for ecotone habitats (Higgins 1999), it is possible that this habitat would be used by the species, particularly as a habitat corridor connecting more significant patches of vegetation. However, similar habitats would remain following construction of the road.

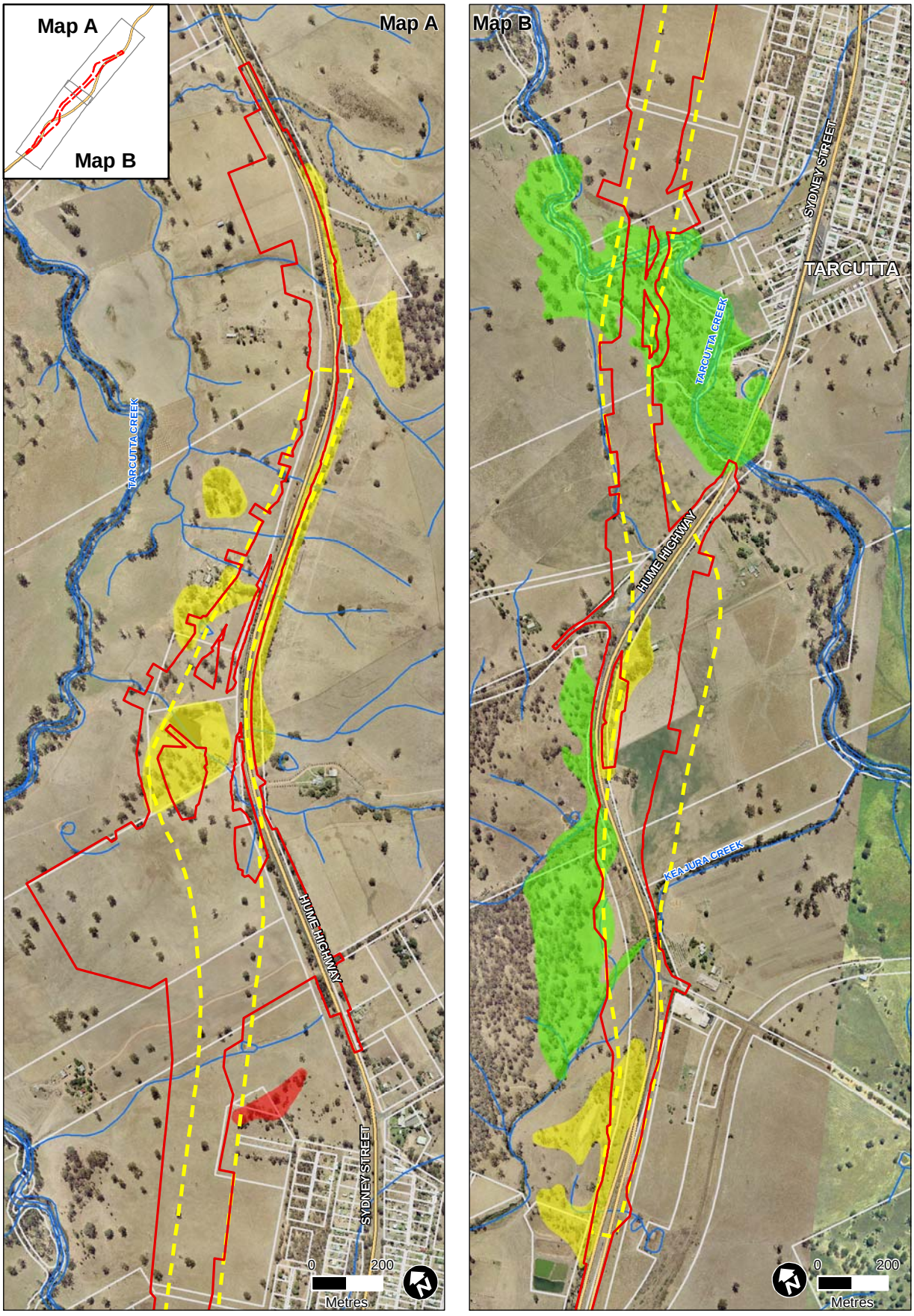

Figure E14 Distribution of potential habitat of the Turquoise Parrot - *Neophema pulchella*

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

The distribution of the Turquoise Parrot in eastern Australia extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range (Department of Environment and Conservation 2007). Therefore, the study area is not at the distribution limit of this species.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency) or flooding regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood and hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

The study area contains moderate to good habitat and foraging resources for the Turquoise Parrot. While the Proposal would present a new barrier in the landscape, this species' high mobility will enable it to access potential habitat occurring in the locality.

