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EMAIL TRANSMISSION

Attention: Scott Barwick **Date: 28th October, 2008**

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From: Dr Kirsten Crosby and Dr Rhidian Harrington **Pages: 31**

Subject: 5236 - Assessments of Significance for Regent Honeyeater within the Hunter Employment Zone (HEZ)

Dear Scott,

You recently engaged Biosis Research Pty. Ltd. to prepare assessments of significance for the Regent Honeyeater within and adjacent to the Hunter Economic Zone (HEZ), Kurri Kurri. The Regent Honeyeater is listed as Endangered under the *Threatened Species Conservation Act* 1995 (TSC Act) and the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act), as well as Migratory under the EPBC Act. These impact assessments have been prepared in order to provide updated information following detection of breeding in the greater HEZ area in 2007/2008.

The project is being assessed under Part 3A of the *Environmental Planning and Assessment Act* 1979 (EP&A Act). Under this Part, no TSC Act assessments of significance are required. Instead, the Department of Environment and Climate Change and the Department of Primary Industries provided guidelines for assessing impacts, through assessing key thresholds and responding to a set of questions (DEC & DPI 2005). The following pages provide these assessments, together with the EPBC Act significance assessments which are still required under Part 3A of the EP&A Act.

Yours sincerely,

Dr Kirsten Crosby and Dr Rhidian Harrington
Senior Zoologists

1.0 Introduction

Objective

The objective of this report is to assess the impacts of Precinct 1 of the HEZ development currently under a Part 3A (EP&A Act) application on the Endangered Regent Honeyeater. The assessments determine the impacts from the Part 3A application only, as well as cumulatively for the whole HEZ development to date. As well as Part 3A assessments, assessments of significance under the TSC Act (Seven Part Tests) and EPBC Act are provided. EP&A Act (part 3A) and TSC Act assessments consider impacts to a "local population" while EPBC Act assessments consider impacts to the species as a whole.

Background

The Hunter Economic Zone (HEZ) study area is comprised of approximately 877 ha of industrially zoned land, and approximately 2,300 ha of conservation zoned land, including portions of Werakata National Park. The site is located to the south of the township of Kurri Kurri in the Cessnock LGA. The HEZ study area is located within the lower Hunter Valley of New South Wales in the Cessnock Local Government Area. The study area is defined as all of the lands covered by the Cessnock Local Environmental Plan (LEP) 1989 (Amendment No. 60) - Hunter Employment Zone. It includes approximately 3,200 ha of areas zoned for industrial purposes, special uses, heritage and environmental conservation. The HEZ LEP study area is shown below in Figure 1.

A number of approvals already exist within Precinct 1 and do not form part of the Part 3A application, and therefore, the Precinct 1 assessments:

1. Roads: HEZ Spine Road running from Leggets Drive in the east, through Precinct 1, then along the northern boundary of Precinct 1, crossing Chinamans Hollow Creek and turning north heading towards the Township of Weston.
2. Stockpiles: Clearings and stockpiles associated with road construction are located within what will become Lots 290 and 440.
3. Land use construction: Clearing and construction has occurred on the following lots. Vegetation retention is confined to the requirements of the current DCP for 10 m front setbacks and 5 m setbacks to the side and rear boundaries.
    - Lot 410: Ullrich Aluminium – Aluminium extrusion facility. DA consent DA8/2007/577/1. Construction well advanced with completion targeted for November 2008. DA consent for subdivision DA 8/2007/813/1 – Approved. Subdivision Certificate not yet released.
    - Lot 210: Infratil – Diesel peak generation power plant. DA consent 10/2006/1038/2. Construction complete and occupation certificate being sought by developer. DA consent for subdivision 8/2007/76/1 – approved. Subdivision Certificate not yet released.
    - Lot 220: Energy Australia – Energised sub-station. The site has been dedicated to Energy Australia.
    - Reservoir and Pump Station: The pump station is located to the north of the Precinct 1 boundary. It is located opposite the boundary between lots 410 and 440.
    - Lot 170: Hunter Water Reservoir and access road constructed and cleared.
    - Hunter Water Corporation Approvals: 1) Trunk Sewer running from Station Street in the north to Precinct 1. The trunk sewer alignment abuts the eastern and western edges of the central 7(b) corridor; 2) Water supply; and, 3) An undetermined application with Hunter Water for the reticulated sewer within Precinct 1.

Approvals that have not yet commenced construction are listed below. The impacts from clearing these lots are considered in the Precinct 1 assessments.

1. Lot 90: DA Consent 8/2006/298/1 – wholesale plant and propagation nursery – approved. Not yet commenced.
2. Lot 170: DA Consent 8/2005/457/1 – Optus Tower - approved. Not yet commenced.

3. Lot 170: DA Consent 8/2006/689/1 – Water Reservoir and access road – approved. Construction nearing completion.
4. Lot 290: DA Consent 8/2004/422 – Helipad. Approved and not commenced.

The HEZ LEP study area is shown below in Figure 1 and the area of impact (including existing approvals) from the Precinct 1 Part 3A application is displayed in Figure 2.

Taxonomy

A recent DNA analysis of honeyeaters has led to the renaming of the Regent Honeyeater. Previously this species was placed in its own genus, *Xanthomyza phrygia*. It is now recognised as being part of the wattlebird group, and is now called *Anthochaera phrygia* (Driskell and Christidis 2004; Christidis and Boles 2008). This change has been accepted by the Commonwealth Department of the Environment, Heritage, Water and the Arts (DEWHA), but has not yet been taken up by the NSW Department of Environment and Climate Change (DECC).

Definitions

The following definitions are used to reduce confusion over locations:

- Precinct 1 – proposed development area.
- HEZ site – lands owned by HEZ.
- Greater HEZ area – includes HEZ site, Crown land to the east and Mindaribba land to the west.
- HEZ LEP area – area covered by the LEP (includes part of Werakata National Park) – marked as the study area on Figure 1.
- Locality – 5km radius around Precinct 1.

Regent Honeyeater Assessments

Habitat information

The Regent Honeyeater occurs in dry open eucalypt forests and woodland, usually being associated with Box-Ironbark assemblages or wet lowland coastal forests (DEC 2005c; Menkhorst *et al.* 1999). The main food resources for the Regent Honeyeater are nectar (from eucalypts and mistletoe) and arthropods (which are most important during the breeding season) (DEC 2005b; Menkhorst *et al.* 1999). Food resources during the breeding season consist of summer-flowering box or ironbark and winter-flowering species utilised at other times include Spotted Gum (*Corymbia maculata*) and Swamp Mahogany (*Eucalyptus robusta*) among others (DEC 2005a; Menkhorst *et al.* 1999).

Only three known breeding strongholds remain for the Regent Honeyeater, one in north-east Victoria and two in NSW (Capertee Valley and the Bundarra-Barraba region) (DECC 2005). Breeding usually occurs between July and January, after which, responding to flowering events, or a lack of food resources in the breeding areas (or a combination of both) Regent Honeyeaters would sometimes migrate nearer to the coast to forage on winter-flowering eucalypts (particularly Spotted Gum and Swamp Mahogany). In some cases, birds would stay in their coastal foraging sites until the following season, if food resources allow (if flowering eucalypts or alternative food resources continue to be available), and may breed there (Geering, D, *pers. comm.*). Breeding pairs construct nests in eucalypts with

rough or fibrous bark (for weaving into nests) or within clumps of mistletoe in smooth-barked eucalypts (DECC 2005).

A total of fourteen nests were located within the greater HEZ area, particularly within Mindaribba land, however one active nest was located south of the large electricity easement, just outside Precinct 1 (Figure 4). This included six active nests, two failed nests, two fledged nests and four nests with an unknown status (Biosis Research 2008). See Figure 2 for details of the nests located. Nests were most often located within Lower Hunter Spotted Gum-Ironbark Forest, within either Broad-leaved Ironbark (*Eucalyptus fibrosa*) or Spotted Gum (usually within a mistletoe in the latter) (Biosis Research 2008). Hunter Lowland Redgum Forest, containing Grey Gum (*Eucalyptus punctata*) and the Forest Red Gum (*Eucalyptus tereticornis*), may also be utilised by the Regent Honeyeater for nesting (D. Geering, *pers. comm*.). One active nest in a Grey Gum was observed during the December 2007 surveys. Trees containing nests varied greatly in size, from 20 cm diameter at breast height (DBH) to >60 cm DBH. These surveys indicated that some successful breeding had occurred within the HEZ study area. Twelve juveniles of varying ages were seen during the survey, including a flock of five juveniles (Biosis Research 2008). Juvenile flocks were also observed by local birdwatchers (Hunter Bird Observers Club) within the same season. It is also possible that some of the breeding may have occurred in the Quorrobolong area, where breeding has been recorded previously and in the current season (A. Morris, *pers. comm*.).

During targeted searches for nesting and individual Regent Honeyeaters, the vegetation was assessed for its value as both potential foraging and nesting habitat (Biosis Research 2008). Previous assessments conducted by Harper Somers O'Sullivan (Harper Somers O'Sullivan 2006) involved assessment and mapping of the potential foraging habitat for the Regent Honeyeater within the HEZ site. These surveys found that the majority of the HEZ LEP study area contained good quality Regent Honeyeater habitat (breeding and foraging). These findings were confirmed by the 2007 survey, as two of the dominant vegetation types, Lower Hunter Spotted Gum-Ironbark Forest and Hunter Lowland Redgum Forest, contained abundant winter-flowering food resources such as Spotted Gum and the Forest Red Gum, as well as abundant summer-flowering food resources such as Broad-leafed Ironbark (*Eucalyptus fibrosa*) and Narrow-leafed Ironbark (*E. crebra*). During the current surveys, similar foraging habitat was also found to be present immediately to the south, east and west of the HEZ site, including within Werakata National Park (Biosis Research 2008).

