



Flora & Fauna Assessment

Hunter Economic Zone

**WIPS Management Industrial
Development**

**Prepared for:
WIPS Management**

Reference 23403 – December 2007



HARPER
SOMERS
O'SULLIVAN

PLANNING ▸ SURVEYING ▸ ECOLOGY

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PROJECT: FLORA & FAUNA ASSESSMENT, HEZ – WIPS MANAGEMENT	
CLIENT:	WIPS MANAGEMENT
REFERENCE NUMBER	23403
DATE:	DECEMBER 2007
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1 INTRODUCTION

RPS Harper Somers O'Sullivan Pty Ltd (RPS HSO) was commissioned by WIPS Management to undertake a flora and fauna assessment for a proposed WIPS Management Industrial Development within the 'Hunter Economic Zone' (HEZ), Cessnock LGA (termed the 'subject site').

As the proposal will involve the clearing of native vegetation and habitat for threatened species and an Endangered Ecological Community (EEC), it will need to be assessed in accordance with the relevant provisions of the *Environmental Planning and Assessment Act 1979* (EPA Act 1979) and the *Threatened Species Conservation Act 1995* (TSC Act 1995).

This Flora and Fauna Assessment complies with all relevant State and Commonwealth threatened species legislation and planning instruments. The report assesses the impacts of the proposal on all fauna and flora species, populations and ecological communities that are applicable to the proposal.

The results of the Ecological Constraints Master Plan (ECMP) data have been used to achieve adequate conservation outcomes for all of the threatened species and EEC's within the HEZ Study Area, which culminated in the Department of Environment and Conservation (DEC) issuing an assumed concurrence for the development of the HEZ, in March 2005. This document advises that Council (and determining authorities under Part 5 assessment under the EPA Act) can assume concurrence for permissible development (as per the Local Environment Plan) in accordance with clause 64 of the *EP&A Regulation 2000*, provided the conditions within Attachment 1 of the concurrence document are met (Appendix B).

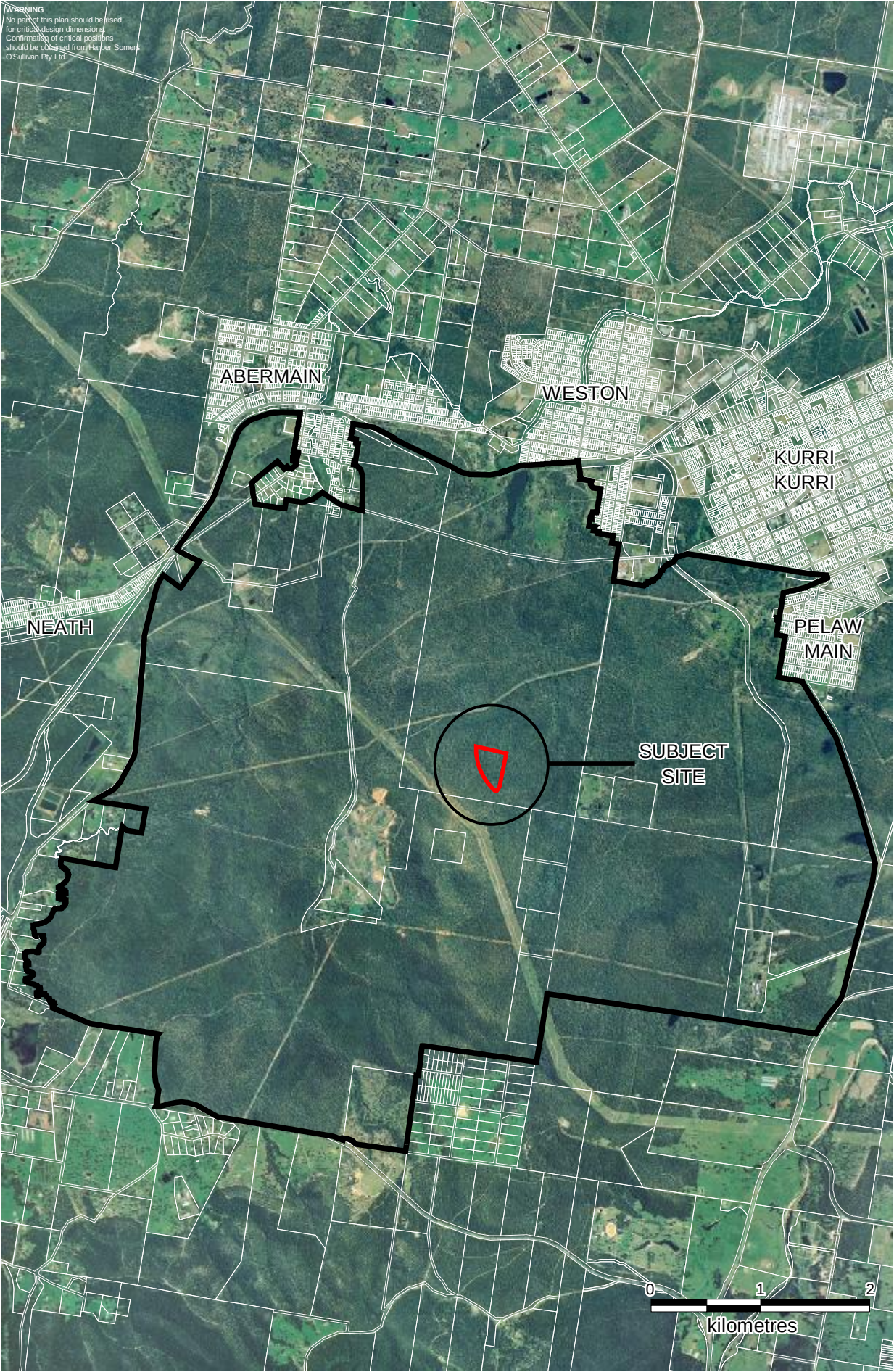
A total of twenty-eight threatened species and four EEC's have been recorded within the HEZ Study Area to date. Of these, twenty-one threatened species and one EEC have been identified as having at least a moderate probability of being affected by the proposal. Application of Section 5A of the *EP&A Act* (Seven-Part Tests) to these species/community indicated that no significant impacts would be expected as a consequence of the proposal.

1.1 Site Particulars

- **Locality** – the proposal is located within the HEZ LEP area, specifically within the Zone No. 4(h) – Hunter Employment Zone.
- **LGA** – Cessnock.
- **Title(s)** – A site within Lot 7 of DP 1037092.
- **Boundaries** – The study area is bounded by land zoned 4(h) Hunter Employment zone.
- **Current land use** – The majority of the site contains intact native bushland with approximately 1.3ha of cleared land in the northwest corner.

The proposal in relation to the HEZ site is shown in Figure 1-1. An aerial photograph showing the extent of the proposal is shown in Figure 1-2.

WARNING
No part of this plan should be used
for critical design dimensions.
Confirmation of critical positions
should be obtained from Harper Somers
O'Sullivan Pty Ltd.



LEGEND

HEZ Study Area

Subject Site Boundary



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ASSESSMENT

CLIENT: WIPS MANAGEMENT

TITLE: SITE LOCATION

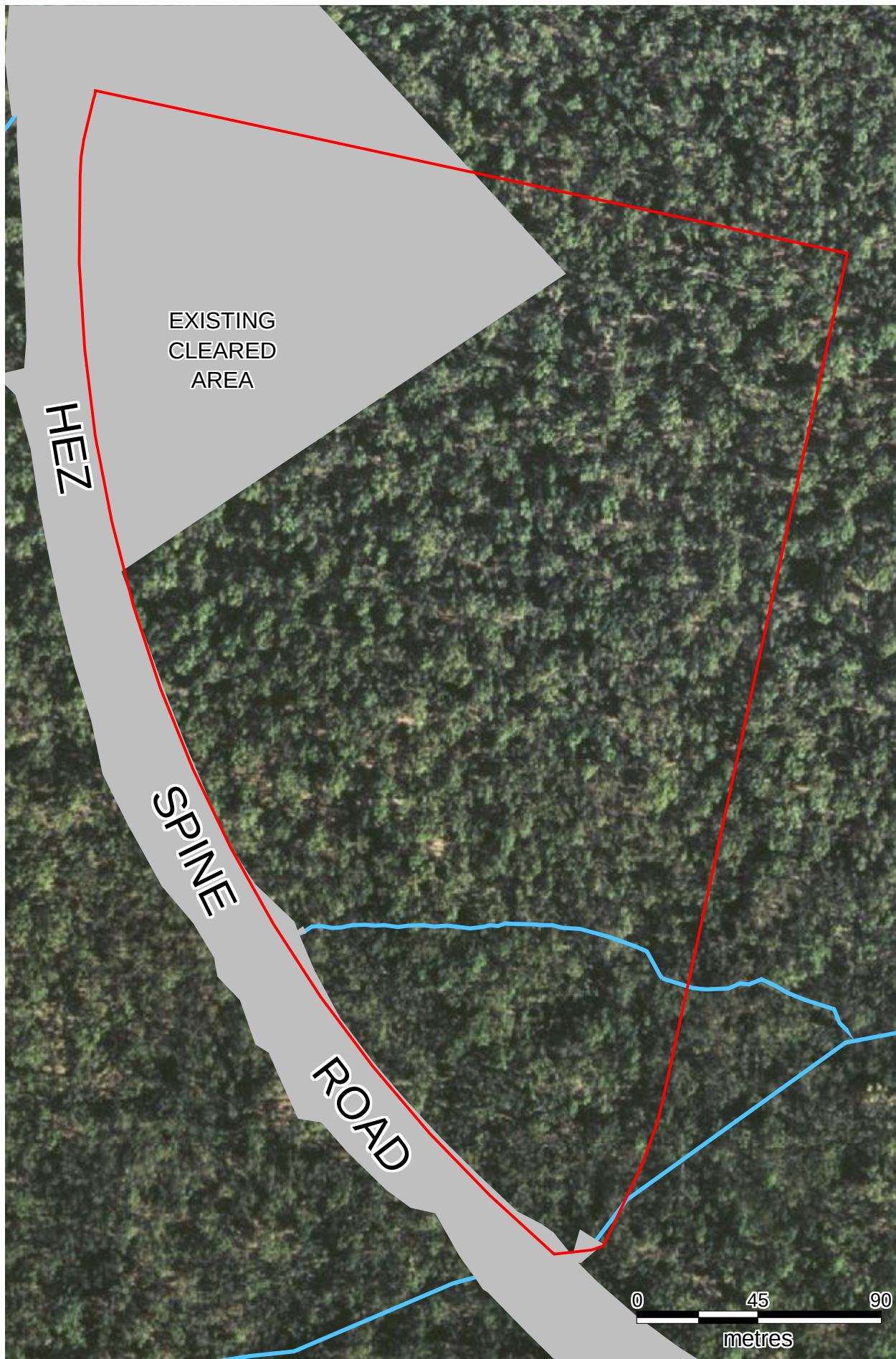
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FIGURE: 1-1
PAGE: 2

CONTOUR INTERVAL:	N/A	DATUM:	MGA Zone 56 (GDA)
SCALE:	1: 50000 at A4 Size	JOB NUMBER:	23403
DATE:	15/6/2007		
DRAWN:	D. Landenberger		



LEGEND

- Site Boundary
- Existing Cleared Area
- Creek



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 ASSESSMENT

CLIENT:
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TITLE:
 AERIAL PHOTOGRAPH

CONTOUR INTERVAL:	N/A	DATUM:	MGA Zone 56 (GDA 94)
SCALE:	1: 2000 at A4 Size	JOB NUMBER:	23403
DATE:	18/6/2007		
DRAWN:	D. Landenberger		

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FIGURE: 1-2
 PAGE: 3



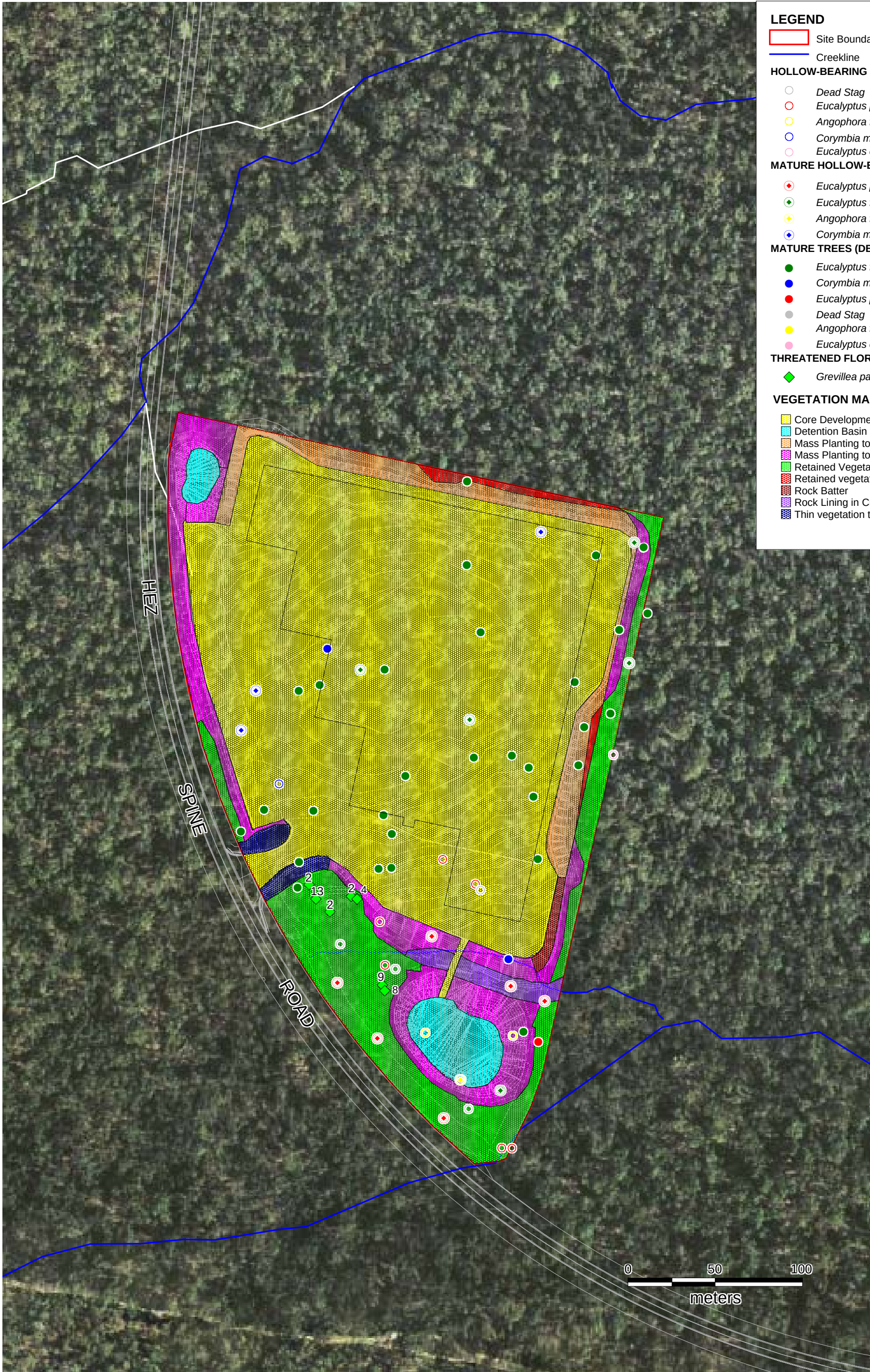
1.2 Description of Proposal

The current proposal is for a WIPS Management development incorporating the construction of a warehouse and office, with appropriate associated landscaping, car parking, access and services.