Therefore, it is not ,likely that the Proposal would affect connectivity between suitable habitats for the Turquoise Parrot.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. The land within the study area is not listed as a critical habitat and it is not considered critical to the survival of the Turquoise Parrot.

Conclusion

The Proposal is not likely to have a significant effect on this species.

E15. Squirrel Glider - *Petaurus norfolcensis*

The Squirrel Glider is listed as Vulnerable under Schedule 2 of the *Threatened Species Conservation Act 1995*. The Squirrel Glider in the Wagga Wagga local government area is also listed as an Endangered Population under Part 2 of Schedule 1 of the *Threatened Species Conservation Act 1995*. This species is widespread on the south-west slopes of NSW and is considered likely to occur along much of the Hume Highway, which is being duplicated from single to dual-carriageway (Van de Ree 2008).

This species was recorded during field surveys at survey site S3 (Southern Travelling Stock Reserve in the southern portion of the Proposal study area). Box-Gum Woodland, roadside vegetation and Riparian Woodland along Tarcutta Creek that occur in the Proposal study area contained foraging resources and suitable tree hollows for breeding. The Squirrel Glider trapped at survey site S3 occurred in good condition habitat and effectively had suitable foraging resources available, including flowering trees. Squirrel Gliders inhabit mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Suitable vegetation communities include at least one species of plant that flowers heavily in winter and one or more of the smooth-barked eucalypts (Department of Environment and Conservation 2005b). *Eucalyptus albens* flowering during winter, *E. melliodora* flowering during summer, *E. blakelyi* flowering during autumn, and *E. sideroxylon* flowering during spring, were all recorded in the relatively large Box-Gum Woodland situated in the Southern Travelling Stock Reserve in the southern portion of the Proposal study area.

Tree hollows greater than five centimetres in diameter, in both living and dead trees, as well as hollow stumps, are used as den sites for refuge and nesting (Gibbons & Lindenmayer 2000). Studies in Queensland showed that Squirrel Gliders used ironbark eucalypts and stags more than the hollows of smooth barked eucalypts and non-eucalypt tree species (Rowston 1998).

Squirrel Gliders use tree hollows for diurnal shelter either alone or in family groups of up to six individuals and offspring that occupy the same hollow simultaneously. The size and composition of groups of gliders occupying a particular hollow varies from day to day because gliders regularly swap den trees within their home range (Van de Ree 2008; Van de Ree, R. 2002). The nests are bowl-shaped and lined with leaves within tree hollows (Triggs 1996).

Squirrel Gliders are nocturnal and display seasonal trends in feeding behaviour that are in accordance with phenological patterns of trees and shrubs (Goldingay & Sharpe 1998). Their diet includes acacia gum, eucalypt sap, nectar, honeydew and manna, lichens with invertebrates and pollen providing protein (NSW National Parks and Wildlife Service 1999b).

Squirrel Gliders are agile climbers and can glide for more than 50 metres in one movement. Nightly movements are estimated as between 300 metres and 500 metres. Home-ranges have been estimated at between 0.65 hectares and 8.55 hectares and movements tend to be greater for males than females. The home-range of a family group is likely to vary according to habitat quality and availability of resources, with more productive forests attributed to smaller home ranges (Quin 1995).