The distribution of mistletoe was mapped by Harper Somers O'Sullivan (as it is also a food and nesting resource for the Regent Honeyeater) and shown to be present over approximately 45% of the HEZ site, including a similar coverage within Precinct 1 (HSO 2004; Harper Somers O'Sullivan 2006). Mistletoe is also an important habitat feature for nesting as it provides a platform for the nests, especially in smooth-barked trees like the Spotted Gum (D. Geering, *pers. comm*.). The 2007 surveys assessed potential nesting habitat throughout the HEZ site and in adjacent areas (to the immediate south, east and west of the HEZ site), based on proximity of good foraging resources; mainly flowering Broad-leaved Ironbark trees. Although no nesting sites were recorded within the HEZ site during the current survey, potential nesting habitat is present throughout the HEZ site within Lower Hunter Spotted Gum-Ironbark Forest and Hunter Lowland Redgum Forest. Although Angophoras were observed flowering within the Kurri Sand Swamp Woodland of the HEZ LEP area, this tree's nectar is a lower quality food resource for the Regent

Honeyeater and as such, it was considered less likely that they would nest in this vegetation type (Biosis Research 2008).

The north-eastern part of the HEZ site contained good quality potential nesting habitat, with many large flowering ironbarks, although they appeared to have flowered earlier in the season (Biosis Research 2008). Incidentally, two Regent Honeyeaters were recorded one kilometre west-southwest of Kurri Hospital in late October 2007 (D. Geering, *pers. comm*.). Given that the breeding cycle of the Regent Honeyeater, from nest building to fledging, lasts approximately five weeks (D. Geering, *pers. comm*.), it is possible that breeding also occurred on this site when flowering was optimal. Much of the north-western and the southern parts of the HEZ site (the latter including Precinct 1) contained potential nesting and feeding resources (Broad-leaved Eucalypts) in varying stages of flowering, and was considered to be good quality habitat. The area directly south of Precinct 1 (Werakata National Park and HEZ 7b land) was investigated and considered to provide good quality habitat as it contained many mature trees. The area directly to the east of the HEZ site contained younger forest and therefore, contained less mature trees and was considered to provide moderate quality nesting habitat for the Regent Honeyeater. North of the HEZ site is mostly cleared or developed and doesn't contain suitable habitat for the Regent Honeyeater. West of the HEZ site is known nesting and feeding habitat for the Regent Honeyeater (Biosis Research 2008).

Competition from larger aggressive honeyeaters, particularly Noisy Miners (*Manorina melanocephala*), Noisy Friarbirds (*Philemon argenticeps*) and Red Wattlebirds (*Anthochaera carnunculata*), is considered a threat to Regent Honeyeaters. Noisy Miners affect avian diversity and abundance by aggressive exclusion of other species (Grey *et al.* 1998). In a subtropical forest in Queensland, Noisy Miner colonies were found to intensively occupy a zone of 20 m from the forest edge, with frequent use occurring up to 100 m from the edge, but little beyond 200 m (Piper and Catterall 2003). In a study in Victoria, it was found that penetration depth differed significantly across four broad habitat types (grassy woodlands to forests) but commonly ranged from 150 m to more than 300 m from the remnant edge (Clarke 2007). These assessment assume a penetration distance of 300 m, but in Clarke's (2007) study this distance related to grassy woodlands, and therefore, within the forest habitats of the site this is a conservative use of these finding and the actual penetration distance is probably less.

1.0 Impact Assessment (Part 3A of the EP&A Act)

Under Part 3A of the EP&A Act, no assessments of significance (Seven Part Tests) are required, however the guidelines for assessment under this part request an impact assessment and assessment of "key thresholds" (DEC & DPI 2005).

1.1 KEY THRESHOLDS:

a) Will the proposal, including actions to avoid or mitigate impacts or compensate to prevent unavoidable impacts, maintain or improve biodiversity values?

Within the approximate 555 ha of HEZ Nominees-owned land, approximately 131.8 ha of vegetation would be conserved and 424.0 ha developed (HSO, *pers. comm.*). Areas of each vegetation community to be conserved includes: 55 of 67 ha of Hunter Lowland Redgum Forest (EEC); 7 of 76 ha of Kurri Sand Swamp Woodland (EEC); and, 58 of 321 ha of Lower Hunter Spotted Gum-Ironbark Forest (EEC). These areas do not include retention with Deferred Areas or future retention areas/setbacks, which would further add to the conservation percentage total. A detailed description mitigation and compensatory measures associated with the HEZ development can be see in the developments Ecological Assessment Report (Harper Somers O'Sullivan 2008).

It is considered that within the HEZ Nominees-owned land that the current mitigation and compensatory measures would not be sufficient to maintain biodiversity values.

b) Is proposal likely to reduce the long-term viability of a local population of the species, population, or ecological community?

Impacts on the lifecycle of the Regent Honeyeater are discussed in detail below (Impact Assessment part a). The total population of Regent Honeyeaters was estimated at between 500-2000 individuals in the 1990's (Menkhorst 1997). Numbers at Capertee Valley (a key breeding site) have been estimated to vary between 55 individuals to more than 400 individuals, depending on the year. The largest confirmed flock at Chiltern (another key breeding area) was 75 birds in 1996 (Higgins *et al.* 2001). A total of fourteen nests were located within the greater HEZ area, particularly within Mindaribba land (Figure 2). This included six active nests, two failed nests, two fledged nests and four nests with an unknown status (Biosis Research 2008). The breeding event in 2007-2008 within the greater HEZ area resulted in significant recruitment of juveniles. According to DECC, this

> "*represented the most significant breeding event for the species across its entire range during the 2007/2008 season and was the most successful in terms of the proportion of fledged nestlings to frequency of nests over several past seasons throughout its range"* (DECC 2008b).

Thus the HEZ study area must be considered to support an ecologically significant proportion of the population of the Regent Honeyeater.

While there is only one record of breeding immediately adjacent to Precinct 1 (see Figure 4), there is no measurable difference in the habitat quality within Precinct 1 compared to where the main breeding records were located. Clearing of habitat within Precinct 1 for the Part 3A application would impact (directly ad indirectly) 5.2 ha of non-edge effected potential breeding and foraging habitat (see below for more information). The land where

the majority of breeding records were located is privately owned, and is therefore not protected. Clearing within Precinct 1 has also created edges with habitat to the north, although no new edges would be created from the Part 3A application. These edges are likely lead to colonisation by Noisy Miners and possibly other hyperagressive species, which are known to aggressively exclude Regent Honeyeaters and would therefore reduce the area of available breeding and foraging habitat for this species. Precinct 1 currently contains potential breeding habitat for the Regent Honeyeater, although current approved clearing has reduced its suitability. Disruption of this habitat is likely to reduce the potential for breeding within the locality, which could cause a long-term decline in the genetic diversity of the species within the locality.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) impact 151 ha of potential habitat for the Regent Honeyeater, which represents 2.6% of potential habitat within the locality, and this is considered likely to reduce the long-term viability of a local population of this species.

c) Is the proposal likely to accelerate the extinction of the species, population or ecological community or place it at risk of extinction?

Impacts on the Regent Honeyeater are discussed in detail below (Impact Assessment). The total population of Regent Honeyeaters is possibly as low as 500 individuals, but may be up to approximately 2000 individuals (Menkhorst 1997). Given the few key breeding areas known, any additional breeding locations for this species are highly important. As only a small number of nests were found to be successful, any disruption to breeding within the HEZ LEP area could place the local population at risk of extinction, or at the very least, reduce the probability that breeding events will take place within the HEZ LEP area in the future. While it is unlikely that the proposal would lead to the extinction of the species, any reduction in breeding success is significant, and could place the species at increased risk of extinction.

d) Will the proposal adversely affect critical habitat?

Critical habitats are areas of land that are crucial to the survival of particular threatened species, populations or ecological communities. Critical habitat is only declared after extensive consultation with the Scientific Committee, public authorities, landholders and the wider community. There is currently no critical habitat listed or recommended for the Regent Honeyeater (DECC 2008a).

1.2 IMPACT ASSESSMENT

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

While there is only one record of breeding immediately adjacent to Precinct 1 (see Figure 4), there is no measurable difference in the habitat quality within Precinct 1 compared to where the main breeding records were located. Clearing of habitat within Precinct 1 for the Part 3A application would impact 88.0 ha of potential breeding and foraging habitat (see below for more information). The land where the majority of breeding records were located is privately owned, and is therefore not protected. Current clearing within Precinct 1 has create edges with habitat to the north. These new edges are likely lead to colonisation by Noisy Miners and possibly other hyperagressive species, which are known to aggressively exclude Regent Honeyeaters and would therefore reduce the area of available breeding and foraging habitat for this species. Precinct 1 currently contains potential breeding habitat for the Regent Honeyeater, although current clearing has reduced its suitability. Disruption of this habitat is likely to reduce the potential for breeding within the locality, which could cause a long-term decline in the genetic diversity of the species within the locality. Cumulative impacts (currently approved development and Precinct 1 Part 3A application) from the removal of potential breeding and foraging habitat within Precinct 1 is likely to reduce the long-term viability of a local population of the Regent Honeyeater.