The works to be carried out as part of the WIPS Management development site located in the HEZ development are as follows:

1. The clearing for and construction of a warehouse and office over an area of approximately 7ha. Other infrastructure will include car parking, access and services.
2. The clearing for and construction of an access to the site, from the HEZ Spine Road, also referred to as HEZ Drive.
3. Conservation and landscaped areas will exist around the internal boundaries of the site. This will include a 10m vegetated buffer along the western boundary, between the site and the HEZ Spine Road. A parcel of existing vegetation that incorporates a creekline within the southern corner of the site will also be retained. The total area of existing vegetation to be retained is approximately 0.96ha. An additional 0.18ha of the area proposed for retention is currently cleared/regenerating due to the past construction of the HEZ Spine Road. Approximately 1.37ha of the site will be dedicated to landscaping, and an additional area of approximately 0.12ha will contain two detention basins.

This type of development is classified as Industrial Development. The development as proposed is shown in Appendix C, whilst Figure 1-3 depicts the impacts associated with the clearing of all vegetation within the nominated proposed core development areas.



LEGEND

- Site Boundary
- Creekline
- HOLLOW-BEARING TREES (DBH <50CM)**
 - Dead Stag
 - Eucalyptus punctata*
 - Angophora floribunda*
 - Corymbia maculata*
 - Eucalyptus capitellata*
- MATURE HOLLOW-BEARING TREES (DBH <50CM)**
 - Eucalyptus punctata*
 - Eucalyptus fibrosa*
 - Angophora floribunda*
 - Corymbia maculata*
- MATURE TREES (DBH >50CM)**
 - Eucalyptus fibrosa*
 - Corymbia maculata*
 - Eucalyptus punctata*
 - Dead Stag
 - Angophora floribunda*
 - Eucalyptus capitellata*
- THREATENED FLORA**
 - Grevillea parviflora ssp. parviflora*
- VEGETATION MANAGEMENT REGIME**
 - Core Development Area
 - Detention Basin Zone 1 and 2 Plantings
 - Mass Planting to Asset Protection Zone
 - Mass Planting to Boundary and Batter
 - Retained Vegetation
 - Retained vegetation through APZ
 - Rock Batter
 - Rock Lining in Creekline
 - Thin vegetation to allow for clear sight



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PROJECT:	FLORA AND FAUNA ASSESSMENT	
CLIENT:	WIPS MANAGEMENT	
TITLE:	VEGETATION MANAGEMENT REGIME	
CONTOUR INTERVAL:	N/A	DATUM: MGA Zone 56 (GDA 94)
JOB NUMBER:	23403	SCALE: 1: 2500 at A3 Size
		DATE: 20/6/2007
		DRAWN: T. Lambert

Layout Ref: H:\HEZ\MAPINFO\23403 - Waltech\Flora and Fauna\23403 Figure 1-3 Vegetation Management Regime A-A4 200807



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FIGURE: 1-3
PAGE: 5



2 METHODS

Detailed ecological investigations have been undertaken over the HEZ site as part of the Ecological Constraints Master Plan (ECMP) process. This information (including methods and results) has been previously presented in detail within a number of Flora and Fauna Assessment Reports conducted within the HEZ by RPS HSO. Most recently, this information has also been incorporated into the revised Habitat Management Strategy (HMS) (RPS HSO, Ecotone, & CCC 2005). A summary of the ECMP methods is presented below in Section 2.1.

The results of the ECMP data have been used to achieve adequate conservation outcomes for all of the threatened species and EEC's within the HEZ Study Area, culminating in the Department of the Environment and Conservation (DEC) issuing an assumed concurrence for the development of the HEZ, in March 2005 (see Appendix B).

In addition to the methods stated below, the subject site was re-visited by Paul Hillier (Ecologist, RPS HSO) on the 22nd March 2006, 12th of July 2006 and an additional visit by Deborah Landenberger (Ecologist, RPS HSO) on 23rd August 2006 to verify the ECMP data and make any necessary changes and observations (as per HMS requirement - Schedule 1(d)).

2.1 Summary of Methods

The following is a summary of ecological investigations undertaken over the entire HEZ study area.

- **Collation of existing flora and fauna datasets and survey reports** – The results of the numerous flora and fauna investigations that have been undertaken within the HEZ to date, in particular threatened species records, have been collated.

Important information sources used include Bell (2001, 2004), Ecotone (1999; 2000, 2002a; 2002b), RPS HSO (2002), NPWS Atlas of NSW Wildlife (2004) and University of Newcastle (2001).

- **Vegetation survey & mapping over the entire HEZ study area** – A detailed vegetation survey and mapping report was undertaken by Stephen Bell (Eastcoast Flora Survey) on behalf of RPS HSO. This was undertaken to replace the broad-scale vegetation maps of the HEZ previously produced by Ecotone (1999; 2000) and House (2003), as well as that previously produced by Bell (2001) within the Werakata National Park section of the study area.
- **Detailed 4(h) development zone surveys and habitat investigations** – Detailed ecological investigations, using high accuracy Differential Global Positioning System (DGPS), were undertaken within the 4(h) development zone and the central 7(b) conservation zone corridor along Chinamans Hollow Creek.
- **Additional targeted threatened species surveys** – In addition to those threatened species surveys previously conducted within the HEZ study area, further targeted surveys for a select number of species were conducted so

that a more comprehensive overview of the occurrence of these species within the HEZ could be attained.

- **Specific targeted threatened flora species surveys** – Previous survey effort for some abundant threatened species, such as *Grevillea parviflora* subsp. *parviflora*, were mapped in grids depicting relative abundance. Recent surveys have been conducted to provide more detailed mapping of this species within the study area.

It is considered that the combined survey effort of the ecological survey reports conducted within the HEZ to date, has satisfied the requirements of Cessnock City Council's Development Control Plan No. 56 "Flora and Fauna Survey Guidelines Lower Hunter Central Coast Region 2002".

3 DESCRIPTION OF THE ENVIRONMENT

Flora

One vegetation community occurs on the subject site, namely Lower Hunter Spotted Gum-Ironbark Forest (LHSGIF). This community is listed as an EEC under the *TSC Act 1995* (refer to Figure 3-1).

One threatened flora species has been recorded within the subject site, namely *Grevillea parviflora* subsp. *parviflora*. *G. parviflora* subsp. *parviflora* is listed as Vulnerable under the *TSC Act* and the *EPBC Act*.

It was also noted that *Macrozamia flexuosa* (Burrawang) listed as a Rare or Threatened Australian Plant (ROTAP) was recorded in high densities within the LHSGIF during these and previous investigations. *Grevillea montana* was also found in high densities, scattered throughout the site. This species is also considered to be of regional significance.

Within the wider HEZ Study Area, a total of over 382 plant taxa and five vegetation communities have been recorded to date, including nine rare or threatened plant species and five EEC's.

Fauna

A total of 239 vertebrate fauna taxa have been recorded within the HEZ Study Area to date, including 28 threatened species. The subject site occurs as a relatively small component of the wider HEZ Study Area and the fauna species known to occur on the site are considered to be typical of the habitats present.

Threatened fauna species that have been recorded in the immediate vicinity of the site (within 0.5km) include Grey-crowned Babbler, Black-chinned Honeyeater, Brown Treecreeper and Yellow-bellied Glider. Squirrel Glider and Powerful Owl have been recorded within 2km of the subject site.

Habitat Attributes

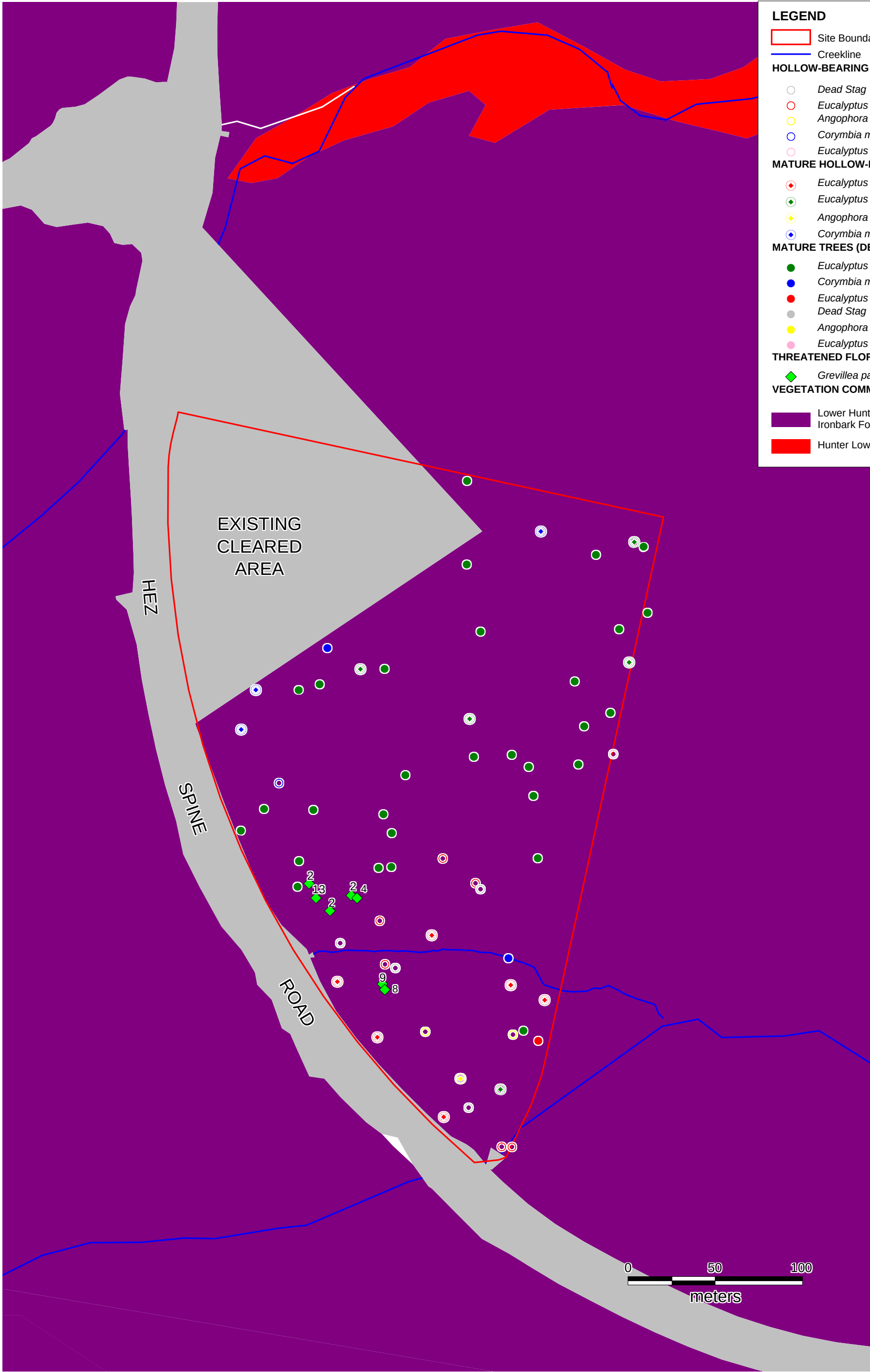
36 keystone mature trees, namely *Angophora floribunda* (Rough-barked Apple), *Eucalyptus capitellata* (Brown Stringybark), *Eucalyptus fibrosa* (Broad-leaved Ironbark), *Eucalyptus punctata* (Grey Gum), dead stag and *Corymbia maculata* (Spotted Gum) occur within the subject site. 15 mature hollow-bearing trees (DBH <50cm) and 14 hollow-bearing trees (DBH >50cm) occur within the subject site, providing potential roosting habitat for microchiropteran bats and medium-sized arboreal mammals such as gliders.

The ecological attributes of the subject site, which would be removed by the proposal is summarised in Table 3-1.