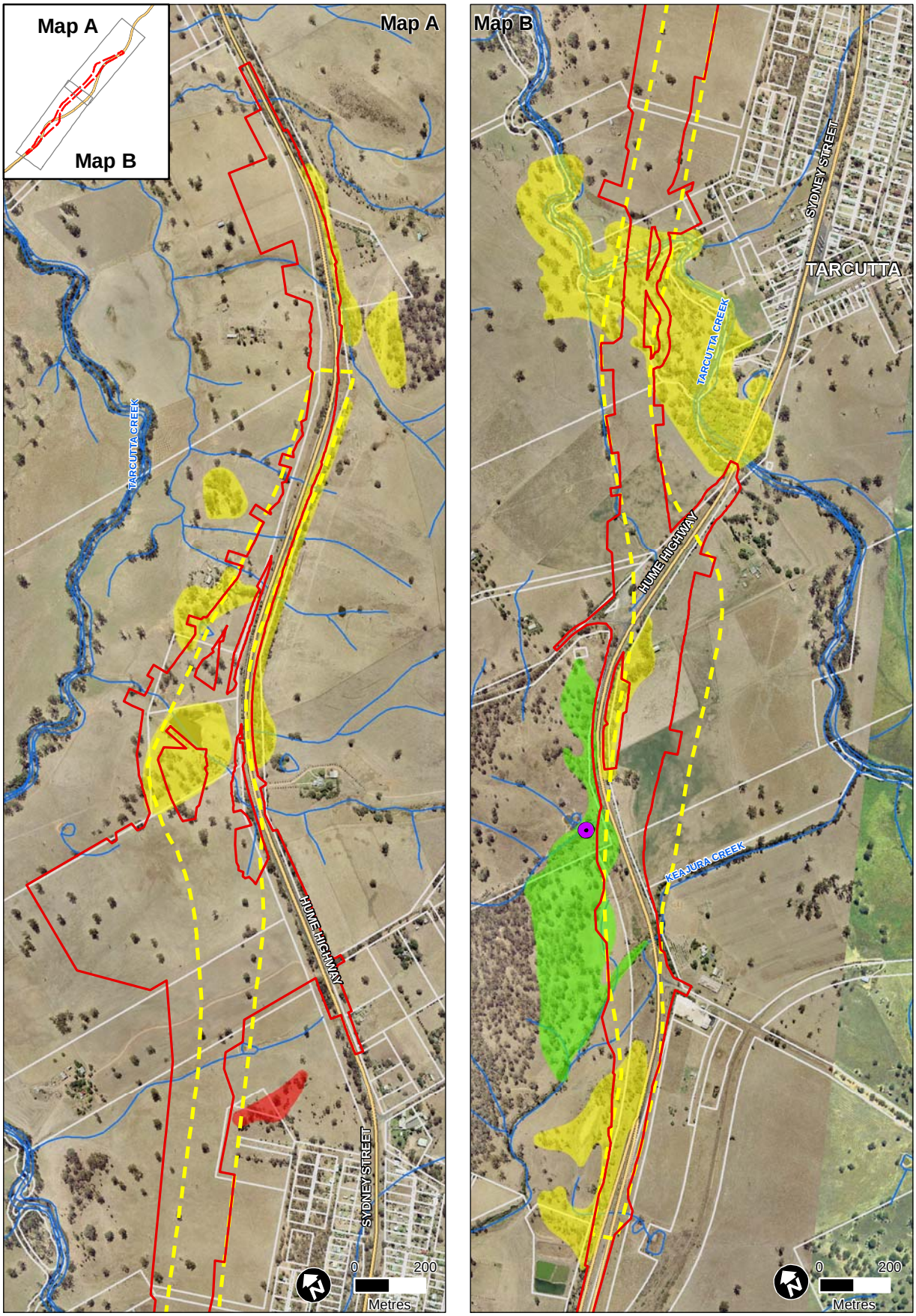

Figure E15 Distribution of known and potential habitat of the Squirrel Glider - *Petaurus norfolcensis*

E15.1 Significance assessment – *Environmental Planning and Assessment Act 1979*

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

Approximately 11 hectares of known and potential habitat for Squirrel Gliders would be affected by the Proposal (refer Figure E15). The majority of vegetation likely to be affected occurs as small remnant stands and paddock trees. However, approximately three hectares of moderate condition Riparian Woodland occurring to the west of the township of Tarcutta (survey site S2) is likely to be affected, and without appropriate mitigation measures, would result in habitat fragmentation. Habitat in the Proposal study area contained trees considered suitable for breeding.

Vegetation within the subject site is likely to be used predominately for foraging, although it may also constitute breeding habitat, and would generally exist as part of a larger home range. Squirrel Gliders are mobile, regularly swap dens sites, occupy territories between 0.65 hectares and 8.55 hectares, and have nightly movements ranging between 300 metres and 500 metres. As such, this species is not likely to be dependent on foraging or breeding resources available in the subject site,. Moreover, as the relatively large Box-Gum Woodland block located on Southern Travelling Stock Reserve (where Squirrel Glider was recorded, survey site S3) would remain largely unaffected by the Proposal, it is not likely that the lifecycle of this species would be affected.

A study of Squirrel Glider populations in the Wagga region (Claridge & van der Ree 2004) has recommended that a landscape-scale approach that incorporates metapopulation theory be adopted to define and manage disjunct populations. This would recognise not only the importance of habitat, but also the importance of movement of individuals in maintaining populations. In a highly fragmented landscape, corridors such as that found in the Proposal study area play a vital role.

Riparian Woodland located at survey site S2 would be affected by the Proposal, and without appropriate mitigation measures, would effectively fragment this habitat on either side of the dual-carriageway. While the Proposal would introduce another barrier in the landscape, it has been suggested that crossing zones be investigated (where feasible) to minimise impacts on connectivity in key areas of the alignment, including Riparian Woodland along Tarcutta Creek.

The Proposal is not likely to significantly contribute to the degradation of habitat quality and significant features used by this species in the wider area.

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

The Proposal would remove approximately 11 hectares of vegetation occurring as small remnant stands and paddock trees, which provide foraging and potential breeding habitat for Squirrel Gliders. Moderate condition Riparian Woodland occurring to the west of the township of Tarcutta (survey site S2) is likely to be fragmented by the Proposal, without appropriate mitigation measures being investigated. Approximately three hectares of Riparian Woodland habitat would be affected.