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

To calculate impacts on Regent Honeyeater habitat, a number of calculations regarding vegetation clearing were made. All native forest and woodland vegetation in the locality (5 km radius of the subject site) includes eucalypts which are potential foraging habitat for this species. Almost all of these plant communities contain Spotted Gum, which is a preferred winter feed tree, and/or ironbark species (*Eucalyptus crebra* and *E. fibrosa*), important summer-flowering species. These particular eucalypts are also known to be the preferred trees for nesting in the HEZ LEP area. Plant communities with one or more of these three eucalypts are taken to be preferred habitat for the Regent Honeyeater. Within the HEZ LEP area, invasion by Noisy Miners is an important limiting factor in the potential breeding and foraging areas for the Regent Honeyeater. Noisy Miners are known to invade up to 300 m from a cleared edge. As such, calculations of indirect impacts include a buffer of 300 m around large cleared areas (easements, urban areas, approved development within Precinct 1) as habitat within this buffer is likely to become unsuitable due to the presence of Noisy Miners. In the same respect, some of the potential habitat mapped (and used in the calculations of impacts) within the locality may also be sub-optimal or unsuitable for the Regent Honeyeater due to edge effects and the presence of Noisy Miners. However, due to the difficulty in accurately mapping these impacts, a 300 m buffer has not been applied to potential habitat outside the HEZ LEP area. Therefore, the area of potential habitat within the locality (within 5 km) is probably less than stated here and proportionally, the impacts greater. Additionally, differences in the distribution of preferred feed trees and other microhabitat features will mean that some areas mapped as potential habitat within the locality would actually provide sub-optimal habitat, which will further increase the impacts from what is stated here. In addition, a buffer of 300 m has been taken around the proposed clearing in the subject site to show the resulting edge effects of the proposal on the study area (HEZ LEP area). It must be noted that the presence of Noisy Miners does not

necessarily preclude the breeding in Regent Honeyeaters, given the presence of a Regent Honeyeater nest immediately adjacent to the electricity easement. Please refer to Figure 5 for a depiction of these areas. Tables 1 and 2 below provide information on vegetation areas and clearing impacts.

Table 1: Vegetation to be cleared or impacted by edge effects

Community	Subject Site (ha)	Edge effects on Study Area (ha)	Total impact (Ha)
Coastal Foothills Spotted gum - Ironbark Forest (main variant)	18.7	21.2	39.9
Coastal Foothills Transition Forest (E. beyeriana variant)	0	5.3	5.3
Grey Gum - Red Gum - Paperbark Forest	4.6	31.3	35.9
Kurri Sands Claypan Scrub (*E. fibrosa* variant)	0	1.4	1.4
Kurri Sands Stringybark Forest	0	0.2	.2
Lower Hunter Spotted Gum - Red Ironbark Forest (main variant)	64.7	91.7	156.4
Paperbark Depression Forest	0	0.3	0.3
Total (ha)	88.0	151.4	239.4
Total (ha) excluding area already impacted by edge effects	5.2	0.0	5.2

Table 2: Vegetation in the Subject Site, Study Area and Locality

Vegetation	Subject Site	Study Area	Locality
a. Total Vegetated Area	88.0 ha	2,756.0 ha	5,819.4 ha
b. Area minus parts already subject to edge effects	5.2	1,504.6	
c. Total area to be impacted (incl. edge effects)	5.2		
Percent of Study Area/Locality that will be impacted		0.2%	0.1%

Precinct 1 Part 3A application would lead to the removal of 88.0 ha of potential breeding and known foraging habitat for the Regent Honeyeater. No new edge effects are created by the current Part 3A application. Taking into account existing edge effects, a total of 5.2 ha would be impacted by the proposal. This is equivalent to approximately 0.2% of habitat in the study area (HEZ LEP area) and 0.1% of habitat in the locality (5 km radius of study site). Note that approximately 1,200 ha of potential habitat within the study area is protected in Werakata National Park. Given the similarity between habitat within Precinct 1 and where the breeding event took place, it must be assumed that Precinct 1 contains potential breeding habitat.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking into account existing edge effects 151 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality.

Regent Honeyeaters are known to be susceptible to aggression from Noisy Miners and Bell Miners along forest edges. Clearing of habitat within Precinct 1 would lead to creation of new edges along which Noisy Miners could invade. As discussed above, these species can colonise up to 300 m in from a forest edge, and may therefore reduce known Regent Honeyeater habitat by this distance. While some vegetation would be retained within Precinct 1, this would mainly be within 20 m buffers of retained vegetation along each side of the roads and drainage corridors. These vegetation buffers would be considered to provide poor habitat for the Regent Honeyeater, given its preference for vegetation away from forest edges.

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

The Regent Honeyeater is widespread but sparsely scatted in mainland eastern Australia. Core breeding areas are in Victoria and NSW. Winter migrants can be found in northern NSW, Queensland, and (previously) south Australia (Higgins *et al.* 2001). The HEZ LEP area is not at the limit of the Regent Honeyeater's distribution.

d) How is the proposal likely to affect current disturbance regimes?

Precinct 1 is currently vegetated over much of its area. An electricity easement runs across the south-west corner of the site. A two-lane road curves in from the south-eastern corner of the property and there are several existing clearings (see Background in the Introduction of this report). The Precinct 1 Part 3A application would lead to the clearing of 88.0 ha of vegetation, but not result in any new edge effects.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) would lead to the clearing of 151 ha of vegetation and increase the incidence of edge effects (e.g. weed invasion and invasion by edge-specialist species such as the Noisy Miner). The proposed development is for an industrial estate, so vehicle movements are likely to be considerable. Precinct 1 will therefore increase the current disturbance regime on the site through vegetation clearing, fragmentation of habitat, edge effects, increased noise, light and collision hazards, and from increased predation.

e) How is the proposal likely to affect habitat connectivity?

Forests within the HEZ site were found to contain good quality habitat for the Regent Honeyeater. The area immediately west of the HEZ site is where known breeding has occurred. The area directly south of the HEZ site (and Precinct 1) is considered to provide good quality habitat and is protected. The area directly to the east of the HEZ site (Crown Land) contained younger forest and therefore was considered to provide moderate quality nesting habitat for the Regent Honeyeater. North of the HEZ site is mostly cleared or developed and doesn't contain suitable habitat for the Regent Honeyeater (Biosis Research 2008). Clearing of vegetation within Precinct 1 would fragment two areas of good quality habitat, but this would not affect movements of the Regent Honeyeater as it is highly mobile. Fragmentation of habitat may affect the Regent Honeyeater by allowing invasion by the hyperaggressive native Noisy Miner, who exclude other birds from areas they inhabit (Piper and Caterall, 2003). The indirect impacts of fragmentation (i.e. presence edge specialist species) may mean that the Regent Honeyeater would find the adjacent areas less desirable, but there would be little impact on habitat connectivity for this species.

f) 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. Critical habitat is only declared after extensive consultation with the Scientific Committee, public authorities, landholders and the wider community. There is currently no critical habitat listed or recommended for the Regent Honeyeater (DECC 2008a).

Part 3A Conclusion

Approximately 5.2 ha of known foraging and potential breeding habitat of the Regent Honeyeater would be impacted (directly and indirectly) by the proposal and this represents approximately 0.1 % of potential habitat in the locality. Given the significance of the recent breeding event within the HEZ LEP study area, that Precinct 1 contains potential breeding habitat, and that the habitat to be impacted by the proposal is considered to be highly important for the long term survival of the species in the locality, and probably, for the species as a whole. Regent Honeyeaters have been detected nesting adjacent to Precinct 1 in its current state. However, the development will reduce the area of potential breeding habitat for this species and is likely to reduce the probability of a breeding event in the future. The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) impact 151 ha of potential habitat for the Regent Honeyeater, which represents 2.6% of potential habitat within the locality, and this is considered likely to reduce the long-term viability of a local population of this species.

2. Assessment of Significance (EPBC Act) – Endangered Species

Introduction
The "action" is defined as the areas included within Precinct 1 within the Part 3A application, and do not consider areas that already have approval, as discussed under Background in the Introduction of this report.

Is there a real chance or a possibility that the action will lead to a long-term decrease in the size of a population of a species?

The total population of Regent Honeyeaters was estimated at between 500-2,000 individuals in the 1990's (Menkhorst 1997). Numbers at Capertee Valley (a key breeding site) have been estimated to vary between 55 individuals to more than 400 individuals, depending on the year. The largest confirmed flock at Chiltern (another key breeding area) was 75 birds in 1996 (Higgins *et al.* 2001). The breeding event in 2007-2008 within the greater HEZ area resulted in significant recruitment of juveniles. According to DECC, this

> "*represented the most significant breeding event for the species across its entire range during the 2007/2008 season and was the most successful in terms of the proportion of fledged nestlings to frequency of nests over several past seasons throughout its range"* (DECC 2008b).

The majority of the breeding taking place in the HEZ LEP area was outside the area proposed for development. Given the similarity of the habitat in both areas, it must be assumed that breeding habitat is present in Precinct 1. As potential breeding and foraging habitat would be impacted by the proposal, and there would be edge effects on land that is nearer the known breeding areas, and a significant breeding event is known to have occurred in the immediate area, there is a possibility that the action would lead to a long-term decrease in the size of the Regent Honeyeater population in the locality.

Is there a real chance or a possibility that the action will reduce the area of occupancy of the species?