Table 3-1 Ecological Attributes of the Site

Detail	Removal/Impact	Comments
Area of Subject Site	Approx. 7.79 hectares	
Total Area of Vegetation on Site	Approx. 5.89 hectares	
Total Area of Vegetation to be Removed - Lower Hunter Spotted Gum / Ironbark Forest (LHSGIF)	Approx 4.93 hectares	Additional native vegetation may be retained within proposed landscaped areas
Vegetation Types to be Retained - Lower Hunter Spotted Gum / Ironbark Forest (LHSGIF)	Approx. 0.96 hectares	Additional native vegetation may be retained within proposed landscaped areas
Hollow-bearing Trees to be retained - Hollow-bearing trees - Small-sized Hollows - Medium-sized Hollows - Large-sized Hollows Hollow bearing Trees to be removed - Hollow-bearing trees - Small-sized Hollows - Medium-sized Hollows - Large-sized Hollows - Total hollow-bearing trees / hollows - Percentage retention	8 8 4 3 6 6 2 1 14 / 24 8 / 57%	Total number of hollow-bearing trees Entrance Diameter 2-10cm Entrance Diameter 11-20cm Entrance Diameter >20cm Total number of hollow-bearing trees Entrance Diameter 2-10cm Entrance Diameter 11-20cm Entrance Diameter >20cm
Keystone Mature Hollow bearing Trees to be retained - Keystone Mature Hollow-bearing trees - Small-sized Hollows - Medium-sized Hollows - Large-sized Hollows Keystone Mature Hollow bearing Trees to be removed - Keystone Mature Hollow-bearing trees - Small-sized Hollows - Medium-sized Hollows - Large-sized Hollows - Total Keystone Mature hollow-bearing trees / hollows - Percentage retention	3 4 4 2 12 24 7 0 15/ 41 3 / 20%	Total no. of Keystone Mature hollow-bearing trees Entrance Diameter 2-10cm Entrance Diameter 11-20cm Entrance Diameter >20cm Total no. of Keystone Mature hollow-bearing trees Entrance Diameter 2-10cm Entrance Diameter 11-20cm Entrance Diameter >20cm
Keystone Mature Trees to be retained - <i>Eucalyptus fibrosa</i> (Broad-leaved Ironbark) Keystone Mature Trees to be removed - <i>Corymbia maculata</i> (Spotted Gum) - <i>Eucalyptus punctata</i> (Grey Gum) - <i>Eucalyptus fibrosa</i> (Broad-leaved Ironbark) - <i>Angophora floribunda</i> (Rough-barked Apple) - <i>Eucalyptus capitellata</i> (Brown Stringybark) - Dead Stag - Total Mature Trees - Total retained - Percentage retained	4 32 2 1 26 1 1 1 36 4 11%	
Threatened Flora Species to be retained - <i>Grevillea parviflora</i> subsp. <i>parviflora</i> Threatened Flora Species to be retained - <i>Grevillea parviflora</i> subsp. <i>parviflora</i> - Total <i>Grevillea parviflora</i> - Percentage retention	14 plants (40 stems) 14 plants (40 stems) 14 plants (40 stems) 100%	The majority of the study area represents potential habitat for this species.

Rare Flora Species habitat to be modified - <i>Grevillea montana</i> - <i>Macrozamia flexuosa</i>	Approx. 3.97 ha of occupied habitat Approx. 4.93 ha of occupied habitat	Occurs in High Density areas. Occurs in High Density areas.
Threatened Fauna Species to be Impacted Upon At least 20 species have the potential to be impacted upon. Species recorded in the immediate vicinity of the road include: Grey-crowned Babbler, Black-chinned Honeyeater, Brown Treecreeper, Yellow-bellied Glider, Squirrel Glider and Powerful Owl.	Various	Degree of impact dependent on numerous factors including individual species range, abundance, habitat utilisation etc.
Other Ecological Attributes Allocasuarina sp. Mistletoe sp. Hollow / Fallen Timber Understorey Diversity Understorey Nectar Logging / Firewood Collection Fire History / Impact Erosion / Soil Disturbance Rubbish Dumping Weeds Feral Animals	Present in sections Present over majority Low Density Low - Moderate Moderate over majority Moderate Moderate Light Light Absent Absent	



LEGEND

Site Boundary

Creekline

HOLLOW-BEARING TREES (DBH <50CM)

Dead Stag

Eucalyptus punctata

Angophora floribunda

Corymbia maculata

Eucalyptus capitellata

MATURE HOLLOW-BEARING TREES (DBH <50CM)

Eucalyptus punctata

Eucalyptus fibrosa

Angophora floribunda

Corymbia maculata

MATURE TREES (DBH >50CM)

Eucalyptus fibrosa

Corymbia maculata

Eucalyptus punctata

Dead Stag

Angophora floribunda

Eucalyptus capitellata

THREATENED FLORA

Grevillea parviflora ssp. parviflora

VEGETATION COMMUNITIES

Lower Hunter Spotted Gum Ironbark Forest

Hunter Lowland Redgum Forest



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CLIENT:	WIPS MANAGEMENT	
TITLE:	VEGETATION COMMUNITIES	
CONTOUR INTERVAL:	N/A	DATUM: MGA Zone 56 (GDA 94)
JOB NUMBER:	23403	SCALE: 1: 2500 at A3 Size
		DATE: 20/6/2007
		DRAWN: D. Landenberger

Layout Ref: H:\HEZ\MAPINFO\23403 - Walltech\Flora and Fauna\23403 Figure 3-1 Vegetation Map A-A4 200807

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FIGURE: 3-1
PAGE: 11

Where industry thrives

4 ECOLOGICAL ASSESSMENT OF THE PROPOSAL

4.1 Summary of Ecological Impacts

The proposal will involve clearing during construction and on-going maintenance and management operations of the site.

Clearing operations will involve the removal of vegetation over an area of the subject site, totalling approximately 4.93 ha of vegetation, consisting of LHS GIFF. Some native vegetation will be retained within the south of the site and along the western boundary, totalling approximately 0.93ha. Additionally approximately 1.37ha of the site will be revegetated within landscaping. Up to 32 keystone mature trees, 12 mature hollow bearing trees and 18 hollow bearing trees, containing a combined total of 40 hollows may require removal for the development of the site. 11 hollow bearing trees, containing a combined total of 25 hollows will be retained within conserved vegetation (refer to Figure 1-3).

Much of the subject site represents potential habitat for *Grevillea parviflora* subsp. *parviflora*. Detailed surveys mapped 40 individual *G. parviflora* subsp. *parviflora* stems (approximately 14 actual plants) in the southwest of the site (Figure 3-1), all of these plants will be retained within the proposed retained habitat areas within the subject site.

Although not recorded within the site, potential habitat for two other threatened flora species exists within the study site, namely *Rutidosia heterogama* and *Callistemon linearifolius*.

A small creekline that traverses the southeastern corner of the subject site is proposed to be retained within a vegetated buffer. Runoff from the site will feed into a detention basin directly north of the creek, thus limiting potential water quality impacts to the creek. A feeder creek to this southern creek, which traverses the site, is likely to be impacted upon by the proposed development.

Whilst the development proposal can be seen to be incrementally impacting upon the ecological attributes of the HEZ remnant, this impact is consistent with the agreed conservation outcomes for the HEZ. Of the threatened fauna species most likely to occur within the subject site, the Yellow-bellied Glider is considered to be most affected due to the relatively high number of observations of this species within the immediate locality of the site and the removal of a small number of hollows potentially suitable for this species. This impact is however not considered to be significant.

4.2 Threatened Species Assessment

4.2.1 Identification of Subject Species

Twenty-three threatened species and one EEC have been identified as occurring on the subject site or as having at least a moderate probability of being affected by development of the site. Therefore, a seven-part test for these species / community has been undertaken under the guidelines of Section 5A of the *EP&A Act* (see Appendix A). These species / community include:

Threatened Flora

- *Callistemon linearifolius*
- *Grevillea parviflora* subsp. *parviflora*
- *Rutidosia heterogama*

Threatened Fauna

- | | |
|---|--------------------------|
| • <i>Litoria brevipalmata</i> | Green-thighed Frog |
| • <i>Lathamus discolor</i> | Swift Parrot |
| • <i>Neophema pulchella</i> | Turquoise parrot |
| • <i>Callocephalon fimbriatum</i> | Gang-gang Cockatoo |
| • <i>Ninox strenua</i> | Powerful Owl |
| • <i>Tyto novaehollandiae</i> | Masked Owl |
| • <i>Chthonicola sagittata</i> | Speckled Warbler |
| • <i>Pomatostomus temporalis temporalis</i> | Grey-crowned Babbler |
| • <i>Climacteris picumnus victoriae</i> | Brown Treecreeper |
| • <i>Melithreptus gularis gularis</i> | Black-chinned Honeyeater |
| • <i>Xanthomyza phrygia</i> | Regent Honeyeater |
| • <i>Stagonopleura guttata</i> | Diamond Firetail |
| • <i>Lophoictinia isura</i> | Square-tailed Kite |
| • <i>Petaurus australis</i> | Yellow-bellied Glider |
| • <i>Petaurus norfolkensis</i> | Squirrel Glider |
| • <i>Miniopterus australis</i> | Little Bentwing-bat |
| • <i>Miniopterus schreibersii</i> | Eastern Bentwing-Bat |
| • <i>Mormopterus norfolkensis</i> | East-coast Freetail-bat |
| • <i>Falsistrellus tasmaniensis</i> | Eastern Falsistrelle |
| • <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat |

Endangered Ecological Community

- Lower Hunter Spotted Gum - Ironbark Forest

4.2.2 Section 5A of the EP&A Act (Seven Part Test) Considerations

The NSW DEC issued an "Assumed Concurrence for the Hunter Economic Zone (HEZ)" in March 2005 (see Appendix B). This document advises that determining authorities can assume concurrence for permissible development (as per the Local Environment Plan) in accordance with clause 64 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation 2000), provided the conditions within Attachment 1 of the concurrence document are met.

Application of Section 5A of the EP&A Act (Appendix A – Seven-Part Tests) to the affected species/community indicated that no significant impacts would be expected as a consequence of the proposal.

4.3 Key Threatening Process (KTP)

The KTP's relevant to this proposal are addressed in detail below. A threatening process is defined in the TSC Act as a process that threatens, or could threaten, the

survival or evolutionary development of species, populations or ecological community. Something can be a threat if it:

- adversely affects threatened species, populations or ecological communities; or
- could cause species, populations or ecological communities that are not currently threatened to become threatened.

Again, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

KTP's are listed in Schedule 3 of the TSC Act. Those most applicable to the current proposal (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Bushrock Removal;
- Removal of dead wood and dead trees; and
- Invasion of native plant communities by exotic perennial grasses.

One preliminary determination 'Loss of Hollow-bearing Trees' is also considered as it is applicable to the current proposal.

Clearing of Native Vegetation

This process is considered the most relevant KTP matter resulting from the proposal. This process can be seen to be applicable to any proposal involving clearing of native vegetation, which encompasses a wide variety of proposed land-use activities.

Key matters as described within the Final Determination of this process that may be at least in part applicable to the proposed development include direct loss of habitat, fragmentation, riparian zone degradation, increased greenhouse gas emissions, increased habitat for invasive species, loss of leaf litter layer, loss or disruption of ecological function, and changes to soil biota.

The proposed development will result in direct loss of approximately 4.93ha of LHGSGIF. This area provides habitat resources for a diverse assemblage of flora and fauna species, including threatened species. The proposed development will also act to facilitate future clearing of surrounding areas of bushland within the 4(h) zone.

Whilst the area of direct impact can be seen to be relatively minor within the context of the greater HEZ site, it is apparent that the proposed development can be seen to be a contributing factor to the detrimental process of Clearing of Native Vegetation on the threatened species present within the HEZ.

However, in saying this, the broader conservation outcomes achieved in the HEZ rezoning process have been based on conserving representative areas of each habitat unit occurring within the study area. The maintenance of biodiversity was a fundamental aim of this representative area conservation approach.

Bushrock Removal

Whilst some bushrock does occur within the study area, particularly on Tomalpin Hill slopes and surrounds, such occurrence within the site is limited to isolated areas such as incised headwater areas.

Any removal of bushrock would be minimal in extent, and isolated in occurrence. No threatened species recorded on the site are known to be detrimentally affected by bushrock removal. Similarly, none of the flora & fauna species recorded on the site are listed within the Final Determination of this process by the NSW Scientific Committee.

Removal of dead wood and dead trees

The HEZ occurs in an area of bushland that is somewhat degraded from previous and ongoing degradation regimes, and therefore critical resources for threatened fauna species including dead wood and dead trees are relatively sparse. The proposal will occur over an area mapped as containing a low density of this habitat resource.

Whilst the construction of the proposed WIPS Management development would result in the further decline of these resources, it is noted that Schedule 5 of the Habitat Management Strategy (RPS HSO, Ecotone, & CCC 2005) recommends that potential habitat resources such as hollow and fallen timber within development areas be placed into adjacent areas of bushland to improve potential habitat resources within the patches of retained vegetation. Schedule 10 of the HMS also recommends that nest boxes be installed to compensate for the loss of tree hollows.

Invasion of native plant communities by exotic perennial grasses

Dense monocultures of perennial grasses that develop after invasion threaten local vegetation. This may result in local and regional declines of many native species and communities including threatened species such as *Rutidosia heterogama*, the Speckled Warbler and the Grey-crowned Babbler that have been recorded within the greater study area of the HEZ. Many of the perennial exotic grasses establish following disturbances such as construction works.

Whilst clearing for the construction of the proposed WIPS Management development may inadvertently create a disturbed area for many perennial exotic grasses to establish, implementation of control and management measures will help to create an environment within which these exotic perennial grasses do not thrive. Furthermore, the proposal is unlikely to instigate this KTP in an area that has already shown much evidence of the invasion of perennial grasses from past disturbances.

It is noted that Schedule 7 of the Habitat Management Strategy (HMS) (RPS HSO, Ecotone, & CCC 2005) recommends that a regular weed eradication and control program be established to prevent areas from potential colonisation of introduced and invasive undesirable plant species.

Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands

The modification of lands for development will invariably result in some alteration to the natural flow regimes of the ephemeral drainage lines that feed from the site down to the central Creek. This KTP is most applicable to the Green-thighed Frog, however

the most suitable habitat for this species is considered to be the central creek, which will be retained intact with vegetated buffers.

The increase in impermeable surfaces associated with development may contribute to increased runoff and flows within associated Creeks. The Water Cycle Management Strategy (PB 2004) has been produced as a guiding document to prevent significant alterations of creek flows such that water quality or retained riparian/aquatic vegetation does not become increasingly degraded.