As Squirrel Gliders regularly swap dens sites within their territories (0.65 hectares to 8.55 hectares) and have regular nightly movements ranging between 300 metres and 500 metres, it is not likely that the removal of 11 hectares would significantly reduce the availability of habitat for this species in the wider landscape. While the relatively large Box-Gum Woodland block located on the Southern Travelling Stock Reserve (where a Squirrel Glider was recorded, survey site S3) would largely remain unaffected by the Proposal, appropriate mitigation measures have been suggested in Section 7 and Appendix F to ameliorate impacts associated with the Proposal and particularly with respect to impacts concerning Riparian Woodland at survey site S2.

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

Squirrel Gliders are widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Therefore, the study area is not at the distributional limit for this species, however, within the Wagga Wagga local government area, Squirrel Gliders are listed as an Endangered population. This Endangered population is legally defined by the boundaries of the Wagga Wagga local government area (NSW National Parks and Wildlife Service 1999b). While the Squirrel Glider has previously been recorded in Ellerslie Nature Reserve, which borders but occurs outside the Wagga Wagga local government area, no records exist to the east of the Hume Highway in the Proposal locality. Therefore, the Squirrel Glider recorded during current surveys may be at the edge of the distributional limit for this Endangered population.

While the Proposal would impact habitat potentially occupied by this species, the relatively large Box-Gum Woodland block located in the Southern Travelling Stock Reserve (where Squirrel Glider was recorded, survey site S3) would largely remain unaffected by the Proposal. However, Riparian Woodland occurring at survey site S2 (west of the township of Tarcutta) would essentially be fragmented by the Proposal, effectively isolating remaining habitat on either side of the Proposal.

Mitigation measures have been suggested in Section 7 and Appendix F to ameliorate impacts associated with habitat fragmentation. It has been suggested that crossing zones be investigated (where feasible) to minimise impacts on connectivity in key areas of the alignment, including Riparian Woodland along Tarcutta Creek.

How is the proposal likely to affect current disturbance regimes?

The Proposal would not significantly affect fire regimes (intensity and frequency), flooding or other disturbance regimes. Remnants of vegetation within the study area have been highly modified by past and present land uses and the Proposal is unlikely to significantly alter microhabitat features any more than currently occurs within the study area. However, the Proposal would increase several disturbance regimes, including loss of native vegetation, dead wood and loss of hollow-bearing trees.

How is the proposal likely to affect habitat connectivity?

Remnant forest and woodland vegetation on private land adjacent to wooded areas along roads, tracks, creeks and paddock boundaries is essential to maintaining connectivity across the landscape, to facilitate dispersal and to maintain foraging and breeding resources (NSW National Parks and Wildlife Service 2003a). Moreover, remnant roadside

woodlands are the only remaining habitat in many areas of this species' range (Ahern & Van de Deer 2003). So, although Squirrel Gliders persist in many remnants of greatly varying area, the capacity of such disjunct habitats to sustain glider populations in the long-term is not assured (Ahern & Van de Deer 2003), hence, connectivity is vital for maintaining populations (Claridge & van der Ree 2004).

The Proposal would involve the removal of approximately eleven hectares of habitat for this species, which occurs predominantly as small remnant stands of vegetation and paddock trees. A further three hectares (approximately) of Riparian Woodland would be affected, which would effectively fragment remaining Riparian Woodland on either side of the Proposal.

The loss of vegetation, particularly Riparian Woodland, is not likely to result in isolation of habitat for Squirrel Gliders. Mitigation measures have been suggested in Section 7 and Appendix F to ameliorate impacts associated with habitat fragmentation. It has been suggested that crossing zones be investigated (where feasible) to minimise impacts on connectivity and reinstate the ability to access adjacent habitat in key areas of the alignment, particularly concerning Riparian Woodland along Tarcutta Creek.

Therefore, it is not likely that a local population of this species would become totally fragmented or isolated from other areas of habitat; however, the Proposal would increase fragmentation and barrier effects.

How is the proposal likely to affect critical habitat?

The Department of Environment and Climate Change maintains a register of critical habitat. Critical habitat cannot be listed for the Squirrel Glider as it is listed under Schedule 2 of the *Threatened Species and Conservation Act 1995.* The land within the Proposal study area is not considered critical to the survival of the local population of Squirrel Glider.

Conclusion

Although the Squirrel Glider was recorded in the study area, the Proposal is unlikely to have a significant effect on this species, despite the loss of habitat. Key areas of potential habitat have been avoided in the design and connectivity would be maintained in key areas.