To calculate impacts on Regent Honeyeater habitat, a number of calculations regarding vegetation clearing were made. All native forest and woodland vegetation in the locality (5 km radius of the subject site) includes eucalypts which are potential foraging habitat for this species. Almost all of these plant communities contain Spotted Gum, which is a preferred winter feed tree, and/or ironbark species (*Eucalyptus crebra* and *E. fibrosa*), important summer-flowering species. These particular eucalypts are also known to be the preferred trees for nesting in the HEZ LEP area. Plant communities with one or more of these three eucalypts are taken to be preferred habitat for the Regent Honeyeater. Within the HEZ LEP area, invasion by Noisy Miners is an important limiting factor in the potential breeding and foraging areas for the Regent Honeyeater. Noisy Miners are known to invade up to 300 m from a cleared edge. As such, calculations of indirect impacts include a buffer of 300 m around large cleared areas (easements, urban areas) as habitat within this buffer is likely to become unsuitable due to the presence of Noisy Miners. In the same respect, some of the potential habitat mapped (and used in the calculations of impacts) within the locality may also be sub-optimal or unsuitable for the Regent Honeyeater due to edge effects and the presence of Noisy Miners. However, due to the difficulty in accurately mapping these impacts, a 300 m buffer has not been applied to potential habitat outside the HEZ LEP area. Therefore, the area of potential habitat within the locality (within 5 km) is probably less

than stated here and proportionally, the impacts greater. Additionally, differences in the distribution of preferred feed trees and other microhabitat features will mean that some areas mapped as potential habitat within the locality would actually provide sub-optimal habitat, which will further increase the impacts from what is stated here. In addition, a buffer of 300 m has been taken around the proposed clearing in the subject site to show the resulting edge effects of the proposal on the study area (HEZ LEP area). It must be noted that the presence of Noisy Miners does not necessarily preclude the breeding in Regent Honeyeaters, given the presence of a Regent Honeyeater nest immediately adjacent to the electricity easement. Please refer to Figure 3 for a depiction of these areas. Tables 1 and 2 below provide information on vegetation areas and clearing impacts.

Table 1: Vegetation to be cleared or impacted by edge effects

Community	Subject Site (ha)	Edge effects on Study Area (ha)	Total impact (Ha)
Coastal Foothills Spotted gum - Ironbark Forest (main variant)	18.7	21.2	39.9
Coastal Foothills Transition Forest (E. beyeriana variant)	0	5.3	5.3
Grey Gum - Red Gum - Paperbark Forest	4.6	31.3	35.9
Kurri Sands Claypan Scrub (*E. fibrosa* variant)	0	1.4	1.4
Kurri Sands Stringybark Forest	0	0.2	.2
Lower Hunter Spotted Gum - Red Ironbark Forest (main variant)	64.7	91.7	156.4
Paperbark Depression Forest	0	0.3	0.3
Total (ha)	88.0	151.4	239.4
Total (ha) excluding area already impacted by edge effects	5.2	0.0	5.2

Table 2: Vegetation in the Subject Site, Study Area and Locality

Vegetation	Subject Site	Study Area	Locality
a. Total Vegetated Area	88.0 ha	2,756.0 ha	5,819.4 ha
b. Area minus parts already subject to edge effects	5.2	1,504.6	
c. Total area to be impacted (incl. edge effects)	5.2		
Percent of Study Area/Locality that will be impacted		0.2%	0.1%

Precinct 1 Part 3A application would lead to the removal of 88.0 ha of potential breeding and known foraging habitat for the Regent Honeyeater. No new edge effects are created by the current Part 3A application. Taking into account existing edge effects, a total of 5.2 ha would be impacted by the proposal. This is equivalent to approximately 0.2% of habitat in the study area (HEZ LEP area) and 0.1% of habitat in the locality (5 km radius of study site). Note that approximately 1,200 ha of potential habitat within the study area is protected in Werakata National Park. Given the similarity between habitat within Precinct 1 and where the breeding event took place, it must be assumed that Precinct 1 contains potential breeding habitat.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking into account existing edge effects 151 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality, and this is considered likely to reduce the area of occupancy for this species.

Regent Honeyeaters are known to be susceptible to aggression from Noisy Miners and Bell Miners along forest edges. Clearing of habitat within Precinct 1 would lead to creation of new edges along which Noisy Miners could invade. As discussed above, these species can

colonise up to 300 m in from a forest edge, and may therefore reduce known Regent Honeyeater habitat by this distance. While some vegetation would be retained within Precinct 1, this would mainly be within 20 m buffers of retained vegetation along each side of the roads and drainage corridors. These vegetation buffers would be considered to provide poor habitat for the Regent Honeyeater, given its preference for vegetation away from forest edges.

Is there a real chance or a possibility that the action will fragment an existing population into two or more populations?

Forests within the HEZ site were found to contain good quality habitat for the Regent Honeyeater. The area northwest of Precinct 1 is where known breeding has occurred. The area directly south of the HEZ site (and Precinct 1) is considered to provide good quality habitat and is protected. The area directly to the east of the HEZ site (Crown Land) contained younger forest and therefore was considered to provide moderate quality nesting habitat for the Regent Honeyeater. North of the HEZ site is mostly cleared or developed and doesn't contain suitable habitat for the Regent Honeyeater (Biosis Research 2008). Clearing of vegetation within Precinct 1 would fragment two areas of good quality habitat, but this would not affect movements of the Regent Honeyeater as it is highly mobile. Fragmentation of habitat may affect the Regent Honeyeater by allowing invasion by the hyperaggressive native Noisy Miner, who exclude other birds from areas they inhabit (Piper and Caterall, 2003). The indirect impacts of fragmentation (i.e. presence edge specialist species) may mean that the Regent Honeyeater would find the adjacent areas less desirable, but there would be little impact on habitat connectivity for this species.

Is there a real chance or a possibility that the action will adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' is defined by DEH (2006) as areas that 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.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the Minister under the EPBC Act (DEH 2006).

The northwest portion of the HEZ estate is known breeding habitat for the Regent Honeyeater, a species that is only known to have three key breeding areas. While this breeding area is not currently recognised as a "key area", the area is providing habitat for foraging and breeding (and possibly dispersal), and it is helping maintain the genetic

diversity of the species. Therefore, the HEZ study area must be considered to contain habitat critical to the survival of the species. Although no known breeding habitat will be impacted by development of Precinct 1, it must be considered that potential breeding habitat is present, and therefore, that there is a real chance that the action will adversely affect habitat critical to the survival of the species.

Is there a real chance or a possibility that the action will disrupt the breeding cycle of a population?

Only three breeding strongholds remain for the Regent Honeyeater, one in north-east Victoria and two in NSW (Capertee Valley and the Bundarra-Barraba region) (DECC 2005). Breeding usually occurs between July and January, after which, responding to flowering events, or a lack of food resources in the breeding areas (or a combination of both) Regent Honeyeaters would sometimes migrate nearer to the coast to forage on winter-flowering eucalypts (particularly Spotted Gum and Swamp Mahogany). In some cases, birds would stay in their coastal foraging sites until the following season if food resources allow (if flowering eucalypts or alternative food resources continue to be available) and may breed there (Geering, D, *pers. comm.*). Breeding pairs construct nests in eucalypts with rough or fibrous bark (for weaving into nests) or within clumps of mistletoe in smooth-barked eucalypts (DECC 2005).

A total of fourteen nests were located within the greater HEZ study area, particularly within Mindaribba land, however one active nest was located south of the large electricity easement, just outside Precinct 1 (Figure 4). This included six active nests, two failed nests, two fledged nests and four nests with an unknown status (Biosis Research 2008). See Figure 2 for details of the nests located. Nests were most often located within Lower Hunter Spotted Gum-Ironbark Forest, within either Broad-leaved Ironbark (*Eucalyptus fibrosa*) or Spotted Gum (usually within a mistletoe in the latter) (Biosis Research 2008). Hunter Lowland Redgum Forest, containing Grey Gum (*Eucalyptus punctata*) and the Forest Red Gum (*Eucalyptus tereticornis*) may also be utilised by the Regent Honeyeater for nesting (D. Geering, *pers. comm.*). One active nest in a Grey Gum was observed during the December 2007 surveys. Trees containing nests varied greatly in size, from 20 cm diameter at breast height (DBH) to >60 cm DBH. These surveys indicated that some successful breeding had occurred within the HEZ study area. Twelve juveniles of varying ages were seen during the survey, including a flock of five juveniles (Biosis Research 2008). Juvenile flocks were also observed by local birdwatchers (Hunter Bird Observers Club) within the same season. It is also possible that some of the breeding may have occurred in the Quorrobolong area, where breeding has been recorded previously and in the current season (A. Morris, *pers. comm.*).

While there is only one record of breeding immediately adjacent to Precinct 1 (see Figure 4), there is no measurable difference in the habitat quality within Precinct 1 compared to where the main breeding records were located. Clearing of habitat for Precinct 1 Part 3A application would impact 5.2 ha of non-edge effected potential breeding and foraging habitat. No new edge effects are created by the Precinct 1 Part 3A application. The land where the majority of breeding records were located is privately owned, and is therefore not protected.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking

into account existing edge effects 151.0 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality. This clearing would also create edges with habitat to the north. These new edges are likely lead to colonisation by Noisy Miners and possibly other hyperagressive species, which are known to aggressively exclude Regent Honeyeaters and would therefore reduce the area of available breeding and foraging habitat for this species. Precinct 1 currently contains potential breeding habitat for the Regent Honeyeater, although current clearing has reduced its suitability. Disruption of this habitat is likely to reduce the potential for breeding within the locality. Therefore, there is a real chance that the cumulative impacts from the removal of potential breeding and foraging habitat within Precinct 1 will disrupt the breeding cycle of a local population of the Regent Honeyeater.