Infection of native plants by *Phytophthora cinnamomi*

Phytophthora cinnamomi is listed as a Key Threatening Process (KTP) under the *Threatened Species Conservation Act 1995 (TSC Act)*. *P. cinnamomi* is a water mould (like a fungus) that attacks the roots of susceptible plants, in many cases killing the plants. In some native plant communities, epidemic disease can develop causing the death of large numbers of plants.

P. cinnamomi may spread with the movement of infected soil or plant material by people or animals and may be transported by water percolating through the soil, in creeks or storm runoff. People can also transport the fungus to new areas on dirt adhering to vehicles, items they are carrying or footwear.

Humans have the capacity to spread the fungus long distances and across barriers which sets us apart from the natural mechanisms for spread. There is practically nothing that can be done to control the natural spread of the fungus or to destroy it, in the native plant communities.

The extent and impact of *P. cinnamomi* is difficult to ascertain, particularly due to a lack of literature for the local area. This KTP must therefore be regarded as potentially applicable to this development.

Loss of Hollow-bearing Trees – Preliminary Determination

Many native fauna are reliant on hollow-bearing trees for shelter and nests, these include 46 mammals, 85 birds, 32 reptiles and 16 frogs. Of these 45 fauna species are listed as threatened on the TCS Act 1995.

Hollows develop following consumption and decay of internal heartwood by fungi and invertebrates, primarily termites. Hollows most commonly occur within myrtaceous trees, basal tree diameter is directly correlated to size and abundance of hollows within each tree.

Many bird, reptile and mammal species are known to move between hollows to reduce parasite infestation, reduce risk of predation, provide thermal microclimates and allow energy-efficient access to foraging areas. Some species also show preference to different hollow types eg hollow entrance size. Mammals prefer hollows with a small entrance when breeding to reduce the risk of predation. There is experimental evidence to suggest that the number of hollows may be limiting resources, and that recovery of threatened hollow-using fauna would benefit from their greater availability.

Supplementation of hollows using nest boxes, when hollows were limiting found that a higher percentage of bird species used nest boxes. Mature trees also provide other resources such as nectar, flowers, fruit and seed than younger trees and diverse habitats for invertebrate populations.

Processes which contribute to the loss of hollow-bearing trees include depletion from wildfire, recruitment hindered, health decline and early death, current density typically below optimal, degraded habitat, change in tree species composition, removal of dead wood, clearing of native vegetation, competition with feral honey bees.

It is noted that Schedule 3 of the Habitat Management Strategy (HMS) (RPS HSO, Ecotone, & CCC 2005) recommends habitat compensation measures which include the use of artificial nest boxes and salvageable hollows from clearing activities to be placed in retained habitat areas of each development proposal. Additional artificial nest boxes will also be placed in the conservation zoned areas of the HEZ estate.

4.4 Assessment under the EPBC Act 1999

On the advice of the Department of the Environment and Water Resources (DEW), the construction and ongoing operation of the entire HEZ estate will be assessed as a single 'controlled action' under the provisions of the EPBC Act, rather than as a series of individual proposals.

Therefore the current proposal will not need to be referred to the DEW, however, it is will need to comply with relevant conditions of approval that the DEW may impose upon development within the HEZ estate as part of EPBC Ref: 2004/1417.

5 DISCUSSION & RECOMMENDATIONS

Flora, fauna and habitat surveys undertaken within the subject site and the wider HEZ Study Area as part of the ECMP process have led to the production of this assessment report.

The results of the ECMP data have been used to achieve adequate conservation outcomes for all of the threatened species and EECs within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. This document advises that Council (and determining authorities under Part 5 assessment under the EPA Act) can assume concurrence for permissible development (as per the Local Environment Plan) in accordance with clause 64 of the *EP&A Regulation 2000*, provided the conditions within Attachment 1 of the concurrence document are met (Appendix B).

Through the provision of conservation areas that support threatened flora and fauna and other landscaped areas incorporated within the WIPS Management development, this proposal is considered to be consistent with the conditions of the DEC Assumed Concurrence. Approximately 0.96ha of existing vegetation is to be protected and retained as part of the proposed development, including fencing to exclude construction impacts from the southern creekline and *Grevillea parviflora* plants. A number of mature and hollow-bearing trees are also to be retained as part of this proposal within these retained areas. Further recommendations pertaining to these conditions are provided in Section 5.1 below.

A total of twenty-eight threatened species and four EEC's have been recorded within the HEZ Study Area to date. Of these, twenty-three threatened species and one EEC have been identified as having at least a moderate probability of being affected by the proposal. Application of Section 5A of the *EP&A Act* (Seven-Part Tests) to these species/community indicated that no significant impacts would be expected as a consequence of the proposal.

Potential impacts to threatened species are considered to be relatively minor given the small amount of habitat that would be removed, and the extent and distribution of threatened species / EEC within the HEZ Study Area (to which the subject site is not considered to be a particularly significant resource).

Nonetheless, some incremental impacts associated with the potential clearance of additional habitats within the 4(h) lands must also be acknowledged and taken into consideration with the current proposal.

Whilst the current proposal will not need to be referred to the DEW under the provisions of the EPBC Act, it is likely that it will need to comply with any relevant conditions of approval that the DEW may impose upon development within the HEZ estate under EPBC/1417.

5.1 Recommendations

To minimise the ecological impacts of the proposal, the following recommendations should also be taken into consideration:

- Construction / clearing works should exclude threatened flora species recorded within the subject site. In particular, the identified *G. parviflora* subsp. *parviflora* plants occurring within areas nominated for retention should be protected.
- Any opportunities to retain mature / hollow-bearing trees within proposed landscape areas should be undertaken.
- An ecologist should be present during all clearing operations.
- All fences must be fauna friendly. The use of barbed or razor wire is strictly forbidden.

As per the conditions of the assumed concurrence, the following should also be taken into account:

- The proposed conservation areas should be protected from the indirect impacts of adjacent development (noise, lighting, overshadowing and dust) through the use of appropriate fencing, vegetative buffers and/or planted screens. The vegetation should also be actively managed to control weed infestation, inappropriate access, frequent fire, erosion, rubbish dumping and encourage natural regeneration. Any landscaping should use locally indigenous plants only and compliment the existing natural vegetation.
- A Vegetation Clearing Plan prepared for the site by RPS HSO should be implemented as necessary.

The development proposal should also comply with all other relevant measures detailed in Cessnock City Council's Environmental Management Strategies, with particular reference to the Schedules of the HEZ Habitat Management Strategy (CCC 2005) and the Water Cycle Management Strategy (PB 2004).

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APPENDIX A: SEVEN-PART TESTS

CONSIDERATION UNDER SECTION 5A OF THE EP&A ACT 1979

Considerations of the effects of the proposed development under the guidelines of Section 5A of the EP&A Act for the concerned threatened species/populations/ecological communities are given below.

The majority of information used for the assessment has been sourced from NSW NPWS Threatened Species Information and Environmental Impact Assessment Guidelines, NPWS Atlas of NSW Wildlife and other published or widely available literature sources such as scientific journals and reports.

23 threatened species and one EEC have been identified as occurring on the site or as having at least a moderate probability of being affected by the proposal. Therefore, a seven-part test for these species / communities has been undertaken under the guidelines of Section 5A of the EP&A Act.

Threatened flora species recorded in the study area with some potential to be impacted upon:

- *Callistemon linearifolius*
- *Grevillea parviflora* subsp. *parviflora*
- *Rutidosia heterogama*

Threatened fauna species recorded in the study area with some potential to be impacted upon:

- | | |
|---|--------------------------|
| • <i>Litoria brevipalmata</i> | Green-thighed Frog |
| • <i>Lathamus discolor</i> | Swift Parrot |
| • <i>Neophema pulchella</i> | Turquoise parrot |
| • <i>Callocephalon fimbriatum</i> | Gang-gang Cockatoo |
| • <i>Ninox strenua</i> | Powerful Owl |
| • <i>Tyto novaehollandiae</i> | Masked Owl |
| • <i>Chthonicola sagittata</i> | Speckled Warbler |
| • <i>Pomatostomus temporalis temporalis</i> | Grey-crowned Babbler |
| • <i>Climacteris picumnus victoriae</i> | Brown Treecreeper |
| • <i>Melithreptus gularis gularis</i> | Black-chinned Honeyeater |
| • <i>Xanthomyza phrygia</i> | Regent Honeyeater |
| • <i>Stagonopleura guttata</i> | Diamond Firetail |
| • <i>Lophoictinia isura</i> | Square-tailed Kite |
| • <i>Petaurus australis</i> | Yellow-bellied Glider |
| • <i>Petaurus norfolcensis</i> | Squirrel Glider |
| • <i>Miniopterus australis</i> | Little Bentwing-bat |
| • <i>Miniopterus schreibersii</i> | Eastern Bentwing-Bat |
| • <i>Mormopterus norfolkensis</i> | East-coast Freetail-bat |
| • <i>Falsistrellus tasmaniensis</i> | Eastern Falsistrelle |
| • <i>Scoteanax rueppellii</i> | Greater Broad-nosed Bat |

Endangered Ecological Communities likely to be affected by the proposal:

- Lower Hunter Spotted Gum Ironbark Forest

For the purposes of the *Environmental Planning and Assessment Act 1979* and, in particular, in the administration of Sections 78, 79 and 112, the following factors have been taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats:

Callistemon linearifolius

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

Callistemon linearifolius is a shrub 3-4 m high, which grows in dry sclerophyll forest on the coast and adjacent ranges. The species has apparently disappeared from a number of formerly known locations, primarily due to urban development. There is also high risk of further local extinctions due to low population numbers.

Difficulty in differentiating between this species and the closely related *Callistemon rigidus* (Stiff Bottlebrush) and *C. pinifolius* (including conflicting identification results from the Royal Botanic Gardens Identification Service) has complicated mapping of occurrence within the study area and hence made assessment of impact difficult.

Field surveys have located approximately 4805 individual *C. linearifolius* plants across the HEZ study area. It is considered likely that other undetected populations exist in other parts of the HEZ (such as in areas that had been recently burnt at the time of field surveys).

The ECMP data has recorded 30 individuals approximately 140m to the west of the subject site. During the most recent site inspection no individuals were located within the site. The current proposal will therefore remove / modify approximately 4.93ha of potential habitat only. The Assumed Concurrence issued by the DEC, set aside two areas (Parcel No. 5 and No. 6) to protect large population(s) of this species within the 4(h) zone. Within the deferred areas approximately 1401 individuals have been recorded. Approximately 1600 individuals have also been recorded within Werakata National Park and 115 plants within State Forests. The conservation zones of the HEZ, which have not been surveyed, are also likely to contain large populations of this species.

The ECMP data has not recorded any individuals within the subject site. During the most recent site inspection no subsequent observations of individuals were made. Therefore, it is considered unlikely that the proposal will place the local population(s) of the species at the risk of extinction. The conservation zones of HEZ LEP area, with supplementary habitats within the DEC deferred conservation areas, are likely to provide adequate conservation outcomes for this species.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

This species was not found on site, however the entire subject site can be considered as potential habitat for *C. linearifolius*. Approximately 4.93ha of potential habitat will be removed by the proposal.

- (i) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality.

- (ii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including *C. linearifolius* within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation; and
- Infection of native plants by *Phytophthora cinnamomi*.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Grevillea parviflora* subsp. *parviflora

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

G. p. parviflora is a low open to erect shrub that occurs in light clayey soils in woodlands from Prospect to Camden and Appin, with disjunct northern populations near Putty, Cessnock and Cooranbong. Most plants appear capable of suckering from a rootstock.

Estimates of population sizes of over 3 million above ground stems have been made for the entire HEZ site (RPS HSO 2002). A rhizome study carried out by RPS HSO during clearing operations of the HEZ Spine Road (Ch700-2100m) involved the excavation of 12 plants, resulting in an average of three above ground stems per plant and ranging between two and eight stems. Research currently in progress is attempting to clarify the taxonomic position of *G. parviflora* within the *G. linearifolia* complex in the lower Hunter Valley and Central Coast (Driscoll & Bell *in prep.*). Numerous forms of what is currently described as *G. parviflora* have been examined, and it is likely that several new taxa within this group may be recognised. Whilst the results of these studies are not known at this stage, it would be prudent to treat all *G. parviflora* specimens on the site as the threatened taxa.

Detailed survey efforts have mapped 40 individual *G. parviflora* subsp. *parviflora* stems (approximately 14 actual plants) in the southwest of the study area (Figure 3-1), of which all will be retained within the retained vegetation within the site. The proposal will remove approximately 4.93ha of potential habitat for this species however, this is unlikely to have a significant impact upon the population as a whole within the HEZ Estate.

Given the relative small area of unoccupied potential habitat to be modified, it is considered that the proposal would be unlikely to place the local population(s) of this species at risk of extinction.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) ***In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

- d) ***In relation to the habitat of a threatened species, population or ecological community:***

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

This species was found to be absent within the majority of onsite habitat and in moderate densities over approximately 0.25ha of habitat. Whilst, 4.93ha of the potential habitat is to be removed for the proposal, no individuals of this species will be removed.

- (iii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will fragment and isolate a small area of habitat containing a relatively small number of individual plants of this species.

- (iv) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

This species tends to occur in a clustered distribution, and was predominately found within the LHSGIF vegetation community. The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including *G. parviflora* subsp. *parviflora* within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);*

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

- f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the TSC Act. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Infection of native plants by *Phytophthora cinnamomi*.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Rutidosia heterogama

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

On current knowledge, the eastern half of the HEZ study area, including the 4(h) development, 7(b) conservation zone, and 8(a) Werakata National Park (Tomalpin section), appears to be the major stronghold for the species within the Hunter Region (RPS HSO *pers obs.*; Stephen Bell *pers. comm.*). The majority of the population (67% of the area of occupancy) occurs within the 4(h) lands. While many plants were evident in recently burnt sites where additional light was available, the species was still present in unburnt areas with moderate shrub cover. It also occurs well distant from established trails in undisturbed areas.