Is there a real chance or a possibility that the action will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

During targeted searches for nesting and individual Regent Honeyeaters, the vegetation was assessed for its value as both potential foraging and nesting habitat (Biosis Research 2008). Previous assessments conducted by Harper Somers O'Sullivan (Harper Somers O'Sullivan 2006) involved assessment and mapping of the potential foraging habitat for the Regent Honeyeater within the HEZ site. These surveys found that the majority of the HEZ LEP area to consist of good quality Regent Honeyeater habitat. These findings were confirmed by the 2007 survey, as two of the dominant vegetation types, Lower Hunter Spotted Gum-Ironbark Forest and Hunter Lowland Redgum Forest, contained abundant winter-flowering food resources such as Spotted Gum and the Forest Red Gum, as well as abundant summer-flowering food resources such as Broad-leafed Ironbark (*Eucalyptus fibrosa*) and Narrow-leafed Ironbark (*E. crebra*) (Biosis Research 2008).

The distribution of mistletoe was mapped by Harper Somers O'Sullivan (as it is also a food resource for the Regent Honeyeater) and shown to be present over approximately 45% of the HEZ site (HSO 2004; Harper Somers O'Sullivan 2006). Mistletoe is also an important habitat feature for nesting as it provides a platform for the nests, especially in smooth-barked trees like the Spotted Gum (D. Geering, *pers. comm*.). The 2007 surveys assessed potential nesting habitat throughout the HEZ site and in adjacent areas (to the immediate south, east and west of the HEZ site), based on proximity of good foraging resources; mainly flowering Broad-leaved Ironbark trees. Although no nesting sites were recorded within the HEZ site during the current survey, potential nesting habitat is present throughout the HEZ site within Lower Hunter Spotted Gum-Ironbark Forest and Hunter Lowland Redgum Forest. Although Angophoras were observed flowering within the Kurri Sand Swamp Woodland of the HEZ LEP area, this tree's nectar is a lower quality food resource for the Regent Honeyeater and as such, it was considered less likely that they would nest in this vegetation type (Biosis Research 2008).

The north-eastern part of the HEZ site contained good quality potential nesting habitat, with many large flowering ironbarks, although they appeared to have flowered earlier in the season (Biosis Research 2008). Incidentally, two Regent Honeyeaters were recorded one kilometre west-southwest of Kurri Hospital in late October 2007 (D. Geering, *pers. comm*.). Given that the breeding cycle of the Regent Honeyeater, from nest building to fledging, lasts approximately five weeks (D. Geering, *pers. comm*.), it is possible that breeding also occurred on this site when flowering was optimal. Much of the north-western and the

southern parts of the HEZ site (the latter including Precinct 1) contained potential nesting and feeding resources (Broad-leaved Eucalypts) in varying stages of flowering, and was considered to be good quality habitat. The area directly south of Precinct 1 (Werakata National Park and HEZ 7b land) was investigated and considered to provide good quality habitat as it contained many mature trees. The area directly to the east of the HEZ site contained younger forest and therefore, contained less mature trees and was considered to provide moderate quality nesting habitat for the Regent Honeyeater. North of the HEZ site is mostly cleared or developed and doesn't contain suitable habitat for the Regent Honeyeater. West of the HEZ site is known nesting and feeding habitat for the Regent Honeyeater (Biosis Research 2008).

As discussed above, the greater HEZ area (including Precinct 1) contains good quality habitat for the Regent Honeyeater in that many large flowering ironbarks, Spotted Gums and mistletoe are present. These are both preferred breeding and preferred foraging habitat. Only three key breeding areas are known, of which only two are in NSW. The presence of breeding within a new area is important for the species as a whole, given its endangered status. The habitat within Precinct 1 is of good quality and is likely to be important to the species within the Locality. Clearing from the Precinct 1 Part 3A application would remove 88.0 ha of potential habitat, but not create any new edge effects. Approximately 5.2 ha of the vegetation to be cleared is currently unaffected by edge effects.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) would remove 109 ha of Regent Honeyeater habitat and will lead to edge effects on 137 ha of habitat. Taking into account existing edge effects, the clearing would result in direct impacts of 74 ha with an additional 77 ha edge-effected (totalling 151 ha).There a real chance or a possibility that these cumulative impacts will modify the availability of habitat to the extent that the species is likely to decline.

Is there a real chance or a possibility that the action will result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat?

Competition from larger aggressive honeyeaters, particularly Noisy Miners (*Manorina melanocephala*), Noisy Friarbirds (*Philemon argenticeps*) and Red Wattlebirds (*Anthochaera carnunculata*), is considered a threat to Regent Honeyeaters. These species (particularly the Noisy Miner) are often considered an invasive native species (Lunney *et al.* 2007). Noisy Miners affect avian diversity and abundance by aggressive exclusion of other species (Grey *et al.* 1998). In a subtropical forest in Queensland, Noisy Miner colonies were found to intensively occupy a zone of 20 m from the forest edge, with frequent use occurring up to 100 m from the edge, but little beyond 200 m (Piper and Catterall 2003). In a study in Victoria, it was found that penetration depth differed significantly across four broad habitat types (grassy woodlands to forests) but commonly ranged from 150 m to more than 300 m from the remnant edge (Clarke 2007). Clearing of habitat within Precinct 1 would lead to creation of new edges along which Noisy Miners could invade. As discussed above, these species can colonise up to 300 m in from a forest edge, and may therefore reduce known Regent Honeyeater habitat by this distance. While some vegetation would be retained within Precinct 1, this would consist of a 20 m buffer of retained vegetation on each side of the road. These would be considered poor habitat for the Regent Honeyeater, given its preference for vegetation away from forest edges. No new edge-affected habitat would be created by the Precinct 1 Part 3A application.

Approximately 137 ha of adjacent habitat would be edge-effected by the cumulative impacts of the HEZ development within Precinct 1 (of which 63 ha of Precinct 1 is already subject to edge effects). Therefore, there is a real chance that these cumulative impacts will result in invasive species that are harmful to the Regent Honeyeater becoming established in their habitat.

Is there a real chance or a possibility that the action will introduce disease that may cause the species to decline?

Clearing vegetation and the associated actions have the potential to introduce or increase incidence of external diseases into vegetation or fauna populations. There is the potential for diseases such as *Phytophora cinnamomi* (Dieback) to be introduced during clearing and construction.

Is there a real chance or a possibility that the action will interfere with the recovery of the species?

The Regent Honeyeater recovery plan (Menkhorst *et al.* 1999) covered the years from 1999 to 2003. An updated version is currently being prepared (DEWHA 2008). Long-term objectives to be achieved within two decades of the 1999 recovery plan included:

1. To ensure that the species persists in the wild.

2. To achieve a down-listing from nationally endangered to vulnerable by stabilising the population and securing habitat extent and quality in the main areas of occupancy.

3. Achieve increasing reporting rates (5%) in areas previously used regularly, eg Munghorn Gap, Bendigo, north-east Melbourne, Eildon area.

Conclusion

Approximately 5.2 ha of potential foraging and breeding habitat would be impacted (directly and indirectly) by the proposal and this represents 0.1 % of potential habitat in the locality. This is not considered to represent a significant proportion of the species habitat.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking into account existing edge effects 151 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality. Given the significance of recent the breeding event in the immediate area, the potential for breeding in the future, and that the habitat to be impacted by the proposal is considered to be highly important for the long term survival of the species in the locality, and probably, for the species as a whole, there is a possibility that the cumulative impacts of the action could lead to a long-term decrease in the size of the local Regent Honeyeater population.

3. Assessment of Significance (EPBC Act) – Migratory Species

For the purposes of the Act, an area of important habitat for migratory species is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species;
- habitat that is of critical importance to the species at particular life cycle stages;
- habitat utilised by a migratory species which is at the limit of the species range; and/or
- habitat within an area where the species is declining.

Is the action likely to substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for the migratory species?

To calculate impacts on Regent Honeyeater habitat, a number of calculations regarding vegetation clearing were made. All native forest and woodland vegetation in the locality (5 km radius of the subject site) includes eucalypts which are potential foraging habitat for this species. Almost all of these plant communities contain Spotted Gum, which is a preferred winter feed tree, and/or ironbark species (*Eucalyptus crebra* and *E. fibrosa*), important summer-flowering species. These particular eucalypts are also known to be the preferred trees for nesting in the HEZ LEP area. Plant communities with one or more of these three eucalypts are taken to be preferred habitat for the Regent Honeyeater. Within the HEZ LEP area, invasion by Noisy Miners is an important limiting factor in the potential breeding and foraging areas for the Regent Honeyeater. Noisy Miners are known to invade up to 300 m from a cleared edge. As such, calculations of indirect impacts include a buffer of 300 m around large cleared areas (easements, urban areas) as habitat within this buffer is likely to become unsuitable due to the presence of Noisy Miners. In the same respect, some of the potential habitat mapped (and used in the calculations of impacts) within the locality may also be sub-optimal or unsuitable for the Regent Honeyeater due to edge effects and the presence of Noisy Miners. However, due to the difficulty in accurately mapping these impacts, a 300 m buffer has not been applied to potential habitat outside the HEZ LEP area. Therefore, the area of potential habitat within the locality (with 5 km) is probably less than stated here and proportionally, the impacts greater. Additionally, differences in the spatial distribution of preferred feed trees and other microhabitat features will mean that some areas mapped as potential habitat within the locality is sub-optimal, which will further increase the impacts from what is stated here. In addition, a buffer of 300 m has been taken around the proposed clearing in the subject site to show the resulting edge effects of the proposal on the surrounding study area (HEZ LEP area). It must be noted that the presence of Noisy Miners does not necessarily preclude the breeding in Regent Honeyeaters, given the presence of a Regent Honeyeater nest immediately adjacent to the electricity easement. Refer to Figure 5 for a depiction of these areas. Tables 1 and 2 below provide information on vegetation areas and clearing impacts.