Due to sporadic occurrence and difficulty in locating individuals outside of its flowering season, the species is likely to occur elsewhere within both the development and conservation zones in the eastern portions of the HEZ and further surveys may be required (such as within recently burnt sections of Werakata National Park) before accurate inferences regarding its distribution can be made. Notwithstanding, current estimates have placed over 20,000 individuals recorded to date within the HEZ.

Whilst the species has not been recorded on the subject site despite a re-visit of the site on the 22nd March 2006, the site would appear to offer seemingly potential habitat, and due to the species ecology, it may occur sporadically within the subject site, such as after a fire event or disturbance when airborne seed may have opportunity to establish.

Given the relative small area of unoccupied potential habitat to be modified, it is considered that the proposal would be unlikely to place the local population(s) of this species at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

- d) *In relation to the habitat of a threatened species, population or ecological community:***

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

This species was not found on site, however the entire subject site can be considered as potential habitat for *R. heterogama*. Approximately 4.93ha of potential habitat will be removed by the proposal.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the locality.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including *R. heterogama* within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) ***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);***

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) ***Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;***

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Infection of native plants by *Phytophthora cinnamomi*.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Litoria brevipalmata (Green-thighed Frog)

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

The Green-thighed Frog occurs in isolated localities from the NSW Central Coast to south-east Queensland. They occur in a range of habitats from rainforest and moist Eucalypt forest to dry Eucalypt forest and heath (NPWS 2000b).

The species is one of only a handful of eastern temperate Australian frog species that exhibit “explosive” breeding (Lemckert and Slatyer, in prep). Breeding occurs following heavy rainfall events in late spring and summer, with frogs congregating around large, temporary pools where males generally only call for one or two nights. Breeding may occur just once or twice per year or not at all and breeding success may be highly variable (Lemckert *et al.* 1997). How these frogs use forested environments during non-breeding times has not been documented (Lemckert and Slatyer, in press), although it is suspected that they forage in leaf litter and dense groundcover vegetation. Although the species breeding sites have not been determined, it is considered likely that any creekline and/or low lying area capable of holding water for extended periods may provide potential habitat for this species.

Two juveniles of this species (with Snout-Vent Lengths of 17.5mm and 18.2mm respectively) were recorded in two creeklines within the 7(b) lands. The size of these individuals suggests that they were approximately 1-2 months old, with the population likely to have bred with the heavy rains that occurred during late summer (January – February 2002). These sightings represent the first record of the species in the catchment of the Hunter River. Therefore, the extant population is likely to be of a high regional and state significance.

Two ephemeral creeklines run through the southern portion of the site. Whilst the sections of the creeks that run through the site have been mapped within the ECMP as ‘low’ habitat quality, this area and downstream areas can still be regarded as potential foraging and sheltering habitat for the Green-thighed Frog. Therefore the proposal may represent an indirect threat to this specie if sound onsite water management principals are not observed and adhered to.

As part of the development of the HEZ estate, Cessnock City Council has prepared a Water Cycle Management Strategy, which will ensure that the potential impacts to creekline environs are minimised through the construction of erosion controls and stormwater detention basins, etc. A water management system that ensures no adverse effects to downstream water quality is essential to prevent the risk of extinction to the Green-thighed Frog.

Given these factors, and provided that recommendations contained within this report are adhered to, it is considered that the proposal would be unlikely to place any local population(s) of this species at risk of extinction.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

As little is known of how the Green-thighed Frog uses forested environments during non-breeding times, it is difficult to ascertain the possible extent of habitat that may be affected by the proposal. For the purpose of this assessment, it is assumed that the most important habitat for this species would be associated with any creekline and/or low lying area capable of holding water for extended periods.

Two ephemeral creeklines run through the southern portion of the site. Whilst the sections of the creeks that run through the site have been mapped within the ECMP as 'low' habitat quality, this area can still be regarded as potential foraging and sheltering habitat for the Green-thighed Frog. The proposal has the potential to indirectly modify habitat for this species through changed water regimes if sound water management practises are not adhered to during the construction and operational phases of the current proposal.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality.

- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Green-thighed Frog, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The proposal only has the potential to indirectly modify habitat for this species, through changed water regimes, if sound water management practises are not adhered to during the construction and operational phases of the current proposal.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

f) Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation; and
- Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Forest Owls - *Tyto novaehollandiae* (Masked Owl) and *Ninox strenua* (Powerful Owl)

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

Powerful Owls are sedentary within home ranges of about 1000ha within open Eucalypt, *Casuarina* or *Callitris* pine forests and woodlands. Principal prey includes medium-sized mammals, particularly possums and gliders. Birds, flying foxes, rats and insects are also taken. They nest in mature Eucalypts containing large tree hollows (Garnett & Crowley 2000).

Masked Owls occupy home ranges of 5 –10km² within a diverse range of wooded habitats that provide large hollow bearing trees for roosting and nesting and nearby open areas for foraging. Prey is principally terrestrial mammals although possums, gliders, bats, birds, lizards and rabbits may be taken opportunistically (Garnett & Crowley 2000).

The Powerful Owl has been recorded by RPS HSO on three occasions as roosting individuals within densely vegetated creekline habitats. Each of these records has been from 7(b) conservation zones. Other recorded locations of the species are from Atlas of NSW Wildlife data within 8(a) and 4(h) lands.

It is likely that a local population of this species is using the HEZ as part or the whole of a foraging home range and it is considered that the entire HEZ could provide foraging habitat for this species. Furthermore, suitable prey species have been widely recorded in the study area. It is also considered likely that the species uses the area for nesting purposes as a significant number of potential nesting sites occur within the larger tree hollows within the study area.

The Masked Owl has not been recorded from the HEZ during formal fauna surveys, with the only recorded locations being from Atlas of NSW Wildlife data. The study area may represent a foraging home range (or part thereof) for one or more pairs of the species (which are known to be greater than 1000ha in size). It is considered likely that the entire HEZ study area constitutes potential habitat for this species, including areas containing suitable roosting and nesting habitat.

The subject site was found to contain no hollows of a size suitable for roosting purposes for these owl species. A small number of trees may potentially contain prey species and therefore the subject site may potentially be used as a small amount of supplementary foraging habitat only.

Given these factors it is considered that the proposal would be unlikely to disrupt the life cycle of any local population of the Powerful Owl and Masked Owl such that a local extinction would occur.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential foraging habitat for these owl species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of these two owl species, they are themselves unlikely to become isolated from other areas of habitat.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Masked Owl and Powerful Owl, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

1. To minimise further loss and fragmentation of habitat outside conservation reserves and State Forests by protection and management of significant owl habitat (including protection of individual nest sites).

The proposal will involve the removal of approximately 4.93ha of foraging habitat for both the Masked Owl and Powerful Owl. The proposal could therefore not be considered to be consistent with this objective. No potential nest sites will be removed.

2. To minimise the impacts of development activities on large forest owls and their habitats outside conservation reserves and State Forests.

The Cessnock LEP (Amendment 60) rezoned approximately 855ha of land at the HEZ as 7(b) Habitat Protection and a further 1273 ha as 8(a) National Park. These conservation zones within the HEZ LEP and some 89ha of additional conservation areas set aside by the DEC Assumed Concurrence are likely to have produced adequate conservation outcomes for each of these species. The setting aside of these areas are considered to have minimised the impacts of development activities on these owl species and their habitats.

3. To assess the distribution and amount of high quality habitat for each owl species across public and private lands to get an estimate of the number and proportion of occupied territories of each species that are, and are not protected.

The Ecological Constraints Master Plan (ECMP) (RPS HSO 2004) project aimed to obtain detailed ecological data for superior strategic planning, development sequencing and conservation decisions for HEZ. The mapping aimed to provide the accurate identification of flora and fauna (and their habitats) on the HEZ site. This work has culminated in a significant ecological database which forms the basis of on-going environmental management strategies.

Whilst the ECMP data is generally limited to the 4(h) zoned lands of the HEZ, within this area it can be used to assess the distribution and quality of habitat for these owl species. In regard to the Powerful Owl, habitat characteristics, particularly hollow trees for nest sites and hollows and tree species potentially used by prey species, give a strong indication of habitat quality. Any sightings or evidence of Owls, or their prey is also included in this data set, which is regularly updated.

4. To monitor trends in population parameters (number, distribution, territory fidelity and breeding success) across the range of the species and across different land tenures and disturbance history.

No detailed monitoring studies identifying trends in population parameters have been conducted as part of the proposal or as part of the wider HEZ.

5. To assess the implementation and effectiveness for forest management prescriptions designed to mitigate the impact of timber-harvesting operations on the owl species and, (if necessary), to use this information to refine the prescriptions so that forestry activities in State Forests are not resulting in adverse changes in species abundance and breeding success.

This objective is not relevant to the current proposal.

6. To improve the recovery and management of the large forest owls based on an improved understanding of key areas of their biology and ecology.

Whilst a large portion of potential habitat for these species has been reserved within the HEZ study area, the current proposal cannot be regarded as improving the recovery and management of the Powerful Owl or Masked Owl.

7. To raise awareness of the conservation requirements of the three large forest owls amongst the broader community, to involve the community in owl conservation efforts and in so doing increase the information base owl habitats and biology.

No schemes, in relation to this proposal, have been put in place that are considered to raise awareness of the conservation requirements of these owl species or involve the community in owl conservation efforts.

8. To coordinate the implementation of the recovery plan and continually seek to integrate actions in this plan with actions in other recovery plans or conservation initiatives.

The DEC co-ordinates the implementation of the actions in this recovery plan and carries out a review of the plan in its final year.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to these species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of Hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

'Woodland Birds' - *Climacteris picumnus victoriae* (Brown Treecreeper), *Melithreptus gularis gularis* (Black-chinned Honeyeater), *Pomatostomus temporalis temporalis* (Grey-crowned Babbler), *Chthonicola sagittata* (Speckled Warbler).

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

The Brown Treecreeper is a medium-sized insectivorous bird that occupies Eucalypt woodlands, particularly open woodland lacking a dense understorey. It is sedentary and nests in tree hollows within permanent territories, breeding in pairs or communally in small groups. Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae.

The Black-chinned Honeyeater is found predominantly west of the Great Dividing Range, although they are also known from drier coastal woodlands of the Cumberland Plain, Western Sydney and in the Hunter, Richmond and Clarence Valleys. The species builds compact, cup-shaped nests and feeds on arthropods, nectar and lerp from Eucalypt foliage and bark.

The Grey-crowned Babbler occupies open woodlands dominated by mature Eucalypts, with regenerating trees, tall shrubs, and an intact ground cover of grass and forbs. The species builds conspicuous dome-shaped nests and breeds co-operatively in sedentary family groups of 2-13 birds. Grey-crowned Babblers are insectivorous and forage in leaf litter and on bark of trees.

Speckled Warblers inhabit woodlands with a grassy understorey, often on ridges or gullies. The species is sedentary, living in pairs or trios and nests on the ground in grass tussocks, dense litter and fallen branches. They forage on the ground and in the understorey for arthropods and seeds. Home ranges vary from 1-6ha.

All four species are threatened by clearance and the fragmentation of woodland habitats, including the removal of dead timber. Reductions in remnant habitat size leads to the isolation of populations, which increases their vulnerability to extinction from stochastic events and decreases their genetic viability in the long term. Habitat fragmentation also increases competition with aggressive species and levels of nest predation.

Brown Treecreepers, Black-chinned Honeyeaters and Grey-crowned Babblers generally do not persist in remnants less than 200ha in area. Speckled Warblers have become locally extinct where no fragments larger than 100ha remain.

The former three of these species have each been recorded fairly regularly within the HEZ. Only the Speckled Warbler appears to occur irregularly, with records being generally quite scarce. Brown Treecreepers have been observed attending nests in tree hollows at two separate parts of the 4(h) zone. These could represent the eastern-most known breeding sites for this species in the region. The HEZ study area also appears to hold a significant population (possibly a stronghold) of Black-chinned Honeyeaters within the lower Hunter region (RPS HSO *pers. obs.*).

The current proposal will remove areas of known and potential habitat for Brown Treecreepers and Black-chinned Honeyeaters, and to a lesser extent Grey-crowned Babblers and Speckled Warblers. The Grey-crowned Babbler appears to be mainly restricted to the Hunter Lowland Redgum Forest and adjacent flats / slopes within the immediate vicinity. Indeed, Grey-crowned Babblers appear able to persist in slightly disturbed habitats in

the locality at a greater capacity to the other three bird species addressed (RPS HSO *pers. obs.*).

Brown Treecreepers and Black-chinned Honeyeaters are more likely to be affected adversely by the proposal, given their noted widespread occurrence within the HEZ and susceptibility to habitat fragmentation and disturbance.

Given the relatively small size of the subject site and the large parcels of habitat within close proximity, including Werakata National Park and HEZ conservation areas, it is considered that the proposal is unlikely to disrupt the life cycle of any local population of the Brown Treecreeper, Black-chinned Honeyeater, Grey-crowned Babbler and Speckled Warbler such that a local extinction would occur.

b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;*

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to these threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential habitat for these woodland birds.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of these species, they are themselves unlikely to become isolated from other areas of habitat.

- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including these woodland birds, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in

March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with these threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

***Lathamus discolor* (Swift Parrot)**

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

Swift Parrots breed only in Tasmania and most birds migrate to the mainland in autumn and over-winter along the Great Dividing Range, where the species lives in Eucalypt forests and woodlands and feeds primarily on nectar and lerp. The sites used on the mainland vary from year to year, in response to nectar availability (Garnett and Crowley 2000).

This species has not been recorded during recent targeted surveys across the study area, which was to be expected given that there was a lack of flowering trees in the locality at the time of surveys. In recent years, both Swift Parrots and Regent Honeyeaters have favoured the coastal Swamp Mahogany Forests, which were heavier in flower.

Given the nomadic nature of these species, potential impacts can be somewhat difficult to quantify. However, large numbers of this species were recorded in the locality during 2000. Subsequent targeted surveys / habitat assessments were conducted in this area (including the HEZ study area) by the Swift Parrot Recovery Team in 2002. The results of these investigations concluded that the Spotted Gum / Ironbark forests of the Lower Hunter are of significance to the national population of the species. Evidence suggests that such habitats within the Lower Hunter area have always been used by the species regularly (Saunders 2002). Such habitat dominates the vegetation of the HEZ and represents a significant habitat resource for this species. The current proposal will remove approximately 4.93ha of potential habitat for the species, containing 36 winter-flowering keystone mature trees (Broad-leaved Ironbark, Spotted Gum and Forest Red Gum).

Given that the species breeds only in Tasmania and that the extent of occurrence of the single population is around 860,000km² (Garnett and Crowley 2000), the removal of habitat as a result of this proposal is highly unlikely to place the population at risk of extinction. However, any habitat removal within an area identified as potentially important to the national population of this species must be regarded as incrementally impacting upon the Swift Parrot.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) ***In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential foraging habitat for this species.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of this species, it is itself unlikely to become isolated from other areas of habitat.

- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Swift Parrot, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

***Neophema pulchella* (Turquoise Parrot)**

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

Turquoise Parrots live in the foothills of the Great Dividing Range in open Eucalypt woodlands and forests that have a grassy or sparsely shrubby understorey. Eggs are laid in the hollows of trees, stumps or even fence posts (Garnett and Crowley 2000).

This species has not been recorded from the HEZ during any formal fauna surveys, with the only records being from Atlas of NSW Wildlife data (records which span 10 years). It is considered possible that this species is resident within the HEZ, although the habitats within HEZ are not typical of preferred habitat noted from other locations within the region. It is also possible that the records of the species from the HEZ are from vagrant or nomadic birds in transit, or that the species has declined in recent years.

Given the paucity of ongoing records of the species within the study area and the unlikelihood of a resident population, the removal of habitat within the subject site and any other indirect impacts are considered unlikely to place any local population(s), if extant, at the risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to this threatened species.

- d) *In relation to the habitat of a threatened species, population or ecological community:***

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential foraging habitat for this species.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the

fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of this species, it is itself unlikely to become isolated from other areas of habitat.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Turquoise Parrot, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) ***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);***

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) ***Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;***

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Callocephalon fimbriatum (Gang-gang Cockatoo)

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

The Gang-gang Cockatoo is a seasonal / nomadic visitor to the HEZ lands, having been recorded on a number of occasions, predominantly feeding on the capsules of Grey Gums (*Eucalyptus punctata* & *E. canaliculata*) within both the 7(b) and 4(h) lands. There are also a number of records of the species from Werakata National Park and elsewhere from the Cessnock LGA. The majority of records are from areas in close vicinity to the Watagan Range, such as Bow Wow Gorge, Congewai Valley and Laguna (Hunter Bird Observers Club records).

The HEZ zoning configuration is considered to provide adequate conservation representation and biodiversity outcomes within the HEZ LEP area, including such wide-ranging species as the Gang-gang Cockatoo. Recent correspondence from DEC (letter sent 5th September 2005) states that the HEZ LEP and assumed concurrence provisions provide adequate protection for the Gang-gang Cockatoo.

Given these factors and the small amount of potential habitat to be removed, it is considered highly unlikely that the proposal would place any local population(s) of this species at risk of extinction.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

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

Not applicable to this threatened species.

- d) ***In relation to the habitat of a threatened species, population or ecological community:***
- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential foraging habitat for this species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of this species, it is itself unlikely to become isolated from other areas of habitat.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Gang-gang Cockatoo, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) ***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);***

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) ***Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;***

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

***Xanthomyza phrygia* (Regent Honeyeater)**

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

The Regent Honeyeater occurs throughout south-eastern Australia and in NSW breeds in several areas along the western slopes of the Great Dividing Range. Movements outside of the breeding season are poorly understood, and numbers fluctuate greatly between years and sites. The species is mostly recorded in box-ironbark Eucalypt associations although birds will also use other woodland types and wet lowland coastal forest dominated by Swamp Mahogany or Spotted Gum (Garnett and Crowley 2000).

Two Atlas of NSW Wildlife recorded locations for this species exist from the HEZ, both within the 4(h) zone in the northern section. One individual of this species has since been recorded within the HEZ study area in winter of 2005 within a flowering Spotted Gum. This tree was also noted as being used by a large population of Black-chinned Honeyeaters. It is therefore likely that this species is an irregular visitor to the HEZ during appropriate periods (such as the flowering of Spotted Gums). No nesting records exist from the HEZ, although nesting attempts have been made by the species at Quorrobolong, to the south of the study area (A. Morris *pers. comm.*).

Potential habitat for this species exists within the vegetation communities that contain winter-flowering Eucalypts. It is expected that the current proposal will involve the removal of approximately 4.93ha of potential habitat containing 36 winter-flowering keystone mature trees (Broad-leaved Ironbark, Spotted Gum and Forest Red Gum). Within the HEZ these tree species are generally located within Lower Hunter Spotted Gum / Ironbark Forest and Hunter Lowland Redgum Forest. Such habitat is widespread within the HEZ and it is likely to represent a significant habitat resource for this species on a regional scale.

The current proposal is unlikely to place the Regent Honeyeater population at risk of extinction. However, any removal of habitat within an area identified as being potentially significant habitat must be regarded as incrementally impacting upon the Regent Honeyeater.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or***
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;***

Not applicable to this threatened species.

d) In relation to the habitat of a threatened species, population or ecological community:

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will remove approximately 4.93ha of potential foraging habitat for this species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of this species, it is itself unlikely to become isolated from other areas of habitat.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Regent Honeyeater, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

f) Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Stagonopleura guttata (Diamond Firetail)

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

The Diamond Firetail ranges in Eastern Australia from the Eyre Peninsula, SA to Clermont, QLD. They live in a wide range of Eucalypt-dominated vegetation communities that have a grassy understorey, including woodland, open forests and mallee. Most occur on the inland slopes of the Great Dividing range, with only small pockets near the coast (Garnett *et al*, 2000). As with most Australian Finch species, Diamond Firetails are highly sociable birds. Members of a breeding colony feed in open areas next to their nests, mostly eating ripe and half ripe grass seeds, and occasionally insects. They drink frequently throughout the day and are generally found near water.

Diamond Firetails breed from August to January. The birds build a bulky, bottle shaped nest of long grass blades and stems. Both parents incubate the four to seven eggs, the young hatch within 12-15 days and leave the nest about 25 days later (Frith, 1977).

Much of the Diamond Firetail habitat has been cleared, and remaining fragments are gradually becoming unstable. Factors that have been postulated to be adversely affecting this species includes the loss of key plants and habitats as a result of the invasion of exotic grasses that are more suitable for flock-foraging species (Garnett *et al*, 2000). The noted expansion of the more commonly occurring flock foraging species Red-browed Firetails (*Neochmia temporalis*) due this factor has disadvantaged the threatened Diamond Firetails in some areas (Read, 1994) due to competition.

This species is threatened by clearance and the fragmentation of woodland habitats. Reductions in remnant habitat size leads to the isolation of populations, which increases their vulnerability to extinction from stochastic events and decreases their genetic viability in the long term. Habitat fragmentation also increases competition with aggressive species and levels of nest predation.

Diamond Firetails generally do not persist in remnants less than 200ha in area. Recent records (early November 2006) of Diamond Firetails in the HEZ consist of two birds seen on two separate occasions by members of the HBOC. The observations were made in the general vicinity of the deferred conservation lands to the west of Kurri Kurri Hospital. Habitat where the birds were observed consisted of Kurri Sand Swamp Woodland exhibiting some components of Lower Hunter Spotted Gum Ironbark Forest. The understorey is diverse and moderately dense.

The current proposal will remove areas of potential occasionally used habitat for these species. Given the relatively small size of the subject site and the large parcels of similar woodland habitats within close proximity, including Werakata National Park and HEZ conservation areas, it is considered that the proposal is unlikely to disrupt the life cycle of any local population of the Diamond Firetail such that a local extinction would occur.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to these threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will modify approximately 4.93 ha of potential habitat.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of these species, they are themselves unlikely to become isolated from other areas of habitat.

- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including birds such as Diamond Firetail, within the HEZ Study Area. This culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with these threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;

- Invasion of native plant communities by exotic perennial grasses; and
- Removal of dead wood and dead trees.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

***Lophoictinia isura* (Square-tailed Kite)**

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

The Square-tailed Kite is endemic to Australia and is widespread throughout the mainland (absent from Tasmania). It is recorded mainly in coastal and subcoastal regions, although it has been observed inland. The species is migratory throughout its range and is a spring-summer breeding migrant to south-eastern, southern and south-western Australia. The Square-tailed Kite inhabits open forests and woodlands, particularly those on fertile soils with abundant passerines. They may also range in nearby open habitats but not into extensive treeless regions. This species is notably absent from alpine regions and small isolated remnant woodlands in large open areas. Within N.S.W. the species has been recorded in ridge and gully forests dominated by Woollybutt (*Eucalyptus longifolia*), River Peppermint (*E. elata*), Blackbutt Peppermint (*E. smithii*) and Spotted Gum (*Corymbia maculata*), as well as in forests of *Angophora* and *Callitris* with shrubby understorey.

The Square-tailed Kite hunts mostly passerines and foliage insects, though it is also known to take mammals and lizards. Most prey is taken from the canopy and rarely from shrubs or in the air. Breeding occurs from July to February with an average clutch size of 3 eggs. Nests are built as a platform or bowl of sticks lined with green *Eucalyptus* leaves in forks or large horizontal branches of *Eucalypts*, *Angophora* or *Melaleuca* trees and may be used in successive years.

Except when breeding this tends to be a solitary bird, usually seen hunting alone high in, or just above the tree canopy in coastal or sub-coastal rainforest, forest or woodland. Nests have been reported in *Eucalyptus* spp., *Angophora* spp. and native pine forests. Prey taken has included fledging birds, insects, rabbits and lizards.

This species is threatened by clearance and the fragmentation of woodland habitats. Reductions in remnant habitat size leads to the isolation of populations, which increases their vulnerability to extinction from stochastic events and decreases their genetic viability in the long term. Habitat fragmentation also increases competition with aggressive species and levels of nest predation.

Square-tailed Kites appear to occupy large hunting ranges of more than 100km². The status of the Square-tailed Kite within the HEZ is largely unknown due to the low number of observations. However, the forests and woodlands making up the HEZ are significant in their extent and the diversity of hunting habitats that they offer this species coupled with its regular sitings within the vicinity of the HEZ suggest that this species is likely to occur there at least intermittently during late summer and Autumn. The closest known breeding records are at Coopernook, in the Hunter Region's north, with young birds at Coopernook generally leaving the nest during December. If this breeding timetable is the general rule for birds in the region, then it is possible that the Weston / HEZ sitings are of birds dispersing after breeding.

The current proposal will remove areas of potential occasionally used habitat for this species. Given the relatively small size of the subject site and the large parcels of similar woodland habitats within close proximity, including Werakata National Park and HEZ conservation areas, it is considered that the proposal is unlikely to disrupt the life cycle of any local population of the Square-tailed Kite such that a local extinction would occur.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:*

- (i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to these threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) The extent to which habitat is likely to be removed or modified as a result of the action proposed;*

The proposal will modify approximately 4.93 ha of potential habitat.

- (ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action;*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of these species, they are themselves unlikely to become isolated from other areas of habitat.

- (iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including birds such as the Square-tailed Kite, within the HEZ Study Area. This culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with these threatened species.

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

KTP's are listed in Schedule 3 of the TSC Act. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Invasion of native plant communities by exotic perennial grasses; and
- Removal of dead wood and dead trees.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Petaurus australis (Yellow-bellied Glider)

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

Yellow-bellied Gliders are usually associated with tall, mature wet Eucalypt forests, although the species is also known from mature dry open forests and woodlands. The species requires tree hollows for nesting and has territories of around 60ha.

This species has been recorded from several parts of the HEZ, primarily from secondary indications of the presence of individuals (such as feeding scars, mostly on Grey Gums). The majority of records have been from within the western half of the 4(h) development zone, the central 7(b) conservation corridor, and on the slopes of Tomalpin Hill (Werakata National Park). It appears that the HEZ supports a viable population(s) of this species. It is likely that records within the HEZ represent the most significant occurrence of this species on the floor of the Lower Hunter Valley (RPS HSO *pers. obs*).

Potential habitat exists for this species primarily within those areas containing Forest Red Gums and Grey Gums, which is predominantly within the Hunter Lowland Redgum Forest and some parts of the Lower Hunter Spotted Gum / Ironbark Forest. Within the 4(h) development zone / 7(b) conservation corridor, there is a positive correlation between the occurrence of these animals and the distribution of mature feed trees and density of hollow-bearing trees.

There are number of trees bearing feeding-scars made by this species within 150m of the subject site and one feeding tree located just inside the western boundary. There are a number of trees (26), bearing hollows of a size suitable for this species occurring within the subject site and most of these are to be removed during the process of development. Precautions to protect individuals during clearing operations and habitat compensation measures, including the erection of nest boxes will be used to lessen potential impacts to this species.

Whilst individuals of this species may potentially be displaced by the proposal, the large parcels of habitat within close proximity to the site, including Werakata National Park and HEZ conservation areas, are considered to provide adequate amounts of habitat for the ongoing existence of the species in the local area. Given these factors, it is considered that the proposal would be unlikely to place the local population at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or***

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

Not applicable to this threatened species.

d) *In relation to the habitat of a threatened species, population or ecological community:*

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed:*

The proposal will remove approximately 4.93ha of potential habitat for this species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action:*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality:*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Yellow-bellied Glider, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ, in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

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

None of the site has been designated 'critical habitat' under Part 3 of the TSC Act.

f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

Recovery Plan *Petaurus australis* (Yellow-bellied Glider)

1. To co-ordinate the recovery of the Yellow-bellied Glider in NSW.

The DEC will co-ordinate the implementation of the actions outlined in this Recovery Plan.