Table 1: Vegetation to be cleared or impacted by edge effects

Community	Subject Site (ha)	Edge effects on Study Area (ha)	Total impact (Ha)
Coastal Foothills Spotted gum - Ironbark Forest (main variant)	18.7	21.2	39.9
Coastal Foothills Transition Forest (E. beyeriana variant)	0	5.3	5.3
Grey Gum - Red Gum - Paperbark Forest	4.6	31.3	35.9
Kurri Sands Claypan Scrub (*E. fibrosa* variant)	0	1.4	1.4
Kurri Sands Stringybark Forest	0	0.2	.2
Lower Hunter Spotted Gum - Red Ironbark Forest (main variant)	64.7	91.7	156.4
Paperbark Depression Forest	0	0.3	0.3
Total (ha)	88.0	151.4	239.4
Total (ha) excluding area already impacted by edge effects	5.2	0.0	5.2

Table 2: Vegetation in the Subject Site, Study Area and Locality

Vegetation	Subject Site	Study Area	Locality
a. Total Vegetated Area	88.0 ha	2,756.0 ha	5,819.4 ha
b. Area minus parts already subject to edge effects	5.2	1,504.6	
c. Total area to be impacted (incl. edge effects)	5.2		
Percent of Study Area/Locality that will be impacted		0.2%	0.1%

Precinct 1 Part 3A application would lead to the removal of 88.0 ha of potential breeding and known foraging habitat for the Regent Honeyeater. No new edge effects are created by the current Part 3A application. Taking into account existing edge effects, a total of 5.2 ha would be impacted by the proposal. This is equivalent to approximately 0.2% of habitat in the study area (HEZ LEP area) and 0.1% of habitat in the locality (5 km radius of study site). Note that approximately 1,200 ha of potential habitat within the study area is protected in Werakata National Park. Given the similarity between habitat within Precinct 1 and where the breeding event took place, it must be assumed that Precinct 1 contains potential breeding habitat.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking into account existing edge effects 151 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality, and this is considered likely to reduce the area of occupancy for this species.

Regent Honeyeaters are known to be susceptible to aggression from Noisy Miners and Bell Miners along forest edges. Clearing of habitat within Precinct 1 would lead to creation of new edges along which Noisy Miners could invade. As discussed above, these species can colonise up to 300 m in from a forest edge, and may therefore reduce known Regent Honeyeater habitat by this distance. While some vegetation would be retained within Precinct 1, this would mainly be within 20 m buffers of retained vegetation along each side of the roads and drainage corridors. These vegetation buffers would be considered to provide poor habitat for the Regent Honeyeater, given its preference for vegetation away from forest edges.The proposal is not considered likely to significantly alter fire or hydrological regimes in the HEZ LEP area. Given the mobility of the Regent Honeyeater and the presence of vegetation surrounding the subject site, the clearing of 88.0 ha of vegetation would not lead to isolation of habitat for this species.

Is the action likely to result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species?

Competition from larger aggressive honeyeaters, particularly Noisy Miners (*Manorina melanocephala*), Noisy Friarbirds (*Philemon argenticeps*) and Red Wattlebirds (*Anthochaera carnunculata*), is considered a threat to Regent Honeyeaters. These species (particularly the Noisy Miner) are often considered an invasive native species (Lunney *et al.* 2007). Noisy Miners affect avian diversity and abundance by aggressive exclusion of other species (Grey *et al.* 1998). In a subtropical forest in Queensland, Noisy Miner colonies were found to intensively occupy a zone of 20 m from the forest edge, with frequent use occurring up to 100 m from the edge, but little beyond 200 m (Piper and Catterall 2003). In a study in Victoria, it was found that penetration depth differed significantly across four broad habitat types (grassy woodlands to forests) but commonly ranged from 150 m to more than 300 m from the remnant edge (Clarke 2007). Clearing of habitat within Precinct 1 would lead to creation of new edges along which Noisy Miners could invade. As discussed above, these species can colonise up to 300 m in from a forest edge, and may therefore reduce known Regent Honeyeater habitat by this distance. While some vegetation would be retained within Precinct 1, this would consist of a 20 m buffer of retained vegetation on each side of the road. These would be considered poor habitat for the Regent Honeyeater, given its preference for vegetation away from forest edges. No new edge-affected habitat would be created by the Precinct 1 Part 3A application.

Approximately 137 ha of adjacent habitat would be edge-effected by the cumulative impacts of the HEZ development within Precinct 1 (of which 63 ha of Precinct 1 is already subject to edge effects). Therefore, there is a real chance that these cumulative impacts will result in invasive species that are harmful to the Regent Honeyeater becoming established in their habitat.

Is the action likely to seriously disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the migratory species?

The total population of Regent Honeyeaters was estimated at between 500-1500 individuals in the 1990's (Menkhorst 1997). Numbers at Capertee Valley (a key breeding site) have been estimated to vary between 55 individuals to more than 400 individuals, depending on the year. The largest confirmed flock at Chiltern (another key breeding area) was 75 birds in 1996 (Higgins *et al.* 2001). The breeding event in 2007-2008 within the greater HEZ area resulted in significant recruitment of juveniles. According to DECC, this

> "*represented the most significant breeding event for the species across its entire range during the 2007/2008 season and was the most successful in terms of the proportion of fledged nestlings to frequency of nests over several past seasons throughout its range"* (DECC 2008b).

Thus the HEZ Estate must be considered to support an ecologically significant proportion of the Regent Honeyeater.

A total of fourteen nests were located within the greater HEZ area, particularly within Mindaribba land, however one active nest was located south of the large electricity easement, just outside Precinct 1 (Figure 4). This included six active nests, two failed nests,

two fledged nests and four nests with an unknown status (Biosis Research 2008). See Figure 2 for details of the nests located. Nests were most often located within Lower Hunter Spotted Gum-Ironbark Forest, within either Broad-leaved Ironbark (*Eucalyptus fibrosa*) or Spotted Gum (usually within a mistletoe in the latter) (Biosis Research 2008). Hunter Lowland Redgum Forest, containing Grey Gum (*Eucalyptus punctata*) and the Forest Red Gum (*Eucalyptus tereticornis*), may also be utilised by the Regent Honeyeater for nesting (D. Geering, *pers. comm.*). One active nest in a Grey Gum was observed during the December 2007 surveys. Trees containing nests varied greatly in size, from 20 cm diameter at breast height (DBH) to >60 cm DBH. These surveys indicated that some successful breeding had occurred on-site. Twelve juveniles of varying ages were seen during the survey, including a flock of five juveniles (Biosis Research 2008). Juvenile flocks were also observed by local birdwatchers (Hunter Bird Observers Club) within the same season. It is also possible that some of the breeding may have occurred in the Quorrobolong area, where breeding has been recorded previously and in the current season (A. Morris, *pers. comm*.).

While there is only one record of breeding immediately adjacent to Precinct 1, the habitat is of a similar quality to that where the main breeding records were found. Clearing from the Precinct 1 Part 3A application would remove 88.0 ha of potential habitat, but not create any new edge effects. Approximately 5.2 ha of the vegetation to be cleared is currently unaffected by edge effects.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) would remove 109 ha of Regent Honeyeater habitat and will lead to edge effects on 137 ha of habitat. Taking into account existing edge effects, the clearing would result in direct impacts of 74 ha with an additional 77 ha edge-effected (totalling 151 ha). The land where the majority of breeding records were located is privately owned, and is therefore not protected. Cumulative impacts from clearing within Precinct 1 would cause edges with habitat to the north, which have lead to colonisation by Noisy Miners and other hyperagressive species, which in turn could reduce the area of available breeding and foraging habitat for the Regent Honeyeater. Disruption of breeding habitat within the greater HEZ area could reduce the potential for future breeding, which could cause a long-term decline in the genetic diversity of the species within the locality.

The HEZ Estate (and Precinct 1) contain both summer and winter foraging habitat. Two of the dominant vegetation types, Lower Hunter Spotted Gum-Ironbark Forest and Hunter Lowland Redgum Forest, contain abundant winter-flowering Spotted Gum (*Corymbia maculata*), as well as species such as Forest Red Gum (*Eucalyptus tereticornis*).

The cumulative impacts from the removal of breeding and foraging habitat within Precinct 1 and impacts on breeding and foraging habitat within the HEZ site is likely to disrupt the life cycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population.

Conclusion:

Approximately 5.2 ha of non-edge effected potential foraging and breeding habitat would be impacted (directly and indirectly) by the Precinct 1 Part 3A application and this represents 0.1 % of potential habitat in the locality. This is not considered to represent a significant proportion of the species habitat.

The cumulative impacts of the HEZ development (currently approved development and Precinct 1 Part 3A application) involves clearing of 109.0 ha of potential habitat. Taking into account existing edge effects 151 ha of potential habitat for the Regent Honeyeater would be impacted (directly and indirectly), which represents 2.6% of potential habitat within the locality. The population in the HEZ LEP area is considered an ecologically significant proportion of the entire Regent Honeyeater population. Given the significance of recent the breeding event in the immediate area, the potential for breeding in the future, and that the habitat to be impacted by the proposal is considered to be highly important for the long term survival of the species in the locality, and probably, for the species as a whole, there is a possibility that the cumulative impacts of the action could lead to a long-term decrease in the size of the local Regent Honeyeater population.