2. To encourage and assist in improving the protection and management of the Yellow-bellied Glider and its habitat.

The Cessnock LEP (Amendment 60) rezoned approximately 855ha of land at the HEZ as 7(b) Habitat Protection and a further 1273 ha as 8(a) National Park. These conservation zones within the HEZ LEP and some 89ha of additional conservation areas set aside by the DEC assumed concurrence must be considered to assist in improving the protection and management of the Yellow-bellied Glider and its habitat.

Notwithstanding, as the current proposal will involve the removal of the majority of vegetation within the site, the proposal cannot be regarded as meeting this objective.

3. To identify and monitor significant populations of the species.

A 'significant population' is defined in the Recovery Plan as one that is essential to the ongoing viability and diversity of a larger regional population. Whilst a specific list of significant populations has not been produced by DEC, it is likely that records within the HEZ represent the most significant occurrence of this species on the floor of the Lower Hunter Valley (RPS HSO *pers. obs*). This species is generally associated with tall mature eucalypt forest in regions of high rainfall, however, within the HEZ, this species is associated with dry forests and has also been recorded in the Kurri Sand Swamp Woodlands. This occurrence could therefore be considered to significantly contribute to the diversity and viability of the species.

Whilst the ECMP data collected for the HEZ site records individual sightings of Yellow-bellied Gliders, as well as indications of their presence and habitat attributes, no ongoing monitoring program is conducted in relation to this proposal.

4. To facilitate strategic research into the ecology of the Yellow-bellied Glider that is relevant to its conservation.

No strategic research into the ecology of the Yellow-bellied Glider has been undertaken in relation to the proposal. Detailed data collected as part of the ECMP has improved knowledge of the species, including preferred feed tree species and preference for certain habitat types in the locality.

5. To increase community awareness of the Yellow-bellied Glider and encourage community involvement in its conservation.

No schemes, in relation to this proposal, have been put in place that is considered to increase community awareness of the Yellow-bellied Glider or encourage community involvement.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Petaurus norfolcensis (Squirrel Glider)

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

Squirrel Gliders occur in dry open forests and woodlands, moist gullies and coastal forests and they require tree hollows for nesting. The species has home ranges of around 6-13 ha and movements of up to one kilometre have been reported. They feed on Eucalypt sap, nectar, pollen, fruit and invertebrates.

One record of this species within the HEZ study area exists on the western slope of Tomalpin Hill within Werakata National Park. Additional records of the species occur within the immediate vicinity including in the Kurri Kurri area and within the study area for the HEZ Link Road (RPS HSO *pers. obs.*). The latest record of this species (December 2005) is from the north of the HEZ study area, near Hospital Road (RPS HSO *pers. obs.*). These recorded locations of the species will not be impacted upon by the current proposal. Various fieldworks undertaken across the HEZ development zone indicates that it is generally dominated by *P. breviceps* (Sugar Glider) (authors *pers. obs.*), however, these two species are known to exist within close proximity to each other.

Potential habitat for this species within the study area can be stated as occurring within the open forested communities that contain higher densities of hollow-bearing trees and understorey nectar-producing plants.

Given the unlikelihood of a significant resident population, the removal of a relatively small area of potential habitat, including five suitably sized hollow-bearing trees, is considered unlikely to place a local population at the risk of extinction.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) ***In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

Not applicable to this threatened species.

- d) ***In relation to the habitat of a threatened species, population or ecological community:***

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed:*

The proposal will remove approximately 4.93ha of potential habitat for this species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action:*

The current proposal will not fragment or isolate an area of habitat for this species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality:*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including the Squirrel Glider, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);*

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;*

No recovery plan or threat abatement plan is associated with this threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Micro-bats - *Falsistrellus tasmaniensis* (Eastern Falsistrelle), *Miniopterus australis* (Little Bentwing-bat), *M. schreibersii* (Eastern Bentwing-Bat), *Mormopterus norfolkensis* (East-coast Freetail-bat), and *Scoteanax rueppellii* (Greater Broad-nosed Bat)

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

These micro-bats share similar foraging habitat requirements in that they forage in Eucalypt woodlands and forests. The Eastern Falsistrelle, East-coast Freetail-bat and Greater Broad-nosed Bat roost in tree hollows. The Little and Eastern Bentwing-Bats roost in caves, mines and other man made structures, although the latter two of these species are also known to occasionally roost in tree hollows.

Foraging habitat occurs for all of these species in relative abundance within the HEZ. Roosting habitat exists in abundance for those species that roost in tree hollows. Previous mining activity within the study area may have left a number of abandoned shafts and tunnels / adits scattered within the study area. Although these locations have not been located or surveyed for the presence of bats, it is possible that a number of cave-roosting species (such as the Bentwing-bats) may use these structures. None of these structures occur within the subject site.

The Bentwing-bats are unlikely to be significantly affected by the proposal given the lack of preferred roosting habitat, generalist foraging habitat requirements and the failure to locate a significant local population of Little Bentwing-bat in any case. A small increased level of impact is likely upon the Eastern Falsistrelle, East-coast Freetail-bat and the Greater Broad-nosed Bat, given that potential roosting habitat, in the form of 18 hollow-bearing trees would be removed. However, neither has been confirmed in any great numbers within the study area and the level of impact upon these species is also unlikely to be significant.

Therefore it can be stated that the current proposal would be highly unlikely to place any local population(s) of these species at risk of extinction.

- b) *In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

No populations of any of the species considered for this assessment (that are relevant to this locality) have been identified under Part 2 of Schedule 1 of the TSC Act.

- c) *In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or***
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;***

Not applicable to this threatened species.

- d) *In relation to the habitat of a threatened species, population or ecological community:***

- (i) *The extent to which habitat is likely to be removed or modified as a result of the action proposed:*

The proposal will remove approximately 4.93ha of potential foraging habitat and roosting habitat (with the exception of the Bentwing-bats) for these species.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action:*

The current proposal will not fragment or isolate an area of habitat for these species. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality. Notwithstanding, due to the high mobility of these species, they are themselves unlikely to become isolated from other areas of habitat.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality:*

The results of the ECMP data have been used to achieve adequate conservation outcomes for threatened species, including these bat species, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) *Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);***

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) *Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;***

No recovery plan or threat abatement plan is associated with these threatened species.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to these species (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Removal of dead wood and dead trees; and
- Loss of hollow-bearing trees (preliminary determination).

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

Lower Hunter Spotted Gum - Ironbark Forest

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

Not applicable to Endangered Ecological Communities.

- b) ***In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction;***

Not applicable to Endangered Ecological Communities.

- c) ***In the case of a critically endangered or endangered ecological community, whether the action proposed:***

- (i) *Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction; or*
- (ii) *Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction;*

The current proposal will involve the removal of approximately 4.93ha of LHSGIF.

Within the HEZ LEP area, a total of approximately 1,840ha of this vegetation community has been mapped. Of this, approximately 1,105ha (i.e. 60% of occurrence) occurs within zones created and managed for conservation purposes i.e 7(b) 'Habitat Protection' and 8(a) 'National Park'. A further 68ha (3.7% of occurrence) is also currently reserved within the DEC Deferred Conservation Areas.

Following the listing of LHSGIF as an EEC, the DEC issued a revised assumed concurrence that states that an adequate conservation outcome for this community has been achieved within the HEZ LEP area.

Therefore it can be stated that the proposal will not have an adverse effect on the extent of the LHSGIF such that the local occurrence is likely to be placed at risk of extinction.

- d) ***In relation to the habitat of a threatened species, population or ecological community:***

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

Approximately 4.93ha of LHSGIF is proposed to be removed.

- (ii) *Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*

The current proposal will not fragment or isolate an area of habitat for this EEC. However, it could be regarded that the proposal, as part of the HEZ proposal may be leading to the fragmentation and isolation of habitat within the wider locality.

- (iii) *The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality;*

The results of the ECMP data have been used to achieve adequate conservation outcomes for EEC's, including LHSGIF, within the HEZ Study Area, which culminated in the DEC issuing an assumed concurrence for the development of the HEZ in March 2005. The habitat to be removed can therefore be considered as not important to the long-term survival of the species in the locality.

- e) ***Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly);***

None of the site has been designated 'critical habitat' under Part 3 of the *TSC Act*.

- f) ***Whether the proposed action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan;***

No recovery plan or threat abatement plan is associated with this EEC.

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

KTP's are listed in Schedule 3 of the *TSC Act*. The KTP's most applicable to the current proposal are discussed in detail in Section 4.3. Those most applicable to this EEC (both directly and indirectly) would appear to be:

- Clearing of Native Vegetation;
- Bushrock Removal;
- Removal of dead wood and dead trees;
- Invasion of native plant communities by exotic perennial grasses; and
- Infection of native plants by *Phytophthora cinnamomi*.

However, the DEC Assumed Concurrence has adequately assessed all relevant ecological matters, and the proposal does not contravene any specific aspect of the Assumed Concurrence.

APPENDIX B: DEC CONCURRENCE



Department of
Environment and Conservation (NSW)

Our reference : HOF52778
Contact : Robert Humphries (02) 9585 6952

Mr C W Cowan
General Manager
Cessnock Council
PO Box 152
CESSNOCK NSW 2325

Dear Mr Cowan

Assumed concurrence for the Hunter Economic Zone (HEZ)

I am writing to Council in relation to the proposed staged development of the 4(h), 1(a) and 5(a) lands at the HEZ.

As of 18 February 2005, the area encompassed by the HEZ Local Environment Plan (LEP) has been shown to support 29 species of threatened flora and fauna and five endangered ecological communities (EECs):- Kurri Sand Swamp Woodland, Hunter Lowland Redgum Forest; River-flat Eucalypt Forest on Coastal Floodplains, Freshwater Wetlands on Coastal Floodplains and the Lower Hunter Spotted Gum Ironbark Forest. Many of these values occur in areas intended for development.

DEC involvement

The former National Parks and Wildlife Service (NPWS), now the Department of Environment and Conservation (DEC), has worked with the proponent HEZ Pty Ltd; Cessnock City Council; the Department of Infrastructure, Planning and Natural Resources (DIPNR); and other government agencies since 1999 to identify constraints and achieve a balance between development objectives and conservation outcomes at the HEZ site. The DEC's roles as a statutory authority under the *Threatened Species Conservation (TSC) Act* and the *National Parks and Wildlife (NPW) Act* were triggered during the preparation of the Cessnock LEP (Amendment 60) - Hunter Employment Zone; at the development application stage for the Stage 1 road infrastructure; and in relation to the licensing of associated activities which have involved picking of threatened species and damage to their habitat. The DEC has also acted in an advisory role to Council on threatened species and cultural heritage matters during the preparation of an Environmental Management Strategy (EMS) for the HEZ and to the consultants for the proponent, Harper Somers O'Sullivan, in the preparation of the Ecological Constraints Master Plan (ECMP).

Conservation outcomes

The Cessnock LEP (Amendment 60) rezoned approximately 855ha of land at the HEZ as 7(b) Habitat Protection and a further 1273 ha as 8(a) National Park. These zones encompass a representative sample of the five endangered ecological communities and other vegetation present at the HEZ, as well as habitat and movement corridors for a number of threatened fauna and flora identified during surveys of the site. However, during finalisation of the LEP, new information about threatened species at the HEZ came to light including important records for Swift Parrot dating back 15 years. Subsequent surveys undertaken as part of the development

assessment process for the road infrastructure also identified a number of previously unrecorded and newly-listed threatened species at the HEZ site. This included significant populations of the vulnerable plants *Grevillea parviflora* subsp. *parviflora* and *Rutidosia heterogama* and breeding sites for the vulnerable Green-thighed Frog and three species of threatened woodland bird. Most of these threatened species were recorded within the 4(h) lands.

The Ecological Constraints Master Plan (ECMP)

To address these additional threatened species, the DEC recommended that detailed constraints mapping be undertaken by the proponent to identify areas of particular sensitivity and guide future development of the industrial lands at the HEZ. The ECMP and subsequent information provided by HEZ Pty Ltd represents the results of systematic threatened species surveys undertaken over a period of 24 months across the industrial lands as well as the habitat protection zone along the central creek line at the HEZ.

Outstanding threatened species issues

Most of these threatened species and their habitat occur to some extent within the 7(b) lands or in Werakata National Park. However, the results of the ECMP clearly indicate that there are a number of threatened flora and fauna which occur largely on the industrial lands and which are either not adequately represented within protected lands or which have important habitat within the 4(h) lands. These species are:

<i>Acacia bynoeana</i>	Green-thighed Frog
<i>Callistemon linearifolius</i>	Swift Parrot
<i>Eucalyptus glaucina</i>	Brown Treecreeper
<i>Rutidosia heterogama</i>	

In addition, the ECMP shows that there are areas along the central creek corridor, but outside of the 7(b) lands, which support a large number of mature, hollow-bearing trees and represent important habitat for a number of threatened fauna recorded at the HEZ.

Assumed concurrence

Under cl. 64 of the *Environmental Planning & Assessment Act Regulation 2000*, the Director General of the DEC has the power to issue an assumed concurrence to Council for the HEZ. This assumed concurrence has the same status as a concurrence issued under section 79B of the *EP&A Act*. The DEC has now met with the proponent, HEZ Pty Ltd, and its consultants, Harper Somers O'Sullivan, on several occasions to discuss an assumed concurrence for the HEZ in the light of the results of the ECMP and potential conservation outcomes for threatened species and/or their habitat which occur on 4(h), 1(a) or 5(a) lands but which are not adequately protected by the LEP. Various options have been discussed including the need to identify additional conservation areas within the 4(h) lands; offsetting for those species which subsequent surveys show are well-represented on lands adjacent to the HEZ; and/or site-specific controls consistent with the EMS for the HEZ.

Accordingly, a number of proposed conservation areas have now been identified within the 4(h) lands which in DEC's opinion have the potential to provide an adequate level of protection for those threatened species and their habitat identified as not being well represented in the Werakata National Park and/or Environmental Protection Zone. This would involve deferring development of approximately 89 ha of industrial land for conservation purposes (as shown in the attached map dated 27 January 2005 and described in the attached table dated 27 January 2005) and would be reflected in a Masterplan for the HEZ site.

The reduction in socio-economic benefits resulting from this decrease in the amount of ecologically unconstrained land available for industrial development could be offset to some degree by rezoning portions of the 7(b) lands, which do not support significant threatened species

values, for industrial uses (see attached map and table). If these 7(b) lands were subsequently rezoned 4(h), this would reduce the additional area to be deferred for conservation to 53 ha.

The DEC advises that, should HEZ Pty Ltd apply to Council to have the Cessnock LEP amended to reflect the recommendations outlined in this letter and the accompanying documentation, the DEC would support such amendments on both threatened species and cultural heritage grounds for the purposes of s. 62 and 34A of the *Environmental Planning and Assessment (EP&A) Act 1979*.

The DEC advises that Council can assume concurrence for permissible development (as per the Local Environment Plan) of the remaining lands at the HEZ (as per the attached map) in accordance with cl. 64 of the *EP&A Regulation 2000* provided the conditions in Attachment 1 are met.

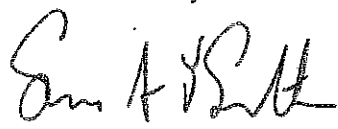
The DEC will assess whether the assumed concurrence and/or the LEP and /or the amended LEP provide adequate protection for any newly-listed or discovered threatened species subsequently identified at the HEZ site. DEC undertakes to do this within 30 working days of being notified of such records and will advise the consent authority and the proponent accordingly.

Under proposed amendments to the *TSC Act*, it may be possible for Council to seek biodiversity certification of the Cessnock LEP (Amendment 60) - Hunter Employment Zone. This would streamline the assessment process for all future development of the HEZ by removing the requirement to undertake threatened species assessments on lands covered by this certification.

The conditions outlined in Attachment 1 have been discussed with and accepted by the proponent, who has committed to undertaking further surveys within the vicinity of the HEZ site over the next 12 months to ascertain whether there is any suitable land which supports equivalent or better threatened species values to the proposed additional conservation areas shown on the attached map.

Should you require any further information regarding this matter please contact Robert Humphries, Manager Threatened Species Unit on 02 9585 6952 or fax 02 9585 6442.

Yours sincerely

 1/3/05

SIMON A Y SMITH
Acting Director General

Attachment 1 - Conditions of Assumed Concurrence

1. The 4(h) lands identified in the attached map titled DEC Deferred Conservation Areas dated 27 January 2005) are deferred from development for the reasons outlined in the Table 1 until such time as:
 - a) the results of further survey work indicate that there has been a change in the conservation status of the threatened species listed above e.g. further large populations are discovered locally on secure tenure; and/or
 - b) alternative lands supporting equivalent or better threatened species values have been identified in the vicinity of the HEZ and secured for conservation to the satisfaction of the Manager, Threatened Species Unit, Metropolitan. This could be achieved through amendments to the Cessnock LEP and/or through the use of positive and or restrictive covenants and may require the purchase of additional land or land swaps with adjoining land owners or Council.
 - c) These deferred areas are to be clearly delineated to the nearest 5 metres on the ground through the use of appropriate corner and angle survey marks signage, and where construction occurs adjacent to deferred areas fencing as well as track closures and rehabilitation to prevent access and avoid damage during construction activities on adjoining 4h land shall be provided.
2. Road crossings of creek lines through deferred areas are to achieve a minimum width, which presents the least possible disruption to the movement of fauna and water flow in these areas as per condition 5 (a) below.
3. Road crossings and associated works adjacent to deferred areas are to be constructed so that they do not impact on these areas. Deferred areas adjacent to construction works are to be clearly delineated on the ground prior to commencement of construction and the deferred conservation areas are to be protected as per condition 1c above.
4. The lands zoned 7(b) Environmental Protection (Conservation), including the deferred areas referred to in condition 1 and shown on the map dated 27 January 2005 are actively managed for conservation consistent with the Environmental Management Strategies (finalised in accordance with condition 5 below) which addresses issues such as:
 - a) access - this is a key issue at the HEZ and requires the rationalisation and closure of the many informal tracks throughout the site to reduce the incidence of arson, rubbish dumping and soil erosion resulting from recreational vehicle use;
 - b) fire frequency - a more natural fire regime should be implemented which reflects the requirements of the threatened species that occur at the site. In most cases this will mean less frequent fire, but once access and the associated arson issue has been addressed, it may be necessary to plan ecological burns; and
 - c) weed control - this should be undertaken by appropriately qualified and experienced bush regenerators using methods which are both effective but will have minimal impact on threatened species and their habitat.
5. The EMS for the HEZ shall be finalised to the satisfaction of the Director General of the DEC within 12 months of the date of this letter (Should the EMS not be finalised within 12 months, this may not affect the validity of this concurrence). The draft EMS and its component strategies, in particular the Habitat Management, Water Management and Bushfire Management Strategies, are to incorporate the specific measures outlined below which will

reduce the impact of development on threatened species and their habitat within the 4(h), 1(a) and 5(a) lands:

- (a) All road crossings of the central creek line (Chinaman's Hollow Creek) as shown on the attached map defined in condition 1 are to be constructed so that they achieve a maximum clearance impact of 35m for the entire length where they cross this important corridor. Where the construction of stormwater detention/retention basins that are part of these crossings can not be restricted to the 35 metre clearance width, they are permitted to be constructed within the 7B lands in accordance with those matters identified in point 6, but should be designed and constructed so as to achieve the minimum impact possible. These areas should be fenced on both sides to include all work prior to the commencement of construction to avoid disturbing adjoining vegetated areas, particularly any lands zoned 7(b) or 8(a). The crossings should be designed in such a way as to minimise impacts on fauna movement and water flow along the creek corridor. Where required, dedicated fauna underpasses and overpasses should be installed to facilitate movement of terrestrial and arboreal fauna along the creek corridor at these crossings and reduce the potential for road kill. Once these crossings have been constructed, any cleared areas in excess of the safe operating requirements for the road, such as batters, should be revegetated.
 - (b) The direct and indirect impacts of changes to water quality and water flows on Green-thighed Frog habitat need to be addressed in detail at the design, construction and operational phases of development including roadworks. This will involve the study and investigation, adoption and implementation of a set of best practice stormwater control measures to ensure that any surface runoff from development sites is contained, treated and released so that it does not significantly alter natural nutrient, pH and sediment levels, as well as in-stream or over-bank flow patterns.
 - (c) A bushfire risk map of the HEZ should be prepared which highlights areas of high bushfire hazard across the site. Once these areas have been identified, appropriate bushfire mitigation measures should be put in place. These measures should be contained within the 4(h), 1(a) and 5(a) lands where practicable and should not impact on the 7(b) lands or identified conservation areas within the 4(h) lands. Such impacts can be avoided by:
 - configuring development of the 4(h), 1(a) and 5(a) lands so that internal roads, car parks and any open space areas are incorporated within Asset Protection and Strategic Fire Advantage Zones wherever practicable; and
 - utilising clearing associated with existing infrastructure, such as powerline or railway easements, to provide bushfire protection for adjacent developable lands.
- This should reduce the need to clear vegetation and enhance fauna movement across the site.
- (d) The 4(h) lands support a number of mature trees (>50cm dbh) which represent important roosting, breeding and foraging habitat for threatened species known to use the HEZ site such as the Swift Parrot, Regent Honeyeater and Brown Treecreeper. Wherever practicable, mature trees within the 4(h) lands should be retained and protected from development by incorporating them within landscaped areas or Asset Protection Zones; and maintaining a vegetative buffer around them. Additional plantings of tree species which provide important foraging habitat for threatened species at the HEZ, such as Spotted Gum, Forest Red Gum and Grey Gum, should be undertaken as part of the landscaping program for the site (see below).

- (e) Proposed conservation areas on 4(h) lands should be protected from the indirect impacts of adjacent development (noise, lighting, overshadowing and dust) through the use of appropriate fencing, vegetative buffers and/or planted screens, as well as perimeter roads and car parks. The vegetation should also be actively managed in accordance with an approved and adopted HEZ Management Plan (as per condition 4 above) to control weed infestation, inappropriate access, frequent fire, erosion, rubbish dumping and encourage natural regeneration. Any landscaping should use locally indigenous plants only and compliment the existing natural vegetation.
6. The following range of activities on the 7(b) lands are covered by this assumed concurrence provided that they are consistent with the objectives and the permissible uses for the 7(b) Environment Protection (Conservation) Zone outlined in the Cessnock LEP (Amendment 60) and the conditions described in this letter. In particular, these activities will need to be consistent with the completed EMS for the HEZ to ensure that both direct and indirect impacts on threatened species and their habitat are minimised.
- roads which cross the 7(b) lands and are part of the internal road network (as shown on the attached map);
 - stormwater detention/retention basins associated with the internal road network (as above);
 - cycle ways associated with the internal road network (as above);
 - the upgrade of existing easements to create service corridors for the installation of utilities such as water, electricity, sewer and gas;
 - environmental education facilities and associated low impact activities such as walking trails and signage;
 - environment protection works which are undertaken in accordance with the EMS for these lands; and
 - use of these lands by Aboriginal people who have the consent of the owners to gather traditional food for ceremonial, cultural or educational purposes, but not for commercial purposes.

Any other activities proposed within the 7(b) zone which are likely to impact on threatened species or their habitat are excluded from this assumed concurrence and will need to be assessed in accordance with the *Environmental Planning & Assessment Act* and the *TSC Act*.

Table 1: HEZ Assumed Concurrence: Deferred Conservation Areas

Parcel	Size	Ownership	Reason
1	17.84 ha	HEZ	Key Threatened Species Further Protected: <i>Callistemon linearifolius</i>, <i>Eucalyptus glaucina</i>, Green-thighed Frog and threatened species reliant on mature trees such as Yellow-bellied Glider and Swift Parrot Endangered Ecological Communities Further Protected: Hunter Lowland Redgum Forest Other: Protection of high quality habitat in the form of mature, hollow-bearing trees; buffering of development impacts on conservation areas, enlargement of key wildlife corridor along Chinamans Hollow Creek
2	19.75 ha	Crown	Key Threatened Species Further Protected: Improves outcome for a large population of <i>Rutidosia heterogama</i> and protects habitat for Black-chinned Honeyeater; Swift Parrot, Regent Honeyeater and other threatened species reliant on mature, hollow-bearing trees such as Yellow-bellied Glider and Powerful Owl. Also buffers high quality Green-thighed Frog habitat and protects <i>Eucalyptus glaucina</i> habitat. Endangered Ecological Communities Further Protected: Hunter Lowland Redgum Forest Other: Protection of high quality habitat in the form of mature, hollow-bearing trees; buffering of development impacts on adjacent habitat protection area along Chinamans Hollow Creek.
3	13.28 ha	Crown	Key Threatened Species Further Protected: Improves outcome for Green-thighed Frog as well as Swift Parrot, Regent Honeyeater and other species reliant on mature, hollow-bearing trees. Protects additional habitat for <i>Grevillea parviflora</i> subsp. <i>parviflora</i> and Glossy Black Cockatoo. Endangered Ecological Communities Further Protected: Lower Hunter Spotted Gum-Ironbark Forest Other: Better protection of high quality habitat in the form of mature, hollow-bearing trees, as well as the creekline(s) flowing into the wetlands at the eastern end of the site and the complex of new stringybark species.
4	15.63 ha	Crown	Key Threatened Species Further Protected: Improves outcome for the large population of <i>Rutidosia heterogama</i> and protects further Green-thighed Frog habitat as well as habitat for <i>Eucalyptus glaucina</i>. Protects additional habitat for Grey-crowned Babbler and Glossy Black Cockatoo. Endangered Ecological Communities Further Protected: Hunter Lowland Redgum Forest Other: Better protection of high quality habitat in the form of mature, hollow-bearing trees; provides a wildlife corridor between parcels of 7(b) land; and protects the creekline flowing west into Chinaman's Hollow Creek.
5	5.42 ha	HEZ	Key Threatened Species Further Protected: Protects a very large stand of <i>Callistemon linearifolius</i> (over 500 individuals) as well as <i>Grevillea parviflora</i> subsp. <i>parviflora</i> and Green-thighed Frog habitat. Endangered Ecological Communities Further Protected: Lower Hunter Spotted Gum-Ironbark

			Forest Other: Protects mature hollow-bearing trees which provide potential foraging and roosting habitat for threatened species such as Yellow-bellied Glider and Koala... Provides protection for the creekline flowing west into Chinamans Hollow Creek.
6	4.75 ha	HEZ	Key Threatened Species Further Protected: Protects a very large stand of <i>Callistemon linearifolius</i> (over 800 individuals). Endangered Ecological Communities Further Protected: Lower Hunter Spotted Gum-Ironbark Forest Other: Improves protection for species reliant on mature, hollow-bearing trees.
7	4.88 ha	HEZ	Key Threatened Species Further Protected: Improves protection for a significant population of <i>Acacia bynoeana</i> (>130 individuals) as well as <i>Grevillea parviflora</i> subsp. <i>parviflora</i> Endangered Ecological Communities Further Protected: Kurri Sand Swamp Woodland Other: Protects a good representative patch of the Kurri Sand Swamp Woodland community.
8	6.75 ha	Crown/ Mindaribba	Key Threatened Species Further Protected: Better protects Green-thighed Frog habitat as well as <i>Grevillea parviflora</i> subsp. <i>parviflora</i> Endangered Ecological Communities Further Protected: Kurri Sand Swamp Woodland Other: Improves protection for species reliant on hollow-bearing trees

Proposed rezoning of 7(b) lands to 4(h)

9	14.1 ha	Crown
10	21.4 ha	Crown

Additional conservation areas

88.33 ha

Proposed amendments to 7(b) lands

35.5 ha

Total additional conservation areas

52.83 ha

Note: Any development of these additional conservation areas is deferred until such time as the DEC is satisfied that suitable alternative lands supporting equivalent threatened species values in the vicinity of the HEZ have been secured and will be actively managed for conservation.