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5. Figures

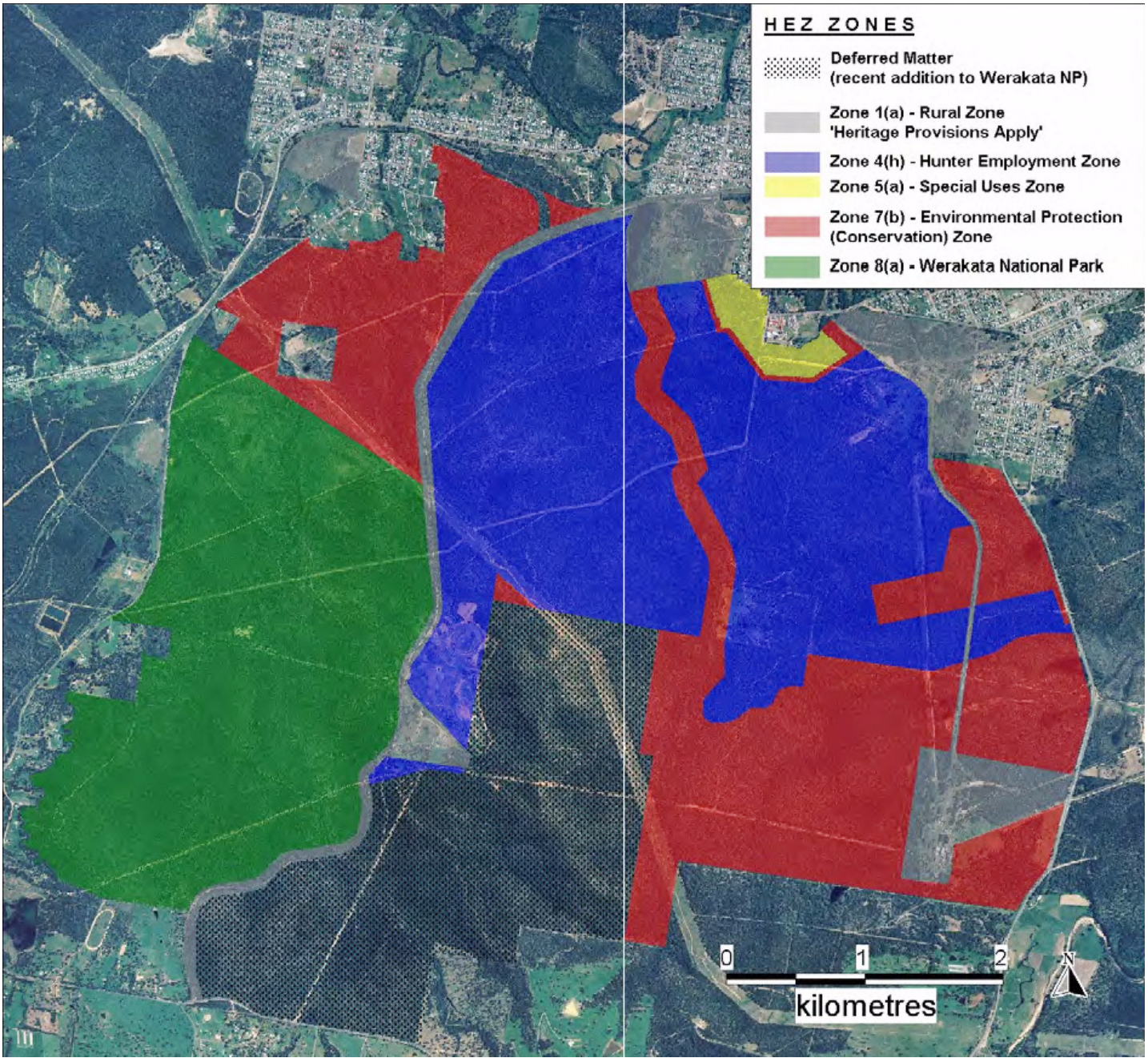

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Figure 1: Hunter Economic Zones

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Checked by: RH	File number: S5236
Loc:5000\5200s\5236\Mapping\S5236 F1_overview.WOR	

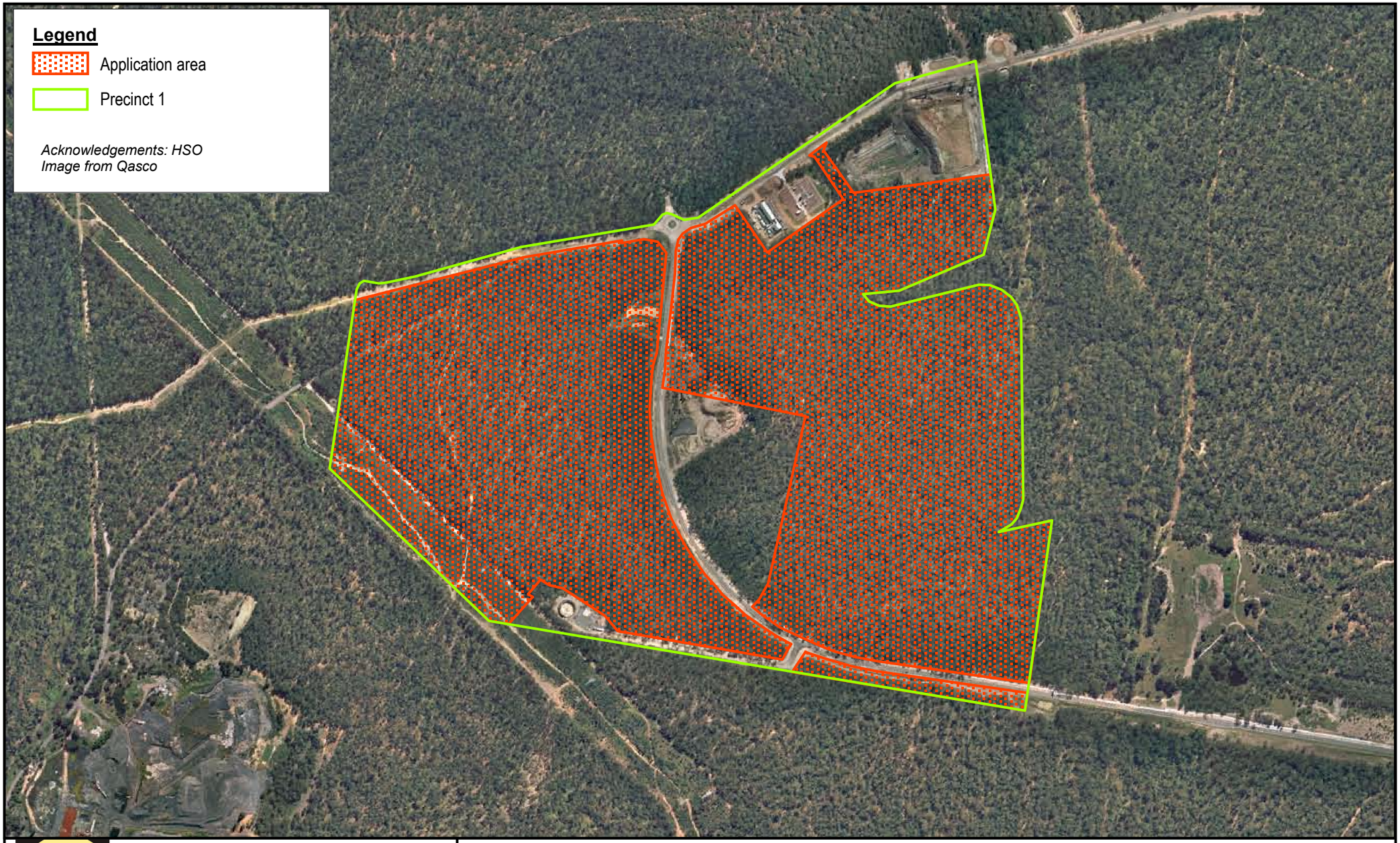

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Figure 2: Area of Precinct 1 under consideration in the Part 3A assessment, excluding approvals where vegetation has already been cleared

Date: 4 November 2008
Checked by: RH
File number: S5236
Location:-..5000\5200s\5236\Mapping\S5236 F2_application.WOR

Scale: 0 0.1 0.2 0.3 0.4 0.5 kilometres

N W E S

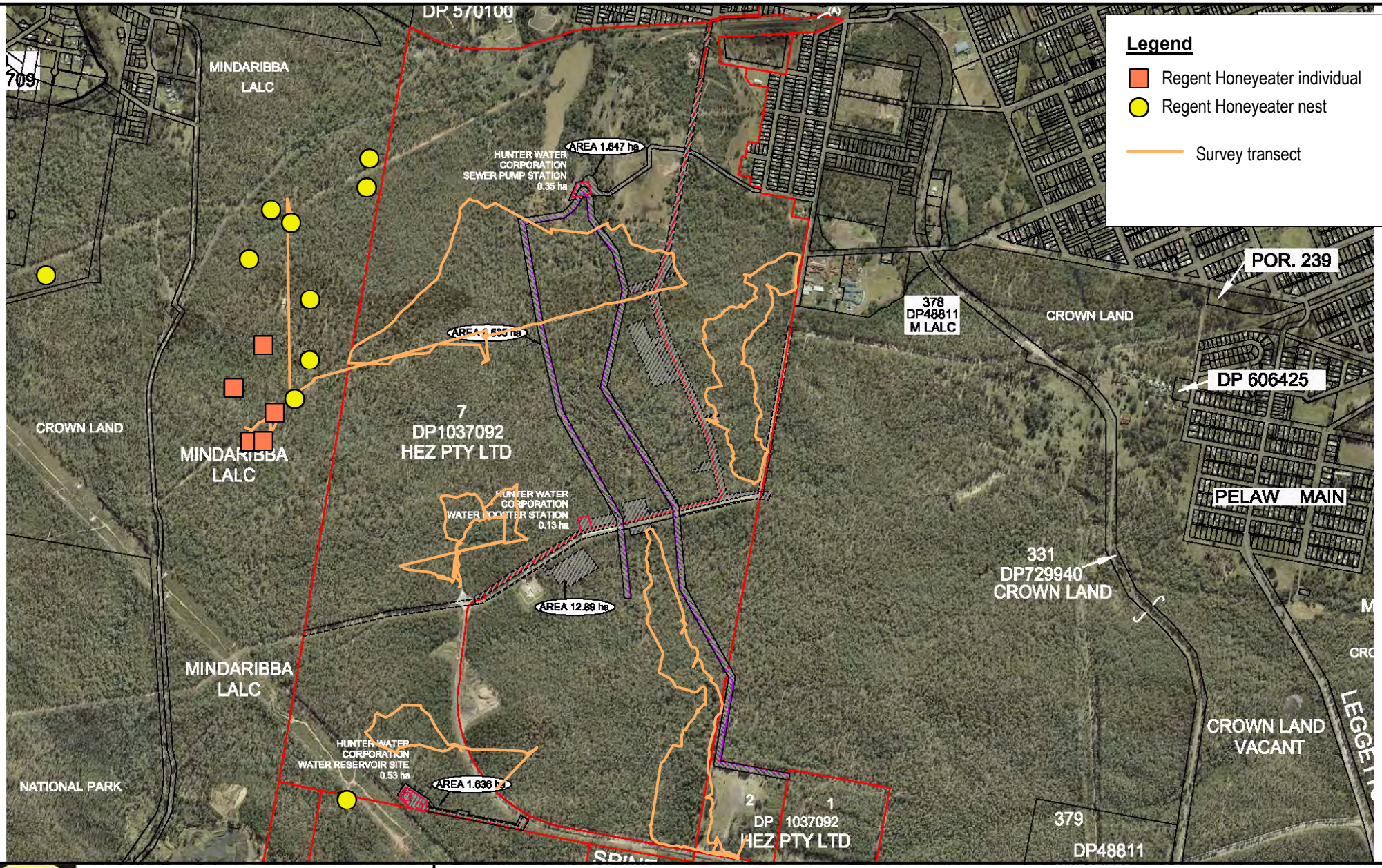

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Figure 3: Results of survey

Date: 4 November 2008

Checked by: KMC | File number: S4964

Location:-5000\5200s\5236\Mapping\S5236 F3_survey.WOR

Scale: 0 0.2 0.4 0.6 0.8 1.0 kilometres

N W E S

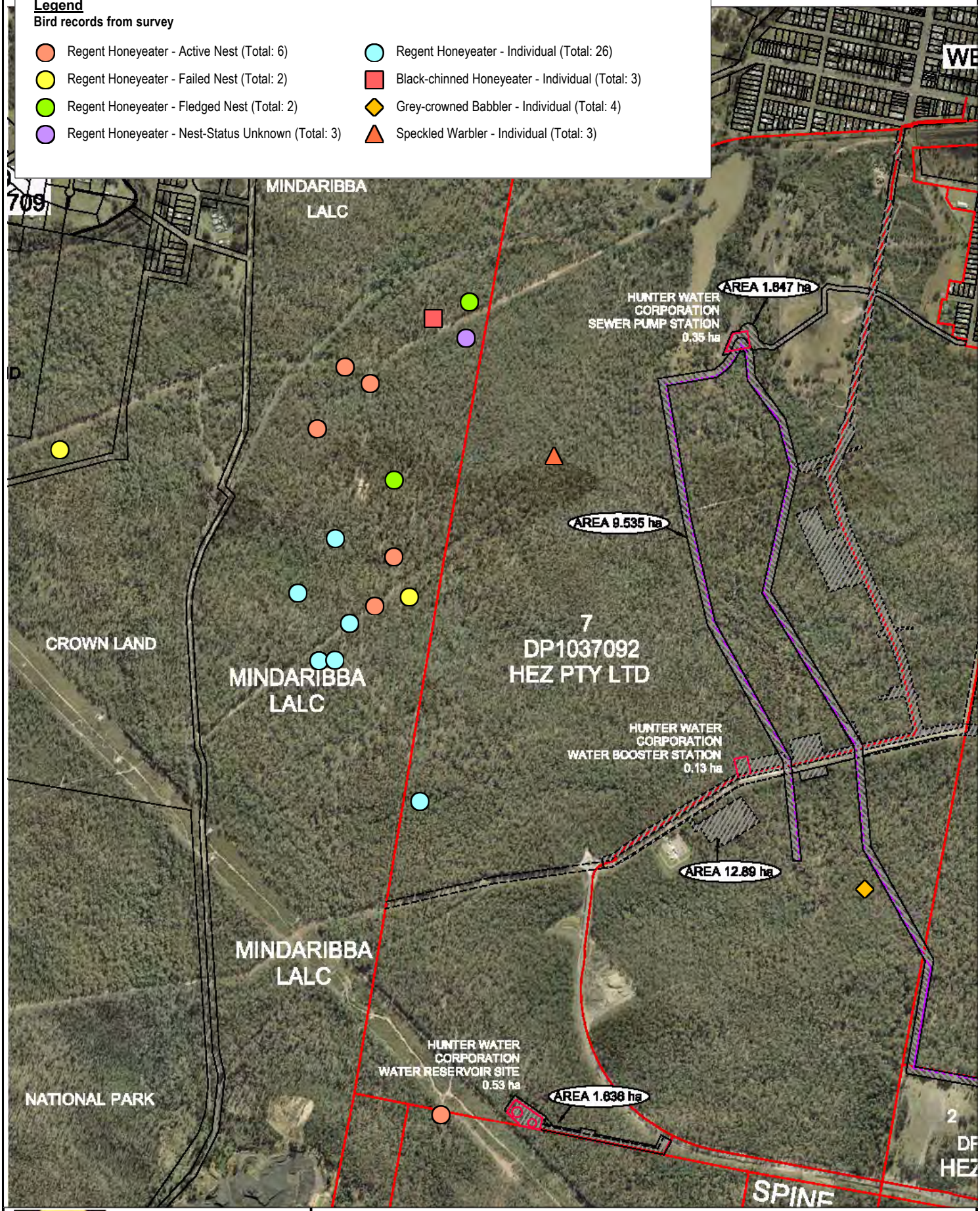

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Figure 4: Survey results

Date: 4 November 2008
Checked by: RH
File number:S5236
Loc:5000\5200s\5236\Mapping\S5236 F4_results.WOR

Scale: 0 0.15 0.3 0.45 0.6 kilometres

N W E S

CESSNOCK ROAD

CESSNOCK ROAD

LEGGETTS LANE

LAKE ROAD

Legend

Survey areas

- Subject Site
- Study Area
- Subject Site including edge effects
- Study Area excluding existing edge effects

Vegetation communities

- Cabbage Gum Floodplain Woodland
- Central Hunter Swamp Oak Forest (River Oak variant)
- Central Hunter Swamp Oak Forest (Swamp Oak variant)
- Coastal Foothills Spotted gum - Ironbark Forest (main variant)
- Coastal Foothills Spotted Gum - Ironbark Forest (riparian variant)
- Coastal Foothills Transition Forest (E. beyeriana variant)
- Coastal Foothills Transition Forest (E. fergusonii variant)
- Coastal Foothills Transition Forest (stringybark variant)
- Ellalong Grey Gum - Stringybark - Apple Forest (type variant)
- Freshwater Wetlands (general variant)
- Freshwater Wetlands (Phragmites variant)
- Freshwater Wetlands (Typha variant)
- Grey Gum - Red Gum - Paperbark Forest
- Grey Myrtle - Paperbark Gully Forest
- Kurri Sands Claypan Scrub (E. fibrosa variant)
- Kurri Sands Claypan Scrub (E. parramattensis variant)
- Kurri Sands Drooping Redgum - Stringybark Forest
- Kurri Sands Heath Woodland
- Kurri Sands Paperbark Heath
- Kurri Sands Shrub Forest
- Kurri Sands Shrub Forest (main variant)
- Kurri Sands Stringybark Forest
- Lower Hunter Beyer's Ironbark Low Forest
- Lower Hunter Grey Box Grassy Forest
- Lower Hunter Narrow-leaved Ironbark Forest
- Lower Hunter Spotted Gum - Red Ironbark Forest (main variant)
- Paperbark Depression Forest
- Quorrobolong Scribbly Gum Forest (Nth Mulbring variant)
- Red Ironbark - Paperbark Forest
- Riparian Apple - Grey Gum Dune Forest
- Riparian Grey Box - Ironbark Clay Forest
- Riverine Apple - Grey Gum Dune Forest
- Sandstone Hills Bloodwood Woodland
- Sandstone Hills Transition Forest (C. eximia variant)
- Sandstone Hills Transition Forest (C. gummifera variant)

Acknowledgements: Vegetation from Stephen Bell

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Figure 5: Vegetation within the vicinity of the Study Area

Date: 4 November 2008

Checked by: KMC | File number: S5236

Location:-5000\5200s\5236\Mapping\S5236 F5_vegcomm.WOR

Scale: 0 0.3 0.6 0.9 1.2 1.5 kilometres

Figure 5: Vegetation within the vicinity of the Study Area